

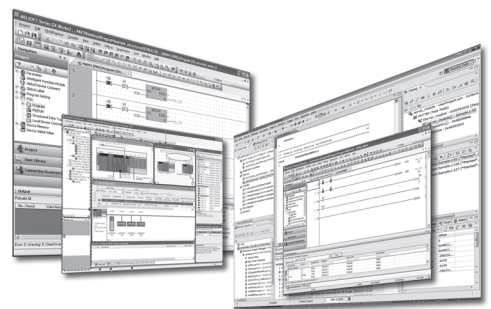


MELSOFT

Engineering Software

PX Developer Version 1 Operating Manual (Programming Tool)

-SW1D5C-FBDQ-E



● SAFETY PRECAUTIONS ●

(Always read these instructions before using this product.)

Before using this product, thoroughly read this manual and the relevant manuals introduced in this manual and pay careful attention to safety and handle the products properly.

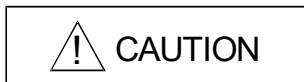
The precautions given in this manual are concerned with this product only. For the safety precautions for the programmable controller system, refer to the user's manual for the module used and MELSEC iQ-R Module Configuration Manual.

The precautions given in this manual are concerned with this product. For the safety precautions of the programmable controller system, refer to the User's Manual for the CPU module.

In this manual, the safety precautions are ranked as "⚠WARNING" and "⚠⚠CAUTION".



Indicates that incorrect handling may cause hazardous conditions, resulting in death or severe injury.



Indicates that incorrect handling may cause hazardous conditions, resulting in minor or moderate injury or property damage.

Note that the ⚠ CAUTION level may lead to serious consequences according to the circumstances. Always follow the precautions of both levels because they are important for personal safety.

Please save this manual to make it accessible when required and always forward it to the end user.

[Security Precautions]

⚠ WARNING

- To maintain the security (confidentiality, integrity, and availability) of the programmable controller and the system against unauthorized access, denial-of-service (DoS) attacks, computer viruses, and other cyberattacks from external devices via the network, take appropriate measures such as firewalls, virtual private networks (VPNs), and antivirus solutions.

[Startup/Maintenance Precautions]

⚠ CAUTION

- The online operations have to be executed after the manual has been carefully read and the safety has been ensured.
Failure to do so may cause a miss operation which results in machine damage or an accident.

● CONDITIONS OF USE FOR THE PRODUCT ●

- (1) MELSEC programmable controller ("the PRODUCT") shall be used in conditions;
- i) where any problem, fault or failure occurring in the PRODUCT, if any, shall not lead to any major or serious accident; and
 - ii) where the backup and fail-safe function are systematically or automatically provided outside of the PRODUCT for the case of any problem, fault or failure occurring in the PRODUCT.

- (2) The PRODUCT has been designed and manufactured for the purpose of being used in general industries.

MITSUBISHI ELECTRIC SHALL HAVE NO RESPONSIBILITY OR LIABILITY (INCLUDING, BUT NOT LIMITED TO ANY AND ALL RESPONSIBILITY OR LIABILITY BASED ON CONTRACT, WARRANTY, TORT, PRODUCT LIABILITY) FOR ANY INJURY OR DEATH TO PERSONS OR LOSS OR DAMAGE TO PROPERTY CAUSED BY the PRODUCT THAT ARE OPERATED OR USED IN APPLICATION NOT INTENDED OR EXCLUDED BY INSTRUCTIONS, PRECAUTIONS, OR WARNING CONTAINED IN MITSUBISHI ELECTRIC USER'S, INSTRUCTION AND/OR SAFETY MANUALS, TECHNICAL BULLETINS AND GUIDELINES FOR the PRODUCT.

("Prohibited Application")

Prohibited Applications include, but not limited to, the use of the PRODUCT in;

- Nuclear Power Plants and any other power plants operated by Power companies, and/or any other cases in which the public could be affected if any problem or fault occurs in the PRODUCT.
- Railway companies or Public service purposes, and/or any other cases in which establishment of a special quality assurance system is required by the Purchaser or End User.
- Aircraft or Aerospace, Medical applications, Train equipment, transport equipment such as Elevator and Escalator, Incineration and Fuel devices, Vehicles, Manned transportation, Equipment for Recreation and Amusement, and Safety devices, handling of Nuclear or Hazardous Materials or Chemicals, Mining and Drilling, and/or other applications where there is a significant risk of injury to the public or property.

Notwithstanding the above restrictions, Mitsubishi Electric may in its sole discretion, authorize use of the PRODUCT in one or more of the Prohibited Applications, provided that the usage of the PRODUCT is limited only for the specific applications agreed to by Mitsubishi Electric and provided further that no special quality assurance or fail-safe, redundant or other safety features which exceed the general specifications of the PRODUCTS are required. For details, please contact the Mitsubishi Electric representative in your region.

- (3) Mitsubishi Electric shall have no responsibility or liability for any problems involving programmable controller trouble and system trouble caused by DoS attacks, unauthorized access, computer viruses, and other cyberattacks.

REVISIONS

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

Print date	*Manual number	Revision
Dec., 2002	SH (NA)-080369E-A	First edition
Apr., 2003	SH (NA)-080369E-B	Correction Section 6.14, Section 7.12.1
Oct., 2003	SH (NA)-080369E-C	Addition Section 5.6.8, Section 5.7.7, Section 6.9.2, Section 7.7.3, Section 7.14.3, Chapter 10, Section 13.2.3, Section 15.5.7, Appendix 3.2 Correction Section 1.2, Section 2.1.3, Section 2.1.4, Section 2.2, Section 3.1, Section 3.2, Section 3.3, Section 5.1, Section 5.5, Section 5.6.3, Section 5.7.1, Section 6.9, Section 6.14, Section 7.2.4, Section 7.3.1, Section 7.5.1, Section 7.7, Section 7.7.2, Section 7.10.1, Section 7.10.2, Section 7.12.1, Section 7.14.1, Section 7.14.2, Section 8.2.2, Section 8.3, Chapter 13, Section 15.3, Appendix 3 Section 6.9 changed to Section 6.9.1 Section 7.7.2 and Section 7.7.3 integrated Chapter 10 to 14 changed to Chapter 11 to 15
Jun., 2004	SH (NA)-080369E-D	Model Addition Q12PRHCPU, Q25PRHCPU Addition Section 11.5 Correction GENERIC TERMS, ABBREVIATIONS, AND TERMS, Section 1.1 to 1.2, Section 2.1 to 2.2, Section 4.1, Section 5.3, Section 5.5, Section 5.7.4 to 5.7.5, Section 5.8.1, Section 5.10, Section 6.2 to 6.3, Section 6.12, Section 6.14, Section 7.4.3, Section 7.5.4, Section 7.6.1, Section 7.6.3, Section 7.14.1 to 7.14.2, Section 8.2.2, Section 8.3, Section 10.1.4 to 10.1.5, Section 11.2 to 11.4, Section 11.6 to 11.7, Section 12.1 to 12.3, Section 13.3, Section 13.8, Section 14.1, Section 15.5, Appendix 2 to 3
Feb., 2005	SH (NA)-080369E-E	Addition Section 10.2, Section 12.1, Section 12.2, Section 12.4.1, Section 12.4.2, Section 12.4.3, Section 12.5, Section 12.6, Section 13.6.1, Appendix 4 Correction Section 2.2, Section 3.2, Section 3.3, Section 5.3, Section 5.5, Section 5.6, Section 5.7.4, Section 7.5.1, Section 7.5.4, Section 7.5.5, Section 10.2.1, Section 10.2.2, Section 11.4, Section 11.7, Section 13.1, Section 13.2.1, Section 13.3, Section 13.6, Appendix 3, Section 12.1 changed to Section 12.3 Section 12.2 changed to Section 12.4 Section 12.3 changed to Section 12.7 Section 13.6 changed to Section 13.6.2

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Feb., 2006	SH (NA)-080369E-F	<p>Addition</p> <p>Section 6.15, Section 10.2.3</p> <p>Correction</p> <p>Section 1.1, Section 2.1.2, Section 2.1.3, Section 2.1.4, Section 2.2, Section 3.2, Section 3.3, Section 5.5, Section 5.7.2, Section 6.3, Section 6.8, Section 6.15.1, Section 7.1, Section 7.5.1, Section 7.6.1, Section 8.4.3, Section 9.1, Section 10.1.6, Section 10.2.1, Section 10.2.2, Section 12.3, Section 13.5, Section 13.6, Section 13.8, Appendix 2, Appendix 3, Appendix 4</p>
Mar., 2007	SH(NA)-080369E-G	<p>Addition</p> <p>Section 8.2.3</p> <p>Correction</p> <p>GENERIC TERMS, ABBREVIATIONS, AND TERMS, Section 2.1.2, Section 2.1.3, Section 2.1.4, Section 2.2, Section 3.2, Section 3.3, Section 5.1, Section 5.5, Section 5.6.2, Section 5.7.4, Section 5.8.1, Section 6.14, Section 6.15.7, Section 7.3.1, Section 7.4.1, Section 7.5.1, Section 7.6.1, Section 7.7.1, Section 7.8.1, Section 7.12.3, Section 8.3, Section 11.4, Section 12.3, Section 12.4.2, Section 12.4.3, Section 13.8.1, Chapter 15, Section 15.5.3, Appendix 2, Appendix 3, Appendix 4.1, Appendix 4.2, INDEX Section 10.2.1 to 10.2.3 are summarized in Section 10.2.</p>
Jun., 2008	SH(NA)-080369E-H	<p>Model Addition</p> <p>Q02PHCPU, Q06PHCPU</p> <p>Correction</p> <p>MANUALS, GENERIC TERMS, ABBREVIATIONS, AND TERMS, Section 1.1, Section 2.1.1, Section 2.1.2, Section 2.1.4, Section 2.2, Section 5.1, Section 5.3, Section 5.10, Section 6.2, Section 6.14, Section 6.16, Section 7.12.2, Section 8.3, Section 8.4.2, Section 11.7, Section 12.1, Section 12.3, Section 12.4.3, Section 12.5.2, Section 13.5, Section 13.8.1, Section 15.5.2, Appendix 3, Appendix 4.1</p>
Jan., 2009	SH(NA)-080369E-I	<p>Addition</p> <p>Appendix 5</p> <p>Correction</p> <p>Section 1.1, Section 2.2, Section 5.1, Section 5.7.2, Section 6.2, Section 6.14, Section 8.3, Section 8.4.2, Section 8.4.3, Section 11.4, Section 11.6.2, Section 12.1, Section 12.2, Section 12.4, Section 12.4.2, Section 12.4.3, Section 12.5.1, Section 12.5.2, Section 13.6.1, Section 15.5.1 to 15.5.3, Appendix 2, Appendix 3, Appendix 4.1, Appendix 4.2</p>

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Dec., 2009	SH (NA)-080369E-J	<p>Addition</p> <p>CONDITIONS OF USE FOR THE PRODUCT, Section 7.5.6, Section 8.3.3, Appendix 4.3, Appendix 4.7</p> <p>Correction</p> <p>SAFETY PRECAUTIONS, Section 3.3, Section 5.1, Section 5.5, Section 5.7.3, Section 5.7.4, Section 5.11, Section 6.14, Section 7.2.1, Section 7.5.1, Section 7.10.1 to 7.10.3, Section 8.3, Section 8.4.3, Section 10.1.3, Section 10.1.4, Section 13.5, Section 15.5.2, Section 15.5.5, Appendix 2, Appendix 3, Appendix 4.1, Appendix 4.2</p> <p>Section 5.11 to 5.11.1 are summarized in Section 5.11</p> <p>Appendix 4.3 to 4.5 changed to Appendix 4.4 to 4.6</p>
Dec., 2010	SH (NA)-080369E-K	<p>Addition</p> <p>Section 5.6.9, Section 5.7.8, Section 7.7 to 7.7.5, Chapter 15</p> <p>Correction</p> <p>MANUALS, MANUAL ORGANIZATION, GENERIC TERMS, ABBREVIATIONS, AND TERMS, Section 1.2, Section 2.1.4, Section 2.2, Section 3.1 to 3.3, Section 5.1, Section 5.3, Section 5.5, Section 5.6.1, Section 5.6.6, Section 5.6.8, Section 5.7, Section 5.7.1, Section 5.7.3, Section 5.7.4, Section 5.10, Chapter 7, Section 7.2.1, Section 7.3.1, Section 7.3.3 to 7.3.5, Section 7.5.1, Section 7.5.3, Section 7.6, Section 7.6.1, Section 7.6.3, Section 7.11.1, Section 7.11.2, Section 7.12.2, Section 7.15.2, Section 8.2.2, Section 8.4.3, Section 8.4.4, Section 10.1.3 to 10.1.5, Section 11.4, Section 11.7, Section 12.4.1, Section 12.4.2, Section 12.5.2, Section 13.2.1, Section 13.6.2, Section 16.5.5, Appendix 1, Appendix 2, Appendix 3, Appendix 4.1 to 4.3</p> <p>Section 7.7 to 7.14.3 changed to Section 7.8 to 7.15.3</p> <p>Chapter 15 changed to Chapter 16</p>
Oct., 2011	SH (NA)-080369E-L	<p>Addition</p> <p>Section 7.2.1, Section 7.2.3, Section 7.3.6, Section 15.2 to 15.2.5</p> <p>Correction</p> <p>HOW TO USE THIS MANUAL, Section 1.2, Section 2.2, Section 3.2, Section 3.3, Section 5.1, Section 5.3, Section 5.5, Section 5.6.9, Section 5.7.3, Section 5.7.4, Section 6.14, Section 6.15.7, Section 6.15.8, Section 7.2.2, Section 7.2.6, Section 7.3.1 to Section 7.3.3, Section 7.4.1, Section 7.4.3, Section 7.5.1, Section 7.5.3, Section 7.6.1, Section 7.7.1, Section 7.7.3, Section 7.8.1, Section 7.9.1, Section 7.9.3, Section 7.11.3, Section 7.11.4, Section 8.4.3, Section 13.1.3, Section 13.6, Section 15.1.1, Section 15.1.2, Appendix 2, Appendix 3, Appendix 4.1, Appendix 4.2</p> <p>Section 7.2.1 changed to Section 7.2.2</p> <p>Section 7.2.2 to 7.2.5 changed to Section 7.2.4 to 7.2.7</p>

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Feb., 2014	SH (NA)-080369E-M	<p>Addition</p> <p>Section 6.3.1, Section 6.17, Appendix 4.8</p> <p>Correction</p> <p>MANUAL ORGANIZATION, GENERIC TERMS, ABBREVIATIONS, AND TERMS, Section 1.1, Section 1.2, Section 2.1.2 to 2.2, Section 3.2, Section 3.3, Section 4.1, Section 5.3, Section 5.5, Section 5.6.5, Section 5.6.9, Section 5.7.2, Section 5.7.4, Section 5.10, Section 5.11, Section 6.1 to 6.3, Section 6.13, Section 6.14, Section 6.15.4, Section 6.15.8, Section 6.16, Section 7.10.6, Section 7.11.3, Section 7.13.2, Section 7.13.3, Section 7.15.1 to 7.15.3, Section 8.2.2, Section 8.3, Section 8.4.2, Section 8.4.3, Section 8.5 to 8.5.2, Section 10.1.4, Section 10.1.5, Section 11.2 to 11.5, Section 11.6.2 to 11.7, Section 12.1 to 12.4.3, Section 12.5.1 to 12.6, Section 12.7.1 to 12.7.3, Section 13.2.1, Section 13.7, Section 13.8.1, Section 13.8.2, Section 14.1 Section 15.1 to 15.2.1, Section 15.2.3, Section 15.2.4, Section 16.2, Section 16.3, Section 16.5.1, Section 16.5.3, Section 16.5.5, Appendix 3 to 4.2, Appendix 4.4 to 4.6, Appendix 5</p>
Jul., 2015	SH (NA)-080369E-N	<p>Correction</p> <p>GENERIC TERMS, ABBREVIATIONS, AND TERMS, Section 2.1.4, Section 2.2, Section 4.1, Section 7.4.3, Appendix 3, Appendix 5</p>
Jan., 2017	SH (NA)-080369E-O	<p>Correction</p> <p>GENERIC TERMS, ABBREVIATIONS, AND TERMS, Section 2.1.4, Section 2.2, Section 4.1, Appendix 3</p>
Apr., 2018	SH (NA)-080369E-P	<p>Correction</p> <p>GENERIC TERMS, ABBREVIATIONS, AND TERMS, Section 1.2, Section 2.1.1, Section 2.1.2, Section 2.1.4, Section 2.2, Section 2.2.1, Section 2.2.2, Appendix 3</p>
Oct., 2018	SH (NA)-080369E-Q	<p>Correction</p> <p>Section 2.2.2</p>
Apr., 2019	SH (NA)-080369E-R	<p>Model Addition</p> <p>Q04UDPVCPU, Q06UDPVCPU, Q13UDPVCPU, Q26UDPVCPU</p> <p>Addition</p> <p>Appendix 4.9</p> <p>Correction</p> <p>GENERIC TERMS, ABBREVIATIONS, AND TERMS, Section 1.1, Section 2.1.1, Section 2.1.2, Section 2.1.4, Section 2.2.2, Section 5.10, Section 6.2, Section 6.3, Section 6.14, Section 6.16, Section 7.3.3, Section 7.13.2, Section 7.15.1, Section 7.15.2, Section 8.2.2, Section 11.2, Section 11.4, Section 11.7, Section 12.3, Section 12.4.1 to Section 12.4.3, Section 15.1.1, Appendix 3</p>

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Apr., 2020	SH (NA)-080369E-S	Correction Section 2.2, Section 2.2.1, Section 2.2.2
Apr., 2021	SH (NA)-080369E-T	Correction SAFETY PRECAUTIONS, CONDITIONS OF USE FOR THE PRODUCT, Section 2.2
Oct., 2021	SH (NA)-080369E-U	Correction Section 2.2.1, Section 4.1
Apr., 2022	SH (NA)-080369E-V	Addition COPYRIGHTS Correction GENERIC TERMS, ABBREVIATIONS, AND TERMS, Section 2.2, Section 2.2.1, Section 2.2.2, Appendix 3
Apr., 2024	SH (NA)-080369E-W	Correction GENERIC TERMS, ABBREVIATIONS, AND TERMS, Section 2.1.2, Section 2.2, Section 2.2.1, Appendix 3

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INTRODUCTION

Thank you for purchasing the engineering software, MELSOFT series.

Read this manual and make sure you understand the functions and performance of MELSOFT series thoroughly in advance to ensure correct use.

Note that the menu names and operating procedures may differ depending on an operating system in use and its version. When reading this manual, replace the names and procedures with the applicable ones as necessary.

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MANUALS

The following manuals are also related to this product.
Refer to the following table for ordering a manual.


Related manuals


Manual name	Manual number (model code)
PX Developer Version 1 Operating Manual (Programming Tool) FBD language programming, compilation, online operations, and debug methods with PX Developer (this manual) (Sold separately.)	SH-080369E (13JU38)
PX Developer Version 1 Operating Manual (Monitor Tool) Operation methods of the monitor tool and methods for monitoring and controlling DDC processing with tag FB (Sold separately.)	SH-080370E (13JU39)
PX Developer Version 1 Programming Manual Details of programming with PX Developer, lists of FB parts, and the PID instructions (Sold separately.)	SH-080371E (13JW00)
PX Developer Version 1 Operating Manual (GOT Screen Generator) Generation procedure for GOT screen project and details about generated screen (Sold separately.)	SH-080772ENG (13JU61)
PX Developer Version 1 Operating Manual (InTouch Interaction) Interaction between PX Developer monitor tool and SCADA software. (InTouch) (Sold separately.)	SH-080773ENG (13JU62)
PX Developer Version 1 Operating Manual (JoyWatcherSuite Interaction) Interaction between PX Developer monitor tool and SCADA software (JoyWatcherSuite) (Sold separately.)	SH-080976ENG (13JU70)

CAUTION

- Please note that we do not guarantee commercially available software compatible with Microsoft® Windows® Operating System introduced in this manual.
- The software copyright of this product belongs to Mitsubishi Electric Corporation.
- No contents in this manual can be reproduced or duplicated in any form or by any means without permission.
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HOW TO USE THIS MANUAL


 **PURPOSE**
Describes the purpose of operations for each chapter or section.


 **BASIC OPERATION**
Describes the operations to set the intended settings.


8.5.2 Assigning/Editing a GX label


(1) GX label assignment

 **PURPOSE**
Set GX label assignment name to global variable of programming tool.

 **BASIC OPERATION**
1. Refer to Section 8.5.1 to display GX label assignment window.
2. Input data in the sections of the window.


 **DISPLAY/SETTING SCREEN**




 **DISPLAY/SETTING DATA**

Item	Description
No.	Indicate a row number. Up to No.5000 can be defined. When error occurs in input data, icon (⊗ or ⊕) will be displayed on error.
GX Works2 Global Label *1	Display/set global label name in GX project. Select cell and input label name to edit global label name. When GX project type is GX Works2 project, input label name within 32 characters, as for GX Developer project, input label name within 16 characters.
PX Developer Global Variable Name	Display/set global variable name of programming tool. 1. Select cell of PX Developer global variable name and click "..." to edit PX Developer global variable name. 2. The "Variable Reference" dialog box (☞ Section 7.11.3) is displayed. ← 3. Select global parts and click the "OK" button. Global variable name can also be set by inputting directly. As shown in the above window, when setting module FB, tag FB and structure type variable, reference operator (☞ Section 7.3.4), reference public variable or member should be applied in it. The settable variable types are global variable, module FB and tag FB.
Comment	Display/set the comments of GX global label. Edit comment by selecting cell and inputting directly. The set comments will be reflected in comments of GX global label. Comment should be input within 64 characters.

*1: When GX project type is GX Developer project, "GX Developer Global Label" is displayed.

 **DISPLAY/SETTING SCREEN**
Describes the screen display procedure.

Reference location
 leads to the reference location.

 **DISPLAY/SETTING DATA**
Describes the display contents on the screen.

There are also the following types of explanations.



HELPFUL OPERATION

Explains the practical operation under the condition that the *BASIC OPERATION* or *DISPLAY/SETTING DATA* is not applicable although the purpose is in conformity.





HELPFUL CORRECTIVE ACTIONS

Explains the processing methods for executing operations abnormally according to "*BASIC OPERATION*" or "*DISPLAY/SETTING DATA*".

POINT	
--------------	--

Informs items to be noted and useful functions relevant to the contents in the chapter or section.

The following table explains symbols in this manual and their description.

Symbol	Description
[]	Expresses the menu names in the menu. [] → [] expresses the drop-down menu. Example: [Project] → [New Project] menu [Online] → [Monitor] → [Start Monitor] menu
()	Expresses the tool buttons of the toolbar corresponding to the drop-down menu. Examples: [Project] → [Save] menu () [Online] → [Monitor] → [Start Monitor] menu ()
" "	Expresses a command button. Example: "OK" button
<< >>	Expresses dialog box tab. Example: <<Change Password>> tab

MANUAL ORGANIZATION

This manual consists of 16 chapters and appendices.

This manual is organized assuming that PX Developer is used and executed according to following sequence from DDC processing of CPU module system programming to running.

<Operating procedures before running the process control system>

Operating procedure 1: Setting and wiring of the process control system	Reference
<ul style="list-style-type: none"> ● Setting and wiring between PLC (CPU module, network module and I/O module, etc.) and process-control device as well as other external device setting.*1 	QCPU User's Manual (Hardware Design, Maintenance and Inspection) Qn(H)/QnPH/QnPRHCPU User's Manual (Function Explanation, Program Fundamentals) QnUCPU User's Manual (Function Explanation, Program Fundamentals)

*1: The parameter settings necessary to use the network module and intelligent function module should be made in advance using GX application, GX Configurator, etc.



Operating procedure 2: Confirm the basis of programming by FBD language in PX Developer programming tool.	Reference
<ul style="list-style-type: none"> ● Confirm the usable FBD parts and their functions in programming tool. 	PX Developer Version 1 Programming Manual



Operating procedure 3: Install PX Developer.	Reference
<ul style="list-style-type: none"> ● Confirm the usable system for PX Developer. 	Chapter 2
<ul style="list-style-type: none"> ● Install PX Developer on a personal computer. 	Method of installing the PX Developer (Included with the product)



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Operating procedure 4: Make a project and program with PX Developer programming tool.	Reference
● Start the programming tool.	Chapter 4
● Learn the screen configuration and basic operations of the programming tool.	Chapter 5
● Make a PX Developer project.	Chapter 6
● Start GX application from PX Developer (☰ Section 7.15.1) and configure GX project (PLC parameters or network parameters).	GX Developer Version 8 Operating Manual GX Works2 Version 1 Operating Manual (Common)
● Set PX Developer project parameters.	Chapter 6
● Program in programming tool and in FBD language. Make the ladder program by GX application when necessary.	Chapter 7 to Chapter 9
● Set the execution conditions of the program.	Section 7.13



Operating procedure 5: Convert (compile) and execute the finished programs.	Reference
● Convert (compile) the FBD program with the programming tool.	Chapter 11



Operating procedure 6: Execute the program with Simulator confirm the online operation and program operation by programming tool.	Reference
● Start Simulator in the programming tool.	Section 15.1
● Switch the programming tool to MONITOR mode, then start monitoring. ● Change the current value of the variable according to needs. Pause FB and confirm the program operation. ● Edit the program, compilation, download to PLC/compile (online change) if necessary. ● Read FB property current value if necessary.	Chapter 11 to Chapter 13
● Execute the FBD program diagnosing if necessary.	Chapter 14



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Operating procedure 7: Execute the program with CPU module, confirm the online operation and program operation by programming tool.	Reference
<ul style="list-style-type: none"> ● Connect the programming tool with CPU module. ● Specify the destination of PLC connection. ● Write the program compiled by the programming tool in CPU module. ● Write the ladder program and PLC parameters to CPU module when making the ladder program by GX application. 	Chapter 12
<ul style="list-style-type: none"> ● Switch the programming tool to MONITOR mode, then start monitoring. ● Change the current value of the variable according to needs. Pause FB and confirm the program operation. ● Edit the program, compilation, download to PLC/compile (online change) if necessary. ● Read FB property current value if necessary. 	Chapter 11 to Chapter 13
<ul style="list-style-type: none"> ● Execute the FBD program diagnosing if necessary. 	Chapter 14



Operating procedure 8: Monitor the processing being executed on CPU module with PX Developer monitor tool.	Reference
<ul style="list-style-type: none"> ● Start the monitor tool, and change the ENGINEER mode. ● Confirm the screen configuration and basic operations. ● Set the monitor target project *2 and PLC transfer setup on the monitor tool setting screen. ● Set the monitor objects and monitor type. ● Confirm the contents of tag data by monitoring on the faceplate. ● Test operation and tuning. ● Change the monitor tool mode into the operator mode. ● Monitor the processing executed on CPU module. 	PX Developer Version 1 Operating Manual (Monitor Tool)

*2: When PLC download has been performed with the programming tool, reload the monitor target project with the monitor tool.

GENERIC TERMS, ABBREVIATIONS, AND TERMS

The following table shows the generic terms, abbreviations, and terms in this manual.

(1) Generic terms and abbreviations

Generic term/abbreviation	Description
PX Developer	Generic term for PX Developer Version 1 (SW1D5C-FBDQ-E) and PX Developer Monitor Tool (SW1DNC-FBDQMON-E) For PX Developer, Programming Tool and Monitor Tool are installed. For PX Developer Monitor Tool, only Monitor Tool is installed.
GX Works2	Software for system design, programming, debug, and maintenance of a programmable controller
GX Developer	
GX Simulator	Abbreviation for GX Simulator Version 7 (SW7D5C-LLT-E Version 7.27D) or later
GX Simulator2	Abbreviation for GX Works2 simulation function
GX application	Generic term for GX Works2 and GX Developer which are interacted with PX Developer.
GX project	Generic term for GX Works2 project and GX Developer project included in PX Developer project
Simulator	Generic term for GX Simulator2 (GX Works2 simulation function) and GX Simulator
FBD program	Generic term for a program created in FBD language
FBD part	Generic term for parts (FB part, function part, variable part, constant part, comment part, inline ST part, etc.) used by the programming tool
Global part	Generic term for module FB, tag FB, and global variable
Peripheral device	Generic term for the personal computer on which PX Developer can be used
QCPU	Generic term for the MELSEC-Q series CPU modules
Process CPU	Generic term for Q02PHCPU, Q06PHCPU, Q12PHCPU, and Q25PHCPU
QnPHCPU	
Universal model process CPU	Generic term for Q04UDPVCPU, Q06UDPVCPU, Q13UDPVCPU, and Q26UDPVCPU
QnUDPVCPU	
Redundant CPU	Generic term for Q12PRHCPU and Q25PRHCPU
QnPRHCPU	
CPU module	Generic term for the Process CPU, Universal model process CPU, and Redundant CPU
PC CPU module	Abbreviation for MELSEC-Q series-compatible PC CPU module manufactured by CONTEC CO., LTD.
Serial communication module	Generic term for QJ71C24, QJ71C24-R2, QJ71C24N, QJ71C24N-R2, and QJ71C24N-R4
C24	
Redundant type extension base unit	Abbreviation for Q65WRB extension base unit for redundant system
CC-Link IE Controller Network module	Generic term for QJ71GP21-SX and QJ71GP21S-SX
MELSECNET/H module	Generic term for QJ71LP21, QJ71LP21-25, QJ71LP21S-25, QJ71LP21G, and QJ71BR11
Ethernet module	Generic term for QJ71E71-100, QJ71E71-B5, QJ71E71-B2, and QJ71E71
CC-Link module	Generic term for AJ61BT11, A1SJ61BT11, AJ61QBT11, A1SJ61QBT11, QJ61BT11, and QJ61BT11N
G4 module	Abbreviation for AJ65BT-G4(-S3) peripheral connection module
ACPU	Generic term for PLC CPU that can be used with MELSEC-A series
MELSECNET/10 compatible mode	Abbreviation for function and performance-compatible mode so that the MELSECNET/H network system can have upward compatibility to existing MELSECNET/10 network system
CC-Link IE Controller Network board	Abbreviation for CC-Link IE Controller Network interface board
MELSECNET/H board	Abbreviation for MELSECNET/H interface board
MELSECNET/10 board	Abbreviation for MELSECNET/10 interface board
Ethernet board	Generic term for Ethernet PC card and Ethernet interface board supported by Windows
CC-Link board	Generic term for A80BDE-J61BT11, A80BDE-J61BT13, Q81BD-J61BT11, and Q80BD-J61BT11N
Personal computer	Generic term for personal computers on which Windows operates
Programming tool	Abbreviation for PX Developer programming tool
Monitor tool	Abbreviation for PX Developer monitor tool

(2) Terms

Term	Description
DDC	Abbreviation for Direct Digital Control A control of controller functions with a digital device.
FB	Abbreviation for Function Block A block with a specific function used in a program.
FBD	Abbreviation for Function Block Diagram defined in IEC61131-3 Programs are created by connecting variables, constants, and blocks containing specific processing, according to the flow of data signal.
ST	Abbreviation for Structured Text defined in IEC61131-3 Programs are created by writing arithmetic operations and logical operations in text format.
Project	Unit that gathers and manages a series of data necessary for configuration of FBD programs executed by the CPU module
Tag	Identification symbol attached to each DDC processing defined by JIS This can be likened to a tag attached to process control equipment.
Sequence control	Control that processes each control step according to preset order and procedures
Loop control	Control method that repeatedly executes processing of specific parts
Member	Basic data items in structure type data (For details of structure, refer to Chapter 9.)
Tag data	Data that data attached to DDC processing indicated with a tag (process condition data/process status data) is summarized Accessing the tag data can monitor status and set conditions of the relevant DDC.
Tag FB	Function block works as a controller or an indicator containing tag data
Module FB	Function block for inputting/outputting data of analog I/O module, digital I/O module, and high-speed counter module connected to the base unit on which the PLC is mounted or CC-Link field bus
Faceplate	Gauge window on which an indicator such as a controller is displayed in image format Values assigned to tag data are manipulated.
System resource	PLC device required for executing FBD programs, used for automatically assigning variables (This cannot be used in ladder programs.)
Ladder program	Program method designed so that contact sequence can be applied to PLC language Draw two vertical control bus lines and describe a contact between the buses for programming.
Reserved word	Part names (such as VAR) that cannot be used as various element names (variable name, FB variable name, and structure name, etc.) For details of reserved words, refer to Appendix 1.
Cross reference	List that shows where variables are declared and used
Assignment information database	*.mdb' file which is created when compilation is executed in the programming tool This file stores assignment information of variables for storing data such as tag data, global variable and device information of the CPU module.
Operation mode	Mode for determining the operation method of the redundant system The following three modes are available. <ul style="list-style-type: none"> • Backup mode • Separate mode • Debug mode
Backup mode	Mode for normal operation of the redundant system If a failure or an error occurs in the control system, the standby system switches to the control system to continue the control of the redundant system. The operation mode can be switched to the separate mode using GX application.
Separate mode	Mode for maintaining a system (partial modification of a program, replacement of modules mounted on the main base unit) without stopping the control during run of the redundant system. During this mode, different programs can be executed in the control system and standby system. System switching cannot be made in this mode (User switching is possible). The operation mode can be switched to the backup mode using GX application.

Term	Description
Debug mode	Mode for performing a debug using a single system prior to redundant system operation. This permits operations without connecting tracking cables. In this mode, the CPU module is fixed to system A, control system. (Tracking of the redundant system is not performed.) Set/cancel this mode in the redundant parameter setting of GX application.
Operation mode change	Switching of the operation mode for system A and system B using GX application while the redundant system is running. The operation mode can be switched between the backup mode and separate mode.
System A	In a redundant system, to distinguish the two systems that are connected via a tracking cable, one system is referred to as 'A system' and the other system is referred to as 'B system'.
System B	
System switching System switching User switching	Control switching to backup system to continue system control and network communication when a trouble occurs in the system that performs control in the redundant system (when a failure or an error occurs in the power supply system, mounted module, or network). (Switching between control system and standby system to avoid system down) The following two types are available. <ul style="list-style-type: none"> System switching Automatic system switching by the redundant system when a trouble occurs User switching System switching by sequence program/GX application
Control system	A system that performs program operation, system control, and network communication in the redundant system When system A and system B start concurrently in the backup mode, the system A will be the control system. (Concurrent startup: One system starts within three seconds after the other system has started.) When the system A and system B start separately, a system that starts first will be the control system.
Standby system	Backup system to continue system control in case of a failure or an error in the module in the control system in the redundant system (The CPU module in the standby system does not calculate programs.) When system A and system B start concurrently in the backup mode, the system B will be the standby system. (Concurrent startup: One system starts within three seconds after the other system has started.) When the system A and system B start separately, a system that starts later will be the standby system.
Redundant system	This system consists of two basic systems including CPU modules, power supply modules, and network modules. (If module error occurs in one system, the other system continues the system control. Thus, system reliability is improved.) To configure the redundant system, prepare two sets of the systems where the above modules of the same models are mounted on the base unit, and connect the CPU modules with tracking cables.
Redundant parameter	Parameter for setting operation mode of Redundant CPU system and tracking transfer setting data (tracking setting) Use GX application to set the parameter.

1 OVERVIEW

1.1 Overview

This manual explains the functions and operations of PX Developer Programming Tool. As for monitor tool, refer to "PX Developer Version 1 Operating Manual (Monitor Tool)".

This programming tool has the following functions:

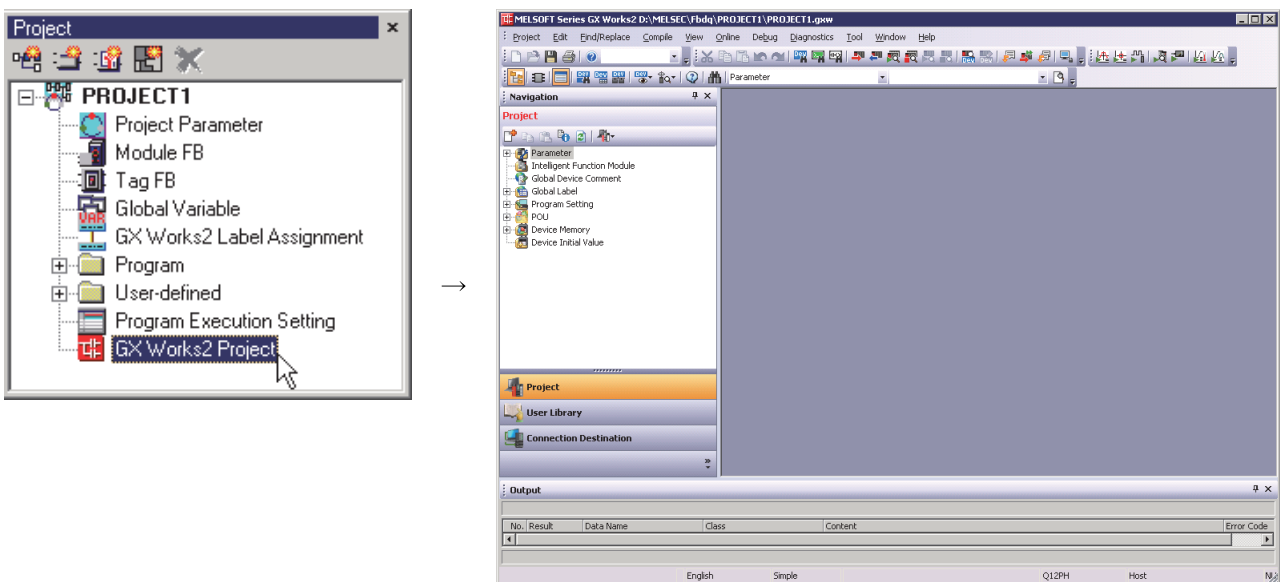
- Create and edit FBD programs in accordance with the IEC61131-3 International Standard
- Compile from FBD program to ladder program
- Monitor the programs (ladder programs converted from FBD language) executed on CPU module

Following are the communication routes applicable for this programming tool:

- Serial/USB
- Ethernet
- MELSECNET/10 (it is necessary to set Process CPU as MELSECNET/10 compatibility mode. Inapplicable to Universal model process CPU and Redundant CPU, as the device is incompatible.)
- MELSECNET/H
- CC-Link IE Controller Network
- CC-Link

GX application (GX Works2/GX Developer) is required to run the PX Developer programming tool.

Note that the combination of GX application and PX Developer varies with the PLC type, used function or network configuration. For details, refer to Section 2.2.2.



GX Works2 starts!

The programming tool has the following modes:

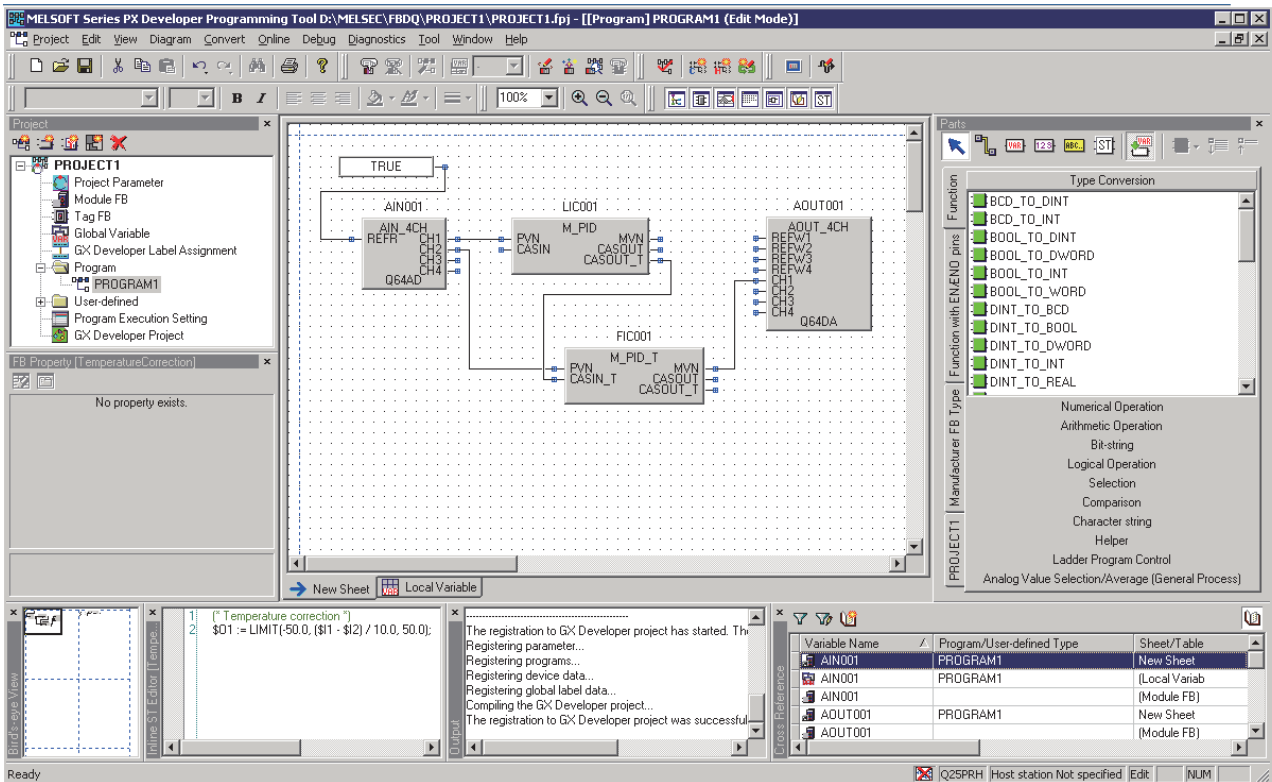
- Edit mode
- Monitor mode

1.2 Features

1

- (1) Easy programming only by arranging and connecting FB

It is very complex and troublesome to describe DDC processing in the ladder program, but it is possible to make a visually understandable program by the programming tool with FBD language in accordance with the IEC61131-3 International Standard. Thus the time and cost of programming can be saved, and the starting period of process control system can be shortened.



- (2) Cooperation with ladder program

In a batch processing system that integrates sequence and loop control, a ladder program for the sequence control can coexist with an FBD program that can simply describe the loop control in a single CPU module.

- (3) **Shorten DDC processing time by supplying tag FB**
Due to the applicable loop processing FB (tag FB) integrating process control dedicated instruction for CPU module and tag data have been provided, the creation time of DDC processing can be shortened.
- (4) **Shorten the man-hours for program access by providing FB for modules access processing**
It is unnecessary to make a ladder program for input/output access because FB (module FB) has provided for the access of Q series I/O modules and analog modules in CPU module.
- (5) **Automatically assign device No. (Physical address)**
FBD program can be created without considering PLC device.
Moreover, the boring device assignment task can be saved through automatic assignment of PLC devices in FBD program.
- (6) **Easily confirm the influence on other processing when modifying FBD program modifications**
As the programming tool provides "Cross reference function" that displays a list of variables used in FBD programs, the influence on other processing can easily be confirmed by tracing the relevant variables in the list, when modifying FBD programs. Furthermore, it includes the filter display function that displays a list of the variables used in specific programs.
These features help to reduce the man-hours for FBD program modification.
- (7) **Application to Redundant CPU**
Programs can be created for the redundant system.
By changing the PLC type, projects for Process CPU module can be used as Redundant CPU programs.
- (8) **Offline debugging**
Offline debugging is possible with the simulation function.
This enables debugging of the created loop control FBD programs without connecting a CPU module.
The input/output of loop control can also be simulated with the I/O simulation function.

2 SYSTEM CONFIGURATION

2.1 System Configuration

This chapter explains the system configuration of PX Developer programming tool and the peripheral devices.

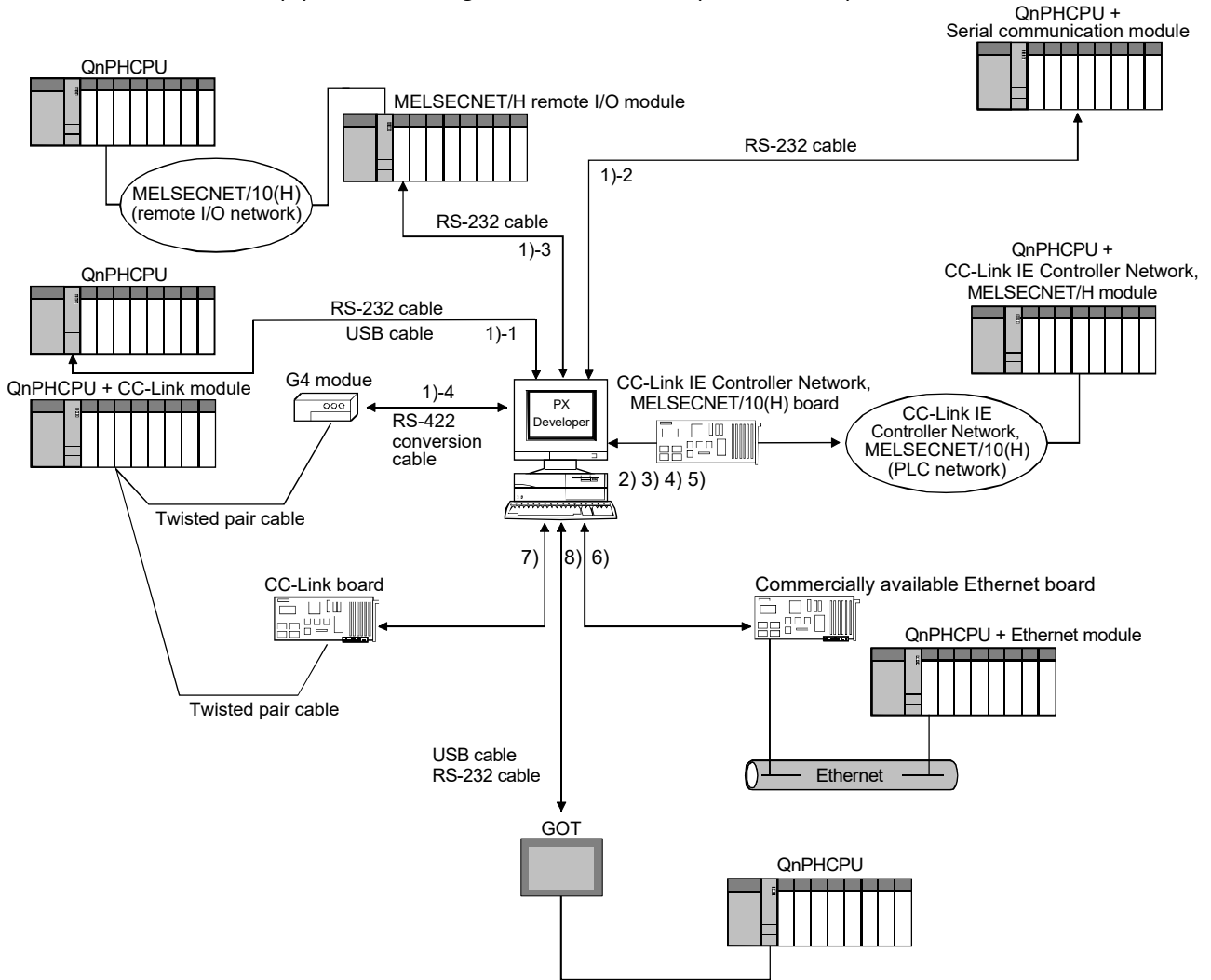
2

2.1.1 Supported CPU

Series	Module type	Model name	Mode	Communication route
MELSEC-Q	Process CPU	Q02PHCPU, Q06PHCPU, Q12PHCPU, Q25PHCPU	—	Refer to Section 2.1.2 (1).
	Universal model process CPU	Q04UDPVCPU, Q06UDPVCPU, Q13UDPVCPU, Q26UDPVCPU	—	Refer to Section 2.1.2 (2).
	Redundant CPU	Q12PRHCPU, Q25PRHCPU	Backup mode	Refer to Section 2.1.2 (3).
			Separate mode	
		Debug mode	Refer to Section 2.1.2 (4).	

2.1.2 Communication route

(1) Connecting to Process CPU(QnPHCPU)



2

(a) Communication route

No.	Connection method		Precautions for connection
1)-1	Serial/USB connection	CPU module	One CPU module can be connected from one personal computer by a USB cable. *1
1)-2		C24	—
1)-3		MELSECNET/10(H) remote	—
1)-4		G4 module	Use the type of AJ65BT-G4-S3.
2)	MELSECNET/10 connection (When using the MELSECNET/10 board)		The PLC must be set to the MELSECNET/10 compatibility mode.
3)	MELSECNET/10 connection (When using the MELSECNET/H board)		The MELSECNET/H board and PLC must be set to the MELSECNET/10 compatibility mode.
4)	MELSECNET/H connection		—
5)	CC-Link IE Controller Network connection		CC-Link IE Controller Network compatible version of Process CPU is required.*2 The driver for CC-Link IE Controller Network board whose version supports Process CPU is required.*3
6)	Ethernet connection		—
7)	CC-Link connection		CC-Link Ver.1 and Ver.2 boards cannot be used together with the same PC.
8)	GOT transparent connection*4		Connection method via GOT is the same as that of GX application. GOT transparent function via GOT2000 is not supported by GX Developer.

*1: Refer to POINT in Section 2.1.3.

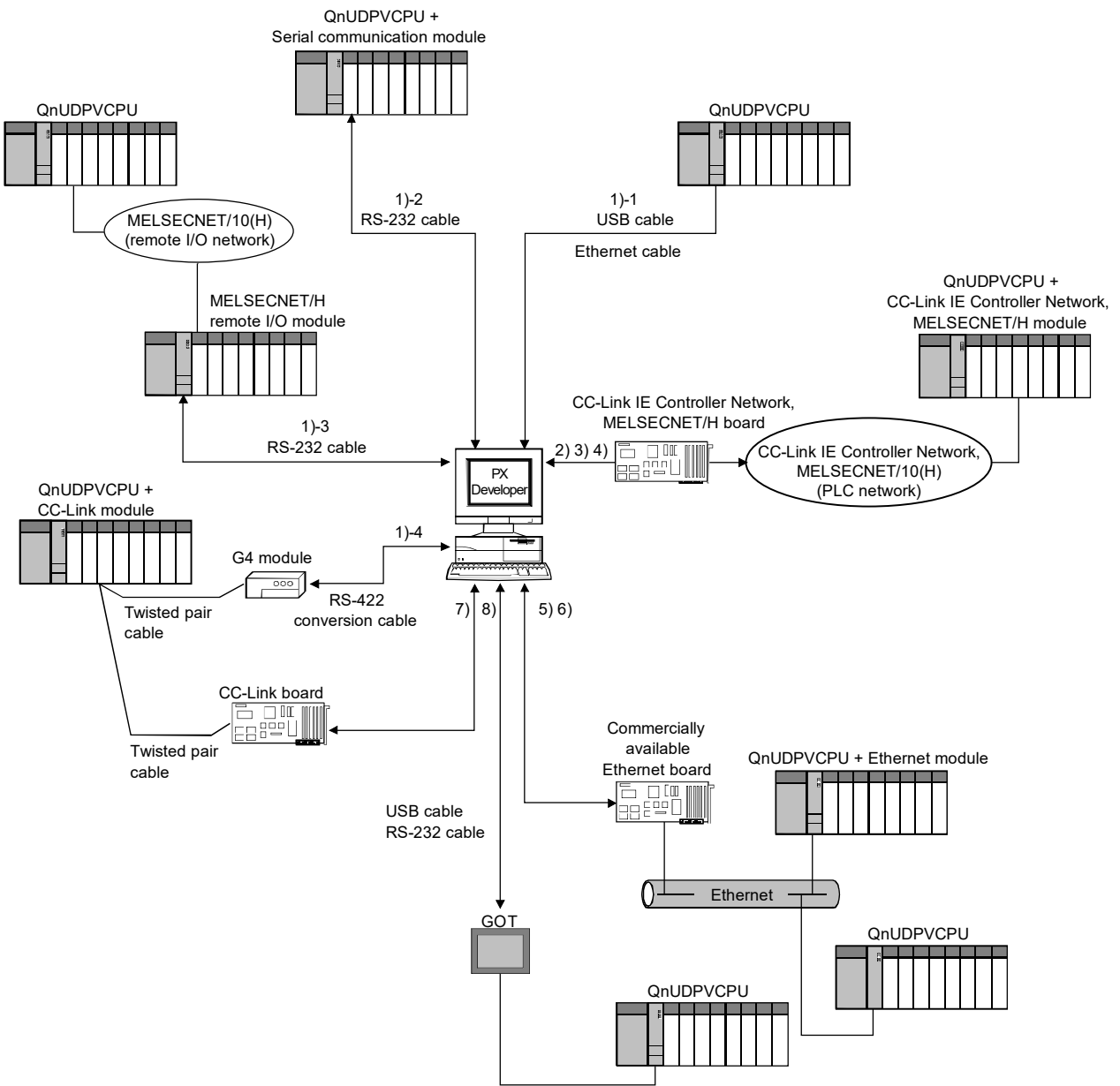
*2: The Process CPU whose first five digits of serial number are 10042 or later is required.

*3: To connect to the Q02PH or Q06PHCPU, the driver (SW1DNC-MNETG-B) version 1.03D or later is required. (When connecting to other CPUs, the driver for QnHCPU can be used.)

*4: For details of GOT transparent function, refer to the following manuals:

- GOT2000 Series Connection Manual (Mitsubishi Electric Product) For GT Works3 Version1
- GOT1000 Series Connection Manual (Mitsubishi Electric Products) for GT Works3
- GOT-A900 Series User's Manual (Connection System Manual)
- GOT-F900 SERIES HARDWARE MANUAL [Connection]

(2) Connecting to Universal model process CPU(QnUDPVCPU)



(a) Communication route

No.	Connection method		Precautions for connection
1)-1	Built-in Ethernet port direct connection/USB connection	CPU module	One CPU module can be connected from one personal computer by Ethernet or USB. *1, *3
1)-2	Serial	C24	—
1)-3		MELSECNET/10(H) remote	—
1)-4		G4 module	Use the type of AJ65BT-G4-S3.
2)	MELSECNET/10 connection (When using the MELSECNET/H board)		The MELSECNET/H board and PLC must be set to the MELSECNET/10 compatibility mode.
3)	MELSECNET/H connection		—
4)	CC-Link IE Controller Network connection		—
5)	Ethernet connection	Ethernet module	—
6)		CPU module	
7)	CC-Link connection		CC-Link Ver.1 and Ver.2 boards cannot be used together with the same PC.
8)	GOT transparent connection*2		Connection method via GOT is the same as that of GX application. GOT transparent function via GOT2000 is not supported by GX Developer.

*1: Refer to POINT in Section 2.1.3.

*2: For details of GOT transparent function, refer to the following manuals:

- GOT2000 Series Connection Manual (Mitsubishi Electric Product) For GT Works3 Version1
- GOT1000 Series Connection Manual (Mitsubishi Electric Products) for GT Works3
- GOT-A900 Series User's Manual (Connection System Manual)
- GOT-F900 SERIES HARDWARE MANUAL [Connection]

*3: When using a built-in Ethernet connection, the communication with a programming tool via a network may not be allowed by Windows Firewall.

Allow the communication with the programming tool via the network by any one of the two methods in the Point below.

POINT
<p>When the communication with a programming tool via a network is not allowed by Windows Firewall, allow the communication with the programming tool via the network by any of the following methods.</p> <ol style="list-style-type: none"> 1) Allow the programming tool to communicate in the "Windows Security Alert" screen which appears when an Ethernet connection is established for the first time. Click the [Allow access] button to unblock the protection (allow the access) and continue the operation. 2) Allow the programming tool (C:\Melsec\Fbdq\FBDQ.exe*1) to communicate in Windows Firewall settings*2 <p>*1: If an installation destination path for PX Developer is changed when installing it, FBDQ.exe will be located under the changed path.</p> <p>*2: To change Windows Firewall settings, logging on as a user in the Administrators group which has full permission to control the computer.</p>

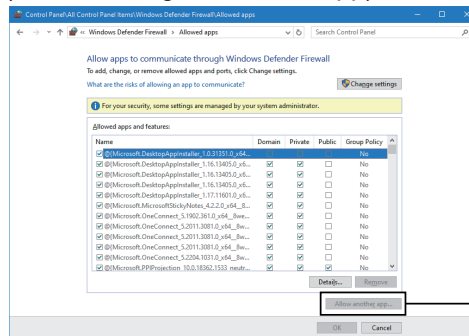
POINT

Add the programming tool (FBDQ.exe) to the allowed apps in Windows Firewall settings*1.

*1: The Windows Firewall settings screen can be displayed by selecting [Control Panel] → [System and Security] → [Allow an app through Windows Firewall].

Even if the programming tool has been already added, enabling the setting is required by selecting the checkboxes of the name of the programming tool and all the network locations.

(Before adding the allowed app)



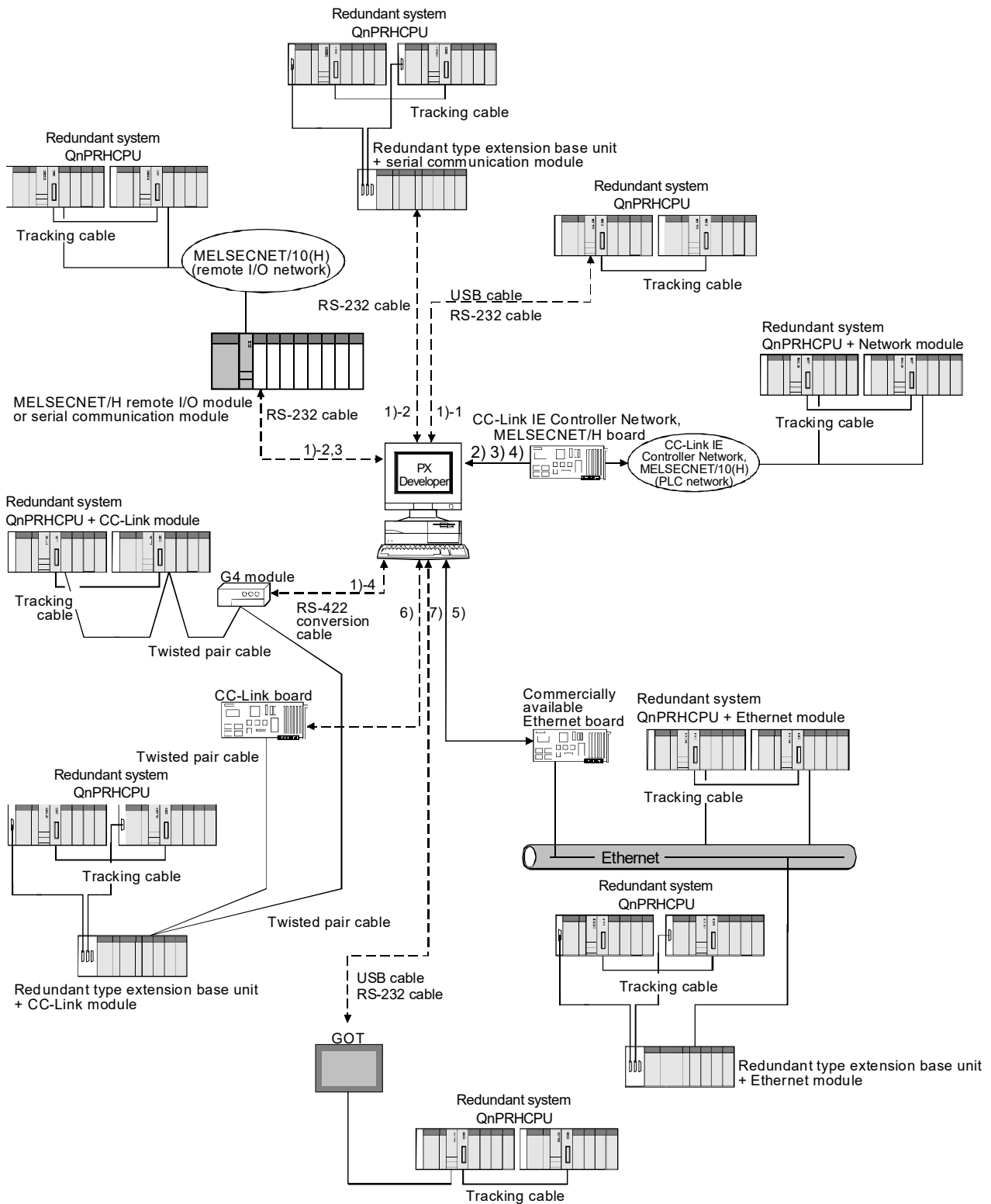
Add the app allowed by the "Allow another app" button which is enabled by the "Change settings" button.

(After adding the allowed app)



Select the checkboxes of all the network locations for the added "FBDQApplication".

(3) Connecting to a Redundant CPU in the Backup Mode/Separate Mode (QnPRHCPU)



(a) Communication route

No.	Connection method		Precautions for connection
1)-1	Serial/USB connection	CPU module	Connect a cable to the CPU module in either of system A or system B. (The communication is performed to the CPU module of another system via tracking cable.) One CPU module can be connected from one personal computer by a USB cable. *1
1)-2		C24	When connecting via the serial communication module mounted to the redundant type extension base unit, the version of Redundant CPU needs to be compatible with the redundant type extension base unit. *6
1)-3		MELSECNET/10(H) remote	—
1)-4		G4 module	Use the type of AJ65BT-G4-S3.
2)	MELSECNET/10 connection*2 (When using the MELSECNET/H board)		The MELSECNET/H board and PLC must be set to the MELSECNET/10 compatibility mode. The driver for MELSECNET/H interface board and the MELSECNET/H module whose version supports Redundant CPU is required. *3
3)	MELSECNET/H connection		The driver for MELSECNET/H interface board and the MELSECNET/H module whose version supports Redundant CPU is required. *3
4)	CC-Link IE Controller Network connection		CC-Link IE Controller Network compatible version of Redundant CPU is required.*4 The CC-Link IE Controller Network module whose version supports Redundant CPU is required. *5
5)	Ethernet connection		The Ethernet module of function version D or later is required to support the Redundant CPU. When connecting via the Ethernet module mounted to the redundant type extension base unit, the version of Redundant CPU needs to be compatible with the redundant type extension base unit. *6
6)	CC-Link connection		The driver for CC-Link Ver.1 board and CC-Link module whose versions support Redundant CPU are required. *7 CC-Link Ver.1 and Ver.2 boards cannot be used together with the same PC. When connecting via the CC-Link module mounted to the redundant type extension base unit, the version of Redundant CPU needs to be compatible with the redundant type extension base unit. *6
7)	GOT transparent connection*8		Connection method via GOT is the same as that of GX application. GOT transparent function via GOT2000 is not supported by GX Developer.

*1: Refer to POINT in Section 2.1.3.

*2: The MELSECNET/10 board is inapplicable, as the driver (SW□DNF-MNET10) is incompatible with the Redundant CPU.

*3: For MELSECNET/H interface board, refer to Section 2.1.4 (1). For MELSECNET/H module, the function version D or later is required.

*4: The Redundant CPU whose first five digits of serial number are 10042 or later is required.

*5: The CC-Link IE Controller Network module whose first five digits of serial number are 10041 or later is required.

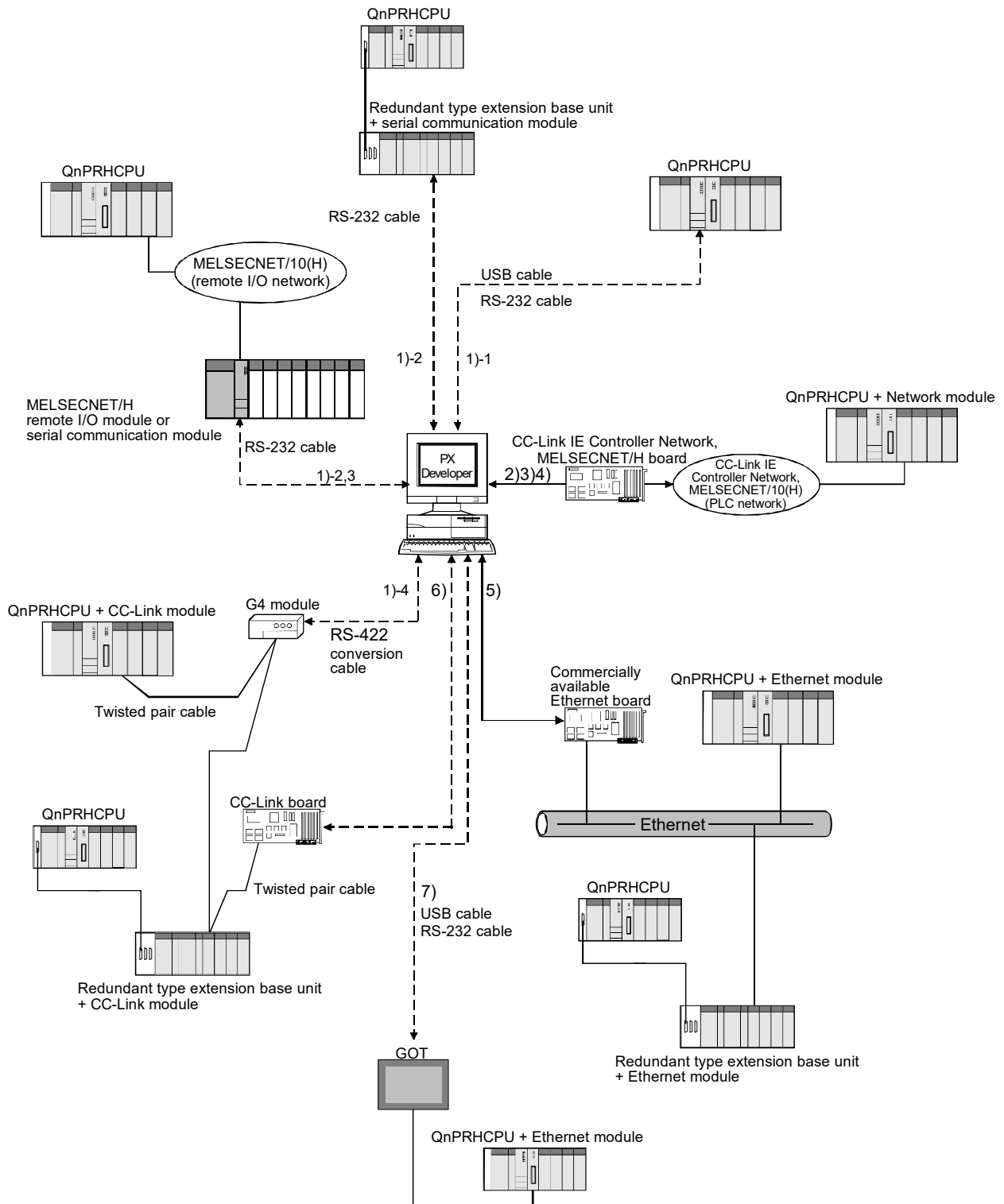
*6: The Redundant CPU whose first five digits of serial number are 09012 or later is required.

*7: For CC-Link Ver.1 board, refer to Section 2.1.4 (3). For CC-Link module, the QJ61BT11N whose first five digits is 06052 or later is required.

*8: For details of GOT transparent function, refer to the following manuals:

- GOT2000 Series Connection Manual (Mitsubishi Electric Product) For GT Works3 Version1
- GOT1000 Series Connection Manual (Mitsubishi Electric Products) for GT Works3
- GOT-A900 Series User's Manual (Connection System Manual)
- GOT-F900 SERIES HARDWARE MANUAL [Connection]

(4) Connecting to a Redundant CPU in the Debug Mode (QnPRHCPU)



(a) Communication route

No.	Connection method		Precautions for connection
1)-1	Serial/USB connection	CPU module	One CPU module can be connected from one personal computer by a USB cable. *1
1)-2		C24	When connecting via the serial communication module mounted to the redundant type extension base unit, the version of Redundant CPU needs to be compatible with the redundant type extension base unit. *6
1)-3		MELSECNET/10(H) remote	—
1)-4		G4 module	Use the type of AJ65BT-G4-S3.
2)	MELSECNET/10 connection*2 (When using the MELSECNET/H board)		The MELSECNET/H board and PLC must be set to the MELSECNET/10 compatibility mode. The driver for MELSECNET/H interface board and the MELSECNET/H module whose version supports Redundant CPU is required. *3
3)	MELSECNET/H connection		The driver for MELSECNET/H interface board and the MELSECNET/H module whose version supports Redundant CPU is required. *3
4)	CC-Link IE Controller Network connection		CC-Link IE Controller Network compatible version of Redundant CPU is required. *4 The CC-Link IE Controller Network module whose version supports Redundant CPU is required. *6
5)	Ethernet connection		The Ethernet module of function version D or later is required to support the Redundant CPU. When connecting via the Ethernet module mounted to the redundant type extension base unit, the version of Redundant CPU needs to be compatible with the redundant type extension base unit. *6
6)	CC-Link connection		The driver for CC-Link Ver.1 board and CC-Link module whose versions support Redundant CPU are required. *7 CC-Link Ver.1 and Ver.2 boards cannot be used together with the same PC. When connecting via the CC-Link module mounted to the redundant type extension base unit, the version of Redundant CPU needs to be compatible with the redundant type extension base unit. *6
7)	GOT transparent connection*8		Connection method via GOT is the same as that of GX application. GOT transparent function via GOT2000 is not supported by GX Developer.

*1: Refer to POINT in Section 2.1.3.

*2: The MELSECNET/10 board is inapplicable, as the driver (SW□DNF-MNET10) is incompatible with the Redundant CPU.

*3: For MELSECNET/H interface board, refer to Section 2.1.4 (1). For MELSECNET/H module, the function version D or later is required.

*4: The Redundant CPU whose first five digits of serial number are 10042 or later is required.

*5: The CC-Link IE Controller Network module whose first five digits of serial number are 10041 or later is required.

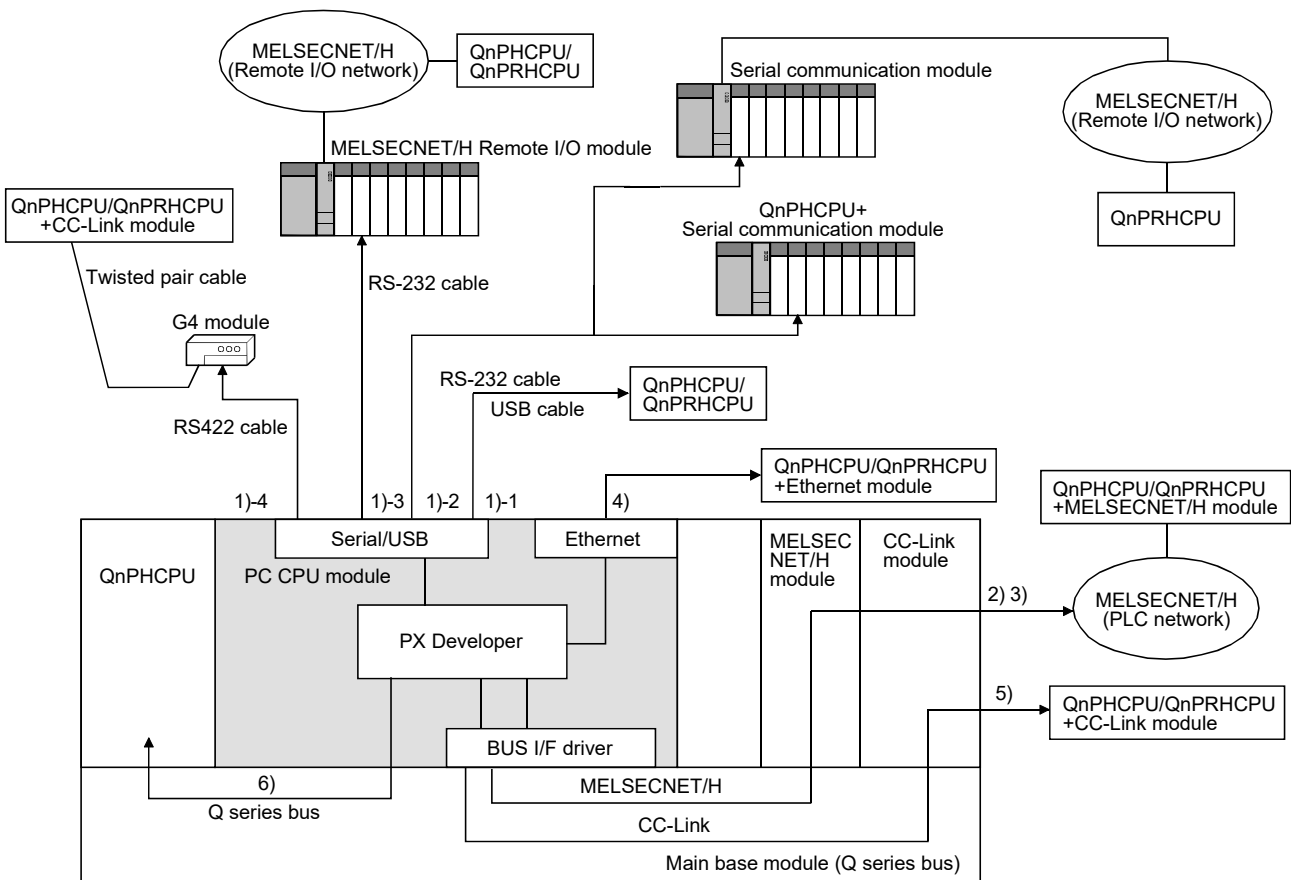
*6: The Redundant CPU whose first five digits of serial number are 09012 or later is required.

*7: For CC-Link Ver.1 board, refer to Section 2.1.4 (3). For CC-Link module, the QJ61BT11N whose first five digits is 06052 or later is required.

*8: For details of GOT transparent function, refer to the following manuals:

- GOT2000 Series Connection Manual (Mitsubishi Electric Product) For GT Works3 Version1
- GOT1000 Series Connection Manual (Mitsubishi Electric Products) for GT Works3
- GOT-A900 Series User's Manual (Connection System Manual)
- GOT-F900 SERIES HARDWARE MANUAL [Connection]

(5) Using the PC CPU module*1



(a) Communication route

No.	Connection method	Precautions for connection	
1)-1	Serial/USB connection	Same with the precautions for Serial/USB connection of (1) to (3).	
1)-2			CPU module
1)-3			C24
1)-4			MELSECNET/H remote
1)-4	G4 module		
2)	MELSECNET/10 connection (When using the MELSECNET/H board)	Same with the precautions for MELSECNET/10 connection of (1) to (3). *2	
3)	MELSECNET/H connection	Same with the precautions for MELSECNET/H connection of (1) to (3). *2	
4)	Ethernet connection	Same with the precautions for Ethernet connection of (1) to (3).	
5)	CC-Link connection	Same with the precautions for CC-Link connection of (1) to (3). *2	
6)	Q series bus connection	Specifying the PLC No. of a multiple CPU is required. *3	

*1: Production of the PC CPU module was discontinued in March, 2011.

*2: If accessing other station via MELSECNET/H module and CC-Link module, the PC CPU must be set to control the network modules.

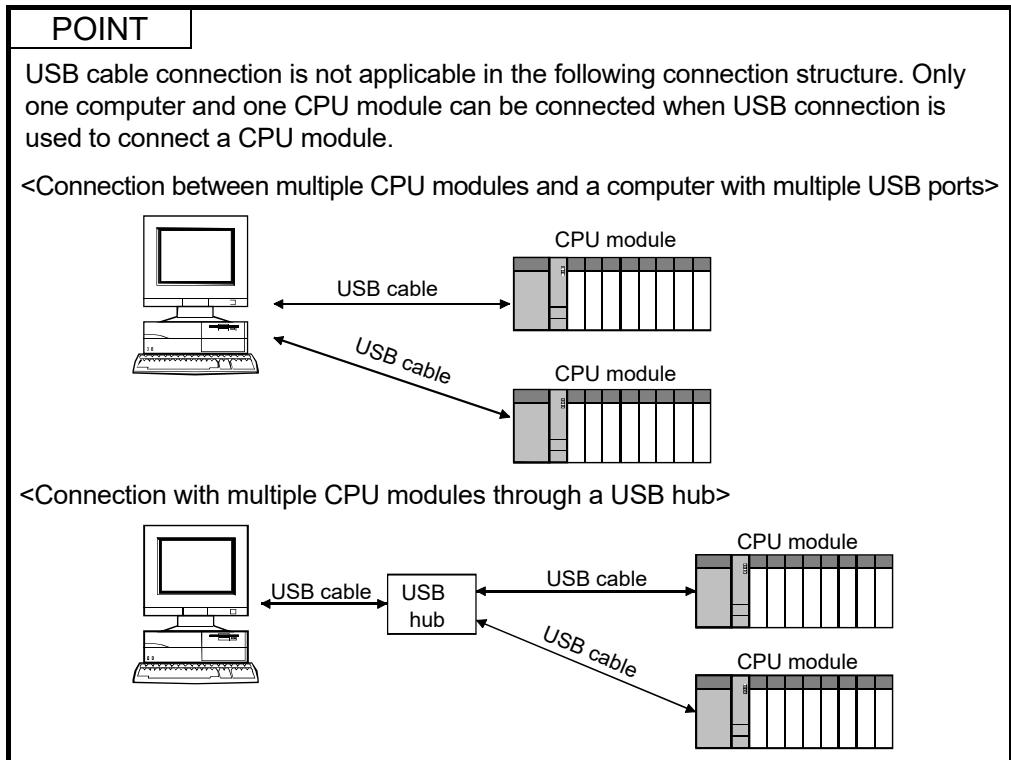
*3: Cannot be used as a Redundant CPU does not support multiple CPU configuration.

2.1.3 Serial/USB connection

(1) Connection cables for serial/USB connection

The connection method of serial/USB connection cable is the same when they are connected to GX application. For the applicable cables, refer to the following manuals:

- GX Works2 Version 1 Operating Manual (Common)
- GX Developer Version 8 Operating Manual



(2) Precautions on USB connection

- 1) A communication error may occur when the personal computer communicates with the CPU module after setting the resume function, suspend setting, power-saving function or standby mode.
Do not set any of the above functions for communication with the CPU module.
- 2) A communication error may occur and normal operation may not be recovered if connecting and disconnecting a USB cable, resetting the CPU module or turning the power ON/OFF is performed frequently during communication with the CPU module.
Be sure to set PX Developer to the offline status except in unavoidable cases when connecting and disconnecting a USB cable, resetting the CPU module or turning the power ON/OFF.
The offline status is the status that PX Developer is not communicating with the CPU module.
When a communication error occurs and normal operation is not recovered, remove a USB cable from the CPU module, and then reconnect it after more than five seconds.
(Even after this operation, an error may occur at the initial communication. Communication, however, will be performed normally at the second time and later.)

2.1.4 Network board

The following describes the applicable network boards to PX Developer Programming Tool.

For corresponding operating systems of network boards, refer to the each network board manual.

(1) CC-Link IE Controller Network board, MELSECNET/H board, MELSECNET/10 board

Network	Board	Driver
CC-Link IE Controller Network *1, *2	Q81BD-J71GP21-SX (For PC/AT, optical) Q81BD-J71GP21S-SX (For PC/AT, optical) (With external power supply) Q80BD-J71GP21-SX (For PC/AT, optical) Q80BD-J71GP21S-SX (For PC/AT, optical) (With external power supply)	SW1DNC-MNETG-B
MELSECNET/H	Q81BD-J71LP21-25 (For PC/AT, optical) Q80BD-J71LP21-25 (For PC/AT, optical) *3 Q80BD-J71LP21S-25 (For PC/AT, optical) (With external power supply)	SW0DNC-MNETH(-B) (For PC/AT)
MELSECNET/10 *4	Q80BD-J71LP21G (For PC/AT, optical) *3 Q80BD-J71BR11 (For PC/AT, coaxial) *3	
MELSECNET/10	A70BD-J71QLP23 (For PC/AT, optical) *5 A70BD-J71QBR13 (For PC/AT, coaxial) *5	SW3DNF-MNET10 (For PC/AT) *5

*1: A CPU module whose first five digits of the serial number are "10042" is required to connect to the following CPU modules.

Q12PHCPU, Q25PHCPU, Q12PRHCPU, Q25PRHCPU

*2: A CC-Link IE Controller Network module whose first five digits of the serial number are "10041" is required to connect to a Redundant CPU.

*3: A MELSECNET/H board whose first five digits of the serial number are "06051" is required to connect to a Redundant CPU.

*4: Use in the MELSECNET/10 compatibility mode.

*5: It has been discontinued.

The following table shows the versions of drivers required to connect to a CPU.

CPU module		SW1DNC-MNETG-B	SW0DNC-MNETH-B	SW3DNF-MNET10
MELSEC-Q series	Process CPU	Q02PHCPU, Q06PHCPU	Version 1.03D or later	All versions
		Q12PHCPU, Q25PHCPU	All versions	
	Redundant CPU	All versions	Version 90K or later	—
	Universal model process CPU	Version 1.16S or later	Version 26C or later	—

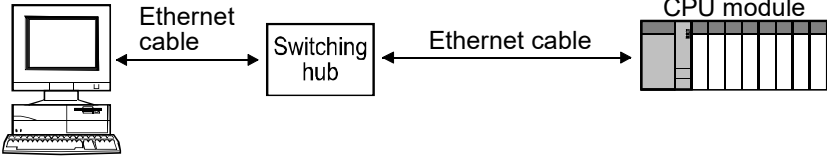
— : Not supported

(2) Ethernet board

The following table shows the Ethernet board/card whose operations are guaranteed by us.

Maker	Model
3COM	EthernetLinkIII LAN PC Card
Allied Telesis	CentreCOM LA-PCM Ethernet PC Card LAN Adapter
	RE2000 (ISA)
TDK	10BASE-T LAN card (Model: LAN-CD021BX)

If there are restrictions on Ethernet module to Ethernet board, follow the restrictions.

POINT
<p>Direct connection to the built-in Ethernet port of a built-in Ethernet CPU is not applicable in the following connection structure.</p> <p><Structures cannot be constructed></p> <ul style="list-style-type: none"> ● Connection between a built-in Ethernet CPU and a personal computer through a hub  <pre> graph LR PC[Personal Computer] -- Ethernet cable --- Hub[Switching hub] Hub -- Ethernet cable --- CPU[CPU module] </pre> <ul style="list-style-type: none"> ● Two or more Ethernet ports are enabled for network connection on the personal computer side.

(3) CC-Link board

Network	Board	Driver
CC-Link Ver.1 CC-Link Ver.2	Q81BD-J61BT11 (Ver.2 Board) *1 Q80BD-J61BT11N (Ver.2 Board) *1	SW1DNC-CCBD2-B (for PC/AT)
CC-Link Ver.1	A80BDE-J61BT11 (Ver.1 Board) *1, *2 A80BDE-J61BT13 (Ver.1 Board) *1, *2	SW4DNF-CCLINK-B (for PC/AT) *2

*1: CC-Link Ver.1 and Ver.2 boards cannot be used together with the same PC.

*2: It has been discontinued.

The following table shows the versions of drivers required to connect to a CPU.

CPU module		SW1DNC-CCBD2-B	SW4DNF-CCLINK-B
MELSEC-Q series	Process CPU	All versions	All versions
	Redundant CPU	All versions	Version G or later
	Universal model process CPU	Version 1.13P	—

2.2 Operating Environment

The following table describes the operating environment.

Item	Description
Computer	Microsoft® Windows® supported personal computer
CPU	Refer to section 2.2.1(1) "Required operating system and personal computer performance".
Required memory	
Hard disk free space	When installing: Hard disk 200MB or more When operating: Free space of virtual memory 100MB or more
Disk Drive	CD disk drive
Display	Resolution: 800 × 600 pixels (256 colors) or more *1
Communication Interface	One of the following is required <Serial USB connection> <ul style="list-style-type: none"> ● RS-232 port ● USB port < Network route > <ul style="list-style-type: none"> ● Ethernet board ● CC-Link IE Controller Network board ● MELSECNET/H interface board ● MELSECNET/10 interface board ● CC-Link board
Pointing Device	Double-button mouse or the compatible pointing device
Operating system (English Version) *2	<ul style="list-style-type: none"> ● Windows 11 (Home, Pro, Enterprise, Education) ● Windows 10 (Home, Pro, Enterprise, Education, IoT Enterprise 2016 LTSC) When using any of the following operating systems, use PX Developer the version of which is 1.52E or earlier. <ul style="list-style-type: none"> ● Windows 8.1, Windows 8.1 (Pro, Enterprise) ● Windows 8, Windows 8 (Pro, Enterprise) ● Windows 7 (Starter, Home Premium, Professional, Ultimate, Enterprise) ● Windows Vista® (Home Basic, Home Premium, Business, Ultimate, Enterprise) ● Windows XP (Professional, Home) Service Pack 1 or later ● Windows 2000 (Professional) ● Windows NT® Workstation 4.0 Service Pack 3 or later *4 ● Windows Millennium Edition ● Windows 98, Windows 98 Second Edition
Required software package	<ul style="list-style-type: none"> ● GX Works2(SW1DNC-GXW2-E, SW1DND-GXW2-E) ● GX Developer(SW8D5C-GPPW-E, SW7D5C-GPPW-E), GX Simulator(SW7D5C-LLT-E) For the versions, refer to Section 2.2.2.

*1: A resolution of 1024 x 768 pixels or more is required to display an illustration for FB property page.

*2: An installation of the latest version of Microsoft Internet Explorer and the Service Pack is recommended.

*3: USB cannot be used with Microsoft® Windows NT® Workstation 4.0 Operating System. If used, a communication error will occur.

2.2.1 Instructions for operating system

(1) Required operating system and personal computer performance

Operating System	Required Personal Computer Performance	
	CPU *1	Required memory
Windows 11	64-bit (x64) processor 1GHz with 2 cores or more	4GB or more
Windows 10 (64-bit edition) Windows 8.1 (64-bit edition) Windows 8 (64-bit edition) Windows 7 (64-bit edition)	64-bit (x64) processor 1GHz or more	2GB or more
Windows 10 (32-bit edition) Windows 8.1 (32-bit edition) Windows 8 (32-bit edition) Windows 7 (32-bit edition) Windows Vista	Pentium® 1GHz or more	1GB or more
Windows XP (Service Pack 1 or later)	Pentium 300MHz or more	128MB or more
Windows Millennium Edition	Pentium 150MHz or more (Pentium 300MHz or more recommended)	64MB or more
Windows 2000 Professional Windows NT Workstation 4.0 (Service Pack 3 or later) Windows 98	Pentium 133MHz or more (Pentium 300MHz or more recommended)	64MB or more

*1: Cannot be used in the multi processor environment.

For Windows Vista and Windows XP, only the 32-bit version is supported.

For Windows 10 IoT Enterprise, only the 64-bit version is supported.

(2) Folder and file access authorization

This product may make change access to the files of the installation destination folder and sub-folder.

Hence, file change access enable must have been set for these folders and files by the user who uses this product.

If file change access enable has not been set, this product may not operate normally.

When this product is used, it is recommended to log on as the user of the administrators group who has the authority to control all of the computer.

The programming tool cannot be used by a user logged on with a built-in guest account.

(3) Unusable functions

When the following functions are used, this product may not run properly.

- Windows XP Mode
- Application start-up in Windows compatibility mode
- Fast user switching
- Remote desktop
- Touch function
- Modern UI
- Virtual environment such as Client Hyper-V
- Virtual Desktops
- Tablet mode
- Virtual PC
- Unified Write Filter
- Text cursor indicator

In the following cases, the screen of this product may not work properly.

- The size of the text and other items on the screen is other than 100% (96 DPI, 9 pt etc.).

Big fonts (Details setting of Screen properties) are not supported.

- The resolution of the screen is changed in operation.
- Windows theme is changed in operation.

Surrogate pair characters are not available.

2.2.2 Required software package

GX application is required to run the PX Developer programming tool.
 The combination of versions of required GX application and PX Developer varies with the PLC type, used function or network configuration.
 The version described in the table below is required.

- (1) GX project type is GX Works2 project
 Use the following versions of GX Works2.

POINT
<ul style="list-style-type: none"> ● When using PX Developer and GX Developer on the operating environment under which GX Developer has been uninstalled from a personal computer, on which PX Developer Version 1.42U or later, GX Developer, and GX Works2 are installed, reinstall PX Developer Version 1.42U or later. ● When GX Works2 is started up with programming tool, the operating environment of the programming tool will be the same as that of GX Works2. For the operating environment of GX Works2, refer to "GX Works2 Installation Instructions".

(a) Restrictions on the combinations with PX Developer

PX Developer	GX Works2
Version 1.42U	Version 1.98C to Version 1.507D
Version 1.44W	Version 1.513K to Version 1.536J
Version 1.46Y to Version 1.49B	Version 1.540N to Version 1.568S
Version 1.50C	Version 1.570U
Version 1.51D to Version 1.52E	Version 1.576A to Version 1.577B
Version 1.53F to Version 1.55H	Version 1.580E to Version 1.605F
Version 1.56J or later	Version 1.610L or later

(b) Restrictions on the PLC types

Connected CPU	PLC type	PX Developer	GX Works2
Process CPU	Q02PHCPU, Q06PHCPU, Q12PHCPU, Q25PHCPU	Version 1.42U or later	Version 1.98C or later
Redundant CPU	Q12PRHCPU, Q25PRHCPU		
Universal model process CPU	Q04UDPVCPU, Q06UDPVCPU, Q13UDPVCPU, Q26UDPVCPU	Version 1.42U or later	Version 1.501X or later

(c) When using the simulation function (GX Simulator2)

Connected CPU	PLC type	PX Developer	GX Works2
Process CPU	Q02PHCPU, Q06PHCPU, Q12PHCPU, Q25PHCPU	Version 1.42U or later	Version 1.98C or later
Redundant CPU	Q12PRHCPU, Q25PRHCPU		
Universal model process CPU	Q04UDPVCPU, Q06UDPVCPU, Q13UDPVCPU, Q26UDPVCPU	Version 1.42U or later	Version 1.501X or later

(2) GX project type is GX Developer project

Use the following versions of GX Developer.

(a) Restrictions on the functions

Function	PX Developer	GX Developer
Download/upload of symbolic data of the project to/from a PLC	Version 1.00A or later	Version 8.03D or later
Connection to CC-Link IE Controller Network	Version 1.18U or later	Version 8.68W or later
Projects without labels	Version 1.20W or later	Version 8.78G or later

(b) Restrictions on the PLC types

Connected CPU	PLC type	PX Developer	GX Developer
Process CPU	Q02PHCPU, Q06PHCPU	Version 1.18U or later	Version 8.68W or later
	Q12PHCPU, Q25PHCPU	Version 1.00A or later	Version 7.20W ^{*1} or later
Redundant CPU	Q12PRHCPU, Q25PRHCPU	Version 1.06G or later	Version 8.18U ^{*2} or later
Universal model process CPU	Q04UDPVCPU, Q06UDPVCPU, Q13UDPVCPU, Q26UDPVCPU	—	—

*1: When downloading/uploading symbolic data of the project to/from a PLC, the version 8.03D or later is required.

*2: When connecting to a Redundant CPU via a module mounted on the redundant type extension base unit, version 8.45X or later is required.

(c) When using the simulation function

Use the following versions of GX Developer and GX Simulator.

Software package	Version
PX Developer Version 1	Version 1.28E or later
GX Developer Version 8	Version 8.94Y or later
GX Simulator Version 7	Version 7.27D or later

3 FUNCTION OVERVIEW

3.1 Function Overview

This chapter mainly describes PX Developer programming tools.

- (1) **Manage program elements through project.**
Manage programs (created by programming tools), parameters and user-defined FB parts in a batch through project to realize administration of program data.
- (2) **Programming with FBD language**
By FBD language, which is in accordance with IEC61131-3 standard, programs can be created through simple operations as configuring parts and establishing direct connection.
Additionally, change of the number of pins is applicable to some pins.
FBD parts can be reconfigured, thus it is possible to edit which FBD part shall be displayed in front.
- (3) **Cross reference function**
A list that shows where variables are declared and used by the programming tool. As it includes the sort and filter display functions, which are helpful to trace the relevant variables, the variables that will be affected by program modification can be confirmed easily.
- (4) **FBD program convert function (compile)**
FBD programs made by programming tools can be converted into executable codes in a CPU module (ladder program or PLC parameter). Error check is automatically executed before conversion.
Additionally, if online change compile is executed (☞ Section 11.4), online change will be executed after compile. Before conversion, error check will be performed automatically.
- (5) **Online function**
Through online connection between programming tool and CPU module, not only monitor the created programs, local variables, I/O value of tag FB and global variables in real time, but also change the current value of the variable during processing. Additionally, as for tag FB, the faceplate can be displayed for monitoring the monitor value (☞ Section 13.5).
- (6) **Diagnostics function**
Diagnose the created FBD programs. When an error is found in the program, the error position can be displayed on the screen and the related details can also be displayed when you double-click the displayed error. (It can be displayed only when the contents containing information about the editing or setting screen of FBD sheet is selected.)
Additionally, it can diagnose created programs as well as CPU module. It makes timely recovery work possible as the current error status and error history can be displayed.

3.2 Function List

Major functions of programming tools are listed in the following table.

Function	Description	Mode *1	Reference	
Project	Project Parameter Setting	To set system resource, program execution interval and event notification.	E	Section 6.14
	Module FB Declaration	Register module FB. (To create data programs without considering module-data input X/Y device and buffer memory address)	E	Section 8.3.2
	Tag FB Declaration	Register tag FB. (To create a program for DDC processing easily by pasting registered tag in the program/FB definition window)	E	Section 8.4.2
	Global variable declaration	Register global variable. (Global variable is the variable that can be referred to in any FBD program and the value can be changed by FBD program)	E	Section 8.2.2
	GX label assignment	To set global label names (in GX project) for PX Developer global parts. (Data exchange between FBD programs and user-created ladder programs can be realized)	E	Section 8.5.2
	Program	To create FBD language programs.	E	Chapter 7
	User-defined	To create user-defined FB type/tag FB type/structure type.	E	Section 6.8
	Add New FB type	To add user-defined FB type.	E	Section 7.14
	Add New Tag FB type	To add user-defined tag FB type.	E	Section 8.4.4
	Add New Structure Type	To add user-defined structure type.	E	Section 9.2
	Program Execution Setting	To set program execution timing and conditions.	E	Section 7.13
	GX project	To open GX project in the PX Developer project, set parameters and create ladder programs.	E/M	Section 7.15
	Print	To print (make printer setting on tables and FBD sheets print respectively).	E/M	Chapter 16
	Copy Data to Other Project	To copy program or user-defined FB type/tag FB type/structure type data to the other project.	E	Section 6.9.2
	Set Login Password	Set the password for logging in to a project.	E/M	Section 6.15.4
Set Permissions	Set the permission for accessing the data in a project.	E	Chapter 6.15.5	
Display	Zoom in/out	To zoom in/out the FBD sheets.	E/M	Section 7.10.6
	Display/Hide	To display/hide the tool bar or status bar.	E/M	Section 5.6.1 (2)
Diagram	FBD sheet	To add, delete, rename, move and copy FBD sheets moreover, to set execution conditions of FBD sheets.	E	Section 7.10.2 to Section 7.10.5, Section 7.12
	Number of pins	To increase/decrease the number of pins of function parts. (Only for those function parts whose number of pins is changeable)	E	Section 7.6.3
Inline ST editor	Inline ST editor	To edit ST program to be set in the inline ST parts.	E	Section 7.7
	Insert inline ST parts	To insert inline ST parts to FBD sheet.	E	Section 7.7.2
	Number of pins	To change the number of pins of inline ST part input variable and output variable.	E	Section 7.7.4

*1: E ... Applicable in edit mode; M ... Applicable in monitor mode

Function		Description	Mode * ¹	Reference	
Cross reference	Cross reference	To display where variables are declared and used.	E/M	Section 10.1	
	Build cross reference information	To build the information on where various variables are declared and used, which will be displayed in the cross reference window.	E/M	Section 10.1.2	
	Operation for cross reference window display data	To interchange cross reference window columns, and to sort display data.	E/M	Section 10.1.5	
	Edit/display filter	To display only the data that match the filter condition by editing the filter condition.	E/M	Section 10.1.6	
FB property page	FB property page	FB property page is displayed.	E	Section 10.2	
Convert	Error check	To check errors before compile FBD programs.	E	Section 11.1	
	Cold-start compile	To convert FBD programs to executable codes in a CPU module.	E	Section 11.2	
	Hot-start compile	To convert FBD programs to executable codes in a CPU module without changing the device assignment of the existing variables.	E	Section 11.3	
	Online change compile	Adding or changing processing can be executed on FBD program without stopping system.	E	Section 11.4	
Online	Transfer setup	To execute the transfer setup of CPU module.	E	Section 12.3	
	Download	To download PX Developer program files, parameters and initial value data into a CPU module.	E	Section 12.4	
	Download Setup	To set the target memory for download symbolic data and the compression rate.	E	Section 12.4.3	
	Upload	To upload the symbolic data from CPU module for project restorations.	E	Section 12.5	
	Delete PLC Data	To delete the symbolic data in CPU module.	E	Section 12.6	
	Check project consistency	To confirm whether data in PX Developer project and GX project, or PX Developer project and CPU module are identical.	E	Section 12.7	
	Monitor	Monitor	To monitor the current values such as local variables in programs/FB definition windows and Entry variable monitor windows, I/O values of tag FB and global variables etc.	M	Chapter 13
		Change current value	To change the current variable value.	M * ²	Section 13.3
		Pause FB	To stop operation of FB parts during execution. (To paused one front FB of the FB part to be verified, and to confirm program execution by changing the current output variable value of paused FB)	M	Section 13.4.1
		Restart FB	To restart the operation of paused FB parts.	M	Section 13.4.2
		Paused FB list	To view the list of all the paused FB parts in the output window.	M	Section 13.4.3
		Faceplate	To monitor tag data status in tag FB with faceplate.	M	Section 13.5
		Read current value of FB property	To read FB property current value.	M	Section 13.6
Debug	Simulation function	To start/stop simulation.	E/M	Section 15.1	
	I/O simulation function	To set/start/end the I/O simulation.	M	Section 15.2	
Diagnostics	FBD program Diagnostics	To check the error that occurs on a CPU module and diagnostics FBD program.	M	Chapter 14	

*1: E ... Applicable in edit mode; M ... Applicable in monitor mode

*2: Applicable only when variable parts and FB parts are selected.

3.3 Menu List

Following is a list of drop-down menus of menu bar.

<p>Project</p> <ul style="list-style-type: none"> — New Project Section 6.2 — Open Project Section 6.3 — Close Project Section 6.4 — Save Section 6.5 — Save As Section 6.6 — Edit Project Comment Section 6.7 — Edit Data <ul style="list-style-type: none"> — Add New <ul style="list-style-type: none"> — New Program Section 6.8 — New FB Type Section 6.8 — New Tag FB Type Section 6.8 — New Structure Type Section 6.9 — Add Copy Section 6.10 — Delete Section 6.11 — Rename Section 6.11 — Edit Comment Section 6.12 — Set Permissions Section 6.15.5 — Change PLC Type Section 6.16 — Set Login Password Section 6.15.4 — Print Setup (Table/ST) Section 16.1 — Print Setup (FBD Sheet) Section 16.1 — Print Section 16.2 — Exit PX Developer Section 4.2 	<p>View</p> <ul style="list-style-type: none"> — Zoom <ul style="list-style-type: none"> — Zoom In Section 7.10.6 — Zoom Out Section 7.10.6 — Equal Section 7.10.6 — Toolbar <ul style="list-style-type: none"> — Standard Section 5.6.2 — Online Section 5.6.3 — Zoom Section 5.6.5 — Format Section 5.6.6 — Convert Section 5.6.7 — Window Section 5.6.8 — Debug Section 5.6.9 — Status Bar Section 5.3 — Window <ul style="list-style-type: none"> — Project Section 5.7.2 — Parts Section 5.7.3 — FB Property* Section 5.7.4 — Output Section 5.7.5 — Bird's-eye View Section 5.7.6 — Cross Reference Section 5.7.7 — Inline ST Editor Section 5.7.8 — Diagram <ul style="list-style-type: none"> — FBD sheet <ul style="list-style-type: none"> — Add Section 7.10.2 — Delete Section 7.10.3 — Rename Section 7.10.5 — Move or Copy Section 7.10.4 — Set Execution Condition Section 7.12.2 — Display Execution Order of FBD parts Section 7.2.2 — Rename Variable*³ Section 7.2.3 — Display FB Definition Section 7.5.5 — Update FB Section 7.5.6 — Change No. of Pins Section 7.6.3 — Bring to Front Section 7.10 — Bring Forward Section 7.10 — Send Backward Section 7.10 — Send to Back Section 7.10 — Convert <ul style="list-style-type: none"> — Error Check Section 11.1 — Cold-start Compile Section 11.2 — Hot-start Compile Section 11.3 — Compile (Online Change) Section 11.4 — Build Cross Reference Information Section 10.1.2
<p>Edit</p> <ul style="list-style-type: none"> — Undo Section 7.10 — Redo Section 7.10 — Cut Section 7.2.6 — Copy Section 7.2.6 — Paste Section 7.2.6 — Paste Variable with New Name Section 7.2.6 — Delete Section 7.2.6 — Insert Row Section 5.8.1 ^{*1} — Delete Row Section 5.8.1 ^{*1} — Find Section 5.8.1 ^{*2} — Edit Mode Section 7.1 — Clear Output Window Section 5.7.5 — Refer to Variable Section 7.3.5 	

*1: Menu options cannot be selected in the Local Variable Sheet.
 Also, menu options cannot be selected during sorting in the Global Variable Declaration window.

*2: Menu option can be selected only in the following windows:
 • Module FB Declaration window • Tag FB Declaration window • Global Variable Declaration window
 • GX Label Assignment window • Structure Type Definition Window • I/O Simulation Setting Window

*3: Menu option name changes depending on the FBD parts selection status: "Rename Variable" when FB parts or variable parts are selected, "Change Value" when constant parts are selected, "Edit Comment" when comment parts are selected, "Rename Inline ST" when Inline ST parts are selected, and "Rename Variable" when no FBD parts are selected.

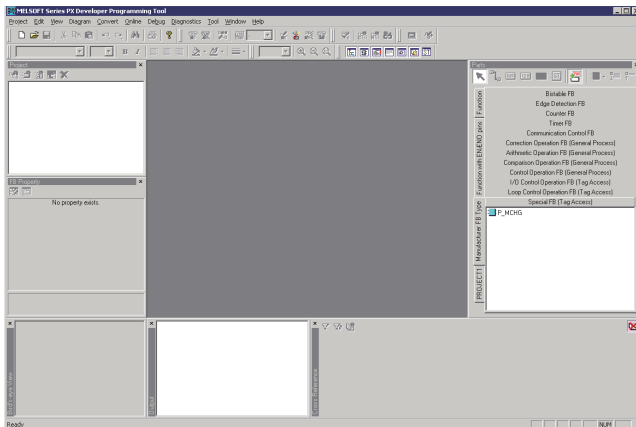
- Online
 - Transfer Setup Section 12.3
 - Upload Section 12.5
 - Download Section 12.4
 - Delete PLC Data Section 12.6
 - Check Project Consistency Section 12.7
 - FB Property Management Section 13.6.1
 - Monitor
 - Start Monitor (All Windows) Section 13.1.1
 - Stop Monitor (All Windows) Section 13.1.2
 - Start Monitor Section 13.1.1
 - Stop Monitor Section 13.1.2
 - Change Current Value Section 13.3
 - Pause FB Section 13.4.1
 - Restart FB Section 13.4.2
 - Paused FB List Section 13.4.3
 - Faceplate Section 13.5
 - Read Out FB Property Section 13.6.2
 - Entry Variable Monitor Section 13.7
- Debug
 - Start Simulation*4 Section 15.1.1
 - I/O Simulation Setting Section 15.2.1
- Diagnostics
 - FBD Program Diagnostics Section 14.1
- Tool
 - Options Section 5.11
- Window
 - Next Section 5.9
 - Previous Section 5.9
 - Cascade Section 5.9
 - Tile Horizontally Section 5.9
 - Tile Vertically Section 5.9
 - Arrange Icons Section 5.9
 - More Windows Section 5.9
- Help
 - PLC Error Section 5.10
 - Online Manual
 - Operating Manual Section 5.10
 - Programming Manual Section 5.10
 - About PX Developer Section 5.10

*4: "Stop Simulation" during the simulation.

4 START AND EXIT

4.1 Starting Programming Tool

This section explains method for starting PX Developer programming tool from the start menu.



- 1) Start the PX Developer programming tool in "MELSOFT Application" from Windows Start.

POINT

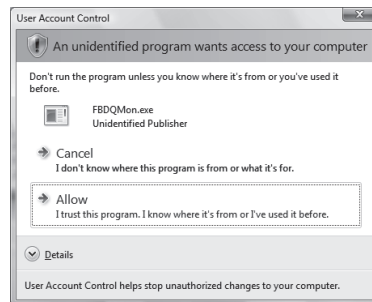
- GX Works2 or GX Developer shown in Section 2.2.2 is required to be installed to start the programming tool.
- Multiple programming tools can be started simultaneously.

<Method to execute programs as an administrator>

- (1) When user account control (UAC) is enabled
All users including administrator are fixed at and operate as "standard user".
To execute programs in administrator authority, specify "Run as administrator".
- (2) When user account control (UAC) is disabled
Programs can be executed by logon user.
(Specifying "Run as administrator" is not necessary.)
- (3) Procedure to execute programs as an administrator
The following shows a procedure to execute the programming tool as an administrator when UAC is enabled.

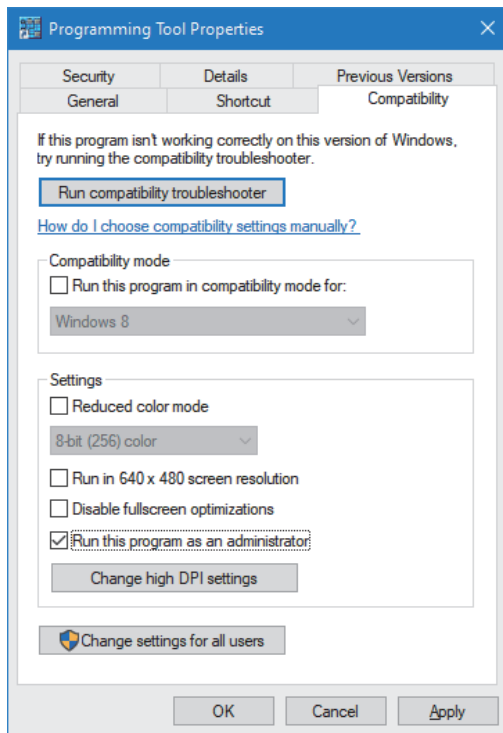
Select the PX Developer programming tool in "MELSOFT Application" from Windows Start, right-click, and select "Run as administrator".

- * When the user account that is logging on to Windows® is an administrator, the following message will be displayed.
Selecting "Yes" to execute programs as an administrator.



(4) Setting to always execute programs as an administrator

To always "execute programs as an administrator", set as follows.



Select the PX Developer programming tool in "MELSOFT Application" from Windows Start, right-click, it and select "Open file location".

- 1) Select "Programming Tool", right-click, and select "Properties".
- 2) Select the <<Compatibility>> tab and check "Run this program as an administrator".

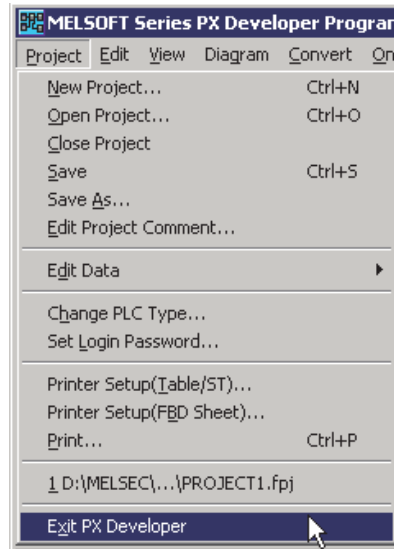
POINT

If "Run this program as an administrator" is specified in GX application, this setting is also required in the programming tool.

4.2 Exiting Programming Tool

This section explains method for closing programming tool.


(1) Exit from menu.




Click [Project] → [Exit PX Developer] in the menu to exit programming tool.

(2) Exit from title bar.



Click  and select [Close].

Or click  at the right top of title bar.

POINT

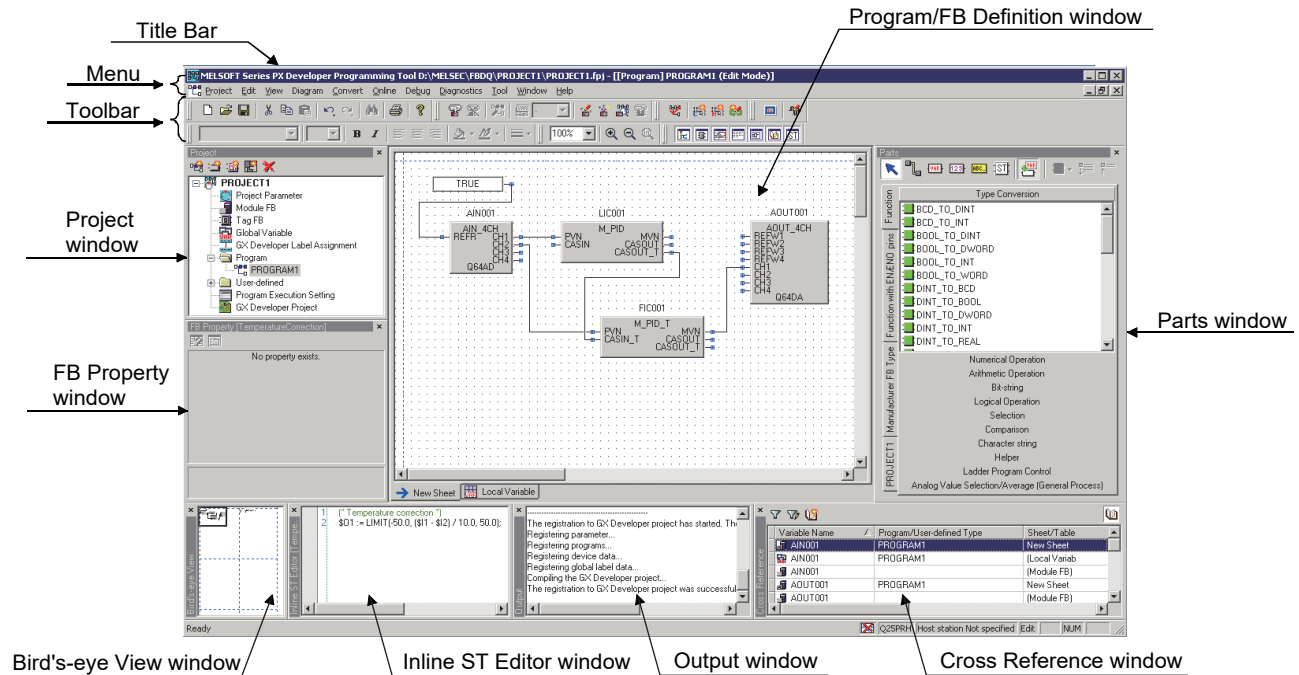
- A dialog box will be displayed to confirm saving if any change is made on the project without saving.
Click the "No" button if saving is unnecessary.
Click the "Yes" button if saving is necessary.
- When GX Developer is started with programming tool, once programming tool is to be closed, the confirmation dialog box for this operation will be displayed.

5 SCREEN CONFIGURATION AND BASIC OPERATIONS

This chapter explains screen configuration, switching between displaying of various parts and window arrangement etc. of PX Developer programming tool.

5.1 Overview of Screen Configuration

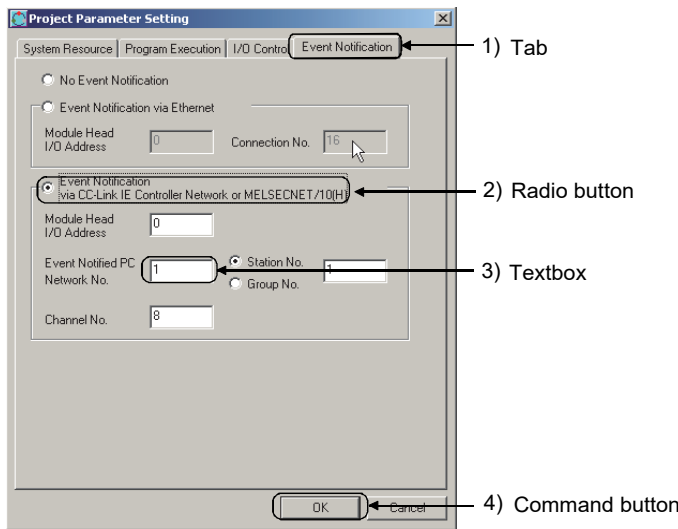
(1) Screen configuration of the programming tool main window



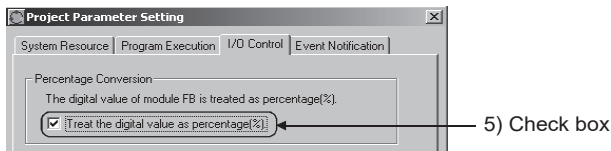
Relevant contents of the items above-mentioned are described in the following table.

Item	Description
Title bar	Display currently opened project path etc.
Menu	Display workable functions list of the programming tool.
Toolbar	Frequent operations (save, copy, paste, etc.) can be executed by clicking the buttons on it instead of opening the menu.
Project window	A window used for opening various setting windows, program/FB definition window etc.
FB Property window	A window used for setting the initial values of public variables of FB parts (Section 7.5) and the values to items of I/O simulation operation (Section 15.2).
Bird's-eye View window	Display active programs/the overall view of FBD sheet in the FB definition window.
Inline ST Editor window	A window for editing ST program to be set in the inline ST parts.
Output window	A window for displaying messages when executing error check or compile.
Cross Reference window	A window for displaying the where variables are declared and used by the programming tool.
Parts window	A window for list display of parts pasted in FBD sheet of the Program/FB definition window.
Program/FB Definition window	A window for editing programs and displaying the local variable sheet in FBD sheet.

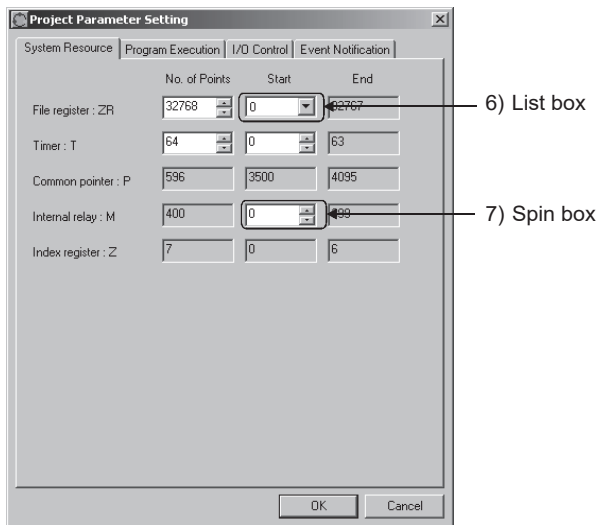
(2) Basic operation of dialog box



- 1) Tab
Click the set item name to execute conversion.
- 2) Radio button
Click one "○" from among multiple options to select this option.
- 3) Textbox
For Input of numerals/characters.
- 4) Command button
Click the command buttons before executing "OK", "cancel" etc or displaying dialog box.



- 5) Check box
Before executing an item, click "☐" to mark it with "✓".



- 6) List box
Click "▾", then the items to be selected after the selection list is displayed.
- 7) Spin box
Sometimes it is necessary to directly input values, sometimes to click "▢" to change numeral values.
When inputting values directly, please click the interior part of the spin box then input values with keyboard.
When modifying values by clicking "▢", the numeral value will be increased accordingly if clicking "▢", and be decreased accordingly if clicking "▢".

POINT

In keyboard operation, the setting item can be selected with "Tab" key.
Multiple items selection can be fulfilled operation through "←", "→", "↑" or "↓" key.

(3) Use keyboard to execute focus moving





Use "Alt" key to move focus towards menu.

Press "←" or "→" to move focus on the menu.

Besides, if "↓" is pressed when the focus is on the menu, a drop-down menu will be displayed on the screen.

(4) List of shortcut keys

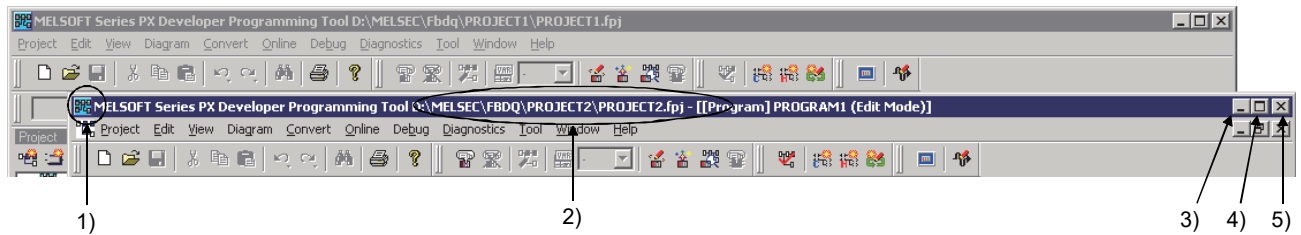
The list of shortcut keys of the programming tool is shown as follows.

Shortcut keys	Functions (Corresponding menu)	Tool button	Shortcut keys	Functions (Corresponding menu)	Tool button
Ctrl+N	New project		Alt+2	Display/Hide FB property window	
Ctrl+O	Open project		Alt+3	Display/Hide output window	
Ctrl+S	Save		Alt+4	Display/Hide bird's-eye view window	
Ctrl+P	Print		Alt+5	Display/Hide cross reference window	
Ctrl+Z	Undo		Alt+6	Display/Hide inline ST editor window	
Ctrl+Y	Redo		Ctrl+Enter	Edit declaration tables and change name of FBD part	—
Ctrl+X	Cut		Ctrl+R	Update FB	—
Ctrl+C	Copy		Ctrl+Shift+F	Bring to front	—
Ctrl+V	Paste		Ctrl+Shift+B	Send to back	—
Ctrl+Alt+V	Paste Variable with New Name	—	F4	Error check	
Delete	Delete	—	Ctrl+F3	Start monitor (All windows)	—
Shift+Ins	Insert Row	—	Ctrl+Alt+F3	Stop monitor (All windows)	—
Shift+Del	Delete Row	—	F3	Start monitor	
Ctrl+F	Find		Alt+F3	Stop monitor	
F2	Edit Mode		F6	Next (Switch to the next window)	—
Alt+0	Display/Hide project window		Shift+F6	Previous (Display the previous window)	—
Alt+1	Display/Hide parts window		Alt+F4	Exit PX Developer/Close windows (such as dialog box)	—

5.2 Title Bar

The title bar is the section that is displayed at the top of the application window. The currently edited project name and the destination for saving this project etc. will display in the title bar so that multiple activated programming tools can be conveniently specified.

<Activate multiple programming tools simultaneously>

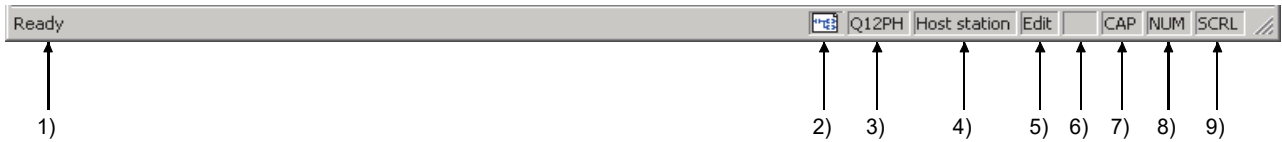


No.	Description
1)	Change the size of the programming tool, or execute CLOSE operation.
2)	Display the project name and the path name.
3)	Minimize the application window.
4)	Maximize the application window. It can also restore the maximized application window to its original size.
5)	Exit the programming tool.

5.3 Status Bar

Status bar, which shows the programming tool status, is located at the top of application window.

Display/Hide the bar by selecting [View] → [Status bar].



[Explanation]

- 1) The current cursor position is displayed.
- 2) The current compile status is displayed.*1

Icon	Compile status
	Compiled
	Invalid initial value*2
	Uncompiled

- 3) The PLC type is displayed.*1
- 4) The connected CPU is displayed.*1,*3
"Simulation" is displayed when connected to Simulator
- 5) The current mode is displayed.*1,*4
- 6) The execution status of I/O simulation is displayed.

Icon	Execution status
	Running I/O simulation.
—	I/O simulation is stopped. (Includes the edit mode)

- 7) The Caps Lock status is displayed.
- 8) The NumLock status is displayed.
- 9) The Scroll Lock status is displayed.

*1: Not displayed when no protect is opened.

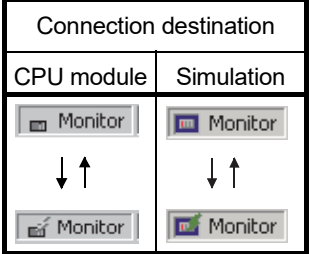
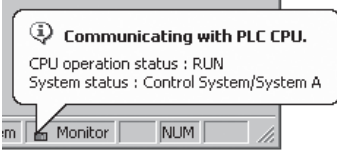
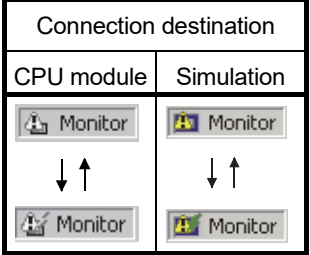
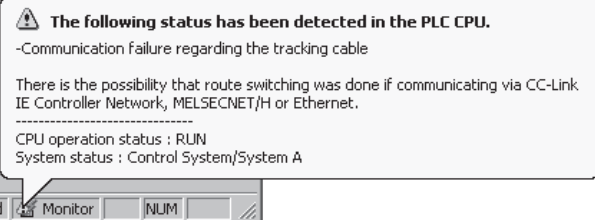
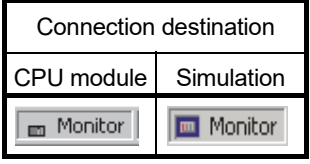
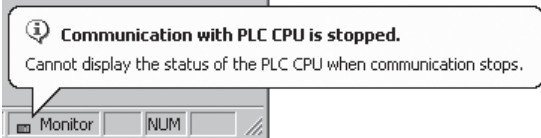
*2: This icon will be displayed in the following cases.



- Right after executing substitute all with FB property management window on the compiled status.
- Right after uploading.

*3: The following provides a display example of connected CPU in a redundant system.



*4: In monitor mode, an icon is displayed before the mode name, as shown below. In addition, when the cursor is placed on the mode display area, the corresponding tool tip will be displayed.

Operation status	Mode display in the status bar	Tool tip example
1) Communicating with the PLC CPU (Other than cases of 2) below)	The following icons are displayed alternatively. 	
2) The following are detected while communicating with the Redundant CPU. <ul style="list-style-type: none"> • Tracking cable communication failure • System switch request issued from the network module 	The following icons are displayed alternatively. 	
3) The communication with the PLC CPU has been stopped.		

If  /  is displayed on the mode display area of status bar while monitoring the Redundant CPU online, this might indicate that the communication route has been automatically switched.

In this case, check the following and remove the cause of route switching. For details, refer to POINT in Section 13.8.1.

- Check the Redundant CPU for an error.
- Check the tracking cable status and whether the tracking cable is correctly connected.
- Check the relevant network module for an error and the network where the relevant network module is connected for an error.

POINT	<p>In monitor mode, the programming tool continuously communicates with the PLC CPU to monitor the CPU operation status. However, when a communication error occurs and monitoring is disabled, it stops the communication with the PLC CPU. To resume the communication with the PLC CPU, remove the error cause and perform online operation.</p>
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5.4 Menu

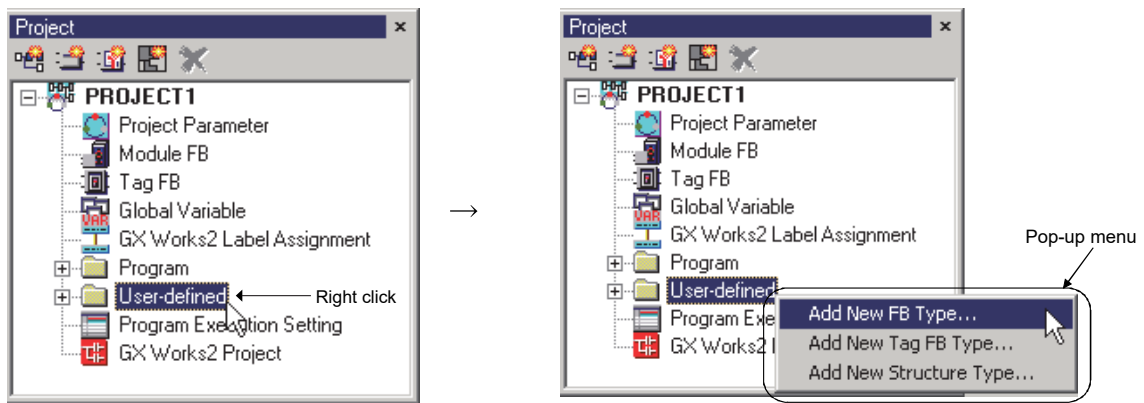
The menu is located under the title bar and the list of workable functions of the programming tools is shown.

For details of menu structure, refer to Section 3.3.

5.5 Pop-up Menu

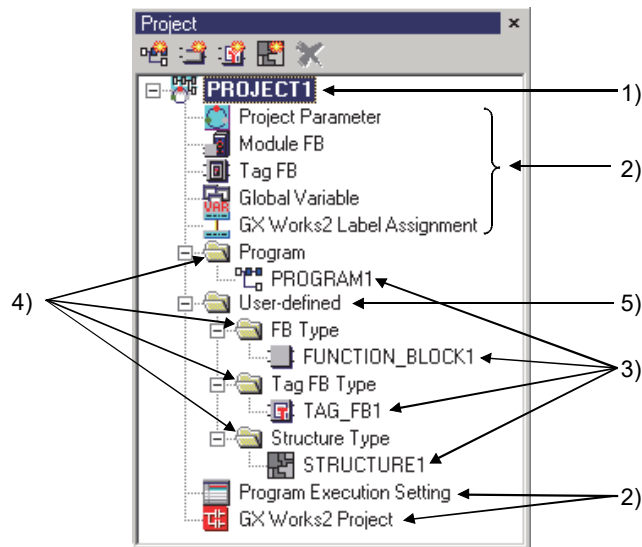
Pop-up menu will display when right-click the mouse at a specific place of the window.

This section describes relevant contents of the workable pop-up menus in the programming tool window.



(1) Pop-up menus of project window

The pop-up menu displayed when right-clicking the "tree" icon in the project window is explained as follows.



1) When right-click the icon of project name.

Item of Menu	Description	Reference
<u>E</u> dit project comment ...	Edit the project comment	Section 6.7

2) When right-click any icon of project parameters, module FB, Tag FB, global variable, GX label assignment, program execution settings, or GX project.

Item of menu	Description	Reference
<u>O</u> pen	Open the window of the selected item	Section 5.7.2
<u>U</u> ppdate GX Project Type	Update the GX project type.	Section 6.17

*1: When right-clicking on the GX project icon, this item is displayed only when the GX project type is GX Works2 project.

3) When right-click the compiled programs and user-defined (FB type, tag FB type, structure type) icons.

Item of menu	Description	Reference
<u>O</u> pen	Open the window of the selected project	Section 5.7.2
Add New <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Type... *1	Add <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> in the project *1	Section 6.8
Add <u>C</u> opy...	Copy the data in the project	Section 6.9
<u>D</u> elete	Delete the data in the project	Section 6.10
<u>R</u> ename	Rename the data in the project	Section 6.11
Edit <u>c</u> omment...	Edit the comment of the data in project	Section 6.12
Set Permissions (<u>E</u>)...	Set the permission for accessing the data in a project	Section 6.15.5

4) When right-click the icons of programs, FB type, Tag FB type, or structure type folders.

Item of menu	Description	Reference
Add New <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Type... *1	Add <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> in the project*1	Section 6.8

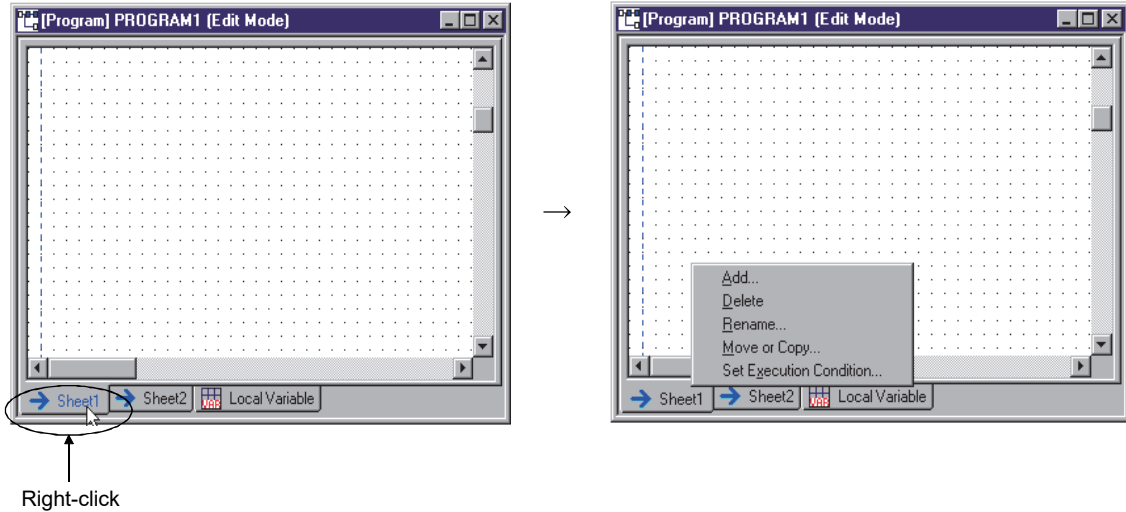
5) When right-clicking the icons of user-defined folders.

Item of menu	Description	Reference
Add New <u>F</u> B type...	Add FB type in the project	Section 6.8
Add New <u>T</u> ag FB type...	Add Tag FB type folders in the project	Section 6.8
Add New <u>S</u> tructure type...	Add structure type in the project	Section 6.8

*1: is the name of currently selected item.

(2) Pop-up menu on FBD sheet tab

This section describes the relevant contents of pop-up menus displayed when right-clicking FBD sheet tab.



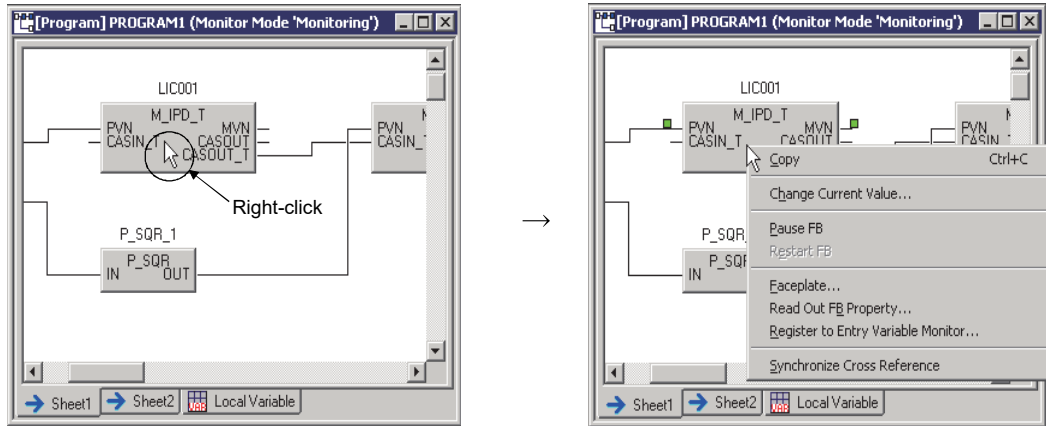
Item of menu	Description	Reference
<u>A</u> dd ...	Add FBD sheet	Section 7.10.2
<u>D</u> elete	Delete the selected FBD sheet	Section 7.10.3
<u>R</u> ename...	Rename the selected FBD sheet	Section 7.10.5
<u>M</u> ove or copy...	Move or copy the selected FBD sheet	Section 7.10.4
Set <u>E</u> xecution Condition...	Set the execution conditions of the selected FBD sheet	Section 7.12

POINT
<ul style="list-style-type: none"> ● Pop-up menus will be hidden after right-clicking the <<Local Variable>> tab. ● FBD sheet can be added up to a maximum of 32 pieces.

(3) Pop-up menus of variable part/FB part in Monitor Mode

Following is an illustration of the relevant contents of the pop-up menu displayed when right-clicking the variable parts/FB parts in the program/FB definition window in MONITOR mode.

(For details of pop-up menu at the edit mode, refer to Section 7.5.1.)



(When right-clicking FB)

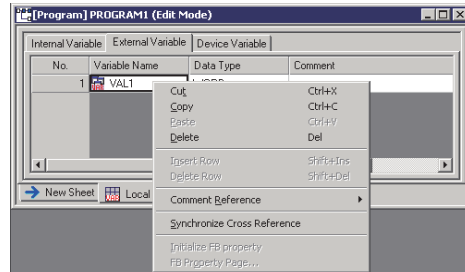
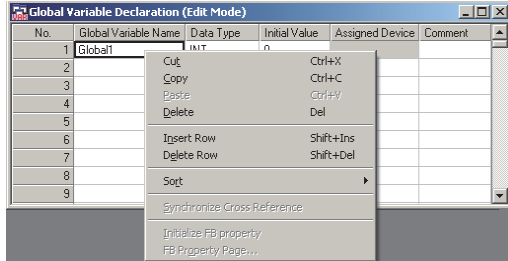
Item of menu	Description	Reference
<u>C</u> opy	Copy the target data onto the clipboard.	Section 15.2.2 (6)
<u>C</u> hange Current Value... ^{*1}	Change the current values of variables.	Section 13.3
<u>P</u> ause FB	Stop the operation of FB.	Section 13.4.1
<u>R</u> estart FB	Restart the operation of FB.	Section 13.4.2
<u>F</u> aceplate... ^{*2}	Display the faceplate.	Section 13.5
<u>R</u> ead Out <u>F</u> B Property...	Upload and display the FB property current values of FB parts selected from CPU module.	Section 13.6.2
<u>R</u> egister to Entry Variable Monitor... ^{*1}	Register the selected variables to the entry variable monitor window.	Section 13.7
<u>S</u> ynchronize Cross Reference	Display the corresponding item in the cross reference window.	Section 10.1.5

*1: When right-clicking the variable parts, only [Change Current Value] and [Register to Entry Variable Monitor] are displayed.

*2: The faceplate only displays when the Tag FB is right-clicked.

(4) Pop-up menu for table

The pop-up menu explained here is displayed when the right mouse button is clicked in the declaration window, GX label assignment window, structure type definition window, I/O simulation setting window or local variable sheet.



(When right mouse button is clicked in global variable declaration window) (When right mouse button is clicked in external variable declaration window)

Item of menu	Description	Reference
Cu <u>t</u> *1	Place the target data on the clipboard.	Section 5.8.1
Co <u>p</u> y	Copy the target data onto the clipboard.	Section 5.8.1
Pa <u>s</u> te *1	Paste the data from the clipboard.	Section 5.8.1
De <u>l</u> ete *1	Delete the selected range.	Section 5.8.1
Ins <u>e</u> rt Row *1*2	Insert a row in the cursor position.	Section 5.8.1
De <u>l</u> ete Row *1*2	Delete the row in the cursor position.	Section 5.8.1
So <u>r</u> t *3	Ascending	Section 8.2.3
	Descending	
	Remove Sorting	
Co <u>m</u> ment Reference *4	Global Part	Section 7.11.2 (4)
	External Variable	
Synchr <u>o</u> nize Cross Reference *5	Display the corresponding item in the cross reference window.	Section 10.1.5
Ini <u>t</u> ialize FB property *6	Initialize the FB property with the manufacturer-defined initial values.	Section 5.7.4
FB Prop <u>e</u> rty Page... *7	Display the FB property page.	Section 10.2

- *1: Can be selected in the edit mode only. Cannot be selected in the monitor mode.
- *2: Cannot be selected in the Local Variable Sheet.
Cannot be selected during sorting in the Global Variable Declaration window either.
- *3: Can be displayed only in the Global Variable Declaration window.
- *4: The menu is displayed only on the <<External Variable>> tab of the local variable sheet.
- *5: Cannot be selected in the I/O simulation setting window.
- *6: Only when all following conditions are fulfilled, the menu is enabled.
 - Public variables are displayed on the FB property window.
 - Initial values can be edited.
 - One or more initial values have been changed.
- *7: Selection possibility of this menu in respective mode of each list is as follows.

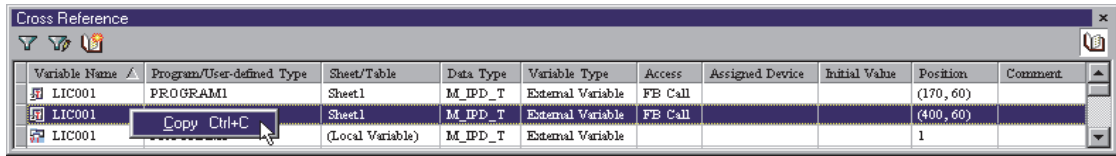
Table type	Edit mode	Monitor mode
Module FB declaration window	×	×
Tag FB declaration window	△	×
Global variable declaration window	×	×
GX label assignment window	×	×
Structure Type Definition Window	×	×
I/O Simulation Setting Window	×	×
Local Variable Sheet	△	×

× : Impossible to be selected
 △ : Possible to be selected depending upon condition
 (Selectable only when the FBs described in Section 10.2 are selected.)

(5) Pop-up menu in Cross Reference window

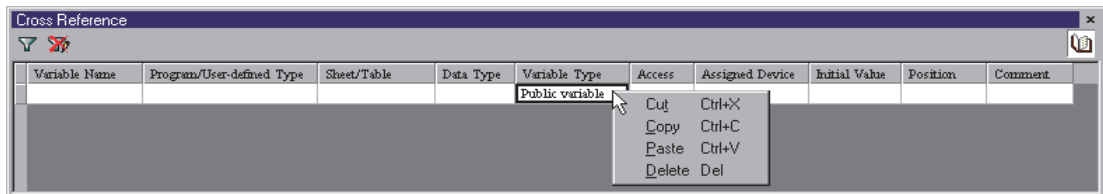
The pop-up menu explained here is displayed when the right mouse button is clicked in the Cross Reference window.

(a) When list is displayed



Item of menu	Description	Reference
Copy	Copy the target data onto the clipboard.	Section 5.8.1

(b) When filter condition editing screen is displayed



Item of menu	Description	Reference
Cu <u>t</u>	Place the target data on the clipboard.	Section 5.8.1
<u>C</u> opy	Copy the target data onto the clipboard.	Section 5.8.1
<u>P</u> aste	Paste the data from the clipboard.	Section 5.8.1
<u>D</u> elete	Delete the selected range.	Section 5.8.1

(6) Other pop-up menus

Besides the menus described in (1) to (5) of this section, there are still other pop-up menus available. Each item of various pop-up menus will be explained here. The list of other pop-up menus is shown as below.

Pop-up menu	Reference
Pop-up menus on FBD parts	Section 7.2.1
Pop-up menus on variable parts	Section 7.3.1
Pop-up menus on constant parts	Section 7.4.1
Pop-up menus on FB parts	Section 7.5.1
Pop-up menus on Function parts	Section 7.6.1
Pop-up menus on Inline ST parts	Section 7.7.1
Pop-up menus of connector	Section 7.8.1
Pop-up menus of comment parts	Section 7.9.1

5.6 Toolbar

The toolbar is the section under the menus displaying centralized small buttons. Here the relevant contents of operation procedure and functions of the toolbar are described.

5.6.1 Common operation of toolbar

(1) Split/Merge toolbars



PURPOSE

Split/Merge toolbars under menus as toolbar windows.



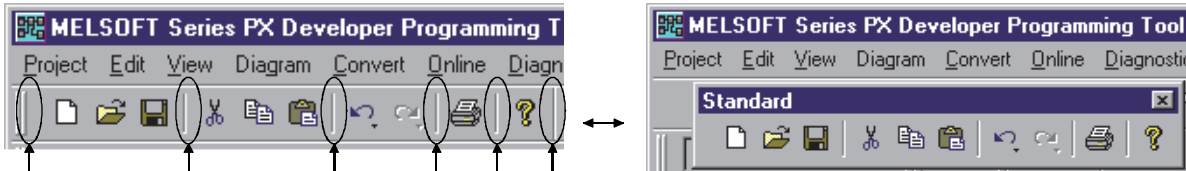
BASIC OPERATION

1. Double click the background or portions marked with vertical lines, or press "Ctrl" key and drag and drop with mouse at the same time, and then the toolbar can be split.
2. If the split tool bar needs to be merged again, you may double-click the portions mentioned above or drag and drop with mouse.
3. The configuration of the merged toolbar can be changed by dragging the toolbar.



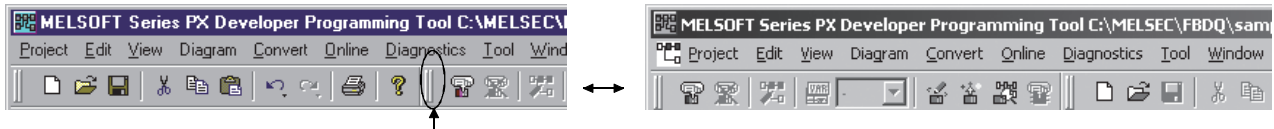
DISPLAY/SETTING SCREEN

● Split/Merge



Double click areas the arrows point to or hold "ctrl" key while drag and drop with mouse at the same time.

● Move the configuration of toolbar



Use mouse to drag toward left or right.


(2) Display/Hide toolbars

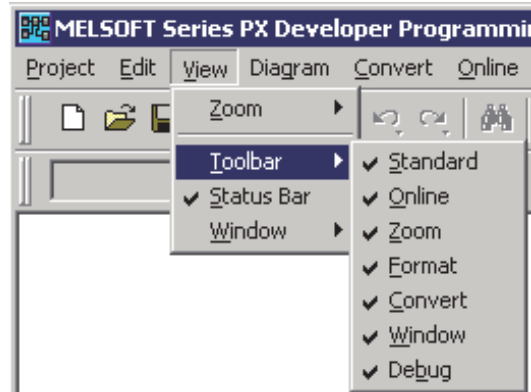
**PURPOSE**

To display/hide the switch of toolbar.

**BASIC OPERATION**

1. Select [View] → [Toolbar] from the menu.
2. Select the items of the toolbar to be displayed/hidden from the displayed submenu.

The currently displayed toolbar is marked with .

**DISPLAY/SETTING SCREEN**

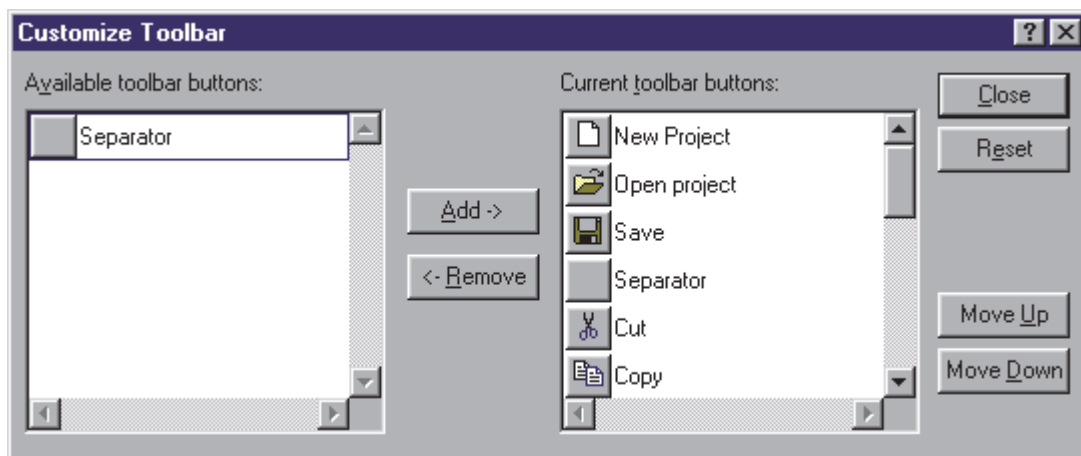
(3) Customize toolbar

**PURPOSE**

Set the buttons displayed in the toolbar.

**BASIC OPERATION**












1. Right-click the mouse on the toolbar or toolbar window where the buttons to be changed is displayed.
2. Display the toolbar's "Customize Toolbar" dialog box.
3. If it is wanted to add buttons into the toolbar, you can select wanted buttons to be added into the toolbar from the button list of "Available toolbar buttons".
If wanted to delete buttons, you can select wanted buttons to be deleted from the toolbar from the button list of "Current toolbar buttons".
4. Click "Add →" or "← Remove" button.
5. When clicking "Add →" button, buttons are added into the button list of "Current toolbar buttons".
6. To change the position of added button, select the added button then click "Move Up" button or "Move Down" button.
7. Click "Close" button to close the "Customize Toolbar" dialog box.

**DISPLAY/SETTING SCREEN****POINT**

To restore the changed toolbar buttons setting to its original status, click the "Reset" button.









5.6.2 Standard toolbar

The button and function list of the standard toolbars is shown as follows.

Tool button	Function
	New Project
	Open Project
	Save
	Cut
	Copy
	Paste
	Undo
	Redo
	Find
	Print
	About PX Developer






5.6.3 Online toolbar

The list of online toolbar's buttons and their functions is shown as follows.

Tool button	Function
	Start Monitor
	Stop Monitor
	Edit Mode
	Entry Variable Monitor
<input type="text" value="7"/>	Number of digits after the decimal point for REAL type
	Download
	Upload
	Check Project Consistency
	FB Current Value Display





5.6.4 Project toolbar

Following is a list of project toolbar buttons and their functions.

Tool button	Function
	Add Program
	Add FB Type
	Add Tag FB Type
	Add Structure Type
	Delete Data

5.6.5 Zoom toolbar

Following is a list of zoom toolbar buttons and their functions.

Tool button	Function
	Display FBD sheet with specified magnification
	Zoom In
	Zoom Out
	Equal

*: The buttons of zoom toolbar are only valid to FBD tables.











Ctrl + mouse wheel scroll operation enables the change of display magnification on the FBD sheet.

Ctrl + turn mouse wheel forward : enlarged to 10 times magnification

Ctrl + turn mouse wheel backward : reduced to 10 times magnification

5.6.6 Format toolbar





Following is a list of format toolbar buttons and their functions.

Tool button	Comment parts	Inline ST parts	Other than the left	Function
	<input type="radio"/>	<input type="radio"/>	<input checked="" type="checkbox"/>	Change character font of selected FBD parts
	<input type="radio"/>	<input type="radio"/>	<input checked="" type="checkbox"/>	Change character size of selected FBD parts
	<input type="radio"/>	<input type="radio"/>	<input checked="" type="checkbox"/>	Set characters of selected FBD parts to bold
	<input type="radio"/>	<input type="radio"/>	<input checked="" type="checkbox"/>	Set characters of selected FBD parts to italic
	<input type="radio"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Paragraphs flush left
	<input type="radio"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Paragraphs centered
	<input type="radio"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Paragraphs flush right
	<input type="radio"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Change background color
	<input type="radio"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Change text color
	<input type="radio"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Change thickness of border line

○: valid, x: invalid








5.6.7 Convert toolbar

Following is a list of conversion toolbar buttons and their functions.

Tool button	Function
	Error Check
	Cold-start Compile
	Hot-start Compile
	Compile (Online Change)

5.6.8 Window toolbar



Following is a list of window toolbar buttons and their functions.

Tool button	Function
	Display/hide the project window.
	Display/hide the parts window.
	Display/hide the FB property window.
	Display/hide the output window.
	Display/hide the bird's-eye view window.
	Display/hide the cross reference window.
	Display/hide the Inline ST editor window.

*: With the window being displayed, click the corresponding button on the window toolbar to hide the displayed window.

5.6.9 Debug toolbar

Following is a list of debug toolbar button and its function.

Tool button	Function
	Start/stop simulation.
	Configure the I/O Simulation.

5.7 Helper Windows

The so-called helper windows contain the following 7 windows: project window, parts window, FB property window, output window, bird's-eye view window, cross reference window and Inline ST editor window.

Operation methods about helper windows will be explained here.

5.7.1 Common operations for helper window

(1) Split/merge helper windows.



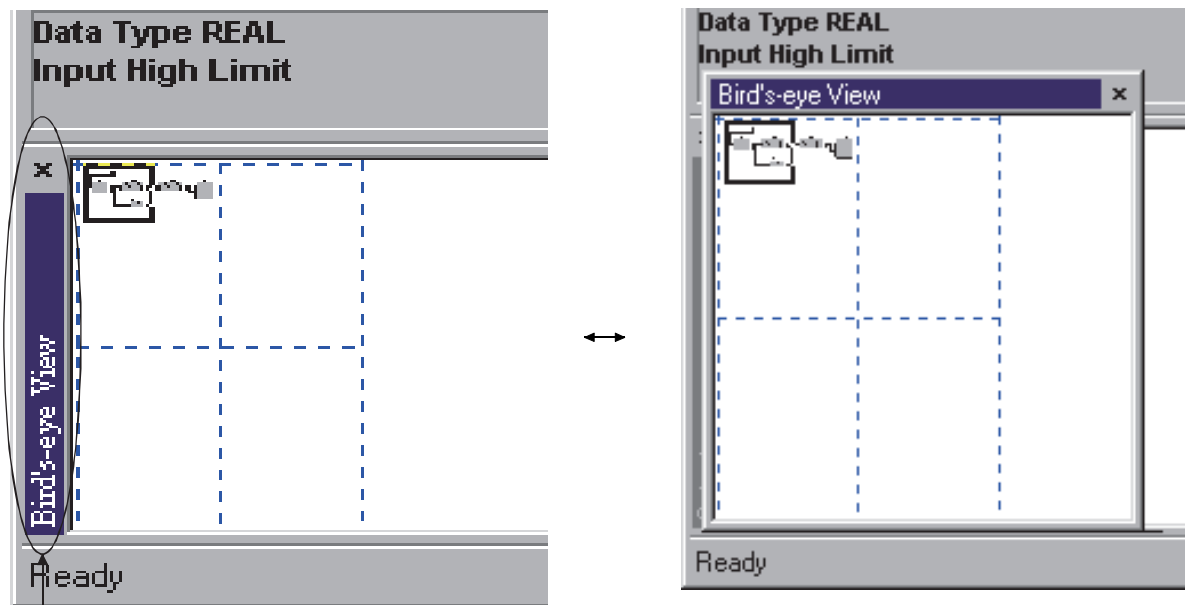
PURPOSE

To split or merge helper windows set around the main window of programming tool.



BASIC OPERATION

1. To split a helper window, double-click its title bar or draw it with mouse while pressing the "Ctrl" key.
2. To remerge the split helper windows, double-click the part mentioned in step 1 or drag the split windows in the main window of programming tool.



Double-click this part or draw it with mouse while pressing the "Ctrl" key

(2) Display/ hide helper windows.



PURPOSE

To display the hidden helper windows


(a) Display/hidden from display menu



BASIC OPERATION

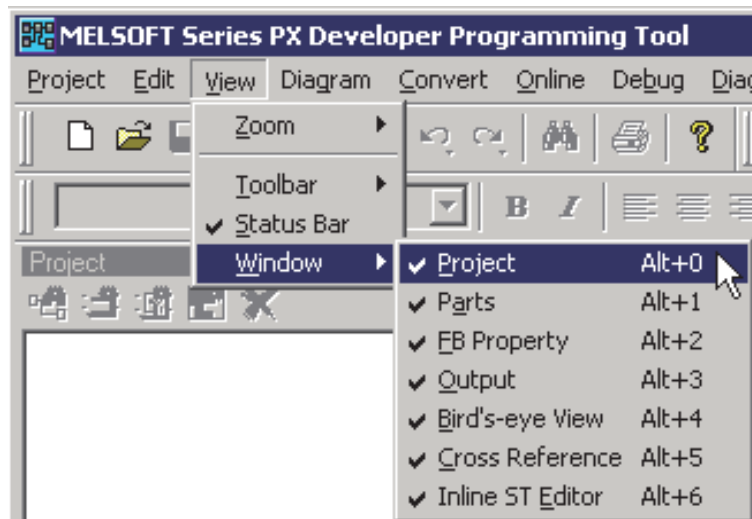
1. Select [View] → [Window] in the menu.
2. Select the item with the requirement of displaying/hiding helper window from displayed submenu.

The displayed window can also be hidden by clicking the "×" button on the title bar of the corresponding window.

The currently displayed toolbar is marked with .



DISPLAY/SETTING SCREEN



POINT

The shortcut keys ("Alt" + "0" to "Alt" + "6") can be used to display/hidden the corresponding helper windows.

(b) Display/hide from toolbar

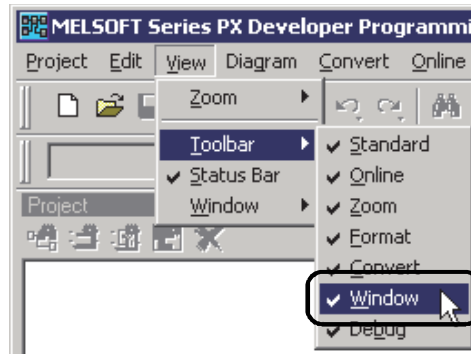


BASIC OPERATION

1. When the window toolbar is not displayed, select [View] → [Window] to display the window toolbar.
2. Click the button of the helper window, to be displayed/hidden, on the window toolbar.
The displayed window can also be hidden by clicking the "x" button on the title bar of the corresponding window.



DISPLAY/SETTING SCREEN



When the window toolbar is not displayed, select [View]→[Toolbar]→[Window] to display the window toolbar.



Window toolbar

5.7.2 Project window

Project window is a window to display the defined or set data in a project in a list in the tree form.

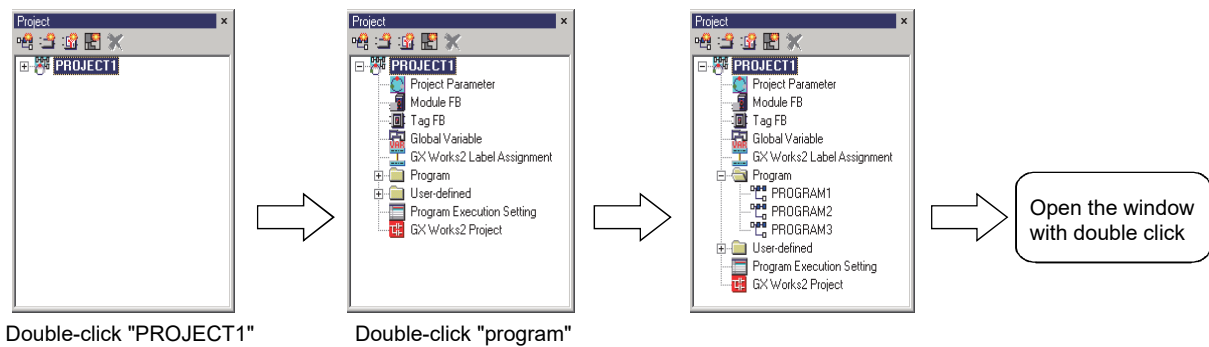
For details, refer to Chapter 6.

**PURPOSE**

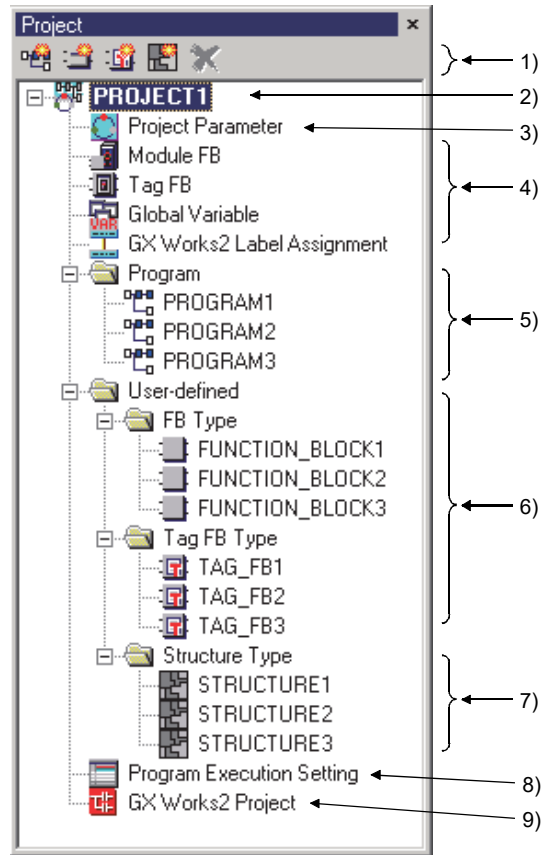
To display a series of data that are administrated by a project in a project window.

**BASIC OPERATION**

1. Double-click the icons or text label in a project window.
2. Display the Edit/Set screen of double-clicked item.

**DISPLAY/SETTING SCREEN**

 DISPLAY/SETTING DATA

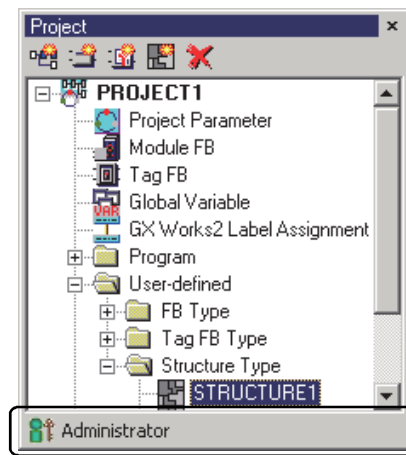


No.	Description
1)	Project toolbar. (☞ Section 5.6.4)
2)	To display project name.
3)	To display "Project Parameter Setting" dialog box. (☞ Section 6.14)
4)	To display Module FB declaration window, Tag FB declaration window, Global variable declaration window*1, GX label assignment window. Note that, if a GX project contained in the PX Developer project is "(without labels)", GX label assignment is not displayed.
5)	To display Program definition window.
6)	To display User-defined FB Definition Window. (☞ Section 7.14)
7)	To display Structure Type Definition Window. (☞ Section 9.1)
8)	To display Program execution timing window. (☞ Section 7.13.2)
9)	To run GX project*1 created for PX Developer project. (☞ Section 7.15.1)

*1: When the GX project type is GX Works2 project, double-click the "GX Works2 Project" icon. As for when the project type is GX Developer project, double-click the "GX Developer Project" icon.

POINT

- The data (program, FB type, tag FB type, structure type) in the project window can be copied. (They can also be copied to the other project.)
For details, refer to Section 6.9.
- GX application is started up by double-clicking a GX project in the project window. For the restrictions when starting up GX application, refer to Section 7.15.1.
- When data protection is enabled, an icon and the access level during login are displayed on the bottom of the project window.



Displays an icon and access level.

5.7.3 Parts window

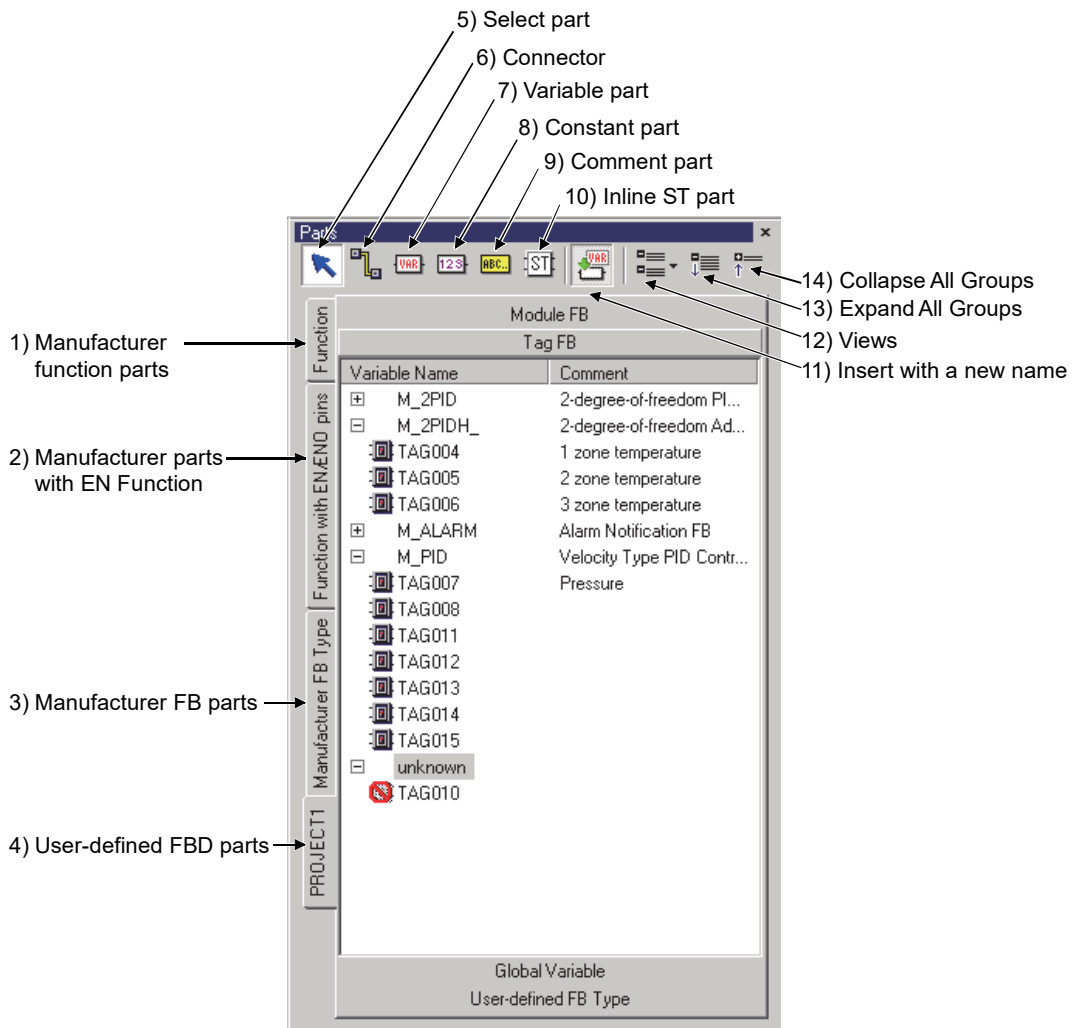
Parts window is used to list FBD parts that are pasted on the FBD sheet in the program/FB definition window when FBD language is used for programming. There are four tabs in a parts window and each tab can be further split according to its functions and purposes.

In programming tool, create an FBD program by selecting a single part from parts window and dragging and dropping it onto the FBD sheet.

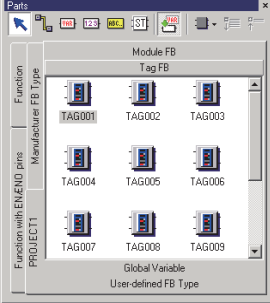
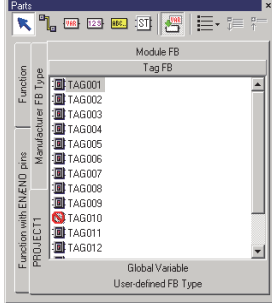
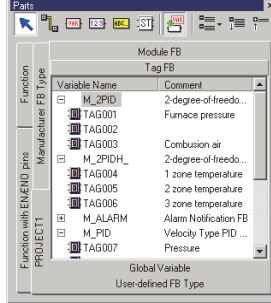



Select FBD parts following the instruction: Click one of the four tabs <<Function>>, <<Function with EN/ENO pins>>, <<Manufacturer FB Type>>, or <<(Project Name)>> on the left side of the parts window, then click the function name displayed on the right side of the tab.

Once the function name is clicked, a parts list will be shown under it. Thus the parts can be selected with mouse and draw them into the FBD sheet in the program/FB definition window (Section 7.1).

The name and content of each part in parts window will be explained here. For details about FBD parts arrangement, refer to Section 7.2.



Name and contents of each part are as follows:

Code	Name	Description
1)	Manufacturer function parts	<p>To display function tags provided by manufacturers. It can be classified into following 11 types:</p> <ul style="list-style-type: none"> ● Type Conversion ● Numerical Operation ● Arithmetic Operation ● Bit-string ● Logical Operation ● Selection ● Comparison ● Character string ● Helper ● Ladder Program Control ● Analog Value Selection/Average (General process)
2)	Manufacturer parts with EN function	<p>To display tags with EN function provided by manufacturers. It can be classified into following 11 types:</p> <ul style="list-style-type: none"> ● Type Conversion (EN/ENO) ● Numerical Operation (EN/ENO) ● Arithmetic Operation (EN/ENO) ● Bit-string (EN/ENO) ● Logical Operation (EN/ENO) ● Selection (EN/ENO) ● Comparison (EN/ENO) ● Character String (EN/ENO) ● Helper (EN/ENO) ● Ladder Program Control (EN/ENO) ● Analog Value Selection/Average (General process) (EN/ENO)
3)	Manufacturer FB parts	<p>To display FB type parts provided by producer. It can be classified into following 12 types:</p> <ul style="list-style-type: none"> ● Bistable FB ● Edge Detection FB ● Counter FB ● Timer FB ● Communication Control FB ● Correction Operation FB (General process) ● Arithmetic Operation FB (General process) ● Comparison Operation FB (General process) ● Control Operation FB (General process) ● I/O Control Operation FB (Tag access) ● Loop control operation FB (Tag access) ● Special FB (Tag access)
4)	User-defined FBD parts (project name)	<p>To display the global parts which have been declared to the project and user-defined FB parts. It can be classified into following 4 types.</p> <ul style="list-style-type: none"> ● Module FB: to show explained content in module FB declaration window ● Tag FB: to show contents in tag FB declaration window ● Global Variable: to show explained content in global variable declaration window ● User-defined FB Type: to show the new FB type on project trees <p>The view format can be selected from among the three types shown below by specifying 12).</p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  <p>Icons</p> </div> <div style="text-align: center;">  <p>List</p> </div> <div style="text-align: center;">  <p>Group *1</p> </div> </div>
5)	 Select part	To operate the pasted FBD parts on the FBD diagram, click this button and then select FBD component.
6)	 Connector	Select this when connector is to be pasted on FBD sheet. In addition to clicking the "Connector" button, a connector can also be extended directly from the output pin of an FBD part. (See Section 7.8.3)
7)	 Variable part	Select this to paste variable parts on FBD sheet.

(To the next page)

Code	Name	Description
8)	Constant part	Select this to paste constant parts on FBD sheet.
9)	Comment part	Select this to paste comment parts on FBD sheet.
10)	Inline ST part	Select this to paste Inline ST parts on FBD sheet.
11)	Insert with a new name	Select this to set a new name of FBD part to be pasted.
12)	Views *2	Select the view format of 4) from among the three types: "Icons ()", "List ()", and "Group ()".
13)	Expand All Groups*3	Select this to expand all groups.
14)	Collapse All Groups*3	Select this to collapse all groups.

*1: Module FBs are grouped by module FB names, tag FBs are grouped by tag FB types, and global variables are grouped by data types.

Global parts/FBs whose type is not declared are grouped as "unknown".

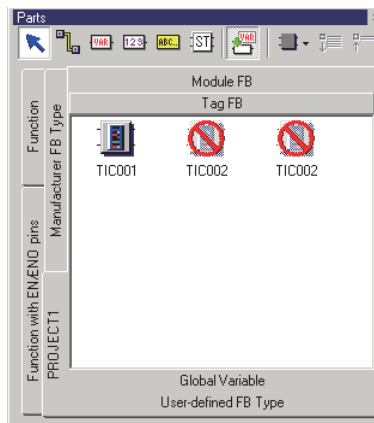
*2: Only when a tab of user-defined FBD parts is opened, the button is enabled.

*3: Only when the view format is [Group] and a tab of Module FB/Tag FB/Global Variable is opened, the button is enabled.

POINT

If error occurs in declaration contents, tag FB cannot be arranged from parts window on FBD sheet.

No.	Tag FB Variable Name	Tag FB Type	Tag Type	Assigned Device	Comment
1	TIC001	M_2PID	2PID	ZR3000	
2	TIC002	M_2PID_DUTY	2PID	ZR3130	
3	TIC002	M_2PID_DUTY	2PID	ZR3260	



The following shows available view formats on each tab.

Format \ Tab name	Icons	List	Group
Function	X	○	X
Function with EN/ENO pins	X	○	X
Manufacturer FB Type	X	○	X
User-defined (project name)	○	○	○*1

*1: FBs are displayed in "List" format on a tab of User-defined FB Type.


5.7.4 FB property window

**PURPOSE**

To display/set the values written below on the FB property window.

- Initial/current value of FB type/tag FB type/Module FB type public variable (operation constant, tag data etc.)
- Current value of local variable being used in ST program of inline ST parts.
- Setting value of I/O simulation operation

**BASIC OPERATION**


1. Select the edit mode to display initial value of FB property or the monitor mode to monitor display current value.
2. Select the FB by performing either of the following operations.
 - Select the FBD parts of the FBD sheet on the Program/FB definition window.
 - Select a row declaring the tag FB on the tag FB declaration window.
 - Select a row declaring the module FB on the module FB declaration window.
 - Select a row where the simulation operation is set on the I/O simulation setting window.
 - Select the FB variable on the local variable sheet.
 - Select the ST parts on the FBD sheet.
3. Items displayed in the FB property window.
4. If it is in Edit mode, select an intended item to change its initial value.
5. When the monitor mode is selected, perform the following operations 1) to 4) to change the current value.
 - 1) Select an item to be changed its current value, and click .
 - 2) "Change Current Value" dialog box is displayed.
 - 3) Change the current value of the selected item.
 - 4) Click the "Set" button.

Generally, nothing will be shown in the FB property window.

The initial/current value cannot be display/set when the public variable is of ADR_REAL or structure type.

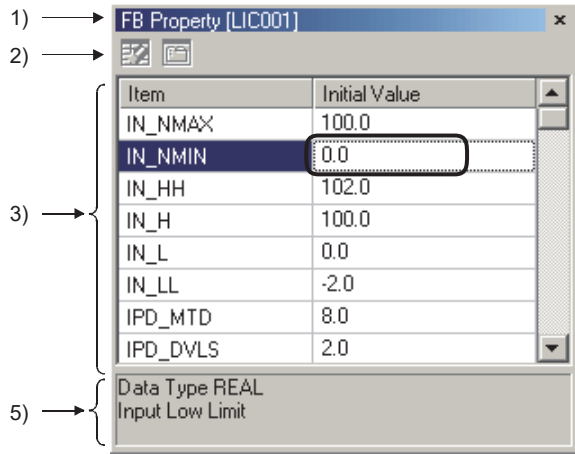
For details of the public variable initial value-settable FB parts, refer to "PX Developer Version 1 Programming Manual".

POINT

- When changing current value in the FB property window in monitor mode, it is not reflected to the initial value of a project. If downloading to PLC After performing cold-start and compile, setting value is initialized by the initial value of a project. To reflect current value to initial value, read current value of FB property ( Section 13.6).
- In monitor mode, the current value (TRUE/FALSE) of the BOOL type can be switched by double-clicking the selected "Current Value" cell while pressing the "Shift" key.
Except for BOOL type, the "Change Current Value" dialog box is displayed.

 **DISPLAY/SETTING SCREEN**

(1) in edit mode



1) →

2) →

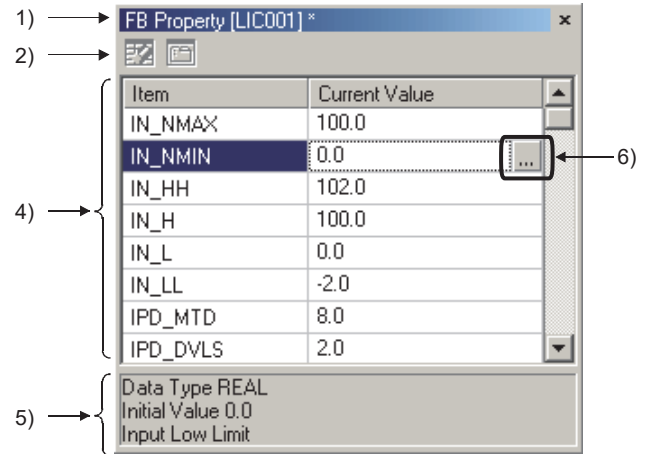
Item	Initial Value
IN_NMAX	100.0
IN_NMIN	0.0
IN_HH	102.0
IN_H	100.0
IN_L	0.0
IN_LL	-2.0
IPD_MTD	8.0
IPD_DVLS	2.0

3) →

5) →

Data Type REAL
Input Low Limit

(2) in monitor mode



1) →

2) →

Item	Current Value
IN_NMAX	100.0
IN_NMIN	0.0
IN_HH	102.0
IN_H	100.0
IN_L	0.0
IN_LL	-2.0
IPD_MTD	8.0
IPD_DVLS	2.0

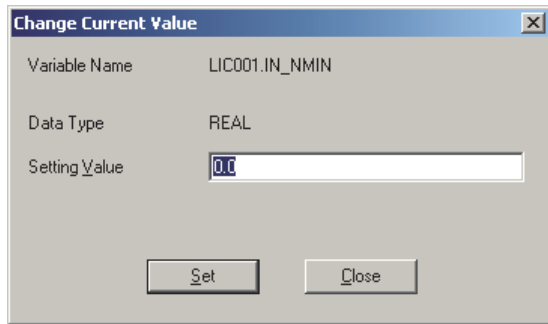
4) →

5) →

6) →

Data Type REAL
Initial Value 0.0
Input Low Limit

(3) "Change Current Value" dialog box



Change Current Value








Variable Name LIC001.IN_NMIN

Data Type REAL

Setting Value 0.0

Set Close

 **DISPLAY/SETTING DATA**

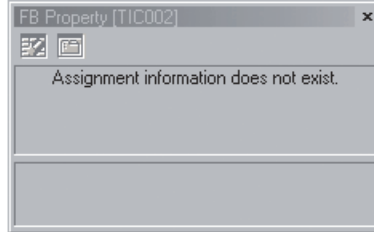
Code	Description						
1)	FB part : "FB property [FB Variable Name]" is displayed. Inline ST part : "FB property [Inline ST part name]" is displayed. I/O Simulation setting: "FB property [I/O Simulation Setting No.]" is displayed. When monitoring on the monitor mode, "*" flickers beside the letter string.						
2)	Tool bar is displayed. <table border="1"> <thead> <tr> <th>Button</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>  </td> <td> The FB property is initialized with the manufacturer-defined initial values. (Only when all following conditions are fulfilled, the button is enabled.) <ul style="list-style-type: none"> ● Public variables are displayed on the window. ● Initial values can be edited. ● One or more initial values have been changed. </td> </tr> <tr> <td>  </td> <td> FB property page is displayed. (The button is enabled only when the FBs described in Section 10.2 are selected in edit mode.) </td> </tr> </tbody> </table>	Button	Description		The FB property is initialized with the manufacturer-defined initial values. (Only when all following conditions are fulfilled, the button is enabled.) <ul style="list-style-type: none"> ● Public variables are displayed on the window. ● Initial values can be edited. ● One or more initial values have been changed. 		FB property page is displayed. (The button is enabled only when the FBs described in Section 10.2 are selected in edit mode.)
Button	Description						
	The FB property is initialized with the manufacturer-defined initial values. (Only when all following conditions are fulfilled, the button is enabled.) <ul style="list-style-type: none"> ● Public variables are displayed on the window. ● Initial values can be edited. ● One or more initial values have been changed. 						
	FB property page is displayed. (The button is enabled only when the FBs described in Section 10.2 are selected in edit mode.)						
3)	The item names and the initial values of public variable (such as operation constant and tag data) of selected FB parts, or the setting item names and the values of selected I/O simulation operation are displayed. Nothing will be displayed when the selected FB parts do not have the public variables and inline ST parts are selected. If using a BOOL type, the initial value setting is executed with the list box. If using other data types, input a value directly.						
4)	Display either of the following. <ul style="list-style-type: none"> ● Public variable (such as operation constant and tag data) of selected FB parts ● Item name and current value of local variable used in ST program of selected inline ST part ● Setting item name and value of selected I/O simulation operation Nothing will be displayed when the selected FB parts do not have the public variables. Using "Change Current Value" dialog box changes the current value.						
5)	To display the description of selected public variable or local variable. <table border="1"> <thead> <tr> <th>Mode</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Edit mode</td> <td>To display data type and comment of selected public variable</td> </tr> <tr> <td>Monitor mode</td> <td>To display data type, initial value and comment of selected public/local variable</td> </tr> </tbody> </table>	Mode	Description	Edit mode	To display data type and comment of selected public variable	Monitor mode	To display data type, initial value and comment of selected public/local variable
Mode	Description						
Edit mode	To display data type and comment of selected public variable						
Monitor mode	To display data type, initial value and comment of selected public/local variable						
6)	To display the  button at the current value area of selected public/local variable. Click the button to display "Change Current Value" dialog box.						



HELPFUL OPERATION

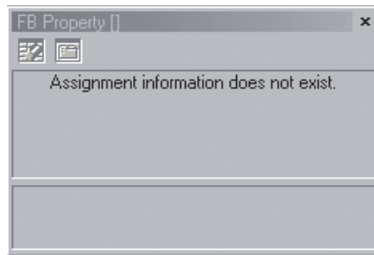
The message [Assignment information does not exist.] may appear on the monitoring FB property window in any of the following cases.

- (1) If adding the FB variable with FB property to declaration window or FBD sheet after compile, and monitoring its FB variable.



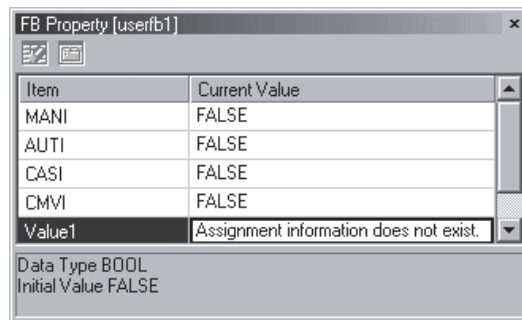
For monitoring added FB variable, execute download after compile.

- (2) If deleting the FB variable name of FB variable with FB property by using declaration window, and monitoring its FB variable.



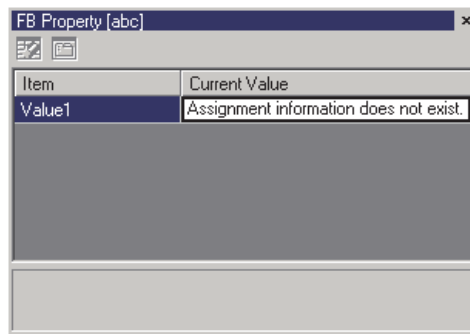
In this case, the FB variable name is not displayed on the title of FB property window.

- (3) If adding the public variable to be FB property to FB type after compilation, and monitoring its FB variable.



Execute download to PLC to monitor the current value of added public variables after compilation.

- (4) If changing program/FB hierarchy by operation such as rename FBD program after compilation, and monitoring its inline ST parts.



Execute download to PLC to monitor the changed inline ST parts after compilation.

POINT

- In execution of hot-start compile or online change compile, the public variable initial value that is set under FB property window may not be substituted in a CPU module.
For details, refer to Section 11.6.1.
- Nothing will be displayed on FB property, if more than one FBD part are selected.
For details about how to select multiple FBD parts, refer to Section 7.2.2.
- In edit mode, changed initial values are displayed in boldface.
- When I/O simulation setting window is active, the operations in the edit mode can be performed on the FB property window even though the mode is monitor mode.

5.7.5 Output window

Output window is used for displaying processing phase, error or warning message and other kinds of information during the course of compile.


Basic operations on output window will be explained here.

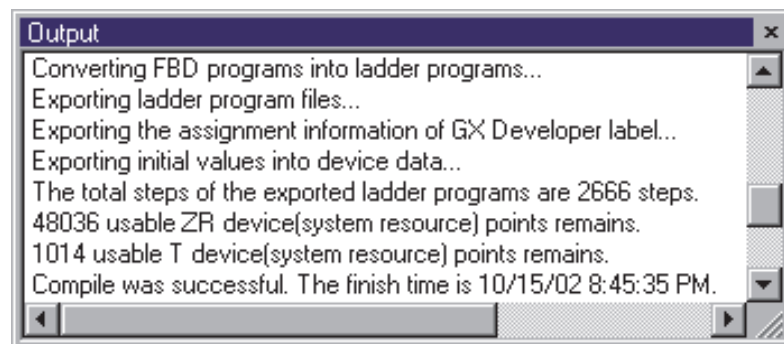
For details, refer to Chapter 11.



**PURPOSE**

All kinds of information are displayed in the output window. Such information can be copied/pasted into a text file and also deleted.

**BASIC OPERATION**

1. Select the part to be copied.
2. Select [Edit] → [Copy] () in menu. (Or press the "Ctrl" + "C" keys)
3. Start a text editor such as Microsoft® Windows® Operating System notebook, and paste content copied in step.
4. Select [Edit] → [Clear Output Window] to delete all in output window or right click the mouse in output window.

**DISPLAY/SETTING SCREEN****POINT**

- The font or character size shown in output window can be changed by setting options.
For details, refer to Section 5.11 (1).
- When double-clicking the lines covering editing screen (such as FBD sheet) or setting screen information, the corresponding screen will be shown.
- More than one line can be selected at the same time in output window.
- With output window separated from the programming tool ( Section 5.7.1 (1)), copy cannot be executed from [Edit] → [Copy] () in the menu. When output window has been separated from the programming tool, execute copy from [Copy] in the right-click menu (or by pressing the "Ctrl" + "C" keys).

5.7.6 Bird's-eye view window

The Bird's-eye view window displays overall view of FBD sheet in the currently activated program/FB definition window.

The zoom-out scale of FB sheet can also be adjusted on the Bird's-eye view window. When screen is not big enough to accommodate the FBD program, the Bird's-eye view window shows its extreme convenience.



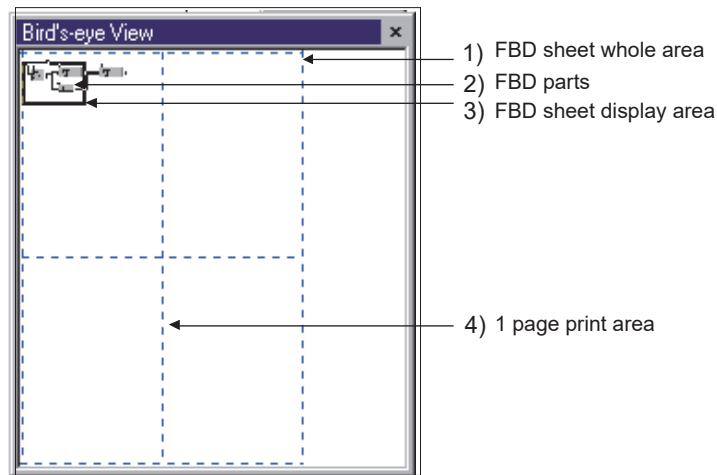
PURPOSE

The size and position of display area can be adjusted while watching the overall arrangement of FBD sheet on bird's-eye view window.

How to adjust the size and position of display area will be explained here.



DISPLAY/SETTING SCREEN



DISPLAY/SETTING DATA


No.	Item	Description
1)	FBD sheet whole area	To display the whole activated FBD sheet field.
2)	FBD parts	To display the activated FBD parts in FBD sheet.
3)	FBD sheet display area	To display the outline border of FBD sheet display area. The outline border size will change with the size modification of program/FB definition window. The FBD sheet display area will be zoomed in/out when drawing the angles of the outline border with mouse. Further more, if moving mouse within the outline border, the arrow will be changed into . In this way, the display area can be moved in FBD sheet by drawing mouse.
4)	1 page print area	It equals to one page area in printing according to selected paper size in printing settings (Section 16.1) of FBD sheet.

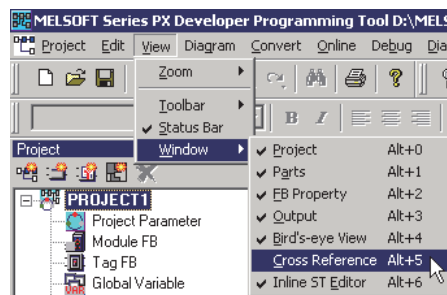
5.7.7 Cross reference window


**PURPOSE**

To display where variables are declared and used by the programming tool.

**BASIC OPERATION**

1. Select [View] → [Window] → [Cross Reference] () in the menu.
2. The cross reference window is displayed.

**DISPLAY/SETTING SCREEN**

Select [View] → [Window] → [Cross Reference] in the menu.
Alternatively, click the  button on the toolbar.



Variable Name	Program/User-defined Type	Sheet/Table	Data Type	Variable Type	Access	Assigned Device	Initial Value	Position	Comment
AD1	PROGRAM1	Sheet1	AIN_4CH_0	External Variable	FB Call			(70, 100)	
AD1	PROGRAM1	(Local Variable)	AIN_4CH_0	External Variable				2	
AD1	(Module FB)		AIN_4CH_0					1	
LIC001	PROGRAM1	Sheet1	M_IPD_T	External Variable	FB Call			(230, 100)	
LIC001	PROGRAM1	Sheet1	M_IPD_T	External Variable	FB Call			(460, 100)	

The cross reference window is displayed.

5.7.8 Inline ST editor window

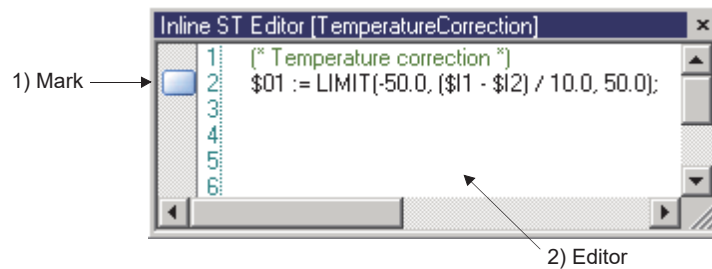
Inline ST editor is a window to edit ST program to be set in the inline ST parts.

**PURPOSE**

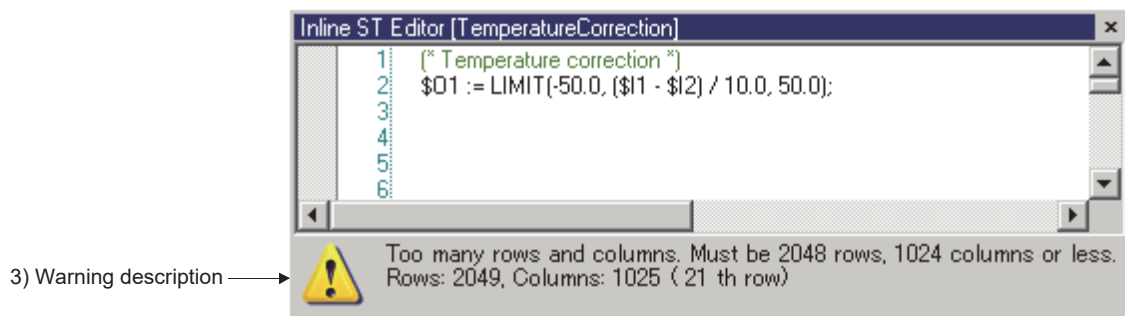
To edit ST program

**BASIC OPERATION**

1. Select an inline ST part to display ST program on the Inline ST editor window.
2. Edit ST program on the Inline ST editor window.
3. Click the area outside of the inline ST part after the edit.
(Remove the focus from the inline ST part.)
ST program is set to the inline ST parts and updated.

**DISPLAY/SETTING SCREEN**

(Warning)





DISPLAY/SETTING DATA

No.	Item	Description												
1)	Mark	Display a mark on the left margin of a jump destination line when displaying a cursor to the specified line/column with the Jump function.												
2)	Editor	<p>Text editor to edit ST program. Displayed colors differ in accordance with character strings.</p> <table border="1"> <thead> <tr> <th>Item</th> <th>Text color</th> <th>Target</th> </tr> </thead> <tbody> <tr> <td>Comment</td> <td>Green</td> <td>Multiple-line comment "(* ... *)", or single line comment "// ... "</td> </tr> <tr> <td>Reserved words for such as operator</td> <td>Blue</td> <td>Reserved words used as text or operator (does not differentiate upper case from lower case) TRUE, FALSE, IF, THEN, ELSE, ELSIF, END_IF, NOT, MOD, AND, XOR, OR</td> </tr> <tr> <td>Character string constant</td> <td>Maroon</td> <td>Character strings which start from double quotation mark (") and end with double quotation mark or the end of the line.</td> </tr> </tbody> </table>	Item	Text color	Target	Comment	Green	Multiple-line comment "(* ... *)", or single line comment "// ... "	Reserved words for such as operator	Blue	Reserved words used as text or operator (does not differentiate upper case from lower case) TRUE, FALSE, IF, THEN, ELSE, ELSIF, END_IF, NOT, MOD, AND, XOR, OR	Character string constant	Maroon	Character strings which start from double quotation mark (") and end with double quotation mark or the end of the line.
Item	Text color	Target												
Comment	Green	Multiple-line comment "(* ... *)", or single line comment "// ... "												
Reserved words for such as operator	Blue	Reserved words used as text or operator (does not differentiate upper case from lower case) TRUE, FALSE, IF, THEN, ELSE, ELSIF, END_IF, NOT, MOD, AND, XOR, OR												
Character string constant	Maroon	Character strings which start from double quotation mark (") and end with double quotation mark or the end of the line.												
3)	Warning description	<p>Display when the number of lines/columns of ST program meets each of the following cases.</p> <ul style="list-style-type: none"> ● The number of lines exceeds 2048 lines. ● Line whose number of columns exceeds 1024 exists. 												

POINT

- Inline ST editor cannot be changed in monitor mode or read-only edit mode which depends on access levels.
- Changing the fonts or the size of letters can be executed with the Option settings. For details, refer to Section 5.11 (1).
- If warning is displayed, execute the following instructions to clear the warning.
 - If the number of lines exceeds 2048 lines, divide ST program into multiple inline ST parts.
 - If a line whose number of columns exceeds 1024 exists, move to a new line in the middle of the corresponding line.

5.8 Table

5.8.1 General operations of table

General table operations used by programming tool will be explained here.

(1) Move of cursor

**PURPOSE**

To move the cursor in a table.

**BASIC OPERATION**

- There are altogether 3 ways in moving cursor.
- Use direction key on keyboard ("↑", "↓", "←", "→").
- Use mouse.
- Use "Enter" key on keyboard.

(2) Input data into tables

**PURPOSE**

To input data into table, follow steps listed below.

**BASIC OPERATION**

1. Select a cell in which data will be input.
2. Input data with keyboard.
3. Press the direction key ("↑", "↓") or press the "Enter" key to confirm the input data.

**DISPLAY/SETTING SCREEN**

No.	Global Variable Name	Data Type	Initial Value
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			

Select a cell



No.	Global Variable Name	Data Type	Initial Value
1	example		
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			

Input data with keyboard and press "Enter" for confirmation

(3) Select row/column



PURPOSE

To select a row/column of a table.



BASIC OPERATION

1. Click left side or the top of cells to select a column or row.
2. If selecting a particular part of a row/column, select a cell at first and then draw it to the intended position.
3. Press "Delete" key to delete content in the high-lighted area.



DISPLAY/SETTING SCREEN

No.	Global Variable Name	Data Type	Initial Value	Assigned Device
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

(4) Select multiple cells



PURPOSE

To select multiple cells.



BASIC OPERATION

Click a cell while pressing "Ctrl" key.



DISPLAY/SETTING SCREEN

No.	Global Variable Name	Data Type	Initial Value	Assigned Device
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

(5) Add/delete a row



PURPOSE

To add/delete rows in table.



BASIC OPERATION

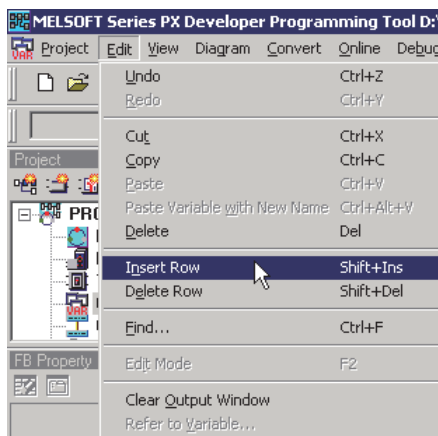
1. Select the next row of the intend-to-add part to add a new row.
Select the intend-to-delete row to delete one row.
2. If a new row is to be added, select [Edit] → [Insert Row] in menu, or right-click mouse and select [Insert Row].
If a row is to be deleted, select [Edit] → [Delete Row] in menu, or right-click mouse and select [Delete Row].



DISPLAY/SETTING SCREEN

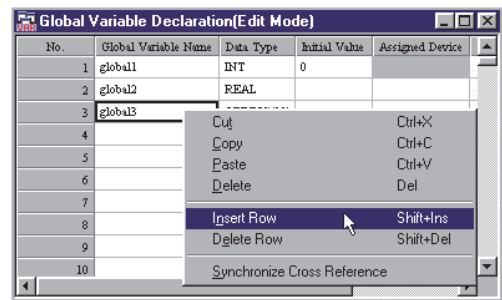
No.	Global Variable Name	Data Type	Initial Value	Assigned Device
1	global1	INT	0	
2	global2	REAL		
3	global3	STRING(20)		
4				
5				
6				
7				
8				
9				
10				

Select row to be added or deleted



Select [Edit] → [Insert Row]/[Delete Row]

Or



Right-click the cell

(6) Cut/copy/paste data



PURPOSE

To cut, copy and paste some data in tables.

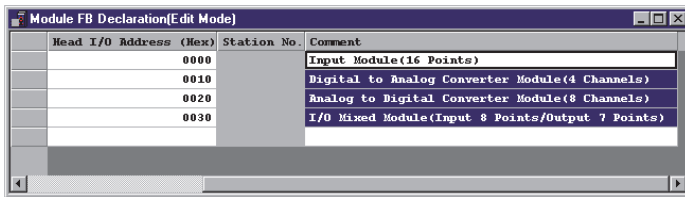
To paste the declaration list of the parts or variables pre-edited in Microsoft® Excel® into the table of programming tools.



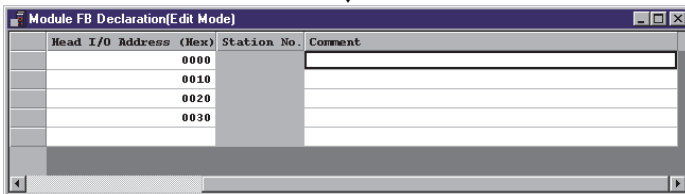
BASIC OPERATION

(a) Cut

Cut the selected area.

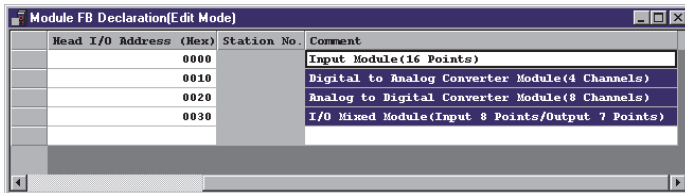


- 1) Select the intend-to-cut part.
- 2) Click [Edit] → [Cut] () in the menu.
Or right-click the cell and select [Cut] in the pop-up menu.



(b) Copy

Copy the selected content onto the clipboard of Windows® .



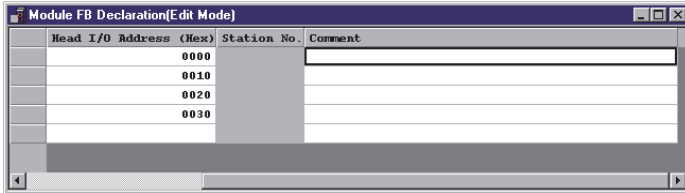
- 1) Select the intend-to-copy part.
- 2) Click [Edit] → [Copy] () in the menu or right-click the cell and select [Copy] in the pop-up menu.

(c) Paste


To paste cut or copied content into the selected area.

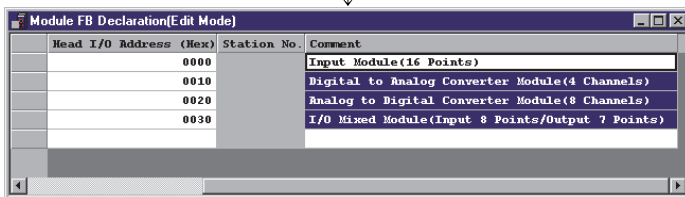
The paste operation may be unavailable in the following condition.

- The table form is different from the data of cut or copied object and pasted object data.
- Cut or copied item is different from the pasted object item.



1) Select the pasted object (copy object) for cut/copied content.

2) Click [Edit] → [Paste] () or the [Paste] on right-click menu.

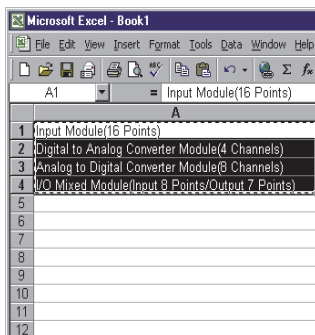


3) Selected area is replaced by cut (copied) content.

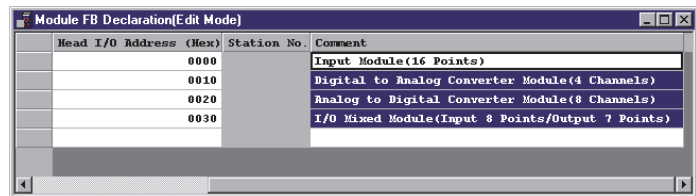
(d) Copy from Microsoft® Excel® and paste


Copy from Microsoft® Excel® and paste it into programming tool table.

(The examples of copying/pasting of to programming tool table from Microsoft® Excel®)



Select and copy Excel® table



Select the high-lighted area and click [Edit] → [Paste] () in Menu.

(7) Change and automatic adjustment of column widths



PURPOSE

Change the column widths of the table.

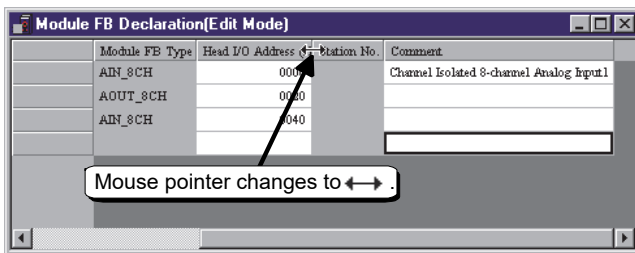
The can also be adjusted automatically.

Automatic adjustment adjusts the column widths automatically so that the data of each cell is not broken midway.



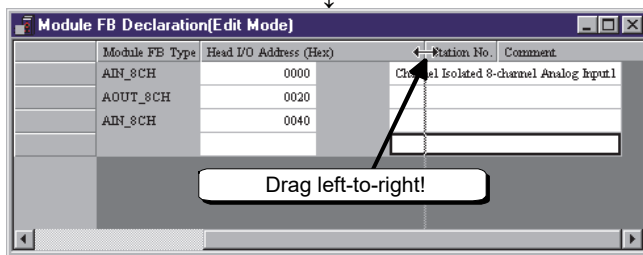
BASIC OPERATION

(a) Change of column width



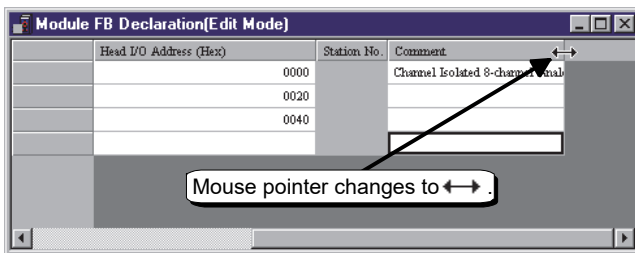
- 1) Move the mouse pointer to the vertical line between the columns of the Item row. (Refer to the left screen.)

- 2) The mouse pointer changes to \leftrightarrow .



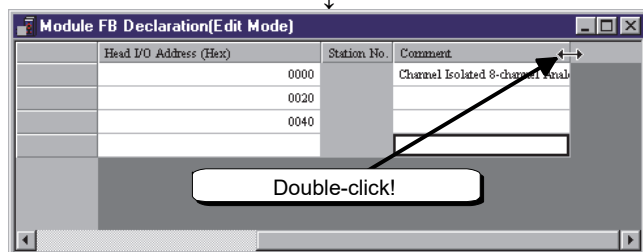
- 3) In the status in above 2), drag the mouse left-to-right to change the column widths of the table.

(b) Automatic adjustment of column width



- 1) Move the mouse pointer to the vertical line between the columns of the Item row. (Refer to the left screen.)

- 2) The mouse pointer changes to \leftrightarrow .

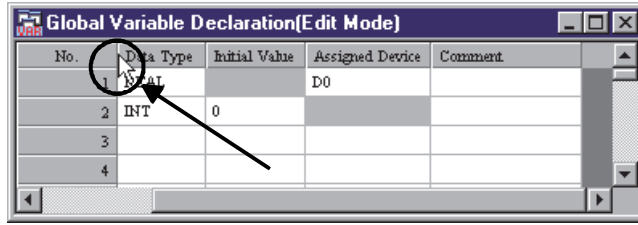


- 3) Double-click in the status in above 2). This automatically adjusts the column widths so that the data of each cell is not broken midway.

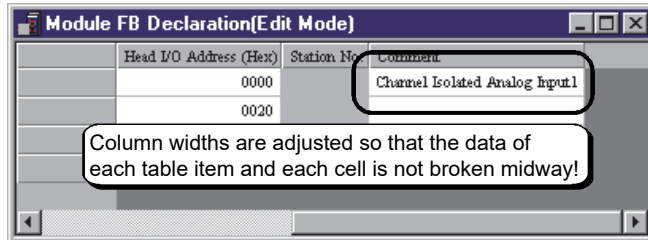
POINT

- The width of a fixed column cannot be changed.

(Example) "No." column of global variable declaration window



- Automatic adjustment adjusts column widths automatically within the on-screen row range so that the data of each table item and each cell is not broken midway.




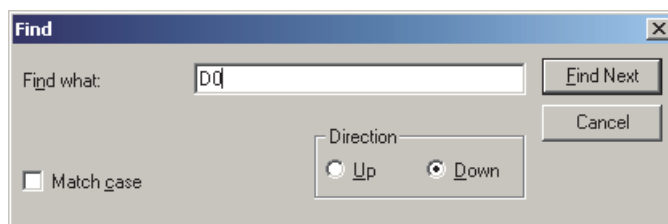
(8) Find cell data

**PURPOSE**

To search for the cell including the specified character string in the active window (searchable window).

**BASIC OPERATION**

1. Display the search target window.
2. Select any cell and display the "Find" dialog box by clicking [Edit] → [Find] () from the menu or pressing the "Ctrl" + "F" keys.
3. Enter the character string to be searched for.
4. Select a search direction and click the "Find Next" button.
5. The corresponding cell is selected when the cell including the character string to be searched for exists.

**DISPLAY/SETTING SCREEN****POINT**

When searching for module FB variables of CC-Link slave stations in the Module FB Declaration window, if the matched cell is hidden, expand rows, and then display and select the cell.

5.9 General Operations of Child Windows

This section mainly describes the general operations on child windows of program/FB definition window in the main window of programming tool.



PURPOSE

Manage the child windows displayed in the main window of the programming tool.



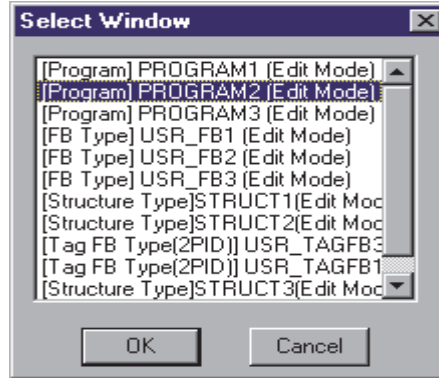
BASIC OPERATION

The arrangement and management of child windows are mainly operated on [Window] menu.

- (1) **The next one**
Select [Window] → [Next] in the menu or press "F6" to display next child window.
- (2) **The previous one**
Select [Window] → [Previous] in the menu or press "Shift"+"F6" to display the last displayed child window.
- (3) **Cascade display**
Select [Window] → [Cascade], the opened child windows will be displayed in a cascading way.
- (4) **Tile horizontally**
Select [Window] → [Tile Horizontally], the current opened child windows will be arrayed in column.
- (5) **Tile vertically**
Select [Window] → [Tile Vertically], the current opened child windows will be arrayed in line.
- (6) **Arrange icons**
Select [Window] → [Arrange Icon], the icons of opened child windows will be arranged with an equal interval.

(7) Other windows

If over 10 child windows are displayed, selecting [More Window] at the bottom of the [Window] menu, following dialog box will be displayed.



The above [Select Window] dialog box will list all the current opened child windows. If double-clicking the window names to be activated or click "OK" button when the window is selected, the selected window will be displayed in the front.

5.10 Help

**PURPOSE**

To identify following contents with "Help" function.

- PLC error
Display GX Works2 Help for error codes.
- Online Manual
Display PDF manual.
- About PX Developer
PX Developer Version.

**BASIC OPERATION**

Click [Help] → [PLC Error]/[Online Manual]/[About PX Developer] on the menu.

POINT

- GX Works2 must be installed to read Help for PLC errors. Display Help from the menu in GX Developer Version 8.500W or later to refer to CPU errors of GX Developer.
- Acrobat® Reader must be installed before users read online manual (PDF data). Refer to readme.txt in the "Manual" folder stored in the CD of this product.

5.11 Option Setting



PURPOSE

To change the font or background color of the programming tool windows, and configure the display settings.



BASIC OPERATION

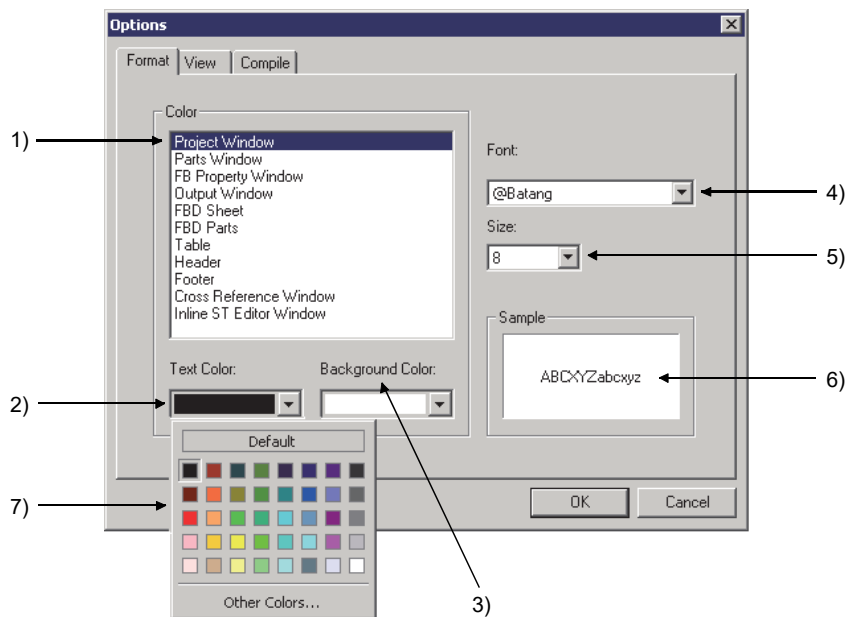
1. Select [Tool] → [Options] on the menu to display the option dialog box.
2. Select the tab for modification and edit the items.
3. Click the "OK" button, settings in step 2 will work.
Click the "Cancel" button, the settings will not take effect. Close the dialog box.

Various tabs will be explained below.


(1) Format



DISPLAY/SETTING SCREEN

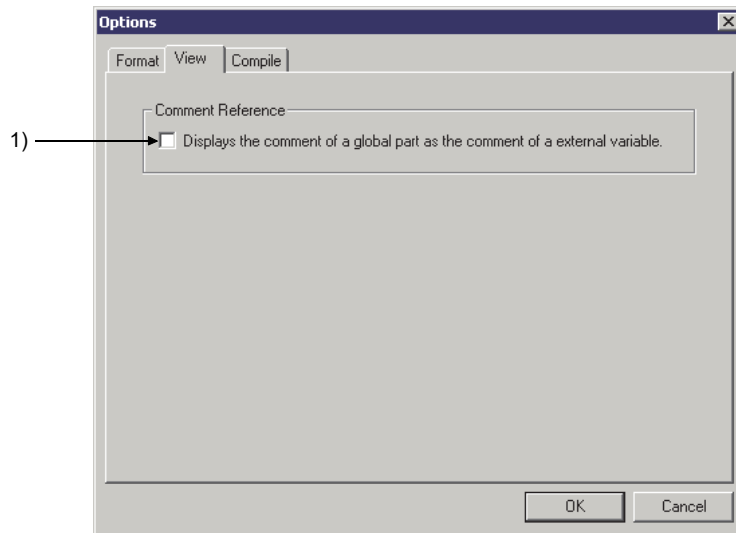


 **DISPLAY/SETTING DATA**

No.	Item	Description
1)	Setting target	To select item for modification
2)	Text color	To change the text color
3)	Background color	To change background color
4)	Font	To change font
5)	Size	To change character size
6)	Sample	To display changed font and color sample in 2) to 5)
7)	Color selection	Click  in 2), 3) to have it displayed. To change it into other colors than the prepared in advance, click "Other colors..." When "Default" is selected, the initial color setting will be restored.

(2) View

 **DISPLAY/SETTING SCREEN**

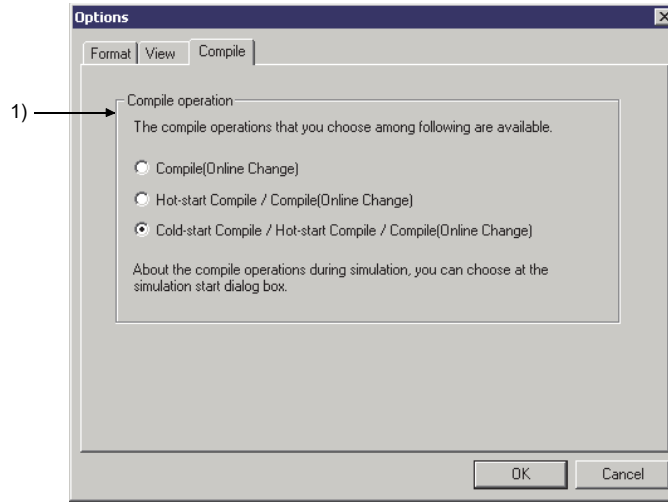


 **DISPLAY/SETTING DATA**

No.	Item	Description
1)	Comment Reference	Checked.....To display the comment of the global part referred by the relevant variable in the comment area. When there is no referred global part, the comment set to the external variable is displayed. Unchecked.....To display the comment set to the external variable.

(3) Compile

 *DISPLAY/SETTING SCREEN*



 *DISPLAY/SETTING DATA*

No.	Item	Description
1)	Compile operation	To select a compile operation to be enabled. The selected compile operation menu and tool button are enabled.

POINT			
<ul style="list-style-type: none"> • The options can be saved for different users. • The following shows the influence when the comment reference target is changed. 			
Item	Influence	Timing of application of option setting	Reference
Local variable sheet	Display contents in the comment area of the external variable	Close of the Options screen by clicking the "OK" button	Section 7.11.2 (4)
Print/print preview	Display contents in the comment area of the external variable	Print/print preview after setting the option settings	Section 16.5.5
Cross reference function	Cross reference status, information resource at creation of cross reference information	Creation of the cross reference information after setting the option settings	Section 10.1.4
Status of project	Becomes unsaved (does not become uncompiled)	Close of the Options screen by clicking the "OK" button	
<ul style="list-style-type: none"> • The compile operation during simulation can be enabled/disabled by specifying the item on the dialog box displayed at start simulation. (☞ Section 15.1) 			

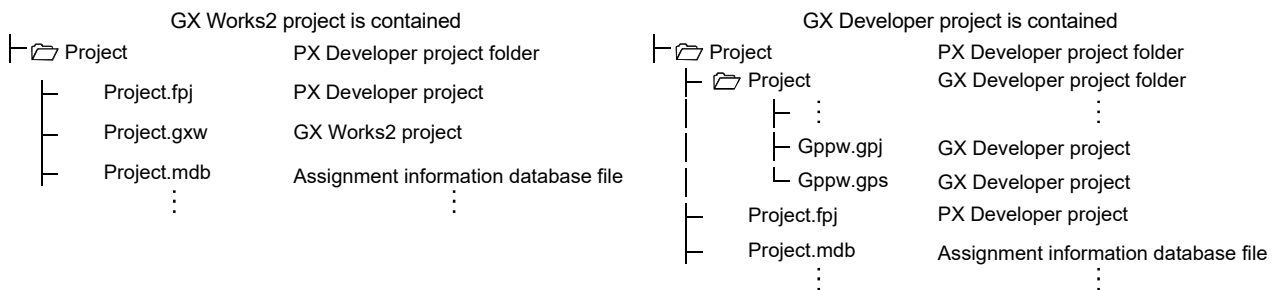
6 CREATING A PROJECT

The so-called PX Developer project is a project to integrate the FBD programs made by PX Developer programming tool and parameters, while the GX project is a project to integrate the ladder programs converted from FBD programs by compile programs, user-created ladder programs and parameters created by the user (PLC parameters, network parameters).

The created FBD programs and parameters can be both managed by the project.

6.1 Relation Between PX Developer Project and GX Project

The folder with the same name as the project can be created inside the PX Developer project folder when creating a new project by programming tools. Besides, GX project is still saved in this folder.

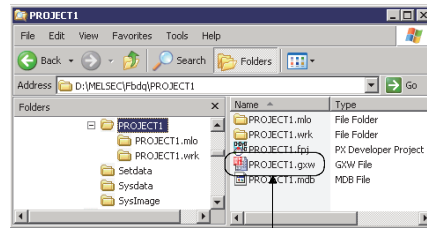


When changing the setting to execute the compile the PX Developer project side, the project setting of GX project is changed as well.

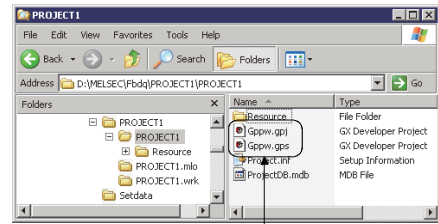
For instance, the global variables of the programming tool will be reflected on the GX application global labels when GX global label assignment (Section 8.5.2) is set and compile is executed. Therefore, data can be exchanged between the FBD program created by the programming tool and the ladder program created by GX application. So PX Developer project and GX project can be operated together interactively.

POINT

- The GX project in PX Developer project is different from the normal GX project. Therefore, operating project directly from GX application should be avoided. Besides, editing the following files from the Explorer in Microsoft® Windows® Operating System should also be avoided.
 - When GX project type is GX Works2 project: [* .gxw] file
 - When GX project type is GX Developer project: [Gppw.gpj] file or [Gppw.gps] file



GX Works2 project

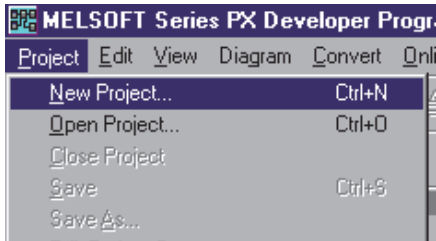



GX Developer project

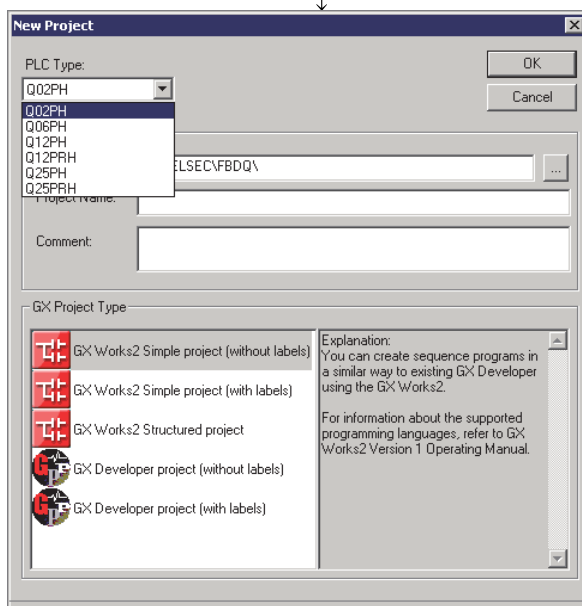
- Once the cold-start compile is executed, the [* .mdb] file will be created in PX Developer project folder. This file is the assignment information database file which saves device and variable assignment information. This file can also be used in hot-start compile, online change compile, switching to monitor mode or PLC downloading.


6.2 Creating a New Project

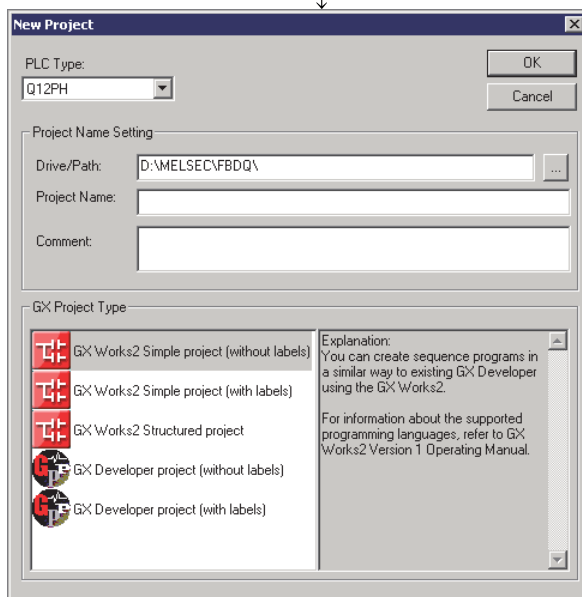
A project should be created before programming with the programming tool.
How to create a new project will be explained below.



1. Click [Project] → [New Project] on the menu. ()

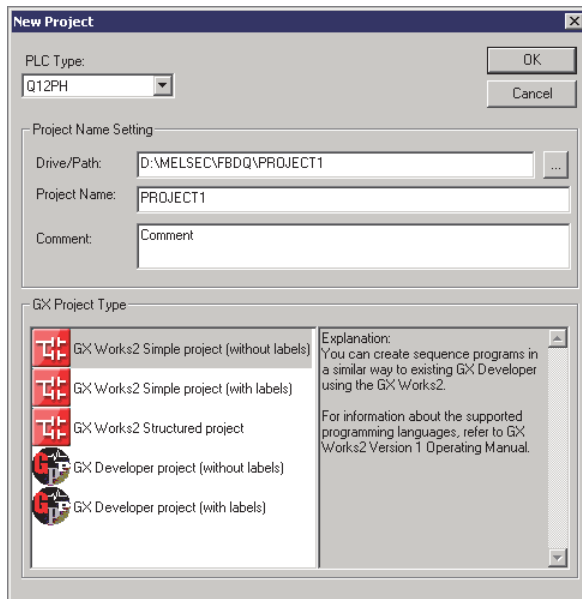


2. Click the list box  and select PLC type in the "New Project" dialog box.



3. Set the drive/path when change the project saving place.
For details of the method for changing the project saving place, refer to the "HELPFUL OPERATION" in this section.

(To the next page)



4. Set the project name.
When setting the project name, the total characters of the drive/path and project name should be within 149 characters. When setting the drive/path and project name, the total characters should be set within 149 characters. On the left is the screen with the project name "PROJECT1".
5. Set the comment according to needs.
The comment can be set within 64 characters. The set comment on the left is a dialog box displayed when opening the project (☞ Section 6.3).
6. Select a GX project type contained in a PX Developer project to be created.
For details on the label assignment, refer to Section 8.5.1.
7. Click the "OK" button.
New project can be created.

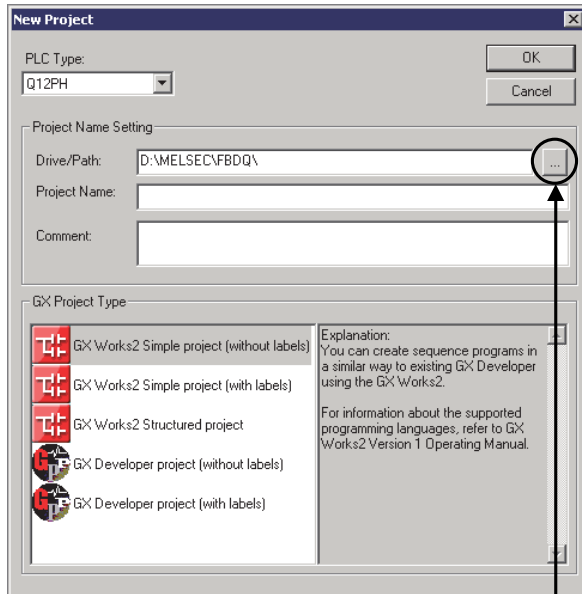
POINT

- When executing the [New project], the following symbols, character string project names and space characters cannot be use in the specified project name and drive/path.
(Symbols)
/ , . : ; * " < > | ? \
(Character string)
COM□ LPT□ AUX CON PRN NUL CLOCK\$
• There are numbers in □.
• "." Dot character can be used in the drive/path.
When specifying GX Works2 project to GX project type, "%" and "" cannot be used for a project name in addition to the symbols and character strings shown above. (These character strings can be used for drive/path.)
- When using the monitor tool to monitor, do not assign the same project name. (Disabled when the drive/path is different.)
- A Universal model process CPU project can be created only in the project whose GX project type is GX Works2.



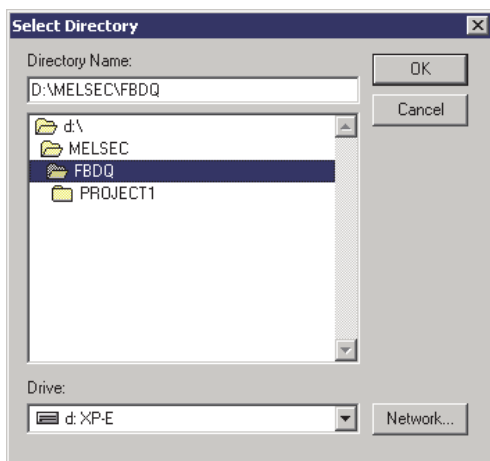
HELPFUL OPERATION

Execute the modification of the drive/path while confirming the folder hierarchy. Click "." set by project name when executing the Step 3 on the previous page. The following dialog box is displayed. At this time, select the drive/path from the folder hierarchy, or key input to set.



1. Click "." at the right side of the drive/ path textbox.

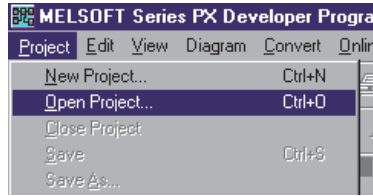
Click




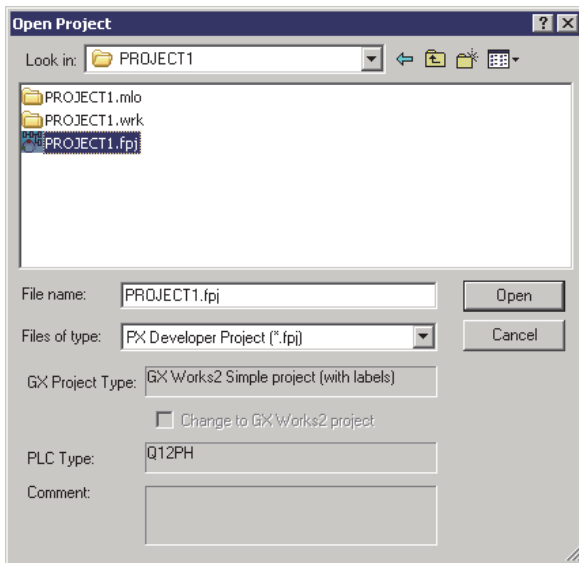
2. The dialog box shown as the left screen is displayed.
3. Click the list box and select the drive when changing the drive.
4. Click the icon at the center of the screen and move the project to the folder hierarchy in demand when using a mouse to change the saving place.
Input the drive/path of the saving place in the direct textbox through a keyboard.
5. Click the "OK" button.

6.3 Opening a Project

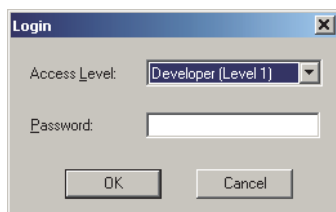
The detailed operations for opening the saved project will be explained as follows.



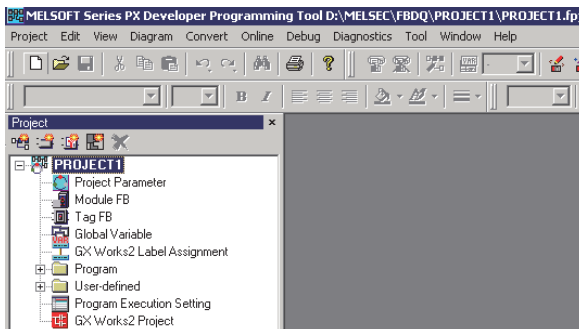
1. Click [Project] → [Open Project] on the menu. ()



2. Click the project name.
3. Click the "Open" button.



4. The left window is displayed if the data protection function is enabled in a project. For the method of enabling data protection, refer to Section 6.15.2.

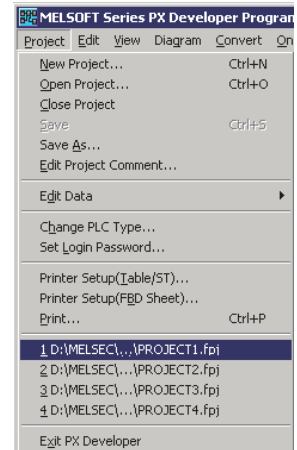


5. Open the specified project.

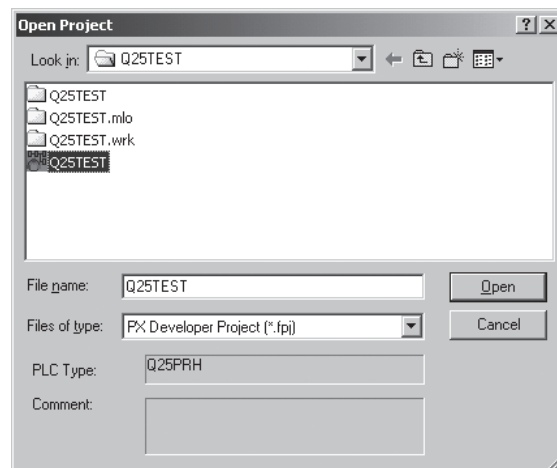
POINT

- A project can also be opened by double clicking the [*. fpj] file in PX Developer project folder on the Windows® explorer.

- The recently opened project file can also be opened from the history record.
4 pieces of the latest history records can be displayed. The initial setting is [Recently Used Project] menu.



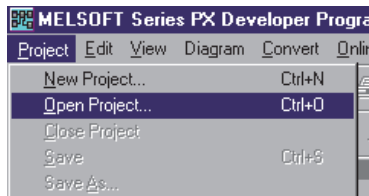
- Redundant CPU projects can be displayed but cannot be opened on the PX Developer Version 1.04E (SW1D5C-FBDQ-E) or earlier.




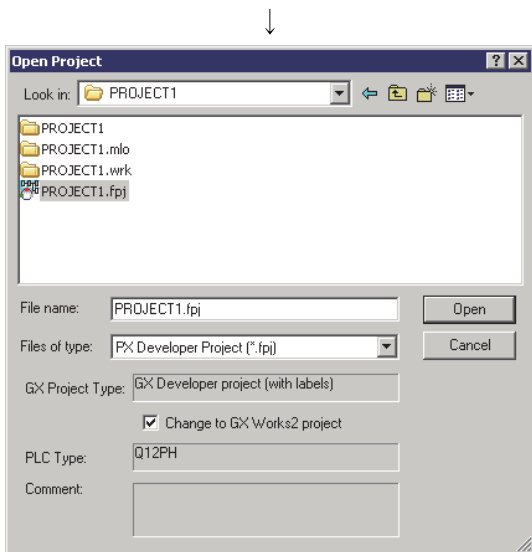
- The project, in which GX Works2 is specified to GX project type, cannot be opened with PX Developer Version 1.34L or earlier.
However, the project in which GX Developer is specified to GX project type can be opened with PX Developer Version 1.34L or earlier.
- A Universal model process CPU project cannot be opened with PX Developer Version 1.34N or earlier.

6.3.1 Changing contained GX Developer project to GX Works2 project and opening it

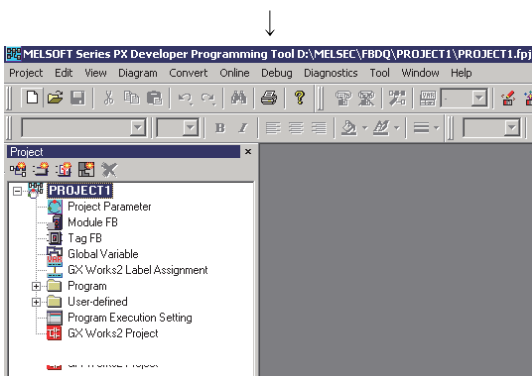
This section explains the operation for changing GX Developer project contained in PX Developer project to GX Works2 project and opening it.



1. Click [Project] → [Open Project] on the menu. ()



2. Click the project name of GX Developer project format.
3. Check the "Change to GX Works2 project" check box.
4. Click the "Open" button.



5. Open the specified project.

(1) GX project type after the change

The GX project type will be changed depending on the project type before the change as shown in the following table.

GX Works2 project contained in PX Developer cannot be changed to GX Developer project.

GX project type before the change		GX project type after the change
Created version	GX project type/label setting	
1.02C to 1.34L	Do not use label	GX Works2 Simple project (without labels)
	Use label	GX Works2 Simple project (with labels)
1.42U or later	GX Developer project (without labels)	GX Works2 Simple project (without labels)
	GX Developer project (with labels)	GX Works2 Simple project (with labels)

(2) PLC parameters and Device/Label Automatic-Assign Setting after the change

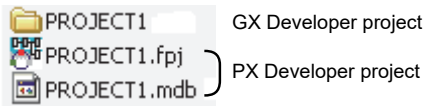
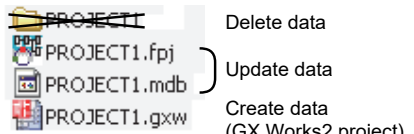
The settings are changed as shown in the following table depending on the settings of PLC parameters before the change.

GX Developer project before the change	GX Works2 project after the change	
Start number set to common pointer No. in PLC parameter	Start number set to common pointer No. in PLC parameter	Pointer device range in the "Device/Label Automatic-Assign Setting"
0 to 3499	(Start number before the change)	Start : (Start number of the common pointers) End : 3499
3500 to 4095	(Start number before the change) *1	(No device points to be assigned automatically)
(Blank)	(Blank) *1	(No device points to be assigned automatically)

*1: For the GX Works2 project after the change, set 3500 or less value as a start number of Common Pointer No.

(3) Data of PX Developer after the change and contained GX project

After the change has been completed, the GX Developer project folder before the change is deleted, and GX Works2 project file after the change is created.

Before	After
	

POINT

- When labels are used in the project before the change, the hot-start compile and compile (online change) cannot be performed right after the change. Perform the cold-start compile.
- The project after the change cannot be opened with version 1.34L or earlier.
- GX Works2 project cannot be returned to GX Developer project after the change. Copying the PX Developer project folder to other folder using Windows® Explorer is recommended.
- The global label of GX Developer project (with labels) registered by PX Developer is moved to the global label "#FBDQ" in GX Works2 project.
- Common pointer of GX Works2
When the pointer type labels are used in a user ladder program, a compile error may occur after the change.
In this case, open the GX Works2 and change the following settings.
 - Set the smaller number to Common Pointer No. in the PLC system setting of PLC parameter.
 - Set the smaller start number to the pointer assignment range in the Device/Label Automatic-Assign Setting.
 For the differences with GX Developer, refer to "GX Works2 Version 1 Operating Manual (Common)".

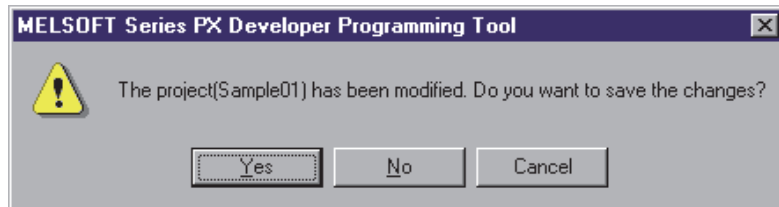
6.4 Closing a Project

**PURPOSE**

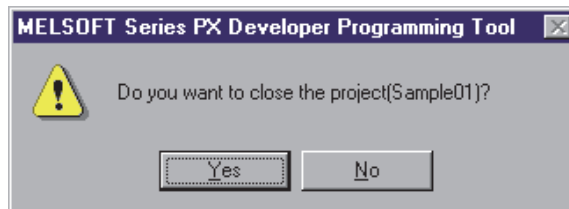
To close the opened project

**BASIC OPERATION**

1. Click [Project] → [Close Project] on the menu.
2. After the project contents are modified, a dialog box confirming whether to save the project will display. If clicking the "Yes" button, the modification will be saved and the project is closed. If clicking the "No" button, the modification will not be saved when the project is closed.



3. When content setting is not modified, the following dialog box will be displayed.
At this time,
Clicking the "Yes" button means to close the project.
Clicking the "No" button means to continue editing the project.




6.5 Saving a Project

**PURPOSE**

Overwrite and save the project file in the current editing.

**BASIC OPERATION**

Click [Project] → [Save] on the menu. ()

6.6 Saving a Project with a New Name


**PURPOSE**

Rename and save the project currently edited.

**BASIC OPERATION**

1. Click [Project] → [Save As] on the menu.
2. Set the driver and path where the project is saved.
3. Set project name.
4. Set comments.
5. Click the "OK" button.
Click the "Cancel" button to close the dialog box and the change will not be saved.

**DISPLAY/SETTING SCREEN**
POINT


- If project shares the same driver/path and project name with that of the recently opened project, it cannot be saved. If project shares the same driver/path and project name with that of the recently opened project, project overwriting and saving will be executed. ( Section 6.5)
- The project file (*.fpj file and *.mdb file) created by this operation is optimised in saving. The size of project file may be reduced before saving.
- Limits for setting driver/path and project name are the same with that in creating a new project. For details, refer to POINT in Section 6.2.

6.7 Editing Project Comments



PURPOSE

To edit project comment.

The comment set here can be specified in the dialog box ( Section 6.3) displayed in opening a project.

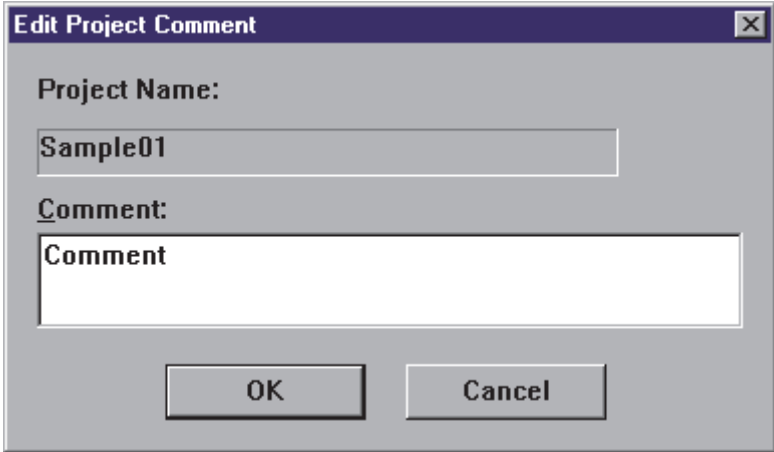


BASIC OPERATION

1. Click [Project] → [Edit Project Comment] on the menu.
2. Enter comment.
Maximum 64 characters can be set.
3. Click the "OK" button.
Click the "Cancel" button to close the dialog box and the change will not be saved.



DISPLAY/SETTING SCREEN



Edit Project Comment

Project Name:
Sample01

Comment:
Comment

OK Cancel

6.8 Adding New Data to Project

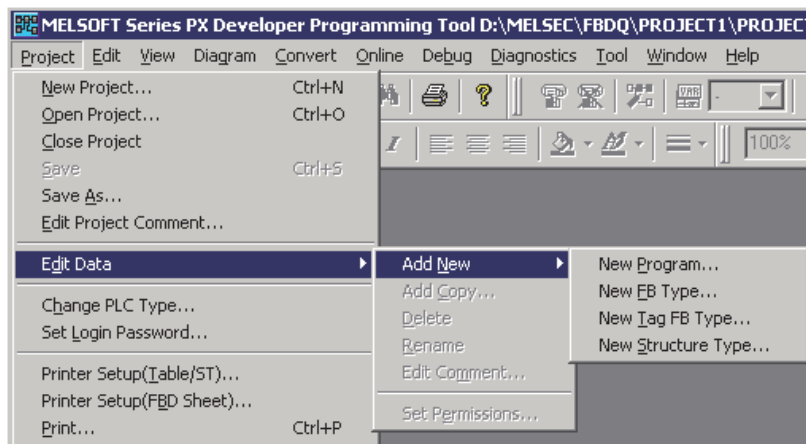
**PURPOSE**

To add a new program, data of FB type, tag FB type and structure type to a project.

(1) Add new data in the menu

**BASIC OPERATION**

1. Open the submenu [Project] → [Edit Data] → [Add New] on the menu.
2. In the submenu opened in Step 1, select the data to be added.
3. Display the "Add" dialog box of all data.
4. Input the new name (within 32 characters).
5. Input the comment if necessary (within 64 characters).
6. Select the tag type from the list box under the condition of tag FB type (☞ Section 8.4.3 (1)).
7. Click the "OK" button.

**DISPLAY/SETTING SCREEN**

Select the project to which data will be added

↓

Add New Program [X]

New Name

Comment

(2) Right-click the icon in the project window to add new data

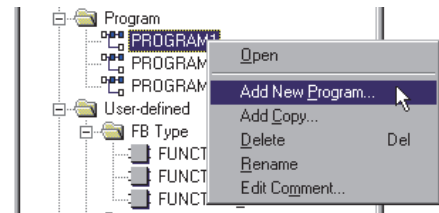
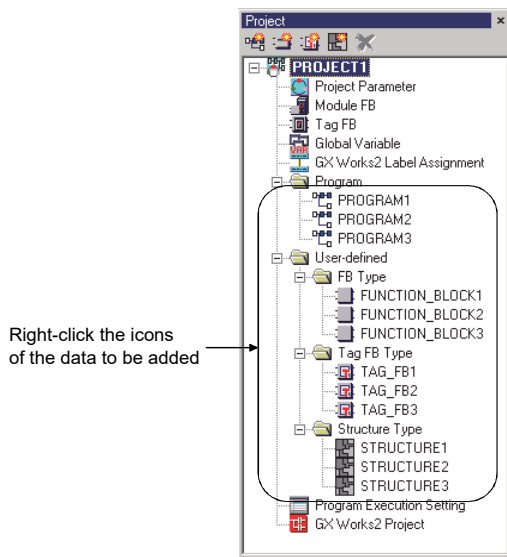


BASIC OPERATION

1. In the project window, right-click the program for adding data.
2. Click the [Add New (each data name) *] after the pop-up menu is displayed.
3. Display the "Add" dialog box of each data.
4. Input the new name. (Within 32 characters)
5. Input the comment if necessary (within 64 characters).
6. Select the tag type from the list box under the condition of tag FB type
(☞ Section 8.4.3 (1)).
7. Click the "OK" button.



DISPLAY/SETTING SCREEN



Click the [Add New Program *1]
(This is the screen of [Add New Program])

*1: There are selectable data type names in the part of (each data name).

(3) Add new data with project toolbar icons

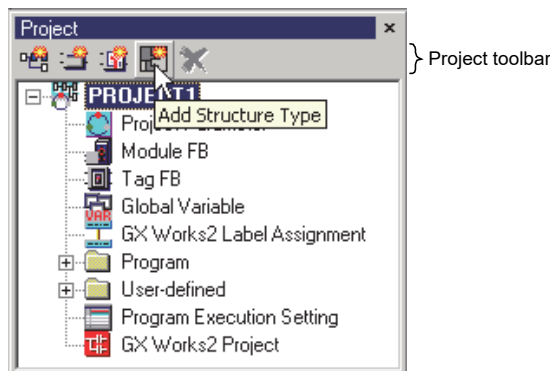


BASIC OPERATION

1. Click the data-adding button of project toolbar at the top of the project window (→ Section 5.6.4).
2. An "Add" dialog box of data will display.
3. Input new names (Within 32 characters).
4. Input the comment if necessary (within 64 characters).
5. Select the tag type from the list box under the condition of tag FB type (→ Section 8.4.3 (1)).
6. Click the "OK" button.



DISPLAY/SETTING SCREEN



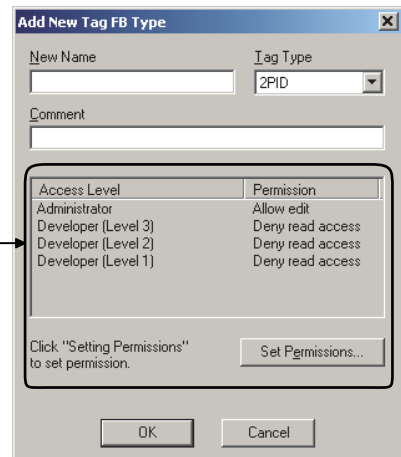
POINT

- Do not set the same name in the data names with those of program, user-defined FB type/tag FB type/structure type, elementary data type, function, and manufacturer FB type. Besides, do not use invalid symbols or reserved words. For details of invalid symbols or reserved words, refer to Appendix 1.
- Maximum of 200 new programs can be added.
- If data protection is enabled in a project, the display of access permission to each access level and the "Set Permissions" button are added to the addition dialog box displayed by the operation of (1) to (3) for each data.

Addition display area →

To change permissions, click the "Set Permissions" button and perform the operation in the Set Permissions window.

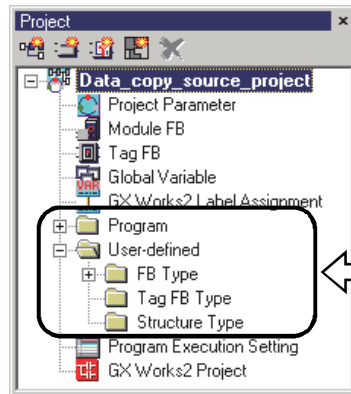
For details of operation, refer to Section 6.15.5.



6.9 Copying Data in Project

**PURPOSE**

To copy data (program, user-defined FB type/tag FB type/structure type) in a project for use in other parts of the same project or the other project.



Data that can be copied
(program, user-defined
FB type/tag FB type/
structure type)

6.9.1 Copying data in the same project

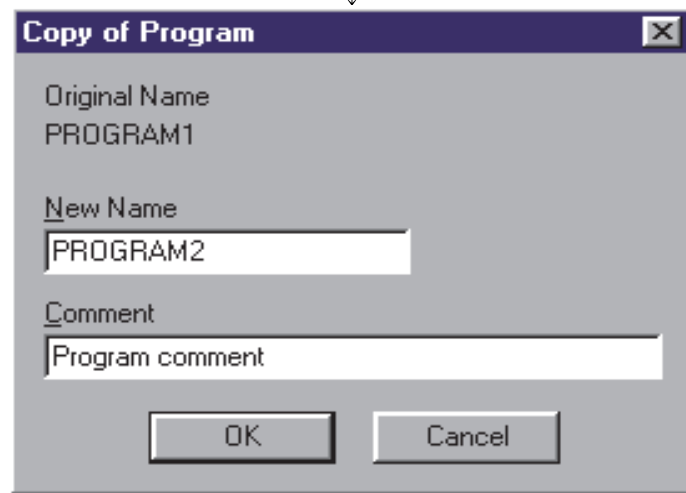
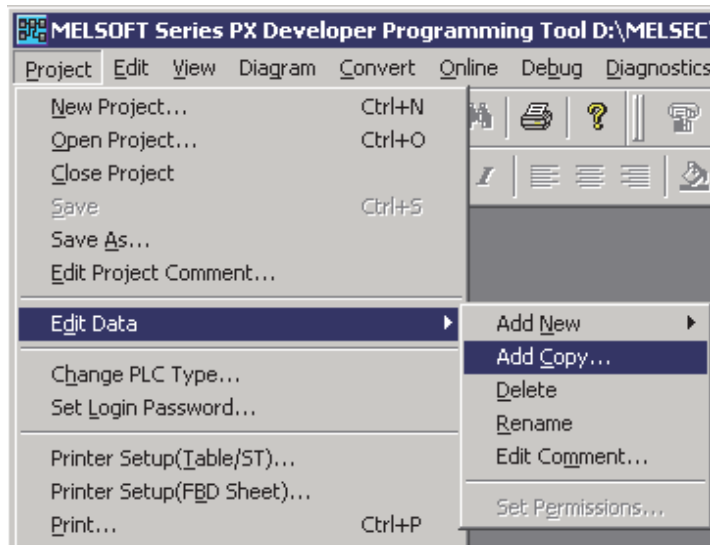
This section explains the method of copying data (program, user-defined FB type/tag FB type/structure type) within the same project.

(1) Copy data in the menu

**BASIC OPERATION**

1. Click and select the data icon to be copied in the project window.
2. Click the [Project] → [Edit Data] → [Add Copy] of the menu.
3. Display the "Copy" dialog box of each data.
4. Input the name of the copied destination (within 32 characters).
5. When adding/modifying the comment, input the comment if necessary (Within 64 characters).
6. Click the "OK" button.

 **DISPLAY/SETTING SCREEN**

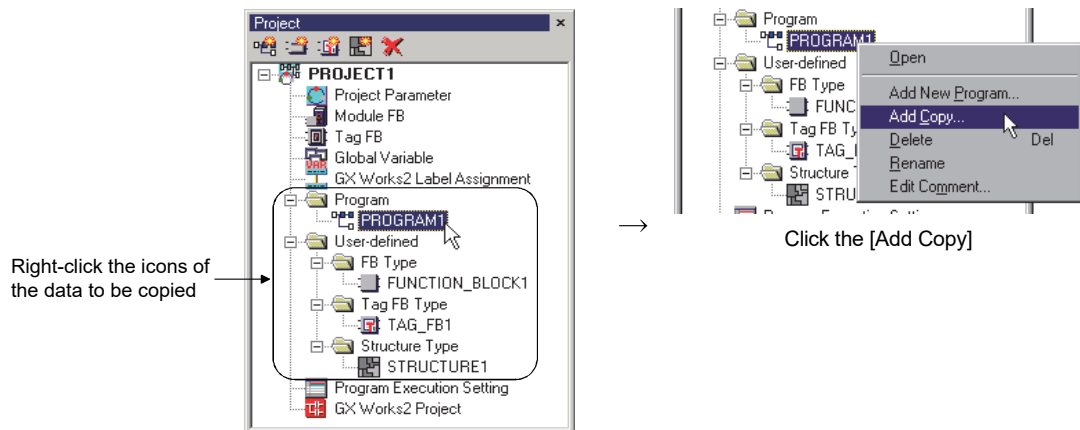


(2) Right-click the icon in the project window to copy data



BASIC OPERATION

1. Right-click the icons of the data to be copied in the project window.
2. Click the [Add Copy] after the pop-up menu is displayed.
3. Display the "Copy" dialog box of each data.
4. Input the name of the copied destination. (Within 32 characters)
5. When adding/modifying the comment, input the comment if necessary (Within 64 characters).
6. Click the "OK" button.



POINT

- Do not set the same name in the data names with those of the program, user-defined FB type/tag FB type/structure type, elementary data type, function, and manufacturer FB type.
Besides, do not use invalid symbols or reserved words.
For details of invalid symbols or reserved words, refer to Appendix 1.
- Up to 200 programs can be added.


6.9.2 Copying data to other project

This section explains the method of copying data (program, user-defined FB type/tag FB type/structure type) to the other project, the data that can be copied, and the precautions for data copy.

**PURPOSE**


To use the program or user-defined FB type/tag FB type/structure type for the other project.

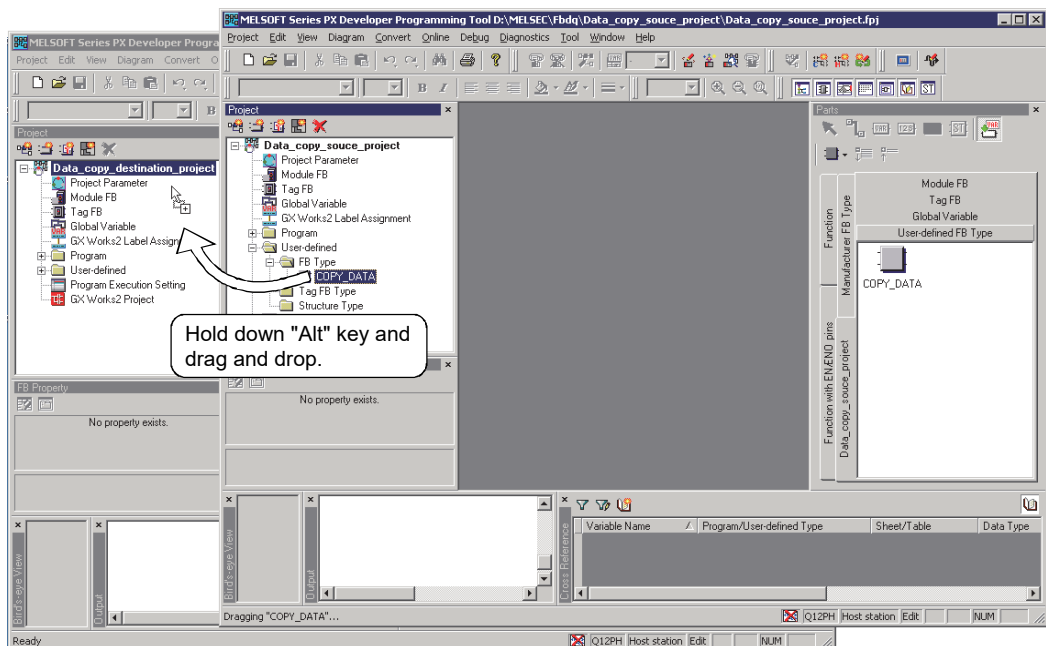
**BASIC OPERATION**

1. Start two programming tools. (👉 Section 4.1)
2. In one programming tool, open the data copy source project.
In the other programming tool, open the data copy destination project.
3. If the project is displayed with the project window hidden, display the project window. (👉 Section 5.7.1 (2))
4. Hold down the "Alt" key and drag the icon (or text label) of the data to be copied onto the copy destination project window.
5. When the icon is over the copy destination project window, the mouse cursor changes to .

Make sure that it has changed to , and then drop it.

Press the "ESC" key to cancel data copy during a drag and drop.

Alternatively, when the mouse cursor is shown as , release the mouse button to cancel data copy.

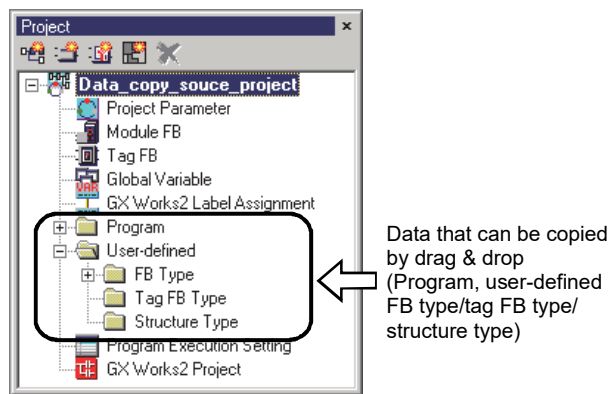
**DISPLAY/SETTING SCREEN**

POINT

For details of the data that can be copied and the copy range, refer to (1) in this section.
 When data cannot be copied to the other project, refer to (2) in this section.
 For details of the precautions for data copy, refer to (3) in this section.

(1) Data that can be copied and copy range

The data that can be copied by a drag and drop are program and user-defined FB type/tag FB type/structure type data.



Data other than the program and user-defined FB type/tag FB type/structure type cannot be copied by a drag and drop.
 For more in information, refer to the table below.


Data that can be copied	Data that is copied	Data that is not copied
Program	<ul style="list-style-type: none"> ● FBD sheet ● Local variable sheet ● FBD sheet execution condition setting ● Program execution setting 	(a) Any of the following global part corresponding declaration window data, i.e., settings that the external variable (used in the data to be copied) refers to. <ul style="list-style-type: none"> ● Global variable declaration ● Module FB declaration ● Tag FB declaration (b) User-defined FB/tag FB/structure type data used in the data to be copied
User-defined FB type	<ul style="list-style-type: none"> ● FBD sheet ● Local variable sheet 	
User-defined tag FB type	<ul style="list-style-type: none"> ● FBD sheet execution condition setting 	
User-defined structure type	All definition data of structure type definition window	———

POINT

When the "data that is not copied" indicated in the above table is included in the data that can be copied (program, user-defined FB type/tag FB type), the "data that is not copied" must be separately copied to the copy destination project.
 For details, refer to "(3) Precautions for data copy" in this section.

(2) When data copy cannot be executed

When data cannot be copied to the other project, check the following points.

Cause of data copy disabled	Resolution	Reference
The copy destination project is not opened.	Open the copy destination project.	Section 6.3
The project window is not displayed in the copy destination project.	Display the project window.	Section 5.7.2
An attempt is made to copy the data that cannot be copied.	The data that can be copied are the program and user-defined FB type/tag FB type/structure type. The other data cannot be copied by a drag and drop.	(1) in this section
In monitor mode	Select [Edit] → [Edit Mode] () on the menu to change to the edit mode.	Section 13.1.1
An attempt is made to copy multiple data simultaneously.	Multiple data cannot be copied simultaneously. To copy multiple data, copy data one by one.	—
The project parameter setting or other dialog box is displayed.	Copy data after closing the displayed dialog box.	—
The data name is being changed in the project window.	Copy data after completion of data name change is completed.	Section 6.11
The programming tool is performing processing, such as compile or PLC download.	Copy data after completion of processing, such as compile or PLC download.	—
The same data name with different data type exists in the copy destination project.*1 (For example, "User-defined FB type" and "Structure type")	Perform either of the following operations and copy data. (a) Change the data name of the copy source project. (b) Change the data name of the copy destination project.	Section 6.11

*1: When the data name and type in the copy source project are the same as those in the copy destination project, the data can be overwritten.

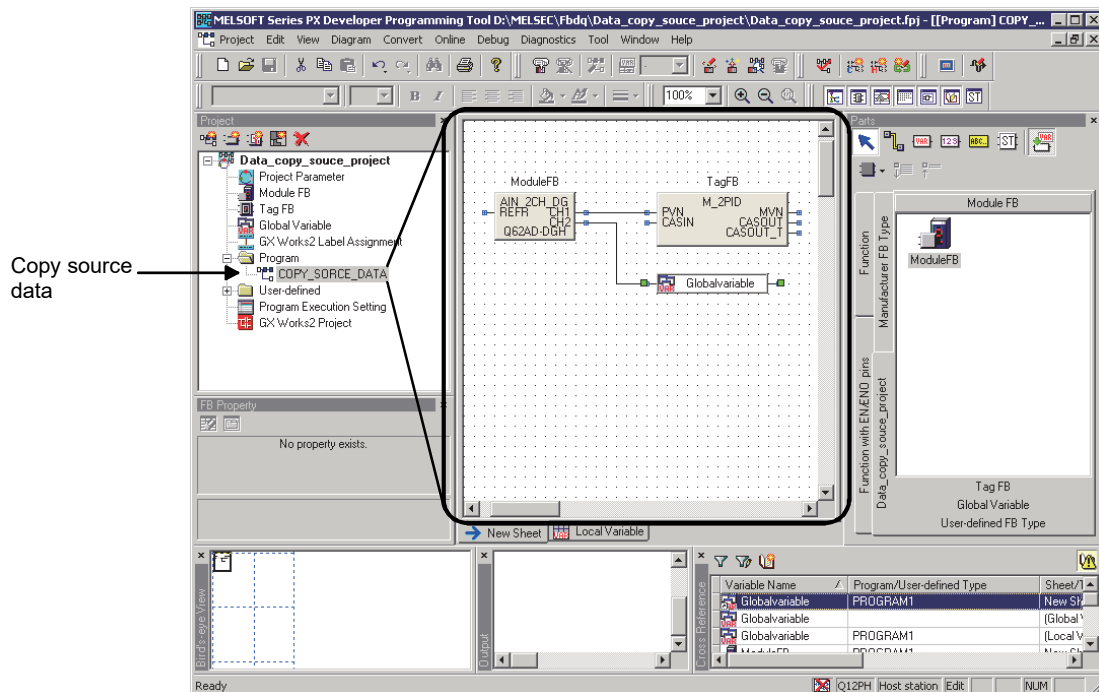
(3) Precautions for data copy

When copying data to the other project, note the following points.

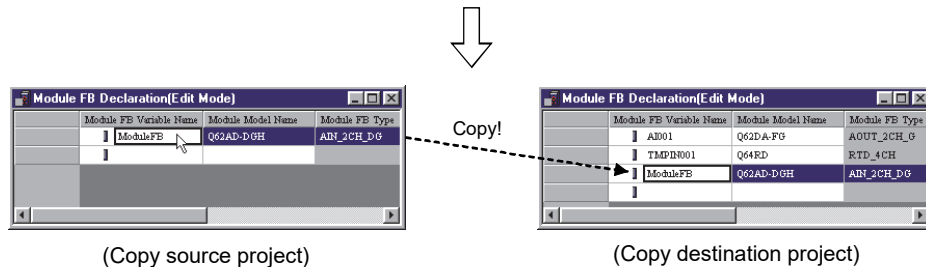
- (a) When data copy is executed, the copy destination project is put in the uncompiled status (☞ Section 5.3). After data copy is compiled, compile the project and perform PLC download.

- (b) When global parts (global variable, module FB, tag FB) are included in the copy source data (program, user-defined FB type/tag FB type), add the declarations of the used global parts to the copy destination project (copy the declaration window data).

This also applies to the declaration of the global parts (global variable, module FB, tag FB) set in the execution condition within the program execution setting.

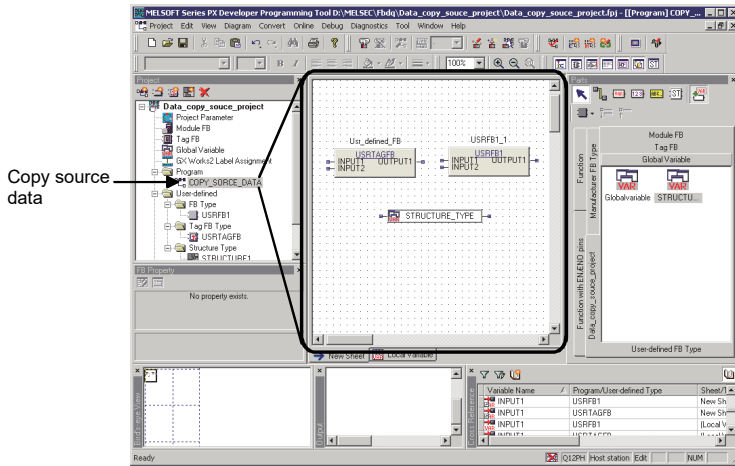


When global parts (global variable, module FB, tag FB) are included in the copy source data (program, user-defined FB type/tag FB type)

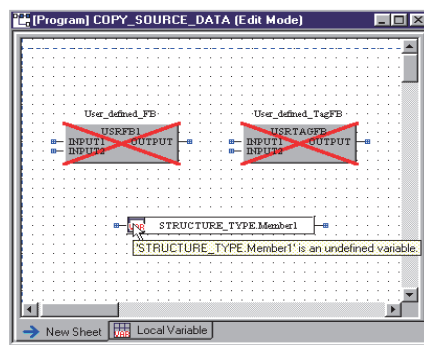


Copy the declaration window data of the global parts (module FB, tag FB, global variable) included in the copy source data to the copy destination project.

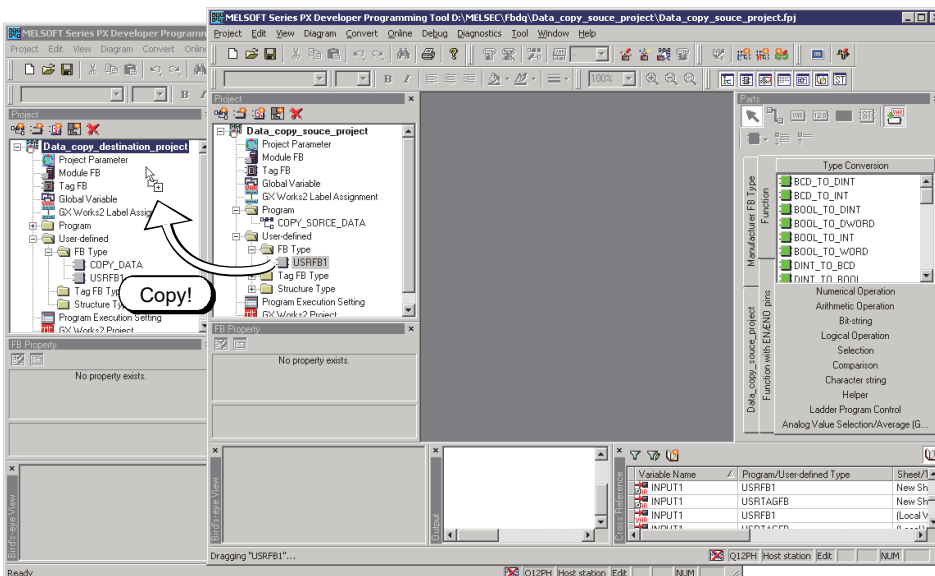
- (c) When the user-defined FB/tag FB and structure type are included in the copy source data (program, user-defined FB type/tag FB type), also copy the used user-defined FB/tag FB and structure type data.



When the user-defined FB/tag FB and structure type are included in the copy source data (program, user-defined FB type/tag FB type)



The user-defined FB type/tag FB type part that does not have the definition source is marked as " X " on the FBD sheet of the copy destination. For the structure type, "Undefined variable." is displayed when the mouse pointer is moved onto the structure type part.



The user-defined FB/tag FB marked as " X " on the FBD sheet and the structure type data displayed as "Undefined variable." are also copied to the copy destination project.


6.10 Deleting Data in Project

**PURPOSE**

To delete data in a project.

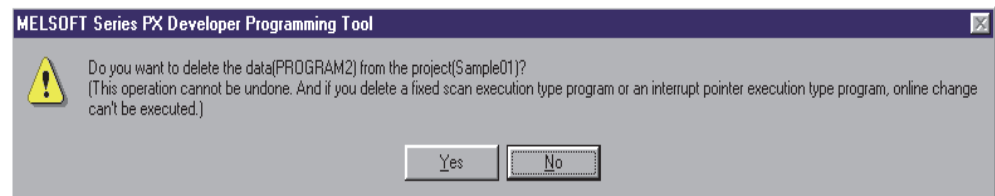
**BASIC OPERATION**

Any one of the following methods can be used to delete data in a project.

- Click [Project] → [Edit Data] → [Delete] in the menu after selecting the icons of the data to be deleted in the project window.
- Select and right click the data icon for deletion in the project window. A pop-up menu will be displayed. Then click the [Delete] in the menu.
- Click the "Delete" button after selecting the icons of the data to be deleted in the project window.
- Click the "Delete" button () of the project toolbar at the top of the project window after selecting the icons of the data to be deleted in the project window.

If any one of the methods mentioned above applied, a dialog box will display for confirming whether to delete the data or not. At this time, clicking "Yes" means to delete the data.

Clicking "No" means not to delete the data.

**DISPLAY/SETTING SCREEN****POINT**

- After data is deleted, compile is executed when there is no program, compile error will occur.
- Online change cannot be executed in deleting fixed scan execution type or interrupt pointer execution type program.

6.11 Changing Data Name in Project

**PURPOSE**

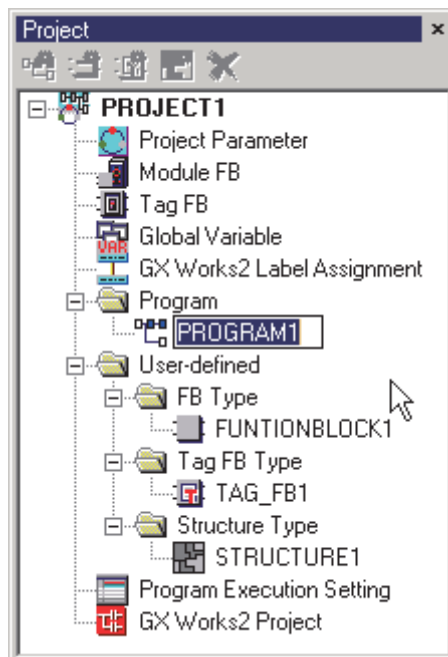
To change the data names in a project.

**BASIC OPERATION**

Any one of the following methods can be applied to change the data names in a project.

- Click [Project] → [Edit Data] → [Rename] in the menu after selecting the icons of the data whose names need to be changed in the project window.
- Select and right click the icons of the data whose names need to be changed in the project window. A pop-up menu will be displayed. Then click the [Rename] in the menu.
- Left click the part of Data names after selecting the icons of the data whose names need to be changed in the project window.

A screen for name input as shown below will be displayed after using any one of the methods mentioned above. Please input data names and press the "Enter" key to confirm the data input.

**DISPLAY/SETTING SCREEN****POINT**

Do not set the same names in the data names with those of the program, user-defined FB type/tag FB type/structure type, elementary data type, function, and manufacturer FB type. Besides, do not use invalid symbols or reserved words. For details of invalid symbols or reserved words, refer to Appendix 1.

6.12 Editing Data Comments in Project

**PURPOSE**

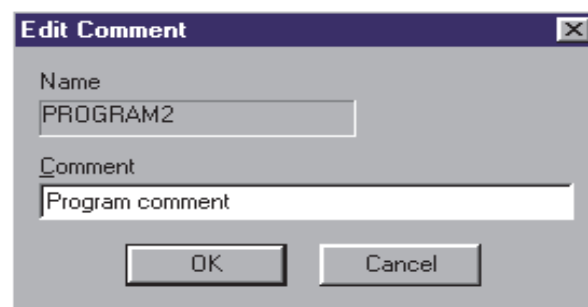
To edit the data comments in a project.

The comments set here can be seen in "Select Data Type" dialog box (☞ Section 7.11.4).

**BASIC OPERATION**

Any one of the following methods can be used to edit the data comments in a project.

- Click [Project] → [Edit Data] → [Edit Comment] in the menu after selecting the icons of the data whose comments need to be edited in the project window.
- Select and right click the icons of the data whose comments need to be edited in the project window. A pop-up menu will be displayed. Then click the [Edit Comment] in the menu.
 - 1) In either of the above methods, display the "Edit Comment" dialog box and input comments. (Within 64 characters).
 - 2) Click the "OK" button.

**DISPLAY/SETTING SCREEN**

6.13 Displaying the Data Editing Screen in Project

Double-click the data icons or text label in a project window or press the "Enter" key to make the editing screen of this project displayed.

The main editing screens are listed as below.

Item names in the project window	Displayed Screens	Reference
Project parameter	"Project parameter setting" dialog box	Section 6.14
Module FB	Module FB declaration window	Section 8.3.1
Tag FB	Tag FB declaration window	Section 8.4.1
Global variable	Global variable declaration window	Section 8.2.1
GX Works2/GX Developer label assignment	GX label assignment window	Section 8.5.1
Program	Program definition window	Section 7.1
FB type	FB definition window (FB type)	Section 7.1
Tag FB type	FB definition window (tag FB type)	Section 7.1
Structure type	Structure type definition window	Section 9.1
Program execution setting	Program execution timing window	Section 7.13.2
GX Works2/GX Developer project	GX application	Section 7.15.1

6.14 Setting Project Parameters

**PURPOSE**

To set the necessary system resources, program execution and event notification used for PX Developer project.

**BASIC OPERATION**

1. Double-click the project parameter icons in the project window.
2. Click the project setting tab in the project parameters setting window to execute setting.
3. Click the "OK" button after setting.
Various tabs will be explained below.

(1) System Resource

**DISPLAY/SETTING SCREEN**

	No. of Points	Start	End
File register : ZR	32768	0	32767
Timer : T	64	0	63
Common pointer : P	596	3500	4095
Internal relay : M	400	0	399
Index register : Z	7	0	6

Refer to POINT in the next page.



DISPLAY/SETTING DATA

Item	Description	Available setting range
File register: ZR	To set the range of the file register (ZR) consumed for variables automatic assignment. The range of the settable point is 3000 to 1041408. But the maximum number of the set points cannot exceed the file register points set to the PLC file setting of PLC parameter in GX application. (Errors may occur when compile) Select a value (multiples of 32K points) from the list box for the start number.	Points QnPHCPU/QnPRHCPU : 3000 to 1041408 Q04UDPVCPU : 3000 to 4325376 Q06UDPVCPU : 3000 to 4587520 Q13UDPVCPU : 3000 to 4718592 Q26UDPVCPU : 3000 to 4849664
Timer: T	To set the range of the timer (T) consumed in timer FB. The range of the settable point is 10 to 2048, and the range of the settable start number is 0 to 23078.	Points: 10 to 2048 Start number QnPHCPU/QnPRHCPU : 0 to 23062 QnUDPVCPU : 0 to 32758
Common pointer: P	To display the range of the common pointer (P) consumed in processing the subprogram call destination management supplied to FB by manufacturers. (Unchangeable)	—
Internal relay: M	To display the range of the internal relay (M) used temporarily by programming tool in internal processing. (Unchangeable) The range of the settable start number is 0 to 32368.	Start number QnPHCPU/QnPRHCPU : 0 to 32368 QnUDPVCPU : 0 to 32767
Index register: Z	To display the range of the index register (Z) used by programming tool in internal processing. (Unchangeable)	—

POINT

- Set the device range avoiding the same range between the system resource setting and Device/Label Automatic-Assign setting of GX application.
- The common pointer (P) set by the system resource indicates the points of the common pointer used by programming tool in the P device 4096 points. Start number of the common pointer set to PLC parameter in GX application should be less than that of the programming tool. When setting the last number of the pointer assignment range to the Device/Label Automatic-Assign setting of GX Works2, set the smaller number than the start number set to the common pointer with programming tool.

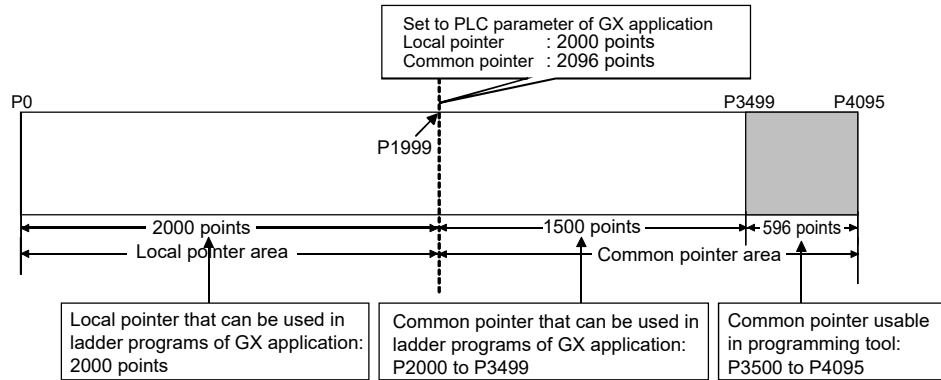
The correct setting example

- Setting example of PLC parameter

Setting of the PLC parameter of GX application: common pointer P2000

(Local pointer P0 to P1999, common pointer P2000 to P4095).

Setting of the programming tool: common pointer P3500 to P4095 (596 points) fixed



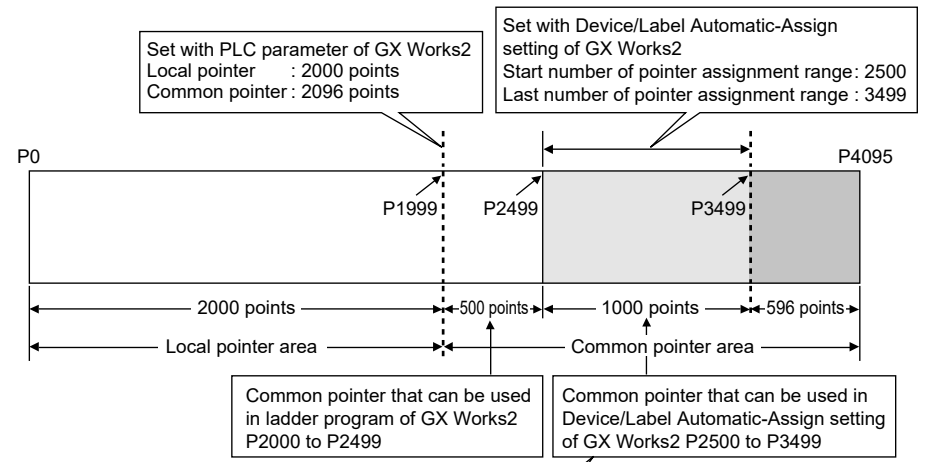
Points of local pointer usable in ladder programs = [Local pointer points]

Points of common pointer usable in ladder programs = [Common pointer points]-[Common pointer points of programming tool 596 points]

- Setting example of Device/Label Automatic-Assign setting (when GX project type is GX Works2 Simple project (with labels) or Structured project)

Setting of GX Works2 Device/Label Automatic-Assign setting: pointer assignment range 2500 to 3499

Setting of the programming tool: common pointer P3500 to P4095 (596 points) fixed



The latter part (P3500 to P4095 fixed) within the available pointer device range (P0 to P4095) is used by programming tool. Therefore, setting the following range to Device/Label Automatic-Assign setting of GX Works2 is required.
 Start number of pointer assignment range: n (common pointer No. of PLC parameter n last number of pointer assignment range)
 Last number of pointer assignment range : 3499 or less

POINT

The wrong setting example

- **Setting example of PLC parameter**
 Setting of the PLC parameter of GX application: common pointer P3600 (Local pointer P0 to P3599, common pointer P3600 to P4095).
 Setting of the programming tool: common pointer P3500 to P4095 (596 points) fixed

Set with PLC parameter of GX application
 Local pointer : 3600 points
 Common pointer : 496 points

Local pointer points set of GX application are in repetition with the common pointer points set by programming tool.
 → The compiled program runs abnormally.

Common pointer used in the programming tool P3500 to P4095

- **Setting example of Device/Label Automatic-Assign setting (when GX project type is GX Works2 Simple project (with labels) or Structured project)**
 Setting of GX Works2 Device/Label Automatic-Assign setting: pointer assignment range 2500 to 3599
 Setting of the programming tool: common pointer P3500 to P4095 (596 points) fixed

Set with PLC parameter of GX Works2
 Local pointer : 2000 points
 Common pointer : 2096 points

Set with Device/Label Automatic-Assign setting of GX Works2
 Start number of pointer assignment range : 2500
 Last number of pointer assignment range : 3599

Common pointer that can be used in Device/Label Automatic-Assign setting of GX Works2 P2500 to P3599

Common pointer used in the programming tool P3500 to P4095

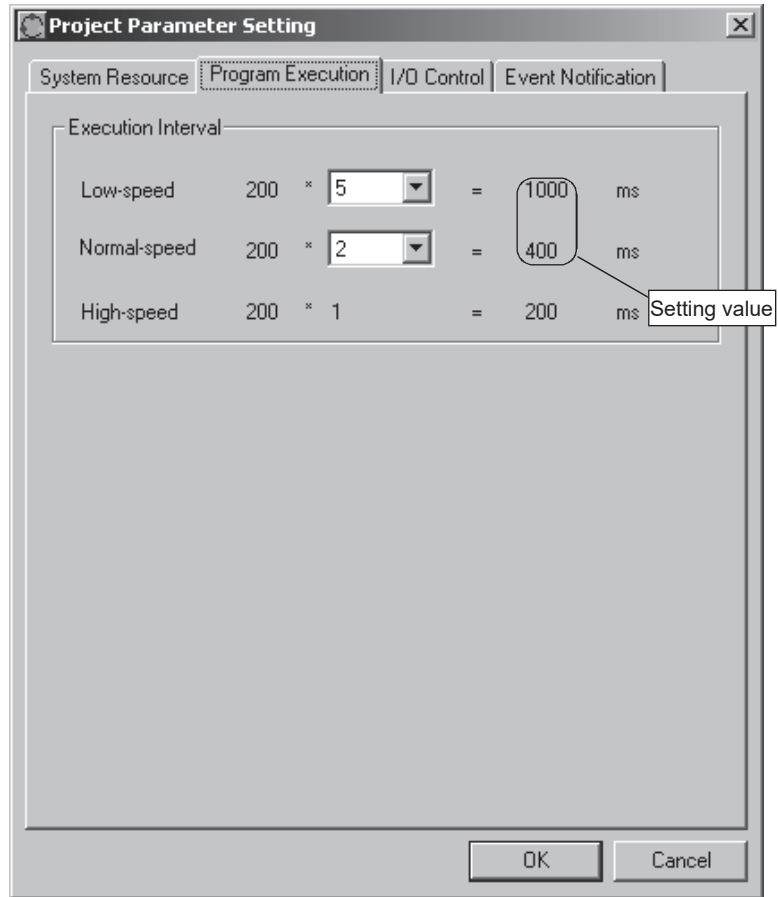
The common pointer points to be used to Device/Label Automatic-Assign setting of GX Works2 is in repetition with common pointer points set by programming tool. → The compiled program runs abnormally.

- If a value that exceeds the maximum/minimum value is set and the spin button is clicked, the setting value is fixed to the maximum/minimum value of the setting range.
- For precautions on using index registers, refer to "PX Developer Version 1 Programming Manual".

(2) Program Execution



DISPLAY/SETTING SCREEN



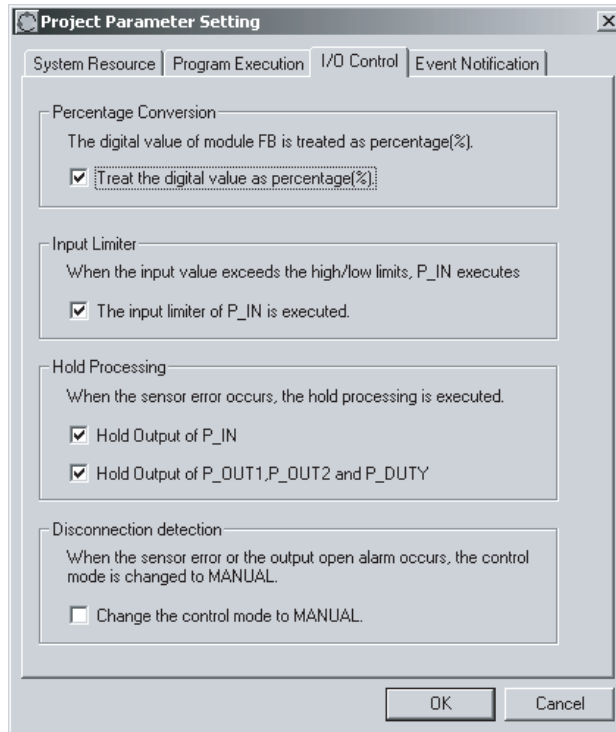
DISPLAY/SETTING CONTENTS

Item	Description
Execution interval	To set the type of program execution interval in the <<Program Execution>> tab. To set the low-speed or normal speed execution interval by changing the setting value. (The execution interval of high-speed is fixed as 200ms) [Low-speed interval setting] The settable values are 5, 10, 20, 25, 50. [Normal speed interval setting] The settable values are 2, 3, 4, 5.

(3) I/O Control



DISPLAY/SETTING SCREEN



DISPLAY/SETTING CONTENTS

Item	Description
Percentage Conversion	To set whether to treat a digital value of an analog I/O module FB as percentage (%).
Input Limiter	To set whether to output a value, which is the output value of P_IN multiplied by the limiter, when a value outside the input high/low limit is input to P_IN input value.
Hold Processing	To set whether to use the last output value (Hold) as the output of P_IN, P_OUT1, P_OUT2, and P_DUTY When an error occurs in the input range check of P_IN.
Disconnection detection	To set whether to change the control mode to MANUAL when a sensor error or output open alarm occurs.

POINT

For details on the digital percentage conversion, refer to "PX Developer Version 1 Programming Manual".

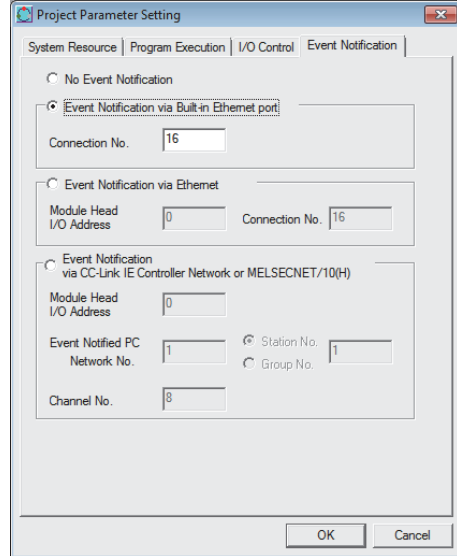
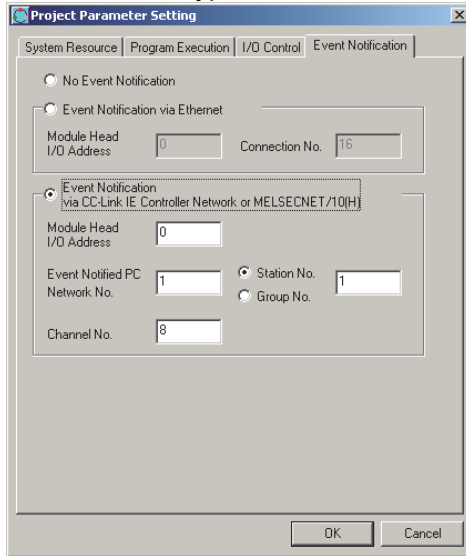
(4) Event Notification



DISPLAY/SETTING SCREEN

1) When Process CPU or Redundant CPU is selected as PLC type

2) When Universal model process CPU is selected as PLC type



CAUTION

- If the modules set by event notification do not exist or there are some errors in setting, an event occurrence will bring a CPU module stop error. It is recommended that when adjusting the system, the user should not only confirm no influence existing on the actual system, but also let the event happen and confirm that no errors mentioned above occurred through the operation of switching to the faceplate control mode (Example: MANUAL→AUTO, AUTO→MANUAL).



DISPLAY/SETTING CONTENTS

Item	Description	Available setting range
No Event Notification	When this item is selected, it would not inform the monitor tool of the event notification *1 even if events (including alarm) occurred in a CPU module, Only the low-speed tag data collection *2 can be used to monitor the periodical alarms/events without the event notification.	—
Event Notification via Built-in Ethernet port (Only for Universal model process CPU)	An Ethernet port can be used to notify the events (including alarm) in a CPU module to the monitor tool. Enter the connection number after setting this item.	Connection No.: 1 to 16
Event Notification via Ethernet	Ethernet can be used to inform the monitor tool of the events (including alarm) in a CPU module. Input the head I/O address and contact No. of Ethernet module after selecting this item.	Module head I/O address: 0 to FF0 Connection No.: 1 to 16

*1: A CPU module is a communication method to notify the monitor tool after detecting the signal changes of the alarm/event in the tag data.

*2: All tags registered in the monitor tool are collected via reading one piece of tag data per second.

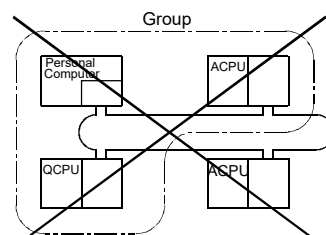
Item	Description	Available setting range
Event Notification via CC-Link IE Controller Network or MELSECNET/10 (H)	<p>CC-Link IE Controller Network or MELSECNET/10 (H) can be used to inform the monitor tool of the events (including alarm) in a CPU module. Execute setting according to the following sequence.</p> <ol style="list-style-type: none"> 1. Input the module head I/O address. (Always specify 0 in the last digit.) 2. Input the network No. of CPU module and the monitor tool (CC-Link IE Controller Network board or MELSECNET/10 (H) board of personal computer) at the events notification place. 3. Select the radio button "Station No." when specifying the station No. to notify, and select the radio button "Group No." when specifying the group No. to notify. 4. Input the Station No. or Group No. in the textbox at the right of the radio button. 5. Input the Channel No. (Channel No. used in the host station) 	<p>Module head I/O address: 0 to FF0 Network No.: 1 to 239 Station No QnPHCPU/QnUDPVCPU : 1 to 64 QnUDPVCPU : 1 to 120 Group No.: 1 to 32 Channel No.: 1 to 8</p>

POINT

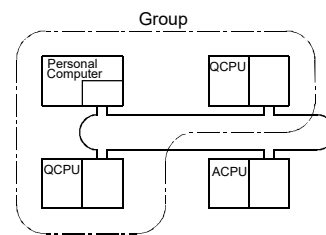
- If the modules set by event notification do not exist or there are some errors in setting, an event occurrence will bring the following:
 - (a) CPU module stops for error.
 - (b) Network module communication error occurs.
 - (c) Event notification cannot be received.

It is recommended that when adjusting the system, the user should not only confirm no influence existing on the actual system, but also let the event occur and confirm again that no events mentioned above occurred through the operation of switching to the faceplate control mode (Example: MANUAL → AUTO, AUTO → MANUAL).

- When specifying the CC-Link IE Controller Network or MELSECNET /10 (H) group No. to notify events, an error will occur once the MELSEC-A series PLC CPU exists in the specified group No.. In this case, make a group so that the MELSEC-A series PLC CPU is not included in the same group. (Only the MELSEC-Q series PLC CPUs should be included in the same group.) Please refer to "Q Corresponding MELSECNET/H Network System Reference Manual (PLC To PLC network)" for details about the MELSECNET/10 (H) group functions.



An error occurs if PLC CPU of MELSEC-A series exists



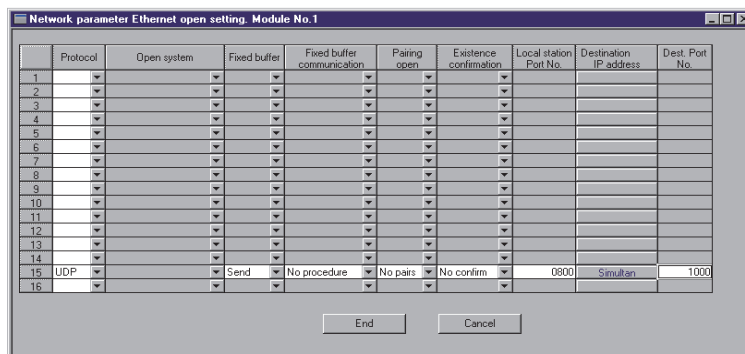
Execute the grouping of the nonexistent of CPU of MELSECNET-A series and specify the corresponding group No.

- Do not use the following Channel No. for the link-dedicated instruction in a user ladder program when executing event notification with CC-Link IE Controller Network or MELSECNET/10 (H).
 - Channel No. used by host station : Channel No. set with event notification
 - Target station storage Channel No.: 1 (fixed Channel No. for monitor tool)

For details of Channel No., refer to description for dedicated instruction of network module manual to be used.

POINT

- Event notification using an Ethernet module and a built-in Ethernet port CPU is a communication method applying UDP/IP to broadcast. Therefore, setting for broadcasting communication with UDP/IP is required in the open setting which is in the network parameters (in the built-in Ethernet port setting tab of the PLC parameters for the built-in Ethernet port connection) of GX application. At this time, set [Destination port No.] according to the setting for [Event Notification UDP Port No. (HEX)] of the monitor tool. For details about the [Event Notification UDP Port No.(HEX)] setting of the monitor tool, refer to "PX Developer Version 1 Operating Manual (Monitor Tool)". For details about the setting method at the time of broadcasting, refer to "Q Corresponding Ethernet Interface Module User's Manual (Basic)".



- Make sure to use the PX Developer Version 1.06G or later monitor tool to monitor the CPU module that includes ladder programs compiled by the PX Developer Version 1.06G or later programming tool. Note that the PX Developer Version 1.04E or earlier monitor tool does not receive the event notification sent from ladder programs compiled by the PX Developer Version 1.06G or later programming tool.
- Do not specify an Ethernet module mounted on the redundant type extension base unit of Redundant CPU to be used for event notification. If such a module is specified, a stop error (error code: 4122) occurs on the Redundant CPU.

6.15 Data protection in the project

Data protection is to avoid editing data such as user-created program, user-defined FB type accidentally and releasing data to the unrelated users.

Data can be protected by enabling of disabling edit/display operation setting to the each data in a project.

6.15.1 Setting access level and permissions

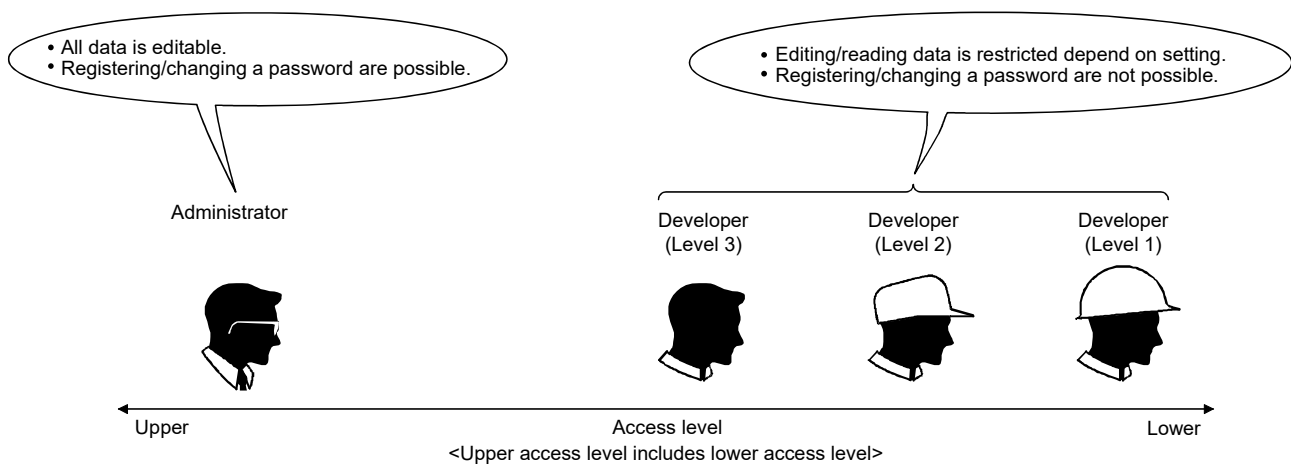
(1) Access level

Access level refers to the target given authority such as edit permission in data protection.

There are four access levels and lower access level is included in upper level.

Access level is divided Administrator having authority for editing all data and Developer (Level 3 to Level 1) editing and reading data are restricted depend on setting.

Registering and changing a password are only possible when access level is Administrator.



(2) Setting permissions

Set "Enable/Disable" for reading from the access level that permitting edit or lower access level.

For the setting procedure of permissions, refer to Section 6.15.5.

(3) Target data to be protected

The following data will be the target of data protection.

- Program
- User-defined FB
- User-defined tag FB
- Structure

(4) Relation between access level and access permission

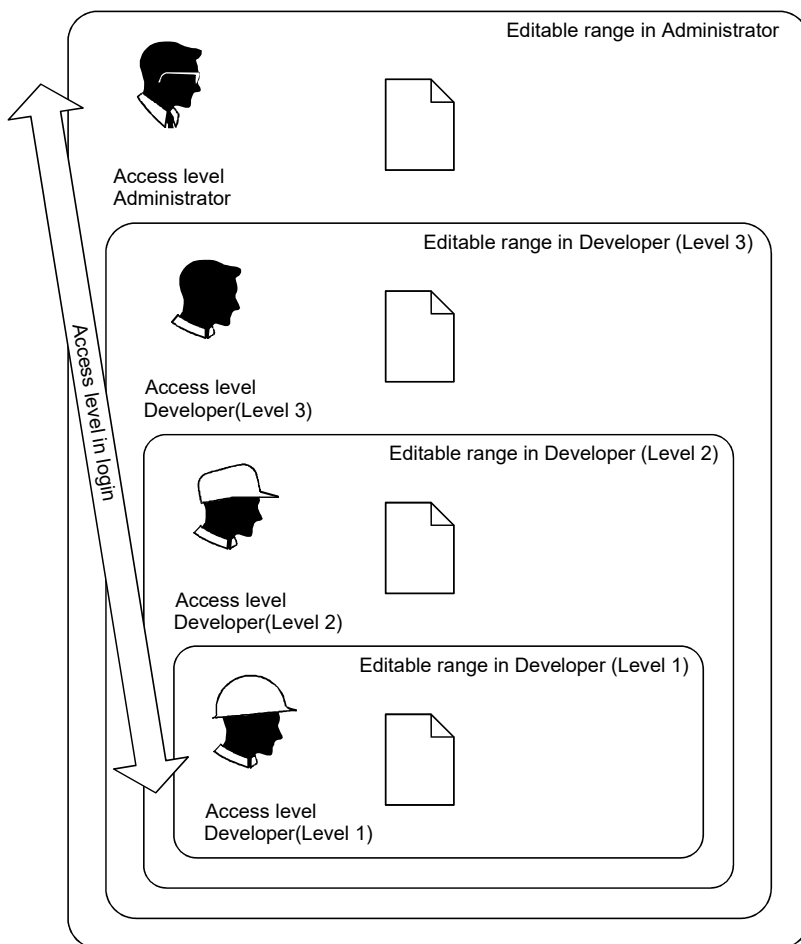
The editable data in the low access level can be edited from the upper access level.

<Example>

The data with permission setting in Developer (Level 2) is editable by the user logged in Developer (Level 2) or more than Developer (Level 2) (Administrator, Developer (Level 3), Developer (Level 2)).

When the reading from the lower access is set to "Enable", data reference is possible whatever access level a user login in.

The following shows the relation between access level and access permission.



... The data to be targeted for data protection of PX Developer project (Program/user-defined FB/user-defined tag FB/structure)

Access level	Edit	Read
Administrator	<input type="radio"/>	<input type="radio"/>
Developer (Level 3)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Developer (Level 2)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Developer (Level 1)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Access level	Edit	Read
Administrator	<input type="radio"/>	<input type="radio"/>
Developer (Level 3)	<input type="radio"/>	<input type="radio"/>
Developer (Level 2)	<input checked="" type="checkbox"/>	<input type="radio"/> *1
Developer (Level 1)	<input checked="" type="checkbox"/>	<input type="radio"/> *1

*1: The case that read from the lower level is permitted

Access level	Edit	Read
Administrator	<input type="radio"/>	<input type="radio"/>
Developer (Level 3)	<input type="radio"/>	<input type="radio"/>
Developer (Level 2)	<input type="radio"/>	<input type="radio"/>
Developer (Level 1)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Access level	Edit	Read
Administrator	<input type="radio"/>	<input type="radio"/>
Developer (Level 3)	<input type="radio"/>	<input type="radio"/>
Developer (Level 2)	<input type="radio"/>	<input type="radio"/>
Developer (Level 1)	<input type="radio"/>	<input type="radio"/>

6.15.2 Enabling/disabling protection data

(1) Enabling data protection in a project

To enable data protection, set the login password for Administrator in "Set Login Password".

For login password setting, refer to Section 6.15.4.

(2) Disabling data protection in a project

To disable data protection, delete the login password space (remain the space blank) for Administrator.

POINT
<ul style="list-style-type: none">● If a project password has been set to the project created with the PX Developer Version 1.08J or earlier, the project password becomes the login password for Administrator and data protection is enabled.● Data protection will not be enabled even if a password is set to the access level other than Administrator.

6.15.3 Login to the project



PURPOSE

When data protection is enabled, password authentication is performed to open a project.

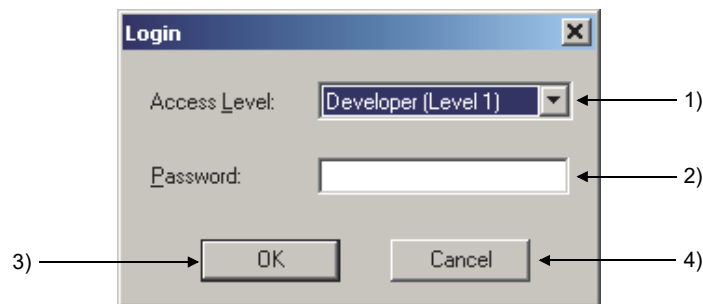


BASIC OPERATION

1. Open the project.
(For the operations for opening a project, refer to Section 6.3.)
2. When data protection is enabled, the Login window appears.
3. Select an access level from the list box.
4. Enter a login password set for the access level.
5. Click the "OK" button.



DISPLAY/SETTING SCREEN



DISPLAY/SETTING CONTENTS

No.	Item/Button	Description
1)	Access Level	Select an access level from the list box to login.
2)	Password	Enter a password set for the access level.
3)	OK	Checks the password. If the password is correct, the access level is accepted and the Login window is closed.
4)	Cancel	Cancels the current setting and closes the Login window.

POINT

- If the login password is lost or forgotten, you cannot login to the project. Be careful not to lose or forget the password. When a login password for Developer (Level 3) or lower is lost, login to the project with "Administrator" and set a password again.
- When a login password for "Administrator" has been set for a new project created (restored) by Uploading from PLC, the Login window is displayed immediately after the Uploading from PLC.

6.15.4 Set login password

**PURPOSE**

To set a login password for each access level of the projects.

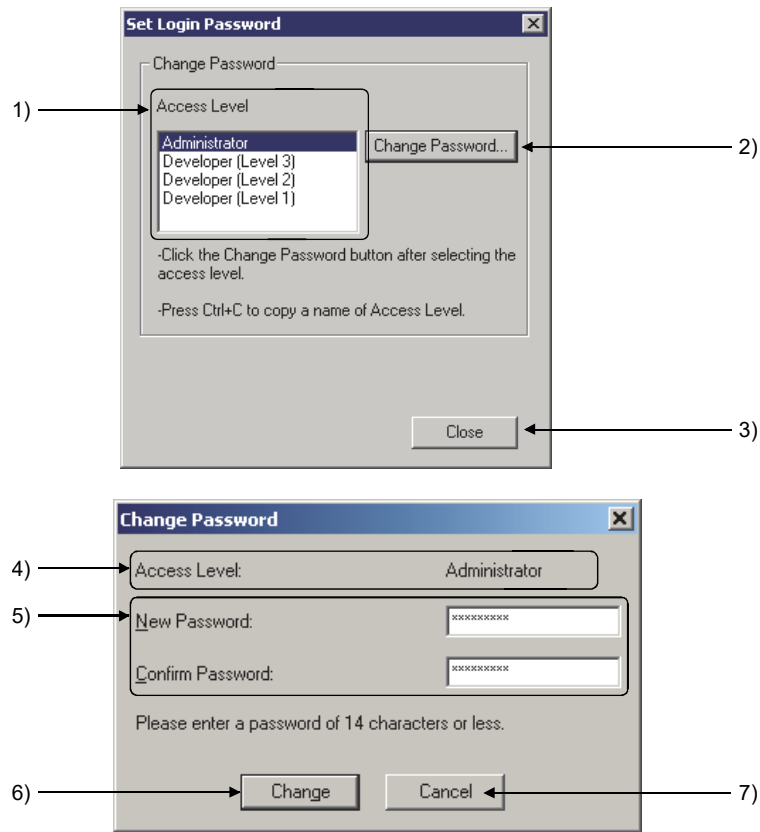
**BASIC OPERATION**

1. Click [Project] → [Set Login Password] from the menu.
2. The Set Login Password window appears.
3. Select an access level for which the password is to be set or changed.
4. Click the "Change Password" button.
5. The Change Password window appears.
6. Type a password in the New Password field.
7. Enter the same password in the Confirm Password field.
8. Click the "Change" button.

POINT

The [Set Login Password] menu is not selectable when the access level used to login is Developer (Level 3) or lower.

 **DISPLAY/SETTING SCREEN**



 **DISPLAY/SETTING CONTENTS**

No.	Item/Button	Description
1)	Access Level	Select an access level for which the password is to be set or changed.
2)	Change Password	Displays the Change Password window.
3)	Close	Closes the Set Login Password window.
4)	Access Level	Displays the access level for which a password is set.
5)	Password entry	Enter a password for the selected access level using 14 alphanumeric characters or less.
6)	Change	Compares the password entered in New Password with the one in Confirm Password. If they are matched, registers the password and closes the Change Password window.
7)	Cancel	Cancel the setting and closes the Change Password window.

6.15.5 Set permissions

**PURPOSE**

For each protected data, set access levels where editing is allowed and whether read access from the lower access levels is allowed or denied.

**BASIC OPERATION**

1. If Monitor mode is currently active, change it to Edit mode referring to Section 13.1.3.
2. In the project window, select a program or user definition (FB type, tag FB type, structure type) for which access permission is to be set or changed.
3. Click [Project] → [Edit Data] → [Set Permissions] from the menu.
Or, right-click the target item in the project window, and then click [Set Permissions] in the pop-up menu.
4. The Set Permissions window is displayed.
5. By dragging the slider, select an access level where editing is to be allowed.
6. In the Read Access for lower levels area, select either Deny Read Access or Allow Read Access with its radio button.
7. Click the "OK" button.
8. A message appears to notify that the Set Permissions setting is complete.

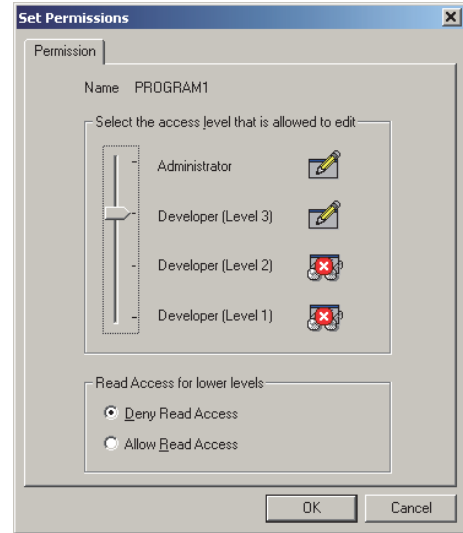
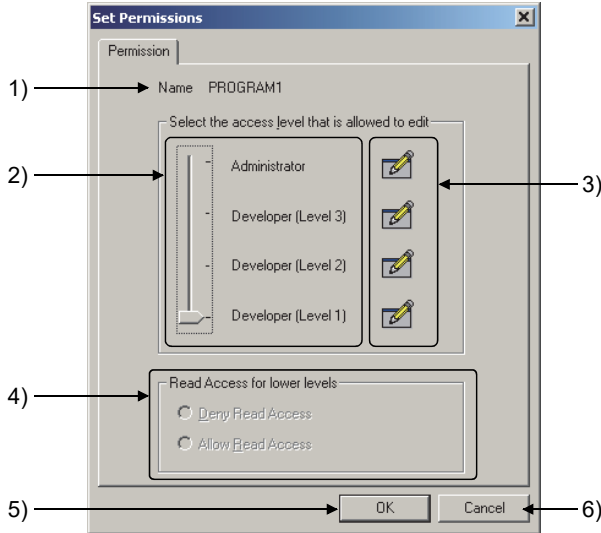
POINT

- [Set Permissions] is not selectable if data protection is disabled.
- The Set Permissions setting cannot be changed in the following cases:
 - a) An access level higher than the one used for the current login has been set.
 - b) The access level of the current login is Developer (Level 1).










 **DISPLAY/SETTING SCREEN**

(When the access level that is allowed to edit is Developer (Level 1) or higher)

(When the access level that is allowed to edit is Developer (Level 3) or higher)

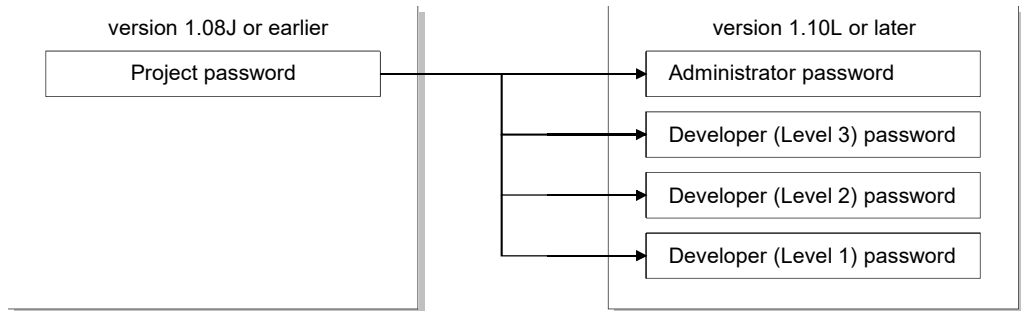


 **DISPLAY/SETTING CONTENTS**

No.	Item/Button	Description												
1)	Name	Displays the name of a program, user-defined FB type, user-defined tab FB type or structure type.												
2)	Select the access level that is allowed to edit	By dragging the slider, set the access level for the target program or data to enable the editing. In the access level selected by the slider or higher level, editing is enabled. The slider can only be dragged within the area of the current access level and lower ones.												
3)	Access permission status display	Displays the operation permitted for each access level as an icon. Displayed icons are changed according to the slider position and the Read Access for lower levels setting. <table border="1" style="margin: 10px auto;"> <thead> <tr> <th>Icon</th> <th>Permission</th> <th>Condition for display</th> </tr> </thead> <tbody> <tr> <td></td> <td>Allow edit</td> <td>The access level is the one selected by the slider or higher</td> </tr> <tr> <td></td> <td>Allow read access</td> <td>The access level is lower than the one selected by the slider, and Read Access for lower levels is set to "Allow Read Access".</td> </tr> <tr> <td></td> <td>Deny read access</td> <td>The access level is lower than the one selected by the slider, and Read Access for lower levels is set to "Deny Read Access".</td> </tr> </tbody> </table>	Icon	Permission	Condition for display		Allow edit	The access level is the one selected by the slider or higher		Allow read access	The access level is lower than the one selected by the slider, and Read Access for lower levels is set to "Allow Read Access".		Deny read access	The access level is lower than the one selected by the slider, and Read Access for lower levels is set to "Deny Read Access".
Icon	Permission	Condition for display												
	Allow edit	The access level is the one selected by the slider or higher												
	Allow read access	The access level is lower than the one selected by the slider, and Read Access for lower levels is set to "Allow Read Access".												
	Deny read access	The access level is lower than the one selected by the slider, and Read Access for lower levels is set to "Deny Read Access".												
4)	Read Access for lower levels	Select either Allow Read Access or Deny Read Access with its radio button to allow or deny read access from lower levels in which editing is not allowed.												
5)	OK	Accepts the setting and closes the Set Permissions window.												
6)	Cancel	Cancels the setting and closes the Set Permissions window.												

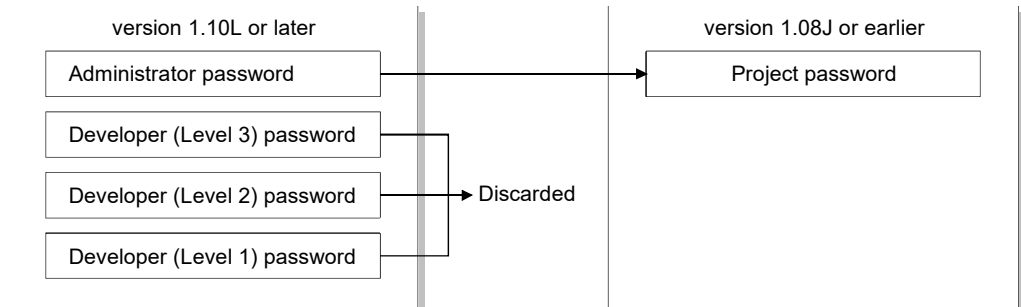
6.15.6 Password handling among different versions

- (1) When opening a project created by version 1.08J or earlier using version 1.10L or later
- (a) When a project password was set on version 1.08J or earlier
The project password is effective for all access levels of version 1.10L or later products.



- (b) When no project password was set on version 1.08J or earlier
No password is set for all access levels of version 1.10L or later products, and thereby the Login window is not displayed when the project is opened.

- (2) When opening a project created by version 1.10L or later using version 1.08J or earlier
The Administrator password set on version 1.10L or later becomes a project password of version 1.08J or earlier products. Passwords set for Developer (Level 3) to Developer (Level 1) are discarded.



6.15.7 Function performing data protection

The following list shows the contents of data protection performed to the read only/read forbidden data when data protection is enabled.

Function	Description	Reference
Parts window	The following operations cannot be performed in edit mode. <ul style="list-style-type: none"> • Selecting the toolbar on the Parts window in read only data. • Dropping when trying to paste FB parts by drag and drop and the data to be dropped is read only. 	Section 5.7.3 Section 7.2
FB property window	The initial value of the FB parts with local variable is unchangeable to the read only data in edit mode.	Section 5.7.4
FB Property Page	The initial value of the FB parts with local variable is unchangeable to the read only data in edit mode.	Section 10.2
Output window	A jump to the error point in read forbidden data cannot be performed.	Section 5.7.5 Section 11.1
Copying data in the same project	The operation to read forbidden data cannot be performed. Note that permission status of original data is not copied to the data to be copied.	Section 6.9.1
Deleting data in project	The operations to read only/read forbidden data cannot perform.	Section 6.10
Changing data name in project	The operations to read only/read forbidden data cannot perform.	Section 6.11
Editing data comments in project	Editing a comment in read only/read forbidden data is impossible.	Section 6.12
Displaying the data editing screen in project	Editing screen of read forbidden data is not displayed.	Section 6.13
Copying data to other project	The operation to read forbidden data cannot be performed. Note that permission status of original data is not copied to the data to be copied.	Section 6.9.2
Program/FB definition windows	If opening in read only, the grid of FBD sheet is not displayed in edit mode.	Section 7.1
Moving FBD parts	The following operations cannot be performed if read only data is opened in edit mode. <ul style="list-style-type: none"> • Move operation using mouse. • Selecting Bring Forward/Send Backward in the diagram menu. 	Section 7.2.4
Changing size of FBD parts	The following operations cannot be performed if read only data is opened in edit mode. <ul style="list-style-type: none"> • Changing size operation using mouse. 	Section 7.2.5
Cutting/copying/pasting/deleting FBD parts	The following operations cannot be performed if read only data is opened in edit mode. <ul style="list-style-type: none"> • Selecting the Cutting/Pasting/Deleting menu. • Copying by [press "Ctrl" key and drag and drop FBD parts with mouse at the same time]. • Copying in a project or to other project by [press "Alt" key and drag and drop FBD parts with mouse at the same time]. 	Section 7.2.6
Inserting variable parts	The following operations cannot be performed if read only data is opened in edit mode. <ul style="list-style-type: none"> • Inserting new variable parts from the Parts window. • Inserting new/existing variable parts by paste operation. 	Section 7.3.2
Definition of new variable	The following operations cannot be performed if read only data is opened in edit mode. <ul style="list-style-type: none"> • Selecting the Rename Variable menu about existing variable parts. • Adding new variable parts by paste operation. 	Section 7.3.3
Refer to Variable	If read only data is opened in edit mode, the Refer to Variable menu is not selectable to existing variable parts.	Section 7.3.5
Changing data type of variable parts	If read only data is opened in the edit mode, the Change Data Type button cannot be used.	Section 7.3.6
Inserting constant parts	The following operations cannot be performed if read only data is opened in edit mode. <ul style="list-style-type: none"> • Inserting new variable parts from the Parts window. • Inserting new/existing constant parts by paste operation. 	Section 7.4.2
Editing value of constant parts	The following operations cannot be performed if read only data is opened in edit mode. <ul style="list-style-type: none"> • Starting edit by double click. • Selecting the Change Value menu to existing constant parts. 	Section 7.4.3
Inserting FB parts	The following operations cannot be performed if read only data is opened in edit mode. <ul style="list-style-type: none"> • Inserting new FB parts from the Parts window. • Inserting new/existing FB parts by paste operation. 	Section 7.5.2

Function	Description	Reference
Definition of new FB parts	The following operations cannot be performed if read only data is opened in edit mode. <ul style="list-style-type: none"> • Selecting the Change Value menu to existing FB parts. • Adding new FB parts by paste operation. 	Section 7.5.3
Setting FB property	If read only data is opened in edit mode, the initial value of the FB parts with local variable is unchangeable.	Section 7.5.4
Referring to definition of FB parts	If definition source is read forbidden data, the source cannot be displayed.	Section 7.5.5
Inserting function parts	The following operations cannot be performed if read only data is opened in edit mode. <ul style="list-style-type: none"> • Inserting new function parts from the Parts window. • Inserting new/existing function parts by paste operation. 	Section 7.6.2
Inserting inline ST parts	The following operations cannot be performed if read only data is opened in edit mode. <ul style="list-style-type: none"> • Inserting new inline ST parts from the Parts window. • Inserting new/existing inline ST parts by paste operation. 	Section 7.7.2
Inserting a connector	The following operations cannot be performed if read only data is opened in edit mode. <ul style="list-style-type: none"> • Inserting new connector parts from the Parts window. • Inserting new/existing connector parts by paste operation. 	Section 7.8.2
Connecting a connector	The following operations cannot be performed if read only data is opened in edit mode. <ul style="list-style-type: none"> • Moving the port of a connector. • Extracting a connector from output pin. 	Section 7.8.2 Section 7.8.3 Section 7.8.5
Adjusting the bending position of connector	If read only data is opened in edit mode, bending position cannot be edited using movement grip.	Section 7.8.4
Inserting comment parts	The following operations cannot be performed if read only data is opened in edit mode. <ul style="list-style-type: none"> • Inserting new comment parts from the Parts window. • Inserting new/existing comment parts by paste operation. 	Section 7.9.2
Editing text of comment parts	The following operations cannot be performed if read only data is opened in edit mode. <ul style="list-style-type: none"> • Selecting the Edit Comment menu about existing comment parts. • Selecting the all functions on the format tool bar. 	Section 7.9.3 Section 5.6.6
Adding an FBD sheet	If read only data is opened in edit mode, the operation menus of each function cannot be selected.	Section 7.10.2
Deleting an FBD sheet		Section 7.10.3
Moving/copying an FBD sheet		Section 7.10.4
Changing an FBD sheet name		Section 7.10.5
Editing declaration information of local variable sheet	The following operations cannot be performed if read only data is opened in edit mode. <ul style="list-style-type: none"> • Editing cells. • Changing variable type and row position by drag and drop. 	Section 7.11.2
"Select Data Type" dialog box	If read only data is opened in edit mode, the calling button for "Select Data Type" dialog box is cannot be selected.	Section 7.11.4
"FBD Sheet Execution Condition Setting" dialog box	If read only data is opened in edit mode, although the "FBD Sheet Execution Condition Setting" dialog box is displayed, the edited contents are not reflected (invalidate the "OK" button).	Section 7.12.2
Defining/editing a structure type Definition Window	The following operations cannot be performed if read only data is opened in edit mode. <ul style="list-style-type: none"> • Editing cells. • Selecting the Select Data Type button. 	Section 9.2
Operations performed in cross reference window	A jump to the variable in read forbidden data cannot be performed.	Section 10.1.5
Error Check	A jump to the error point in read forbidden data cannot be performed (Error check for read only data is executable).	Section 11.1
Cold-start compile	A jump to the error point in read forbidden data cannot be performed.	Section 11.2
Hot-start compile		Section 11.3
Online change compile		Section 11.4
Batch reflection of FB property current value to initial value	In monitor mode, local variable in read only/read forbidden data cannot be displayed in the FB property management window.	Section 13.6.1
Reflection of FB property current value of specified FB parts to initial value	If read only data is opened in monitor mode, the initial value of the FB parts with local variable is unchangeable by reflecting current value.	Section 13.6.2
FBD program diagnostics	A jump to the error point in read forbidden data cannot be performed in monitor mode.	Section 14.1
Printing programs/user-defined FBs	Read forbidden program and user-defined FB cannot be printed. (The checkbox of print target in the "Print" dialog box cannot be checked).	Section 16.5.5
Printing structure type	Read forbidden structure cannot be printed.	Section 16.5.6

6.15.8 Restrictions on data protection

(1) Unprotectable data with data protection

The following data is unprotectable even if data protection is enabled.

- Project parameter
- Global variable declaration
- Module FB declaration
- Tag FB declaration
- GX label assignment
- Program execution setting
- I/O Simulation setting
- Various data of GX project
- Setting data independent of processing description by FBD program
(For example: Transfer setup, print setting, project comment)

(2) Functions display the variable in read forbidden data

The following shows the functions display the variable in read forbidden data.

- Cross reference
- FBD Program Diagnostics
- Entry Variable Monitor.....registering the variable and changing the current value in read forbidden data are possible.
- I/O Simulation settingregistering the variable in read forbidden data are possible.

(3) Restrictions on data copy between projects

When copying editable data or read only data from a project to other project, the permissions setting in the original project are not reflected to the copied data.

Along with creating a new data, the copied data can be edited in the access level greater or equal to the one during login.

To protect the copied data in the same setting with the original project, permission setting is required in the target project.

POINT

When setting the security for GX Works2 project, register the access level name and password of PX Developer on the User Management screen of GX Works2. The access level name of PX Developer can be copied from the setting screen of login password.

The screenshot shows a 'User Addition' dialog box with the following content:

User Addition

User Addition
Please enter the user name, access level and password, re-enter the password to confirm, and then click [OK].

Please enter the password with 6 to 32 single-byte characters, numeric characters, alphabets A-Z, a-z, single space and !"#%&()*+,-./:;<=>?@[]^_`{|}~. Passwords are case-sensitive.

User Name: Administrator

Access Level: Administrators

Authorized to Use All Functions.

Password: *****

Re-enter Password: *****

OK Cancel

6.16 Changing the PLC Type



PURPOSE

To change the PLC type setting in a project being edited.

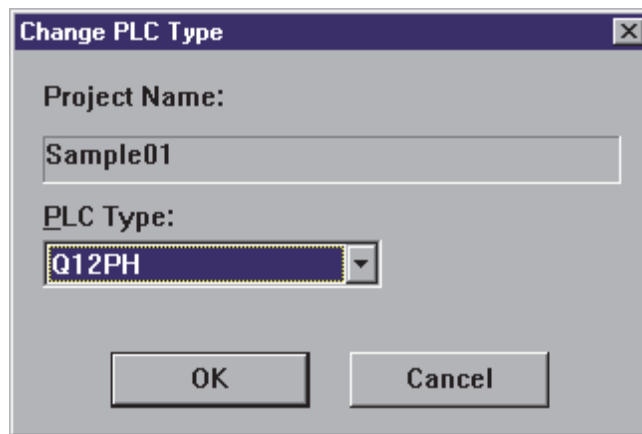


BASIC OPERATION

1. Click [Project] → [Change PLC Type] on the menu.
2. Click the (▼) in the list box after the "Change PLC Type" dialog box is displayed.
3. Select the PLC type to be changed.
4. Click the "OK" button.



DISPLAY/SETTING SCREEN



POINT

- Cold-start compile must be executed again if PLC type has been changed.
- Do not change PLC type in editing GX project. Please save GX project at first when editing GX project in changing PLC type.
Please change PLC type after the above operation.
- PX Developer project and GX project will be automatically saved.
- When changing the PLC type to PLC type that has different file register capacity, adjust the file register capacity as necessary.
The table below shows the maximum file register capacity when using a standard RAM for each PLC type.

PLC type	Maximum file register capacity when using standard RAM
Q02PHCPU, Q06PHCPU	64K points
Q04UDPVCPU, Q12PHCPU, Q12PRHCPU, Q25PHCPU, Q25PRHCPU	128K points
Q06UDPVCPU	384K points
Q13UDPVCPU	512K points
Q26UDPVCPU	640K points

POINT

- When changing PLC type from Process CPU or Redundant CPU to Universal model process CPU, a program size may exceed its capacity if the program includes a function or FB whose number of steps is increased by the change. Therefore, check the program size by calculating its memory size with a GX application after changing PLC type.
For memory size calculation, refer to the following manuals.
 - GX Works2 Version 1 Operating Manual (Common)
 - GX Developer Version 8 Operating ManualIf the program size exceeds its capacity, consider taking the following corrective actions.
 - Review the program.
 - Select a model which has a larger program memory.
 - Use the file register of the system resource within the range less than 64K words.
(Using a file register whose size is less than 64K words can save one step in a program compared with using the one whose size has exceeded 64K words.)
- In REAL type operation, the operation result may not be exactly the same between Process CPU/Redundant CPU and Universal model process CPU. When changing PLC type from Process CPU or Redundant CPU to Universal model process CPU, make sure that there is no problem in the actual system.

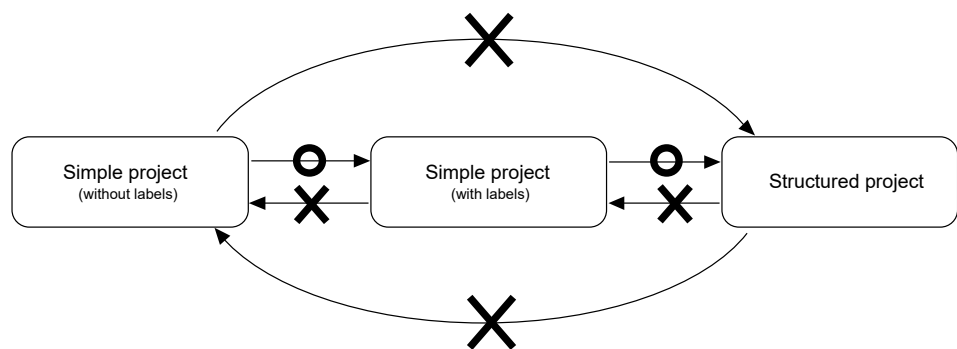
6.17 Changing GX Works2 Project Type

**PURPOSE**

Change the project type of GX Works2 contained in PX Developer using GX Works2.

Using the method explained below, the type of a Simple project is changed from "without labels" to "with labels". In addition, a Simple project 'with labels' can be changed to a Structured project.

Changing from a Simple project "with labels" to a Simple project "without labels" or changing a Structured project to a Simple project is not supported.

**BASIC OPERATION**

1. Open the GX Works2 project in the project window.
2. Click [Project] → [Change Project Type] on the menu of GX Works2.
3. Save and close the GX Works2 project.
4. Right-click the GX Works2 project in the project window, and select [Update GX Project Type] from the pop-up menu.
If the project type differs, the change confirmation dialog box is displayed.
5. Click the "OK" button.

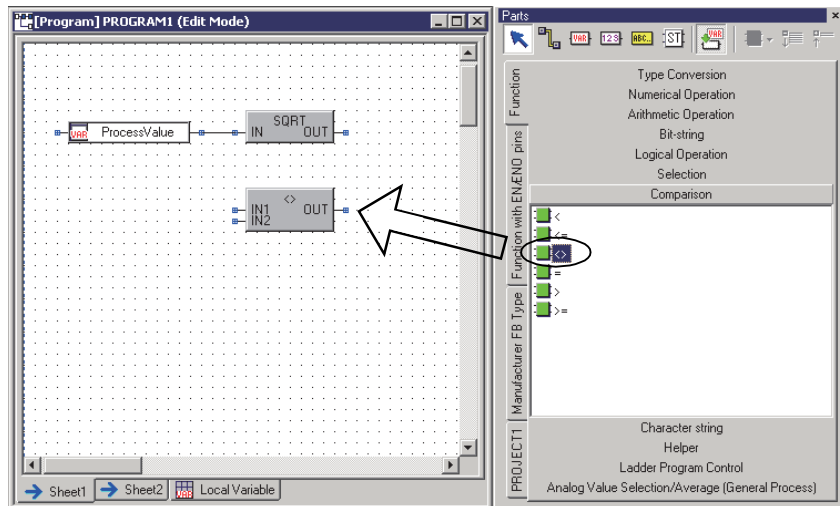
POINT

- When the project type is changed with GX Works2, compiling with GX Works2 is required.
- Set the pointer less than P3500 to Device/Label Automatic-Assign Setting of GX Works2.
- Before the change, backing up PX Developer project is recommended.

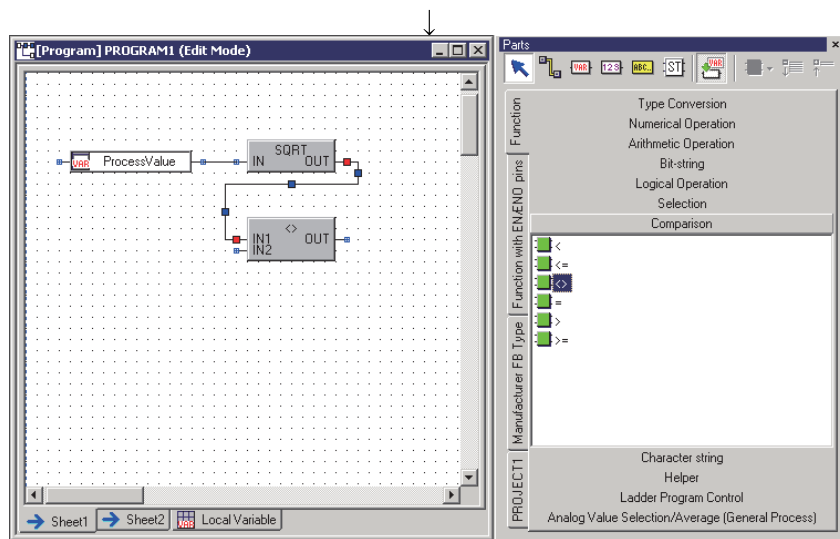
7 EDITING A PROGRAM/FB DEFINITION

This chapter mainly deals with how to make FBD programs by PX Developer programming tool or how to set variables.

This programming tool uses FBD language, which is prescribed in IEC61131-3, to make a program. The FBD language is a kind of "graphical language", which connect the block, variable and constant by data or signal flow to program for a special processing.



Arrange Parts




Connect the parts with connector to make programs!

The following is a list of FBD parts used in the programming tool. For general operation methods of FBD parts, refer to Section 7.2. For their insertion methods and details, refer to the following list.

FBD parts type	Reference
Variable parts	Section 7.3
Constant parts	Section 7.4
FB parts	Section 7.5
Function parts	Section 7.6
Inline ST parts	Section 7.7
Connector	Section 7.8
Comment parts	Section 7.9

7.1 Program/FB Definition Windows

Program/FB definition window consists of FBD sheet and local variable sheet. It makes programs and defines FB type/tag FB type as well as setting all kinds of variables. Switch to edit mode when making an FBD program. (When programming tool is started, it is in edit mode.)

If it is in the monitor mode, click [Edit] → [Edit Mode]  on the menu or press the "F2" key to return to edit mode. When it is in the monitor mode, the current window is in the monitor status. (For details of functions of monitor mode, refer to Chapter 13.)

(1) Open a program/FB definition window



PURPOSE

Open a program/FB definition window.

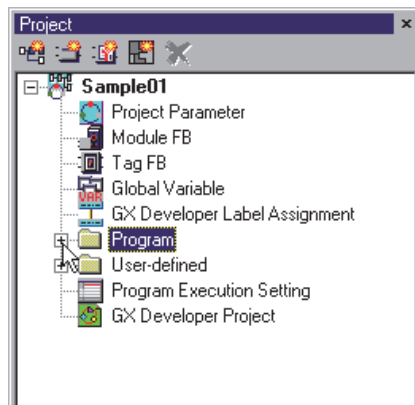



BASIC OPERATION

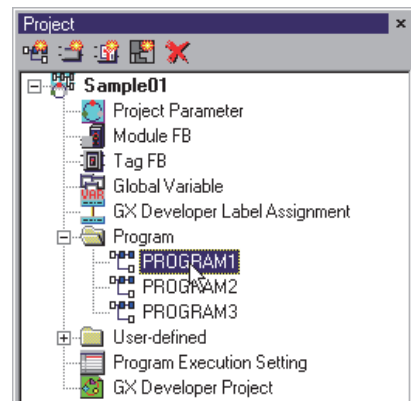
1. If a project is not opened, please open it. To make a new project, refer to Section 6.2.
2. Open program/FB definition window in the project window. If the project window is not displayed, refer to Section 5.7.1(2) to display it.
3. Open program folder icon or user-defined folder icon in the project window.
4. Double-click edited program/user-defined FB type icons. If there is no FB program, refer to Section 6.8 to add a new FBD program in the project.



DISPLAY/SETTING SCREEN

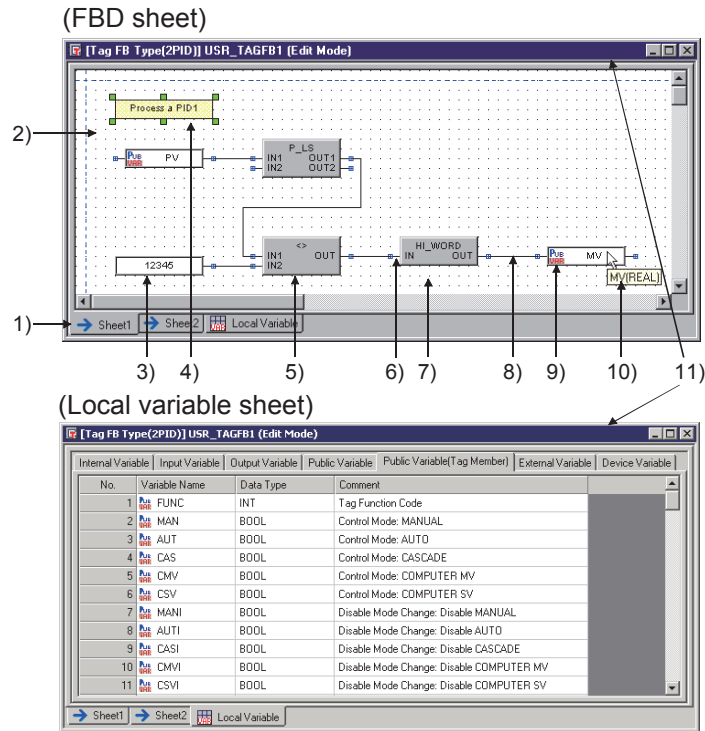


Click  to open icons



Double-click an icon to display program/FB definition window

<Program/FB Definition Window>



DISPLAY/SETTING SCREEN

No.	Item	Description
1)	Sheet tab	To display sheet names on tabs. The maximum length of sheet names is 64 characters. But the last sheet (the sheet on the right end) will always be << Local Variable >> tab.
2)	Grip	To display it around the currently selected FBD parts. Drag this grip with mouse to change its size.
3)	Constant parts	This part stores a constant internally. For details, refer to Section 7.4.
4)	Comment parts	To add notes or comments in the sheet. The settable maximum length of character string is 64KB.
5)	FB/Function parts	To execute some particularly processed parts. For details, refer to Section 7.5, Section 7.6.
6)	Connection point	To connect FBD part points with connectors. The number of connection points can be decreased or increased in some functions.
7)	Grid	To be displayed in grey in FBD sheet. Basically, FBD parts can adjust themselves to point the four angles correctly to the grid automatically provided that they are moved or changed in size.
8)	Connector	This part is used for connection part with another part. The connector route should be adjusted automatically to avoid overlapping with other FBD parts (comment part excluded). Connectors should have directions and they cannot be connected directly.
9)	Variable parts	To save variable parts. For details, refer to Section 7.3.
10)	Tool tip	To display contents of FBD parts when mouse is moved upon them.
11)	Title bar	To display the target program/FB type name. Also to display the current mode (edit/monitor) after the program/FB type name.

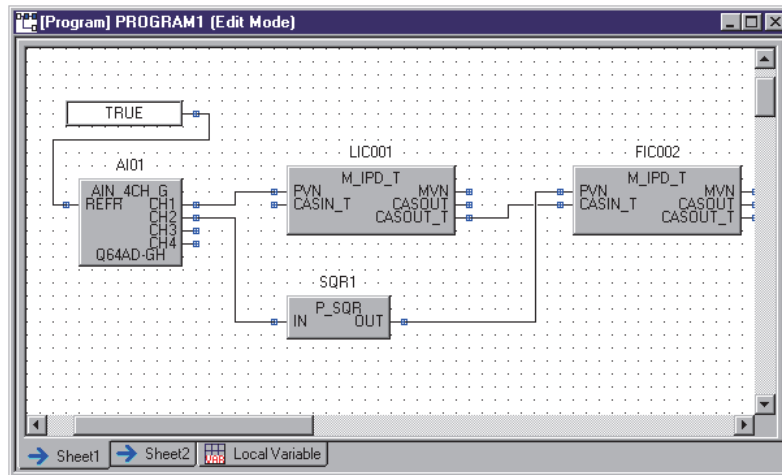
POINT

When a program is being opened in allow read only access setting, [Read-only] is displayed in the title bar.

7.1.1 Relation between local variable sheet and FBD sheet

The content of each part will be automatically displayed in the local variable sheet when variable name, variable type and data type have been arranged on FB parts or variable parts. Therefore, all the variables in FBD sheet can be managed through local variable sheet in a batch.

(FBD Sheet)



Insert parts



Displayed automatically!

(Local Variable Sheet)

No.	Variable Name	Data Type	Comment
1	FIC002	M_IPD_T	
2	LIC001	M_IPD_T	
3	AI01	AIN_4CH_G	

Displayed as local variables

7.2 General Operations of FBD Parts

This section mainly deals with operation methods of FBD parts such as how to copy and paste them.

7.2.1 Inserting FBD parts



PURPOSE

To insert FBD parts in an FBD sheet.



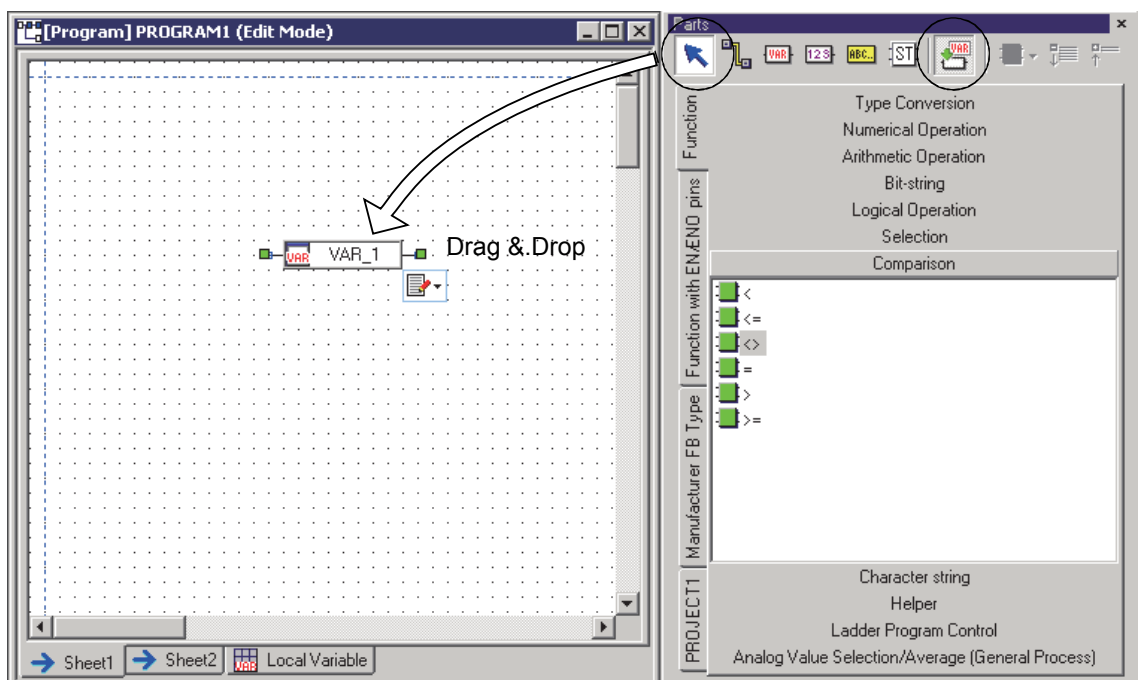
BASIC OPERATION

1. To set a new name to an FBD part to be inserted in an FBD sheet, click the "Insert with a new name" button on the Parts window to switch to ON. To name an FBD part "???", click the button to OFF.
Note that this operation is required only for variable parts, FB parts (manufacturer FB type, user-defined FB type), and inline ST parts.
2. Select an FBD part on the Parts window, and insert in an FBD sheet.
For details of the method for inserting FBD parts, refer to the following sections.

FBD part inserted in FBD sheet	Reference
Variable parts	Section 7.3.2
Constant parts	Section 7.4.2
FB parts	Section 7.5.2
Function parts	Section 7.6.2
Inline ST parts	Section 7.7.2
Connector	Section 7.8.2
Comment parts	Section 7.9.2



DISPLAY/SETTING SCREEN



(1) Status and operation of "Insert with a new name" button

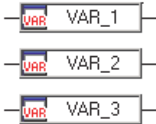
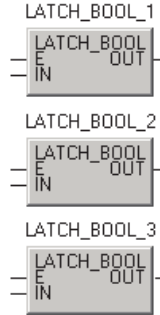
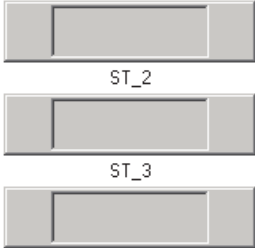
Click the button to switch the ON/OFF status.

The following describes the button status and operation.



Button status	Operation (name of FBD part)
OFF	Name an FBD part "???".
ON	Create a name avoiding the same name as the other local variables or reserved words in accordance with the type of FBD part.

(2) Setting description of FBD part inserted with new name

The following describes the setting description of FBD part inserted when the "Insert with a new name" button is ON.

Item	FBD parts	Variable parts	FB parts	Inline ST parts
Name		VAR_1, VAR_2, ... 	FB type name_1, FB type name2, ... 	ST_1, ST_2, ... 
Data Type		REAL type	FB type	
Variable Type		Internal variable	Internal variable	
Comment		(None)	Comment set for FB type	

POINT

- When inserting an FBD part from the Parts window with the ON status of the "Insert with a new name" button, a new name is not set to module FB, tag FB, or global variable which already has a variable name.
- When a variable part is inserted with a new name, the data type is REAL type, the variable type is internal variable.
Use the "Change Data Type" button () or the local variable sheet to change a data type of variable part. Use the local variable sheet to change a variable type. ( Section 7.3.6, Section 7.11.2)
- When an FB part is inserted with new name, the FB type name is used in a part of new name. (For example, a new name of LATCH_BOOL type FB is LATCH_BOOL_1.)
When an FB part whose type name is long is inserted, COPY is used in a part of new name. (Ex: COPY_1)

7.2.2 Selecting FBD parts

**PURPOSE**

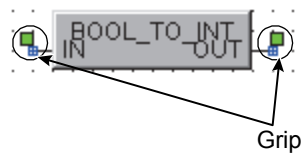
To select FBD parts arranged on FBD sheet.

**BASIC OPERATION**

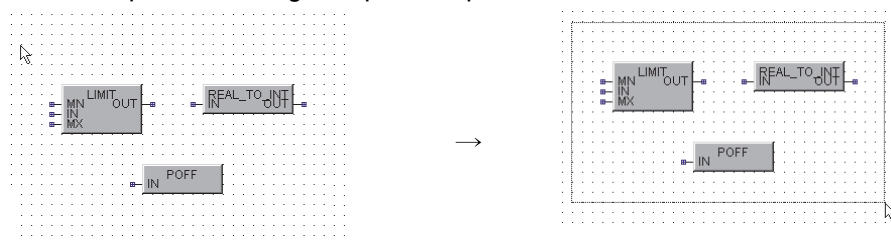
- Select FBD parts with mouse
 1. To select a single FBD part, just click the wanted one.
 2. To select more than 1 FBD part, click the parts while pressing the "Shift" key, or press the left button of mouse after locating the cursor in the background of FBD sheet and then pull the mouse in oblique direction to have wanted FBD parts selected.

- Select FBD parts by keyboard
 1. Press the "Tab" key. Each time one FBD part will be selected in the order by which it is pasted.
 2. Press the "Shift" + "Tab" keys. Each time one FBD part will be selected in the converse order by which it is pasted.

The grip will be displayed around the FBD part after it is selected by either of the above two ways.

**DISPLAY/SETTING SCREEN**

<Example of selecting multiple FBD parts with mouse>



Press the left button of mouse while dragging it in oblique direction.

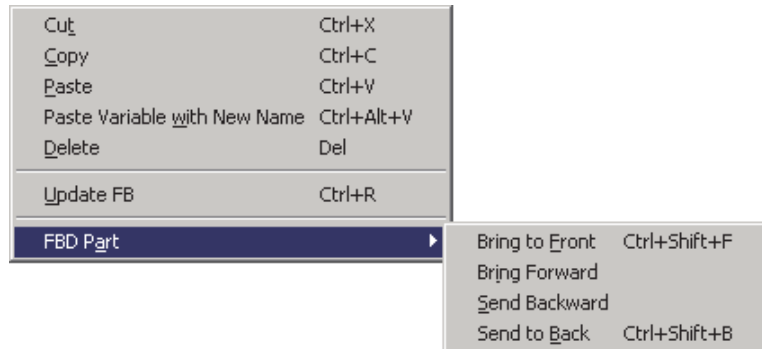
Once the button is released, multiple FBD parts will be selected.

POINT

Multiple FBD parts cannot be selected simultaneously in monitor mode.

The pop-up menu of FBD parts (in edit mode)

When selecting multiple FBD parts, right-click to display the following pop-up menu.

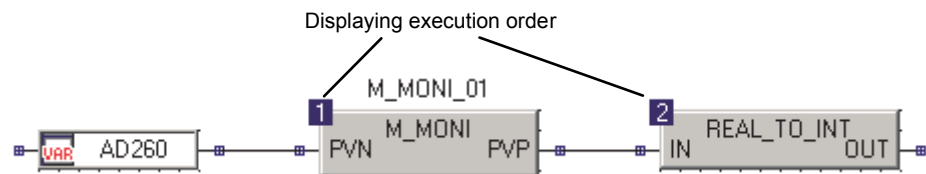


Item	Description
Cut	Refer to Section 7.2.6.
Copy	
Paste	
Paste Variable with New Name	
Delete	
Update FB	Refer to Section 7.5.6.
FBD Part	To change the priority of FBD parts.

POINT

Whether or not to display the execution order of FB parts, function parts and Inline ST parts can be switched by selecting [Diagram] → [Display Execution Order of FBD parts] on the menu.

To establish the order, select [Convert] → [Error Check] on the menu.



The following shows the three types of the execution order display.

Display	Status
1 (Blue)	Error check is successful and order is established.
1 (Red)	An order is undecided as the FBD sheet whose order is established has been edited.
? (Red)	An order is unclear such as FB/function parts are newly added, error check is not performed.

Note that the display is discarded once closing a project. Perform error check to display it in restarting a project.

7.2.3 Changing name of FBD parts

**PURPOSE**

To change a name of FBD part on an FBD sheet.

**BASIC OPERATION**

- Change the name of FBD parts with mouse
 1. Select the FBD part for change (Section 7.2.2).
 2. Move the mouse pointer within the range of name of FBD parts.

(Example: the range of variable name of variable part)

When cursor is transformed into the symbol , double-click. Alternatively, right-click the FBD part and select the following items whose names are to be changed from the pop-up menu.

FBD parts	Item of Menu
Variable parts	Rename Variable
FB parts	Rename Variable
Inline ST parts	Rename Inline ST
Constant parts	Change Value
Comment parts	Edit Comment

3. Input the new name and press the "Enter" key.

- Change the name of FBD parts by keyboard
 1. Select the FBD part for change (Section 7.2.2).
 2. Press the "Ctrl" + "Enter" keys.
 3. Input the new name and press the "Enter" key.

Note that the change operation cannot be executed in the following situation.





- When multiple parts are selected
- In the monitor mode
- Without authority for editing by the data protection function

7.2.4 Moving FBD parts

**PURPOSE**

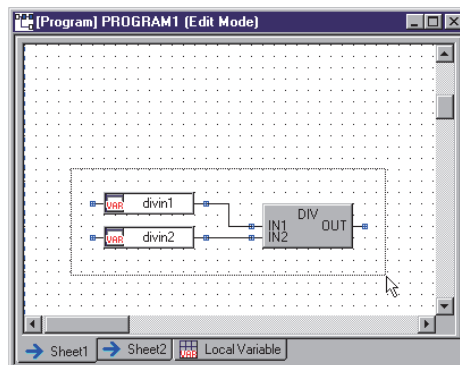
To move FBD parts arranged on FBD sheet.

**BASIC OPERATION**

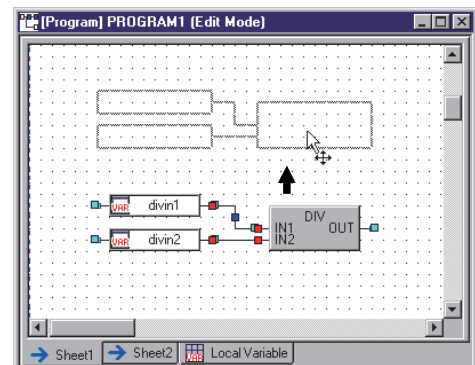
- Move FBD parts with mouse
 1. To move a single FBD part, click the wanted FBD part with mouse.
 2. When mouse pointer is transformed into  please drag the FBD part.
 3. To move multiple FBD parts, select multiple FBD parts at first.
( Section 7.2.2)
 4. Move the mouse pointer to one of the selected FBD parts (cursor is transformed into ) and drag it with mouse.
- Move FBD parts with keyboard
 1. Select an FBD part ( Section 7.2.2).
 2. In FBD parts selecting status, FBD part can be moved with "↑", "↓", "←", "→" keys on keyboard.
 3. Use "↑", "↓", "←", "→" keys while pressing the "Ctrl" key to move FBD parts by grid as unit.

**DISPLAY/SETTING SCREEN**

<Example of moving multiple FBD parts with mouse>



Select multiple FBD parts with mouse.



After selecting multiple FBD parts, drag the mouse pointer onto one of the parts.

7.2.5 Changing size of FBD parts

**PURPOSE**

To change the size of FBD parts arranged on FBD sheet.

**BASIC OPERATION**

- Change the size of FBD parts with mouse
 1. Select the FBD part for size change (☞ Section 7.2.2).
 2. A grip will be displayed around the selected FBD part.
 3. Once mouse pointer is moved onto the grip, it will be transformed into↔.
 4. Drag mouse to the left or right.
- Change the size of FBD parts by keyboard

Select the wanted FBD part (☞ Section 7.2.2).
Move it with "←","→" keys while pressing the "Shift" key.

**DISPLAY/SETTING SCREEN****POINT**

Only the right-to-left size of FBD parts can be changed.
While the top-to-bottom size of comment parts can be changed.

7.2.6 Cutting/Copying/Pasting/Deleting FBD parts

(1) Cut an FBD part


**PURPOSE**

To cut an FBD part arranged on FBD sheet.

The cut part can be pasted by executing step "(3) Paste an FBD part" in this section.

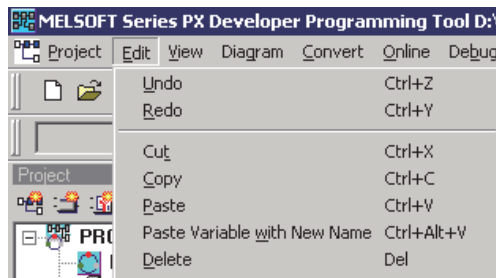
**BASIC OPERATION**

FBD parts can be cut in the following three ways.

- Select the to-be-cut FBD part and then click [Edit] → [Cut] () on the menu.
- Select the to-be-cut FBD part and then press the "Ctrl" + "X" keys.
- Right-click the to-be-cut FBD part and then select [Cut] from the pop-up menu.

**DISPLAY/SETTING SCREEN**

<[Edit] menu>



(2) Copy an FBD part


**PURPOSE**

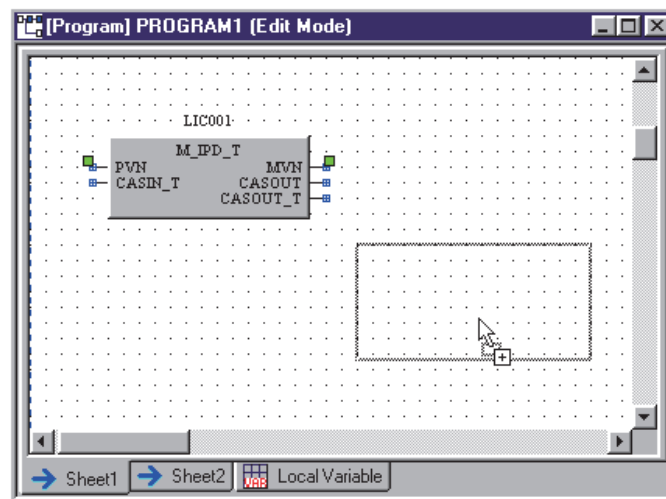
To copy an FBD part arranged on FBD sheet.

The copied FBD part can be pasted by executing step "(3) Paste an FBD part" or "(4) Paste an FBD part (new name)" in this section.

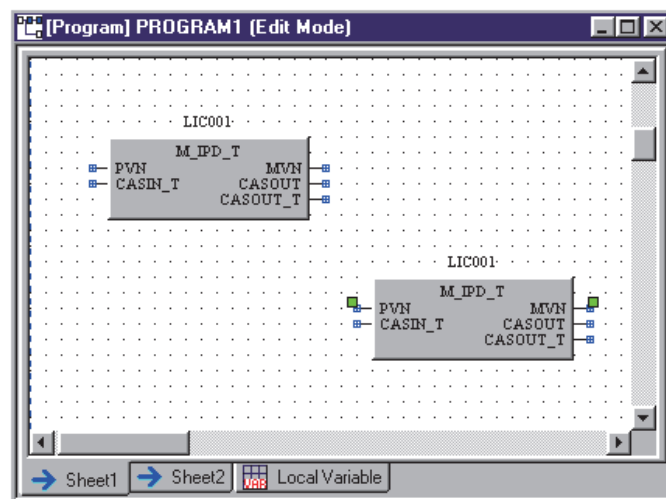
**BASIC OPERATION**

FBD parts can be copied in the following four ways.

- Select the to-be-copied FBD part and then click [Edit] → [Copy] () on the menu.
- Select the to-be-copied FBD part and then press the "Ctrl" + "C" keys.
- Right-click the to-be-copied FBD part and select [Copy] from the pop-up menu.
- If the copy-paste operation is for a single FBD sheet, just drag the FBD part to the target place while pressing the "Ctrl" key.



Hold down the "Ctrl" key and drag the FBD part!



The FBD part is copied!


(3) Paste an FBD part

**PURPOSE**

To paste the cut/copied FBD part to an FBD sheet.

**BASIC OPERATION**

FBD parts can be pasted in the following four ways.

- Open the target FBD sheet, and click [Edit] → [Paste] () on the menu.
- Open the target FBD sheet, and press the "Ctrl" + "V" keys.
- Right-click on the target FBD sheet, and select [Paste] from the pop-up menu.
- If the cut-paste operation is within the same FBD sheet, just drag & drop the FBD part to the target position while pressing the "Ctrl" key.

POINT

- When a copied FBD part is pasted to another FBD sheet, the corresponding declaration about the local variable is pasted too.
- When a copied FBD part is pasted to another FBD sheet where there exists a homonymous FBD part with different variable and data types, the pasted FBD part will be renamed to [???] automatically. (FBD parts without the same variable and data type cannot be arranged in this operation.)
- In a single FBD sheet, FBD parts with the same variable name, variable type and data type can be arranged.

(4) Paste an FBD part (new name)

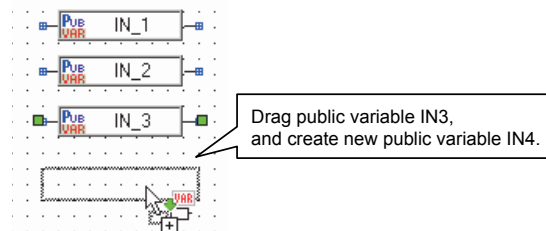
**PURPOSE**

To utilize a cut/copied name of FBD part, change to a new name which avoids the same name, and paste to an FBD sheet.

**BASIC OPERATION**

FBD parts can be pasted (new name) in the following four ways.

- Open the target FBD sheet, and click [Edit] → [Paste Variable with New Name] on the menu.
- Open the target FBD sheet, and press the "Ctrl" + "Alt" + "V" keys.
- Right-click on the target FBD sheet, and select [Paste Variable with New Name] from the pop-up menu.
- Drag the FBD part, and drop it to the target FBD sheet while pressing the "Ctrl" + "Alt" keys.

**POINT**

- When a cut/copied FBD part is in either of the following situations, [Paste Variable with New Name] cannot be executed.
 - Multiple FBD parts are cut/copied simultaneously.
 - The name of FBD part is "???".
 - Reference operator [.] is used for the name of FBD part.
- When the type of cut/copied variable part is public variable (tag member), the variable type created by [Paste Variable with New Name] is public variable.
- When the name of cut/copied FBD part is long, COPY is appended to the name created with [Paste Variable with New Name]. (Ex: COPY_1)

(5) Delete FBD parts

**PURPOSE**

To delete the FBD parts arranged on FBD sheet.

**BASIC OPERATION**

FBD part can be deleted in the following three ways.

- Select a to-be-deleted part and click [Edit] → [Delete] on the menu.
- Select a to-be-deleted part and press the "Delete" key.
- Right-click a to-be-deleted part and select [Delete] from the pop-up menu.

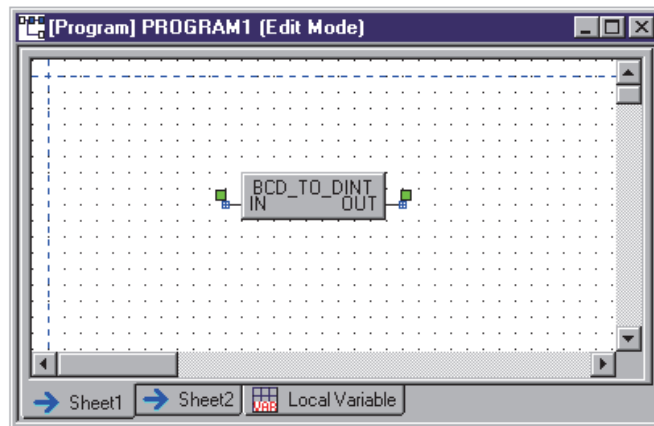
7.2.7 Pasting FBD parts to other applications

**PURPOSE**

To paste FBD part graph displayed in programming tools into other applications. This chapter mainly deals with how to paste it into "Paint" on Microsoft® Windows® Operating System.

**BASIC OPERATION**

1. Cut/copy FBD parts by the method mentioned in step (1) or (2) of Section 7.2.6.
2. Click "Start" button in Windows® and move cursor to [Program] → [Accessories].
3. Click [Paint].
4. Click [Edit] → [Paste] on the menu after paint is started.
5. Paste FBD part images.

**DISPLAY/SETTING SCREEN**

7.3 Variable Parts

Variable is used for storing data. The variable with specified data type can only store data (value) of such type.

This section mainly explains displaying contents or insertion of variable and adding/or referring to a declaration.

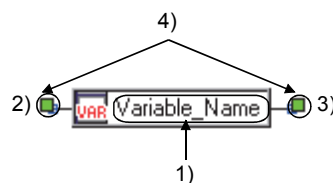
7.3.1 Displaying contents of variable parts

(1) List of variable and its displaying contents

The following shows the list of variable part.

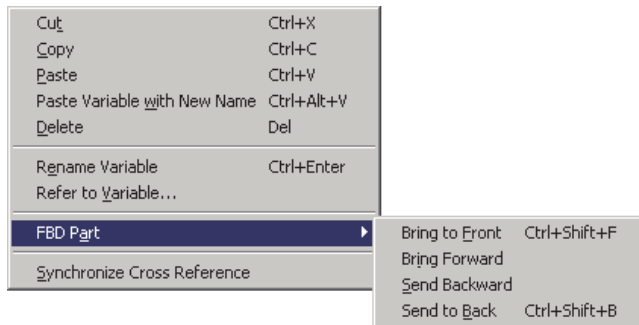
Variable type	Description	Displaying contents on FBD sheet
Internal Variable	It is applicable in a program, user-defined FB type/tag FB type. It cannot be accessed from an external FBD program. Data is saved in the internal memory.	
Input Variable	To serve as input value (input pin of user-defined FB type/tag FB type) in user-defined FB type/tag FB type.	
Output Variable	To serve as output value (output pin of user-defined FB type/tag FB type) in user-defined FB type/tag FB type.	
Public Variable	It can be accessed from the inside of a certain FB type/tag FB type or from the outside of an adjacent FBD program. Data is saved in the internal memory.	
External Variable	To refer to the variable of global part. The type of external variable must be consistent with that of global part name.	
Device Variable	A variable which reads/writes the PLC device values. Use a device name as a variable name. Declare device variables for each FBD which uses the device.	

The following shows the names and the functions of variable part.



- 1) Variable name
- 2) Input connection point and input pin
- 3) Output connection point and output pin
- 4) Grip

- (2) The pop-up menu of variable parts (in edit mode)
 Right-click a variable part to display the following pop-up menu.



Item	Description
Cut	Refer to Section 7.2.6.
Copy	
Paste	
Paste Variable with New Name	
Delete	
Rename Variable	To rename a selected variable part. (☞ Section 7.2.3)
Refer to Variable...	The "Variable Reference" dialog box is displayed. (☞ Section 7.11.3)
FBD Part	To change the priority of FBD parts.
Synchronize Cross Reference	To display the corresponding item in the cross reference window. (☞ Section 10.1.5)

*: For the details about the pop-up menu in monitor mode, refer to Section 5.5 (3).

POINT

The tool tip contents is displayed when a mouse pointer is placed on variable parts.



The tool tip is shown in [Variable name (data type)] format.

7.3.2 Inserting variable parts

**PURPOSE**

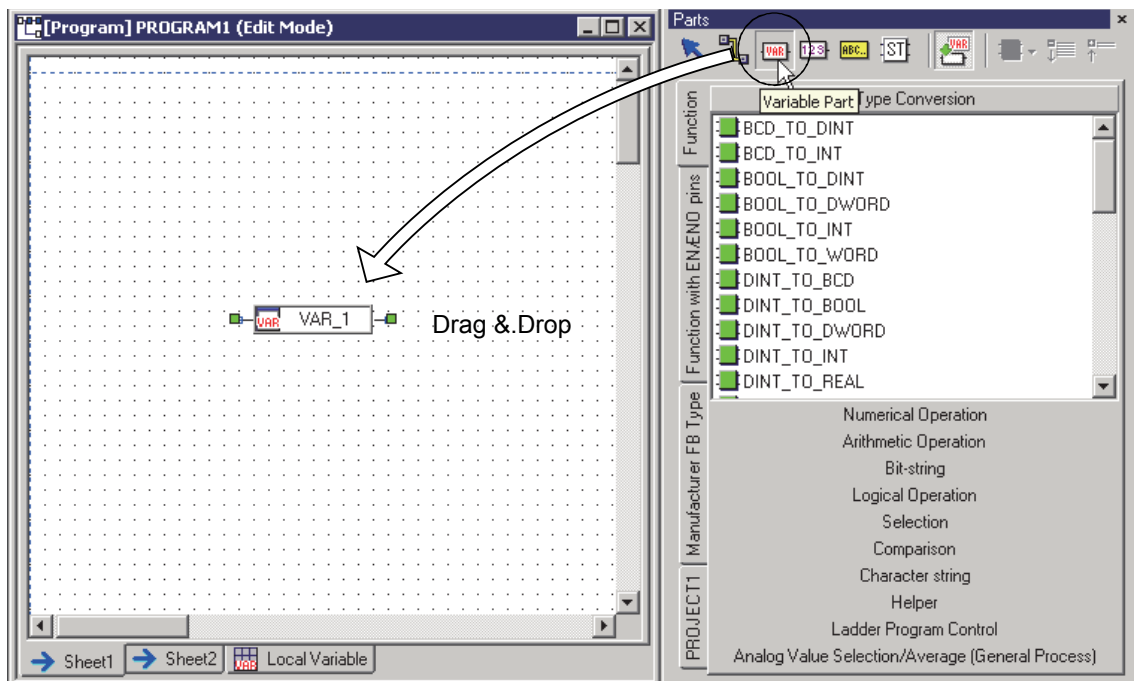
To insert a variable part into an FBD sheet.

**BASIC OPERATION**

Variable parts can be inserted into an FBD sheet by following two methods.

- By dragging and dropping mouse
 1. Click "Variable Part" in the part window.
 2. Drag the variable part into FBD sheet.
 3. Drop the variable part in FBD sheet.

- By clicking mouse
 1. Click "Variable Part" in parts window.
 2. Move variable part to the arrangement place when mouse pointer is transformed into .
 3. Click on the FBD sheet.

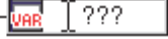
**DISPLAY/SETTING SCREEN**

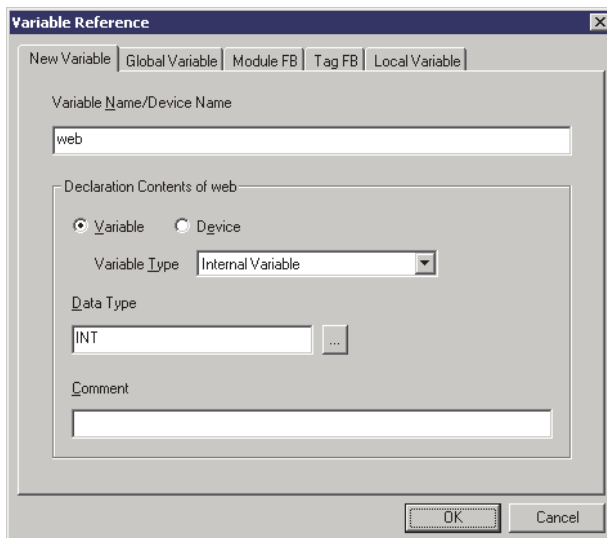
7.3.3 Definition of new variable

**PURPOSE**

To define the new variable parts arranged on FBD sheet.

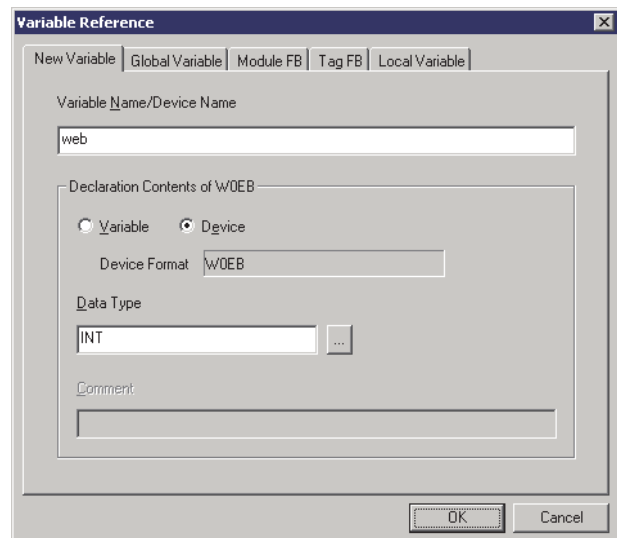
**BASIC OPERATION**

1. Click variable part in FBD sheet.
2. Move mouse pointer within the range of variable names. When cursor is transformed into the symbol , double-click the mouse. (For the method for changing variable names other than mentioned above, refer to Section 7.2.3.)
3. Input the new variable name and press the "Enter" key.
4. If variable parts share no common variable name in the same program/user-defined FB type/tag FB type, the "Variable Reference" dialog box will be displayed.
5. Set variable name/device name, variable type, data type and comments.
6. Click the "OK" button.

**DISPLAY/SETTING SCREEN**


The dialog box is titled "Variable Reference" and has tabs for "New Variable", "Global Variable", "Module FB", "Tag FB", and "Local Variable". The "New Variable" tab is selected. The "Variable Name/Device Name" field contains "web". Under "Declaration Contents of web", the "Variable" radio button is selected. The "Variable Type" dropdown menu is set to "Internal Variable". The "Data Type" field contains "INT". There is a "Comment" field at the bottom. "OK" and "Cancel" buttons are at the bottom right.

When selecting the "Variable" radio button



The dialog box is titled "Variable Reference" and has tabs for "New Variable", "Global Variable", "Module FB", "Tag FB", and "Local Variable". The "New Variable" tab is selected. The "Variable Name/Device Name" field contains "web". Under "Declaration Contents of W0EB", the "Device" radio button is selected. The "Device Format" field contains "W0EB". The "Data Type" field contains "INT". There is a "Comment" field at the bottom. "OK" and "Cancel" buttons are at the bottom right.

When selecting the "Device" radio button



DISPLAY/SETTING DATA

Item	Description
Variable Name/Device Name	Input a variable name of local variable to be newly added. (Within 98 characters)
Variable Type radio button	Select the type of variables with the radio button.
Variable Type	Select "Variable" with the "Variable Type radio" button to display the list box. Select "Variable Type" from the list box.
Device Format	Select "Device" with "Variable Type radio" button to display device format. Display the input character string as a device name. "The device name is incorrect." is displayed when a device whose name is not applicable to PX Developer *1 or character string which exceeds 96 letters.
Data Type	Set a data type. 1. Select a cell of data type and click "." button to input a data type. 2. The "Select Data Type" dialog box (☞ Section 7.11.4) is displayed. 3. Select a data type and click the "OK" button. Setting a data type can also be set by inputting directly. (Within 32 characters)
Comment	When "Variable" is selected, input a comment of variable to be added. (Within 64 characters) Cannot be input when a variable type is "External Variable" with the status that the check box of [Comment Reference] is checked. (☞ Section 5.11 (2))

*1: For details of devices which are supported by PX Developer, refer to Section 8.2.2 (2).

POINT

- For information about restrictions for naming a FB variable (invalid character string or symbol), refer to Appendix 1.
- In basic operation 4 mentioned on the previous page, the local variables that share the same name but differ in variable type or data type in the local variable with declaration cannot be defined.
- In the case of programs, input variable, output variable and public variable cannot be specified.
- When a variable of a variable part or a FB part is renamed, even if its comment contains 65 characters or more, it will be truncated to 64 characters on the <<New Variable>>tab.
- Data type can also be selected in "Select Data Type" dialog box (☞ Section 7.11.4).
- The device format of a device variable cannot be specified over the boundaries between the data register (D)/link register (W) of the internal user device and the extended data register (D)/extended link register (W). For details, refer to "QnUCPU User's Manual (Function Explanation, Program Fundamentals)".

7.3.4 Definition of variable using reference operator

**PURPOSE**

When inputting a variable name, applying reference operator [.] enables to refer to the following variables.

- Structure type member
- Input variable, output variable and public variable in FB part
- Tag data of tag FB (tag member)
- Bits in a device variable of WORD type

This section explains the definition method of the variable with reference operator.

**BASIC OPERATION**

Specify variable name in format of [FB variable name.Variable name] (They are [Structure type variable name.Member name] in structure type) when inputting a variable name.

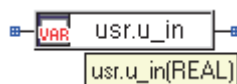
Express variable name in format of [FB variable name.Structure type variable name.Member name] when the reference target input variable, output variable and open variable on the reference operator are of structure type.

For detailed information about the structure type member, refer to Section 9.3.

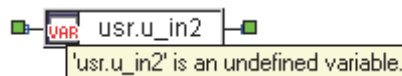
(Example) A user-defined input variable [u_in] with reference variable name: FB variable name [usr]



Under this situation, the variable name should be like this:



When referring a variable using reference operator if the variable specified by [variable name] of [FB variable name.Variable name] do not exist, is displayed on the tool tip ['FB variable name.Variable name' is an undefined variable].

**POINT**

- Reference variable name (structure type variable name and structure member name included) is case-sensitive when entering variable or structure member name in use of reference operator. If variable name or structure name does not accord in case, the variable or structure member cannot be referred.
- When the variable is defined using reference operator, the character strings prior to reference operator will be displayed in the variable name part of local variable sheet (☞ Section 7.11).
- WORD type device variable can refer data which added a bit number in hexadecimal format with written in "variable name. bit No." as BOOL type equally to bit-specified word device.
Bit-specified word device functions when specified 1 word which is from 0 to 9, A to F (upper case letter) is input to a bit number.

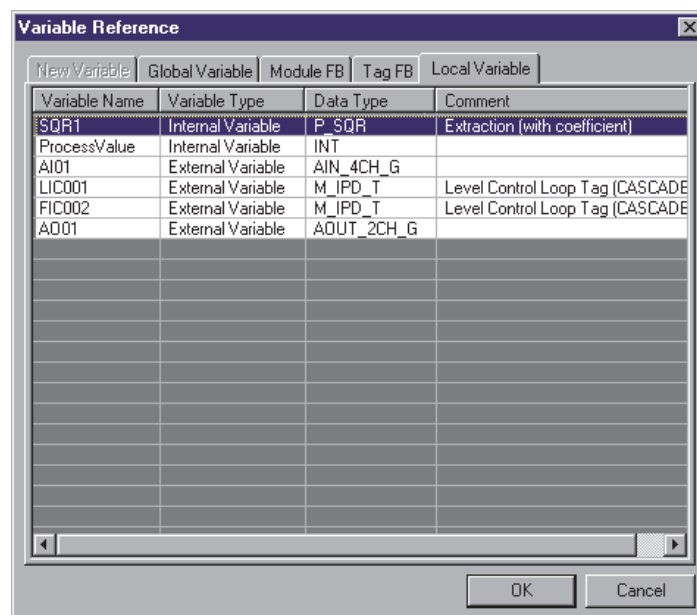
7.3.5 Referring to the existing variables

**PURPOSE**

To change the variable name of variable parts arranged on FBD sheet into that of other declared variable name for referring to the variable with reference operator (☞ Section 7.3.4).

**BASIC OPERATION**

1. Click the to-be-renamed variable part and select [Edit] → [Refer to Variable] on the menu.
Alternatively, right-click variable part to be renamed and select [Refer to Variable] on the pop-up menu.
2. The "Variable Reference" dialog box is displayed. (☞ Section 7.11.3)
3. Select any variable from the list of declared local variable or global variable and click the "OK" button.

**DISPLAY/SETTING SCREEN****POINT**


- Click a header of column to execute ascending/descending sort based on the clicked column. (The sorting order is switched between ascending and descending by click.) An icon (ascending order ▲, descending order ▼) is displayed to the right of the sorted item name.
- "Variable type" of local variable sort is executed on the numeral values (internal data) in accordance with types, not on displayed character string.

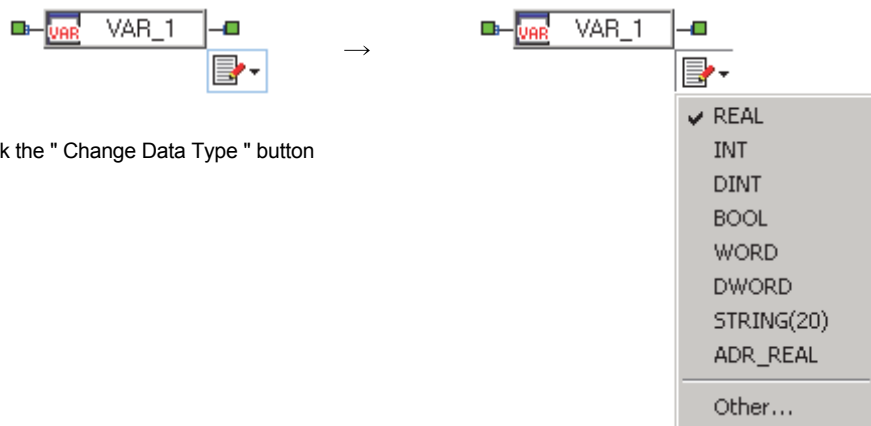
7.3.6 Changing data type of variable parts

**PURPOSE**

To change a data type of variable part on an FBD sheet.


**BASIC OPERATION**

1. Select a variable part whose data type is to be changed.
2. Click the "Change Data Type" button () that is displayed on the lower right when the mouse pointer is moved to an area of variable name, and select a new data type from displayed Change Data Type menu.

**DISPLAY/SETTING SCREEN**

Click the " Change Data Type " button

Select a data type from displayed Change Data Type menu.

Select [Other...] from the Change Data Type menu to select a data type from displayed "Select Data Type" dialog box ( Section 7.11.4).

POINT

- For data type change of variable part, data type can be changed to elementary data type or structure type.
- For the variable parts where either of the following variables is set, the "Change Data Type" button cannot be used.
 - Reference operator [.] is used.
(Includes bit-specified device variable)
 - Public variable (tag member) is referred on an FBD sheet for user-defined tag FB type.

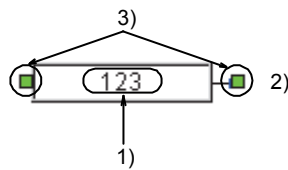
7.4 Constant Parts

This section mainly explains the display content or increment of constant parts, adding constant parts and editing constant parts value.

7.4.1 Displaying contents of constant parts

(1) Component names of constant part

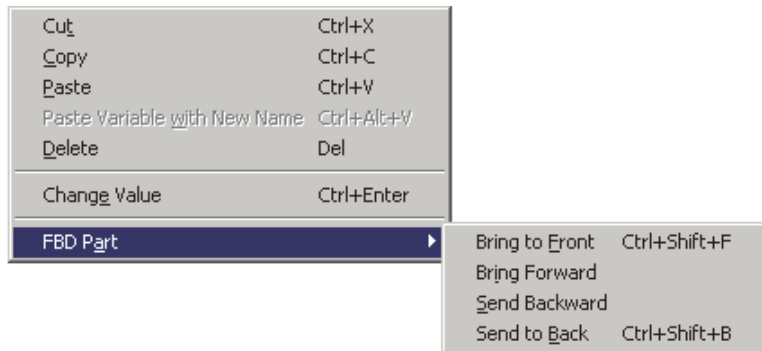
The following shows the names and the functions of constant part.



- 1) Constant value
- 2) Output joint point and output pin
- 3) Grip

(2) Pop-up menu of constant parts

Right-click a constant part to display the following pop-up menu.



Item	Description
Cut	Refer to Section 7.2.6.
Copy	
Paste	
Paste Variable with New Name	
Delete	
Change Value	To change the value of selected constant parts. (☞ Section 7.2.3)
FBD Part	To change the priority of FBD parts.

POINT

The tool tip content is displayed when a mouse pointer is placed on the output pin of constant parts.

7.4.2 Inserting constant parts

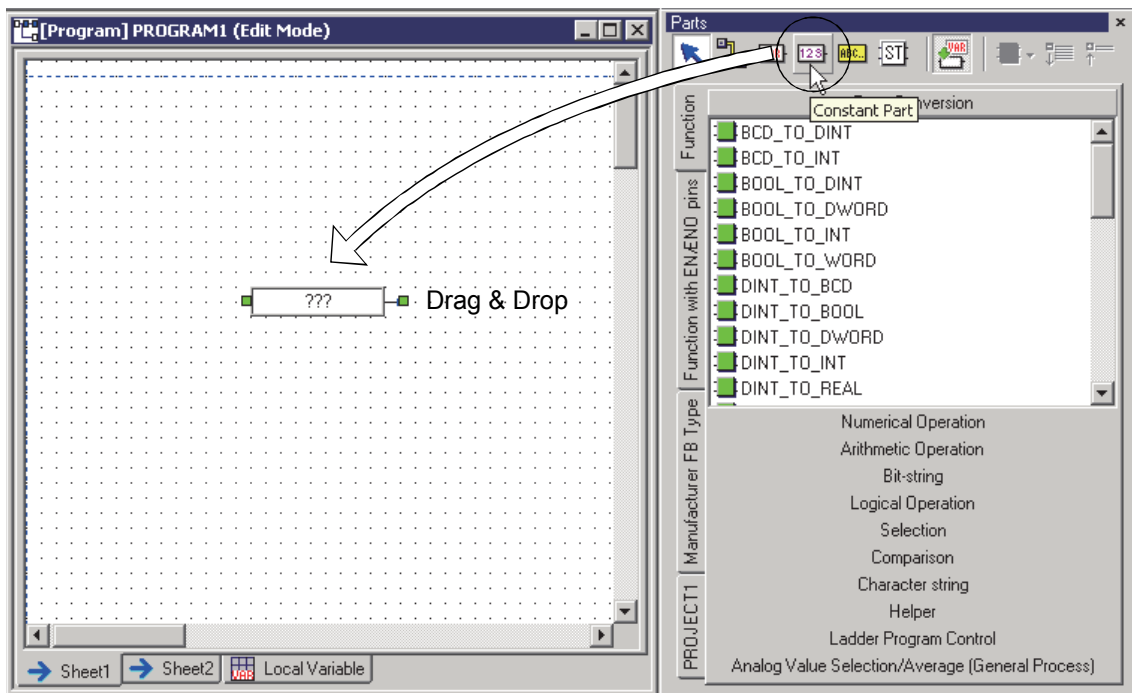
**PURPOSE**

To insert a constant part into FBD sheet.

**BASIC OPERATION**

Constant parts can be inserted into FBD sheet in the following two ways.

- By dragging and dropping mouse
 1. Click "Constant Parts" in parts window.
 2. Drag a constant part from the parts window into FBD sheet.
 3. Drop constant part in the FBD sheet.
 4. Insert into FBD sheet the FBD part named [???].
- By mouse-clicking
 1. Click "Constant Parts" in parts window.
 2. Move the constant part to the wanted place with mouse, meanwhile mouse pointer is transformed into .
 3. Insert the FBD part name [???] by clicking on the FBD sheet.

**DISPLAY/SETTING SCREEN**

7.4.3 Editing value of constant parts


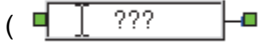


PURPOSE

To input or modify value of constant parts.



BASIC OPERATION

1. Click constant parts on the FBD sheet.
2. Double-click when mouse pointer is transformed into  symbol
() on the constant part.
3. Input constant value. Please refer to the following table for format of constants that can be input.
4. Press the "Enter" key.

The input format of constant value

Input form to parts	Data type candidate	Input format/input examples
Character string	STRING	Embrace the character string with double quotation marks (") before inputting it. Its maximum length is 32 characters. However, the following characters cannot be used in the character string. • double quotation marks (") • Comma (,) • Horizontal tab Example: "ABC"
Decimal integral	REAL, INT, DINT, WORD DWORD, BOOL	Number could be input with a minus mark. Example: 10, -10
Decimal real number	REAL	Number could be input with a decimal point or briefly as [.3(=0.3)] or [3. (=3.0)] or in index. Example: 10.0, 1.005E+008
Hexadecimal integral	INT, DINT, WORD, DWORD BOOL	Add [H] to value header and input it. Example: H10
True or false	BOOL	Input TRUE or FALSE. 0 (=FALSE), 1(=TRUE) can be input as decimal or hexadecimal number to specify TRUE or FALSE. Example: TRUE, FALSE, 0,1,H0 and H1



DISPLAY/SETTING SCREEN



POINT
The data type of adjacent FBD part determines the one of constant part. If the value (data) input in constant part does not accord with the input variable data type of FBD part, error will occur once compile. For details, refer to Section 11.7 (3).

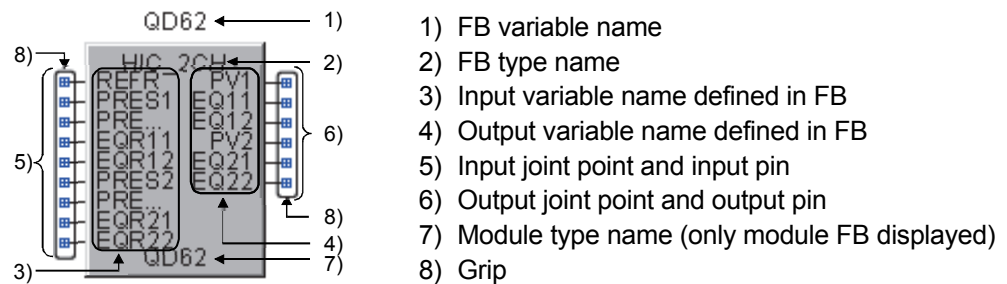
7.5 FB Parts

This section deals with insertion or display contents of FB parts, definition of new FB parts and FB performance setting.

7.5.1 Displaying contents of FB parts

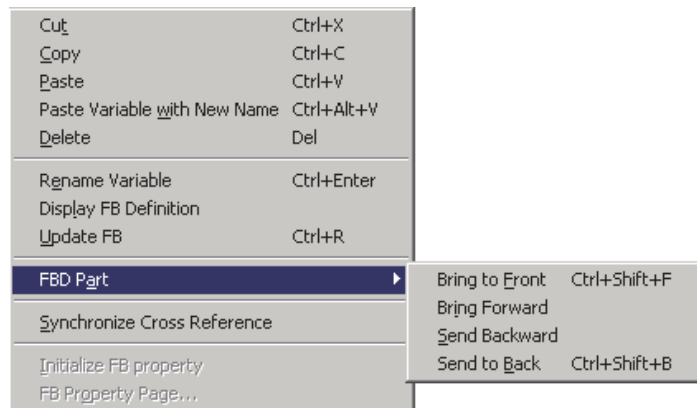
(1) Component names of FB part

The following shows the names and the functions of FB part.



(2) Pop-up menu of FB parts (in edit mode)

Right-click an FB part to display the following pop-up menu.

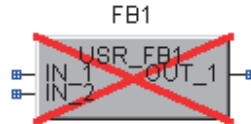


Item	Description
Cut	Refer to Section 7.2.6.
Copy	
Paste	
Paste Variable with New Name	
Delete	
Rename Variable	To rename a selected FB part. (Refer to Section 7.2.3)
Display FB Definition	To display program-definition window of FB part definition source. (Only when user-defined FB/tag FB is selected, the menu can be selected.)
Update FB	Refer to Section 7.5.6. (Only when the right-clicked FB part is marked as "x", the menu can be selected.)
FBD Part	To change the priority of FBD parts.
Synchronize Cross Reference	To display the corresponding item in the cross reference window. (Refer to Section 10.1.5)
FB property page...	To display FB property page. (The menu can be selected only when the FBs described in Section 10.2 are selected in edit mode.)

*: For more information about pop-up menu in monitor mode, refer to Section 5.5 (3).

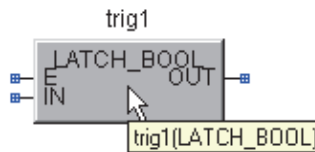
POINT

- When user-defined FB/tag FB is pasted in FBD sheet, "x" will appear on user-defined FB/tag FB on FBD sheet if content of user-defined FB/tag FB type definition is changed (example: delete input variable).



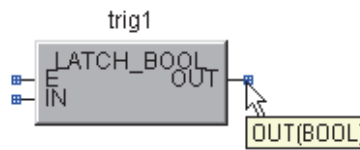
In this case, the content can be changed using the update FB function (☞ Section 7.5.6).

- No compile error occurs even if input pin and output pin of FB part are not connected.
- A tool tip indicating part content displays the FB name when a mouse pointer is placed on the parts except input/output pin of FB parts.



The tool tip is displayed in [FB variable name (FB name)] format.

- The variable name and data type of a pin are displayed with a tool tip when a mouse pointer is placed on the input pin or output pin of FB parts.



The tool tip is displayed in [Input/output variable name (data type)] format.

7.5.2 Inserting FB parts

**PURPOSE**

To insert FB parts into FBD sheets.

**BASIC OPERATION**

1. Display parts window.
2. Click tag to display FB parts (example: <<Manufacturer FB Type>> tab).
3. Select the type of parts to be inserted.
4. Select the to-be-inserted FB part from the displayed FB parts list.
5. Drag the FB part from parts window into the FBD sheet.
6. Drop FB part in FBD sheet.

**DISPLAY/SETTING SCREEN**

1) Click tab

2) Select part type

3) Select FB parts

4) Drag and Drop

POINT

The following FB parts need different operations when inserting FB part.

The operations are explained as below.

- Module FB

Local variable sheet will automatically reflect the external variable of module FB when the Module FB is inserted into FBD sheet. Here, the external variable comment is in declaration window (☞ Section 8.3.1) of module FB.

- Tag FB

The external variable of tag FB will be automatically displayed in local variable sheet once tag FB is inserted. Here, the external variable comment is arranged in declaration window (☞ Section 8.4.1) of tag FB.

- Tag FB/module FB

Comment of tag FB/module FB can be changed in the local variable sheet. Therefore even the same part may have different comment in different program/FB definition window. (Even if the comments of module FB or tag FB that is arranged in program/FB definition window is changed, it has nothing to do with the comments in FB declaration windows).

- Tag access FB of manufacturer FB

Tag access FB beyond user-defined tag FB type cannot be inserted. Additionally, tag access FB that does not support user-defined FB-type tag cannot be inserted either. For details of tag type that can be pasted to tag access FB, refer to Appendix 2.


- Please do not use tag FB, general process FB or tag access FB for scan programs and interrupt pointer execution type programs (in terms of execution type by timer execution type). Otherwise, error will occur during operation. (It is the same when use user-defined FB type/tag FB type using above mentioned FB in program).


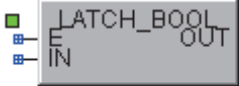
7.5.3 Definition of new FB parts

**PURPOSE**

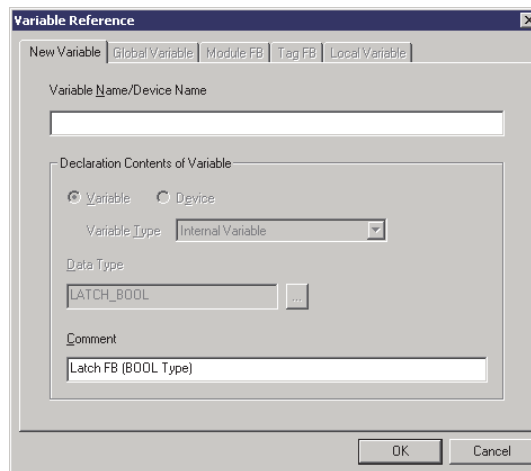
To define FB parts arranged on an FBD sheet.

**BASIC OPERATION**

1. Click FB parts on an FBD sheet.
2. Move mouse pointer within variable name ( Section 7.5.1) and double-click

the mouse when the cursor is transformed into  ().

3. Input FB variable name and press the "Enter" key.
4. "Variable Reference" dialog box will be displayed if there are no variable parts with a common name in the same program, user-defined FB type/tag FB type. When there are comments for FB parts in advance, those comments are displayed in the comment text box.
5. Set variable names and the comment.
6. Click the "OK" button.

**DISPLAY/SETTING SCREEN****POINT**

- For details of restrictions for defining a variable name (invalid character string or symbol), refer to Appendix 1.
- Variable type and data type of FB parts cannot be changed.
- For information about the definition of module FB and tag FB, refer to Section 8.3.2 and Section 8.4.2 respectively.
- When a variable of a variable part or a FB part is renamed, even if its comment contains 65 characters or more, it will be truncated to 64 characters on the <<New Variable>>tab.


7.5.4 Setting FB property

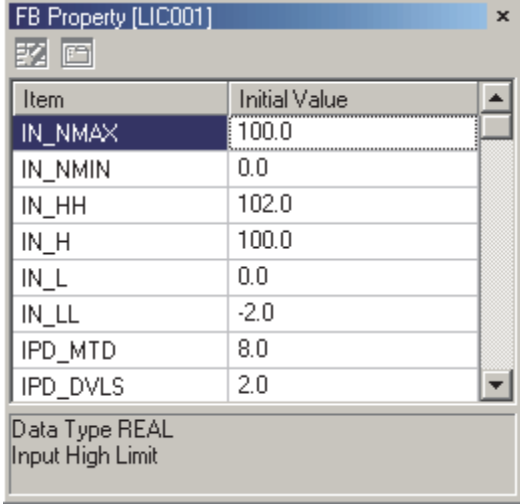
**PURPOSE**

To display/set the initial value of FB type/Tag FB type/Module FB type public variable.

The set public variable is processed as the property of FB type/Tag FB type/Module FB type.

**BASIC OPERATION**

1. If FB Property Window is hidden, select [View] → [Window] → [FB Property] () in the menu to display it or press the "Alt" + "2" keys.
2. Click FB/Tag FB/Module FB in FBD sheet.
3. Set FB properties when the property contents are displayed.

**DISPLAY/SETTING SCREEN**


Item	Initial Value
IN_NMAX	100.0
IN_NMIN	0.0
IN_HH	102.0
IN_H	100.0
IN_L	0.0
IN_LL	-2.0
IPD_MTD	8.0
IPD_DVLS	2.0

Data Type REAL
Input High Limit

POINT

- For details of display/set contents of FB Property window, refer to Section 5.7.4.
- When executing hot-start compile or online change compile, sometimes the initial values of public variables set in FB property window may not be reflected to a CPU module.
For details, refer to Section 11.6.1.
- For public variables with FB type/tag FB type/Module FB type, refer to "PX Developer Version 1 Programming Manual".

7.5.5 Referring to definition of FB parts

**PURPOSE**

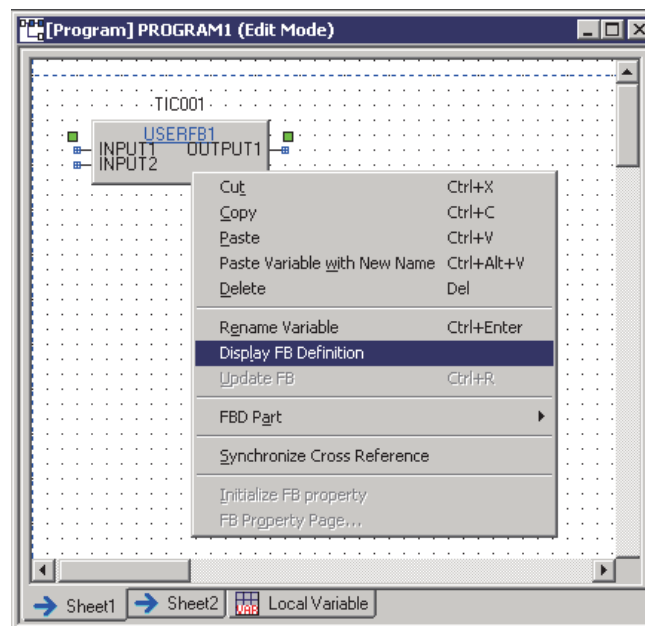
To display definition window in user-defined FB/Tag FB arranged on an FBD sheet.

**BASIC OPERATION**

1. Move the mouse pointer onto the FB type name of User-defined FB/Tag FB on the FBD sheet to display the hand pointer, and then click it.
Or, select [Display FB definition] from the pop-up menu displayed by right-clicking user-defined FB/Tag FB.
2. Display the definition window of selected user-defined FB/Tag FB.

**DISPLAY/SETTING SCREEN**

Display the hand pointer and click.



Select from the pop-up menu.

POINT

- Only in user-defined FB/Tag FB can FB part definition resource be displayed.
- FB type name of FB parts that can display definition resource will be displayed in blue and underlined.

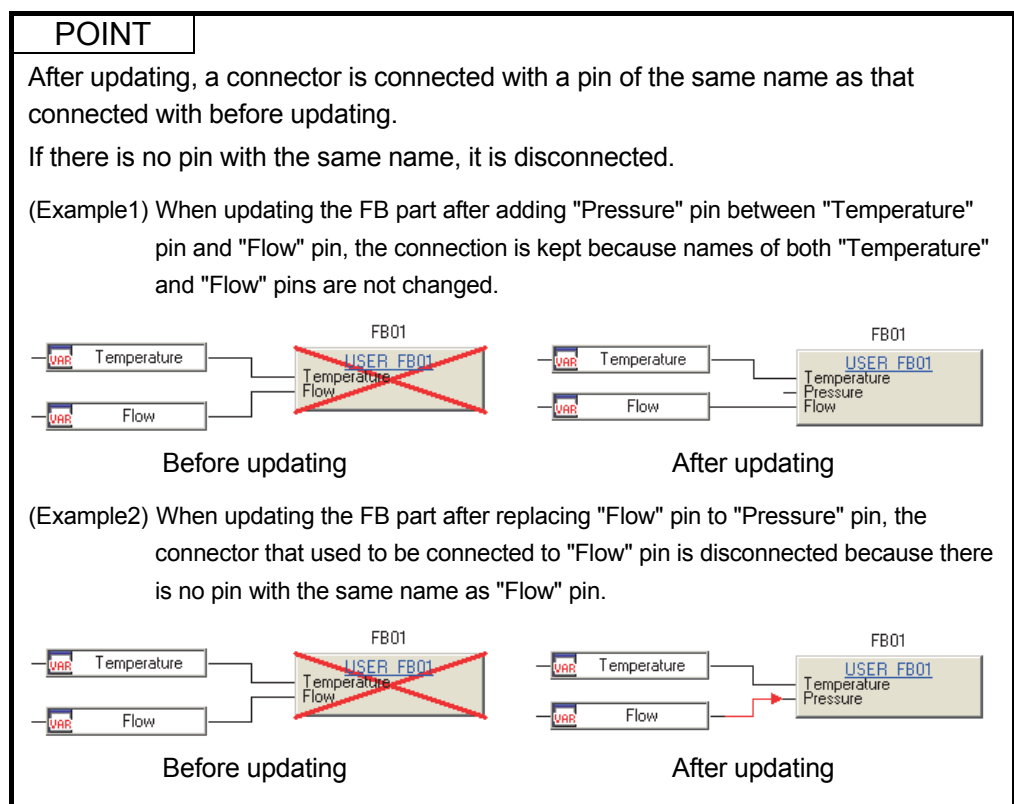
7.5.6 Updating FBs

**PURPOSE**

To update an FB part in response to changes of its definition without repasting the user-defined FB or tag FB.

**BASIC OPERATION**

1. Select an FB part to be updated.
2. Select [Diagram] → [Update FB] in the menu or select [Update FB] in the pop-up menu displayed by right-clicking.



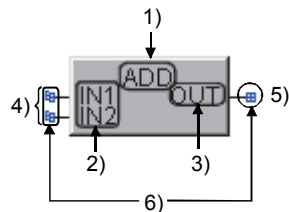
7.6 Function Parts

This section mainly deals with display or insertion of function parts, and the addition and deletion of the number of pins.

7.6.1 Displaying contents of function parts

(1) Component names of function part

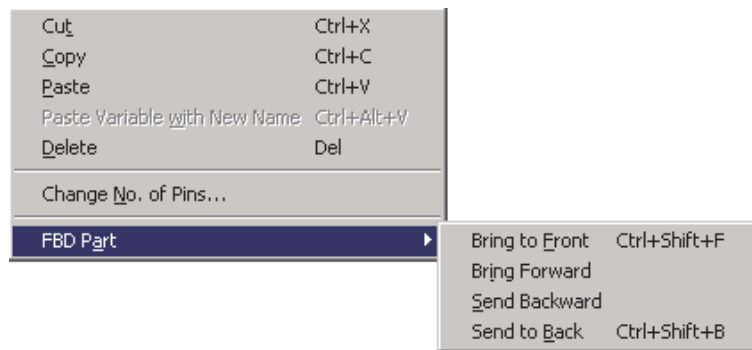
The following shows the names and the functions of each unit.



- 1) Function name
- 2) Input variable name defined in function
- 3) Output variable name defined in function
- 4) Input connection point and input pin
- 5) Output connection point and output pin
- 6) Grip

(2) Pop-up menu of function part

Right-click a function part to display the following pop-up menu.



Item	Description
Cut	Refer to Section 7.2.6.
Copy	
Paste	
Paste Variable with New Name	
Delete	
Change No. of Pins...	To change input variable number (the number of pins) of selected function part.
FBD Part	To change the front-back position of FBD parts.

(3) Function with EN/ENO

Functions can be classified into two types: one is with EN/ENO pins the other without. Function with EN/ENO pins means adding EN and ENO pins function respectively in I/O variable of general functions.

Function with EN is only executed when TRUE is input in EN. Normally, the ENO output is TRUE in operation processing. On the contrary, the ENO output is FALSE when operation errors occur.

If FALSE is input in EN, the output from ENO will be FALSE.

The function with EN/ENO pins can be selected in <<Function with EN/ENO pins>> tab of parts window.

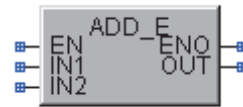
Usually [E] is attached at the end of the function name with EN/ENO pins.



DISPLAY/SETTING SCREEN



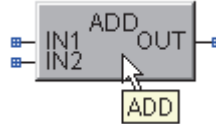
General functions



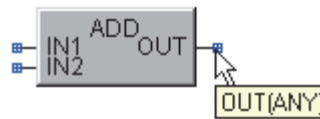
Function with EN/ENO pins

POINT

- A tool tip indicating part content displays the function name when a mouse pointer is placed on the parts except input/output pin of function parts.



- The variable name and data type of pin are displayed with a tool tip when a mouse pointer is placed on the input pin or output pin of function parts.



The tool tip is displayed in [Input/output variable name (data type)] format.

- Connectors must be connected with input pins of function part. However, errors may also occur in compile even when connectors and input pins are connected. For details, refer to Section 11.7 (1). (Errors will not occur if the input pins (EN and P excluded) of functions, such as BIND(_E), CALL_DINT(_E) and CALL_REAL(_E), are not connected with connectors)
- Connectors do not have to be connected with output pins of function parts but they must be connected with output pins of BIND and BIND_E functions (Errors may occur in compile).
- For details of functions, such as BIND(_E), CALL_DINT(_E) and CALL_REAL(_E), refer to "PX Developer Version 1 Programming Manual".

7.6.2 Inserting function parts



PURPOSE

To insert function parts in an FBD sheet.



BASIC OPERATION

1. Display parts window.
2. Click <<Function>>/<<Function with EN/ENO pins>> tab to display parts.
3. Select to-be-inserted part type.
4. Select to-be-inserted part from the displayed function parts list.
5. Drag the function part from parts window to FBD sheet.
6. Drop the function part onto the FBD sheet.



DISPLAY/SETTING SCREEN

1) Click the tab

2) Select part type

3) Select function parts

4) Drag and Drop

7.6.3 Adding and deleting pins



PURPOSE

To add and delete input pins in function parts whose number of input pins can be changed.

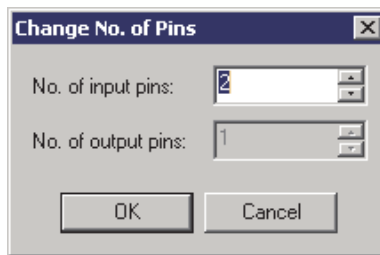


BASIC OPERATION

1. Click the function part for adding/deletion of input pins.
2. Click [Diagram] → [Change No. of Pins] in the menu or right-click the function part and select [Change No. of Pins] from the pop-up menu.
3. The "Change No. of Pins" dialog box is displayed.
4. Input the number of pins in the textbox or add/decrease pins by using spin box button.
5. Click the "OK" button.



DISPLAY/SETTING SCREEN



POINT

- When function part goes beyond the area (blue dotted line) of FBD sheet after the number of input pins is changed, errors will occur.
At this time, move function parts from the blue dotted line part and set the number of input pins again.
- Function parts whose number of input pins can be changed are listed as follows. Function parts that are not listed in the following form allow no change on its number of input pins.
Additionally, the number of input pins can be set in the following range.

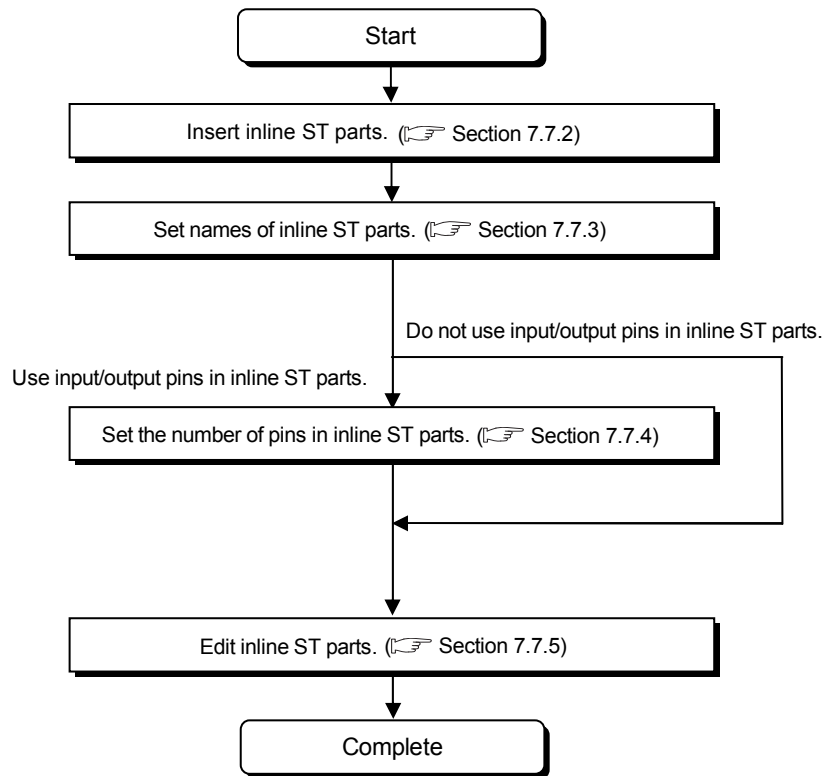
Function parts	The settable number of input pins *1
ADD, MUL, AND, OR, XOR, MAX, MIN, >, >=, =, <=, <	2 to 8
ADD_E, MUL_E, AND_E, OR_E, XOR_E, MAX_E, MIN_E, >_E, >=_E, =_E, <=_E, <_E, MUX	3 to 9
MUX_E	4 to 10
P_HS, P_LS, P_MID, P_AVE	2 to 16
P_HS_E, P_LS_E, P_MID_E, P_AVE_E	3 to 17

*1: Total number of input pins including EN, K pins etc.

7.7 Inline ST Parts

This section explains the display contents, insert, setting the number of pins, and editing of inline ST parts.

The following describes a creation procedure of inline ST part.



POINT

The following variables can be used in the inline ST parts.

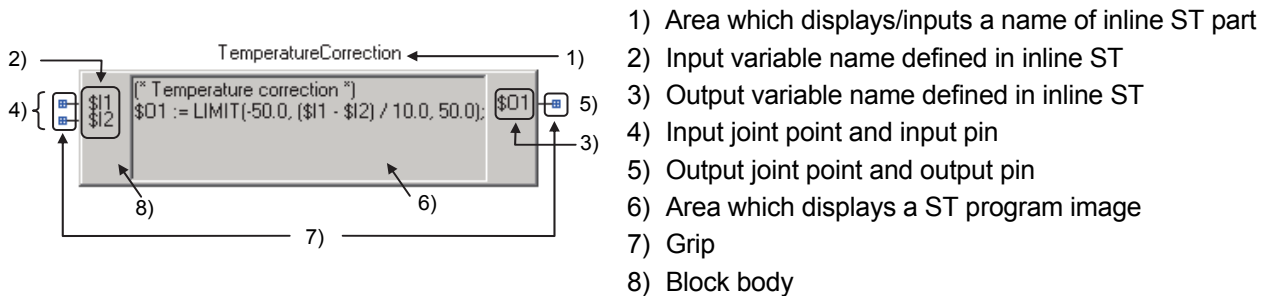
- Input/output variables of inline ST parts
- Local variable which declared in FBD program

Local variables can be used in inline ST program by arranging on FBD sheet.

7.7.1 Displaying contents of inline ST parts

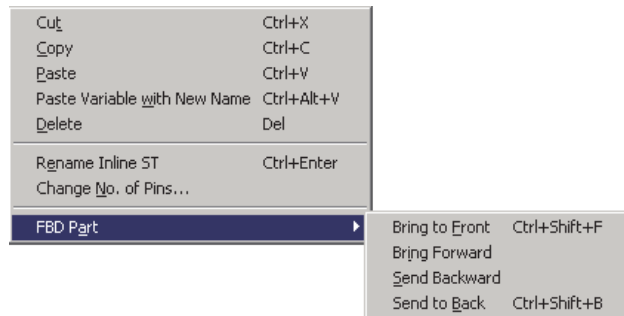
(1) Component names of inline ST part

The following shows the names and the functions of inline ST parts.



(2) Pop-up menu of FB parts (in edit mode)

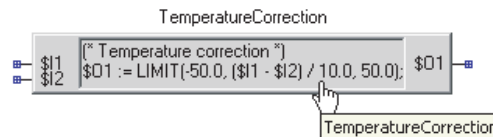
Right-click a inline ST part to display the following pop-up menu.



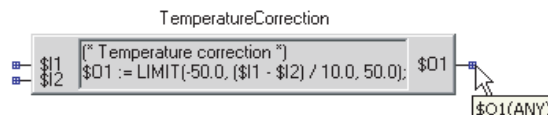
Item	Description
Cut	Refer to Section 7.2.6.
Copy	
Paste	
Paste Variable with New Name	
Delete	
Rename Inline ST	To rename a selected inline ST part. (Refer to Section 7.2.3)
Change No. of Pins	To change the number of selected input/output variables of inline ST parts (number of pins).
FBD Part	To change the priority of FBD parts.

POINT

- A tool tip indicating part content displays the inline ST name when a mouse pointer is placed on the parts except input/output pin of inline ST parts.



- The variable name and data type of a pin are displayed with a tool tip when a mouse pointer is placed on the input pin or output pin of inline ST parts.



The tool tip is displayed in [Input/output variable name (data type)] format.


7.7.2 Inserting inline ST parts

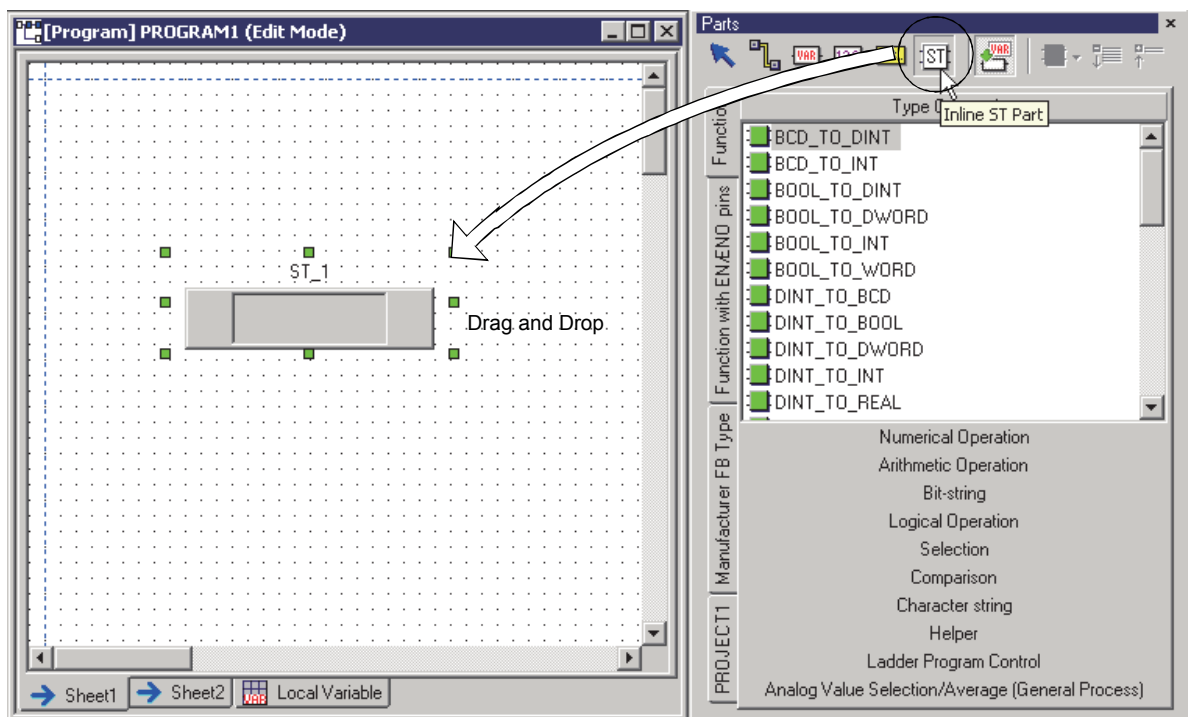
**PURPOSE**

To insert an inline ST part into FBD sheet.

**BASIC OPERATION**

Inline ST parts can be inserted into FBD sheet in the following two ways.

- By dragging and dropping mouse
 1. Click "Inline ST Parts" in parts window.
 2. Drag an inline ST part from the parts window into FBD sheet.
 3. Drop inline ST part in the FBD sheet.
- By mouse-clicking
 1. Click "Inline ST Parts" in parts window.
 2. Move the inline ST part to the wanted place with mouse, meanwhile mouse pointer is transformed into .
 3. Click on the FBD sheet.

**DISPLAY/SETTING SCREEN**

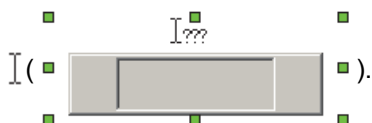
7.7.3 Definition of inline ST parts

**PURPOSE**

To define inline ST parts arranged on an FBD sheet.

**BASIC OPERATION**

1. Click inline ST parts on an FBD sheet.
2. Move mouse pointer to the area of inline ST part name (☞ Section 7.7.1) and double-click the mouse when the cursor is transformed into



3. Input a name of inline ST part and press the "Enter" key (within 28 characters).
4. Input is settled when the same part names do not exist in the same program, user-defined FB type/tag FB type.

POINT

For details of restrictions for defining a name of inline ST part (invalid character string or symbol), refer to Appendix 1.

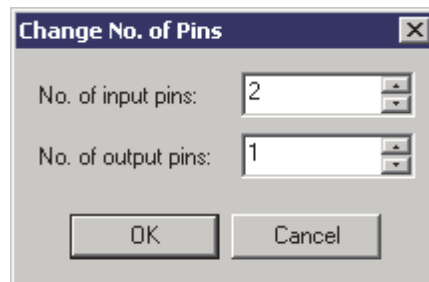
7.7.4 Setting number of pins of inline ST parts

**PURPOSE**

To set the number of input/output pins.

**BASIC OPERATION**

1. Click the inline ST part for adding/deletion of pins.
2. Click [Diagram] → [Change No. of Pins] in the menu or right-click the inline ST part and select [Change No. of Pins] from the pop-up menu.
3. The "Change No. of Pins" dialog box is displayed.
4. Input the number of pins in the textbox or add/decrease pins by using spin box button.
5. Click the "OK" button.

**DISPLAY/SETTING SCREEN****POINT**

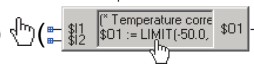
- When inline ST part goes beyond the area (blue dotted line) of FBD sheet after the number of pins is changed, errors will occur.
At this time, move function parts from the blue dotted line part and set the number of input pins again.
- The number of pins which can be set is
The number of input pins: 0 to 8
The number of output pins: 0 to 8

7.7.5 Editing inline ST parts

**PURPOSE**

To edit inline ST parts arranged on an FBD sheet.

**BASIC OPERATION**

1. Move mouse pointer to the area of ST program image (see Section 7.7.1) and click the mouse when the cursor is transformed into  (see Section 5.7.8).
2. Edit ST program on the displayed inline ST editor window (see Section 5.7.8).

7.8 Connector

This section explains display contents of a connector, how to insert it, and how to connect FBD parts.

FBD parts can be connected by either of the following ways.

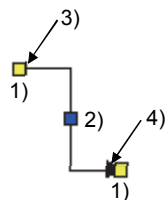
- Use "Connector" button to insert a connector. (☞ Section 7.8.2)
- Extend a connector from the output pin of an FBD part. (☞ Section 7.8.3)

In the former way, click the "Connector" button to connect FBD parts one by one. In the latter way, extend a connector from an output pin of an FBD part, and then connect it to other FBD part. (It is not necessary to click the "Connector" button.)

7.8.1 Displaying contents of connectors

(1) Component names of connector

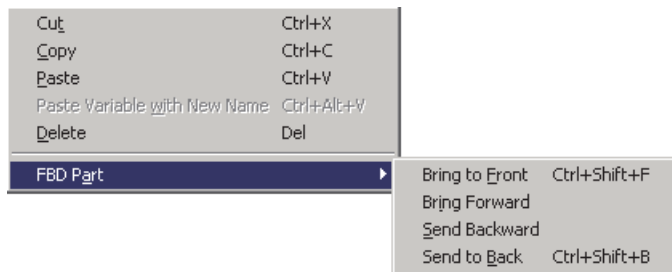
The following shows the names and functions of connector.



- 1) Connection point and grip
- 2) Movement grip
- 3) Output pins connection point
(Connected with the output point of the FBD parts)
- 4) Input pins connection point
(Connected with the input pins of the FBD parts)

(2) Pop-up menu of the connector

- (a) Right-click a connector to display the following pop-up menu.
(Except for movement grip)



Item	Description
Cut	Refer to Section 7.2.6.
Copy	
Paste	
Paste Variable with New Name	
Delete	
FBD Part	To change the priority of FBD parts.

- (b) When right-clicking the movement grip



Item	Description
Fix Position	Set whether to fix the bending position of connectors.

7.8.2 Using "Connector" button to insert a connector

**PURPOSE**

To insert connectors in FBD sheet to connect FBD parts.

**BASIC OPERATION**


1. Insert the connector in FBD sheet

There are two ways as shown below to insert the connectors in the FBD sheet.

(a) To insert by dragging and dropping with mouse.



- Click the "Connector" button in the parts window.
- Drag the connector from the parts window to the FBD sheet.
- Drop the connector in the FBD sheet.

(b) To insert by clicking the mouse.

- Click the "Connector" button in the parts window.
- Move the connector by mouse pointer to the arrangement place. At this time the mouse pointer becomes .
- Click the mouse in the FBD sheet to insert a connector.

2. Select a connector with mouse click.

3. Move the mouse pointer to the grip of the output pins connection point

( Section 7.8.1) of the connectors. At this time, the mouse pointer will transform into  (refer to the diagram in the next page).

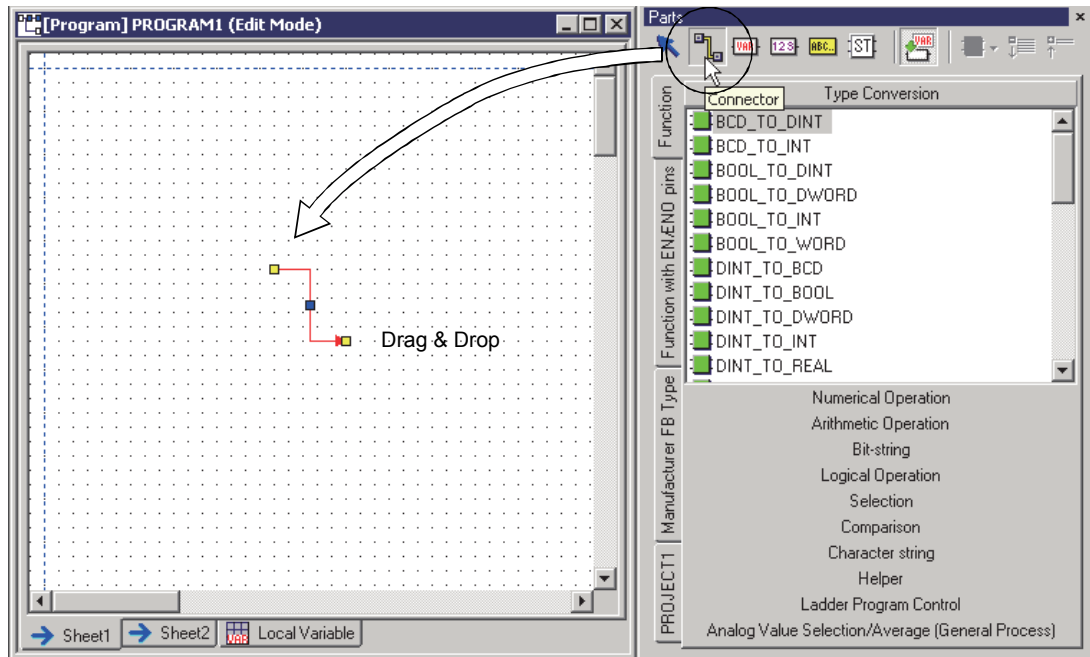
4. Drag the mouse and drop to the output pins of FBD parts after Step 3.

Thus the connection with an output pin is established.

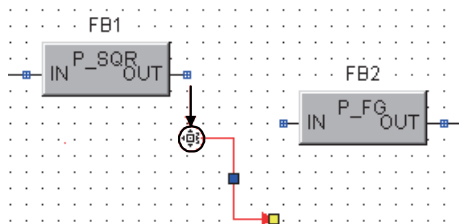
5. Operating method for connecting connector with input pin is the same as Step 2 to 4.

The color of connector will change from red to black after completing the connection normally; otherwise, the color does not change.

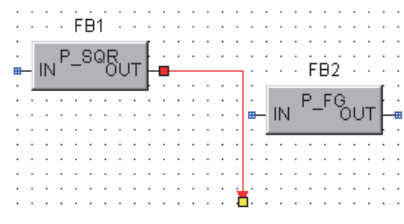
 **DISPLAY/SETTING SCREEN**



Insert a connector into an FBD sheet.



Click the connector and move the mouse point to the end point.



Drag and drop to the I/O pin of FBD parts.

POINT

- During the operation of Step 3., clicking the mouse on the output pins of the FBD parts can enable the insertion of connector as well as establish connection between connectors and output pins. Besides, the user just needs one operation to establish connection of the output pins to →input pins by dragging and dropping the mouse to the output pins.

- Click the "Connector" button.
- Press the left button of the mouse on the output pins.
- Press the left button of mouse, and drag & drop to the input pins.
- Complete the connection of wires.

- The connector only consists of the vertical and horizontal wire (no diagonal wire).
- Connection is not allowed between connectors.
- The input pin connection point can only connect with the input pins of FBD parts. Similarly, the output pins connection point can only connect with the output pins.
- The input pin of FBD parts can only connect one connector. However, the output pins of FBD parts can connect several connectors.
- The output pin and input pin for FBD Parts connected by the connector must be the same data type. If connected by different data type, it may cause compile error.
- When connecting with FBD parts, or moving the already-connected FBD parts, the connection route will be automatically adjusted in order to avoid the overlapping of connectors and other FBD parts. (Except for comment parts)
- The connection cannot be established between two overlapped connection points of FBD parts. Please use connector to connect FBD parts.

- ✗ The connection cannot be established between two overlapped connection points of FBD parts.
- The connection is established by connector.

7.8.3 Extending from output pin



PURPOSE

To extend a connector from an output pin of an FBD part on the FBD sheet to connect the FBD part to other one.

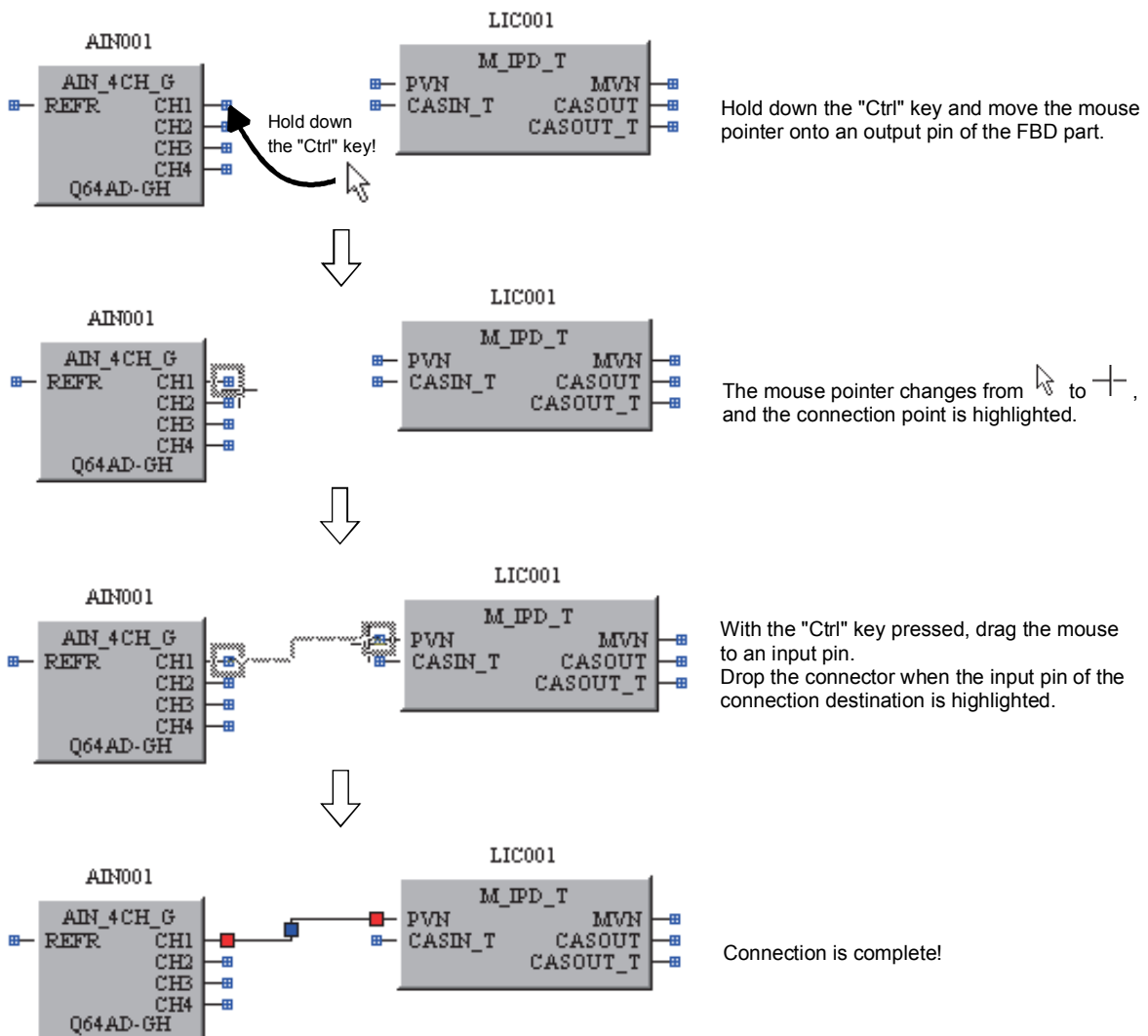


BASIC OPERATION

1. Hold down the "Ctrl" key and move the mouse pointer onto an output pin of an FBD part.
The mouse pointer changes from to , and the connection point is highlighted.
2. With the "Ctrl" key pressed, drag the mouse to an input pin.
3. Drop the connector when the input pin of the connection destination is highlighted.

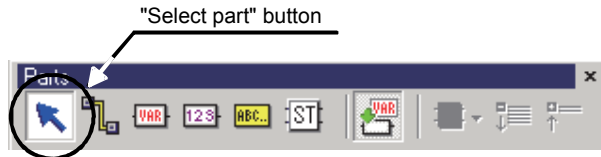


DISPLAY/SETTING SCREEN

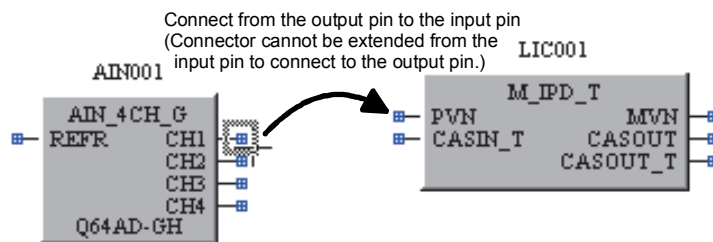


POINT

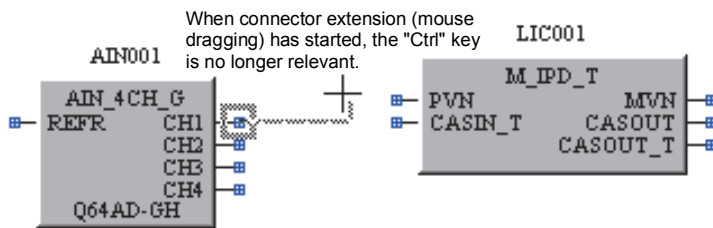
- A connector can be extended from an output pin when the "Select part" button on the parts window is ON.



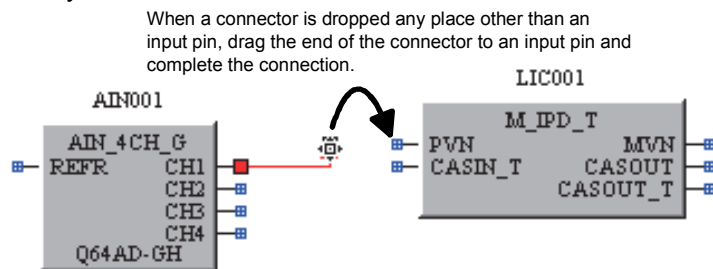
- Extend a connector from the connection point of an output pin to that of an input pin.
A connector cannot be extended from an input pin side to connect an output pin side.



- When connector extension (mouse dragging) has started, this ensures wiring between the pins; the "Ctrl" key is no longer relevant.



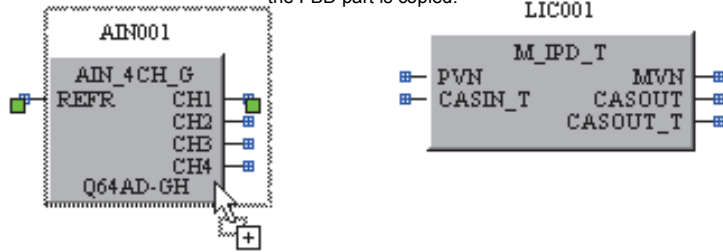
- If a connector is dropped at any place other than an input pin, the connection will not be completed. The connector will turn red and remain within the FBD sheet. In this case, drag the end of the connector to an input pin and complete the connection by reference to Section 7.8.2.



POINT

- When the mouse is dragged from any place other than the output pin of an FBD part with the "Ctrl" key pressed, the FBD part is copied. (☞ Section 7.2.6 (2))

When the mouse is dragged from any place other than an output pin, the FBD part is copied.



7.8.4 Adjusting the bending position of connector

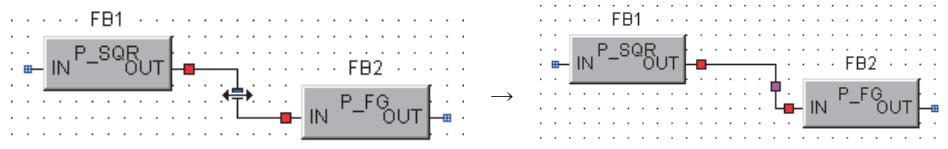
(1) Adjust the bending position of connector

**PURPOSE**

To adjust the bending position of connector.

**BASIC OPERATION**

1. Click and select the connector needed to be adjusted the bending position.
2. Move mouse onto the movement grip. At this time, the pointer changes to \updownarrow or \leftrightarrow .
3. Drag the connectors.

**DISPLAY/SETTING SCREEN**

Move the mouse cursor to the movement grip.

Drag the movement point to adjust the bending position.

POINT

- As shown above, the connectors that have been connected with FBD parts can be moved only when the two ends have right-angled parts.
- The connector cannot be bent manually. The bending part is automatically formed.

(2) Fix the position

**PURPOSE**

To fix the bending position of connector.

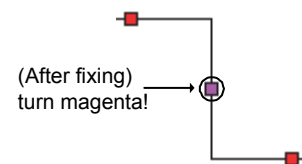
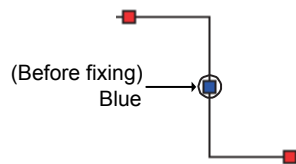
**BASIC OPERATION**

The bending position of the connector can be fixed by any of the following operations:

- Click the movement grip.
- Drag the movement grip and adjust the bending position.
- Right-click the movement grip and select (Fix Position) on the displayed pop-up menu. (→ Section 7.8.1 (2) (b))

If the position of connector is fixed, the color of the movement grip turns from blue to magenta.

To unfix the bending position of connector, right-click the movement grip and then select [Fix Position] on the displayed pop-up menu.

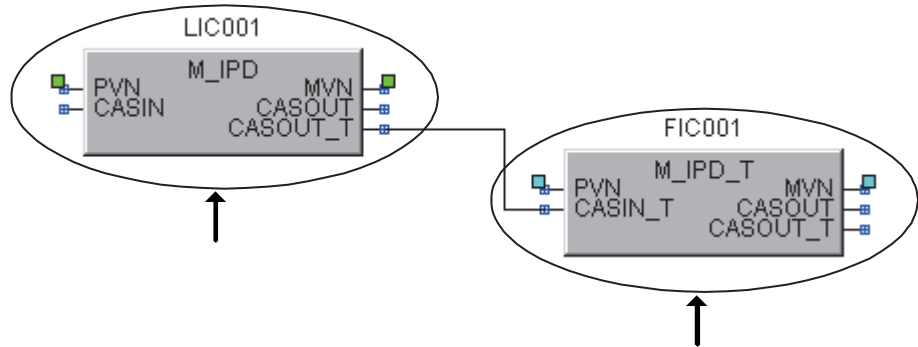
**DISPLAY/SETTING SCREEN**

- Click the movement grip.
- Drag the movement grip.
- Right-click the movement grip and select [Fix Position] on the displayed pop-up menu.

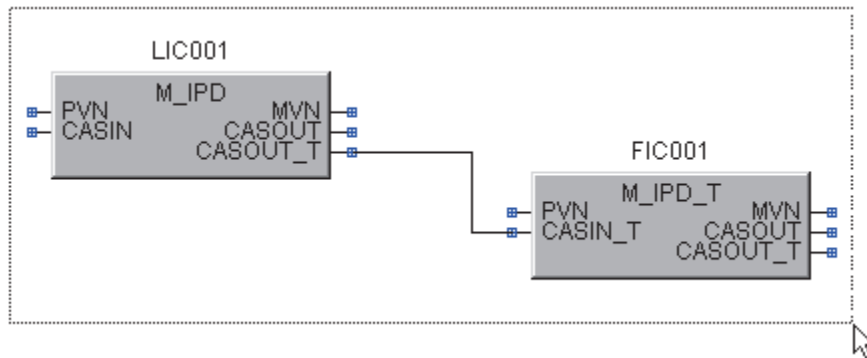
The color of movement grip turns from blue to magenta.

POINT

- The fixing of bending position is available in the status of normal wiring.
The fixing bending position is disabled if FBD parts are unconnected with both ends of connectors.
- The following indicates: The fixture of bending position will be cancelled if the connecting position of connectors is changed or moved.
 - 1) When the connecting position of connectors is changed. (☞ Section 7.8.5)
 - 2) Only the FBD parts at 2 ends of connectors will be moved for moving FBD parts.



The fixture of bending position will be cancelled if the connecting position of connectors is moved.



The fixture of bending position will be kept when moving the connecting position of connectors after all the FBD parts selected.


- 3) At the time of moving connectors to reconnect the same parts.

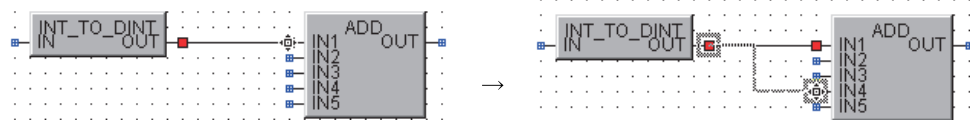
7.8.5 Changing the connection position

**PURPOSE**

To change the connection position with FBD parts.

**BASIC OPERATION**

1. Click and select the connector for connection position changing.
2. Move the mouse pointer to the pins of the FBD parts connected by the connector.
3. The mouse pointer changes to  (refer to the diagram below).
4. Move the mouse pointer and drop to the pins of FBD parts after the status described in Step 3. is displayed.

**DISPLAY/SETTING SCREEN**

Move the mouse pointer to the I/O pins of FBD parts.

Change the connection position by dragging and dropping the mouse pointer.

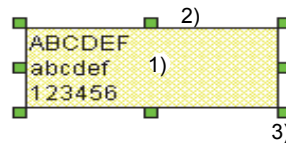
7.9 Comment Parts

This section explains the display contents, insertion and comment editing of the comment parts.

7.9.1 Displaying contents of comment parts

(1) Component names of comment part

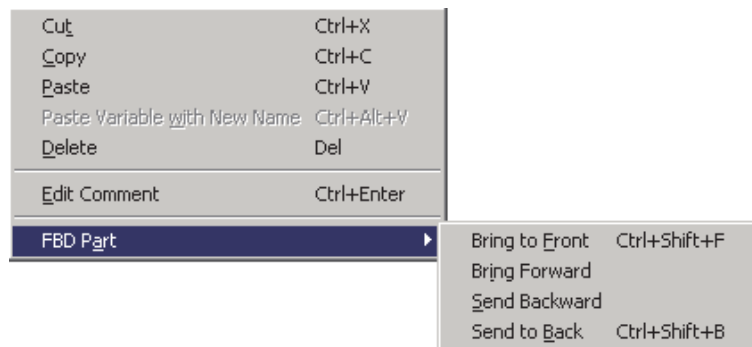
The following shows the names and the functions of comment parts.



No.	Description
1)	To display the comment contents. The font and background of this part can be set in the format toolbar. (☞ Section 5.6.6)
2)	Border line of comment parts.
3)	It is a grip. By dragging this part, the size of comment part can be changed. What is different from other FBD parts is that the width of the comment parts can be changed.

(2) Pop-up menu on the comment parts

Right-click a comment part to display the following pop-up menu.



Item	Description
Cut	Refer to Section 7.2.6.
Copy	
Paste	
Paste Variable with New Name	
Delete	
Edit Comment	To edit the comment of the selected part. (☞ Section 7.2.3)
FBD Part	To change the priority of FBD parts.

7.9.2 Inserting comment parts

**PURPOSE**

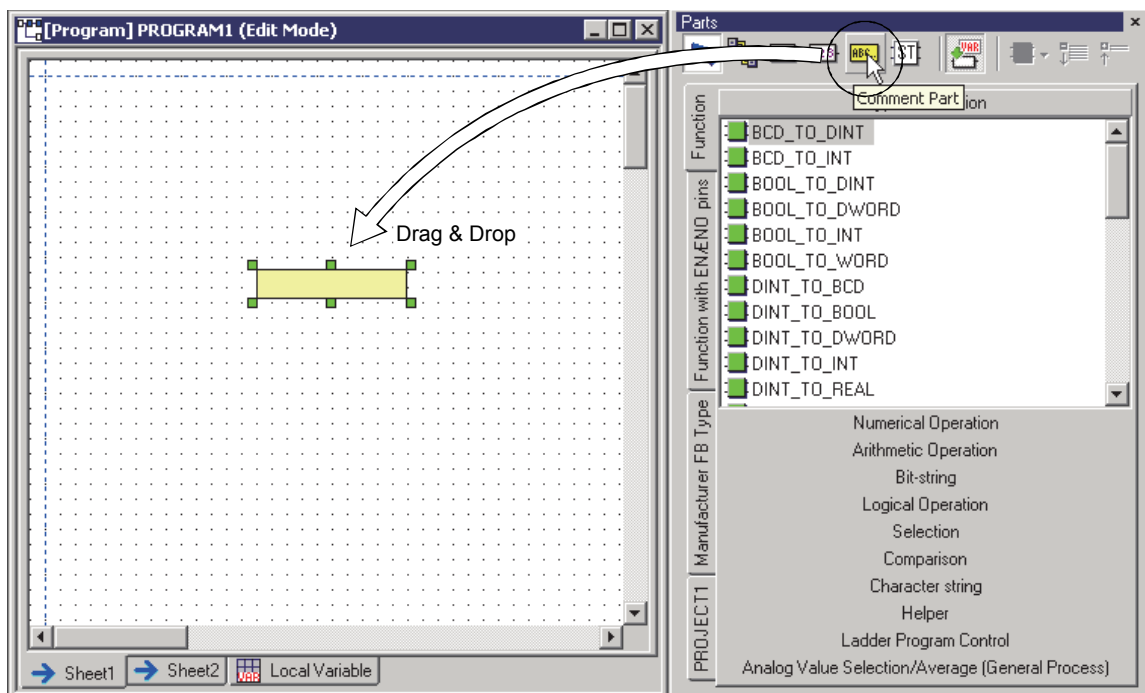
To insert comment parts to FBD sheet.

**BASIC OPERATION**

User can use the following two ways to insert comment parts to FBD sheet.

- To insert by dragging and dropping the mouse.
 1. Click the "Comment Part" in the parts window.
 2. Drag the comment parts from the parts window to the FBD sheet.
 3. Drop the comment parts in the FBD sheet.

- To insert by mouse click.
 1. Click the "Comment Part" in the parts window.
 2. Move the mouse pointer and move the comment parts to the arrangement place when the mouse pointer transforms into +.
 3. Click in the FBD sheet to insert the comment part.

**DISPLAY/SETTING SCREEN****POINT**


The comment parts can be inserted to the connectors.

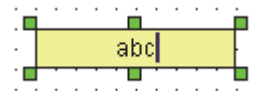
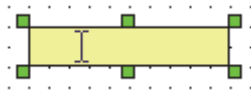
7.9.3 Editing text of comment parts

**PURPOSE**

To insert and edit the comments in the comment parts.

**BASIC OPERATION**

1. Click and select a comment part in FBD sheet.
2. Move the pointer to the comment part, and double click it when the mouse pointer transforms into  (refer to the following diagram).
3. To change the line of the comment, press the "Enter" key while editing the comment.
4. Click the part outside the comment part after the input. (Remove the focus from the comment part.)
Thus the comment is set.

**DISPLAY/SETTING SCREEN**

Move the pointer to the comment part and double click it after selecting the comment part.

Input the comment. Click the part outside the comment part after the input.

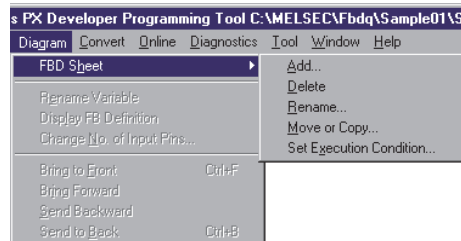
POINT

The comment will be automatically return to the right side when the input character width exceeds the comment part width. The user needs to extend its size vertically in order to display all the returned comments.

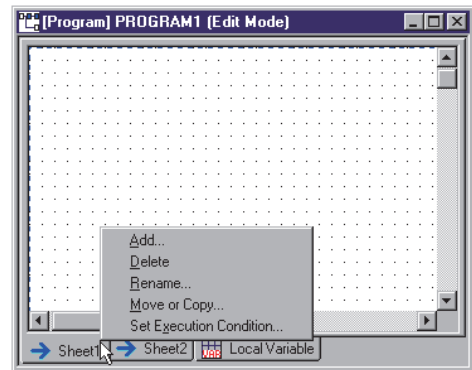
7.10 FBD Sheet

This section explains various operations in FBD sheet.

Execute the [Diagram] → [FBD Sheet] in the menu or right click the FBD Sheet tab and add FBD Sheet on the displayed pop-up menu.



Menu [Diagram] → [FBD Sheet]



Right-click the FBD Sheet tab
(☞ Section 5.5 (2))

7.10.1 Switching between FBD sheets

**PURPOSE**

To switch between several existing FBD sheets.

**BASIC OPERATION**

Click the FBD Sheet tab that needs to be switched in the FBD sheet.

Or switch FBD sheet by pressing the "Ctrl" + "PageUp" keys (switch to the tab at the left side), and "Ctrl" + "PageDown" keys (switch to the tab at the right side).

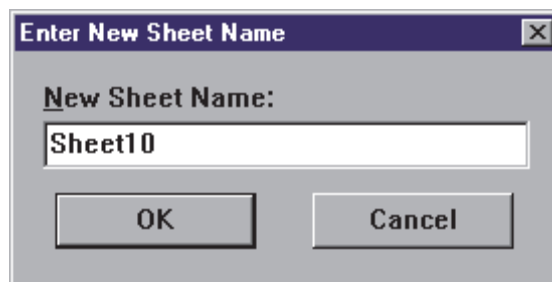
7.10.2 Adding an FBD sheet

**PURPOSE**

To add FBD sheets in the program/FB definition window.

**BASIC OPERATION**

1. Display the program/definition window for adding FBD sheets.
2. Click [Diagram] → [FBD Sheet] → [Add] in the menu.
Or right click the FBD Sheet tab and then click [Add] in the displayed pop-up menu.
3. A dialog box for inputting the sheet name will be displayed once the Step 2 is executed.
4. Input the added FBD sheet name (within 64 characters).
5. Click the "OK" button.

**DISPLAY/SETTING SCREEN****POINT**

- Do not give an existing name to a new-added FBD sheet.
- Maximum of 32 FBD sheets can be added.
- After the FBD sheet is added, select [Edit] → [Undo] to recover the FBD sheet to its previous status before adding.

7.10.3 Deleting an FBD sheet

**PURPOSE**

To delete FBD sheets in the program/FB definition window.

**BASIC OPERATION**

1. Display the FBD sheet that needs to be deleted.
2. Click [Diagram] → [FBD Sheet] → [Delete] in the menu.
Or right click the FBD Sheet tab that needs to be deleted, and then click [Delete] on the displayed pop-up menu.
3. A dialog box for confirming deletion will be displayed.
Click "Yes" to cancel the FBD sheet.

POINT

- After the FBD sheet is deleted, select [Edit] → [Undo] in menu to recover the FBD sheet to its previous status before deleting.
- A single FBD sheet cannot be deleted.

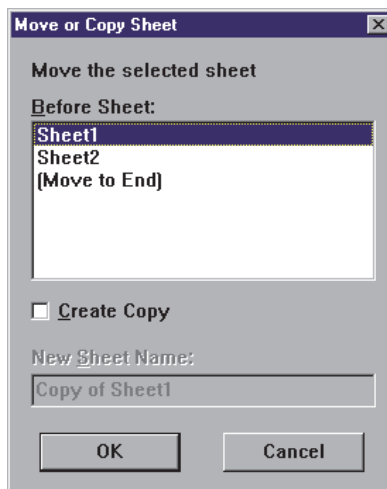
7.10.4 Moving/Copying an FBD sheet

**PURPOSE**

To move or copy an FBD sheet in the program/FB definition window.

(1) Move FBD Sheet**BASIC OPERATION**

1. Display the FBD sheet which needs to be moved.
2. Click [Diagram] → [FBD Sheet] → [Move or Copy] in the menu.
Or right click the tab of FBD Sheet which needs to be moved, and then click [Move or Copy] in the displayed pop-up menu.
3. "Move or Copy Sheet" dialog box will be displayed once the operation in Step 2 is executed.
4. Select the before sheet name of the moved FBD sheet.
5. Click the "OK" button.

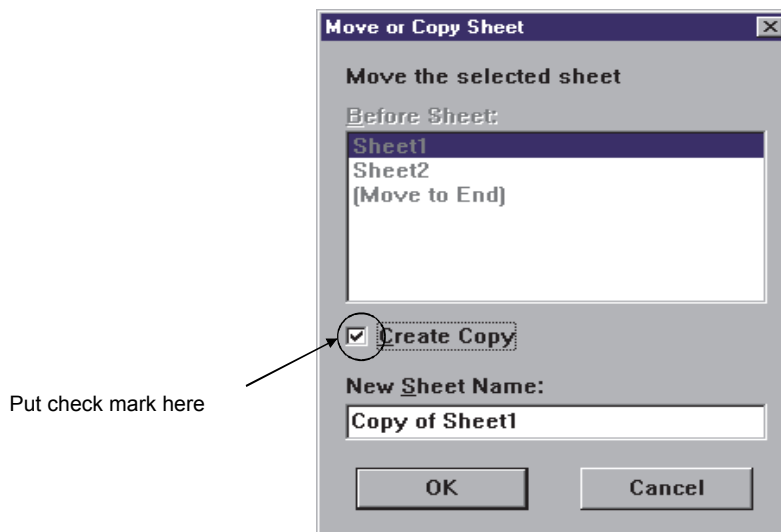
**DISPLAY/SETTING SCREEN****POINT**

After the FBD sheet is moved, select [Edit] → [Undo] in the menu to return to the status before moving.

(2) Copy an FBD sheet

**BASIC OPERATION**

1. Display the FBD Sheet that needs to be copied.
2. Click [Diagram] → [FBD Sheet] → [Move or Copy] in the menu.
Or right click the FBD Sheet tab which needs to be copied, and then click the [Move or Copy] in the displayed pop-up menu.
3. "Move or Copy Sheet" dialog box will be displayed once the Step 2 is executed.
4. Input the selection mark in the check box of [Create Copy].
5. Input the copied FBD sheet name (within 64 characters).
6. Click the "OK" button.

**DISPLAY/SETTING SCREEN****POINT**

- The existing FBD sheet name cannot be specified when copying an FBD sheet.
- After the FBD sheet is copied, select [Edit] → [Undo] in menu to recover the FBD sheet to its previous status.
- The name which adds [Copy of] at the beginning of the copied sheet name has been input in "New Sheet Name" textbox when opening the dialog box mentioned above, if the original sheet name exceeds 57 characters. The new sheet name exceeds the character limit (64 characters) by adding [Copy of]. In this case, characters exceeding the limit will be deleted at the end of the sheet name.

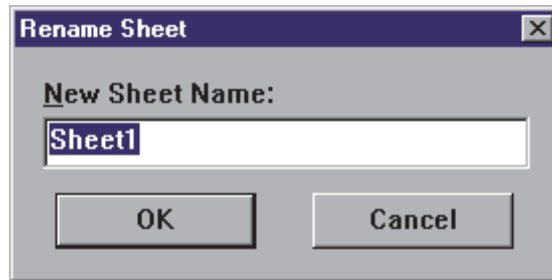
7.10.5 Changing an FBD sheet name

**PURPOSE**

To change FBD sheet names in the program/FB definition window.

**BASIC OPERATION**

1. Display the FBD sheet that needs to be renamed.
2. Click [Diagram] → [FBD Sheet] → [Rename] in the menu.
Or right click the FBD Sheet tab which needs to be renamed, and then click [Rename] in the displayed pop-up menu.
3. "Rename Sheet" dialog box will be displayed once the Step 2 is executed.
4. Input the new name
5. Click the "OK" button.

**DISPLAY/SETTING SCREEN****POINT**

- The FBD sheet with an existing name cannot be specified.
- After the name is changed, select [Edit] → [Undo] in menu to recover the FBD sheet to its previous status before changing.

7.10.6 Changing the displaying magnification of FBD sheet

**PURPOSE**

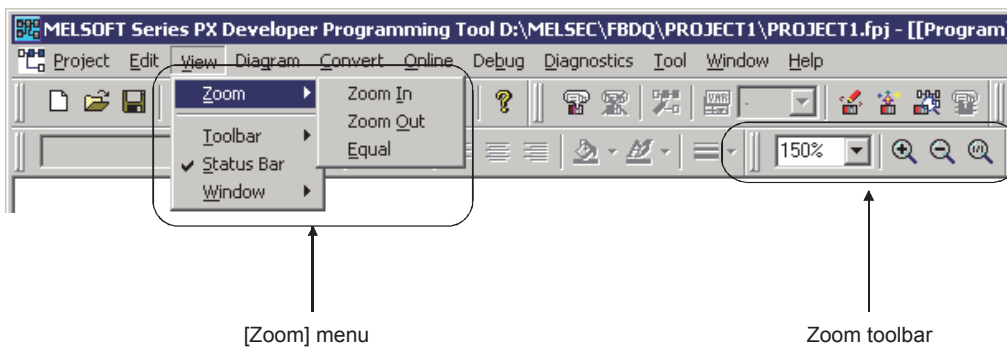
To change the display magnification of FBD sheet.

**BASIC OPERATION**

Firstly display the FBD sheet that needs changing.

Then the display magnification of the FBD sheet can be changed by one of the following methods.

- Click [Zoom in]/[Zoom out]/[Equal] of the [View] → [Zoom] in the menu.
- Change the display magnification from the zoom toolbar. (☞ Section 5.6.5)
- Change the display magnification by bird's-eye view window. (☞ Section 5.7.6)
- Drag the mouse to the background part of the FBD sheet while pressing the "Alt" key.
- Ctrl + scroll mouse wheel back and forth. (☞ Section 5.6.5)

**DISPLAY/SETTING SCREEN****POINT**

- The magnification of the display setting is saved in each FBD sheet.
- The setting range is 50% to 400%.
- The detailed magnification can be set by directly inputting value in the zoom toolbar.

7.11 Local Variable Sheet

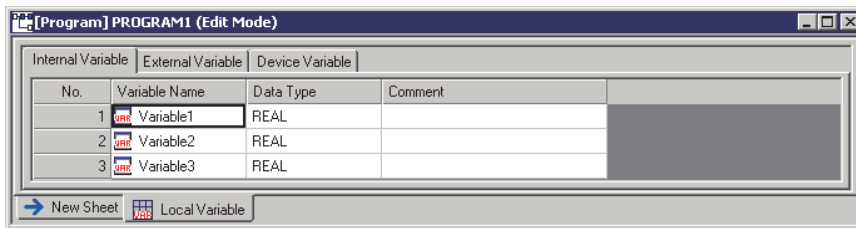
There are two types of variables: Local variable and global variable (see Section 8.2). The local variables mentioned in this section mean the variables used by each program and user-defined FB type/Tag FB type. The local variable sheet lists the variables in the FBD sheet. It is displayed in the previous sheet of the program/FB definition window. This section explains the local variable sheet used in the local variables declaration.

7.11.1 Displaying contents of local variable sheet

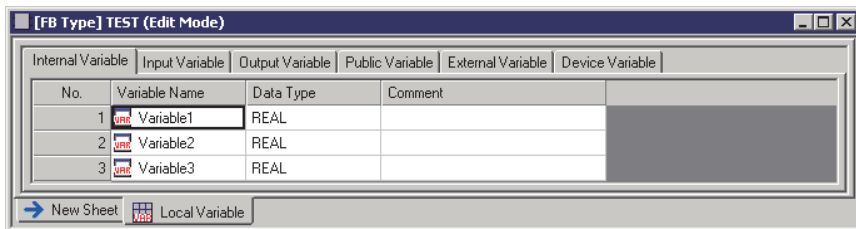
The display contents of the local variable sheet vary with the data types which are displayed currently.

 **DISPLAY/SETTING SCREEN**

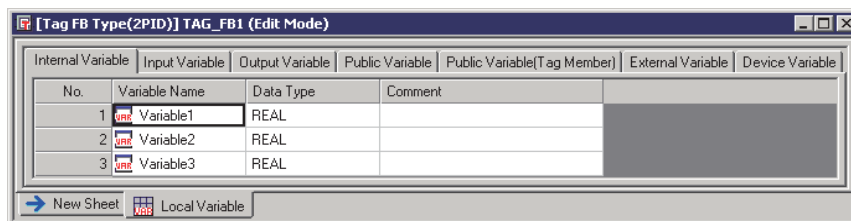
(In program)



(In FB type)



(In tag FB type)





DISPLAY/SETTING DATA

Item	Description																
Variable Type Tab	<p>To switch and display the variables used in program/FB type/Tag FB type by sheets according to the different variable types.</p> <ul style="list-style-type: none"> ● In program Internal variable, external variable, and device variable. ● In FB type Internal variable, input variable, output variable, public variable, external variable, and device variable. ● In Tag FB type Internal variable, input variable, output variable, public variable, public variable (Tag member), external variable, and device variable. (Display the tag data of public variable as <<Public Variable (Tag Member)>> tab.) 																
No.	<p>Indicate a row number. Select and drag the No. cell to select multiple rows. When multiple rows have been selected, only copy is enabled. (☞ Section 5.8.1 (6) (b))</p>																
Variable Name (Device when selecting <<Device Variable>> tab)	<p>To display the variable names. The icon corresponding to the variable type is displayed on the left of the variable name. The following icons are displayed.</p> <table border="1"> <thead> <tr> <th>Variable type</th> <th>Icon</th> </tr> </thead> <tbody> <tr> <td>Internal variable</td> <td></td> </tr> <tr> <td>Input variable</td> <td></td> </tr> <tr> <td>Output variable</td> <td></td> </tr> <tr> <td>Public variable</td> <td></td> </tr> <tr> <td>Public variable (tag member)</td> <td></td> </tr> <tr> <td>External variable</td> <td></td> </tr> <tr> <td>Device variable</td> <td></td> </tr> </tbody> </table>	Variable type	Icon	Internal variable		Input variable		Output variable		Public variable		Public variable (tag member)		External variable		Device variable	
Variable type	Icon																
Internal variable																	
Input variable																	
Output variable																	
Public variable																	
Public variable (tag member)																	
External variable																	
Device variable																	
Data Type	To display the variable data type of the declaration.																
Comment	<p>To display the comments to the variables. Display contents may differ depending on the selecting status of [Comment Reference] menu (☞ Section 7.11.2 (4)). When [Comment Reference] → [Global Part] is selected, it cannot be edited.</p>																

POINT

- In the local variable sheet of user-defined FB type/Tag FB type, the of the input pins/output pins in the user-defined FB/ Tag FB order pve corresponds to that of the I/O variables. For details, refer to POINT in Section 7.14.
- In the local variable sheet, by drag and drop of the icon in the "Variable Name" field, the corresponding variable data can be shifted to other line within the same variable type tab, or moved into other variable type tab (variable type change). (☞ Section 7.11.2 (4) and (5).)

7.11.2 Editing declaration information of local variable sheet

The user can edit declaration information such as variables names, data types, comments, variable type and declaration position of variable in the local variable sheet. In the local variable sheet, multiple cells or rows can be selected and copied to a Excel® table, etc. (☞ Section 5.8.1)

New variables cannot be added to or deleted from the local variable sheets but from the FBD sheet.

Besides, the items in the << Public Variable (Tag Member)>> tab of Tag FB and in the monitor mode cannot be edited.

This section explains the editing methods and restrictions for the variables.

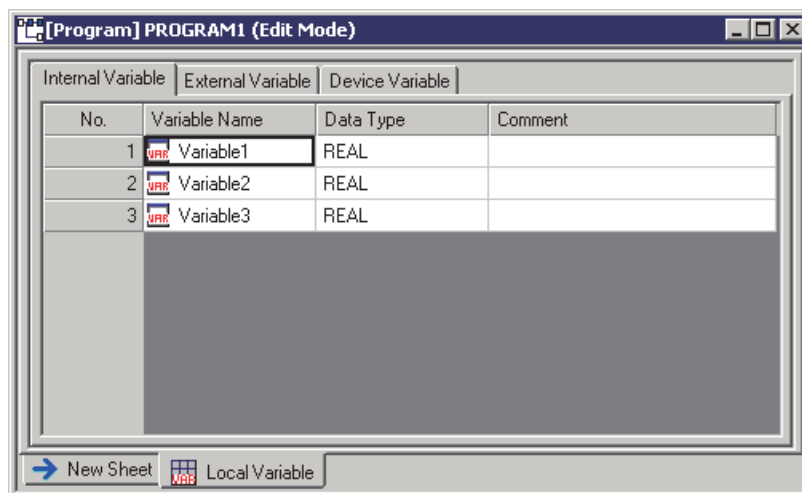
(1) Rename

**PURPOSE**

To rename an FBD part.

**BASIC OPERATION**

1. Double click the cell of the variable name that needs to be changed.
 2. Input the variable name.
 3. Press the "Enter" key to confirm the input variable name.
- Once the variable name is changed, all the parts with the same variable name arranged on the FBD sheet will be changed.

**DISPLAY/SETTING SCREEN****POINT**

- The variable name that is the same as other local variable cannot be used.
- For details of restrictions for defining a variable names (invalid character string or symbols), refer to Appendix 1.

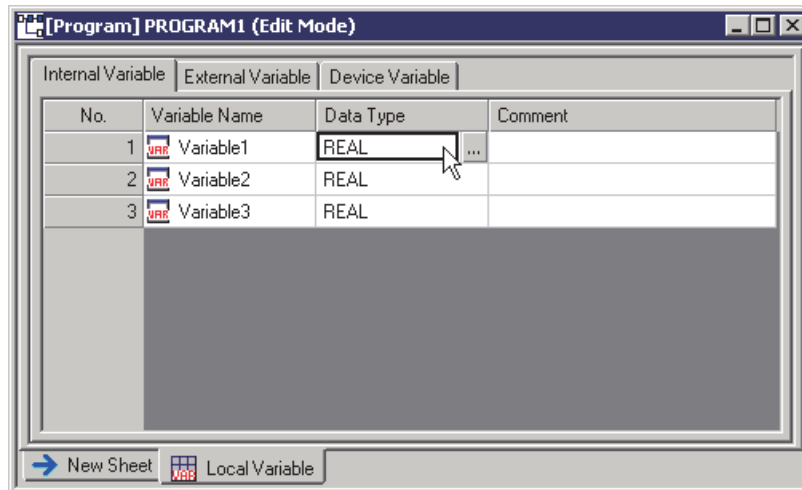
(2) Change the data types

**PURPOSE**

To change the data types of variables.

**BASIC OPERATION**

1. Click the cell of data type.
2. Once the Step 1. is executed, "..." will be displayed. Then click "...".
3. Select a data type and click the "OK" button after displaying a dialog box in which the data type can be selected (☞ Section 7.11.4).
All parts with the same variable name arranged on the FBD sheet will be changed.

**DISPLAY/SETTING SCREEN****POINT**

When one or more variables of the same type are pasted as FB parts on the FBD sheet, the variable type cannot be changed.

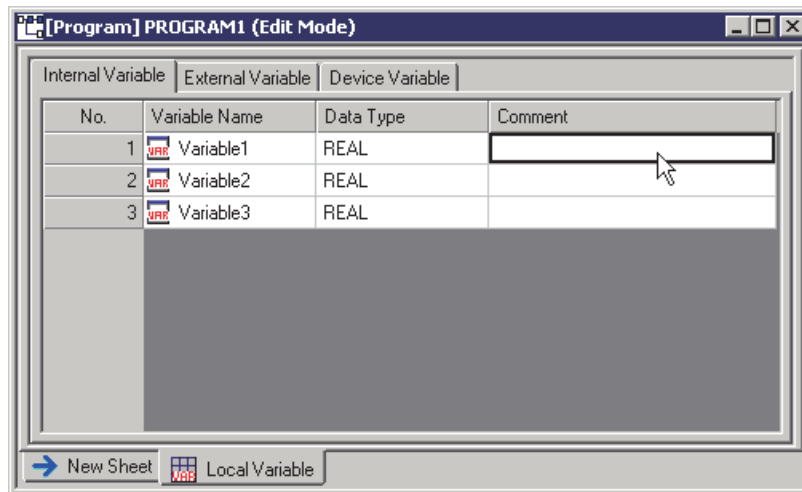
(3) Change the comments

**PURPOSE**

To change the comments of the variables.

**BASIC OPERATION**

1. Double click the cell of the comment.
2. Input the comment.
3. Press the "Enter" key to confirm the input comment.

**DISPLAY/SETTING SCREEN**

(4) Setting display of external variable comments

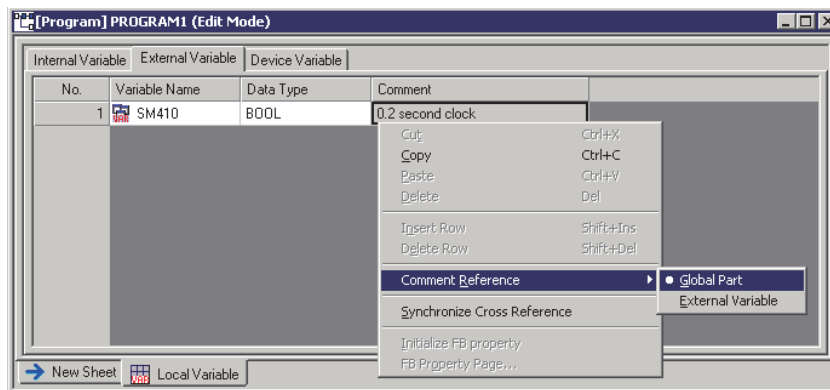
**PURPOSE**

To set a content to be displayed in comment cells of variables.

**BASIC OPERATION**

1. Select the <<External Variable>> tab.
2. Select [Comment Reference] → [Global Part] or [Comment Reference] → [External Variable] in the pop-up menu displayed by right-clicking the comment cell.
3. The display content of the comment cells are changed in accordance with the selection.

The display content of the comment cells in all programs/user-defined FBs will be changed.

**DISPLAY/SETTING SCREEN****POINT**

- If [Global Part] is selected in [Comment Reference], external variable comments on the local variable sheet are automatically updated when comments are changed and saved on the declaration table of global parts.
When a new external variable is declared on the local variable sheet, it is instantly updated.
- If [Global Part] is selected in [Comment Reference], not the comment of the global part referred by the external variable but the comment set to the external variable is displayed in the comment area after the variable type of the external variable is changed.

(5) Change the variable type



PURPOSE

To change the variable type.



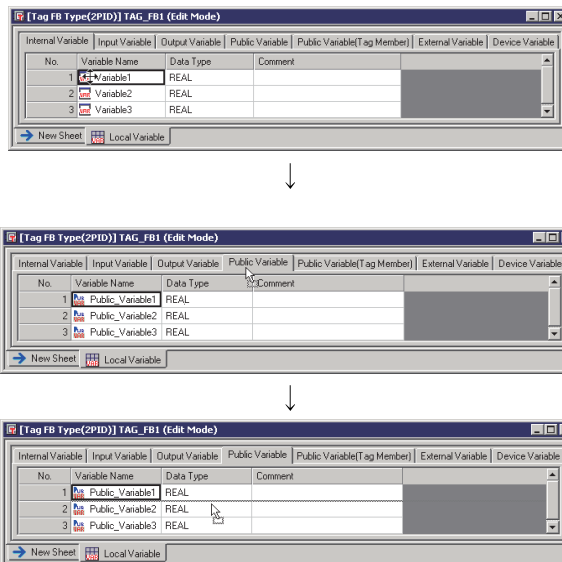
BASIC OPERATION

1. Move the mouse pointer to the icon corresponding to the variable of which type to be changed.
The mouse pointer changes to
2. Drag the variable type tab that needs to be changed.
3. Display the variable list defined by the dragged variable type.
4. Draw onto the variable type tab when adding data at the end of the displayed variable list.
Drop onto the row that needs to be added when adding data to a random row.
During dragging, a highlighted line is displayed between the rows where data will be inserted.

Once the variable type is changed, the icons of the variable parts placed in the FBD sheet and local variable sheet change according to the newly selected type. In the meantime all parts with the same variable name arranged in the FBD sheet will be changed as well. For details of relations between variable types and icons, refer to Section 7.3.1.



DISPLAY/SETTING SCREEN



Move the mouse pointer to the icon corresponding to the variable of which type to be changed.



The mouse pointer changes to .

Drag to the variable type tab which needs to be changed, thus a variable list of the change target will be displayed. (The left screen is a list of <<Public Variable>> tab)

Drop to the position of the row that needs to be inserted. During dragging, a highlighted line is displayed between the rows where data will be inserted.

(The left screen shows the case of inserting to the second row.)

POINT

- The arrangement of the variables in the local variable sheet can also be changed by dragging and dropping the icon in the "Variable Name" field.
( (5) in this section)
- Multiple variables cannot be simultaneously changed in (variable) type. Change one variable in type at a time.
- Press the "ESC" key to cancel the variable type change during drag and drop operation.
When the mouse cursor is displayed as , release the mouse button to cancel a variable type change.
- When one or more variables and device variable of the same type are pasted as FB parts on the FBD sheet, the variable type cannot be changed.
The variable types that can be changed are follows; Elementary data type (except Public variable (Tag member)) and Structure type.

(6) Change the variable declaration position



PURPOSE

To move the row where the variable has been declared.

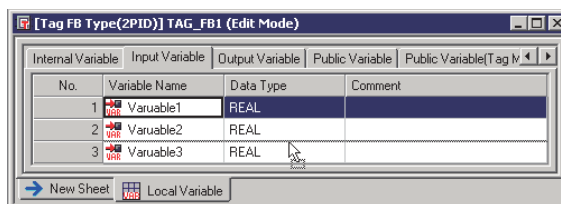
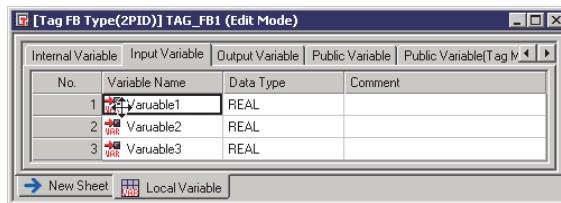


BASIC OPERATION

1. Move the mouse pointer onto the icon of the variable name cell of the variable whose row position is desired to be changed.
The mouse pointer changes to
2. In this status, start dragging.
During dragging, a highlighted line is displayed between the rows where data will be inserted.
Drop onto the position of the destination row.



DISPLAY/SETTING SCREEN




Move the mouse pointer onto the icon of the variable name cell of the variable whose row position is desired to be changed.

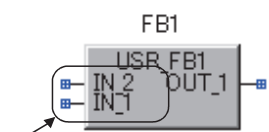
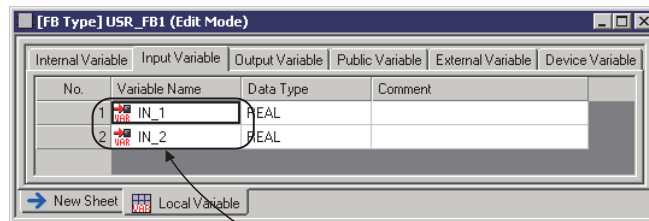
The mouse pointer changes to .

In this status, start dragging. During dragging, a highlighted line is displayed between the rows where data will be inserted.

Drop onto the position of the destination row.

POINT

- Multiple variables cannot be simultaneously changed in (variable) row. Change one declaration position of variable at a time.
- Press the "ESC" key to cancel the variable type change during drag and drop operation.
When the mouse cursor is displayed as , release the mouse button to cancel a declaration position change of variable.
- The arrangement of the input pins/output pins of a user-defined FB/tag FB corresponds to the sequence of input/output variable rows in the local variable sheet.



Correspondence !

7.11.3 "Variable Reference" dialog box

**PURPOSE**

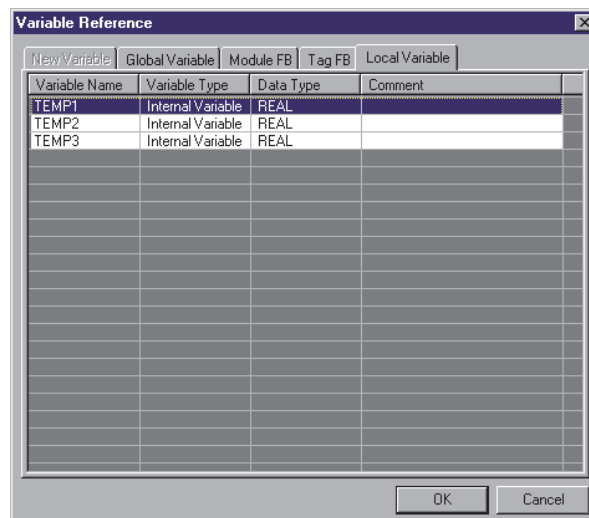
Refer to the declared variables (global variables, module FB, tag FB and local variables) in various declaration windows. Besides, it can also be used for changing the variable names of the variable parts arranged in the FBD sheet to the declared variable names. (☞ Section 7.3.5)

This enables reference of the declared variables easier, as well as reference of the output variables and public variables of the FB parts.

**BASIC OPERATION**

The "Variable Reference" dialog box will be displayed in the following cases:

- When inputting the variable name after arranging variable parts or FB in the FBD sheet and executing the declaration.
- When clicking [Edit] → [Refer to Variable] in menu in selecting variable parts.
- When right clicking the variable parts of FBD sheet and clicking the [Refer to Variable] in the displayed pop-up menu.
- When clicking "..." displayed in selecting the cell of the PX Developer global variable names in the GX label assignment window (☞ Section 8.5.1).
- When clicking "..." displayed in selecting the cell of the variable names in the entry variable monitor window (☞ Section 13.7).
- When clicking "..." displayed in selecting the left/right cell of the "FBD Sheet Execution Conditions Setting" dialog box (☞ Section 7.12.2).
- When clicking "..." displayed in selecting the left/right cell of the "Program Execution Setting" dialog box (☞ Section 7.13.3).
- When clicking "..." displayed in selecting the cell of variable name of connection source/connection destination in the I/O simulation setting window (☞ Section 15.2.2).

**DISPLAY/SETTING SCREEN**

POINT

- The items in "Variable Reference" dialog box cannot be edited.
- When an error occurs in the declaration contents of the global parts (global variables, module FB, tag FB), an error icon will be displayed on the left of the variable name of this part. The variable that corresponds to the icon cannot be selected. Here, please clear this error in the declaration window of the global parts. (☞ Chapter 8)
- When "Comment Reference" check box (☞ Section 5.11 (2)) is checked, the comments of the global parts referred by the variables whose variable type is "External Variable" are displayed. When there is no referred global part, the comment set to the relevant external variable is displayed.

7.11.4 "Select Data Type" dialog box

**PURPOSE**

To select data type easily in "Select Data Type" dialog box when new variable is declared.

**BASIC OPERATION**

The "Select Data Type" dialog box will be displayed in the following cases:

- When selecting the data type in declaring a new variable. (☞ Section 7.3.3)
- When clicking "..." displayed in selecting the data type cell in the local variables window (☞ Section 7.11.2 (2)).
- When clicking "..." displayed in selecting the data type cell in the global variables declaration window (☞ Section 8.2.2).
- When clicking "..." displayed in selecting the tag FB type cell in the tag FB declaration window (☞ Section 8.4.2).
- When clicking "..." displayed in selecting the data type cell in the structure type definition window (☞ Section 9.2).
- When selecting [Other...] on the menu displayed by clicking the "Change Data Type" button of variable part. (☞ Section 7.3.6)

1. Click the type tag of the data type that needs to be selected, and select one displayed data type.
2. Input the No. of character (the setting range is 1 to 255) in the text bar below the dialog box when selecting STRING type (character string) in the data type.
3. Click the "OK" button or double click the selected data type to determine the data type.

**DISPLAY/SETTING SCREEN**

Data Type	Comment
ADR_REAL	Pointer to a REAL type variable
BOOL	Boolean (FALSE = 0 or TRUE = 1)
DINT	32-bit signed integer (-2147483648 to 2147483647)
DWORD	Bit string of length 32
INT	16-bit signed integer (-32768 to 32767)
REAL	Single-precision real numbers
STRING	Character string
WORD	Bit string of length 16

No. of Characters (1 to 255)

OK Cancel

7.12 FBD Sheet Execution Condition Setting




In program/FB definition window, programs are executed in order from the left FBD sheet to the right FBD sheet when there are several sheets in a certain program and user-defined FB type/Tag FB type. Execution conditions can be set to each FBD sheet in programming tool.

This section explains the execution conditions setting of each FBD sheet in one program/ FB definition window.

The execution conditions can be set for programs as unit in the programming tool. For details, refer to Section 7.13.

7.12.1 Execution state

Execution conditions of the FBD sheet can be classified into the following 3 types. Once execution conditions of the FBD sheet are set, the FBD Sheet tab icon will be changed as follows:

Execution Conditions	Execution results	Sheet tab Icon
Execute	To execute the processing defined by the FBD sheet.	
Do not execute	Not to execute the processing defined by the FBD sheet.	
Execute conditionally	To execute the processing defined by the FBD sheet only when the input execution conditions are met.	

7.12.2 "FBD Sheet Execution Condition Setting" dialog box

**PURPOSE**

To set the execution conditions on each FBD sheet, and control the programs execution.

**BASIC OPERATION**

1. Select the FBD sheet that needs to be set the execution conditions.
2. Click the [Diagram] → [FBD Sheet] → [Set Execution Condition] in menu.
Or right click the FBD sheet, click the [Set Execution Condition] from the displayed pop-up menu.
3. Display the FBD sheet execution condition setting dialog box of the FBD sheet.
4. Select the execution state.
5. Select the "Execution conditionally" in the execution state, and set the execution condition. (Refer to the next page)
6. Click the "OK" button.

**DISPLAY/SETTING SCREEN**

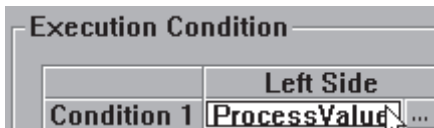
Condition	Left Side	Operator	Right Side	OR condition ->
Condition 1	ProcessValue	<>	0	<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Condition 2	LIC001_PVN	<	200	<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Condition 3	FIC002_PVN	<	global1	<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Condition 4				<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Condition 5				<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Condition 6				<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Condition 7				<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Condition 8				<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

 **DISPLAY/SETTING DATA**

	Item	Description
Execution State	Execute	To execute the processing defined by the FBD sheet.
	Do not execute	Do not execute the processing defined by the FBD sheet.
	Execute conditionally	To execute the processing defined by the FBD sheet only when the input execution conditions are met. For the execution condition setting, refer to the following contents.
Execution Condition	Left side	To input the declared variable name in the local variable sheet.
	Right side	To input the declared variables in the local variable sheet or constants*1.
	Operator	To select the comparison operator (=, <>, <, >, <=, >=).
	Conditions combination (OR, AND conditions)	To set the conditions combination by selecting in the check box.

*1: Constants can only be input to the right side.
For the input format of the constants, refer to Section 7.4.3.

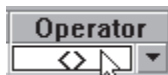
The setting procedure of the execution conditions is shown as follows:



1. Set the execution conditions. Select the cell of the [Left Side].
2. Directly input the declared variable name in the local variable sheet.
Or select the [Left side] cell, click the button "...". Then in the displayed variables reference dialog box, select the variable item that needs to be set in the left side condition and click the "OK" button, or double click the variable item.



3. Select the cell of the [Right side].
4. Input the variable name or directly input constants as the Step 2. mentioned above.



5. Set the items for comparison operation. Select the cell [Operator], a button (▼) will be displayed. Then click this button to set the comparison operator of the left item and right item.

Condition	Left Side	Operator	Right Side	OR condition >
Condition 1	ProcessValue	<>	0	<input type="checkbox"/>
Condition 2	LIC001.PVN	<	200	<input type="checkbox"/>
Condition 3	FIC002.PVN	<	global1	<input type="checkbox"/>
Condition 4	PID001.PV	>	0	<input type="checkbox"/>
Condition 5	PID001.PV	<	100	<input type="checkbox"/>
Condition 6				<input type="checkbox"/>
Condition 7				<input type="checkbox"/>
Condition 8				<input type="checkbox"/>

6. Set the combination of the conditions. Various conditions with AND or OR can be combined by selecting in the check box on the right of the execution conditions.

Vertical direction corresponds to AND conditions and horizontal direction corresponds to OR conditions.

The left screen is

[(Condition 2 AND Condition 3) OR (Condition 1 AND Condition 3 AND Condition 5) OR (Condition 4 AND Condition 5)].

POINT

- Only the execution conditions of local variables can be set.
- Conditions combination check boxes are not available when the left side, right side and comparison operator items are not input completely in.
- The user should set the execution conditions when selecting the "Execute conditionally" in the execution state. Otherwise, an error will occur.
- The sheet operation method in the dialog box of the FBD sheet execution condition setting is the same as "Section 5.8 Table".
- The conditions combination should be checked even if only one condition needs to be set.

Example: when the FBD sheet needs to be executed provided that there is only one execution condition (global variable G is bigger than 0) and it is true:

1. Input [G] to the left side of the condition 1.
2. Select [>] in operator item.
3. Input [0] to the right side.
4. Input a check mark at the left top (1st row 1st column) of the conditions combination check box.

Execution Condition

	Left Side	Operator	Right Side	OR condition ->	
Condition 1	G	>	0	<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	A N D
Condition 2				<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
Condition 3				<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
Condition 4				<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
Condition 5				<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
Condition 6				<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
Condition 7				<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
Condition 8				<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	

- Vertical direction corresponds to AND conditions and horizontal direction corresponds to OR conditions in the execution conditions check box.

Example 1: Condition 2 AND condition 3 AND condition 5

	OR condition ->	
Condition 1	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	A N D
Condition 2	<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
Condition 3	<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
Condition 4	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
Condition 5	<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
Condition 6	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
Condition 7	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
Condition 8	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	

Example 2: Condition 2 OR condition 3 OR condition 5

	OR condition ->	
Condition 1	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	A N D
Condition 2	<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
Condition 3	<input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
Condition 4	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
Condition 5	<input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
Condition 6	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
Condition 7	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
Condition 8	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	

- When specifying a device variable, input the same character string as variable name.

7.13 Program Execution Setting

The interval and timing of executing the created program can be set in the programming tool.

This section explains the execution setting of programs.

Execution conditions can be set in FBD sheet in the program/FB definition window in the programming tool. For details, refer to Section 7.12.

7.13.1 Execution type

There are two methods to execute the programs, one is the timer execution, and the other is the interrupt execution. They are explained as follows.

(1) Timer execution

Timer execution means to control the start timing by adding up the CPU module scan times.

The interval of the timer execution can be selected from the following four types.

Normal	Description
High speed	To execute with an interval of 200 ms.
Normal speed	To execute with an interval of [(high-speed execution type interval 200 ms) × n1*1] ms. (n1=2, 3, 4, 5)
Low speed	To execute with an interval of [(high-speed execution type interval 200 ms) × n2*1] ms. (n2=5, 10, 20, 25, 50)
Scan	From the next scan of executing the initial execution type program (when power is switched from ON to RUN, or the program that is executed only once when power is switched from STOP to RUN), to execute at each scan interval.

*1: n1, n2 can be set in the project parameter setting. For details, refer to "Section 6.14 (2) Program Execution Setting".

(2) Interrupt execution

The interrupt execution can be classified into two types, one is the fixed scan execution type that uses CPU module fixed scan execution type programs, and the other is the interrupt pointer execution type that uses the interrupt pointer.

Execution state	Description
Fixed scan execution	To execute within each interval set (execution interval).
Interrupt pointer execution	Temporarily interrupt the other programs execution to execute when the interrupt factor that corresponds to the CPU module interrupt pointer (I) occurs.

POINT

- Do not use Tag FB, general Process FB and Tag access FB in the following programs
Timer execution type program whose speed dependent is "Scan".
Interrupt pointer execution type program.
(It is the same when using the user-defined FB type/Tag FB type which has FB in the above-mentioned type programs.)
- Timer execution of other than the scan type will produce an error of up to +1 scan time, which is greater than interrupt execution.

7.13.2 Program execution timing window



PURPOSE

To display how to set the program execution timing is set.



BASIC OPERATION

1. Display the project window when it is not displayed. (☞ Section 5.7.1 (2))
2. Double click the [Program Execution Setting] in the project window.
3. Display the program execution timing window.












DISPLAY/SETTING SCREEN

Program Name	Priority	Phase	Type
PROGRAM2	30		Scan
PROGRAM1	16		High-speed
PROGRAM4	13	1	Normal Speed
PROGRAM5	31	1	Normal Speed
PROGRAM3	2	3	Low-speed
Total			
			3 1 2 1 1 3 1 1 1 1



DISPLAY/SETTING SCREEN

No.	Description												
1)	<p>To display the program names, execution state (the icon is displayed on the left of the program name), priority (execution type: only the timer execution), phase (speed dependent: only the normal speed and low-speed) which are set in the programs execution setting dialog box (☞ Section 7.13.3) and execution types of the programs.</p> <p><Icons of the execution state></p> <table border="1"> <thead> <tr> <th>Execution state*1</th> <th>Execution results</th> <th>Icons</th> </tr> </thead> <tbody> <tr> <td>Execute</td> <td>To execute program processing.</td> <td></td> </tr> <tr> <td>Do not execute</td> <td>Not to execute program processing.</td> <td></td> </tr> <tr> <td>Execute conditionally</td> <td>To execute program processing only when the conditions are met.</td> <td></td> </tr> </tbody> </table> <p>The indication priority order of the program in project window is as follows. Programs are displayed in alphabetical order if their conditions are the same in each following type programs.</p> <ol style="list-style-type: none"> The programs are displayed from small pointer number to big pointer number in the programs of interrupt pointers execution. The programs are displayed according to their intervals from short to long in the programs of fixed scan execution. The programs are displayed in order of scan/high speed/normal speed/low-speed (when their speed dependent are the same, they are displayed according to the sequence from the short phase to the high priority) in the programs of execution timer. <p>*1: The execution state has nothing to do with the display sequence.</p>	Execution state*1	Execution results	Icons	Execute	To execute program processing.		Do not execute	Not to execute program processing.		Execute conditionally	To execute program processing only when the conditions are met.	
Execution state*1	Execution results	Icons											
Execute	To execute program processing.												
Do not execute	Not to execute program processing.												
Execute conditionally	To execute program processing only when the conditions are met.												
2)	To display the interval of timer execution type set by the project parameters.												
3)	[*] is used for expressing the execution timing of each program. The total of programs which is started in each timing (timer execution type) is displayed in "Total" column.												
4)	The programs execution setting dialog box will be displayed when clicked. (☞ Section 7.13.3)												

POINT

The number of settable programs for fixed scan execution differs depending on the PLC type.

When the number of programs that exceeds the maximum number of programs is set, a compile error occurs, not an error in the program execution setting.

PLC type	Maximum number of programs
Q02PHCPU	15
Q06PHCPU	30
Q04UDPVCPU, Q06UDPVCPU, Q12PHCPU, Q12PRHCPU, Q13UDPVCPU, Q25PHCPU, Q25PRHCPU, Q26UDPVCPU	100

7.13.3 "Program Execution Setting" dialog box



PURPOSE

To perform the execution setting (execution state, execution type, execution condition) of each program.

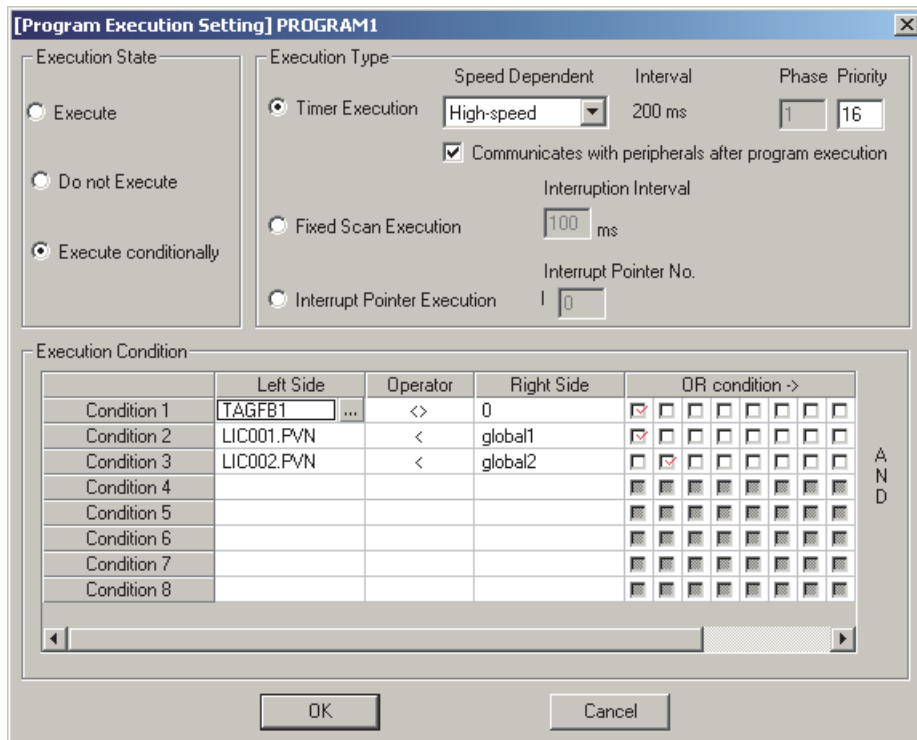


BASIC OPERATION

1. Refer to Section 7.13.2 and display the program execution timing window.
2. Click the program name cell for execution setting.
3. Click the button "..." displayed on the right of the cell after completing Step 2.
4. Display the "Program Execution Setting" dialog box.
5. Click the radio button to select the item to be set.
6. Set the selected item. (Refer to the next page)
7. Click the "OK" button to apply the changes and close the dialog box.
Click the button "Cancel" or "X" not to apply the changes but close the dialog box.



DISPLAY/SETTING SCREEN





DISPLAY/SETTING DATA

	Set Items	Description
Execution State	Execute	To execute the selected program. The timer execution, fixed scan execution, and interrupt pointer execution can be selected. (For details of setting method, refer to the items in this table.)
	Do not execute	Not to execute the selected program.
	Execute conditionally	To execute the selected program if the input conditions are met. The timer execution, fixed scan execution, and interrupt pointer execution can be selected. Besides, the execution conditions should be set. (For details of setting method, refer to the items in this table.)
Execution Type	Timer execution	[Speed dependent] To click the list box (▼) of the speed dependent, select one of the high speed/normal speed/low speed/scan. The interval will be displayed after selecting. The interval (n times of [high-speed execution type interval 200 ms]) is the value set previously by the project parameters (☞ Section 6.14 (2)) when selecting the normal speed or low speed. [Phase] To input value in the phase textbox. The phase width is fixed as n times of 200 ms. Input the value of n. The settable range is 1 to n. (n is the value set by project parameters (☞ Section 6.14 (2))). For details of the phase, refer to "PX Developer Version 1 Programming Manual". [Priority] To input value to the priority textbox. The settable range is 0 to 31. The closer to 0 the numeric value is, the higher the priority level is. The setting of the priority level is valid only in the programs with the same execution types. On the contrary, the priority level is not valid in the programs with different execution types. [Communicates with peripherals after program execution] By checking the check box, improve monitor response of monitor tools and indicators. Uncheck the check box so that data cannot be changed due to communication with peripheral devices during the execution of more than one program. (☞ POINT in this section) The initial values are high-speed for Speed dependent, 1 for Phase, 10 for Priority, and checked for Communicates with peripherals after program execution.
	Fixed scan execution	[Interruption Interval] To input value to the interruption interval textbox. The settable range is 1 to 999 ms. The initial value is 10.
	Interrupt pointer execution	[Interrupt Pointer No.] To input value in the interrupt pointer number textbox. The settable range is 0 to 255. Errors will occur in compile when the interrupt pointer number is used in other programs. The initial value is 10.
Execution Condition	Left side	To input the variable name of the global parts (global variables, tag FB, module FB). The reference operator (☞ Section 7.3.4) should be used to refer to the public variables when inputting the variable name of module FB and tag FB. Otherwise, errors will occur in compile.
	Right side	To input the variable name or constant *1 of the global parts (global variables, tag FB, module FB). The reference operator (☞ Section 7.3.4) should be used to refer to the public variables when inputting the variable name of module FB and tag FB. Otherwise, errors will occur in compile.
	Operator	To select the operator (=, <>, <, >, <=, >=).
	Conditions combination	To set the conditions combination by inputting check marks in the check box. For details, refer to Section 7.12.2.

*1: Constants can be only input to the right side.
For the input format of constants, refer to Section 7.4.3.

POINT	
<ul style="list-style-type: none"> • The following shows the example that the response to the monitoring system improves when "Communicates with peripherals after program execution" is checked for FBD programs. <p>If "Communicates with peripherals after program execution" is not checked, consistency of data is kept between the program being executed and next program since no communication is performed with peripheral devices until the execution of next program is completed.</p> <p><Execution program></p> <ol style="list-style-type: none"> 1) User ladder program Execution type: Scan execution (Set in PLC parameter of GX application.) 2) FBD program a, b, c Interval: High-speed (200ms) Communicates with peripherals after program execution: a, c ... Checked b Unchecked 3) FBD program d Interval: Normal-speed (600ms), Phase: 1 Communicates with peripherals after program execution: Checked 4) FBD program e, f Interval: Normal-speed (600ms), Phase: 2 Communicates with peripherals after program execution: Checked <p><Program execution timing></p>	<div style="margin-top: 10px;"> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin-bottom: 10px;"> <p>Since "Communicates with peripherals after program execution" is checked for FBD programs a, c, d, e, and f, the response improves due to communication with peripheral devices after FBD program execution.</p> </div> <div style="border: 1px solid black; padding: 5px; width: fit-content;"> <p>Since "Communicates with peripherals after program execution" is unchecked for FBD program b, consistency of data is kept between the execution of FBD program b and c.</p> </div> </div> <div style="margin-top: 10px;"> <p style="text-align: center;">↗ : Communication with peripheral devices at END processing ⌚ : Communication with peripheral devices after FBD program execution</p> </div>
<ul style="list-style-type: none"> • When project files created with PX Developer Version 1.12N or earlier are opened in PX Developer Version 1.13P or later, "Communicates with peripherals after program execution" for those files is unchecked. 	

7.14 User-defined FB type

The user-created FB type can be defined in the programming tool.

The creation time of the FBD programs can be shortened by defining the processing used frequently in the program as a FB in advance.

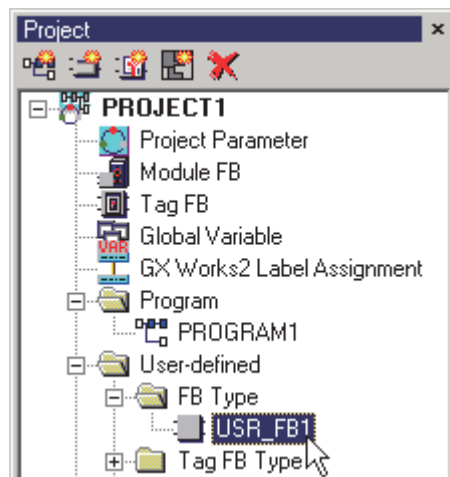
User-defined FB type is composed of the previously-prepared function parts, FB parts (tag access FB excluded), etc.

This section explains how to create a FB type.

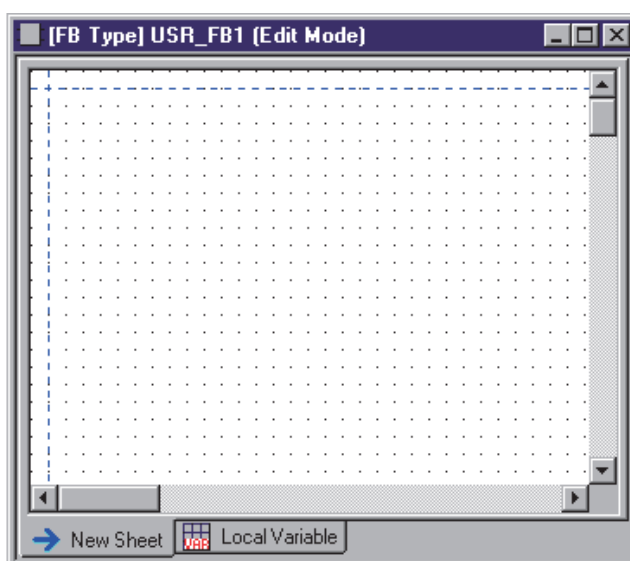
For details of user-defined tag FB type, refer to Section 8.4.4, for details of structure type, refer to Chapter 9.

**PURPOSE**

To create the user-defined FB type.

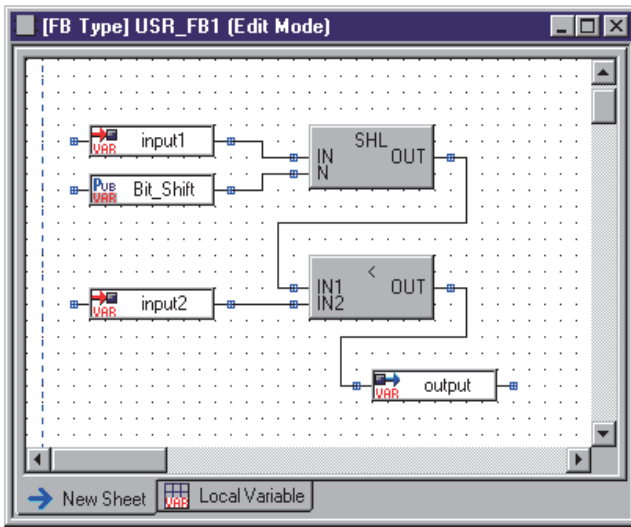
**BASIC OPERATION**

1. Add the data of the user-defined FB type to the project window. (See Section 6.8)
2. Double click the icon of user-defined FB type added to the project window.

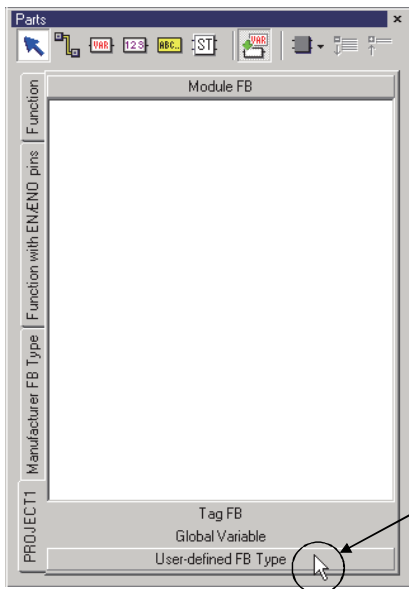


3. The added FB definition window will be displayed after completing Step 2.

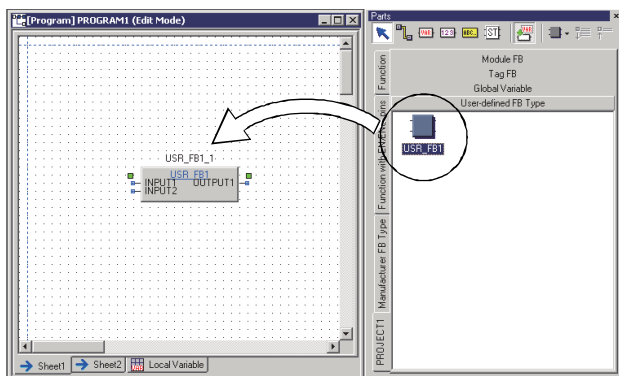
(To the next page)



4. Arrange the FBD parts in the displayed FB type definition window, and create the processing contents of the user-defined FB type.



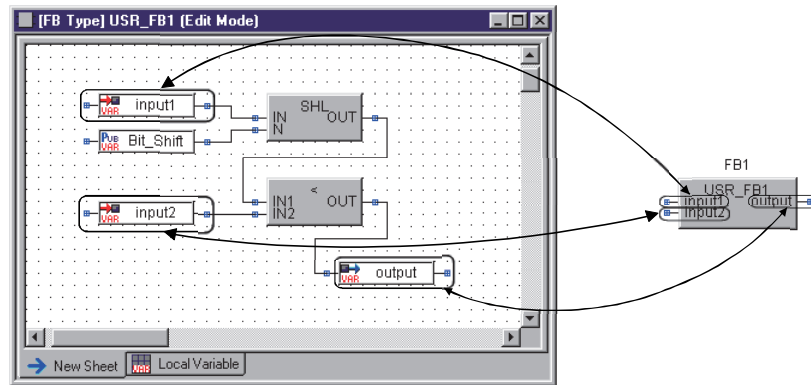
5. Click the <<Project Name>> tab in the part window (the left screen is [Sample 01]). Then click "User-defined FB Type".



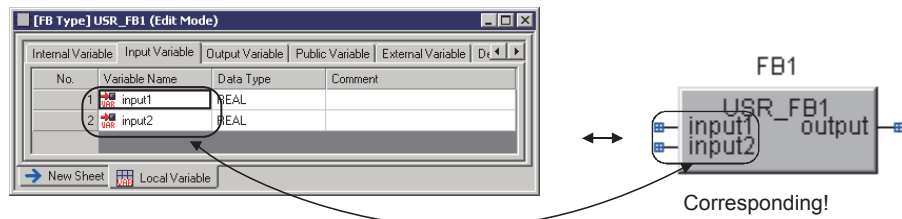
6. The icon of the user-defined FB type will be displayed after completing Step 5. The defined FB type can be used by dragging and dropping the icon in the FBD sheet.

POINT

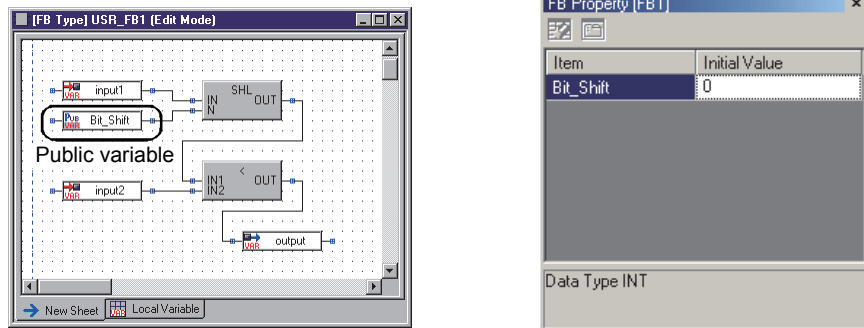
- The user-defined FB cannot be pasted to the definition window of the FB (it should not be pasted on itself).
- The input/output of the user-defined FB type can be realized by input/output variables.
(The input variables correspond to input pins, and output variables correspond to output pins.)



- The order of input pins/output pins of the user-defined FB corresponds to order the order of Input/Output variables in the local variable sheet.



- The initial value of the public variables can be changed in the FB property window after arranging the user-defined FB. Besides, the public variables in the user-defined FB can be referred to with the variable parts. (Section 7.3.4) However, the initial value cannot be set if the public variable is ADR_REAL type or structure type. (The initial value of the public variable should be set in the FB property window after inserting the user-defined FB type and setting FB variable names in the FBD sheet.)



7.15 Cooperation with Ladder Program

The processing (such as the interlock processing) which is difficult to describe in the FBD programs can be described in the ladder programs. Besides, the data can be changed between FBD programs and ladder programs. (For details, refer to "Section 8.5 Exporting Data to GX Global Label".)

7.15.1 Opening a GX project in the PX Developer project



PURPOSE

To make ladder programs by GX application. The GX project in the PX Developer should be started in order to create the ladder programs and set the PLC parameters and network parameters.



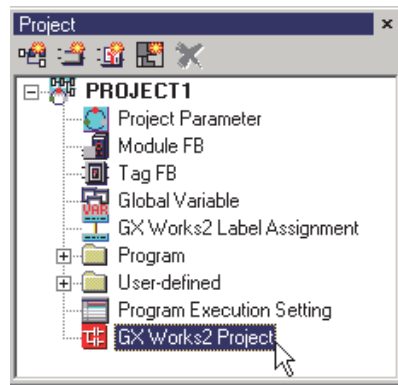
BASIC OPERATION

1. Start the GX project in the PX Developer project from the project window. Refer to Section 5.7.1 (2) to display the project window when it is not displayed.
2. Double click the "GX Works2 Project" icon*1 in the project window.
3. Start the GX project.

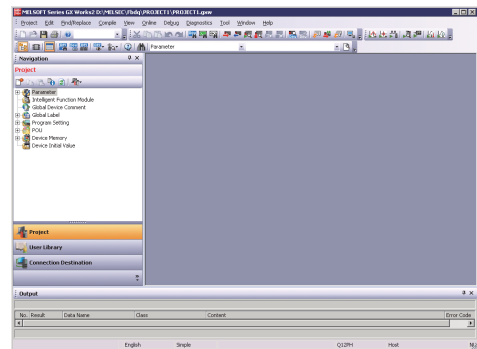
*1: When the GX project type is GX Developer project, double click the "GX Developer Project" icon.



DISPLAY/SETTING SCREEN



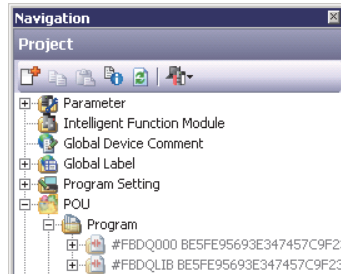
Double click the "GX Works2 Project" icon!



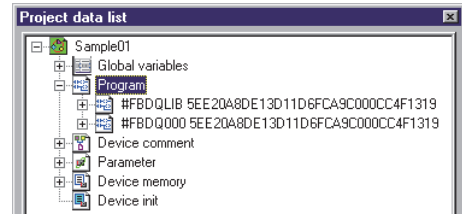
Open the GX Works2 project in the PX Developer project!

POINT

- A program named [#FBDQ...] will be created when compile has been executed and starting the GX project in the PX Developer project.



(GX Works2)



(GX Developer)

The program named [#FBDQ...] is a ladder program compiled and converted by programming tool. Do not add the name [#FBDQ...] in the created program name.

- Do not perform the following operation with starting up a GX project. The function of the programming tool does not operate properly.
 - Register the password for the ladder program ([#FBDQ...]) which is converted by the compilation of the programming tool, PLC parameter, and source information."

For a GX Works2 project, do not perform the following operations in addition to the above.

(When using Universal model process CPU)

- Lock the CPU module by a security key.
- Lock the GX Works2 project by a security key.

For details of the operations, refer to the following manuals:

- GX Works2 Version 1 Operating Manual (Common)
- GX Developer Version 8 Operating Manual

POINT

- GX application will be started when the project window is double-clicked. However, there are following restrictions in using GX application:
 - 1) While using the target GX project with starting up GX application independently, GX project cannot be started up.
 - 2) Following functions cannot be used on GX application:
 - New project
 - Open project
 - Close project
 - Save as
 - Change PLC typeThe following function cannot be used in addition to the functions shown above with GX Works2.
 - Open other project
 - 3) Ladder program [#FBDQ...] converted by programming tools cannot be edited on GX application.
Global label [#FBDQ] cannot be edited with GX Works2 project.
 - 4) There are following restrictions in data operation of programs:
 - When adding a new data, [#FBDQ..] cannot be specified as a data name.
 - The operation such as copy/paste, delete, and change name cannot be performed for the data named [#FBDQ..].
 - 5) For the tracking settings on the Redundant parameter screen, changing the following items will be disabled.
 - The tracking device setting method is fixed to "Device detail Setting".
 - Device range setting of tracking block No.33 to 64 and edit of file register file setting are disabled.*1

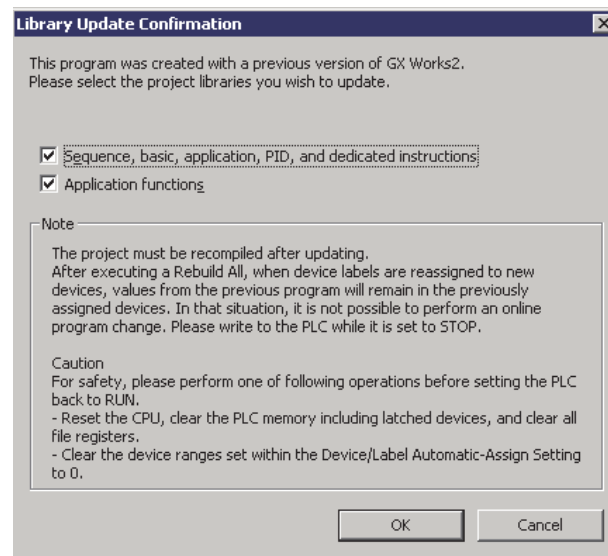
*1: Use tracking block number 1 to 32 to make the following tracking device settings.

 - Output Y device
 - B device, W device for host station transmission
 - Various devices for user ladder programs (including the device range of "Auto device setting" of GX application)
 - 6) For the precautions when the security is set to the target GX Works2 project, refer to POINT in Section 6.15.8.
 - 7) For the target GX Works2 project, do not set the block password to the program whose name is started with [#FBDQ].
- For a Universal model process CPU project, set the file register range of the system resource within the latch range in [File Register Extended Setting] of the device setting of the PLC parameter in the GX Works2 project.

POINT

- Due to GX Works2 is upgraded, the added new instructions and/or application functions for GX Works2 Structured Project can be used. To use the added new instructions and/or application functions in GX Works2 Structured Project contained in PX Developer project, perform the following operation.
 - 1) Startup GX Works2 in the start menu.
 - 2) Open GX Works2 Structured Project contained in PX Developer with GX Works2.
 - 3) When the instructions or application functions need to be updated, update by selecting the items on the dialog box.

All programs need to be compiled when instructions and/or application functions are updated.



7.15.2 Creating a ladder program

**PURPOSE**

To make the ladder programs using GX application.

(1) Create Ladder Program

**BASIC OPERATION**

1. Start the GX project from the programming tool. (☞ Section 7.15.1)
2. Create a ladder program.

For details of creation methods of ladder programs and settings using GX application, refer to the following manuals:

- GX Works2 Version 1 Operating Manual (Common)
- GX Developer Version 8 Operating Manual

POINT

- The QDRSET(P) instruction (setting of file for file register) must not be included in the user-created ladder program. If included, FBD program will not normally operate when the file for file register is renamed by the QDRSET(P) instruction.
- Programming tool reads/downloads the following devices in processing. Please be sure not to change device value from user-created ladder program.

Device used in programming tool	Change-forbidden range of device value
ZR (or R)	Range set with the system resource in the project parameter setting* ¹ (However, the items of tag data* ² within the range can be changed by specifying with ZR.)
T	Range set with the system resource in the project parameter setting* ¹
P	P3500 to P4095
M	Range set with the system resource in the project parameter setting* ¹
Z	Z0 to Z6 (However, the device value can be changed when the check box of "High speed execution" is cleared in "interrupt program/Fixed scan program setting" of PLC parameter of GX application.) * ³
SD	SD0 to SD8, SD16 to SD19, SD203, SD1500 to SD1505
SM	SM1, SM390, SM701, SM1500 to SM1501, SM1552 to SM1583

*1: For details of project parameter setting, refer to Section 6.14.(1).

*2: The device assigned to tag data can be checked from the tag FB declaration window.

*3: For details, refer to "Precautions on using index registers" in the "PX Developer Version 1 Programming Manual".

POINT

- With the programming tool, the data (value) of a global part in the FBD program can be exchanged with the data (value) in the ladder program.
(☞ Section 8.5)
- The number of ladder programs which can be created is differ depending on the PLC type.
However, if the fixed scan type program is created using the programming tool, this will affect the number of ladder programs, i.e., it will decrease by the number of the created fixed scan type programs.

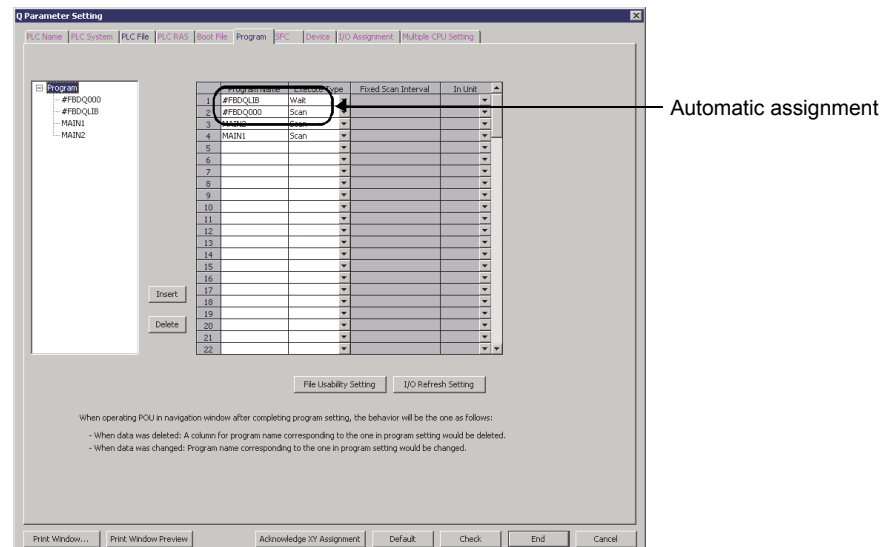
PLC type	Maximum number of programs
Q02PHCPU	28
Q06PHCPU	60
Q04UDPVCPU, Q06UDPVCPU, Q12PHCPU, Q12PRHCPU, Q13UDPVCPU, Q25PHCPU, Q25PRHCPU, Q26UDPVCPU	124

- The FB created using GX application is not compatible with the FB used in PX Developer.

(2) Setting on GX application

**BASIC OPERATION**

When using GX application to create ladder programs, make the settings for them in the <<Program>> tab within the [PLC Parameter] of GX application.



For details of the setting methods, refer to the following manuals:

- GX Works2 Version 1 Operating Manual (Common)
- GX Developer Version 8 Operating Manual

POINT

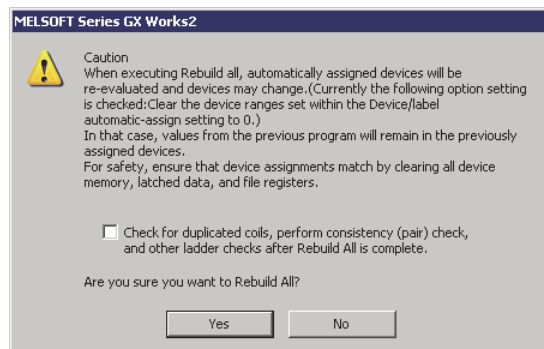
- Do not change the program setting named [#FBDQ...] in the [PLC parameter] of GX application.
- When making various parameter settings to the GX project in the project created with the programming tool, always start GX application from the programming tool.

(3) Program check with GX application

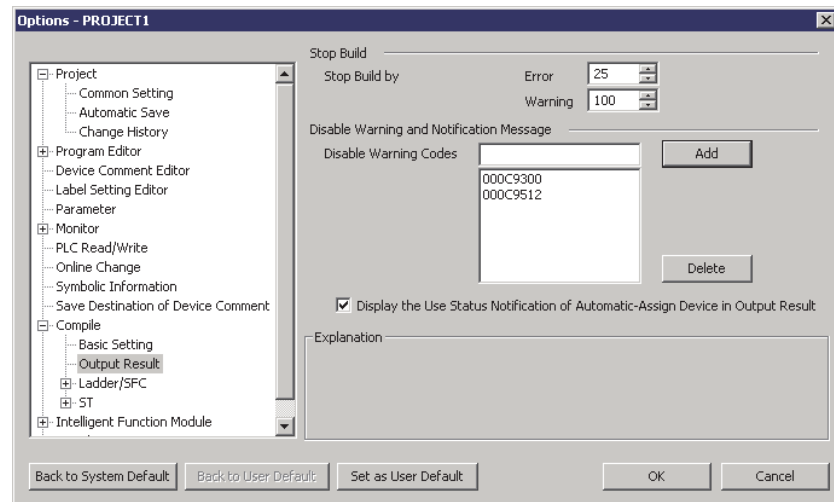
After checking programs using GX application, the warning for FBD program (ladder program start with #FBDQ) which is generated by PX Developer is output, however, there is no problem for the operation of the program.

The output of the warning can be controlled by the following operation.

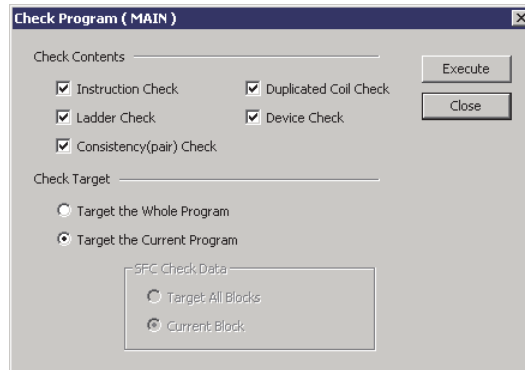
- When GX project type is GX Works2 Simple project (with labels)/Structured project, clear the "Check for duplicated coils, perform consistency (pair) check, and other ladder checks after Rebuild All is complete." check box on the confirmation dialog box displayed when selecting [Compile] - [Rebuild All] in the menu of GX Works2, and perform a compile.



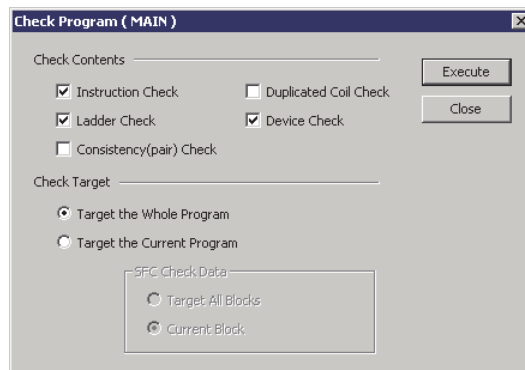
Register the warning codes ('000C9300' and '000C9512') to "Disable Warning Message" by selecting [Tool] → [Options] → [Compile] → [Output Result] in the menu of GX Works2, and perform compilation.



- When GX project type is GX Works2 Simple project (without labels) or GX Developer project, perform the program check by displaying the program other than FBD program (ladder program start with #FBDQ) generated by PX Developer, and selecting "Target the Current Program" on the Check Program screen displayed by selecting [Tool] → [Check Program] in the menu of GX application.



Perform the program check by clearing the "Duplicated Coil Check" and "Consistency (pair) Check", and selecting "Target the Whole Program" on the confirmation dialog box displayed by selecting [Tool] → [Check Program] in the menu of GX application.



7.15.3 Precautions for ladder programming

For the precautions for various parameter settings, etc. made by user ladder creation or using GX application, refer to "Precautions When Using GX application" in the "PX Developer Version 1 Programming Manual".

MEMO

8 GLOBAL PARTS

Global parts are variables/parts that can be referred to in any program/FB type. Global parts are classified as global variable, module FB and tag FB.

There are declaration windows in the above three types of global parts. Once declaration is done in declaration window of programming tool, parts will be added into the parts window and global parts can be used in FBD program.

This chapter explains these three types of global parts.

8.1 Relation between Global Parts and Program/FB Type

Once dragging and dropping the global parts from the parts window into an FBD sheet after global parts have been declared in declaration windows, the parts information will be automatically shown as external variable in the local variable sheet.

However, even if the declaration is changed in the declaration window of global parts, the added external variable in the local variable sheet will not reflect the change.

Therefore, global parts (external variable) on FBD sheet will mismatch the declaration in declaration window. (The changed contents will not be reflected on global parts on FBD sheet.) In this case, try in the following ways to accord declaration in declaration window with declaration of global parts (external variable) in local variable sheet.

The external variable of the global parts in local variable sheet has been referred to for change. The change is the same as that made in declaration window of global parts.

Or delete from FBD sheet the global parts whose declaration has been changed and then paste it to the parts window again.

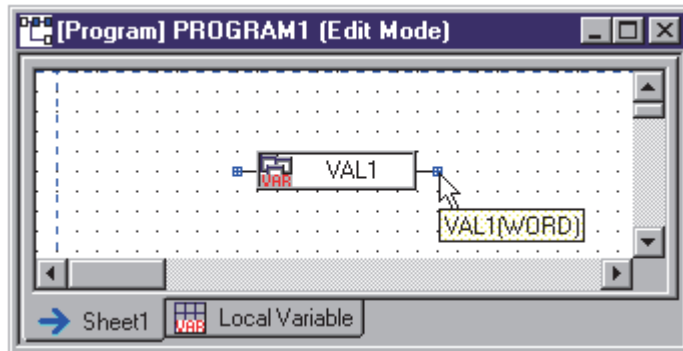
The change contents of the local variable sheet and parts items that must be pasted again when change in declaration windows are listed as follows.

(Items that are not in the following list are declarations that do not need to be changed in the local variable sheet)

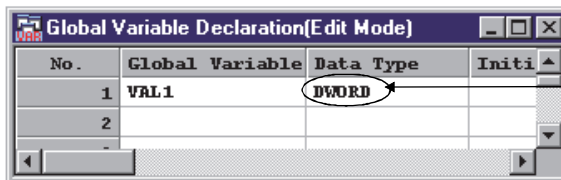
- Changing global variable declaration
Global variable name, data type
- Changing tag FB declaration
Tag FB variable name, tag FB type (re-paste parts in changing tag FB)
- Changing module FB declaration
Module FB variable name, module type name (re-paste parts in changing module type name)

Similarly, in changing declaration of global parts (external variable) on local variable sheet, global parts (external variable) on local variable sheet will disaccord with global parts declaration on declaration windows. (The change on the local variable sheet will not be reflected in the declaration windows.) Here, please change declaration on declaration windows to conform them to declaration on local variable sheet.

(Example) When the change contents on global variable declaration window are not reflected in global parts on FBD sheet.

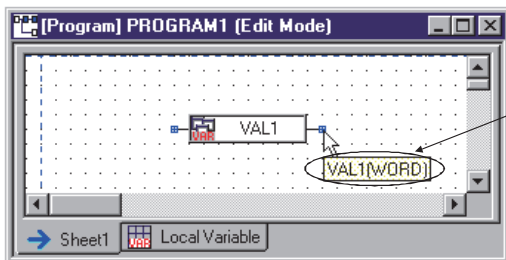


Change the declaration window contents when pasting global parts on FBD sheet

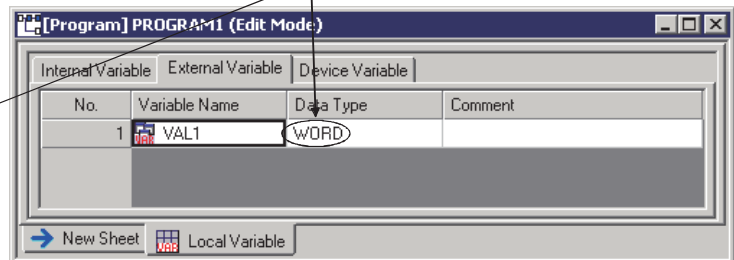


Data type is changed from WORD to DWORD!

Data type is kept as WORD!



(FBD sheet)



(Local variable sheet)

Even if declaration on global variable declaration window is changed, the change will not be reflected on the global part on FBD sheet and in the local variable sheet. (Changing WORD to DWORD is not reflected)

In the above case, please refer to the previous page to conform the declaration of global parts (external variable) on local variable sheet to declaration on global variable declaration window.

POINT

The compile error occurs when referring to unspecified variable in global parts in external variable.

8.2 Global Variable

Global variable means variable that can be referred to in all FBD programs. Global variable can be accessed with external variable.

For the local variable, only the data (value) defined in FBD program can be accessed. While as for global variable, data (value) can be accessed even between the different FBD programs.

8.2.1 Global variable declaration window



PURPOSE

To display windows for global variable declaration.

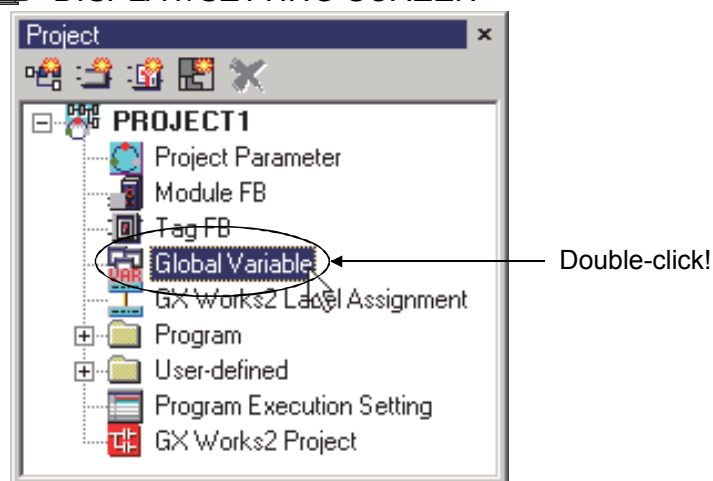


BASIC OPERATION

1. Double-click the global variable icon on the project window.
2. Display global variable declaration window.



DISPLAY/SETTING SCREEN



No.	Global Variable Name	Data Type	Initial Value	Assigned Device	Comment
1					
2					
3					
4					
5					

8.2.2 Declaring/Editing a global variable

(1) Global Variable Declaration



PURPOSE

To declare a global variable in order to use it



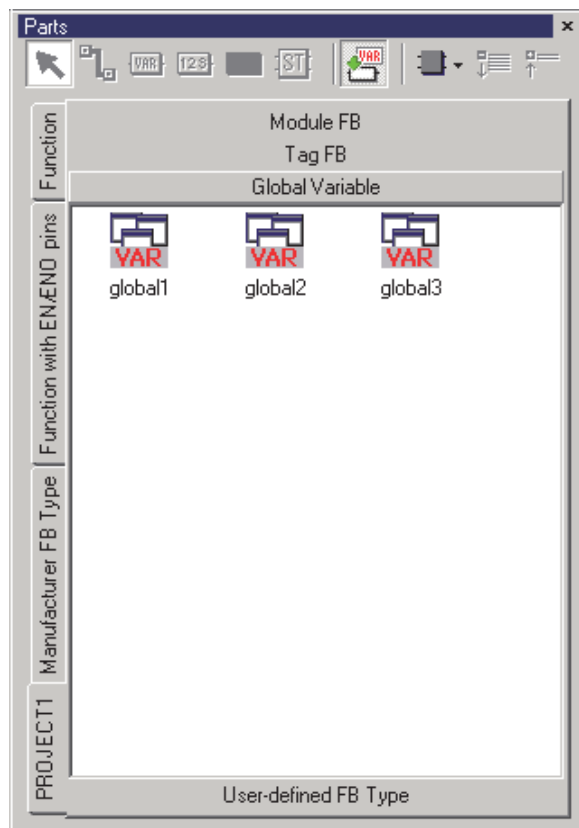
BASIC OPERATION

1. Refer to Section 8.2.1 to display global variable declaration window.
2. Input data or value in each item.
3. Declared variable will be added to the "Global Variable" item in parts window after global variable is declared.






DISPLAY/SETTING SCREEN

No.	Global Variable Name	Data Type	Initial Value	Assigned Device	Comment
1	global1	INT	0		1 second counter
2	global2	INT			
3	global3	REAL	0.0		
4					
5					






DISPLAY/SETTING CONTENTS

Item	Description
No.	Indicate a row number. Up to No.32000 can be defined. When an error occurs in the declared global variable, icon ( or ) will be displayed corresponding to the error content.
Global Variable Name	Display/set global variable name. Select the cell and enter the variable name (Within 32 characters).
Data Type	Display/set data type. 1. Select the data type cell and press "." to edit data type. 2. The "Select Data Type" dialog box ( Section 7.11.4) is displayed. 3. Select data type and click the "OK" button. Setting a data type can also be set by inputting directly. The settable data type consists of elementary data type and structure type.
Initial Value	Display/set initial value of elementary data type global variable. Select the cell and input value in editing the initial value. The input format is the same as the constant input format. For constant input format, refer to Section 7.4.3.
Assigned Device	Display/set the PLC device assigned to global variable. Select the cell and input data in editing PLC device. The intelligent function module device (U○¥G○) and link direct device (J○¥○○) can be set but the intelligent function module device and link direct device cannot be set in the STRING type global variable assigned device. For details about the range of the devices that can be input, refer to (2) in this section. Devices will be assigned automatically when assigned devices are not set in compile. Device will be assigned in the head member in structure type. For details of PLC devices, refer to the following manuals: ● Qn(H)/QnPH/QnPRHCPU User's Manual (Function Explanation, Program Fundamentals) ● QnUCPU User's Manual (Function Explanation, Program Fundamentals)
Comment	Display/set the comments of global variable. Select the cell and directly input the comments for editing. The corresponding set comments will be displayed when mouse pointer is placed on the parts on parts window. Comment should be input within 64 characters.

POINT

- When pasting global variable parts (external variable in reference to global variable) on an FBD sheet and changing the declaration in global variable declaration window, the change will not be reflected by the part on the FBD sheet. For details, refer to Section 8.1.
- The maximum number of defined global variables is 32000.
- The initial value and assigned device cannot be set at the same time.
- The structure members will not be displayed.
- When errors occur in declared data, error icon will be displayed at the left side of the No. ( (3) in this section)
Once the error line is selected, the error content will be displayed in the status bar.
- Global variable cannot share the same name with tag FB variable or module FB variable.

(2) The Settable Device Range

The following is a list of settable range in assigned device in a global variable declaration window.

(a) Process CPU/Redundant CPU

Classification	Type	Device name	Initial value		Range set by parameter setting	Error check range
			Points	Range of use		
Internal user device	Bit device	Input	8192 points	X0 to X1FFF	Not allowed	X0 to X1FFF
		Output	8192 points	Y0 to Y1FFF		Y0 to Y1FFF
		Internal relay	8192 points	M0 to M8191 *3	Changeable within 29K words	M0 to M32767
		Latch relay	8192 points	L0 to L8191		L0 to L32767
		Annunciator	2048 points	F0 to F2047		F0 to F32767
		Step relay	8192 points	S0 to S511/Block	Not allowed	S0 to S511/Block
	Link relay	8192 points	B0 to B1FFF	Changeable within 29K words	B0 to B7FFF	
	Word device	Data register	12288 points		D0 to D12287	D0 to D25983
		Link register	8192 points	W0 to W1FFF	W0 to W657F	
Internal system device	Bit device	Special relay	2048 points	SM0 to SM2047 *3	Not allowed	SM0 to SM2047
		Special link relay	2048 points	SB0 to SB7FF		SB0 to SB7FF
	Word device	Special register	2048 points	SD0 to SD2047 *3		SD0 to SD2047
		Special link register	2048 points	SW0 to SW7FF		SW0 to SW7FF
Direct device	Bit device	Direct input	4096 points	DX0 to DXFFF	Not allowed	DX0 to DXFFF
		Direct output	4096 points	DY0 to DYFFF		DY0 to DYFFF
Link direct device *2	Bit device	Link input	8192 points	Jn\X0 to Jn\X1FFF	Not allowed	Jn\X0 to Jn\X1FFF
		Link output	8192 points	Jn\Y0 to Jn\Y1FFF		Jn\Y0 to Jn\Y1FFF
		Link relay	16384 points	Jn\B0 to Jn\B3FFF		Jn\B0 to Jn\B3FFF
		Special link relay	512 points	Jn\SB0 to Jn\SB1FFF		Jn\SB0 to Jn\SB1FFF
	Word device	Link register	16384 points	Jn\W0 to Jn\W3FF		Jn\W0 to Jn\W3FF
		Special link register	512 points	Jn\SW0 to Jn\SW1FF		Jn\SW0 to Jn\SW1FF
Intelligent function module device *2	Word device	Buffer register	65536 points	Un\G0 to Un\G65535 *1	Not allowed	Un\G0 to Un\G65535 *1
File register	Word device	File register *4	*5	*5	Not allowed	ZR0 to ZR1042431

*1: Practically workable points vary with intelligent function modules.

*2: N for link direct device Jn ranges 1 to 255, and for intelligent function module device Un ranges 0 to 1FF.

*3: Within some range the device value cannot be changed. For details, please refer to point in the next page.

*4: When the file register is specified, the R device cannot be used. Use the ZR device.

*5: Initial values differ depending on the PLC type. The initial values for each PLC type are as follows.

Device name	PLC type	Initial value	
		Points	Range of use
File register	Q02PHCPU, Q06PHCPU	65536 points	ZR0 to ZR65535
	Q12PHCPU, Q12PRHCPU, Q25PHCPU, Q25PRHCPU	131072 points	ZR0 to ZR131071

(b) Universal model process CPU

Classification	Type	Device name	Initial value		Range set by parameter setting	Error check range	
			Points	Range of use			
Internal user device	Bit device	Input	8192 points	X0 to X1FFF	Not allowed	X0 to X1FFF	
		Output	8192 points	Y0 to Y1FFF		Y0 to Y1FFF	
		Internal relay	*1	*1, *2		*3	M0 to M61439
		Latch relay	8192 points	L0 to L8191			L0 to L32767
		Annunciator	2048 points	F0 to F2047			F0 to F32767
		Step relay	8192 points	S0 to S511/Block			S0 to S511/Block
	Link relay	8192 points	B0 to B1FFF	B0 to BEFFF			
	Word device	Data register	*1	*1	*3,*4	*1	
Link register	8192 points	W0 to W1FFF	*1				
Internal system device	Bit device	Special relay	2048 points	SM0 to SM2047 *2	Not allowed	SM0 to SM2047	
		Special link relay	2048 points	SB0 to SB7FF	*3	SB0 to SB7FF	
	Word device	Special register	2048 points	SD0 to SD2047 *2	Not allowed	SD0 to SD2047	
		Special link register	2048 points	SW0 to SW7FF	*3	SW0 to SW7FF	
Direct device	Bit device	Direct input	4096 points	DX0 to DXFFF	Not allowed	DX0 to DXFFF	
		Direct output	4096 points	DY0 to DYFFF		DY0 to DYFFF	
Link direct device *5	Bit device	Link input	16384 points	Jn\X0 to Jn\X3FFF*6	Not allowed	Jn\X0 to Jn\X3FFF	
		Link output	16384 points	Jn\Y0 to Jn\Y3FFF*6		Jn\Y0 to Jn\Y3FFF	
		Link relay	32768 points	Jn\B0 to Jn\B7FFF*6		Jn\B0 to Jn\B7FFF	
		Special link relay	512 points	Jn\SB0 to Jn\SB1FFF		Jn\SB0 to Jn\SB1FF	
	Word device	Link register	131072 points	Jn\W0 to Jn\W1FFFF*6		Jn\W0 to Jn\W1FFFF	
		Special link register	512 points	Jn\SW0 to Jn\SW1FF		Jn\SW0 to Jn\SW1FF	
Intelligent function module device *5	Word device	Buffer register	65536 points	Un\G0 to Un\G65535 *7	Not allowed	Un\G0 to Un\G65535 *7	
File register	Word device	File register *8	*1	*1, *2	*4	*1	

*1: Initial values differ depending on the PLC type. The initial values of each PLC type are as follows.

Device name	PLC type	Initial value		Error check range	
		Points	Range of use		
Internal relay	Q04UDPVCPU, Q06UDPVCPU	15360 points	M0 to M15359	M0 to M61439	
	Q13UDPVCPU, Q26UDPVCPU	28672 points	M0 to M28671		
Data register	Q04UDPVCPU	22528 points	D0 to D22527	D0 to D4365311	The maximum value obtained by summing up the internal devices and extended file register
	Q06UDPVCPU			D0 to D4627455	
	Q13UDPVCPU	41984 points	D0 to D41983	D0 to D4779007	
	Q26UDPVCPU			D0 to D4910079	
Link register	Q04UDPVCPU	8192 points	W0 to W1FF	W0 to W429BFF	The maximum value obtained by summing up the internal devices and extended file register
	Q06UDPVCPU			W0 to W469BFF	
	Q13UDPVCPU			W0 to W48EBFF	
	Q26UDPVCPU			W0 to W4AEBFF	
File register	Q04UDPVCPU	65536 points	ZR0 to ZR65535	ZR0 to ZR4325375	
	Q06UDPVCPU			ZR0 to ZR4587519	
	Q13UDPVCPU	131072 points	ZR0 to ZR131071	ZR0 to ZR4718591	
	Q26UDPVCPU			ZR0 to ZR4849663	



*2: Within some range, the device value cannot be changed. For details, please refer to POINT in the next page.

- *3: The total maximum number of device points differs depending on the PLC type. The maximum number of points for each PLC type is as follows.
Q04UDPVCPU, Q06UDPVCPU: 40K words, Q13UDPVCPU, Q26UDPVCPU: 60K words
- *4: The range of file register can be extended up to the end device in the file register extended setting.
- *5: N for link direct device Jn ranges 1 to 255, and for intelligent function module device Un ranges 0 to 1FF.
- *6: For range of use for each network type, refer to the manual for the network.
- *7: Practically workable points differ depending on the intelligent function module.
- *8: When the file register is specified, the R device cannot be used. Use the ZR device.

POINT	
<ul style="list-style-type: none"> ● Timer (T), retentive timer (ST), counter(C), file register (R), and device BL and TR of SFC cannot be used. ● When setting file register (ZR) and internal relay (M) in assigned devices, the device range should not be duplicated with the range set by project parameter system resource (☞ Section 6.14 (1)). ● Indirect-specified device (from @), indexing device (to Z*), digit-specified device (from K*) cannot be used as assigned device. ● The file register (R) cannot be used with the programming tool. Use the ZR device. The file register (R) can be used in user-created ladder programs. However, when using the file register (R) in a user-created ladder program, do not use the file register (ZR) in the range set by the system resource of the project parameter (☞ Section 6.14 (1)). ● Programming tool uploads/downloads the following devices in processing. Please be sure not to change device value from global variable or user-created ladder program. 	
Device used in programming tool	Change-forbidden range of device value
ZR (or R)	Range set with the system resource in the project parameter setting*1 (However, the items of tag data*2 within the range can be changed by specifying with ZR.)
T	Range set with the system resource in the project parameter setting*1
P	P3500 to P4095
M	Range set with the system resource in the project parameter setting*1
Z	Z0 to Z6 (However, the device value can be changed when the check box of "High speed execution" is cleared in "interrupt program/Fixed scan program setting" of PLC parameter of GX application.) ³
SD	SD0 to SD8, SD16 to SD19, SD203, SD1500 to SD1505
SM	SM1, SM390, SM701, SM1500 to SM1501, SM1552 to SM1583
<p>*1: Refer to Section 6.14 (1) for details of the project parameter setting. *2: The device assigned to tag data can be checked from the tag FB declaration window. *3: For details, refer to "Precautions on using index registers" in the "PX Developer Version 1 Programming Manual".</p> <ul style="list-style-type: none"> ● The device format of a device variable cannot be specified over the boundaries between the data register (D)/link register (W) of the internal user device and the extended data register (D)/extended link register (W). For details, refer to "QnUCPU User's Manual (Function Explanation, Program Fundamentals)". 	

(3) Error list of global variable declaration window

The following is a list of errors in global variable declaration window.

Item	Description	Error icon	
Global variable name	<ul style="list-style-type: none"> ● Variable name duplication error Occurring in setting the declared global variable name, module FB variable name, and tag FB variable name. 		
	<ul style="list-style-type: none"> ● Variable name no specification error Occurring when all the other items have been set except global variable name. ● Variable name format error Occurring when illegal characters (including reserved words*1) are used in global variable name. 		
Data type	<ul style="list-style-type: none"> ● Data type no specification error Occurring when all the other items have been set except data type. ● Data type format error Occurring when illegal characters are used in data type. ● Data type specification error Occurring when the data type which cannot be specified in data type (elementary data type and structure type excluded) is specified. 		
Initial value	<ul style="list-style-type: none"> ● Initial value format error Occurring when illegal characters are used in initial value. ● Initial value type mismatch error Occurring when the specified data type does not accord with input data type of initial value. 		
Assigned device	<ul style="list-style-type: none"> ● Assigned device type mismatch error Occurring when the specified data type does not accord with input data type of assigned device or illegal characters are used in assigned devices. 		

*1: For reserved words, refer to Appendix 1.

POINT

When errors occur in declaration, the variables cannot be placed on FBD sheet from parts window.
(Unless the errors are caused by initial value and assigned device)

No.	Global Variable Name	Data Type	Initial Value	Assigned Device	Comment
1	global1	INT	0		I.second counter
2	global2	INT			
3	global3	ENT	0.0		

(4) Editing operations in global variable declaration window.



PURPOSE

To paste the global variable declaration list made by Microsoft® Excel® onto the global variable declaration window when inserting, deleting a row or items in the global variable declaration window.



BASIC OPERATION

For details, refer to "Section 5.8.1 General operations of table".

POINT

- The global variables can be deleted even when they are referred from the external variables.
Please delete the external variable which refers to the global variable in program/FB definition window as well when deleting the global variable declaration. Otherwise, an error may occur in compile when the external variable reference target does not exist.
- Click [Edit] → [Undo] in menu to recover to the previous status before changing.

8.2.3 Sorting global variable declaration

**PURPOSE**

To sort global variable declaration according to global variable name and assigned device.

**BASIC OPERATION****(1) Operation for sorting global variable declaration**

1. Select any cell in the column to be sorted.
2. Display the pop-up menu to select either [Sort] → [Ascending] or [Sort] → [Descending].
3. Global variable declarations are sorted in ascending order or descending order based on the selected column.

(2) Operation for removing sort of global variable declaration

1. Select any cell.
2. Display the pop-up menu to select [Sort] → [Remove Sorting].
3. Cancels sorting if sorted and returns the order to No. ascending.

**DISPLAY/SETTING SCREEN**

No.	Global Variable Name	Data Type	Initial Value	Assigned Device	Comment
4	LIMIT1	REAL	0.0		Limit value1
5	LIMIT2	REAL	10.0		Limit value2
3	PRESS1	USER_STR			Press1
6	STATE1	INT	20		Status1
2	STATE2	DINT	10		Status2
1	STATE3	INT	2		Status3
7					

An example of sorting in ascending order based on the global variable name column.

* Either of the following icons is displayed next to the sorted item name.

Icon	Description
	Indicates that sort is performed in ascending order.
	Indicates that sort is performed in descending order.

POINT

- When Sort or Remove Sorting is performed, [Edit] → [Undo], [Edit] → [Redo] in menu cannot be operated since previous operations are not stored.
- When Sort is performed, [Edit] → [Insert Row], [Edit] → [Delete Row] in menu cannot be operated.

8.3 Module FB

Module FB realizes data I/O processing of modules such as analog I/O, digital I/O and high-speed counter. These modules are connected with PLC base unit.

Once module is declared in module FB declaration window, module FB will be added to module FB section in parts window and module FB can be used in FBD program.

By tracing the related variables when modifying the FBD programs, the influence on other processing can be confirmed easily.

The following is a list of workable module model names in programming tool.

Classification		Corresponding module model name
I/O module		QX10, QX28, QX40, QX40-S1, QX41, QX41-S1, QX42, QX42-S1, QX50, QX70, QX71, QX72, QX80, QX81, QX82, QX82-S1, QY10, QY18A, QY22, QY40P, QY41P, QY42P, QY50, QY68A, QY70, QY71, QY80, QY81P, QH42P, QX48Y57
Analog module		Q64AD, Q64AD2DA, Q68ADV, Q68ADI, Q62AD-DGH, Q66AD-DG, Q64AD-GH, Q68AD-G, Q62DA, Q62DAN, Q64DA, Q64DAN, Q68DAV, Q68DAVN, Q68DAI, Q68DAIN, Q62DA-FG, Q66DA-G, Q68CT
Temperature input module		Q64TD, Q64TDV-GH, Q68TD-G-H01, Q68TD-G-H02, Q64RD, Q64RD-G, Q68RD3-G
Counter module		QD62, QD62E, QD62D, QD60P8-G
Remote module via CC-Link master module *1	Master module	QJ61BT11, QJ61BT11N
	For remote I/O station	CC-Link Remote (1 to 4 stations occupied)
	For remote device station	CC-Link Remote (1 to 4 stations occupied)

*1: Incompatible with CC-Link Ver. 2.

(1) To use module FB

The startup of the module must have been completed to use the module FB.

For the setting necessary to use the module. (☞ (1) (a) in this section)

When the setting necessary to use the module is completed and the startup of the module is completed, declare the module FB with the programming tool.

When the module FB declaration is completed, the module FB can be used in an FBD program. (☞ (1) (b) in this section)

(a) Settings with intelligent function module operation

Perform the following are the settings which are necessary to use the analog module, temperature input module and counter module with GX Works2 or GX Developer and GX Configurator.

- Intelligent function module switch setting
- Parameter (initial setting)
- Auto refresh

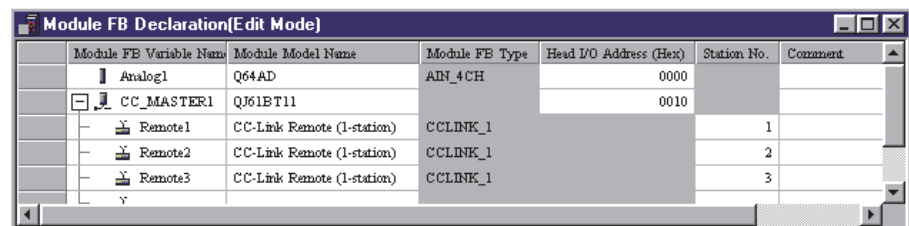
For the settings with intelligent function module operation, start GX application from the project window of the programming tool.

Use GX application to make the network parameter setting necessary to use the CC-Link remote module.

For details of the setting procedure and setting method of each module, refer to the manual of the used module.

(b) Setting using programming tool

By declaring the module to be used in the module FB declaration window, the module FB part declared in the module FB item of the part window is added, making the module FB usable in the FBD program.



Module FB Variable Name	Module Model Name	Module FB Type	Head I/O Address (Hex)	Station No.	Comment
Analog1	Q64AD	AIN_4CH	0000		
CC_MASTER1	QJ61BT11		0010		
Remote1	CC-Link Remote (1-station)	CCLINK_1		1	
Remote2	CC-Link Remote (1-station)	CCLINK_1		2	
Remote3	CC-Link Remote (1-station)	CCLINK_1		3	

POINT

- In the module where the module FB is performing data I/O processing, do not use the auto refresh function with the PLC device using intelligent function module operation. If the auto refresh function is used, the output value of the module FB will be illegal.
- The module FB is incompliant with the intelligent function module mounted in the MELSECNET/H remote station.
For details, refer to "Access to MELSECNET/H Remote I/O Station" in "PX Developer Version 1 Programming Manual".

8.3.1 Module FB declaration window



PURPOSE

To display module FB declaration window.

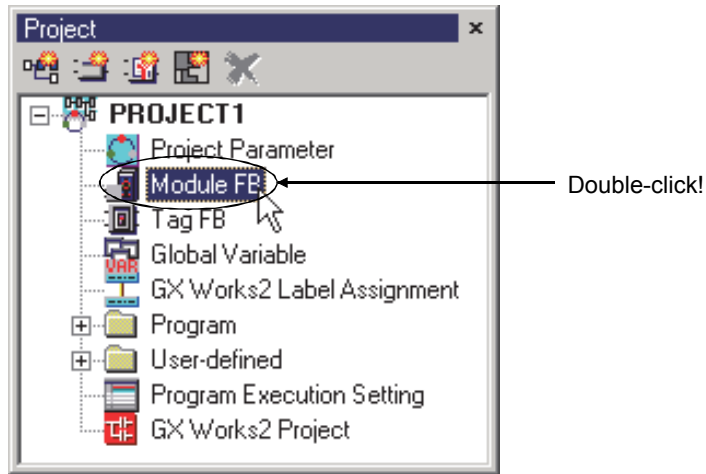


BASIC OPERATION

1. Double-click module FB icon in project window.
2. Display module FB declaration window.



DISPLAY/SETTING SCREEN



Module FB Declaration(Edit Mode)						
Module FB Variable Name	Module Model Name	Module FB Type	Head I/O Address (Hex)	Station No.	Comment	

8.3.2 Declaring/Editing a module FB

(1) Module FB declaration



PURPOSE

To declare module FB in order to use it.



BASIC OPERATION

1. Refer to Section 8.3.1 to display module FB declaration window.
2. Input value or data into each item.
3. Parts will be added to module FB item in the parts window after module FB is declared.




DISPLAY/SETTING SCREEN

Module FB Variable Name	Module Model Name	Module FB Type	Head I/O Address (Hex)	Station No.	Comment
Analog1	Q64AD	RIN_4CH	0000		
CC_MASTER1	QJ61BT11		0010		
Remote1	CC-Link Remote(1-station)	CCLINK_1		1	
Remote2	CC-Link Remote(1-station)	CCLINK_1		2	
Remote3	CC-Link Remote(1-station)	CCLINK_1		3	


The 'Parts' window displays a list of declared module function blocks (FB) under the 'Module FB' category. The items shown are Analog1, Remote1, Remote2, and Remote3. The window interface includes a toolbar with icons for variable types (VAR, I2S, ST, VAR) and a vertical sidebar with tabs for 'Function', 'Function with EN/END pins', 'Manufacturer FB Type', and 'PROJECT1'. At the bottom of the window, there are labels for 'Tag FB', 'Global Variable', and 'User-defined FB Type'.



DISPLAY/SETTING DATA

Item	Description
Module FB Variable Name	Display/set module FB variable name. Select a cell and input variable name to edit it. (Within 32 characters)
Module Model Name	Display/set module model name. 1. Select the cell of the module model name and click  to edit module FB. 2. Display the module list. 3. Select module model name in the list. On occasion of CC-Link, only the sub-station list will be displayed.
Module FB Type	Display/set automatically the module FB type name corresponding to module model name. However, it displays nothing when the selected module model name is CC-Link master module. (This item cannot be edited)
Head I/O Address (Hex.)	Display head I/O address. Select the cell and edit head I/O address by inputting 4-bit hexadecimal number. (The first bit should be 0. Only 0 to 9 or A to F can be input) This section cannot be edited in CC-Link remote module.
Station No.	It only can be input in CC-Link remote module. Edit module station No. The number ranges is 1 to 64.
Comment	Display/set the comments of module FB. Select the cell and directly input comment. The comments set on this row will be displayed when placing mouse pointer to parts on the parts window. Comment should be input within 64 characters.

POINT

- If the declaration is changed in module FB declaration window after module FB is pasted in FBD sheet, parts in FBD sheet will not reflect the change.
For details, refer to Section 8.1.
- The declaration order of module FB does not have to accord with the installation order in base unit.
- If CC-Link master module has been declared, the declared CC-Link master module will not be displayed in the parts window.
- If module model name is changed into another one in CC-Link master module, data on the CC-Link remote module connected with it will be deleted.
- If error occurs in the declared data, error icon will be displayed at the left end of the row.  (2) in this section
If the error row is selected, the error will be displayed in the status bar.
- The module FB cannot share the same name with global variable or tag FB variable.

(2) Error list in module FB declaration window

The following table summarizes the possible errors in module FB declaration window.

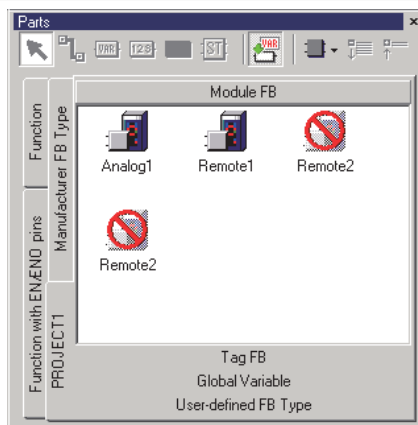
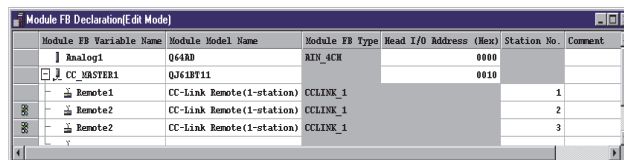
Item	Description	Error icon
Module FB Variable Name	<ul style="list-style-type: none"> Variable name duplication error Occurring when declared global variable name, module FB variable name and tag FB variable name have been set. 	
	<ul style="list-style-type: none"> Variable name no specification error Occurring when all the other sections have been set except the module FB name. Variable name format error Occurring when illegal characters (including reserved words*1) are used in module FB variable name. 	
Module Model Name	<ul style="list-style-type: none"> Module model name no specification error Occurring when all the other sections have been set except module model name. 	
Head I/O address (Hex.)	<ul style="list-style-type: none"> Head I/O address defining error Occurring when value out of the range 0 to 1FF0 is specified for head I/O address. Additionally, error occurs when the first bit is not 0. Head I/O address no specification error Occurring when all the other sections have been set except initial I/O address. 	
Station No.	<ul style="list-style-type: none"> Station number no specification error Occurring when all the other sections have been set except station number. Station number specification error Occurring when value out of the range 1 to 64 is specified to station number. 	

*1: For reserved words, refer to Appendix 1.

POINT

Module FBs cannot be placed if errors have been occurred in FBD sheet from parts window.

(Unless the error results from head I/O address or station number)




(3) Editing operations in module FB declaration window

**PURPOSE**

To perform the operations of deleting a row of item (delete module FB declaration), inserting or deleting a row, and paste a module FB declaration list made by Microsoft® Excel® onto the module FB declaration window.

**BASIC OPERATION**

For details, refer to "Section 5.8.1 General operations of table".

POINT
<ul style="list-style-type: none"> ● When performing Row Insertion for a line to which CC-Link remote module is selected, a row for CC-Link remote module will be added. ● If the set CC-Link master module row is deleted in row deletion, the adjacent CC-Link remote module row will be deleted as well. ● Errors may occur when the pasted data content is incorrect. ( (2) in this section) ● Only the selectable module model name can be pasted in the part of module model name. ● In the row where CC-Link master module has been set, if the user pastes module type name row contents beyond the CC-Link master module, the adjacent CC-Link row will be deleted as well. ● When the items are set at the last row, a new row will be added automatically. When the items are set at the last row of CC-Link remote module, a new row for CC-Link remote module will be added. ● When deleting module FB declaration, please delete module FB on program/ FB definition window as well. Otherwise errors may occur in compile.

8.3.3 Operation constant setting

The initial value of operation constant in module FB type can be set in FB property window (☞ Section 5.7.4). In order to set them in FB property window, select module FB in module FB declaration window or select module FB part on FBD sheet. After the selection, the settable operation constant will be displayed in FB property window.



PURPOSE

To set Operation constants.

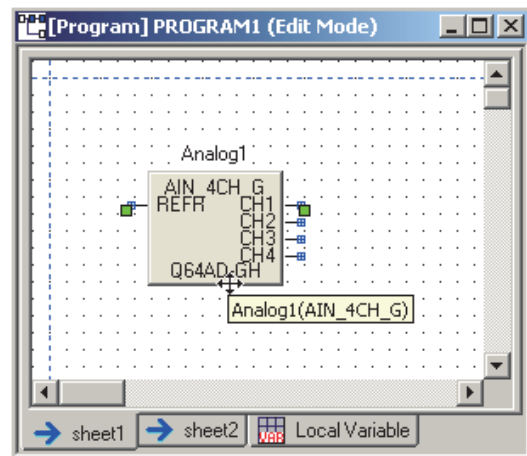
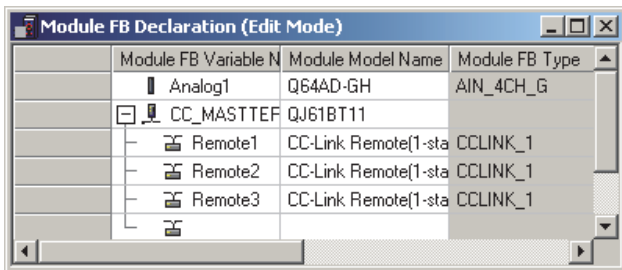


BASIC OPERATION

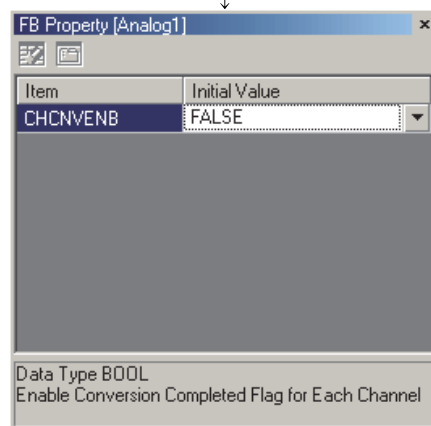
1. Select a FB part in module FB declaration window or select FB parts on FBD sheet.
2. Once the item in step "1" is completed, the settable operation constant will be displayed in FB property window.
3. Set initial value of operation constants in FB property window. (☞ Section 5.7.4)



DISPLAY/SETTING SCREEN



Select module FB (Parts)



Please refer to "PX Developer Version 1 Programming Manual" for details about operation constant of module FB.

POINT

When a module FB is modified and it still has a public variable with the same name and same data type as before the modification, its previous operation constants are taken over.

8.4 Tag FB

Tag is an identification symbol given to various kinds of DDC processing in process control system. Tag data relates with DDC processing and is expressed in tag. By using tag FBs, tag installation can be performed easily.

Once the tag FB is declared in tag FB declaration window, the declared tag FB will be added to tag FB section in parts window. Additionally, the program with DDC processing can be created easily.

The tag data in tag FB and operation constant initial value of process control instructions can be set in FB property window. (☞ Section 8.4.3)

The faceplate can be used to monitor and control the tag data DDC processing status (☞ Section 13.5).

The following list shows the differences between tag FB type and FB type.

Item	Tag FB type	FB type
Tag data	Each tag type has defined structure tag data.	Tag types no tag data.
Variable declaration	Be declared as global variables.	Only be declared as local variables.
User definition	It can be defined by using all function parts and FB parts.	It can be defined by using all function parts and FB parts except tag access FB.

8.4.1 Tag FB declaration window



PURPOSE

To display tag FB declaration window.

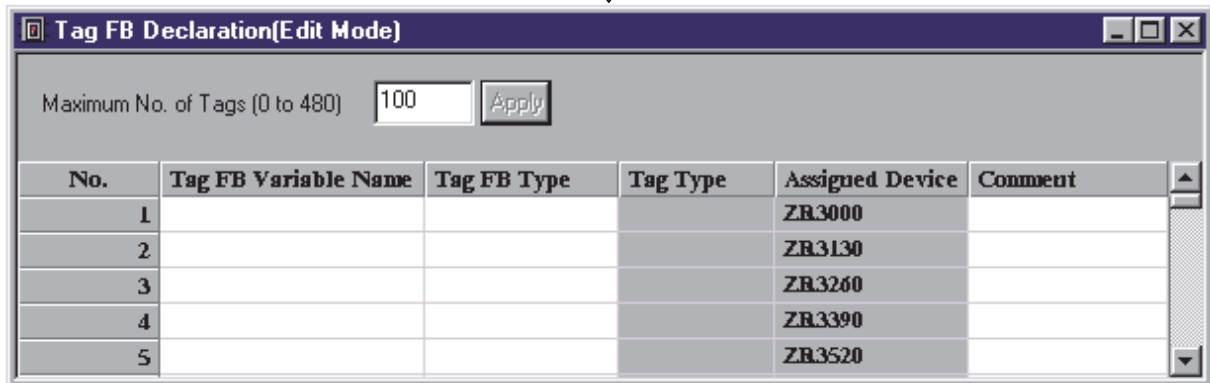
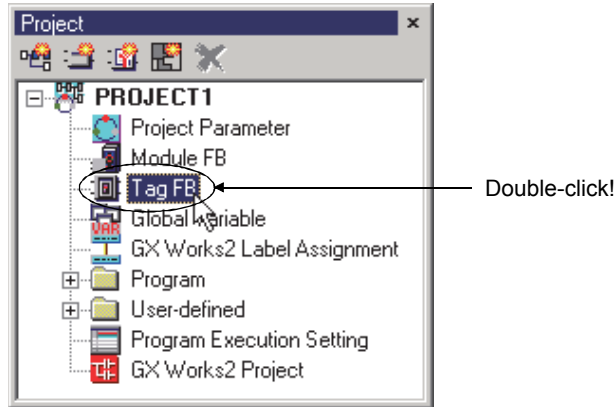


BASIC OPERATION

1. Double-click tag FB icon on the project window.
2. Display tag FB declaration window.



DISPLAY/SETTING SCREEN



8.4.2 Declaring/Editing a tag FB

(1) Tag FB declaration



PURPOSE

Declare a tag FB to use it.

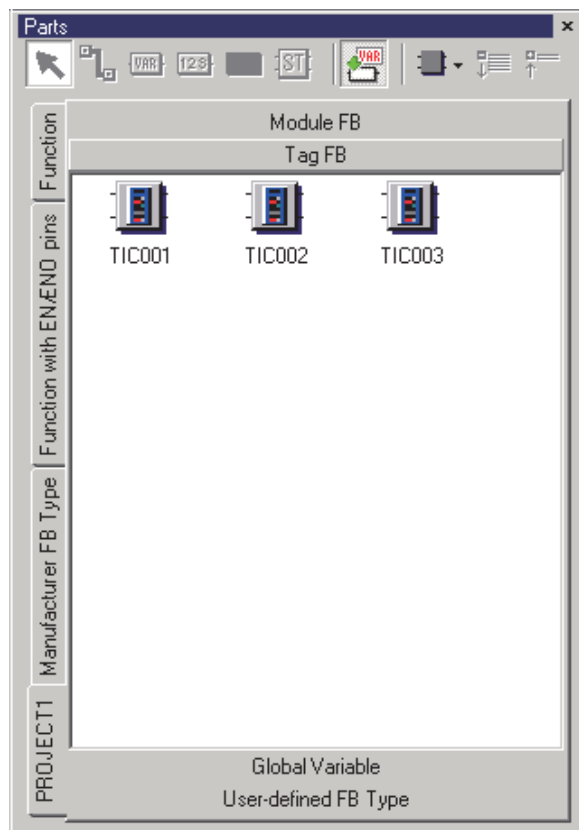
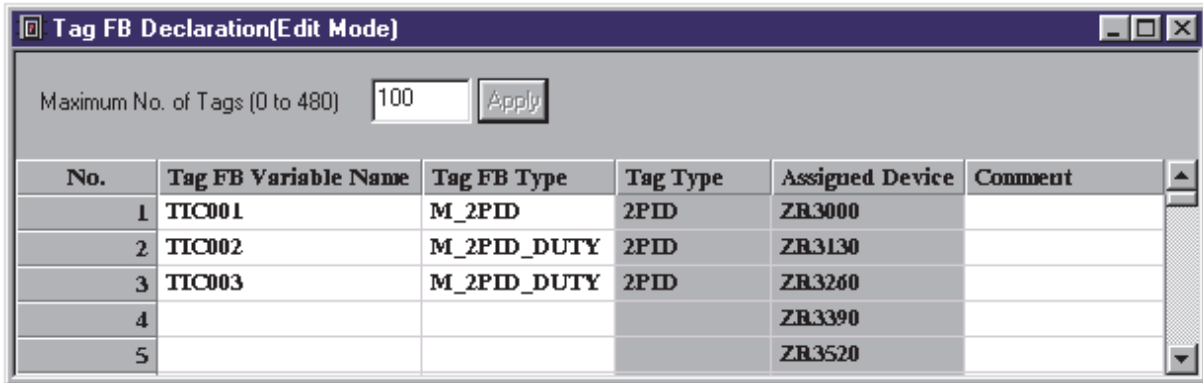


BASIC OPERATION

1. Refer to Section 8.4.1 to display tag FB declaration window.
2. Input data in each item.
3. Parts will be added to tag FB item in parts window after tag FB is declared.







DISPLAY/SETTING SCREEN








DISPLAY/SETTING CONTENTS

Item	Description
Maximum No. of Tags	Display/set maximum tag FB number that can be used. The available range differs depending on the PLC type. To set the number, just select any value within the range and click the "Apply" button. The initial value is 100.
No.	Indicate a row number. Only rows (No.) that have been set by the above maximum No. of tags can be shown. When error occurs in declared tag FB, icons ( or ) will be displayed in the corresponding place.
Tag FB Variable Name	Display/Set tag FB variable name. Tag FB variable name is tag name. Select a cell and input variable name for editing. (Within 32 characters)
Tag FB Type	Display/set tag FB data type. 1. Select the cell of tag FB and click "...". 2. The "Select Data Type" dialog box ( Section 7.11.4) is displayed. 3. Select tag FB type and click the "OK" button. Tag FB type can also be set by inputting directly.
Tag Type	Display tag type of the corresponding tag FB type. (This item cannot be edited)
Assigned Device	Display start address of tag data area in the CPU module used by tag FB type. One tag FB uses 130 points device. The start device is ZR (3000 + start device number*1). (This item cannot be edited)
Comment	Display/set the comments of tag FB. Select a cell and input comment for editing. When the mouse is placed onto the parts on parts window or the faceplate is displayed, comments will be displayed. ( Section 13.5) Comments should be input within 64 characters.

*1: A start device number of file register (ZR) set on the system resource of the project parameter.

POINT

- If the declaration in tag FB declaration window is changed after the tag FB is pasted in FBD sheet, the change will not be reflected in FBD sheet.
For details, refer to Section 8.1.
- If error occurs in the declared data, an error icon will display at the left side of No. ( (2) in this section).
Once the error row is selected, error contents will be displayed in the status bar.
- Tag FB variable cannot share the same name with global variable or module FB variable.
- Errors will occur in hot-start compile ( Section 11.3) or online change compile ( Section 11.4) after maximum No. of tags or tag type is changed.
At this time, please execute cold-start compile. To hold the current value of the variable that is saved in a CPU module, please return to the maximum No. of tags or tag type before changing.
- If tag FB name is changed, the settings on FB properties will be held.
But if the change is made on tag FB type, the settings will not be held.

(2) Error list of tag FB declaration window

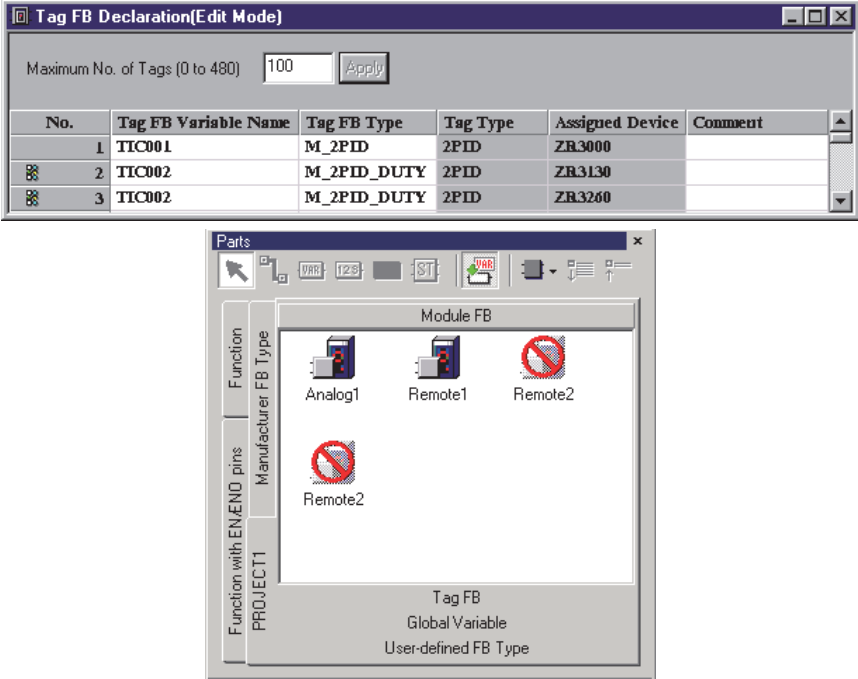
Following list displays possible errors in tag FB declaration window.

Item	Description	Error icon
Maximum No. of tags	<ul style="list-style-type: none"> ● Maximum No. of tag error Error occurs when a minor number of assigned tags are set as the maximum tag number. 	—
Tag FB variable name	<ul style="list-style-type: none"> ● Tag variable name duplication error Error occurs when the existing name as either of global variable name, module variable name and tag FB variable name are set. 	
	<ul style="list-style-type: none"> ● Tag variable name no specification error Error occurs when all the other items have been set except tag FB variable name. ● Tag variable name format error Error occurs when invalid characters (including reserved words*1) are used in tag FB variable name. 	
Tag FB type	<ul style="list-style-type: none"> ● Data type no specification error Error occurs when all the other items have been set except tag FB type. ● Data format error Error occurs when invalid characters are used in tag FB type. ● Data type definition error Error occurs when invalid data type (except tag FB type) is set in tag FB type. 	

*1: For reserved words, refer to Appendix 1.

POINT

If error occurs in declaration contents, tag FB cannot be arranged from parts window on FBD sheet.



Tag FB Declaration(Edit Mode)

Maximum No. of Tags (0 to 480)

No.	Tag FB Variable Name	Tag FB Type	Tag Type	Assigned Device	Comment
1	TIC001	M_2PID	2PID	ZR3000	
2	TIC002	M_2PID_DUTY	2PID	ZR3130	
3	TIC002	M_2PID_DUTY	2PID	ZR3260	

Parts

Module FB

Function
Function with EN/END pins
PROJECT1

Manufacturer FB Type

Tag FB
Global Variable
User-defined FB Type

(3) Editing operations in tag FB declaration window



PURPOSE

To delete an item of the row, insert or delete a row and paste a tag FB declaration list made by Microsoft® Excel® onto tag FB declaration window.



BASIC OPERATION

For details, refer to "Section 5.8.1 General operations of table".

POINT

- The tag FB can be deleted when it is referred to by external variable. When deleting tag FB declaration, please delete tag FB on program/FB definition window. Otherwise error may occur.
- Select [Edit] → [Undo] in menu to recover sections to the status before the change.

8.4.3 Tag data/operation constant setting

The initial value of tag data/operation constant in manufacturer tag FB type can be set in FB property window (☞ Section 5.7.4). In order to set them in FB property window, select tag FB in tag FB declaration window or select tag FB part on FBD sheet. After the selection, the settable tag data/operation constant will be displayed in FB property window.



PURPOSE

To set Tag data/Operation constants.

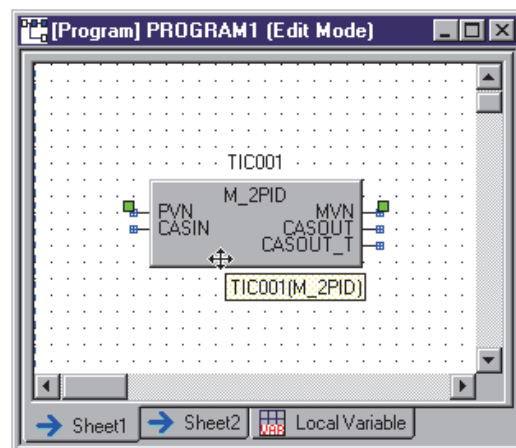
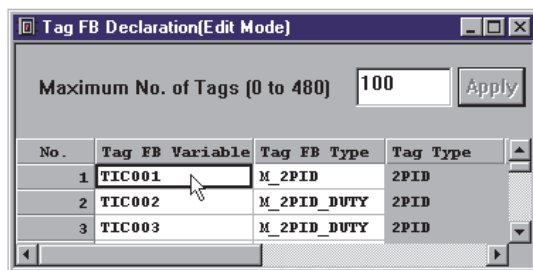


BASIC OPERATION

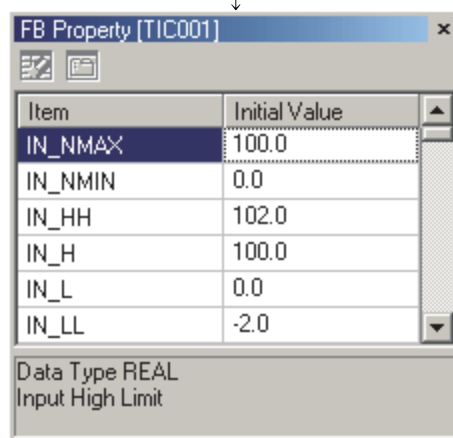
1. Select a FB part in tag FB declaration window or select FB parts on FBD sheet.
2. Once the item in step "1" is completed, a list of settable tag data/operation constants will be displayed in FB property window.
3. Set initial value of tag data/operation constants in FB property window. (☞ Section 5.7.4)



DISPLAY/SETTING SCREEN



Select tag FB (Parts)



(1) Tag Type

Tag type can be classified into four types: loop tag, status tag, alarm tag and message tag.

Classification	Description
Loop tag	Used for loop control processing. Considered as process control dedicated instructions (PID instructions) for CPU module.
Status tag	Used for monitoring and controlling ON/OFF status.
Alarm tag	Used for notify alarm.
Message tag	Used for informing guidance message.

A list of tag type and manufacturer tag FB in each tag type

Classification	Tag type	Name	Manufacturer tag FB
Loop tag	PID	PID control	M_PID(_T), M_PID_DUTY(_T)
	2PID	2-degree-of-freedom PID control	M_2PID(_T), M_2PID_DUTY(_T)
	2PIDH	2-degree-of-freedom advanced PID control	M_2PIDH(_T)_
	PIDP	Position type PID control	M_PIDP(_T), M_PIDP_EX(_T)_
	SPI	Sample PI control	M_SPI(_T)
	IPD	I-PD control	M_IPD(_T)
	BPI	Blend PI control	M_BPI(_T)
	R	Ratio control	M_R(_T)
	ONF2	2 position ON/OFF control	M_ONF2(_T)
	ONF3	3 position ON/OFF control	M_ONF3(_T)
	PFC_SF	Predictive functional control (simple first order lag)	M_PFC_SF_
	PFC_SS	Predictive functional control (simple second order lag)	M_PFC_SS_
	PFC_INT	Predictive functional control (integral process)	M_PFC_INT_
	PGS	Program setter	M_PGS
	PGS2	Multi-point program setter	M_PGS2_
	MOUT	Manual output	M_MOUT
	MONI	Monitor	M_MONI
	SWM	Manual setter with monitor	M_SWM_
	MWM	Manual output with monitor	M_MWM
	SEL	Loop selector	M_SEL(_T1)(_T2)(_T3_)
BC	Batch counter	M_BC	
PSUM	Pulse integrator	M_PSUM	
PVAL	Position-proportional output	M_PVAL_T_	
HTCL	Heating and cooling output	M_HTCL_T_	
Status tag	NREV	Motor irreversible control	M_NREV
	REV	Motor reversible control	M_REV
	MVAL1	ON/OFF control 1 (without intermediate value)	M_MVAL1
	MVAL2	ON/OFF control 2 (with intermediate value)	M_MVAL2
	PB	Push button operation	M_PB_
	TIMER1	Timer 1 (Timer stops when COMPLETE flag is on.)	M_TIMER1
	TIMER2	Timer 2 (Timer continues when COMPLETE flag is on.)	M_TIMER2
	COUNT1	Counter 1 (Counter stops when COMPLETE flag is on.)	M_COUNTER1
COUNT2	Counter 2 (Counter continues when COMPLETE flag is on.)	M_COUNTER2	
Alarm tag	ALM	Alarm	M_ALARM
	ALM_64PT	64-points alarm	M_ALARM_64PT
Message tag	MSG	Message	M_MESSAGE
	MSG_64PT	64-points message	M_MESSAGE_64PT

(2) Operation Constant

All operation constants of the dedicated PID instructions in manufacturer tag FB type can be set for each tag.

Please refer to "PX Developer Version 1 Programming Manual" for details about operation constant of tag FB.

For details of the method for defining operation constant in user-defined tag FB type, refer to Section 8.4.4.

POINT

When a tag FB is modified and it still has a public variable with the same name and same data type as before the modification, its previous operation constants are taken over.

8.4.4 User-defined tag FB type

User-defined tag FB can be defined in programming tool.

User-defined tag FB type consists of function parts and FB parts which are pre-defined in programming tool.

This section explains the methods of creating user-defined tag FB.

For details of user-defined FB type, refer to Section 7.14, for details of structure type, refer to Chapter 9.

(1) Create user-defined tag FB type.

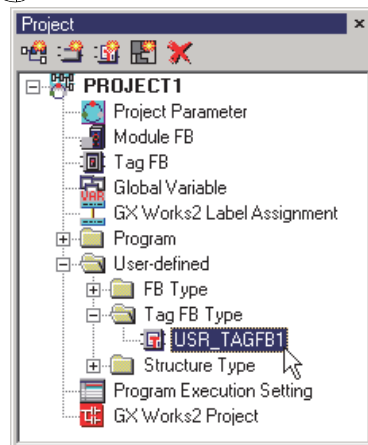


PURPOSE

To create user-defined tag FB type.



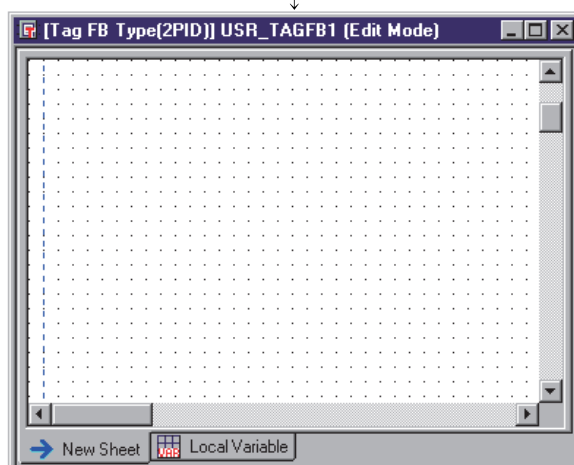
BASIC OPERATION



1. Add data of user-defined tag FB type in project window.

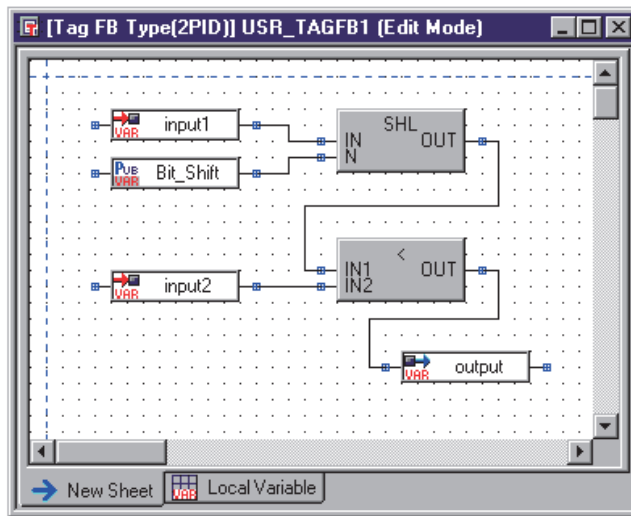
(Hand icon pointing to Section 6.8)

2. Double-click the added user-defined tag FB type icon in project window.



3. Once step 2 is completed, the definition window for the added tag FB type will be displayed.

(To the next page)



4. Arrange FBD parts in the tag FB type sheet of the added tag FB type definition window.

No.	Tag FB Variable	Tag FB Type	Tag Type	Assigned Device	Comment
1				ZR3000	
2				ZR3130	
3				ZR3260	

5. Open tag FB declaration window. (Section 8.4.1)

No.	Tag FB Variable	Tag FB Type	Tag Type	Assigned Device	Comment
1				ZR3000	
2				ZR3130	
3				ZR3260	

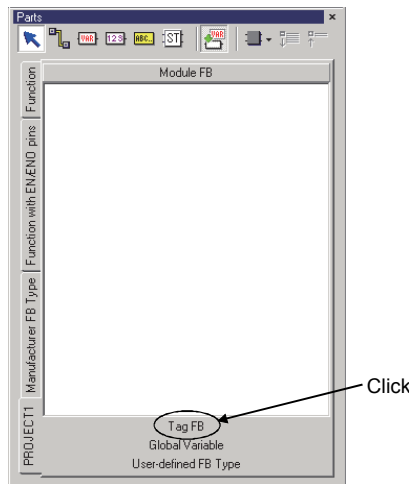
6. Declare tag FB and input data such as tag FB variable name. Here, select the defined tag FB type in step 1 for data type.

Click

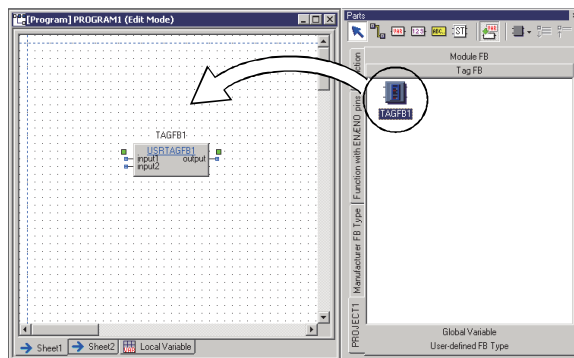
Data Type	Comment
USR_TAGFB1	User-defined Tag FB Type1

7. Click the "OK" button after inputting all the items.

Select the user-defined tag FB type specified in step 1.



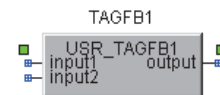
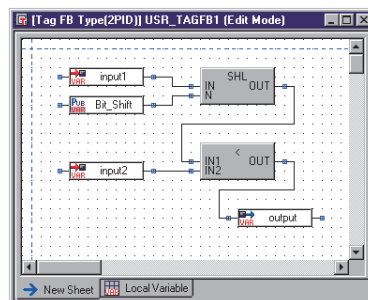
8. Click Project Name tab ([PROJECT1] in left screen) in parts window and click "Tag FB".



9. Once step 8 is completed, declared tag FB icon in step 6 will be displayed. To use defined tag FB please drag and drop this icon on FBD sheet.

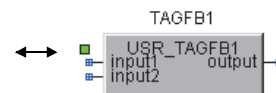
POINT

- Defined tag FB cannot be pasted (cannot be self-pasted) on the FB definition window.
- Tag access FB can be used in user-defined tag FB type. However, if the used tag access FB does not support the tag type of the user-defined tag FB type, the tag access FB cannot be used. For details of tag type that can be pasted to tag access FB, refer to Appendix 2.
- I/O variable are used to realize input/output to the user-defined tag FB. (Input variable is compatible with input pin and output variable is compatible with output pin.)



- User-defined tag FB input pin/output pin order corresponds with the order of I/O variables in local variable sheet.

Internal Variable	Input Variable	Output Variable	Public Variable	Public Variat
No.	Variable Name	Data Type		Comment
1	input1	INT		
2	input2	INT		



(2) How to hold operation constant (public variable) in user-defined tag FB type

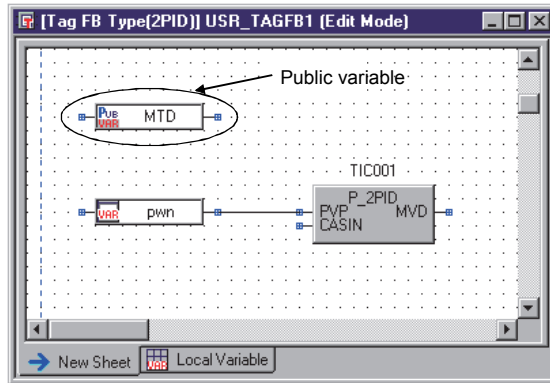


PURPOSE

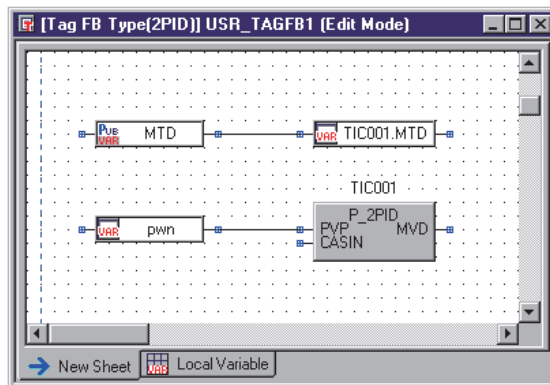
To set initial value of tag FB operation constant that is used in user-defined tag FB directly from user-defined tag.



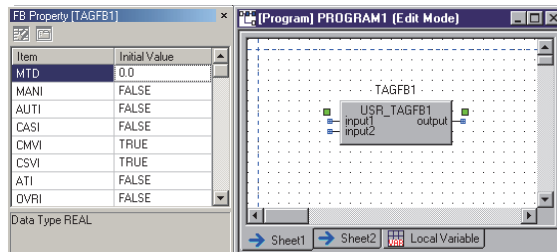
BASIC OPERATION



1. Define public variable (Section 7.3.3) in making user-defined tag FB type.



2. Substitute declared public variable with operation constant of tag access FB. Use variable parts in the substitution.
For example, when operation constant [MTD] named [TIC001] is substituted with tag FB variable name, the variable name of the variable part is defined as [TIC001.MTD].
Connect public variable and variable [TIC001.MTD].



3. Declare tag FB in tag FB declaration window (1) in this section. Select user defined tag FB type in settings of tag FB type.
4. Arrange tag FB (defined above) in FBD sheet.
5. Select the set user-defined tag FB. [MTD] is displayed in the FB Property window.

POINT

The public variable of FB parts can be accessed by attaching [.] to variable name. For details, refer Section 7.3.4.

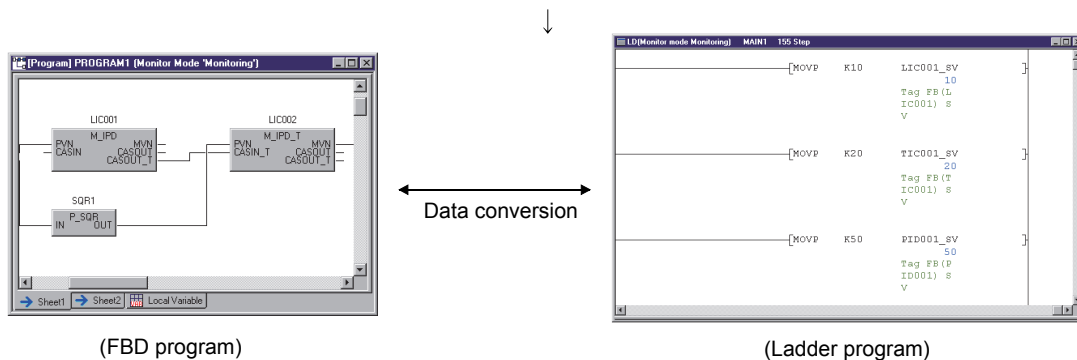
8.5 Exporting Data to GX Application Global Label

In programming tool, global label name in GX project can be set to global parts of programming tool. Thus, global part data (value) can exchange with ladder program data (value).

For example, if changing the setting value (SV value and the like) in ladder program, they can refer to the setting value (PV value and the like) of tag in ladder program.

No.	GX Works2 Global Label	FX Developer Global Variable Name	Comment
1	LIC001_SV	LIC001_SV	Tag FB (LIC001) SV
2	TIC001_SV	TIC001_SV	Tag FB (TIC001) SV
3	PID001_SV	PID001_SV	Tag FB (PID001) SV

Set in the GX Works2 label assignment window.



(FBD program)

(Ladder program)

Data in FBD program can exchange with data in ladder program!

POINT

Describe the loop control using FBD program in programming tool, and describe the sequence control using ladder program in GX application. The data also can be exchanged by using GX label assignment setting.

8.5.1 GX label assignment window



PURPOSE

To exchange data (value) in global part of FBD program and ladder program, the GX label assignment setting must be executed.

Label programming can be performed in GX application by using global part data (value) in programming tool.

For details about label programming, refer to the following manuals:

- GX Works2 Version 1 Operating Manual (Common)
- GX Developer Version 8 Operating Manual



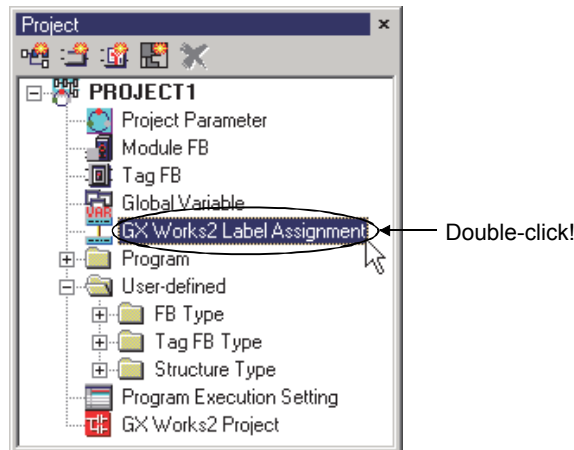
BASIC OPERATION

1. Double-click "GX Works2 Label Assignment" icon*1 on project window.
2. The GX label assignment window is displayed.

*1: When GX project type is GX Developer project, double-click the "GX Developer label Assignment" icon.



DISPLAY/SETTING SCREEN



↓

No.	GX Works2 Global Label	PX Developer Global Variable Name	Comment
1			
2			
3			

8.5.2 Assigning/Editing a GX label

(1) GX label assignment



PURPOSE

Set GX label assignment name to global variable of programming tool.



BASIC OPERATION

1. Refer to Section 8.5.1 to display GX label assignment window.
2. Input data in the sections of the window.



DISPLAY/SETTING SCREEN

No.	GX Works2 Global Label	PX Developer Global Variable Name	Comment
1	LIC001_SV	LIC001_SV	Tag FB (LIC001) SV
2	TIC001_SV	TIC001_SV	Tag FB (TIC001) SV
3	PID001_SV	PID001_SV	Tag FB (PID001) SV



DISPLAY/SETTING DATA

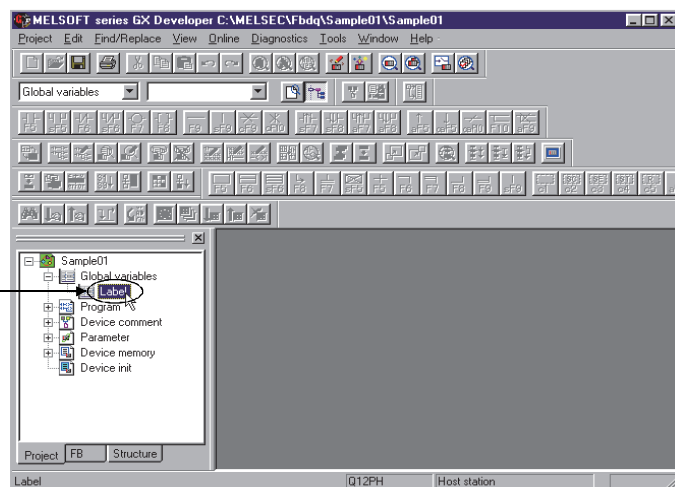
Item	Description
No.	Indicate a row number. Up to No.5000 can be defined. When error occurs in input data, icon (🚫 or 🔴) will be displayed on error.
GX Works2 Global Label *1	Display/set global label name in GX project. Select cell and input label name to edit global label name. When GX project type is GX Works2 project, input label name within 32 characters, as for GX Developer project, input label name within 16 characters.
PX Developer Global Variable Name	Display/set global variable name of programming tool. 1. Select cell of PX Developer global variable name and click "..." to edit PX Developer global variable name. 2. The "Variable Reference" dialog box (👉 Section 7.11.3) is displayed. 3. Select global parts and click the "OK" button. Global variable name can also be set by inputting directly. As shown in the above window, when setting module FB, tag FB and structure type variable, reference operator (👉 Section 7.3.4), reference public variable or member should be applied in it. The settable variable types are global variable, module FB and tag FB.
Comment	Display/set the comments of GX global label. Edit comment by selecting cell and inputting directly. The set comments will be reflected in comments of GX global label. Comment should be input within 64 characters.

*1: When GX project type is GX Developer project, "GX Developer Global Label" is displayed.

POINT

- Note that the total number of the global labels which have already been registered and GX global labels to be registered from PX Developer does not exceed the maximum number of the global labels of GX application. For the maximum number of the global label of GX application, refer to the following manuals:
 - GX Works2 Version 1 Operating Manual (Common)
 - GX Developer Version 8 Operating Manual
- When GX project type is GX Works2 project, the contents of GX Works2 label assignment in programming tool is reflected to the global data (#FBDQ) in GX Works2 project. If the global labels, which are used in a ladder program of GX Works2 project, are deleted using GX Works2 Label Assignment window, an error will occur at compilation. In this case, edit a ladder program in GX Works2 to remove the compile error.
- When GX project is GX Developer project, in GX Developer label assignment, only global label registration and overwriting can be carried out in GX Developer. Even if the sections are deleted in GX Developer label assignment window, the global label at GX Developer side cannot be deleted. (Even if executing compile after sections are deleted) Here, please delete global label at GX Developer side.

Double click



- Global labels are registered to GX Developer by Auto External. Refer to "GX Developer Version 8 Operating Manual" for detailed information about Auto External.
- If the global label name of GX application set with programming tool is inappropriate, a compile error will occur.
- The maximum number of settable label assignment is 5000.
- When error occurs in set data of programming tool, error icon (👉) (3) in this section) will be displayed at the left side of No. Once the error row is selected, the error content will be displayed in status bar.

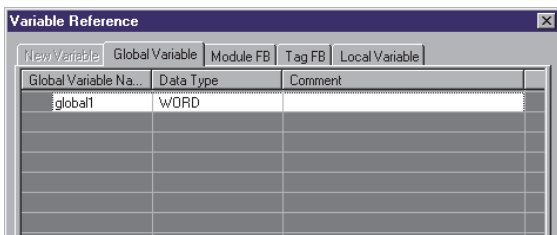
(2) The corresponding data type GX label assignment

Following list summarizes the corresponding data type in programming tool and GX application (device type).

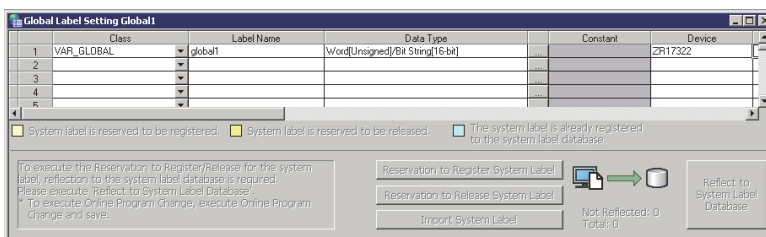
Data type (programming tool)	Data type (GX Works2)	Device type (GX Developer)
BOOL	Bit	BOOL
INT	Word [Signed]	INT
WORD	Word [Unsigned]/ Bit String [16-bit]	INT
DINT	Double Word [Signed]	DINT
DWORD	Double Word [Unsigned]/ Bit String [32-bit]	DINT
REAL	FLOAT (Single Precision)	REAL
STRING GX Works project : within 255 characters GX Developer project : within 50 characters	String (within 255 characters)	STRING (within 50 characters)



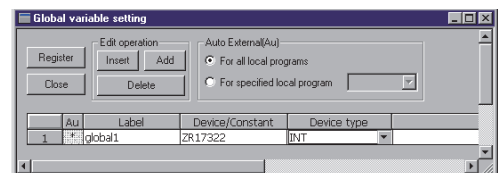
DISPLAY/SETTING SCREEN



(Programming tool)



(GX Works2)






(GX Developer)

POINT

- Error will occur if things (that are not included in the above list) data type at compile.
- If the registered global variable in GX application and tag FB public variable are STRING type (character string), the character number should be fewer than the maximum number shown in the table above. Otherwise error may occur in compile.

(3) Error list of GX label assignment window

Following list summarizes the possible errors in GX label assignment window.

Item	Description	Error icon
GX Works2/ GX Developer global label	<ul style="list-style-type: none"> ● Variable name duplication error Occurring when declared GX application is set. 	
	<ul style="list-style-type: none"> ● Variable name no specification error Occurring when all the other sections have been set except global label of GX application, the global label of GX application is unset in the status of the settings other than global labels of GX application exist. ● Variable name format error Occurring when illegal characters (including reserved word*1) are used in GX global label. 	
PX Developer global variable name	<ul style="list-style-type: none"> ● Global variable no specification error Occurring when all the other sections have been set except PX Developer global name. ● Global variable format error Occurring when illegal characters (including reserved word*2) are used in PX Developer global variable Name. 	

*1: For reserved words for GX Works2, refer to "GX Works2 Version 1 Operating Manual (Common)", as for reserved words for GX Developer, refer to "GX Developer Version 8 Operating Manual".

*2: For reserved words, refer to Appendix 1.



(4) Editing operations in GX label assignment window



PURPOSE

To delete a row of sections, insert a row, delete a row or paste label assignment list made by Microsoft® Excel® onto the GX label assignment window.



BASIC OPERATION

For details, refer to "Section 5.8.1 General operations of table".

POINT

The user can return to the previous status before changing by clicking the [Edit] → [Undo] in the menu after changing.

9 STRUCTURE

This chapter explains the structure definition in the PX Developer programming tool.
The so-called structure is a variables (members) aggregation of the different data types.

9.1 Structure Type Definition Window



PURPOSE

To define the structure type in order to use the structure type data in FBD programs.

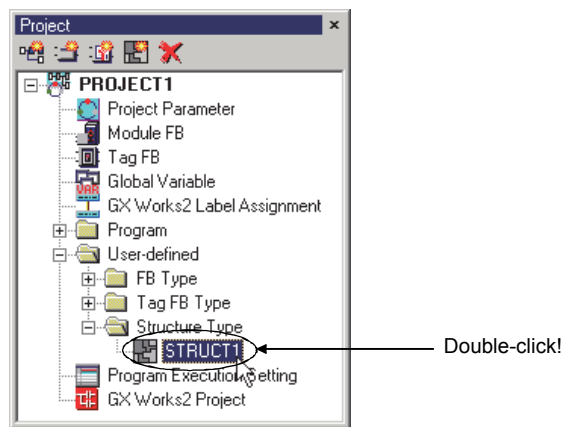


BASIC OPERATION

1. The structure type definition window will be displayed when double clicking the icon of the definition target structure type in the project window.
Therefore, the structure type data shall be added in the project window at first.
(Hand cursor icon Section 6.8)
2. Double-click the icon of the added structure type in the project window.
3. Display the structure type definition window.



DISPLAY/SETTING SCREEN



No.	Member Name	Data Type	Comment
1			
2			
3			

POINT

When a structure type is being opened in allow read only access setting, [Read-only] is displayed in the title bar.

9.2 Defining/Editing a Structure Type Definition Window

(1) Definition of the members



PURPOSE

To define the members of the structure type.

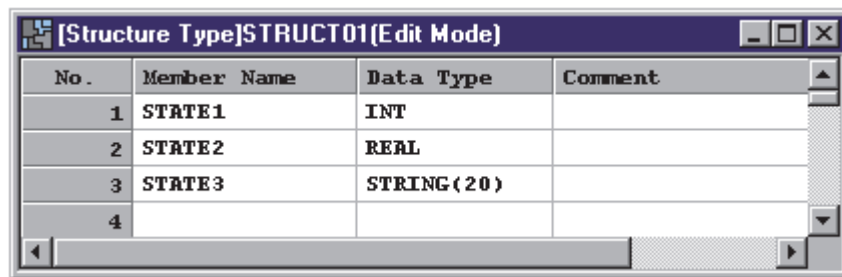


BASIC OPERATION

1. Refer to Section 9.1 and display the structure type definition window.
2. Input the data or value to each item.



DISPLAY/SETTING SCREEN





DISPLAY/SETTING CONTENTS

Item	Description
No.	Indicate a row number. Up to No. 255 can be defined. When an error occurs in the declared member contents, the icon (⊗ or ⊕) will be displayed in the corresponding contents.
Member Name	To display the member name. To select the cell to input the member name in define/edit member name. (Within 32 characters)
Data Type	To display data type. 1. Select the data type cell and click "...". 2. The "Select Data Type" dialog box (☞ Section 7.11.4) is displayed. 3. Select the data type and click the "OK" button. Setting a data type can also be set by inputting directly. Only the elementary data type can be set.
Comment	To display the comments of the members. To select the cell and directly input the comment. Comment should be input within 64 characters.

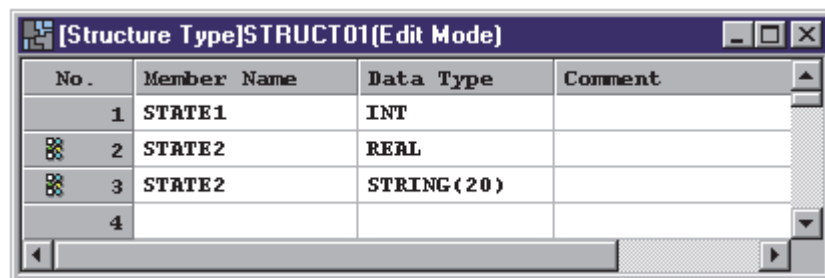
POINT
<ul style="list-style-type: none"> ● 255 members of the structure type can be defined in maximum. ● An error icon will be displayed on the left of the No. When an error occurs in the declared data (☞ (2) in this section), error contents will be displayed in the status bar if selecting the error row. ● Do not use the same name as that of the program or data type in the member name of the structure type. ● After the structure type member is changed, an error will occur if executing the hot-start compile (☞ Section 11.3) or online change compile (☞ Section 11.4). Please execute the cold-start compile under this condition. And please return to the changed contents before changing it if the current value of the variable stored in CPU module needs to be maintained.

(2) Error list in the structure type definition window

The error list in the structure type definition window is shown as below.

Item	Description	Error icon
Member Name	<ul style="list-style-type: none"> ● Member name duplication error This occurs when the defined member name has already been used. 	
	<ul style="list-style-type: none"> ● Member name no specification error This occurs when the member name has not been set and at least one item exists. ● Member name format error This occurs when the incorrect characters (including the reserved words*1) are used in the member name. 	
Data Type	<ul style="list-style-type: none"> ● Data type no specification error This occurs when the data type has not been set and at least one item exists. ● Data type format error This occurs when the incorrect characters are used in the data type. ● Data type specification error This occurs when the data type except elementary data type has been specified in the data type. 	

*1: For reserved words, refer to Appendix 1.



(3) Edit operations in the structure type definition window

**PURPOSE**

To delete one row, insert row and delete row in the structure type definition window, then paste the structure type definition list previously-made by sheets such as Microsoft® Excel® to the structure type definition window.

**BASIC OPERATION**

For the operation methods, refer to "Section 5.8.1 General operations of table".

POINT

- The structure type member can be deleted under the condition that it is refer to by the external variables reference in the program/FB definition window.
The reference to member variable parts in the program/FB definition window should be deleted simultaneously when deleting the structure type member.
An error will occur when executing the compile in the status of the nonexistent member of the reference target.
- The user can return to the previous status before changing by clicking the [Edit] → [Undo] on the menu after changing.

9.3 Reference of Structure Type



PURPOSE

To refer to the structure type member in the FBD programs.
 This section explains how to refer to the structure in FBD programs.



BASIC OPERATION

Methods for referring to the member [STATE1] of the structure type [STRUCT01] will be explained with examples as below.

1. Refer to Section 9.1 and Section 9.2 to define the structure type (STRUCT01) and member.

2. Arrange the variable parts in the FBD sheet. (Section 7.3.2)

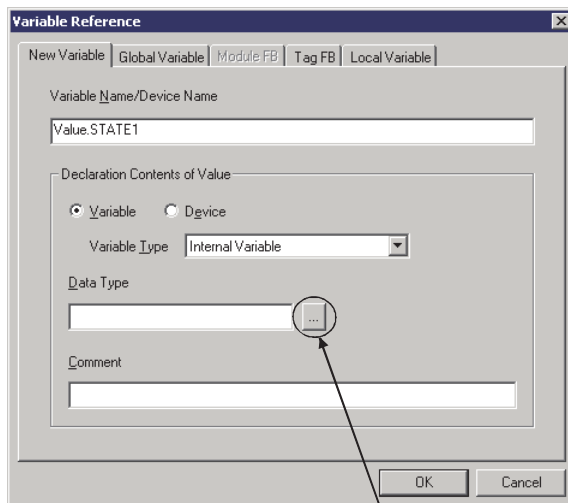
3. Input the variable name. (Section 7.3.3)

Add [.Member name] at the end of the variable name when inputting the variable name. That means to add [.STATE1] at the end of the variable name when referring to the member [STATE1].

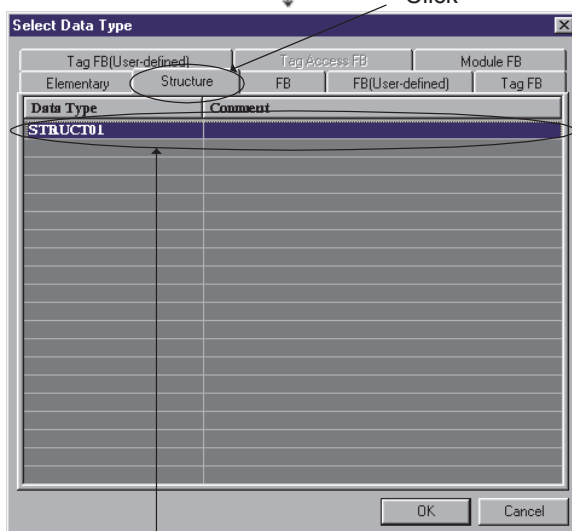
Example: [Value.STATE1]

Input the variable name and press the "Enter" key to display "Refer to variable" dialog box.

4. Select the data type and structure type data here (refer to the left screen).

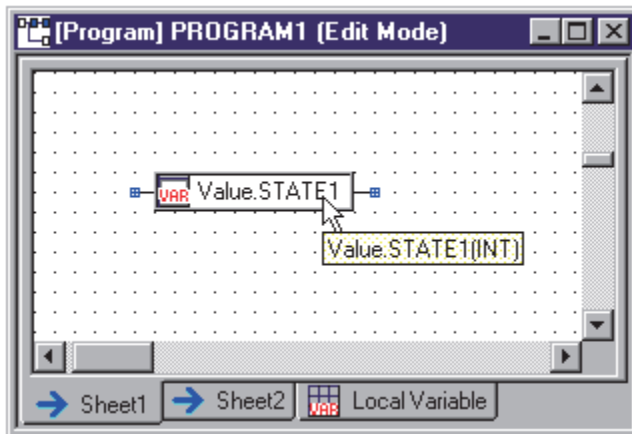


Click



Select the structure type (STRUCT01) defined in the Step 1.

(To the next page)



5. Arrange the variable parts referring to the member [STATE1] of the structure type [STRUCT01] on the FBD sheet.

POINT

- By attaching [.] to the variable name, the structure type member can be referred to as mentioned above, and the public variables of the FB parts can be referred to as well.
For details, refer to Section 7.3.4.
- Place the mouse cursor on the variable part to display the referred member data type when the referred the structure type member is correct.
- In the Step 4, the member cannot be referred to if the elementary data type (such as INT) has been selected. The structure type data should be selected when data type is selected.

10 CONVENIENT FUNCTIONS

This chapter explains the functions that help to create and edit FBD programs with the PX Developer programming tool.

10.1 Cross Reference Function

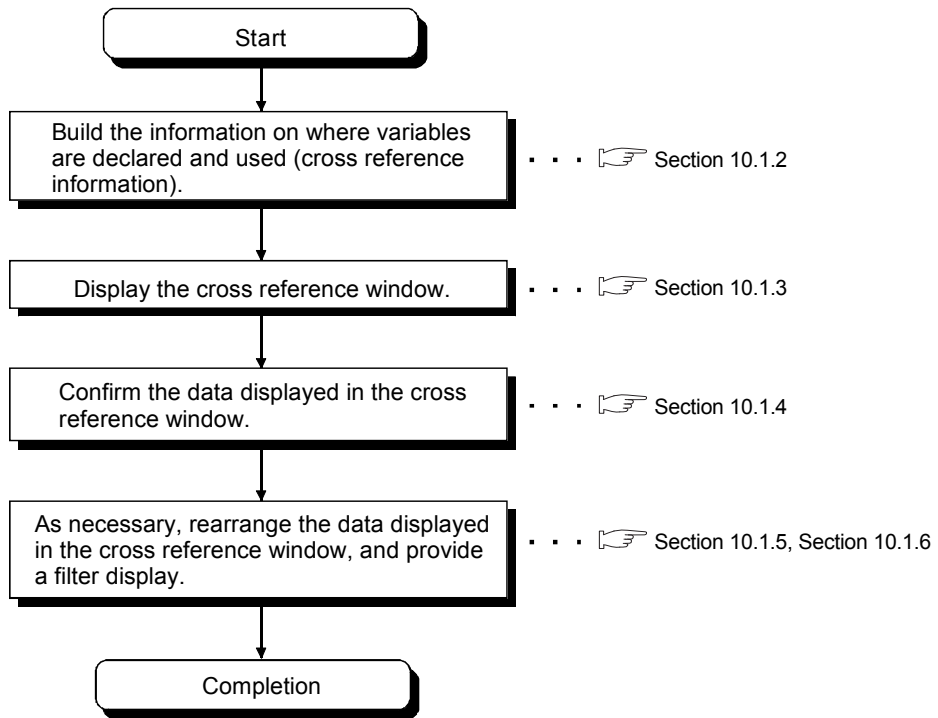
The cross reference function is designed to display where variables are declared and used by the programming tool.

By tracing related variables when modifying of FBD programs, the influence on other processing can be confirmed.

Furthermore this function includes the filter display function that displays only the data that satisfy the specified condition.

10.1.1 Procedure for using the cross reference function

This section explains the procedure for using the cross reference function.



POINT

- Cross reference information must be built to list positions where variables are declared and used in the cross reference window.
To use the cross reference function, first build the cross reference information.
- Use of the cross reference function does not affect the compile status.

10.1.2 Building cross reference information



PURPOSE

To build the information on where variables are declared and used, that will be displayed in the cross reference window.



BASIC OPERATION

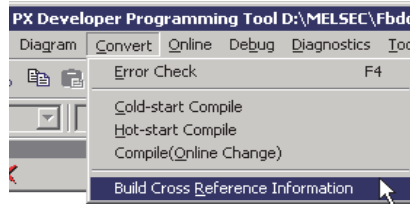
1. Select [Convert] → [Build Cross Reference Information] in the menu.
2. The creation of the cross reference information starts.

While the cross reference information is being built, the progress dialog box is displayed. To stop this operation, press the "Ctrl" + "Break" keys while the progress dialog box is being displayed.

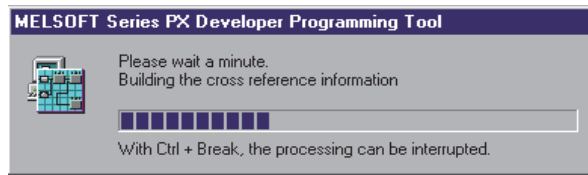
3. When the creation of the cross reference information is complete, the cross reference status icon (Section 10.1.4) in the cross reference window changes to .



DISPLAY/SETTING SCREEN



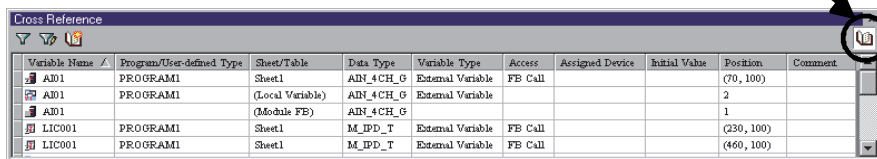
Select [Convert] → [Build Cross Reference Information] in the menu.



To stop creation of the cross reference information, press the "Ctrl" + "Break" keys while the progress dialog box is being displayed.



Cross reference status icon



When the creation of the cross reference information is complete, the cross reference status icon in the cross reference window changes to ().

POINT

- Creation of cross reference information does not affect the compile status.
- Cross reference information can be built in the status where an error exists in an FBD program, etc. (status that will result in a compile error).
- If the project is closed without being saved after creation of the cross reference information, the cross reference information may not match the project data. In this case, build the cross reference information again.
- Cross reference information can also be built in the monitor mode.

10.1.3 Cross reference window displaying method




PURPOSE

To display where variables are declared and used by the programming tool.




BASIC OPERATION

1. Select [View] → [Window] → [Cross Reference] () in the menu.
2. The cross reference window is displayed.



DISPLAY/SETTING SCREEN



Select [View] → [Window] → [Cross Reference] in the menu, or click the  button on the toolbar.



Variable Name	Program/User-defined Type	Sheet/Table	Data Type	Variable Type	Access	Assigned Device	Initial Value	Position	Comment
AD01	PROGRAM1	Sheet1	AN_4CH_G	External Variable	FB Call			(70, 100)	
AD01	PROGRAM1 (Local Variable)		AN_4CH_G	External Variable				2	
AD01	PROGRAM1 (Module FB)		AN_4CH_G					1	
LIC001	PROGRAM1	Sheet1	M_IPD_T	External Variable	FB Call			(230, 100)	
LIC001	PROGRAM1	Sheet1	M_IPD_T	External Variable	FB Call			(460, 100)	

The cross reference window is displayed.

POINT

Cannot open the cross reference information in programming tool that is lower than the version where the cross reference information was created.
For details, refer to Appendix 4.3.

10.1.4 Data displayed in cross reference window

This section explains the items, display/setting description, and listed variables on the cross reference window.

(1) Items and display/setting description on the cross reference window



DISPLAY/SETTING SCREEN
















Variable Name	Program/User-defined Type	Sheet/Table	Data Type	Variable Type	Access	Assigned Device	Initial Value	Position	Comment
AD01	PROGRAM1	Sheet1	AD1_4CH_G	External Variable	FB Call			(70, 100)	
AD01	PROGRAM1	(Local Variable)	AD1_4CH_G	External Variable				2	
AD01	(Module FB)	(Module FB)	AD1_4CH_G					1	
LIC001	PROGRAM1	Sheet1	M_IPD_T	External Variable	FB Call			(230, 100)	
LIC001	PROGRAM1	Sheet1	M_IPD_T	External Variable	FB Call			(460, 100)	



DISPLAY/SETTING CONTENTS



No.	Item	Description								
1)	Variable Name	<p>Displays the variable name or member name.</p> <p>The icon corresponding to the declared or used variable type is displayed on the left of the variable name. (For details of the displayed icons, refer to (2) in this section.)</p> <p>The variable name that uses a reference operator (↵ Section 7.3.4) is also displayed. In this case, the data type displayed in "4) (Data Type)" is that of the variable indicated by the reference operator.</p> <p>Displays the data including bit specification for device variable with bit-specified word device.</p> <p>In this case, displays "BOOL" for "4) Data Type, the same data as the variable name for "7) Assigned Device".</p>								
2)	Program/User-defined Type	Displays the name of the program, user-defined FB type/tag FB type or structure type that has declared or uses the variable.								
3)	Sheet/Table	<p>Displays the name of the declaration window or FBD sheet that has declared or uses the variable.</p> <p>The display description is as follows.</p> <table border="1"> <thead> <tr> <th>Item</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Variable used in FBD sheet</td> <td>The FBD sheet name is displayed.</td> </tr> <tr> <td>Variable declared in corresponding declaration window such as global variable declaration window.</td> <td>The declaration window name (module FB, GX Works2 label assignment, etc.) is displayed.</td> </tr> <tr> <td>Variable used in inline ST</td> <td>"(a name of inline ST part)" after FBD sheet name is displayed.</td> </tr> </tbody> </table>	Item	Description	Variable used in FBD sheet	The FBD sheet name is displayed.	Variable declared in corresponding declaration window such as global variable declaration window.	The declaration window name (module FB, GX Works2 label assignment, etc.) is displayed.	Variable used in inline ST	"(a name of inline ST part)" after FBD sheet name is displayed.
Item	Description									
Variable used in FBD sheet	The FBD sheet name is displayed.									
Variable declared in corresponding declaration window such as global variable declaration window.	The declaration window name (module FB, GX Works2 label assignment, etc.) is displayed.									
Variable used in inline ST	"(a name of inline ST part)" after FBD sheet name is displayed.									
4)	Data Type	<p>Displays the data type of the variable.</p> <p>On the row of the variable that uses the reference operator, the data type of the variable indicated by the reference operator is displayed.</p>								
5)	Variable Type	Displays the type of the variable.								

No.	Item	Description										
6)	Access	<p>Displays how the variable is used. The display contents are as follows.</p> <table border="1"> <thead> <tr> <th>Item</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Position where variable part is used</td> <td>Read*¹ Write*² Read/Write*³</td> </tr> <tr> <td>Position where FB part is used</td> <td>FB Call</td> </tr> <tr> <td>Used in conditional expression of FBD sheet execution condition setting or program execution setting</td> <td>Left Side Right Side</td> </tr> <tr> <td>Other than above</td> <td>(No indication)</td> </tr> </tbody> </table> <p>*1: Indicates the variable part that performs data read. *2: Indicates the variable part that performs data write. *3: Indicates the variable part that performs data read/write.</p>	Item	Description	Position where variable part is used	Read* ¹ Write* ² Read/Write* ³	Position where FB part is used	FB Call	Used in conditional expression of FBD sheet execution condition setting or program execution setting	Left Side Right Side	Other than above	(No indication)
Item	Description											
Position where variable part is used	Read* ¹ Write* ² Read/Write* ³											
Position where FB part is used	FB Call											
Used in conditional expression of FBD sheet execution condition setting or program execution setting	Left Side Right Side											
Other than above	(No indication)											
7)	Assigned Device	<p>Displays the PLC device assigned to the variable declared in the global variable declaration window or tag FB declaration window. The display contents are as follows.</p> <table border="1"> <thead> <tr> <th>Variable type</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Global variable</td> <td>The assigned device of the global variable is displayed. Set the assigned device of the global variable in the global variable declaration window.</td> </tr> <tr> <td>Device variable</td> <td>A device is displayed.</td> </tr> <tr> <td>Tag FB type</td> <td>The assigned device of the tag FB type displayed in the tag FB declaration window is displayed. However, the assigned device of the tag FB used in the FBD sheet is not displayed.</td> </tr> <tr> <td>Other than above</td> <td>(No indication)</td> </tr> </tbody> </table>	Variable type	Description	Global variable	The assigned device of the global variable is displayed. Set the assigned device of the global variable in the global variable declaration window.	Device variable	A device is displayed.	Tag FB type	The assigned device of the tag FB type displayed in the tag FB declaration window is displayed. However, the assigned device of the tag FB used in the FBD sheet is not displayed.	Other than above	(No indication)
Variable type	Description											
Global variable	The assigned device of the global variable is displayed. Set the assigned device of the global variable in the global variable declaration window.											
Device variable	A device is displayed.											
Tag FB type	The assigned device of the tag FB type displayed in the tag FB declaration window is displayed. However, the assigned device of the tag FB used in the FBD sheet is not displayed.											
Other than above	(No indication)											
8)	Initial Value	<p>Displays the initial value of the variable set in the global variable declaration window or FB property window. The display contents are as follows.</p> <table border="1"> <thead> <tr> <th>Variable type</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Global variable</td> <td>The initial value of the global variable is displayed. Set the initial value of the global variable in the global variable declaration window.</td> </tr> <tr> <td>Public variable</td> <td>The initial value of the public variable set in the FB property window is displayed.</td> </tr> <tr> <td>Other than above</td> <td>(No indication)</td> </tr> </tbody> </table>	Variable type	Description	Global variable	The initial value of the global variable is displayed. Set the initial value of the global variable in the global variable declaration window.	Public variable	The initial value of the public variable set in the FB property window is displayed.	Other than above	(No indication)		
Variable type	Description											
Global variable	The initial value of the global variable is displayed. Set the initial value of the global variable in the global variable declaration window.											
Public variable	The initial value of the public variable set in the FB property window is displayed.											
Other than above	(No indication)											

No.	Item	Description																		
9)	Position	<p>Displays the position where the variable is declared/used. The display contents are as follows.</p> <table border="1"> <thead> <tr> <th>Item</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Variable used in FBD sheet</td> <td>The coordinate of the FBD part placed in the FBD sheet (based on the top left of the FBD sheet defined as the origin (0. 0)) is displayed.</td> </tr> <tr> <td>Variable declared in corresponding declaration window such as global variable declaration window.</td> <td>The row number in the corresponding declaration window is displayed.</td> </tr> <tr> <td>Variable used in inline ST</td> <td>The line/column number (the number of characters including tabs from the left end) on the inline ST editor window is displayed.</td> </tr> <tr> <td>Variable used in conditional expression of FBD sheet execution condition setting or program execution setting</td> <td>The conditional expression No. in the "execution condition" of the setting dialog box is displayed.</td> </tr> </tbody> </table>	Item	Description	Variable used in FBD sheet	The coordinate of the FBD part placed in the FBD sheet (based on the top left of the FBD sheet defined as the origin (0. 0)) is displayed.	Variable declared in corresponding declaration window such as global variable declaration window.	The row number in the corresponding declaration window is displayed.	Variable used in inline ST	The line/column number (the number of characters including tabs from the left end) on the inline ST editor window is displayed.	Variable used in conditional expression of FBD sheet execution condition setting or program execution setting	The conditional expression No. in the "execution condition" of the setting dialog box is displayed.								
Item	Description																			
Variable used in FBD sheet	The coordinate of the FBD part placed in the FBD sheet (based on the top left of the FBD sheet defined as the origin (0. 0)) is displayed.																			
Variable declared in corresponding declaration window such as global variable declaration window.	The row number in the corresponding declaration window is displayed.																			
Variable used in inline ST	The line/column number (the number of characters including tabs from the left end) on the inline ST editor window is displayed.																			
Variable used in conditional expression of FBD sheet execution condition setting or program execution setting	The conditional expression No. in the "execution condition" of the setting dialog box is displayed.																			
10)	Comment	<p>Displays the comment of the variable. Set the comment in the corresponding declaration window. Display contents may differ depending on the selecting status of "Comment Reference" check box (☞ Section 5.11 (2)).</p>																		
11)	Toolbar	<p>Click the buttons on this toolbar to edit the filter condition and build the cross reference information.</p> <table border="1"> <thead> <tr> <th>Button</th> <th>Item</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td></td> <td>Filter</td> <td>Click this button to make the filter display valid or invalid.</td> </tr> <tr> <td></td> <td>Edit Filter Condition</td> <td>Click this button to edit the filter condition. (☞ Section 10.1.6)</td> </tr> <tr> <td></td> <td>Build Cross Reference Information</td> <td>Click this button to build the cross reference information. (☞ Section 10.1.2)</td> </tr> <tr> <td></td> <td>Apply Filter</td> <td>The cross reference window is displayed under the filter condition edited in filter condition editing. This button is displayed only while the filter condition is being edited.</td> </tr> <tr> <td></td> <td>Cancel Filter Editing</td> <td>The edited filter condition is discarded. This button is displayed only while the filter condition is being edited.</td> </tr> </tbody> </table>	Button	Item	Description		Filter	Click this button to make the filter display valid or invalid.		Edit Filter Condition	Click this button to edit the filter condition. (☞ Section 10.1.6)		Build Cross Reference Information	Click this button to build the cross reference information. (☞ Section 10.1.2)		Apply Filter	The cross reference window is displayed under the filter condition edited in filter condition editing. This button is displayed only while the filter condition is being edited.		Cancel Filter Editing	The edited filter condition is discarded. This button is displayed only while the filter condition is being edited.
Button	Item	Description																		
	Filter	Click this button to make the filter display valid or invalid.																		
	Edit Filter Condition	Click this button to edit the filter condition. (☞ Section 10.1.6)																		
	Build Cross Reference Information	Click this button to build the cross reference information. (☞ Section 10.1.2)																		
	Apply Filter	The cross reference window is displayed under the filter condition edited in filter condition editing. This button is displayed only while the filter condition is being edited.																		
	Cancel Filter Editing	The edited filter condition is discarded. This button is displayed only while the filter condition is being edited.																		

No.	Item	Description			
12)	Cross reference status	Displays whether the cross reference information has been updated or not.			
		Icon	Applicability	Status	Description
			Applicable	Latest	The cross reference information displayed in the cross reference window has been updated.
				Not the latest	The FBD program has been modified after creation of the cross reference information. Hence, the FBD program does not match the cross reference information. To update the cross reference information, build the cross reference information. (☞ Section 10.1.2)
	Not applicable	—	The cross reference function cannot be used. The cross reference information may not exist. To use the cross reference function, build the cross reference information. (☞ Section 10.1.2)		

POINT

- If the FBD program is modified, it does not match the cross reference information.
In this case, the cross reference status icon changes to ().
To update the cross reference information, build the cross reference information again.
- Immediately after the cross reference information is built, the data are displayed with the filter display invalid.
(All data are displayed in the cross reference window.)
To make the filter display valid, click the "Filter" button (.
- Icons in the "Variable Name" field shows whether the variables displayed in the cross reference window has been declared in the position such as declaration window or used in the position such as FBD sheet
"☒" mark is displayed with the icons, if they are used in an FBD sheet or other position.
For details of icons, refer to (2) in this section.

(2) Variables listed in cross reference window

The cross reference window lists all variables declared in the declaration windows and variables used in the FBD sheets, etc.

The following variables are displayed in the cross reference window.

Declared/Used	Positions where listed variables are declared/used	Variable type	Icon	Reference	
Variable declared in declaration window, etc.	Local variable sheet	Internal variable		(3) (a) in this section	
		Input variable			
		Output variable			
		Public variable			
		Public variable (tag member)			
		External variable			
		Device variable			
		Global variable declaration window	Global variable		(3) (b) in this section
		Module FB declaration window	Module FB type		
		Tag FB declaration window	Tag FB type		
	Structure type definition window (Structure type member)	—			
Variable used in FBD sheet, etc.	<ul style="list-style-type: none"> ● Variable part in FBD sheet ● Variable part used in inline ST ● Conditional expression of FBD sheet execution condition setting 	Internal variable		(3) (d) in this section (3) (e) in this section	
		Input variable			
		Output variable			
		Public variable			
		Public variable (tag member)			
		External variable			
		Device variable			
	FB part in FBD sheet	Module FB type		(3) (f) in this section (3) (g) in this section	
		Tag FB type			
		Other FB types *			
	<ul style="list-style-type: none"> ● Conditional expression of program execution setting ● GX label assignment 	Global variable		(3) (f) in this section (3) (g) in this section	
		Module FB type			
		Tag FB type			

*: FB parts other than the module FB type and tag FB type. (Manufacturer FB type, user-defined FB type/tag FB type)

- (3) Display contents for each position where variable is declared/used
Variable details are displayed in the cross reference window according to where the variable is declared/used as shown below.

The items of the following tables correspond to those of the cross reference windows.

- (a) When the variable registered to the local variable sheet is displayed

Variable Name	Program/User-defined Type	Sheet/Table	Data Type	Variable Type	Access	Assigned Device	Initial Value	Position	Comment
Variable name	Name of program/user-defined FB type/tag FB type that uses the variable	(Local Variable)	Data type	Variable type ^{*1}	No indication	Assigned device is displayed ^{*2}	No indication	Row No. in local variable sheet	Comment

- (b) When the variable declared in the global variable/module FB/tag FB declaration window is displayed

Variable Name	Program/User-defined Type	Sheet/Table	Data Type	Variable Type	Access	Assigned Device	Initial Value	Position	Comment
Variable name	No indication	(Global Variable)/(module FB)/(Tag FB)	Data type/module FB type name/tag FB type name	No indication	No indication	Assigned device is displayed ^{*3}	Initial value is displayed ^{*4}	Row No. in corresponding declaration window	Comment

- (c) When the structure type member is displayed

Variable Name	Program/User-defined Type	Sheet/Table	Data Type	Variable Type	Access	Assigned Device	Initial Value	Position	Comment
Member name	User-defined structure type name	(Structure)	Data type	No indication	No indication	No indication	No indication	Row No. in structure type definition window	Comment

- (d) When the variable part in the FBD sheet or the FB part in the FBD sheet is displayed


Variable Name	Program/User-defined Type	Sheet/Table	Data Type	Variable Type	Access	Assigned Device	Initial Value	Position	Comment
Variable name ^{*5*}	Name of used program/user-defined FB type/tag FB type that uses the variable	Name of used FBD sheet that uses the variable	Data type	Variable type ^{*1}	Read, Write, Read/Write, FB Call	Assigned device is displayed ^{*7}	Initial value is displayed ^{*8}	Coordinate of FBD part placed in FBD sheet	Comment

*1: Any of the internal variable, input variable, output variable, public variable, public variable (tag member), external variable, and device variable is displayed.

*2: Displayed only in the case of the device variable.

*3: Displayed only in the case of the global variable or tag FB type.

*4: Displayed only in the case of the global variable.

*5: The variable name that uses the reference operator ( Section 7.3.4) is also displayed.

In this case, the data type displayed in the "Data Type" field is that of the variable indicated by the reference operator.

*6: Displays the contents including bit specification for device variable with bit-specified word device.

In this case, displays "BOOL" for "Data Type", the same content as the variable name for "Assigned Device".

*7: Displayed only in the case of the global variable or device variable.

*8: In the case of the global variable, the initial value set in the global variable declaration window is displayed.

In the case of the "FB variable name. public variable", the initial value of the public variable set in the FB property declaration window is displayed.

(e) When the variable used in inline ST is displayed

Variable Name	Program/User-defined Type	Sheet/Table	Data Type	Variable Type	Access	Assigned Device	Initial Value	Position	Comment
Variable name ^{*5*} ^{*6*}	Name of program/user-defined FB type that uses the variable	Name of FBD sheet/inline ST part that uses the variable	Data type	Variable type ^{*1*}	Read, Write	Assigned device is displayed ^{*7*}	Initial value is displayed ^{*8*}	Line/column number on the inline ST editor window	Comment

(f) When the variable used in the conditional expression of the FBD sheet execution condition setting is displayed

Variable Name	Program/User-defined Type	Sheet/Table	Data Type	Variable Type	Access	Assigned Device	Initial Value	Position	Comment
Variable name ^{*5*}	Name of program/user-defined FB type/tag FB type that uses the variable	Name of FBD sheet that uses the variable	Data type	Variable type ^{*1*}	Left Side/Right Side	Assigned device is displayed ^{*4*}	Initial value is displayed ^{*8*}	Conditional expression No. in FBD sheet execution condition setting	Comment

(g) When the global part (global variable, module FB type, tag FB type) used in the conditional expression of the program execution condition setting is displayed


Variable Name	Program/User-defined Type	Sheet/Table	Data Type	Variable Type	Access	Assigned Device	Initial Value	Position	Comment
Variable name ^{*5*} ^{*6*}	Name of program that uses the variable	(Program Execution Condition)	Data type	Global Variable/Module FB/Tag FB	Left Side/Right Side	Assigned device is displayed ^{*7*}	Initial value is displayed ^{*8*}	Conditional expression No. in program execution setting	Comment

(h) When the PX Developer global variable name used in the GX Works2 label assignment window is displayed

Variable Name	Program/User-defined Type	Sheet/Table	Data Type	Variable Type	Access	Assigned Device	Initial Value	Position	Comment
PX Developer global variable name	No indication	(GX Works2 Label Assignment)	Data type	Global Variable/Module FB/Tag FB	No indication	Assigned device is displayed ^{*4*}	Initial value is displayed ^{*8*}	Row No. in GX Works2 label assignment window	Comment

*1: Any of the internal variable, input variable, output variable, public variable, public variable (tag member), external variable, and device variable is displayed.

*4: Displayed only in the case of the global variable.

*5: The variable name that uses the reference operator ( Section 7.3.4) is also displayed.

In this case, the data type displayed in the "Data Type" field is that of the variable indicated by the reference operator.

*6: Displays the contents including bit specification for device variable with bit-specified word device.

In this case, displays "BOOL" for "Data Type", the same content as the variable name for "Assigned Device".

*7: Displayed only in the case of the global variable or device variable.

*8: In the case of the global variable, the initial value set in the global variable declaration window is displayed.

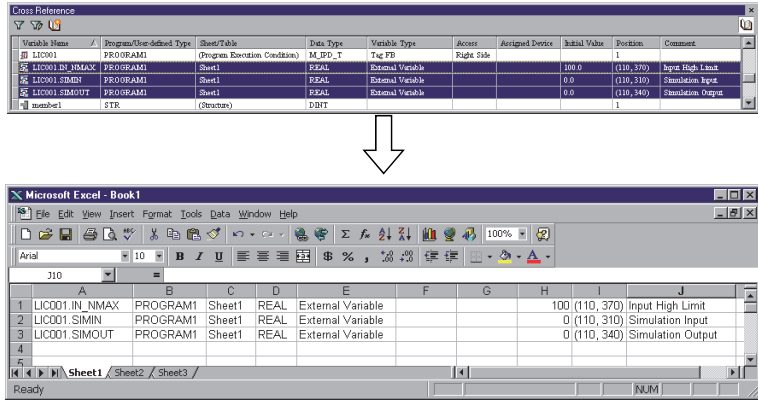
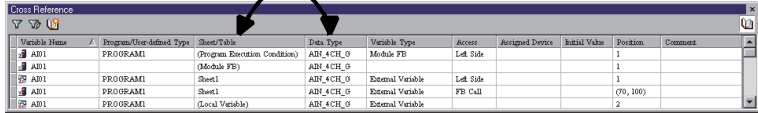
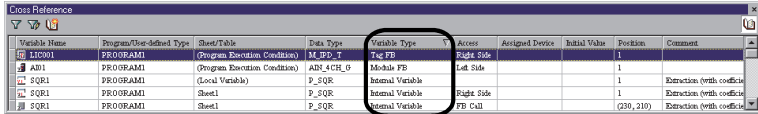
In the case of the "FB variable name. public variable", the initial value of the public variable set in the FB property declaration window is displayed.

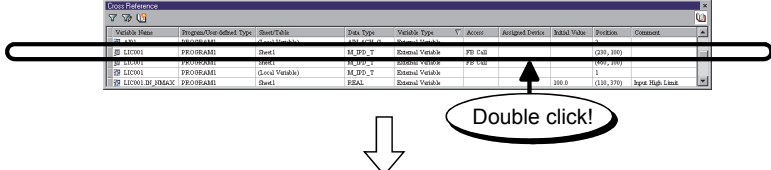
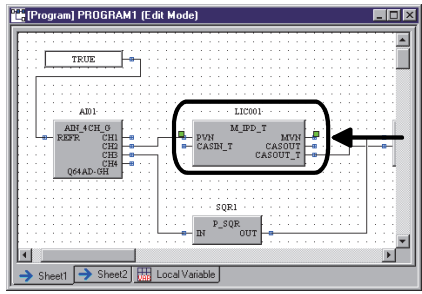
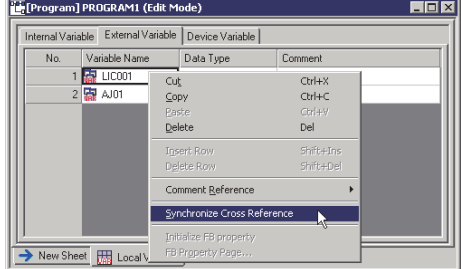
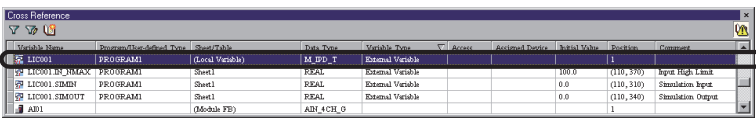
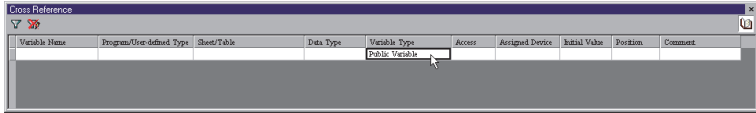
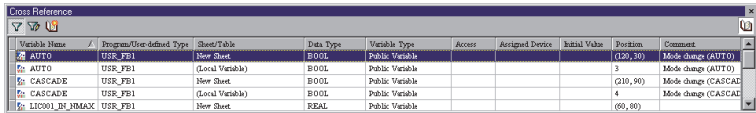
10.1.5 Operations performed in cross reference window



PURPOSE

To execute copy, sort, etc. of the data displayed in the cross reference window.
The following operations can be performed in the cross reference window.

Operation	Description	Reference
Copy	 <p style="text-align: center;">Data of the selected cell is copied to the other application.</p>	(1) in this section
Column interchange	<p style="text-align: center;">Column interchange</p> 	(2) in this section
Data sort	<p style="text-align: center;">Sort in ascending or descending order</p> 	(3) in this section

Operation	Description	Reference
<p>Jump to position where variable is declared/used</p>	 <p>Double click!</p>  <p>Jump to position where variable is declared/used.</p>	<p>(4) in this section</p>
<p>Display the corresponding item in cross reference window</p>	 <p>Click [Synchronize Cross Reference] in the pop-up menu.</p>  <p>Corresponding item in the cross reference window is displayed.</p>	<p>(5) in this section</p>
<p>Filter display</p>	 <p>Filter condition is edited.</p>  <p>Only the data that match the filter condition are displayed.</p>	<p>Section 10.1.6</p>

(1) Data copy

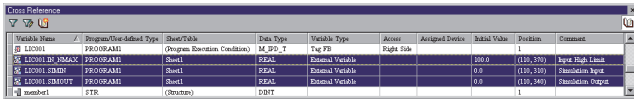


PURPOSE

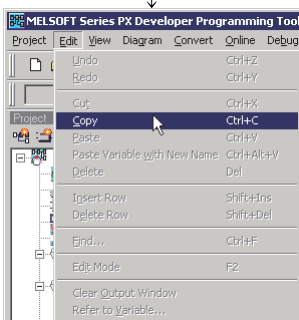
To copy the data displayed in the cross reference window and paste it onto other application.



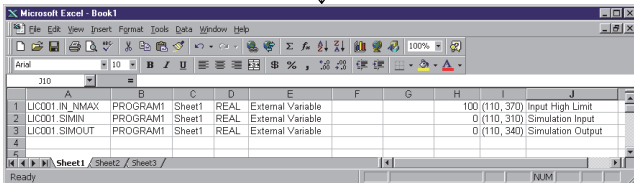
BASIC OPERATION



1. Select the area to be copied.
When copying the data of multiple rows, select multiple rows. (☞ Section 5.8.1)



2. Select [Edit] → [Copy] (📄) in the menu.
Alternatively, click [Copy] in the right-click menu.



3. Paste the data copied in the above step 2. to Microsoft® Excel®, etc.

POINT

- In the cross reference window, only copy of the data in the selected cell is allowed.
Other operations such as cut and paste of the data are not allowed.
- In the cross reference window, data can be selected in units of row.
(This does not apply when editing filter conditions.)
- With cross reference window separated from the programming tool (☞ Section 5.7.1 (1)), copy cannot be executed from [Edit] → [Copy] (📄) in the menu. When cross reference window has been separated from the programming tool, execute copy from [Copy] in the right-click menu (or by pressing the "Ctrl" + "C" keys).

(2) Column interchange



PURPOSE

To interchange the columns in the cross reference window.

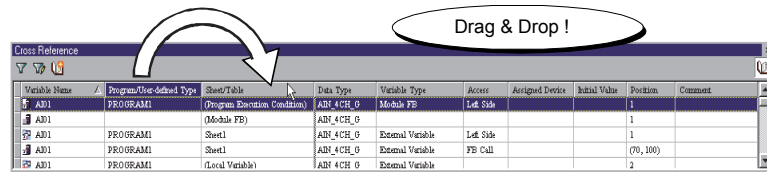


BASIC OPERATION

Drag and drop the header part of the column with the mouse.



DISPLAY/SETTING SCREEN



(3) Data sort



PURPOSE

To sort (rearrange) the data displayed in the cross reference window.



BASIC OPERATION

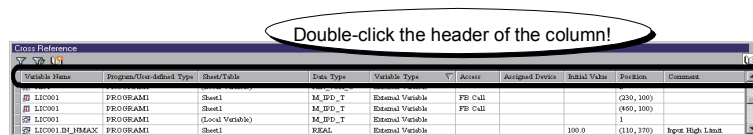
Double-click the header of the column.

The data are sorted on the basis of the double-clicked column in ascending or descending order.

(The sorting order is switched between ascending and descending by double-click.)



DISPLAY/SETTING SCREEN



POINT

- The order of the interchanged display columns is not saved. Exiting the programming tool returns to the initial status.
- Data can be sorted based on one column. To sort data based on multiple columns, use filter display function (👉 Section 10.1.6) together with sort function.

(4) Jump to position where variable is declared/used



PURPOSE

To display where the variable displayed in the cross reference window is declared/used.



BASIC OPERATION

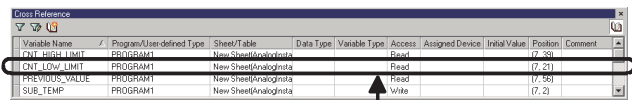
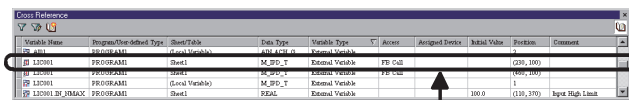
Double-click any row in the cross reference window. The position where the variable is declared/used is displayed.

When it is displayed, the corresponding variable is selected.

When jumping to a variable to be used in inline ST variable, a cursor is displayed on the line and column where the variable is used.

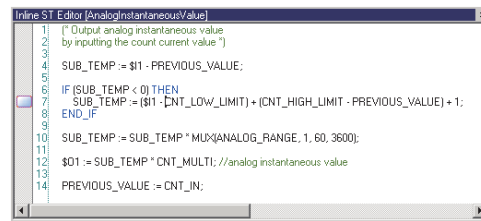
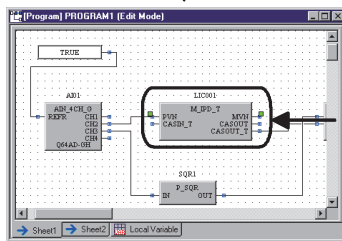


DISPLAY/SETTING SCREEN



Double click!

Double click!



Jump to position where variable is declared/used.

Jump to position where variable is used.

POINT

- When the cross reference status is not the latest (🔄), a jump may not be made to the correct location of variable declaration/use. In this case, build the cross reference information again.
- When the row of the variable used in the conditional expression of FBD sheet execution condition setting or program execution setting is double-clicked, the corresponding variable is not selected. In this case, the following dialog box is displayed.

Row double-clicked in cross reference window	Displayed dialog box
Variable used in the conditional expression of FBD sheet execution condition setting	Corresponding FBD sheet execution condition setting dialog box (👉 Section 7.12.2)
Variable used in the conditional expression of program execution setting	Program execution timing window (👉 Section 7.13.2) *1

*1: The corresponding variable can be searched for in the following procedure.

1. Confirm the program name of the variable double-clicked in the "Program/User-defined type" field of the cross reference window.
2. In the program execution timing window, select the program name that was confirmed in above step 1.
3. Click the button, which is displayed when the program name is selected, to display the program execution setting dialog box (👉 Section 7.13.3).

(5) Display of corresponding item in cross reference window

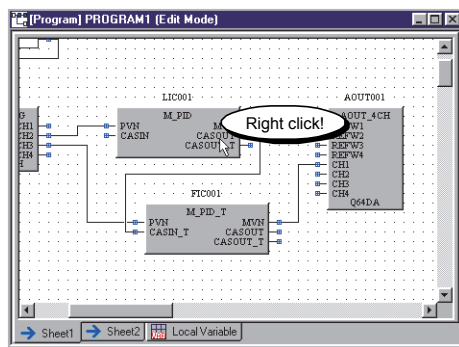


PURPOSE

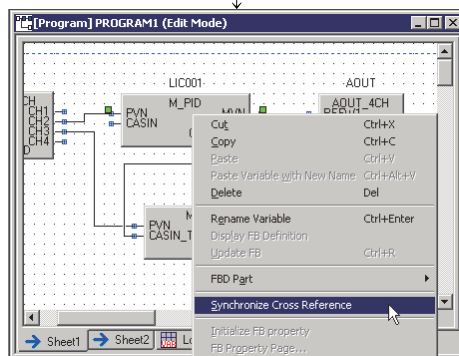
To display the corresponding item of the cross reference window from the variable declared/used in the global variable declaration/module FB declaration/tag FB declaration window, GX label assignment window, structure type definition window, FBD sheet or local variable sheet, inline ST.



BASIC OPERATION



1. Right-click on the variable declared/used in the global variable declaration/module FB declaration/tag FB declaration window, GX label assignment window, structure type definition window, FBD sheet or local variable sheet, inline ST.
Two or more corresponding items of the cross reference window cannot be displayed simultaneously. Select the items and parts one by one.



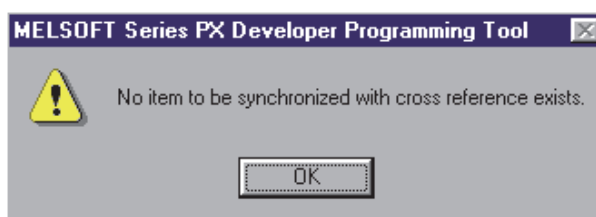
2. Click [Synchronize Cross Reference] in the pop-up menu displayed by right-clicking.

Variable Name	Program/Sheet	Address	Data Type	Variable Type	Access	Assigned Device	Initial Value	Position	Comment
LD0001	PROGRAM1	(Type FB)	M_PID	Global Variable	FB Out	Z23000		1	
LD0002	PROGRAM1	(Global Variable)	LATCH_WORD	Internal Variable				2	Latch FB (WORD) Type
LD0003	PROGRAM1	(Global)	LATCH_WORD	Internal Variable	FB Out			(020, 430)	Latch FB (WORD) Type
LD0004	STB	(Boolean)	DBIT					1	

3. The corresponding item in the cross reference window is displayed.

POINT

- The corresponding item of the cross reference window cannot be displayed from the variable used in the FBD sheet execution condition setting dialog box or program execution setting dialog box.
- During filter condition editing (☞ Section 10.1.6), the corresponding item of the cross reference window cannot be displayed.
- For other than the variables displayed in the cross reference window (☞ Section 10.1.4 (2)), the corresponding item of the cross reference window cannot be displayed.
- When the corresponding item of the cross reference window could not be found, the following dialog box is displayed.



In this case, check either of the following.

1. When the cross reference status is not the latest (⚠), the corresponding item may not be displayed correctly.
In this case, build the cross reference information again.
2. The corresponding item of the cross reference window can be displayed for only the variable displayed in the cross reference window.
For the variable hidden by the filter display function, the corresponding item of the cross reference window cannot be displayed.
In this case, cancel the filter display and then execute [Synchronize Cross Reference].

10.1.6 Filter display function






PURPOSE

To display only the data, which satisfy the specified filter condition, in the cross reference window.

Use this function to list only the variables used in a specific program, for example.



BASIC OPERATION

1. Click the "Edit Filter Condition" button () in the cross reference window.
2. The cross reference window changes to the filter condition editing screen.
If a filter condition was previously specified, the filter condition is displayed.
3. Enter the filter condition. ( (1) in this section)
4. When the entry of the filter condition is completed, click the "Apply Filter" button ()

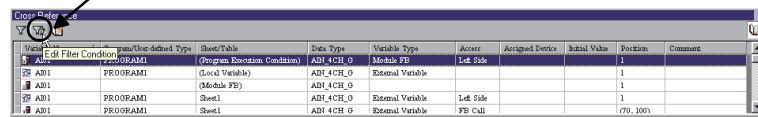
The data that match the filter condition are displayed as a list.

To discard the entered filter condition, click the "Cancel Filter Editing" button

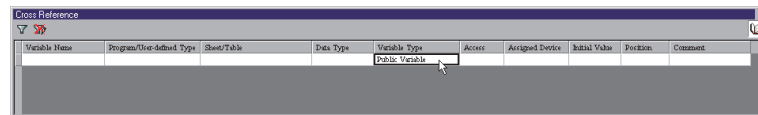


DISPLAY/SETTING SCREEN

Click the "Edit Filter Condition" button!



Variable Name	Program/User-defined Type	Sheet/Table	Data Type	Variable Type	Access	Assigned Device	Initial Value	Position	Comment
AD1	PROGRAM1	(Program Execution Condition)	AD1_4CH_G	Module FB	Init. Sts.			1	
AD1	PROGRAM1	(Local Variable)	AD1_4CH_G	External Variable				1	
AD1	PROGRAM1	(Module FB)	AD1_4CH_G					1	
AD1	PROGRAM1	Sheet1	AD1_4CH_G	External Variable	1st Side			1	
AD1	PROGRAM1	Sheet1	AD1_4CH_G	External Variable	FB Call			(70, 100)	

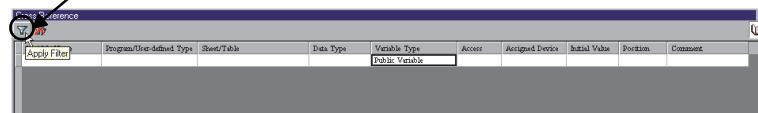



Variable Name	Program/User-defined Type	Sheet/Table	Data Type	Variable Type	Access	Assigned Device	Initial Value	Position	Comment
				Public Variable					

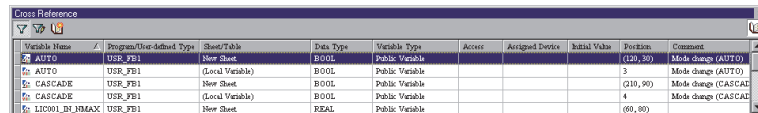
Enter the filter condition on the filter condition editing screen.



Click the "Apply Filter" button!



Variable Name	Program/User-defined Type	Sheet/Table	Data Type	Variable Type	Access	Assigned Device	Initial Value	Position	Comment
				Public Variable					

Variable Name	Program/User-defined Type	Sheet/Table	Data Type	Variable Type	Access	Assigned Device	Initial Value	Position	Comment
fr AUTO	USR_FB1	New Sheet	BOOL	Public Variable				(130, 80)	Mode change (AUTO)
fr CASCADE	USR_FB1	New Sheet	BOOL	Public Variable				(G10, 90)	Mode change (CASCADE)
fr CASCADE	USR_FB1	(Local Variable)	BOOL	Public Variable					Mode change (CASCADE)
fr L1001_B1_NMAX	USR_FB1	New Sheet	REAL	Public Variable				(69, 80)	

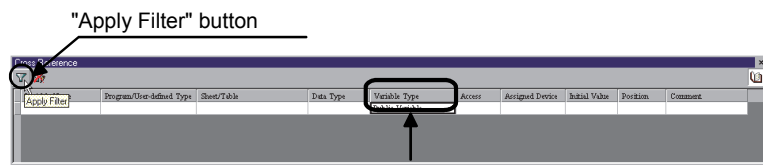
With the filter valid, the cross reference window is displayed.

(1) Editing the filter condition

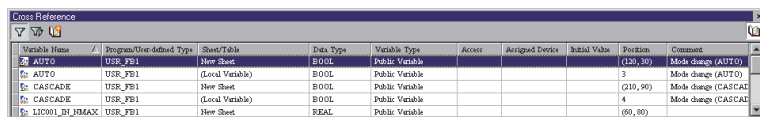
Specify the filter condition using a character string, numeral or wildcard character (refer to (a) below).

On the filter condition editing screen, display data can be cut, copied, pasted and/or deleted in the [Edit] menu or in the pop-up menu displayed with a right-click. (→ Section 5.5 (5))

(Example) When displaying only the variables whose variable type as public variable



Enter Public variable in the "Variable Type" field and click the "Apply Filter" button.



Only the variables typed as public variable are displayed.

(a) Editing the filter condition using a wildcard character

A wildcard character can indicate one or more characters.

The following wildcard characters can be used for editing the filter condition.

Wildcard characters applicable for editing the filter condition

Wildcard character	Description
?	Indicates any one character (including numeral). For example, when "P_?" is specified as the filter condition, "P_<", "P_=", "P_>", etc. match the filter condition.
*	Indicates any characters (0 or more characters). For example, when "M_2PID*" is specified as the filter condition, "M_2PID", "M_2PID_T", "M_2PID_DUTY", "M_2PIDH_", "M_2PIDH_T_", etc. match the filter condition.
#	Indicates any one numeral. For example, when "M_TIMER#" is specified as the filter condition, "M_TIMER1", "M_TIMER2", etc. match the filter condition.
[Character string]	<ul style="list-style-type: none"> Indicates characters in a specific range when "-" (hyphen) is used within []. For example, when "[a-z]" is specified as the filter condition, a to z and A to Z (alphabets) match the filter condition. Indicates any one character within []. It is used to specify a wildcard character as the filter condition. For example, when "[*]" is specified as the filter condition, "*" matches the filter condition.
[!Character string]	Indicates a character string that does not correspond to the above [Character string]. For example, when "[!a-z]" is specified as the filter condition, character strings other than alphabets match the filter condition.

POINT
<ul style="list-style-type: none"> ● The filter condition is case insensitive. For example, when "[a-z]" is specified as the filter condition, a to z and A to Z match the filter condition. ● When specifying a range as in [a-z], specify the range in ascending order. When a range is specified in descending order as in [z-a], the filter condition is invalid. ● Blank characters, which are entered at both ends of the filter condition, are ignored. ● The filter condition can be specified for multiple columns together. When the filter condition is specified for multiple columns, the AND condition of the multiple columns is the filter condition. ● When the variable that does not include an initial value (the area where the blank in the cross reference window) is used as the filter condition, enter [] as the filter condition.

(b) Filter condition entry example

The entry examples of the filter condition are indicated below.

Entry example	Examples that match the filter condition	Examples that do not match the filter condition
a?a	aaa, aba, aAa	abca, aAAa
ab*	abc, abcdefg	cab, acb
a*a	aa, aba, ABa, aBBCCa	abc, aBC
ab	abc, AABB, Eab, EAB, abE	Eac, aac
a[*]a	a*a	aa, aba, ABa, aBBCCa
a#a	a0a, a1a, a2a	aaa, a10a
[a-z]	a, A, b, B, c, C	1, 2, <, &
[!a-z]	1, 2, <, &	a, A, b, B, c, C
[!0-9]	a, A, <, &	0, 1, 2, 9
a[!a-c]#	ad0, Ae0, a71	aa0, aB1

10.2 FB Property Page



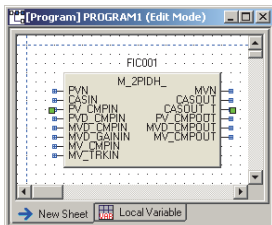
PURPOSE

To input and display FB Property easily with dedicated screen.
The following shows the target FBs.

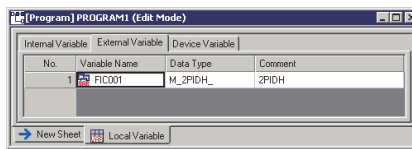
Category I	Category II	FB
Manufacturer FB	Tag FB	2-degree-of-freedom advanced PID control (M_2PIDH(_T)_)
		Program setter (M_PGS)
		Multi-point program setter (M_PGS2)
	General process FB	Function Generator (P_FG)
Inverse Function Generator (P_IFG)		
User defined FB	Tag FB	FB whose tag type is "PGS"



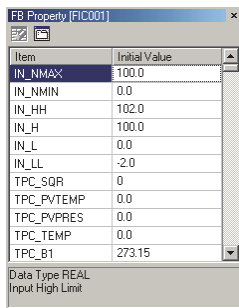
BASIC OPERATION



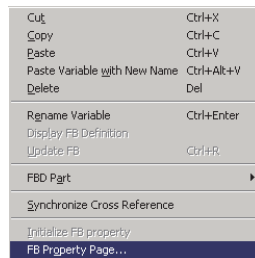
(FBD sheet)



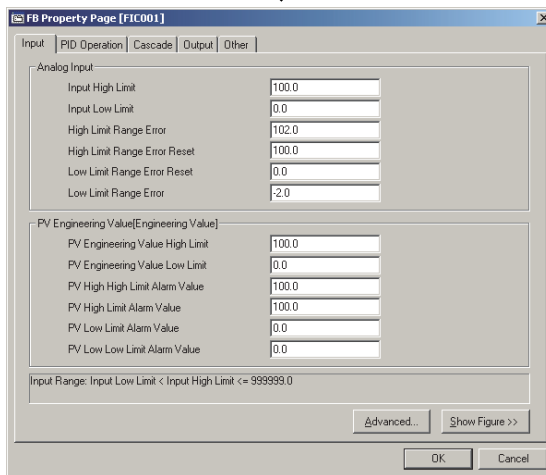
(Local Variable Sheet)



(FB Property Window)

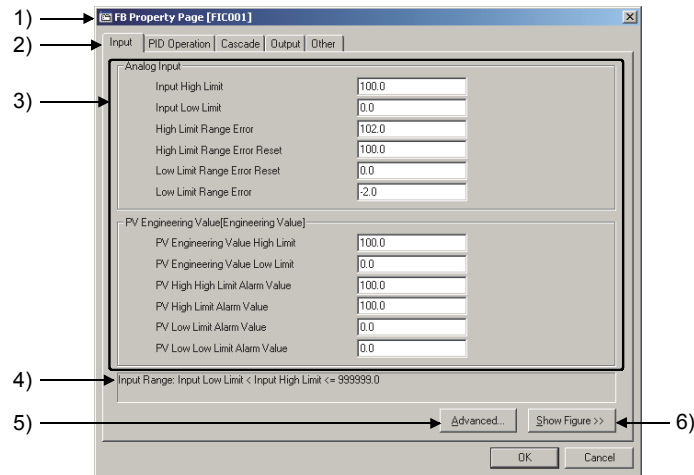


(pop-up menu)



1. Set to the edit mode.
(Section 13.1.3)
2. Select the FB with FBD sheet or Local Variable Sheet on each declaration window or program/FB Definition window.
3. Click the button on the FB Property Window or select [FB Property Page] on the pop-up menu displayed by right-clicking.
4. FB Property Page is displayed.

 **DISPLAY/SETTING SCREEN**



 **DISPLAY/SETTING DATA**

No.	Item	Description
1)	Title Bar	Displays the target FB variable name in [].
2)	Setting item tab	Displays the function classification of the target setting item.
3)	Setting data display	Displays the setting target data. The contents differ depending on FB type.
4)	Input range, error detail display	Displays the input range and error message on the target FB property item. (For errors during input check, refer to (1) in this section.)
5)	Advanced Setting button	Displays the screen for advanced function setting.
6)	Show Figure/Hide Figure switching button	Displays the illustration for the FB property item being selected. The illustration differs depending on the item type. (For display example of the screen, refer to (2) in this section.)

POINT

For details on each setting item, refer to "PX Developer Version 1 Programming Manual".

(1) Error and warning in input check

The input value of FB property is checked if it is valid. The following table shows the background color to the check result.

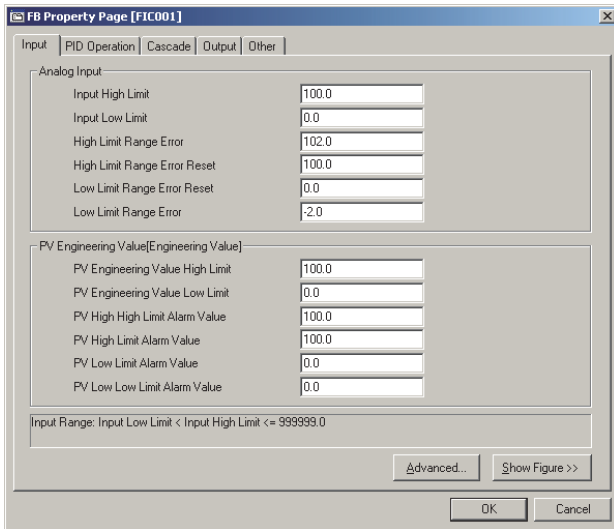
Input check result	Background color
Valid	White
Error	Red
Warning	Yellow

- If the result is "Error"
The setting value is inconsistent or provokes CPU abnormal operation. Click an error point and correct the value following the error detail displayed in the error detail display. The window cannot be closed with the OK button without correction.
- If the result is "Warning"
The setting value is not within value range and other than the use to be recommended. Click the warning point and confirm the contents in explanation display.

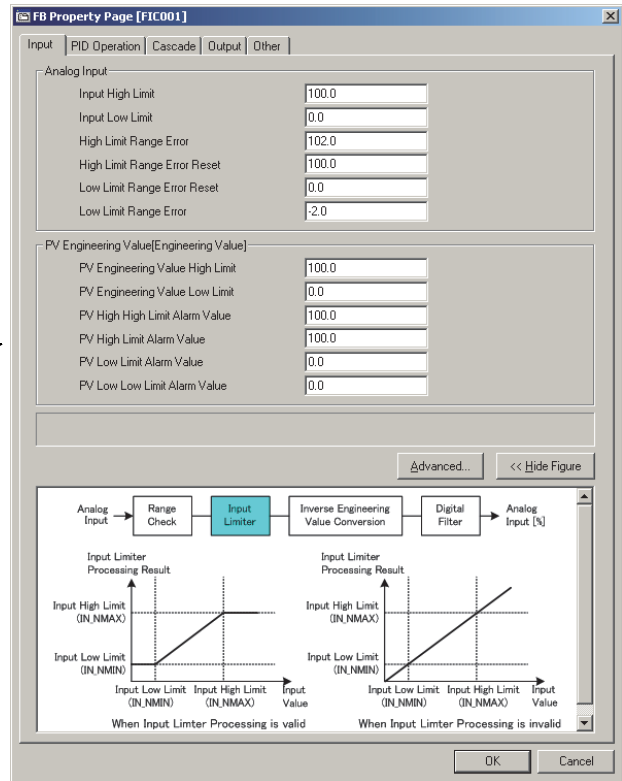
(2) Switching Show Figure/Hide Figure

The following diagrams show the example when switching a display with the "Show Figure"/"Hide Figure" switching button.

<Display without a figure>

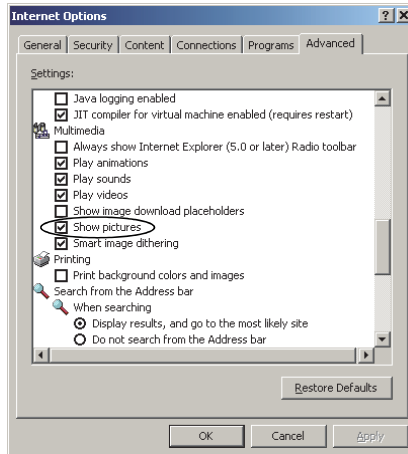


<Display with a figure>



POINT

- When displaying a dialog box at maximum size during diagram display, the diagram will not be displayed any longer (While a dialog box is displayed at maximum size, the Show Figure/Hide Figure switching button is disabled).
- To display a figure, check the [Show pictures] in the Advanced Tab of Microsoft® Internet Explorer property (checked at default).



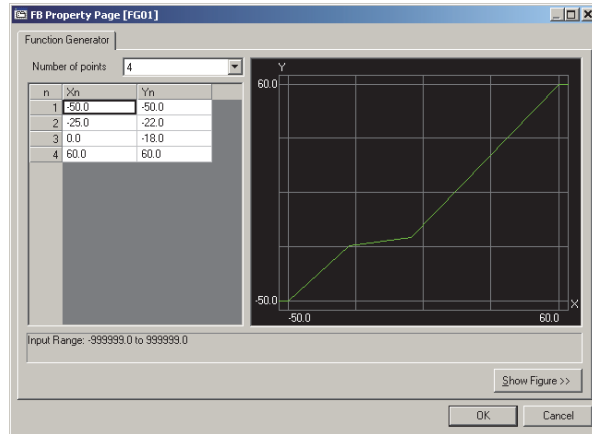
(3) Screen transition

A screen display changes by switching the tabs in the following table. Clicking the "Set" button on the <<Other>> tab switches the screen.

FB type	Tab name	Advanced setting tab/screen
M_2PIDH(_T)_	Input	PV Engineering Value, Temperature Pressure Compensation, Function Generator, First Order Lag, and PV Compensation
	PID Operation	2-degree-of-freedom PID Operation and SV Setting
	Cascade	—
	Output	MV Output, MV Output Selection, and MV Compensation
	Other	Mode Disablement, Disable Alarm Detection, Alarm Level, and Monitor Tool Display
M_PGS, Tag types of user-defined tag FB (PGS)	Program Setting Device	—
	Other	Mode Disablement, Disable Alarm Detection, Alarm Level, and Monitor Tool Display
M_PGS2_	Program Setting Device	General
	Other	Mode Disablement, Disable Alarm Detection, Alarm Level, and Monitor Tool Display
P_FG, P_IFG	Function Generator	—

(4) Setting coordinates for Function Generator

Coordinates for a Function Generator can only be entered by the number set in Number of points as the screen below.



Coordinates for the Function Generator can only be reflected to a FB by the number of displayed points.

All undisplayed coordinates are set as (0, 0) to the FB.

Coordinates for a Function Generator can be copied from such as Excel® and be pasted on the screen.

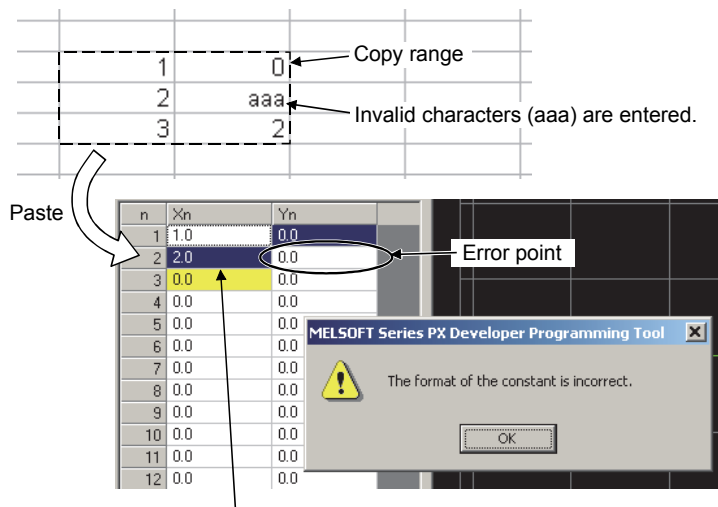
When multiple coordinates for a Function Generator are entered with the paste function at a time and an input error occurs in a setting item, all entries before the setting item is fixed.

(An entry processing after the error point is cancelled.)

After the entry is fixed, the color of the fixed cell is inverted.

Correct the error cause in the cell next to the one inverted and reenter the coordinate.

<Example when an error occurs at pasting>



Coordinates in the third line cannot be entered due to an error of Y coordinate in the second line.

11 COMPILING FBD PROGRAM

The FBD programs created by PX Developer programming tool can be checked with the error check function before compile.

The FBD programs created by programming tool can be converted to executable code (the ladder program) by compile.

The compile methods can be classified as the following three types.

- Cold-start compile (☞ Section 11.2)
- Hot-start compile (☞ Section 11.3)
- Online change compile (☞ Section 11.4)

This section first explains how to check for errors of programs created by the programming tool, how to compile the programs and the error examples caused by compile operation.

11.1 Error Check



PURPOSE

With error check, the FBD program error can be found out before compile.

Besides, errors can be checked in compile.

The errors can be found out and corrected in the program/FB definition module by checking one FBD program beforehand.

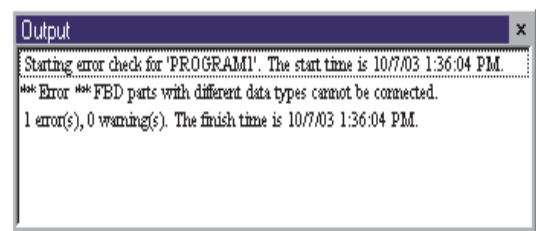
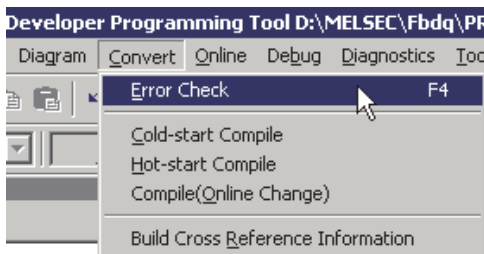


BASIC OPERATION

1. Activate the program/FB definition window for error check.
2. Click [Convert] → [Error Check] (☞) on the menu.
Or press the "F4" key.
3. Error check will be executed immediately after performing the Step 2. The results of the error check are displayed in the output window (☞ Section 5.1).
4. Double-click the error messages or warning in the output window to display the screen of the error positions (only when selecting the message including the editing screen or setting screen of the FBD sheet).



DISPLAY/SETTING SCREEN



Click [Convert] → [Error Check] on the menu or click ☞ on the toolbar.

Display the error check results in the output window.



POINT

The error check is only for one program/FB.

11.2 Cold-start Compile





PURPOSE

The cold-start compile means to convert the FBD programs to the executable codes (ladder programs, PLC parameters) in a CPU module. The cold-start compile should be first executed when creating and compile the FBD programs. Then the hot-start compile ( Section 11.3) or online change compile ( Section 11.4) should be executed for maintaining the current status during the process of running, and adding or changing the FBD program processing.

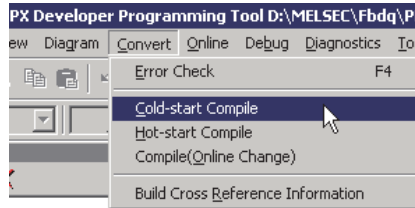



BASIC OPERATION

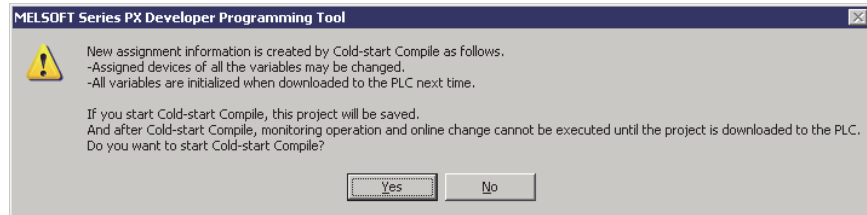
1. Click [Convert] → [Cold-start Compile] () on the menu.
2. Display the "Confirm" dialog box to confirm starting cold-start compile. Click the "Yes" button to start the cold-start compile.
3. Start the cold-start compile.
4. Results of the cold start compile are displayed in the output window ( Section 5.1).
Press the "Ctrl" + "Break" keys during compile to interrupt cold-start compile.
5. When detecting an error or compile failure, shoot the trouble with the reference to warnings or error messages displayed in the output window. Then execute the compile once again.



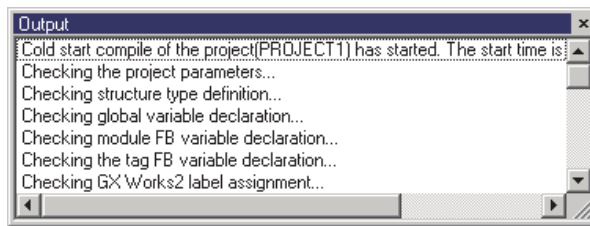
DISPLAY/SETTING SCREEN



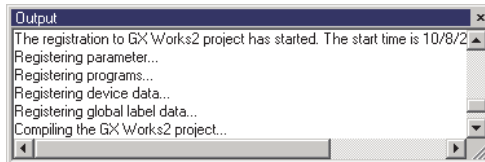
Click [Convert] → [Cold-start Compile] on the menu or click  on the toolbar.



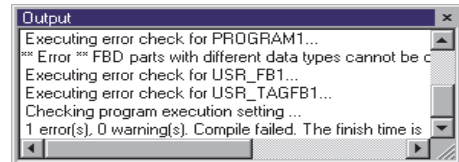
Click the "Yes" button on the dialog box to confirm starting cold-start compile.



Display the project name and compile type when starting to compile.



(When the compile is successful)



(When the compile fails)



HELPFUL OPERATION (1)

The following dialog box will be displayed if program on GX application side is not converted or compile is executed when PLC parameter/global label setting screen is displayed.



In this case please convert GX application program or close the PLC parameter/global label setting screen.

Convert the program of GX application by selecting [Compile] menu in GX Works2. As for GX Developer, select [Convert] → [Compile] menu.

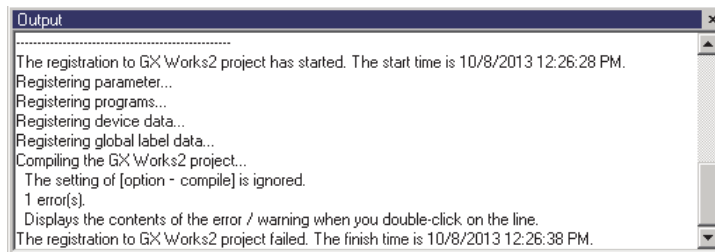
For details, refer to the following manuals:

- GX Works2 Version 1 Operating Manual (Common)
- GX Developer Version 8 Operating Manual

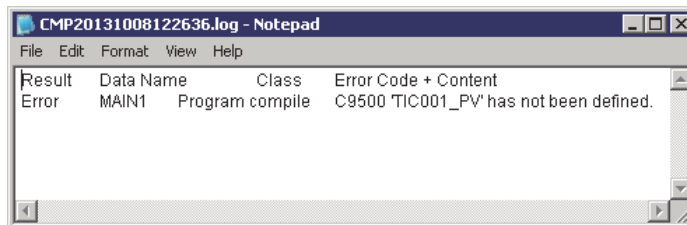


HELPFUL OPERATION (2)

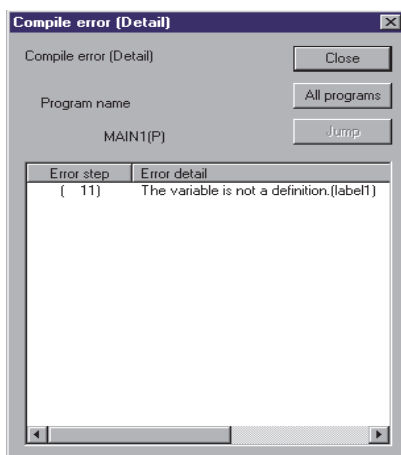
When GX project type is GX Works2 project, the error content is displayed on the output window at compilation error occurrence, and the processing will be broken.



Double-click the "Displays the contents of the error/warning when you double-click on the line." to display error contents (log file in the text format).



When GX project type is GX Developer project, the following dialog box is displayed after compilation completed in case a compile error has been occurred.



(Jumping into the error position is disabled by clicking "Jump" button)

At this time, execute compile again after modifying the error part of GX project.

POINT

- The variable value assigned to file register (ZR) by cold-start compile will be held even when power is turned off or the PLC is reset.
The PLC download must be executed after cold-start compile to initialize the variable value.
For a Universal model process CPU project, set the file register range of the system resource within the latch range of [File Register Extended Setting] in the [Device] tab of PLC parameter of the GX Works2 project.
- PX Developer project and GX project will be automatically overwritten and saved when compiled.
- All errors in the FBD programs and parameters will be automatically checked for errors before compile.
- PLC download cannot be executed if cold-start compile is not completed normally.
- Double click the error information or warning in the output window to display the error part screen. (However, it is applicable only when lines that conclude the information of editing and setting screen of FBD sheet are selected.)

11.3 Hot-start Compile

POINT
<ul style="list-style-type: none"> ● There are some restrictions in hot-start compile. For details of restrictions of hot-start compile, refer to Section 11.6. ● PX Developer project and GX project will be automatically overwritten and saved when compiled.

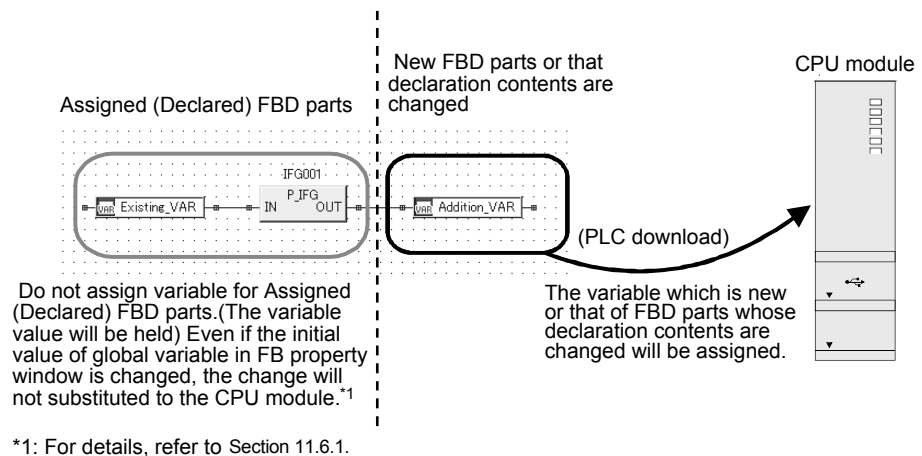


PURPOSE

Hot-start compile is a function that compiles the project without changing the assigned devices of variable of FBD parts assigned on FBD sheet.

It is used in system operation that is to hold the current status while adding processing to FBD program or changing it. (Arranged variable value of FBD parts will be held.)

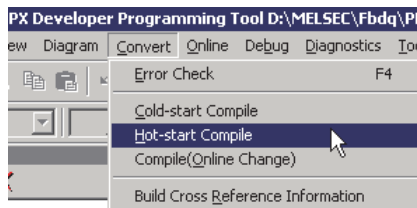
On the contrary, current status will not be held in cold-start compile (Section 11.2). (All variable values return to initial values)




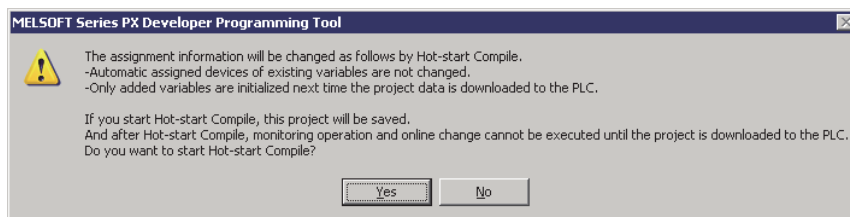
BASIC OPERATION

1. Click [Convert] → [Hot-start Compile] () on the menu.
2. Display start confirmation dialog box of hot-start compile.
Click the "Yes" button to start hot-start compile.
3. The progressing status and result of hot-start compile will be displayed on the output window (Section 5.1).
Press the "Ctrl" + "Break" keys during compile to interrupt hot-start compile.
4. When error is detected and when the compile fails, refer to the warnings and error information displayed on the output window and compile the project again.

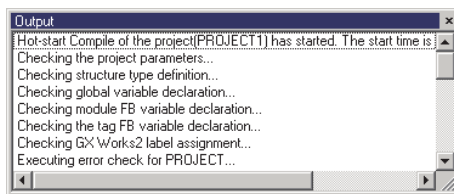
 **DISPLAY/SETTING SCREEN**



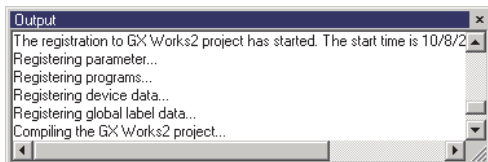
Click [Convert] → [Hot-start Compile] on the menu or click  on the toolbar.



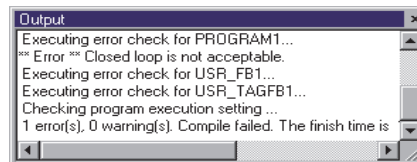
Click the "Yes" button on the dialog box to confirm starting hot-start compile.



Display project name and compile type when compiled.




(When the compile is successful)





(When the compile fails)

11.4 Online Change Compile

 CAUTION
<ul style="list-style-type: none"> ● The CPU module control will change in online change. Please ensure safety before carrying out online change.

POINT	<ul style="list-style-type: none"> ● There are some restrictions in online change compile. For details of restrictions of online change compile, refer to Section 11.6. Online change of programming tool is a function which converts ladder programs (#FBDQ000, #FBDQLIB) into executable code and download them to the CPU module without stopping the CPU. (Online change of files) <For Universal model process CPU> The program is overwritten to the ladder program in the CPU module. <For Process CPU or Redundant CPU> After writing the data in the free area of program memory or a memory card (SRAM card or ATA card) in CPU module temporarily, the data is overwritten to the ladder program in the program memory. Therefore, a free area that is equals to steps of the bigger converted ladder program (#FBDQ000, #FBDQLIB) is required in CPU module, and if the free area of the program memory is insufficient, a memory card (SRAM card or ATA card) is required. The steps of converting ladder program can be specified by GX application.
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<ul style="list-style-type: none"> ● In online change, the scan time will be prolonged as showed in the following table: 	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 30%;">Section</th> <th>PX Developer → Online change CPU module</th> </tr> </thead> <tbody> <tr> <td style="padding: 5px;">Blank area ensured on program memory ensured</td> <td style="padding: 5px;"> Maximum prolonged time of scan time (ms) = 4.0 × (k step of #FBDQ000) + 0.8 However, if the calculated time is less than 97ms, 97ms shall be taken as the maximum prolonged time of scan time. </td> </tr> <tr> <td style="padding: 5px;">Blank area ensured on memory card ensured (except for ATA card*1)</td> <td style="padding: 5px;"> Maximum prolonged time of scan time (ms) = 5.1 × (k step of #FBDQ000) + 0.8 However, if the calculated time is less than 97ms, 97ms shall be taken as the maximum prolonged time of scan time. </td> </tr> </tbody> </table>	Section	PX Developer → Online change CPU module	Blank area ensured on program memory ensured	Maximum prolonged time of scan time (ms) = 4.0 × (k step of #FBDQ000) + 0.8 However, if the calculated time is less than 97ms, 97ms shall be taken as the maximum prolonged time of scan time.	Blank area ensured on memory card ensured (except for ATA card*1)	Maximum prolonged time of scan time (ms) = 5.1 × (k step of #FBDQ000) + 0.8 However, if the calculated time is less than 97ms, 97ms shall be taken as the maximum prolonged time of scan time.
Section	PX Developer → Online change CPU module						
Blank area ensured on program memory ensured	Maximum prolonged time of scan time (ms) = 4.0 × (k step of #FBDQ000) + 0.8 However, if the calculated time is less than 97ms, 97ms shall be taken as the maximum prolonged time of scan time.						
Blank area ensured on memory card ensured (except for ATA card*1)	Maximum prolonged time of scan time (ms) = 5.1 × (k step of #FBDQ000) + 0.8 However, if the calculated time is less than 97ms, 97ms shall be taken as the maximum prolonged time of scan time.						

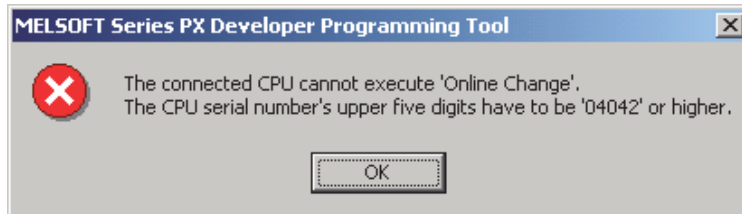
*1: Scan time will be prolonged for 1.25s every 30k steps if ATA card is used.
Therefore, it is recommended to use SRAM card rather than ATA card in online change.

<ul style="list-style-type: none"> ● Do not execute the online change with multiple personal computers simultaneously. If executed, the program content may be deleted.
--

POINT

- Please use Process CPU whose serial number's upper 5 digits are 04042 or higher to execute online change.

If online change is executed in situation that the above conditions are not satisfied, the following error message will be displayed.



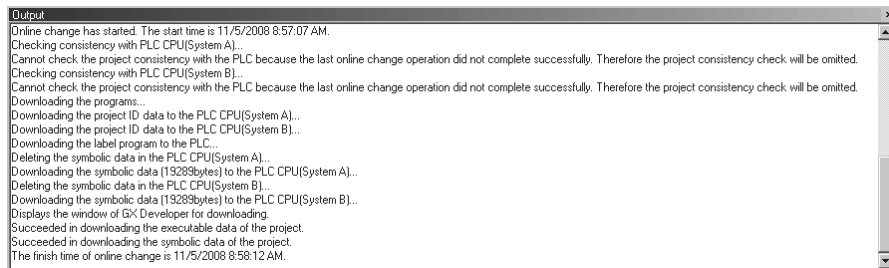
Process CPU serial No. can be confirmed via the plate at the side of Process CPU, or by the following steps [Diagnostics] → [System Monitor] → "Product Inf. List" in GX application.

For details of serial No., refer to the following manuals:

- QCPU User's Manual(Hardware Design, Maintenance and Inspection)
- GX Works2 Version 1 Operating Manual (Common)
- GX Developer Version 8 Operating Manual
- During the execution of online change, even if online change fails which may result from other operation or communication failure, the CPU module will continue its operation normally.

However, project consistency check results are not identical (☞ Section 12.7). In this case, please execute online change compile again.

During the process of one more online change compile again, following message will be displayed on the output window and check of online change will be skipped.



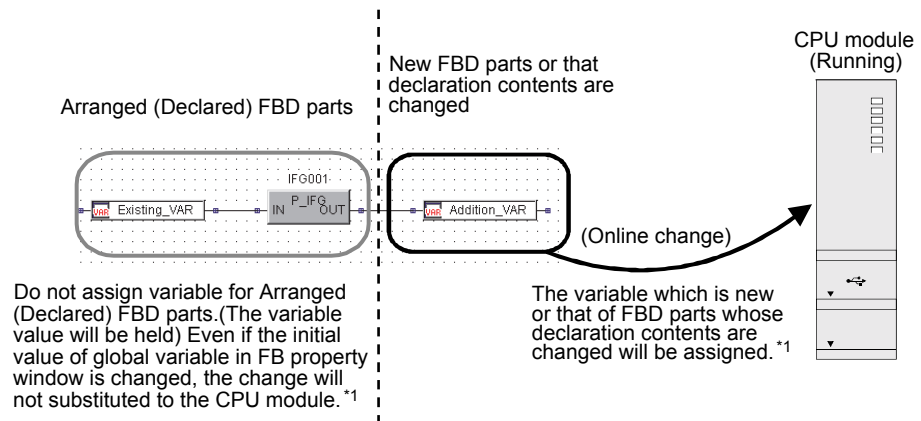
- PX Developer project and GX project will be automatically overwritten and saved in online change compile.
- Online change cannot be executed when PLC download is not executed after cold-start compile or hot-start compile.



PURPOSE

Online change compile is to execute compile not changing the assigned devices of FBD parts that have been arranged on FBD sheet, and rewrite the function of CPU module in RUN.


It is used in the case that adding/changing processing in FBD program while not stopping system is preferred. (Variable value of arranged FBD parts will be held)



*1: For details, refer to Section 11.6.1.



BASIC OPERATION

1. Click [Convert] → [Compile (Online Change)] () on the menu.
2. Display compile start confirmation dialog box.
Click the "Yes" button to start compile.
Press the "Ctrl" + "Break" keys during compile to interrupt it.
3. When the compile is successful, Online Change Window is displayed.
4. To download the Symbolic Data of the project, input the selection mark in the check box of [The Symbolic Data].
(The selection mark of [The Executable Data] cannot be removed.)
5. To download the symbolic information of GX Works2, input the selection mark in the check box of [After downloading the above items, a window of GX Works2 for downloading will be displayed.] *1.
6. Click the "OK" button to close the Online Change Window and start online change.
7. If the check box of [After downloading the above items, a window of GX Works2 for downloading will be displayed.] is selected on the Online Change Window, the window of GX Works2 for downloading is displayed. *2
Close this window after downloading the required data.

*1: When GX project type is GX Developer project, select [After downloading the above items, a window of GX Developer for downloading will be displayed.]

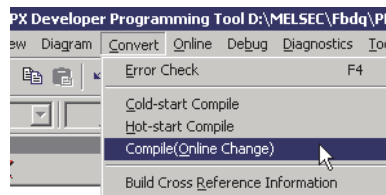
*2: When GX project type is GX Developer project, the window of GX Developer for downloading is displayed.


POINT

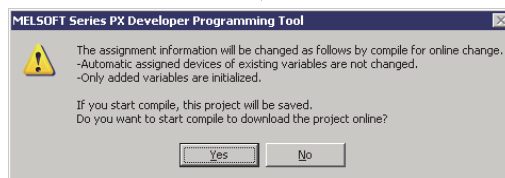
- For details of executable data and the symbolic data, refer to Section 12.1.
- Display/Set data of online change window is the same as download window. Refer to Section 12.4.
- The download of the symbolic data of PX Developer side and the symbolic information of GX application side is required to restore PX Developer project. However, if labels are not used, the download of symbolic information is not required.



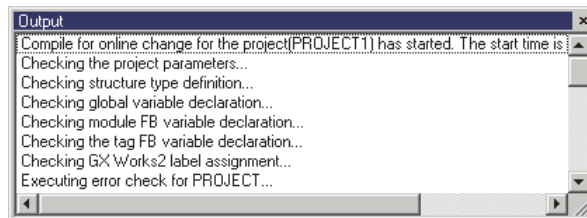
DISPLAY/SETTING SCREEN



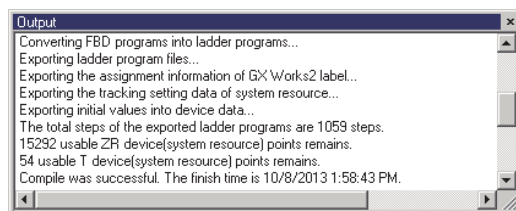
Click [Convert] → [Compile (Online Change)] on the menu or click  on the toolbar.



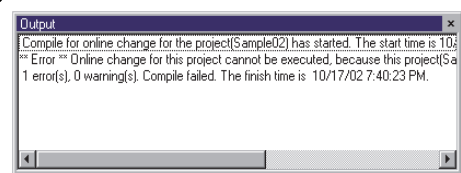
Click the "Yes" button on the dialog box to confirm starting compile.



Display project name and compile types when compiled.



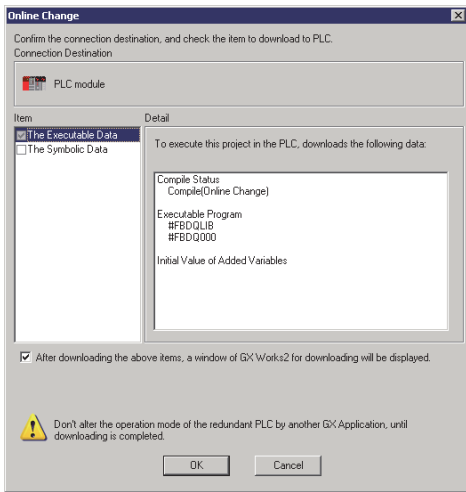
(When the compile is successful)



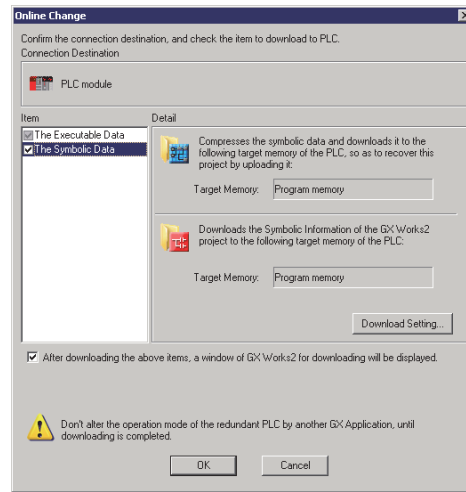
(When the compile fails)

(End)

(To the next page)



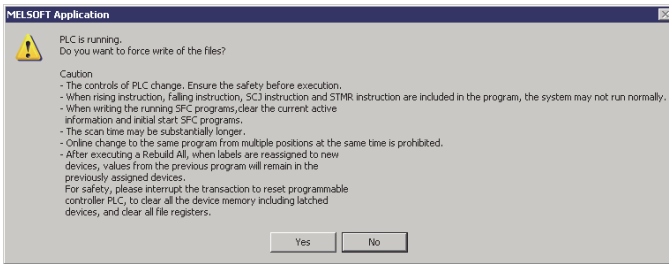
Online Change Dialog Box when selecting [The Executable Data] is displayed.



If necessary, change the target memory on the [Detail] area, when selecting [The Symbolic Data].

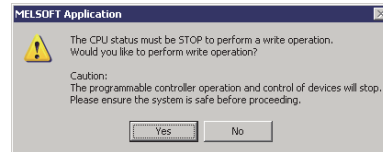
To download the symbolic data, select [The Symbolic data]

Click the "OK" button.

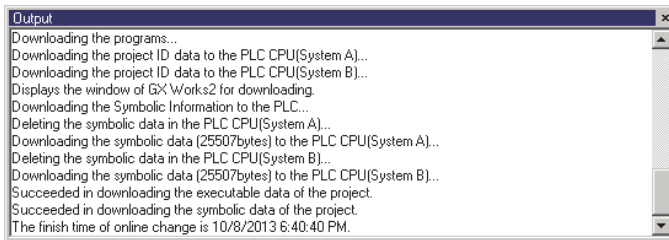


Display online change start confirmation dialog box when the CPU module is in RUN status. Click the "Yes" button. *1

*1: Clicking the "No" button displays the following dialog box.



Clicking the "Yes" button executes download to PLC after setting the CPU to the remote STOP status.



Start online change.

POINT

In Redundant CPU configuration, online change is executed as shown below.

Operation mode	Online change
Backup mode	Online change is executed for both systems. (Control/Standby) However, if an error occurs, online change is not executed.
Separate mode/ Debug mode	Online change is executed only for the PLC CPU specified in the target system field of the transfer setup screen.

11.5 Data Generated by Compilation

(1) Data generated in the contained GX project

GX project type	GX Works2 Simple project (without labels)	GX Works2 Simple project (with labels)	GX Works2 Structured project
Data generated in GX Works2 project			

GX project type	GX Developer project (without labels)	GX Developer project (with labels)
Data generated in GX Developer project		

No.	Item	Description
1)	Parameter	<ul style="list-style-type: none"> Program setting of PLC parameter program execution setting execution type Tracking setting of redundant parameter (for Redundant CPU) The device range within system resource
2)	Program setting	Execution types set to program execution setting
3)	Ladder program	Ladder programs converted from FBD programs
4)	Device memory	File to be used as file register (ZR), which are assigned to the variables to be used in FBD programs
5)	Global label/global variable	Global label generated by GX label assignment function

(2) Compile of Redundant CPU projects

When cold-start compile or hot-start compile is executed in a Redundant CPU, the device range within system resource is automatically registered into the tracking setting of GX project redundant parameters. This enables the operation to be continued after the control system is switched when executing FBD programs in a Redundant CPU.

However, devices used in user ladder need tracking setting.

For details, refer to "PX Developer Version 1 Programming Manual".

POINT

<p>If compile is executed after the device range within system resource was changed, the tracking setting of redundant parameters of GX application will be changed. Therefore, reset the Redundant CPU after download to PLC.</p>
--

11.6 Restrictions for Hot-start compile/Online Change Compile

Following paragraphs mainly deal with the information about restrictions of hot-start compile and online change compile.

(1) Restrictions on reflection of variable initial value and initialization.
(☞ Section 11.6.1)

As for the variable which assigned devices have not been changed, even if its initial value is changed in the FB property window or global variable declaration window, the changed initial value will not be reflected on the CPU module.

(2) Restrictions on project setting (☞ Section 11.6.2)

Changing one of the project settings will cause compile error.

(3) Other restrictions (☞ Section 11.6.3)

Other restrictions not included in above (1) and (2).

11.6.1 Restrictions about substitution of variable initial value and variable initialization

Following paragraphs mainly describes substitution of variable initial value and restrictions on initialization.

(1) Relation between devices assignment of variable and variable initialization.

Variable initialization is to reflect the initial value if the variable has initial values or reset the value to 0, 0.0, FALSE or "" (blank character) if the variable has initial value.

However, public variable which assigned devices have been specified to will not be initialized. (Not to be reset either)

(a) About device assignment and variable initialization in cold-start compile

All the variables will be assigned to devices in cold-start compile. Therefore, variable initialization will be carried out to all the variables during PLC download after cold-start compile.

(b) About device assignment and variable initialization in hot-start compile or online change compile.

To above (a), in hot-start compile or online change compile, assigned devices of variable that have been used (declaration) in FBD program will not be changed. Changing assigned devices can be carried out to the variables that satisfy any of the following conditions:

- Local variable that is newly added by inserting FB parts or variable parts to FBD sheet or changing variable name. (Except for external variable)
- Variables that are added to the declaration windows of global parts or variables which names are changed in the declaration windows of global parts.
- Variables that have been used declared in FBD program and one of the following properties have been changed: data type, character number (only for STRING type variable) and assigned devices specified/not specified (only for global variable).

For variables that satisfy the above conditions, assigned devices will be changed. Therefore, variable initialization will be carried out in PLC download after hot-start compile or online change compile.

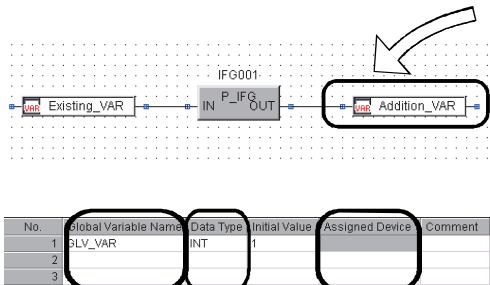
On the other hand, variable initialization will not be carried out on the variables which assigned devices are not changed and the current value of this variable will be used to continue processing by CPU module.

(2) Restrictions for variable initial value changing

In PLC download after hot-start compile or online change compile, initial value substitution or variable initialization will be only carried out on the variables whose assigned devices have been changed. Therefore, to variables whose assigned devices are not changed, even if their initial value is changed under FB property window and declaration window of global variable, the changed initial value will not be substituted to the CPU module.

When FB parts or global variable is re-declared, or one of the following sections is changed (when initial value is substituted): variable name, data type, character number (only for STRING type variable), assigned devices specified/not specified (only for global variable).

Make new declaration to FB parts or global parts, or change variable name, data type, character number (only for STRING typevariable), arrangement device (only for global variable)



Hot-start compiling or online change compile

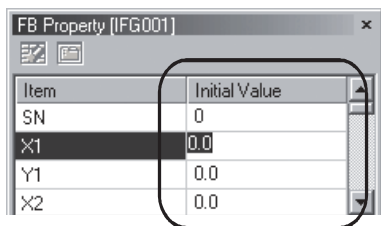
Assigned device change occur!

Variable assigned device (ZR)

The initial values of variables reflect to the CPU module!

If the specification of variable name, data type, character number (only for STRING type), as well as assigned device (only for global variable) is not changed, only initial value is changed. (In case that initial value change is not substituted)

Only the initial value changed



No.	Global Variable Name	Data Type	Initial Value	Assigned Device	Comment
1	GLV_VAR	INT	1		
2					
3					

Hot-start compiling or online change compile

Assigned device does not change!

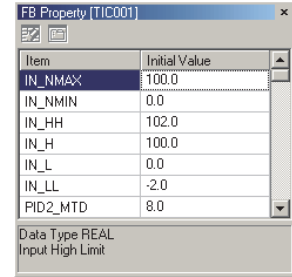
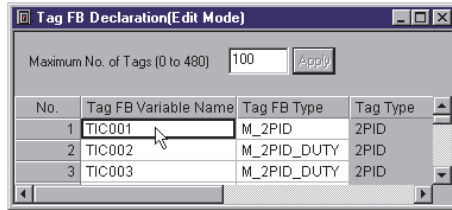
The assigned device of variables (ZR)

The change of initial value does not reflect to the CPU module!

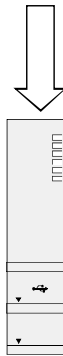
POINT

- When the initial value of declared tag FB or global variable is changed, no matter whether they have been arranged on FBD sheet, the changing of initial value will not be substituted on the CPU module. (The same situation when tag FB and global variable have been arranged to FBD sheet after initial value is changed.)

Change the initial value of declare tag FB and global variable.
 (including the case when tag FB and global variable are not configured on FBD sheet)



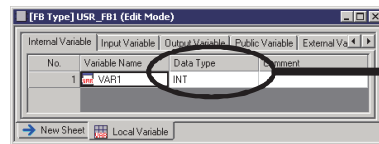
PLC download or online change



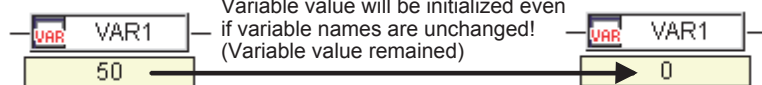
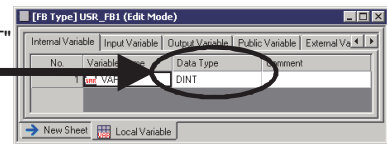
The change of initial value is not reflected to the CPU module!

- To variable that has been used (declaration) on FBD program, even if its variable name has not been changed, the variable will be initialized when any of the following properties is changed: data type, character number (only for STRING type variable) and assigned devices specified/not specified (only for global variable).
 (Variable value will not be held)

(For example) at the occasion of local variable



Data type changes from "INT" to "DINT"



11.6.2 Restrictions for project setting change

The restriction of project setting change is elaborated below.

After the setting changes listed in the following table, hot-start compile or online change compile will cause compile error.

(1) At the time of hot-start compile

The setting changes causing compile errors	Solution (Execute (a) or (b))	Reference
"File register: ZR" or "Timer: T" points are reduced in project parameter setting window.	(a) Execute hot-start compile prior to file register points change or after the point increment. (b) Execute cold-start compile.	Section 6.14
The start number of "File register: ZR", "Timer: T" or "Internal relay: M" is changed in project parameter setting window.	(a) Return to the status prior to the change of start number of file register for executing hot-start compile. (b) Execute cold-start compile.	Section 6.14
PLC type is changed.	(a) Return to the status prior to the PLC type change for executing hot-start compile. (b) Execute cold-start compile.	Section 6.16
"Maximum No. of tags" is changed in tag FB declaration window.	(a) Return to the status prior to maximum tag number change for hot-start compile. (b) Execute cold-start compile.	Section 8.4.2
The declaration position of tag FB is changed in tag FB declaration window.	(a) Return to the status prior to the change of declaration position for executing hot-start compile. (b) Execute cold-start compile.	Section 8.4.2
"Tag FB" type is changed to different tag FB type in tag FB declaration window. *1	(a) Return to the status prior to the change or set the same tag FB type of tag type*1 for executing hot-start compile (b) Execute cold-start compile.	Section 8.4.2
The members of structure type are changed in structure type definition window.	(a) Return to the status prior to the change of structure type change for executing hot-start compile. (b) Execute cold-start compile.	Section 9.2

*1: For details of the relation between tag type and tag FB type, refer to Section 8.4.3 (1).

(2) At the time of online change compile

The setting change causing compile errors	Solution (Execute (a) or (b))	Reference
Add the fixed scan execution type or interrupt pointer execution type program in project windows.	(a) Delete the added programs and execute online change compile. (b) Execute cold-start compile or hot-start compile.	Section 6.8
Delete fixed scan execution type or interrupt point execution type programs.	(a) Execute cold-start compile or hot-start compile.	Section 6.10
"File register: ZR" or "Timer: T" points are reduced in project parameter setting window.	(a) Return to the status prior to the file register points change for online change compile. (b) Execute cold-start compile.	Section 6.14
The start number of "File register: ZR", "Timer: T" or "Internal relay: M" is changed in project parameter setting window.	(a) Return to the status prior to the change of start number of file register for online change compile. (b) Execute cold-start compile.	Section 6.14
PLC type is changed.	(a) Return to the status prior to the PLC type change for online change compile. (b) Execute cold-start compile.	Section 6.16
"Execution type" is changed in the program executing setting window.	(a) Return to the status prior to the execution type change for online change compile. (b) Execute cold-start or hot-start compile.	Section 7.13.1
The "Interruption interval" of fixed scan execution is change in program execution setting window.	(a) Return to the status prior to the interruption interval change for online change compile. (b) Execute cold-start or hot-start compile.	Section 7.13.3
"Execution condition" is changed when choosing fixed scan execution in program execution setting window.	(a) Return to the status prior to the execution condition change for online change compile. (b) Execute cold-start or hot-start compile.	Section 7.13.3
The execution state of fixed scan execution program is changed in program execution setting window.	(a) Return to the status prior to the executing state change for online change compile. (b) Execute cold-start or hot-start compile.	Section 7.13.3
Change the assignment target device of variable ^{*1} which is referred to the execution condition by fixed scan execution start type program in program execution setting window.	(a) Return to the status prior to the change of reference variable data type for online change compile. (b) Execute cold-start or hot-start compile.	Section 7.13.3
Change the assigned device of reference global variable ^{*1} which is referred to the execution condition by fixed scan execution type program in program execution setting window.	(a) Return to the status prior to the group variable assigned device change for online change compile. (b) Execute cold-start or hot-start compile.	Section 7.13.3
"Maximum No. of tags" is changed in tag FB declaration window.	(a) Return to the status prior to the maximum tag number change for online change compile. (b) Execute cold-start compile.	Section 8.4.2
The declaration position of tag FB is changed in tag FB declaration window.	(a) Return to the status prior to the declaration position change for online change compile. (b) Execute cold-start compile.	Section 8.4.2
"Tag FB" type is changed to different tag FB type in tag FB declaration window. ^{*2}	(a) Return to the status prior to the tag FB type for online change compile or set the same tag FB type of tag type. ^{*2} (b) Execute cold-start compile.	Section 8.4.2

(To the next page)

The setting change causing compile errors	Solution (Execute (a) or (b))	Reference
The definition content is changed in GX label assignment windows. (Except blank row insertion, deletion or row exchanging)	(a) Return to the status prior to definition content change. (b) Execute cold-start or hot-start compile.	Section 8.5.2
Edit the assigned device of reference variable *1 in GX label assignment windows.	(a) Return to the status prior to data type change of reference variables for online change compile. (b) Execute cold-start or hot-start compile.	Section 8.5.2
Edit the global variable assigned device Which GX label assignment window refers to.	(a) Return to the status prior to global variable assigned device changes for online change compile. (b) Execute cold-start or hot-start compile.	Section 8.5.2
Change the members of structure in structure definition window.	(a) Return to the status prior to structure type member changes for online change. (b) Execute cold-start compile.	Section 9.2

*1: The change of assignment target device will occur when the data type in the "Assignment specified reference expression" of following table.

*2: For details of the relation between tag types and tag FB type, refer to Section 8.4.3 (1).

Settable variable reference expression	Assignment specified reference expression
Elementary data type global variable	Elementary data type global variable
Structure type global variable. Member variable	Structure type global variable
Module FB variable. Input variable	Module FB variable
Module FB variable. Output variable	Module FB variable
Module FB variable. Public variable	Module FB variable
Manufacturer tag FB variable. Input variable	Manufacturer tag FB variable
Manufacturer tag FB variable. Output variable	Manufacturer tag FB variable
Manufacturer tag FB variable. Public variable (Except tag member variable)	Manufacturer tag FB variable
Manufacturer tag FB variable. Public variable (Except tag member variable)	Manufacturer tag FB variable
User-defined tag FB variable. Elementary data type input variable	Elementary data type input variable
User-defined tag FB variable. Elementary data type output variable	Elementary data type output variable
User-defined tag FB variable. Elementary data type public variable (Except tag member variable)	Elementary data type public variable (Except tag member variable)
User-defined tag FB variable. Elementary data type public variable (Tag member variable)	User-defined tag FB variable
User-defined tag FB variable. Structure type input variable. Member name	User-defined tag FB variable Structure type input variable
User-defined tag FB variable. Structure type output variable. Member name	User-defined tag FB variable Structure type output variable
User-defined tag FB variable. Structure type public variable. Member name	User-defined tag FB variable Structure type public variable

11.6.3 Other restriction

The following explains the restriction except the restriction mentioned in Section 11.6.1 and Section 11.6.2.

(1) At the time of hot-start compile

Cause of compile error	Measurement	Reference
Cold-start compile is not executed after newly creating.	Execute PLC download after cold-start compile	Section 11.2 Section 12.4
PLC download is not executed after cold-start compile.	Execute PLC download after cold-start compile	Section 12.4

(2) At the time of online change compile

Cause of compile error	Measurement	Reference
Cold-start compile is not executed after projects are newly creating.	Execute PLC download after cold-start compile	Section 11.2 Section 12.4
After executing cold-start compile or hot-start compile, online change compile was performed without executing PLC download.	After executing cold-start compile or hot-start compile, execute PLC download and then online change compile.	Section 11.2 Section 11.3 Section 12.4
After uploading, the uploading of symbolic information is not executed with GX application.	Perform either of the following operations. <ul style="list-style-type: none"> Upload the symbolic information and parameter with GX application. Download after executing the Cold-start Compile or the Hot-start Compile. 	Section 11.2 Section 11.3 Section 12.4

11.7 Error Example in Compile

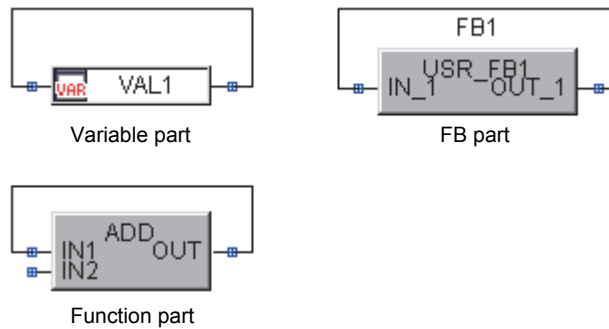
(1) Error examples in error check/compile

The following are examples of error check and error in compile.

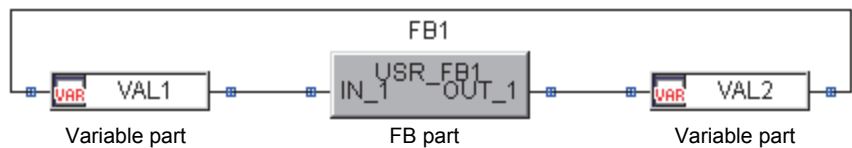
(a) Closed loop

Error may occur when the following loops exist in FBD program.

(Example 1) The loop onto itself

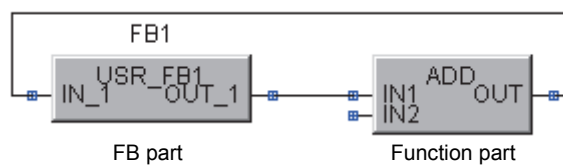


(Example 2) The loop with FB part in the middle

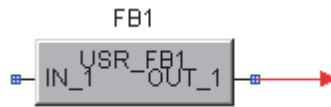


*: Error will occur even if both sides of FB part are not variable parts as showed in the above figure.

(Example 3) The loop from function part to FB part

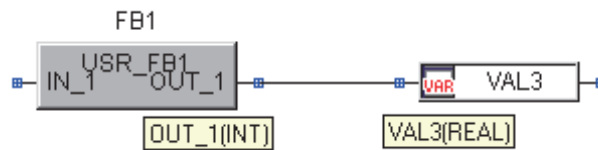


- (b) When the one or both end of the connector is not connected with parts



- (c) When the data types on the both sides of the connector are different

Errors will occur when the data types of the parts connected with the two ends of the connector are different.



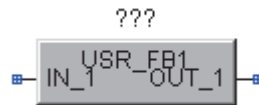
- (d) When the input pins are not connected with the function parts

Errors will occur even if only one of the input pins in the function parts is not connected. However, the functions BIND (_E), CALL_DINT (_E), CALL_REAL (_E) should be excluded (EN, P pins need connection). Please refer to "PX Developer Version 1 Programming Manual" for details about the function parts.



- (e) When the variable names and FB variable names are not set

Errors will occur when the variable names, FB variable names and constant values of the constant parts are not set.



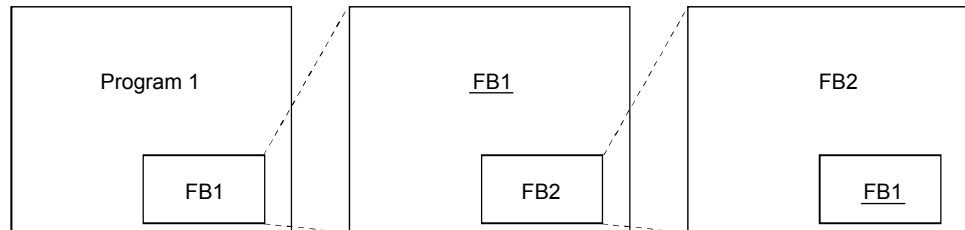
POINT
 When Redundant CPU or Universal model process CPU is selected as PLC type, PLOW (_E) function cannot be used.

(2) Error examples in compile

(a) When the recursive call exists

The programming tool can be used to realize structuralized programming by combining the user-defined FB type and tag FB type.

However, the program itself defined in the upper hierarchy cannot be called from the lower hierarchy (recursive call is not permitted).



*: FB 1 is a recursive call under this condition.

(b) When the created program exceeds the capacity set by the project parameters.

In system resource setting of the project parameters (☞ Section 6.14 (1)), an error will occur when the created program exceeds the set points.

(c) When the variable names of the global parts are duplicated

An error will occur in compile under the condition that the variable names are duplicated have been declared in the global variable declaration window, Module FB declaration window and tag FB declaration window.

(d) When an error occurs in setting the FBD sheet execution conditions

An error will occur in compile when no local variables in the program/FB type are specified, or when there is an error in the execution condition under the condition that the constants at the left side are specified.

(For details of FBD sheet execution condition setting, refer to Section 7.12)

(e) When the mismatch occurs in the program execution setting

An error will occur in compile when variables beyond the global parts are specified, or when there is an error in the execution conditional expression under the condition that the constants at the left side are specified.

An error will occur as well when the programs whose execution type exceed 101 (16 for the Q02PHCPU and 31 for the Q06PHCPU).

(For details of program execution setting, refer to Section 7.13)

(f) When the number of program/FB hierarchy is larger than 8

The programming tool can be used to realize structuralized programming by using the user-defined FB and tag FB (For example, to paste the other user-defined FB in the user-defined FB type).

An error will occur in compile when the program/FB hierarchies exceed 8.

(g) When no program exists

An error will occur under the condition that no program exists by deleting all programs in the project (☞ Section 6.10).

(3) Data type setting of the constant parts

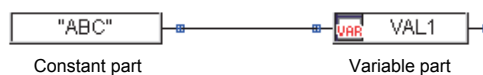
The data type of constant part cannot be determined by itself, but determined by the data type of FBD parts connected as constant part.

In the constant parts, the relations between the input value and data type candidate are listed as below.

Classification	Input Values	Data Type Candidate						
		STRING	INT	DINT	WORD	DWORD	REAL	BOOL
Character String	" " (Example: "ABC")	○	—	—	—	—	—	—
Decimal Integer	0	—	○	○	○	○	○	○
	1	—	○	○	○	○	○	○
	2 to 32767	—	○	○	○	○	○	—
	-32768 to -1	—	○	○	○	○	○	—
	32768 to 2147483647	—	—	○	—	○	○	—
	-2147483648 to 32769	—	—	○	—	○	○	—
Hexadecimal	H0	—	○	○	○	○	—	○
	H1	—	○	○	○	○	—	○
	H2 to HFFFF	—	○	○	○	○	—	—
	H10000 to HFFFFFFFF	—	—	○	—	○	—	—
Real Number	Numbers with decimal points or of exponential-type (Example: 1.0 1.005E+ 0.08)	—	—	—	—	—	○	—
TRUE or FALSE	TRUE	—	—	—	—	—	—	○
	FALSE	—	—	—	—	—	—	○

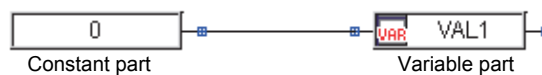
(a) Examples of determining the data type of constant parts

(Example 1)



In the above graph, the constant part value is ["ABC"], so the data type of the constant part should be the STRING type. Therefore, the connected variable part data type except STRING will lead to the data type mismatch. Thus, an error will occur.

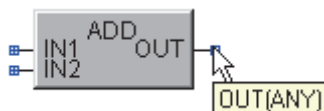
(Example 2)



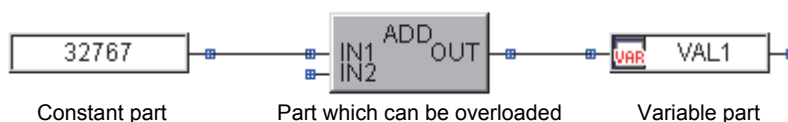
In the above graph, the constant part value is [0], so the data type of the constant part should be the INT, DINT, WORD, DWORD, REAL, BOOL types. Therefore, the connected variable part data type except INT, DINT, WORD, DWORD, REAL, BOOL types will lead to the data type mismatch. Thus, an error will occur.

(b) Overload

In the function parts, one part can correspond to several data types. For example, the numerical operation function ABS can process I/O parameters of the INT, DINT, and REAL types. Such function parts are called the function parts which can be overloaded. The data type as mentioned above will be displayed as [ANY] in tooltip when the I/O variables of the function parts correspond to the multiple data types.



(Example 1)

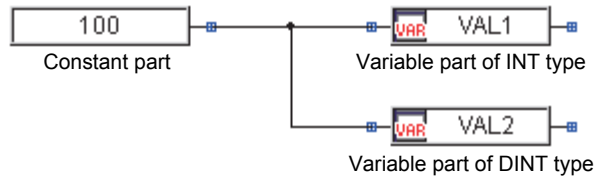


In the above graph, the constant part value is [32767], so the data type of the constant part should be the INT, DINT, WORD, DWORD, REAL types. However, the function part (ADD) connected with the constant part can be overloaded, and the input pins have three data type candidates of INT, DINT, and REAL types. In this case, the data types of the constants are determined not only by the input pins, but also by the variable part data type connected with the output pins.

An error will occur when the data types of the variable part connected with the output pins are except the INT, DINT, and REAL types.

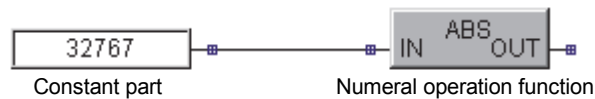
(c) Error examples caused by constant parts

(Example 1)



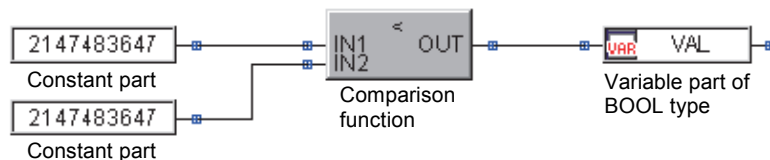
In the above graph, the constant part value is [100], so the data type of the constant part should be INT, DINT, WORD, DWORD, REAL types. However, an error will occur, because one constant part is connected with multiple data types, and the data type cannot be determined as only one.

(Example 2)



In the above graph, the constant part value is [32767], so the data type candidates of the constant part should be the INT, DINT, WORD, DWORD, REAL types. However, an error will occur, because the data types of the constant part cannot be determined when the output pins are not connected with any data type.

(Example 3)



In the above graph, the constant part value is [2147483647], so the data type of the constant part should be the DINT, DWORD, REAL types. However, the function part (<) connected with the constant part can be overloaded, and the output pin is fixed as BOOL type, so the data type cannot be determined by the output pins. In this case, the parts which can determine the constant part data type should exist in either of the input pins. But in the case of above graph, in any one of the constant parts, there are multiple data type candidates of the DINT, DWORD, and REAL types, so the data types of the constant parts cannot be determined. An error will occur under this condition.

POINT

Please connect the function input pins with the parts which can determine the data types of the constant parts when the input pins of the comparison function (<, <=, <>, =, >, >=) are connected with the constant parts of the constant values for – 2147483648 to 2147483647 (Decimal integer) or H0 to HFFFF (Hexadecimal).

(4) List of error/warning message

The following describes messages and contents of errors or warnings which are output on the output window by inline ST program error check, and corrective action.

(a) Error message

Item	Error Message	Cause	Corrective Action
Variable	"*1" : Undefined variable. (Variable name is entered in *1.)	An undefined variable was used.	Define the used variable.
	"*1" : Input variable or output variable that has not been set to pin. (Input variable name/output variable name is entered in *1.)	Input variable or output variable that has not been set to pin was used. Ex 1: myINT := \$I2; Input variable that has not been set to pin was used. Ex 2: \$O9 := 1; Output variable that cannot be set to pin was used.	Set the number of pins. Use local variables.
	"*1" : The variable is not structure type or FB type. (Variable name to the left of reference operator is entered in *1.)	A reference operator was used for a variable that is not structure type or FB type. Ex: myINT.Member := 1; The reference operator was used for the elementary data type variable.	Substitute a value to the structure type member.
	"*1" : Is not a member of structure type (*2). (Member name is entered in *1, structure type is entered in *2.)	The member that is not defined as structured type was referred. Ex: mySTRUCT.NotDefineMember := 1;	Define as the structure type member.
	"*1" : Is not input variable, output variable or public variable of FB type "*2". (Variable name is entered in *1, and FB type name is entered in *2.)	A variable that is not input variable, output variable, or public variable of FB type was referred. Ex 1: TAG001.PVNN := 1; Incorrect input variable name of tag FB type was referred. Ex 2: myFB.NotDefineMember := 1; Input variable, output variable, or public variable that is not defined as user-defined FB type was referred.	Change to the correct input variable name. Define as input variable, output variable, or public variable of user-defined FB type.
	"*1" : Is not elementary data type or structure type. (Variable name is entered in *1.)	A variable that is not elementary data type or structured type was used. Ex: TAG001 := TAG002; A value was substituted to FB type variable.	Substitute a value to input variable, output variable, or public variable of FB type variable. Ex: TAG001.SV := TAG002.SV;
	"*1" : Cannot specify the bit because device variable is not WORD type. (Device variable name is entered in *1.)	Bit is specified for a device variable that is not WORD type. Ex: D0.1 := TRUE; Bit is specified for INT type device variable.	Change the type of device variable to WORD type.

(To the next page)

Item	Error Message	Cause	Corrective Action
Variable	"*1" : Specify a bit of word device with hexadecimal number(0 to F). (Device variable name is entered in *1.)	The format of bit specification is incorrect. Ex 1: D0.10 := TRUE; Tenth bit was specified in decimal. Ex 2: D0.b := TRUE; Bit was specified in lower case letters.	Specify bit in hexadecimal (0 to F). Ex 1: D0.A := TRUE; Specify bit in upper case letters. Ex 2: D0.B := TRUE;
	"*1" : Cannot access link direct device(J***) or intelligent function module device(U*\G*) as STRING type. (Variable name is entered in *1.)	Link direct device (J***) or intelligent function module device (U*\G*) was used as a STRING type.	Use as the data type other than STRING type.
	"*1" : The value cannot be substituted for direct input device(DX). (Variable name is entered in *1.)	Tried to substitute a value to direct input device.	Change to another device.
	"*1" : The value cannot be acquired from direct output device(DY). (Variable name is entered in *1.)	Tried to acquire a value from direct output device.	
Assignment statement	":=" : Data type mismatch the left side(*1) and the right side(*2). (Left side data type is entered in *1, right side data type is entered in *2.)	A right side expression whose data type is different was assigned to the left side. Ex 1: myREAL := myINT; The INT type variable is assigned to the REAL type variable. Ex 2: mySTRUCT := 1; The constant is assigned to the structure type variable.	Convert the data type of assignment source in accordance with the data type of assignment target. Ex 1: myREAL := INT_TO_REAL(myINT); Assign a value to the structure type member. Ex 2: mySTRUCT.Member := 1;
Conditional statement	Use boolean expression as condition.	Expression that is not Boolean expression for a condition was used. Ex 1: IF myINT THEN myREAL := 1.0; END_IF; INT type variable was used for a condition of IF statement. Ex 2: IF myBOOL THEN myINT := 1; ELSIF myREAL THEN myINT := 2; END_IF; REAL type was used for a condition of ELSIF statement.	Convert the data type to BOOL type. Ex 1: IF INT_TO_BOOL(myINT) THEN myREAL := 1.0; END_IF; Use comparison operator. Ex 2: IF myBOOL THEN myINT := 1; ELSIF myREAL > 0 THEN myINT := 2; END_IF;

(To the next page)

Item	Error Message	Cause	Corrective Action
Function	"*1": The function name is invalid. (Function name is entered in *1.)	The function that is not in the manufacturer library was called. Ex 1: myREAL := MAXX(1.0, 2.0); Incorrect function name was input. Ex 2: myREAL := POW(2.0, 3.0); "_" was not added to the end of the function name.	Correct the function name.
	"*1" : An argument with different data types cannot be used. (Function name is entered in *1.)	An argument whose data type was different was used. Ex: myREAL := SEL(myBOOL, myINT, myREAL); INT type was specified for the second argument of function "SEL", and REAL type was specified for the third argument of function "SEL".	Convert the data type of argument to be the same data type. Ex: myREAL := SEL(myBOOL, INT_TO_REAL(myINT), myREAL);
	"*1" : Cannot be used this function. (Function name is entered in *1.)	A function that is not on the list of usable functions was called. Ex 1: myREAL := POFF(); The function that does not have output was called. Ex 2: myBOOL := UNBIND(myWORD); The function that has multiple outputs was called.	Arrange a function on an FBD sheet and call it.
	"*1" : Specify argument(s) of *2 to *3. (A function name is entered in *1, the minimum number of arguments is entered in *2, maximum number of arguments is entered in *3.)	The number of arguments that is different from function definition was specified. Ex 1: myREAL := MAX(); An argument was not given. Ex 2: myREAL := MAX(1,2,3,4,5,6,7,8,9); more than 8 which is the maximum number of arguments.	Give an argument within the range displayed on a message. For arguments which exceeded the range, change to function call for multiple times. Ex: myREAL := MAX(1,2,3,4,5,MAX(6,7,8,9));
	"*1" : Specify *2 argument(s). (Function name is entered in *1, the number of arguments is entered in *2.)	The number of arguments that is different from function definition was specified. Ex 1: myREAL := DIV(1.0); less than 2 which is the specified number of arguments. Ex 2: myREAL := DIV(1.0, 2.0, 3.0); more than 2 which is the specified number of arguments.	Give an argument within the range displayed on a message. Use an operator. Ex: myREAL := 1.0 / 2.0 / 3.0;
	"*1" : An argument of ordinal *2 is not (*3) type. (Function name is entered in *1, ordinal number of argument is entered in *2, data type that is specified for argument is entered in *3.)	Argument that has different data type from function definition was specified. Ex 1: myREAL := SQRT(myINT); INT type was specified for argument of function "SQRT" which has 1 argument. Ex 2: myINT := MAX(myWORD, myINT); WORD type was specified for argument of function "MAX" which has multiple arguments.	Give an argument of data type which is displayed on a message with such as type conversion. Ex 1: myREAL := SQRT(INT_TO_REAL(myINT)); Ex 2: myINT := MAX(WORD_TO_INT(myWORD), myINT);

(To the next page)

Item	Error Message	Cause	Corrective Action
Operator	"*1" : The left side is not (*2) type. (Operator is entered in *1, data type that is specified for argument is entered in *2.)	Data type which is different from the definition was specified for the left side of operator. Ex: myREAL := myWORD + myREAL; WORD type was specified for the left side of operator "+".	Give an argument of data type displayed on a message. Execute the type conversion.
	"*1" : The right side is not (*2) type. (Operator is entered in *1, data type that is specified for argument is entered in *2.)	Data type which is different from the definition was specified for the right side of operator. Ex: myREAL := myREAL + myWORD; WORD type was specified for the right side of operator "+".	
	"*1" : Specify (*2) type. (Operator is entered in *1, data type that is specified for argument is entered in *2.)	Data type which is different from the definition was specified for unary operator. Ex 1: myINT := -myWORD; WORD type was specified for unary operator "-". Ex 2: myWORD := NOT myINT; INT type was specified for unary operator "NOT".	
	"*1" : The data type on both sides must be the same. (Operator is entered in *1.)	Data type which is different between left and right sides was specified. Ex: myREAL := myREAL + myINT; REAL type for the left side, INT type for the right side were specified.	Execute the type conversion. Ex: myREAL := myREAL + INT_TO_REAL(myINT);
	"*1" : An overflow has occurred during operation. (Operator is entered in *1.)	Overflow occurred during operation. Ex: myINT := 32767 + 1; The value which exceeds the range of INT type was substituted for INT type variable.	Change the data type to the one which can acquire the operation result. Ex: myDINT := 32767 + 1;
	"*1" : Divide or mod by zero. (Operator is entered in *1.)	Division operation or modulus operation was executed by 0.	Change to avoid 0 denominator for division operation or modulus operation.
Statement	"*1" : Invalid character in ST program. (Unusable characters is entered in *1.)	Characters which cannot be used in ST program were used. Ex 1: myINT := !10; Character "!" is used. Ex 2: myINT := myINT@pressure; Character "@" is used.	Remove the characters displayed on a message.
	The statement cannot be parsed. : "*1" (The parse error is entered in *1.)	Statement was not parsed by incorrect description. Ex 1: myINT := ; The right side of Assignment statement is null. Ex 2: POFF_E(myBOOL, "MAIN"); The function was called without the left side. Ex 3: myINT; A statement with variable only was used.	Check around the error in the program. Input the left side. Ex 2: myBOOL := POFF_E(myBOOL, "MAIN"); Correct to the right statement by such as substitution. Ex 3: myINT := myINT2;

(To the next page)

Item	Error Message	Cause	Corrective Action
Statement	The statement cannot be parsed.	Statement was not parsed by incorrect description. Ex: myINT := 1 Semicolon was not added to the end of the statement.	Correct the statement.
	Missing "*" before "*2". (Missing letters are entered in *1, missing area is entered in *2.)	Failed to parse the statement by incorrect description. Ex: myINT := 1 * (2 + 3 ; A parenthesis is insufficient.	Enter the symbols displayed on a message.
	No end mark "*" in a comment.	The multiple line comment is not "("" ")" format.	Enter the end mark "*")".
	Error count exceeds 100. Stopping compilation.	The number of errors exceeded 100 in ST program of inline ST part.	Correct the errors.
	The format of "*" is incorrect. : *2 (Character string whose format is incorrect is entered in *1. Factor of the incorrect format is entered in *2.)	Format error occurred. Ex 1: myINT := program1; A program name was used. Ex 2: myINT := ADD; A function name was used.	Change to another name.
	The statement is too long.	The number of operators or functions in 1 statement was too many, or a statement was too long to parse. Ex 1: myDINT := 1 + 2 + ... + 502; Many operators were used. Ex 2: IF myBOOL01 THEN IF myBOOL02 THEN ... END_IF; END_IF; Nest was executed many times in IF statement.	Shorten the statement by such as partition. Ex 1: myDINT1 := 1 + 2 + ... 251; myDINT2 := 251 + 252 + ... + 502; myDINT := myDINT1 + myDINT2; Decrease the number of nests by dividing the IF statement.

(b) Alarm message

Item	Alarm Message	Cause	Corrective Action
Constant	"*1" : The real number will be rounded to 7 digits. (A constant of real number is entered in *1.)	Real number exceeded the number of significant figures. Ex: myREAL := 1.2345678; A real number whose number of significant figures is 8 was substituted.	Change to a real number within the number of significant figures. Ex: myREAL := 1.234567;
Operator	"*1" : An underflow has occurred during operation. Rounded to zero. (Operator is entered in *1.)	Underflow occurred during a real number operation. Ex: myREAL := 1.175495E-38 / 10; The real number of operation result is below the minimum value of REAL type.	Change to avoid a real number operation result being underflow. If a real number operation result is underflow, change the operation processing to 0 constant.

MEMO

12 PLC CONNECTION

This chapter explains the following.

- Download/Upload of projects and data to be used in Download/Upload.
- Operations needed to connect programming tool with CPU module.
- Operations to download the program made with programming tool to PLC CPU.
- Operations to download/upload the data needed for restoration of project.

12.1 Download/Upload

For performing the process control on PLC system, it is necessary to execute the data that has been user-created with PX Developer and generated with compile on PLC CPU.

This section describes Download/Upload, and data to be used in Download/Upload.

(1) Download

Download is designed to store the data created/generated with programming tool to PLC CPU.

Download is due to PX Developer or GX application.

The following two data are downloaded with PX Developer.

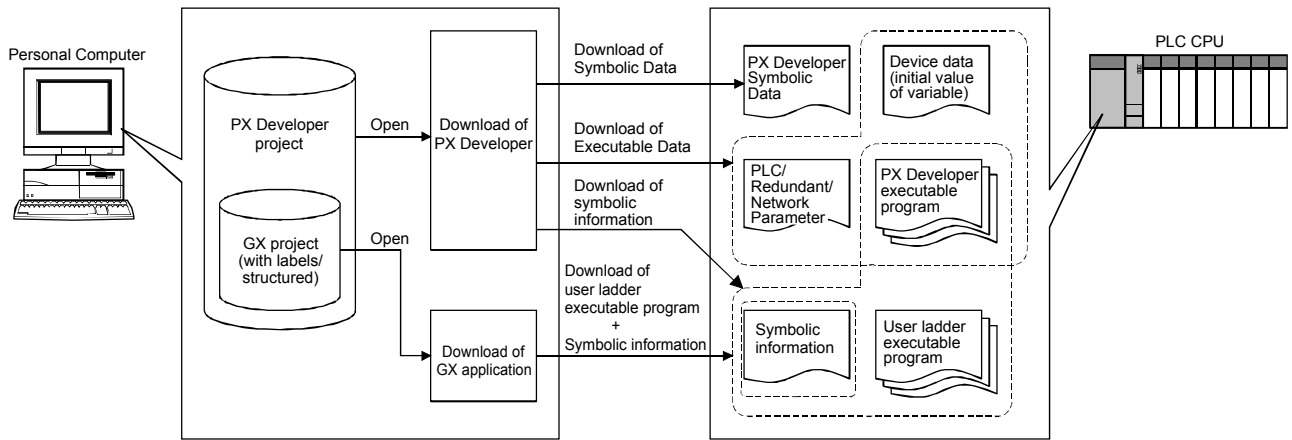
- Data needed to execute on PLC CPU (Executable Data).
- Data needed to restore the project (Symbolic Data of the project^{*1}).

In addition, if a user ladder executable program exists in the GX project, download that program to PLC with GX application.

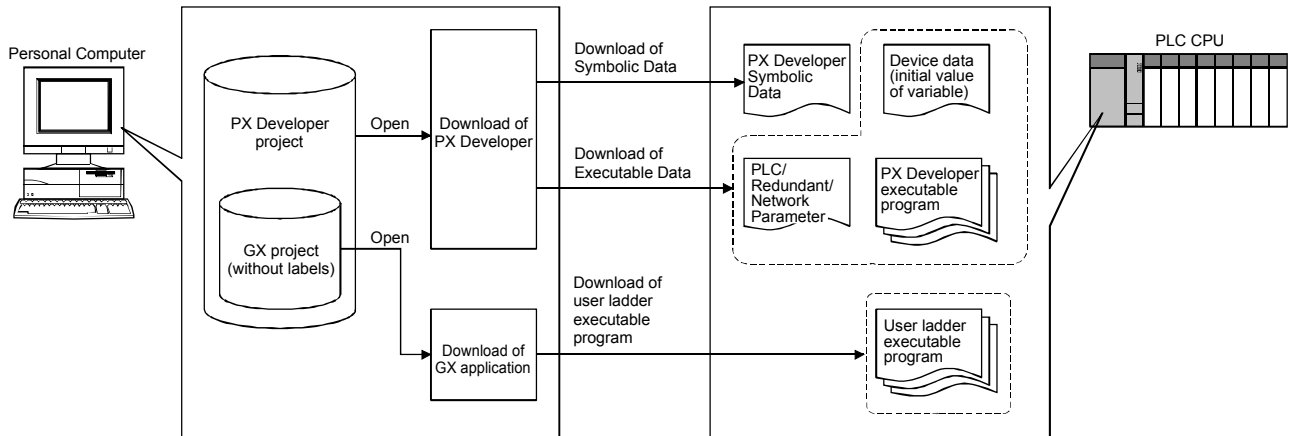
*1: Indicates symbolic data of PX Developer project and symbolic information of GX project.

Data to be downloaded to PLC CPU

1) Project with labels/Structured project



2) Project without label

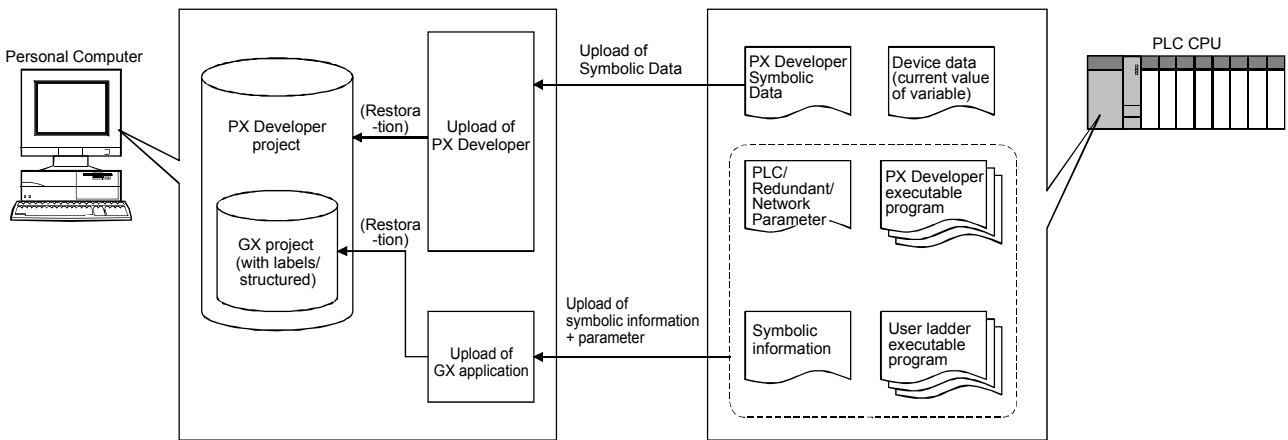


(2) Upload

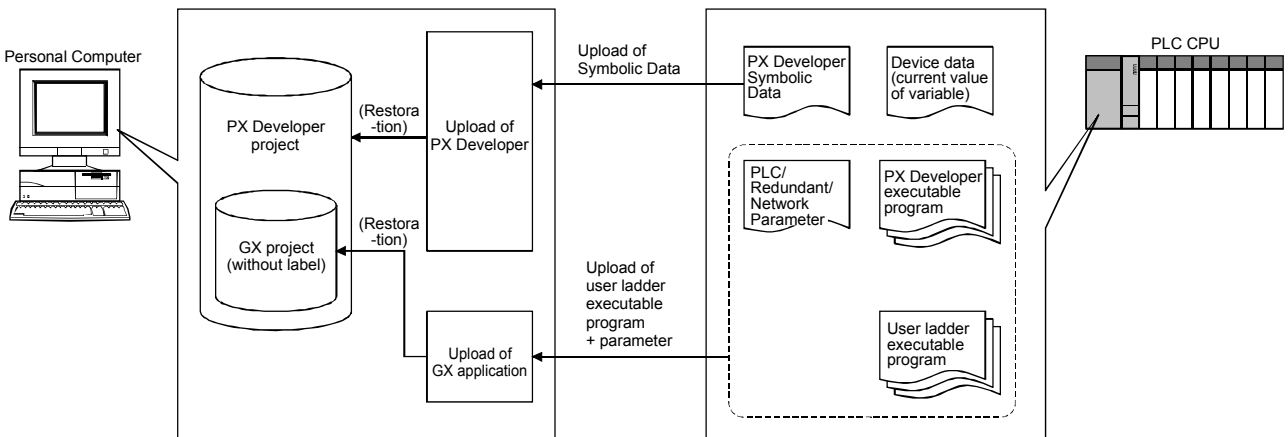
Upload is designed to load the data stored in PLC CPU to PX Developer. If the data needed to restore the projects are stored in PLC CPU with downloading, the project can be stored by uploading without project data on personal computer side. Upload is executed by both of PX Developer and GX application. PX Developer uploads the symbolic data, and GX application uploads the symbolic information.

Data uploaded from PLC CPU

1) Project with labels/Structured project



2) Project without label



(3) Data to be used in Upload/Download

Data		Description
PX Developer Data	Executable Data	Data needed to execute FBD Program on PLC CPU. It contains the following data created by the compile of programming tool. <ul style="list-style-type: none"> • PC/Network (/Redundant) parameter • PX Developer executable program • Device data (initial value of variable) *1
	Symbolic Data	Data needed to restore PX Developer project with upload. The compressed information about symbolic drawing of FBD program and variable assignment that are not contained in the Executable Data is stored. Program memory, or memory card (SRAM card and ATA card) can be specified for the download target memory. (☞ Section 12.4.3)
GX application Data	User ladder executable program	Data needed to execute sequence program on PLC CPU.
	Symbolic information	Data needed to execute the program created by label in place of device on PLC CPU. In addition, it is needed to restore the PX Developer Project with upload.

*1: The device data (initial value of variable) cannot be uploaded to personal computer.

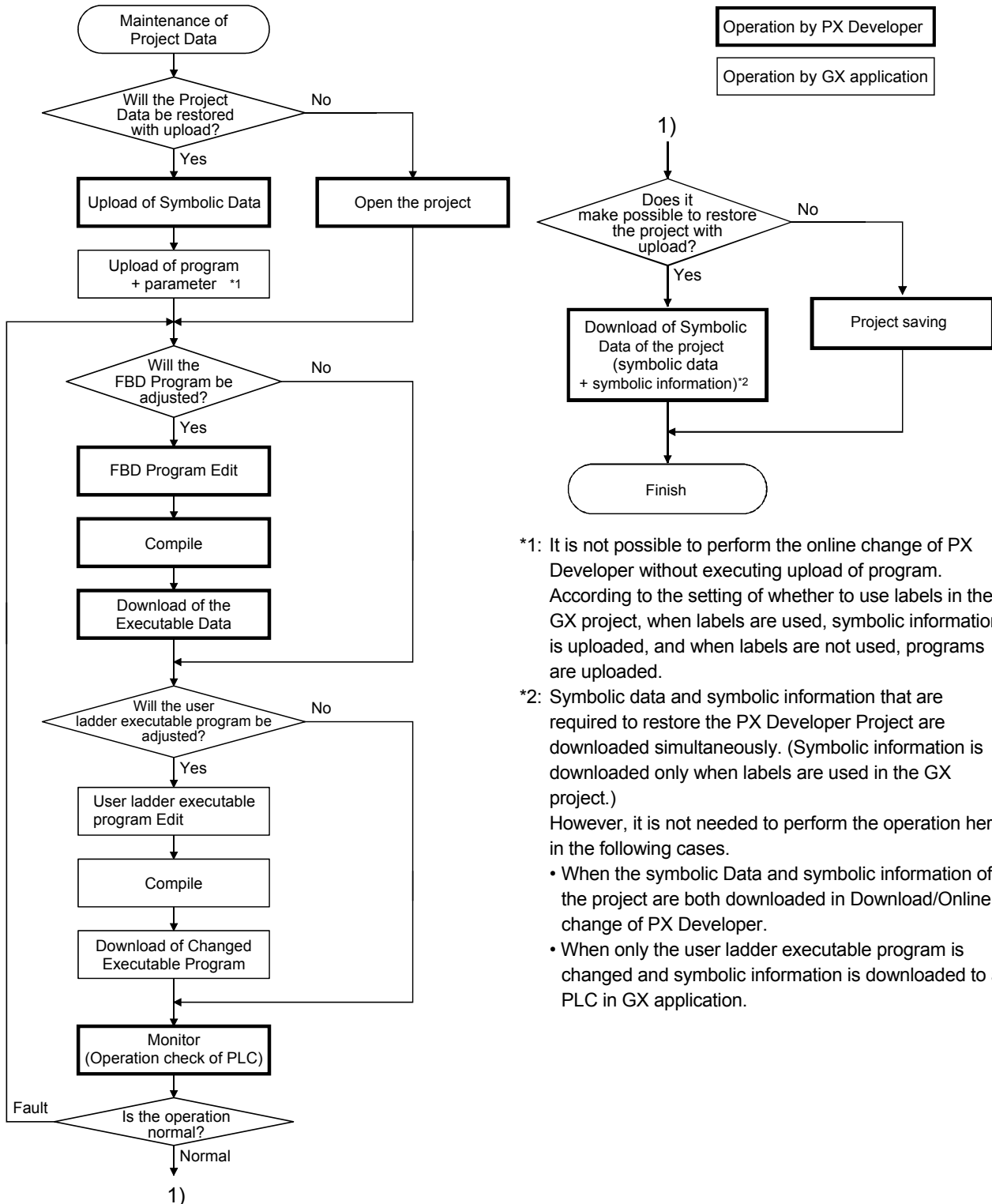
However, the device data (current value of variable) on PLC CPU processing, can be uploaded with Reading Current Value of FB Property.

(☞ Section 13.6)

12.2 Procedure for restoration and maintenance of Project Data

This chapter describes the procedure to restore the PX Developer project and GX project in personal computer side based on the data saved in PLC CPU and to execute the maintenance.

Procedure of Project Data maintenance



*1: It is not possible to perform the online change of PX Developer without executing upload of program. According to the setting of whether to use labels in the GX project, when labels are used, symbolic information is uploaded, and when labels are not used, programs are uploaded.

*2: Symbolic data and symbolic information that are required to restore the PX Developer Project are downloaded simultaneously. (Symbolic information is downloaded only when labels are used in the GX project.) However, it is not needed to perform the operation here in the following cases.

- When the symbolic Data and symbolic information of the project are both downloaded in Download/Online change of PX Developer.
- When only the user ladder executable program is changed and symbolic information is downloaded to a PLC in GX application.

POINT

- The download of symbolic information is needed to restore the GX project. When the download/Online change of PX Developer is executed without downloading the symbolic information, download the latest symbolic information by GX application.
- According to the setting of whether to use labels in a project, the combination of required versions of GX application and PX Developer varies. For details, refer to Section 2.2.2.
- PX Developer Version 1.08J or later can download/upload of the [Symbolic Data].
- When the download of [Symbolic Data] of PX Developer is executed, it will be stored in program memory or memory card (SRAM card or ATA card) as the file name, "#FBDQINF.BIN".
Never change or delete the [Symbolic Data] written in ATA card, otherwise the upload with PX Developer cannot be executed.
- Right after executing the upload of [Symbolic Data], the following contents of Project Data is vary to the data on downloading.
Reset, if necessary.

Data	Description after uploading
Transfer setup	The contents of Transfer setup, which have been set up on uploading, are stored. However the contents will return to default setting (PLC direct coupled setting), if the restored PLC type varies to the PLC type specified on uploading.
GX project	To be returned to the contents on the writing a new program.

12.3 Specifying PLC Transfer Setup



PURPOSE

The PLC transfer setup of CPU module should be specified in order to download the FBD programs created by programming tool in CPU module and monitor the current values of the variables by online monitor. This chapter explains methods for specifying the transfer setup.

For details of communication routes supported by programming tool, refer to Section 2.1.2.



BASIC OPERATION

1. Click [Online] → [Transfer Setup] in the menu.
2. The "Transfer Setup" window is displayed.
3. Select the computer interface in [PC side I/F].
Then double-click the icon to execute the detailed setting.
4. Click the interface of PLC in [PLC side I/F].
Then double-click the icon to execute the detailed setting.
5. Double-click the icon in [Other station] to execute the detailed setting.
6. Double-click the icon in [Network route] to execute the detailed setting.
7. Specify the PLC No. which is installed in Process CPU accessed from programming tool under the condition of multiple CPU system configuration.
Click the PLC No. icon of the once-clicked multiple CPU under the condition of no specification and returning to the multiple CPU. (Specific to Process CPU)
8. In the case of redundant system configuration, select from the following options for Redundant CPU.
"Not specified", "Control System", "Standby System", "System A", "System B"
9. Click the "OK" button.

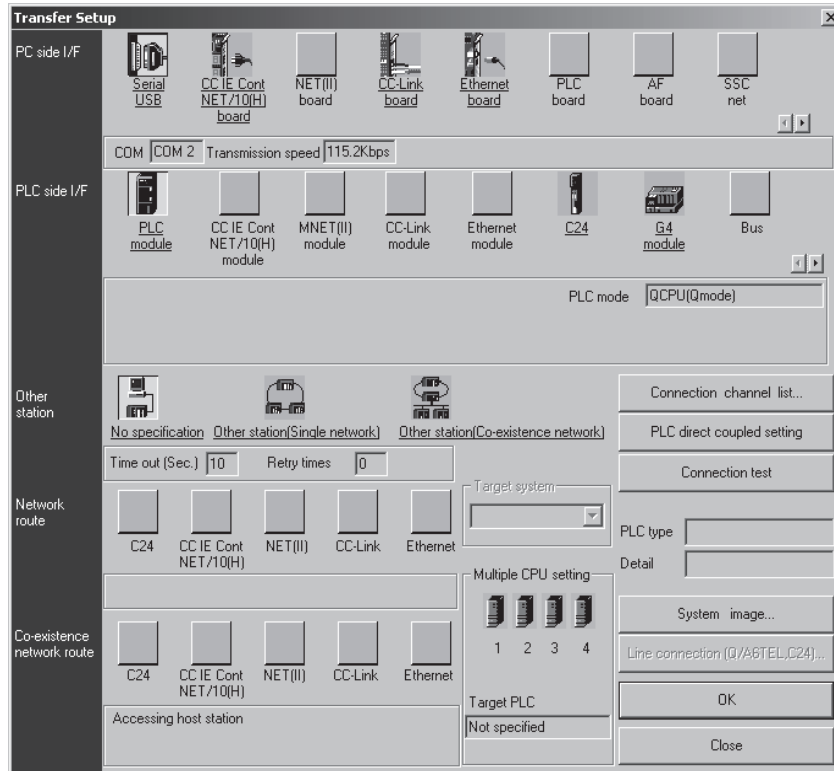
The background color of the selected item icons is yellow.

For details of setting, refer to "GX Developer Version 8 Operating Manual".

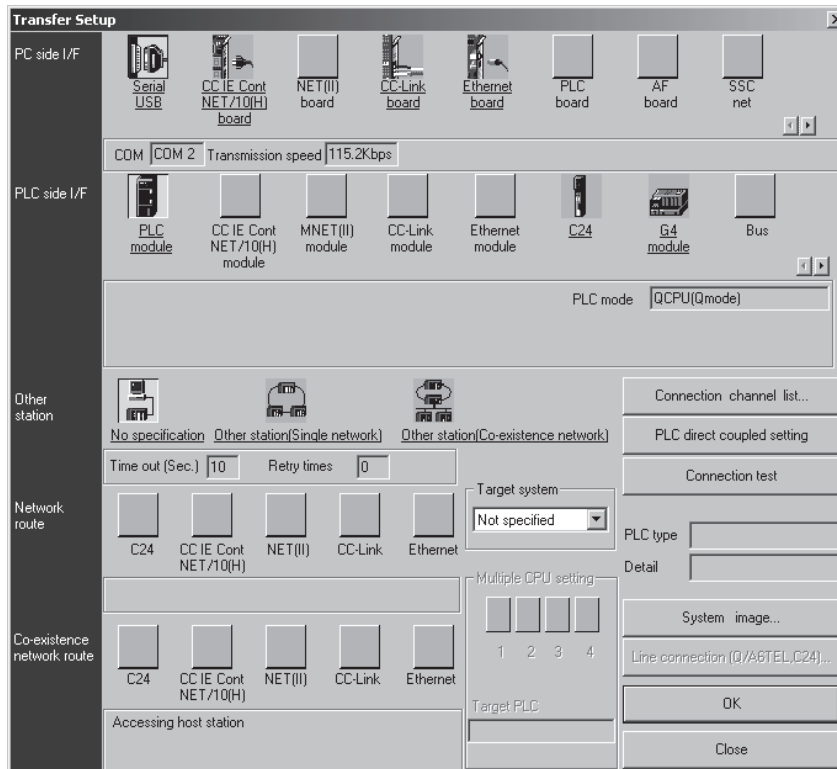


DISPLAY/SETTING SCREEN

1) When Process CPU or Universal model process CPU is selected as PLC type



2) When Redundant CPU is selected as PLC type





DISPLAY/SETTING DATA

Item	Description												
PC side I/F	To specify PC side I/F. PC side I/F which can be specified is serial USB, CC IE Cont NET/10(H) board, CC-Link board, Ethernet board, and Q series bus. Then double click the icons to execute the detailed setting.												
PLC side I/F	To display the PLC side interface. The following contents will be displayed after specifying the PC side I/F. PC side I/F is serial USB: PLC module, C24, G4 module, MNET/10(H) remote PC side I/F is CC IE Cont NET/10 (H) board: CC IE Cont NET/10 (H) module PC side I/F is CC-Link board: CC-Link module PC side I/F is Ethernet board: Ethernet module PC side I/F is Q series bus: PLC module Double click the displayed icons to execute detailed settings. (The detailed settings cannot be executed under the condition of [MNET/10 (H) module]).												
Other station	To display the specification status of the local station or other stations. The following contents will be displayed by specifying the PC side I/F. PC side I/F is serial USB and PLC side IF is CPU module or C24: No specification, Other station (Single network), Other station (Co-existence network) PC side I/F is Q series bus: No specification Other than the above: Other station (Single network), Other station (Co-existence network) Double click the selected icons to execute the detailed settings.												
Network route	To display network communication route. Selectable when Other station (Single network) or Other station (Co-existence network) is selected in Other station. Double click the selected icons to execute the detailed settings.												
Co-existence Network route	Selectable when Other station (Co-existence network) is selected in Other station with the network route predetermined. By double-clicking a selected icon, detailed settings can be made.												
Multiple CPU setting (Specific to Process CPU)	To specify the PLC No. which is set in Process CPU accessed by programming tool in multiple CPU system configuration. To specify [No choice made] or [PLC No. 1] in single-CPU system configuration.												
Target system (Specific to Redundant CPU)	Specify the connection target from the following when configuring a system using Redundant CPUs. *1 <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 30%;">Options</th> <th>Connection target.</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">Not specified</td> <td>CPU direction connection: The CPU module directly connected to personal computer. Via a module mounted to the main base unit: The CPU module of station in which the network module corresponding to the station No. specified in Network route is mounted. Via a module mounted to the redundant type extension base unit: The CPU module in the control system</td> </tr> <tr> <td style="text-align: center;">Control System</td> <td>The CPU module in the control system</td> </tr> <tr> <td style="text-align: center;">Standby System</td> <td>The CPU module in the standby system</td> </tr> <tr> <td style="text-align: center;">System A</td> <td>The CPU module to which the A side connector of tracking cable is connected.</td> </tr> <tr> <td style="text-align: center;">System B</td> <td>The CPU module to which the B side connector of tracking cable is connected.</td> </tr> </tbody> </table>	Options	Connection target.	Not specified	CPU direction connection: The CPU module directly connected to personal computer. Via a module mounted to the main base unit: The CPU module of station in which the network module corresponding to the station No. specified in Network route is mounted. Via a module mounted to the redundant type extension base unit: The CPU module in the control system	Control System	The CPU module in the control system	Standby System	The CPU module in the standby system	System A	The CPU module to which the A side connector of tracking cable is connected.	System B	The CPU module to which the B side connector of tracking cable is connected.
Options	Connection target.												
Not specified	CPU direction connection: The CPU module directly connected to personal computer. Via a module mounted to the main base unit: The CPU module of station in which the network module corresponding to the station No. specified in Network route is mounted. Via a module mounted to the redundant type extension base unit: The CPU module in the control system												
Control System	The CPU module in the control system												
Standby System	The CPU module in the standby system												
System A	The CPU module to which the A side connector of tracking cable is connected.												
System B	The CPU module to which the B side connector of tracking cable is connected.												
PLC direct coupled setting	To set as CPU module direct connection (RS-232).												
Connection test	To test whether PLC can communicate with a CPU module when the current transfer setup is specified.												
OK	To substitute the set transfer setup and close the "Transfer setup" window.												
Close	Not to reflect the set connection destination but to close the "Transfer setup" window.												

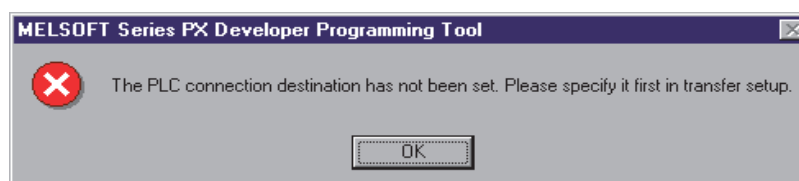
*1 When connected to the Redundant CPU via a module mounted to the redundant type extension base unit, some functions shown in the table below cannot be executed.

Function \ Target system	System A, System B	Not specified, Control System, Standby System	Restrictions
Upload	○	△	FBD programs can be restored since uploading of symbolic data is enabled, but such as PLC/redundant/network parameters and symbolic information cannot be restored since uploading by GX application is disabled.
Online change compile	×	×	—
Download	×	×	—
Project consistency check	○	×	—

○: Executable △: Executable with restrictions ×: Not executable

POINT

- First specify the connection target of the CPU module to download the FBD programs created with the PX Developer version 1.04E or earlier programming tool or to monitor the current values of the variables by online monitor. The following dialog box will be displayed in PLC downloading or online operation without specifying the connection target.



- For detailed settings of each network route in the Transfer Setup window, refer to the "GX Developer Version 8 Operating Manual".
- When GX project type is GX Works2 project, the connection target information is reflected to "Current Connection" on Navigation window.
- "CC-Link IE Field Network board" cannot be specified to PC side I/F. Besides, it cannot be specified to Network Communication Route.

12.4 Downloading to PLC



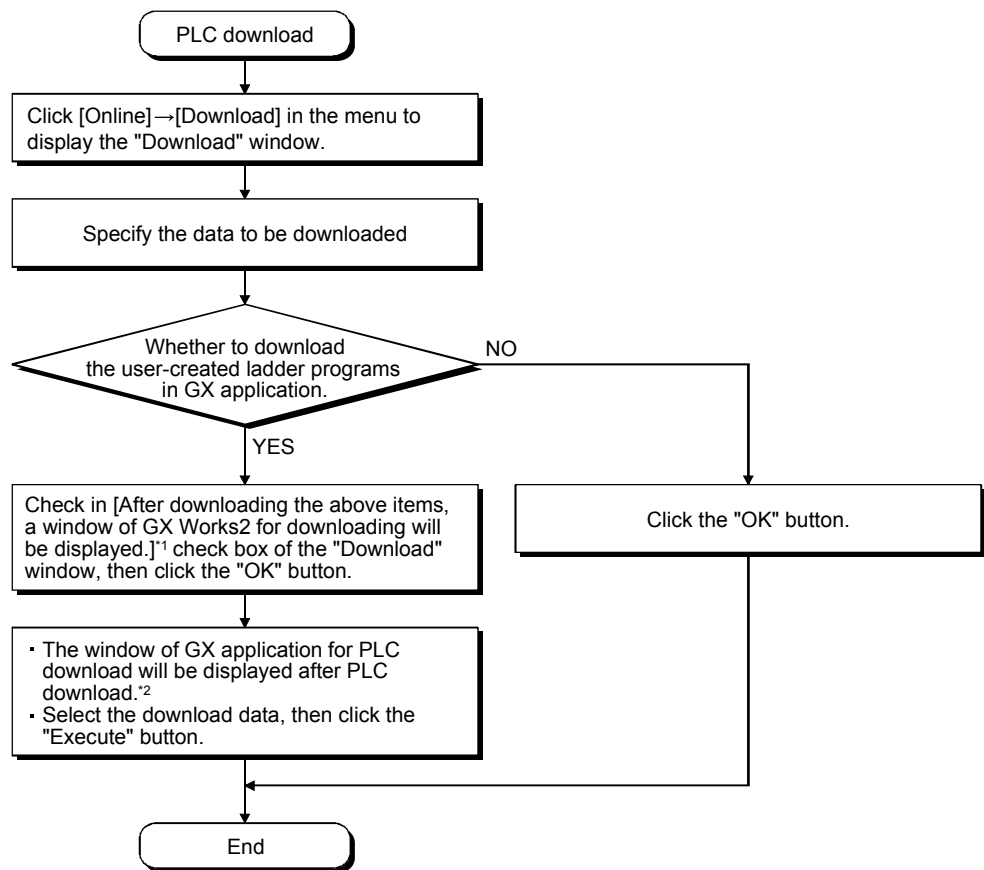
PURPOSE

To download the executable data (PX Developer program file or parameter) created by compile with programming tool, symbolic data, and symbolic information to the CPU module. If there is user-created ladder program at GX application side, the ladder program will be downloaded to the CPU module.



BASIC OPERATION

(1) Operation procedure of PLC download



*1: When GX project type is GX Developer project, select the [After downloading the above items, a window of GX Developer for downloading will be displayed.] checkbox.
 *2: For details of operations such as method for displaying "Download" window, refer to (2) in this section.

POINT

When the monitor tool is used, download the monitor target project again in the monitor tool after executing PLC download with the programming tool.




POINT			
Download to PLC is executed to the following PLC CPU in a redundant system.			
Operation mode	Tracking status	Target PLC CPU	Remarks
Backup mode	No error	PLC CPUs of both systems (Control system to Standby system order)	—
	Error has occurred*1	Target PLC	A message appears for confirming download to PLC of both systems is disabled.
Separate mode	Always	PLC CPU specified in the PLC connection destination	—
Debug mode	Always		

*1: Tracking error could be caused by any of the following:

- The other Redundant CPU is powered OFF.
- The other Redundant CPU is reset.
- Tracking cable failure.

Note that, "other Redundant CPU error stop" will not be a tracking failure when downloading data to PLC.

(2) PLC download methods

1. Click the [Online] → [Download] in the menu (.
2. The "Download" window is displayed.
3. Input the selection mark in the check box of the [The Executable Data], if downloading the executable data of the project.
4. Input the selection mark in the check box of the [The Symbolic Data], if downloading the symbolic data of the project.
To change the target memory displayed on the [Detail] area in this case, click the  button to display the Download Setting window and change the target memory on the <<The Symbolic Data>> tab and <<Symbolic Information>>*1 tab.
( Section 12.4.3)
5. Input the selection mark in the check box of [After downloading the above items, a window of GX Works2 for downloading will be displayed]*2, if downloading the ladder program and device comment created on the GX Works2 side.
6. Click the "OK" button to close the download window and start downloading.
7. If the check box of [After downloading the above items, a window of GX Works2 for downloading will be displayed] on the download window is selected, the window of GX Works2 for downloading will be displayed.
After downloading the required data, close this window.

*1: When GX project type is GX Developer project, select the <<Label Program>> tab.

*2: When GX project type is GX Developer project, select the [After downloading the above items, a window of GX Developer for downloading will be displayed.] checkbox.

12.4.1 Downloading the Executable Data



PURPOSE

Download the required data (PX Developer program file or parameter) for which FBD program is executed by PLC CPU to the CPU module.



BASIC OPERATION

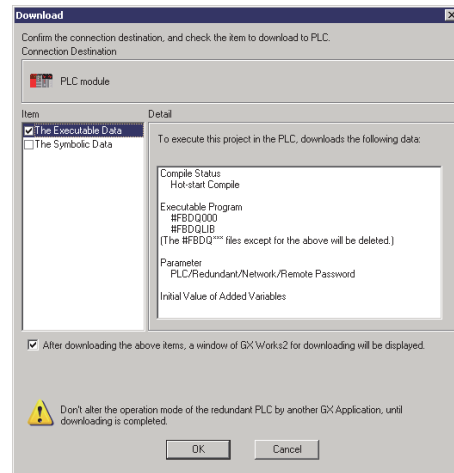
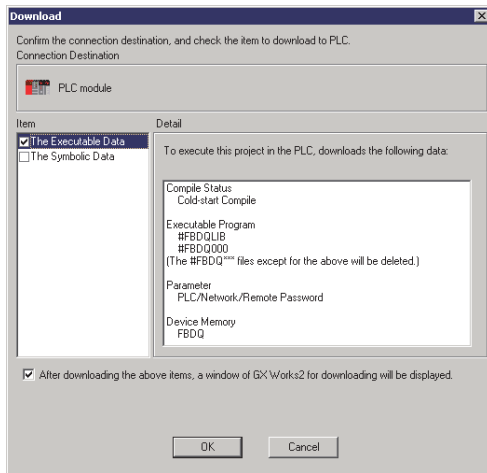
1. Display the "Download" window by the operation described in Section 12.4.
2. Input the selection mark in the check box [The Executable Data] in Item area and click the "OK" button.



DISPLAY/SETTING SCREEN




1) When Process CPU or Universal model process CPU is selected as PLC type

2) When Redundant CPU is selected as PLC type





DISPLAY/SETTING DATA

Item	Description
Connection Destination	To display a connection target (CPU module () or Simulation ()).
The Executable Data *1	To input the selection mark in the check box when downloading required data for which the project is executed by PLC CPU. To display the detailed information for executable data on [Detail] area when this item is selected. However, this item cannot be selected when compile status is invalid initial value ().
Compile Status	To display the latest-executed compile type (cold-start compile or hot-start compile). (For details of compile contents, refer to Section 11.2 and Section 11.3.)
Executable Program	To display the program file name and make files automatically. The name for the automatically made file is [#FBDQ***].
Parameter	To display the download parameter type.
Device Memory (In Cold-start Compile)	To display the file name of the device memory in the cold-start compile status.
Initial Value of Added Variables (In Hot-start Compile)	To display [Initial Value of Added Variables] in the hot-start compile status.
After downloading the above items, a window of GX Works2 for downloading will be displayed.*2	To display the "Download" window of GX application after downloading when inputting the selection mark in this check box. To input the selection mark in the check box when downloading the files such as ladder programs or device comments made in GX application side.

*1: For downloading the symbolic data of project, refer to Section 12.4.2.

*2: When GX project type is GX Developer project, [After downloading the above items, a window of GX Developer for downloading will be displayed.] is displayed.

12.4.2 Downloading the Symbolic Data



PURPOSE

Download required data for project restoration by uploading to CPU module.



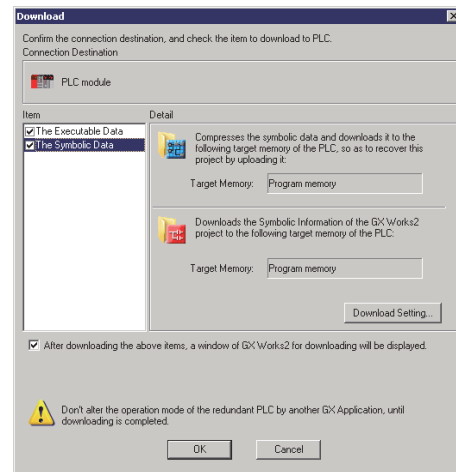
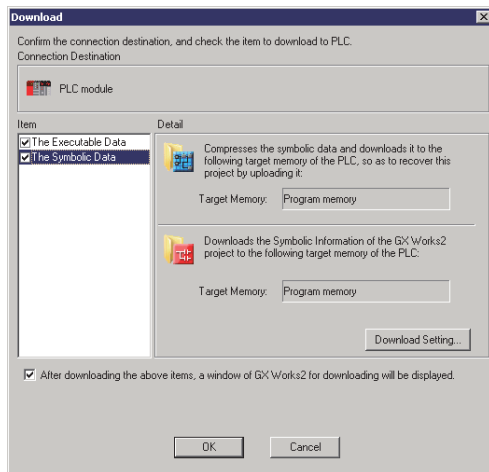
BASIC OPERATION

1. Display the "Download" window with the operation described in Section 12.4.
2. Input the selection mark on the check box [The Symbolic Data] and click the "OK" button.



DISPLAY/SETTING SCREEN










- 1) When Process CPU or Universal model process CPU is selected as PLC type
- 2) When Redundant CPU is selected as PLC type



DISPLAY/SETTING DATA

Item	Description
Connection Destination	To display a CPU module ().
The Symbolic Data*1	To input the selection mark in the check box when downloading required symbolic data and symbolic information for project restoration by uploading. To display the detailed information for symbolic data on [Detail] area when this item is selected. Cannot be selected during the simulation.

*1: For downloading the executable data of project, refer to Section 12.4.1.

Item	Description																	
Target memory	<p>To display PLC CPU memory name that becomes a target of downloading for symbolic data and label programs. (It is the same name as that of the downloading setting (☞ Section 12.4.3).</p> <p>Displays a memory name of the target PLC CPU for downloading symbolic information to PLC. (The same name as the setting in the Download Setting (☞ Section 12.4.3).)</p> <p>The icon displayed on the screen differs depending on the GX project type. Note that, when the installed GX Developer does not support^{*2} the download of label programs from PX Developer to a PLC, and label programs cannot be downloaded to a PLC, memory name of PLC is not displayed and a warning message is displayed. The following table shows the details.</p> <table border="1"> <thead> <tr> <th rowspan="2">Whether to use labels in a project</th> <th rowspan="2">Downloading symbolic information to PLC^{*2}</th> <th colspan="2">Display item</th> </tr> <tr> <th>Icon</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Not used</td> <td>-</td> <td>None^{*3}</td> <td>None^{*3}</td> </tr> <tr> <td rowspan="2">Used</td> <td>Not supported</td> <td> GX Developer project  </td> <td>Label programs cannot be downloaded simultaneously because GX Developer does not support it.</td> </tr> <tr> <td>Supported</td> <td> GX Works2 project  GX Developer project  </td> <td>Target memory</td> </tr> </tbody> </table>	Whether to use labels in a project	Downloading symbolic information to PLC ^{*2}	Display item		Icon	Description	Not used	-	None ^{*3}	None ^{*3}	Used	Not supported	GX Developer project 	Label programs cannot be downloaded simultaneously because GX Developer does not support it.	Supported	GX Works2 project  GX Developer project 	Target memory
Whether to use labels in a project	Downloading symbolic information to PLC ^{*2}			Display item														
		Icon	Description															
Not used	-	None ^{*3}	None ^{*3}															
Used	Not supported	GX Developer project 	Label programs cannot be downloaded simultaneously because GX Developer does not support it.															
	Supported	GX Works2 project  GX Developer project 	Target memory															
"Download Setting" button	Displays the Download Setting window to change the settings for a target memory and compression rate of symbolic data.																	
After downloading the above items, a window of GX Works2 for downloading will be displayed. ^{*4}	<p>To display the "Download" window for GX application after downloading when input the selection mark in this check box.</p> <p>To check when downloading symbolic information on GX application side.</p>																	

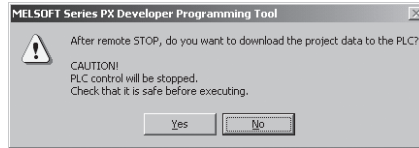
*2: For details of supported versions, refer to Section 2.2.2.

*3: Not displayed since the download of symbolic information is not required.

*4: When GX project type is GX Developer project, [After downloading the above items, a window of GX Developer for downloading will be displayed.] is displayed.

POINT

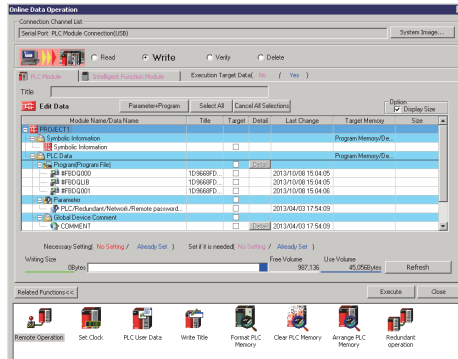
- In PLC download, PLC download can be executed after remote stop is executed on programming tool when the CPU module is in RUN status. The following dialog box will be displayed after PLC download.



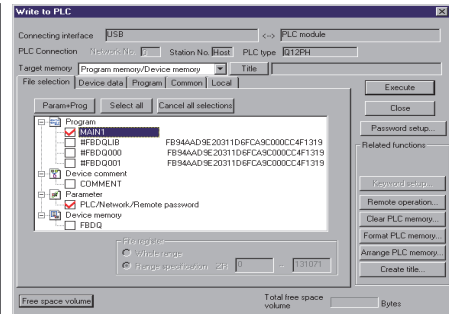
Here, the CPU module will remain the remote STOP status if clicking the "NO" button. Please start GX application from programming tool in order to execute remote RUN (refer to Section 7.15.1), and execute remote RUN with remote operation.

- When inputting "Check" in the "After downloading the above items, a window of GX Works2 for downloading will be displayed." check box and executing PLC download, the Write to PLC screen will be displayed after downloading programming tool related files to PLC. The selected data will be downloaded in the CPU module when selecting the user-created ladder programs and click the "Execute" button. Click the "Close" button to end PLC download without downloading the data. For details of operations of the Write to PLC screen, refer to the following manuals:

- GX Works2 Version 1 Operating Manual (Common)
- GX Developer Version 8 Operating Manual



(Write to PLC screen of GX Works2)



(Write to PLC screen of GX Developer)

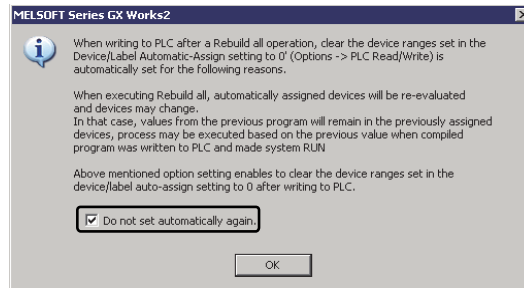
- In a project, data cannot be downloaded to the CPU module when executing the hot-start compile in case that PLC download is never executed after the cold-start compile. Here, the PLC download should be executed after being compiled again by cold-start compile.
- Messages will be displayed before PLC download when GX project is not compiled (such as when the GX project is not compiled by GX application after changing the local label). At this time PLC download should be executed after being compiled by GX application. Compile the program of GX application by selecting [Compile] menu in GX Works2. (As for GX Developer, select [Convert] → [Convert] menu.)

For details, refer to the following manuals:

- GX Works2 Version 1 Operating Manual (Common)
- GX Developer Version 8 Operating Manual

POINT

- If download to PLC is cancelled or an error occurs in this setting when the PLC type is Redundant CPU, programs written into the Redundant CPUs of both systems are inconsistent.
If the operation status is changed to RUN in the backup mode, the consistency check error will occur.
In this case, execute download to PLC again so that the programs will be consistent.
- When a user ladder executable program exists in a GX project, and downloading data to a PLC in GX application, download symbolic information as well.
- When the [The Symbolic Data] item is checked, symbolic data and label programs are downloaded to a PLC.
- Password authentication is required for uploading the symbolic data when downloading symbolic data of project that password is set.
- When "Clear the device ranges set in the Device/Label Automatic-Assign setting to 0 at time of PLC write after a Rebuild All Operation" check box is cleared with GX Works2 project which has been started up from PX Developer, this change may not be applied at restart of GX Works2 from PX Developer.
In this case, perform the following operation.
 - 1) Open GX Works2 project contained in PX Developer on Windows® Explorer.
 - 2) Select [Tool] → [Options] → "PLC Read/Write" in GX Works2, clear the option above, save and close the project.
 - 3) Open the GX Works2 project on Windows® Explorer again.
The confirmation dialog box is displayed. Select "Do not set automatically again".



- 4) Clear the option explained in step2 of GX Works2 project, and save and close the project.

For details, refer to the following manuals:

- GX Works2 Version 1 Operating Manual (Common)
- GX Developer Version 8 Operating Manual

12.4.3 Download Setting



PURPOSE

Set target memory for downloading symbolic data and symbolic information. The compressed rate and size of symbolic data can be checked.



BASIC OPERATION

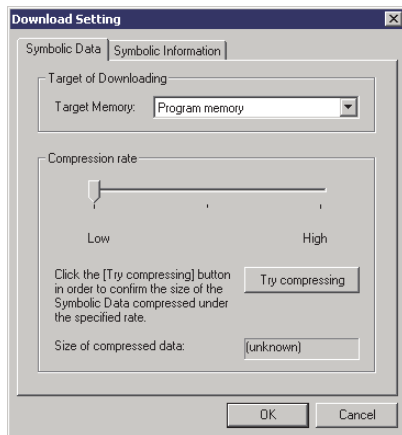
1. Select the item [The Symbolic Data] on the "Download/Online Change" window and click the "Download Setting" button in the [Detail] area.
2. Select <<The Symbolic Data>> tab and set "Target memory" and "Compression rate" for downloading symbolic data.
3. To check the size of the symbolic data after compression at the selected compression rate, click the "Try compressing" button.
4. For the GX project that uses labels, select the <<Symbolic Information>> tab*1 and when downloading label programs to a target memory which is different from that of the symbolic data, check the "Download the label program to the target memory different from the symbolic data" check box and select a target memory.
5. Click the "OK" button.

*1: When GX project type is GX Developer project, select the <<Label Program>> tab.

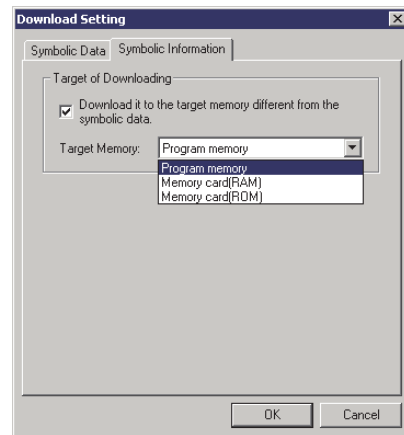


DISPLAY/SETTING SCREEN

<<Symbolic Data>> tab



<<Symbolic Information>> tab



DISPLAY/SETTING DATA

Item	Description
<<The Symbolic Data>> tab	A tab control for indicating the settings of the symbolic data.
<<Symbolic Information>> tab*1	A tab control for indicating the settings of the symbolic information. This tab will not be displayed for projects without labels.

*1: When GX project type is GX Developer project, <<Label Program>> tab is displayed.

Item	Description																	
Target memory	<p>To select the PLC CPU memory stores symbolic data and symbolic information from the list box. *2</p> <ul style="list-style-type: none"> When Process CPU or Redundant CPU is selected as PLC type <table border="1"> <thead> <tr> <th>Target memory</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Program memory</td> <td>Downloads to the program memory of CPU module.</td> </tr> <tr> <td>Memory card (RAM)</td> <td>Downloads to the SRAM card inserted in the memory card slot.</td> </tr> <tr> <td>Memory card (ROM)</td> <td>Downloads to the ATA card inserted in the memory card slot. (Flash card is not applicable.)</td> </tr> </tbody> </table> <ul style="list-style-type: none"> When Universal model process CPU is selected as PLC type <table border="1"> <thead> <tr> <th>Target memory</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Program memory</td> <td>Downloads to the program memory of CPU module.</td> </tr> <tr> <td>Memory card (SD)</td> <td>Downloads to the SD card inserted in the memory card slot.</td> </tr> <tr> <td>Standard RAM</td> <td rowspan="2">Downloads to the memory built in CPU module.</td> </tr> <tr> <td>Standard ROM</td> </tr> </tbody> </table> <p>In the <<Label Program>> tab, the selection of target memory becomes invalid in case of the following:</p> <ul style="list-style-type: none"> GX project type is GX Developer. The installed GX Developer does not support*3 the download of label programs. The download is used from PX Developer. 	Target memory	Description	Program memory	Downloads to the program memory of CPU module.	Memory card (RAM)	Downloads to the SRAM card inserted in the memory card slot.	Memory card (ROM)	Downloads to the ATA card inserted in the memory card slot. (Flash card is not applicable.)	Target memory	Description	Program memory	Downloads to the program memory of CPU module.	Memory card (SD)	Downloads to the SD card inserted in the memory card slot.	Standard RAM	Downloads to the memory built in CPU module.	Standard ROM
Target memory	Description																	
Program memory	Downloads to the program memory of CPU module.																	
Memory card (RAM)	Downloads to the SRAM card inserted in the memory card slot.																	
Memory card (ROM)	Downloads to the ATA card inserted in the memory card slot. (Flash card is not applicable.)																	
Target memory	Description																	
Program memory	Downloads to the program memory of CPU module.																	
Memory card (SD)	Downloads to the SD card inserted in the memory card slot.																	
Standard RAM	Downloads to the memory built in CPU module.																	
Standard ROM																		
Compression rate	To select compression rate of symbolic data from 3 stages. *2																	
"Try compressing" button	Displays the symbolic data size at the selected compression rate.																	
Download it to the target memory different from the symbolic data	<p>Select when downloading symbolic information to a target memory which is different from the target memory selected in the <<The Symbolic Data>> tab. If this item is not selected, the selection of target memory becomes invalid, and the target memory selected in the <<The Symbolic Data>> tab is selected.</p> <p>If the installed GX Developer does not support*3 the download of label programs from PX Developer to a PLC, the check box becomes invalid because label programs cannot be downloaded to a PLC.</p>																	

*2: Symbolic data cannot be downloaded when capacity of target memory is insufficient. In that case, change target memory or increase compression rate.

In the case of high compression rate, it will take longer time for compression.

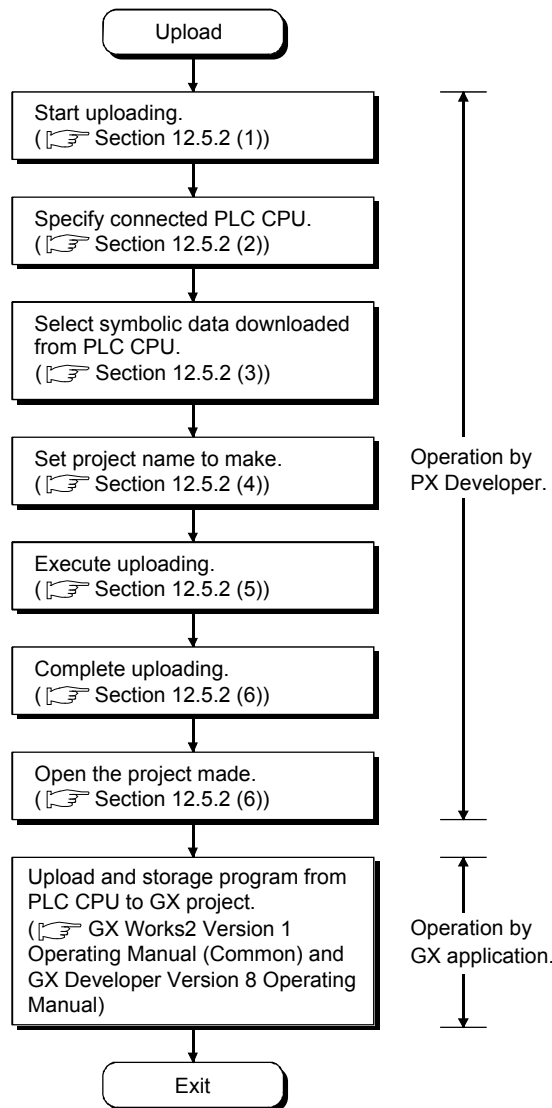
*3: For details of supported versions, refer to Section 2.2.2.

POINT
<p>Even the same compression rate is specified to symbolic data, the size display after compression varies in the range of several tens of bytes. The size of symbolic data written to the PLC can be checked on the output window during the execution of Write to PLC.</p>

12.5 Uploading from PLC

Upload symbolic data from memory in PLC CPU and restore project.

12.5.1 Uploading procedure



POINT



- PX Developer Version 1.08J or later is required to upload.
- Open the GX project and perform uploading of program and parameter after uploading of PX Developer is completed.
Also, if there are Device comments or data, upload for those matters.
Note that the version of GX application that can upload data from PLC varies according to the PLC type of the PX Developer project and the setting of whether to use labels in a GX project contained in the PX Developer project. For the required version of GX application, refer to Section 2.2.2.
- When PX Developer project is opened by PX Developer Version 1.08J or later right after being made with uploading, perform compile for executing download. However, online monitor can be executed without performing compile.

12.5.2 Uploading the Symbolic Data

(1) Start upload



BASIC OPERATION

1. Click [Online]-[Upload] () on the menu.
2. When PX Developer project is opened, close PX Developer project.
3. The "Upload" window (transfer setup PLC CPU) is displayed.
( "DISPLAY/SETTING SCREEN" of (2) in this section)

(2) Specify connected PLC CPU.






PURPOSE

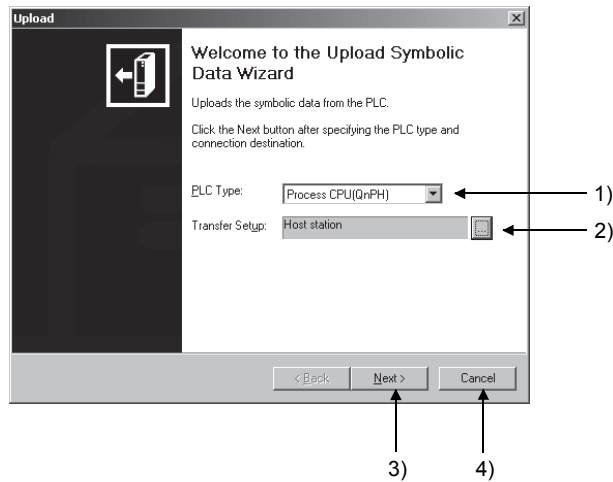
Specify connected PLC CPU.




BASIC OPERATION

1. Display the "Upload" window (transfer setup PLC CPU) with the operation of (1) in this section.
2. Select PLC type from list box.
3. Click the  button to display the "Transfer setup" window.
( "DISPLAY/SETTING SCREEN" of Section 12.3)
4. Specify transfer setup CPU with the "Transfer setup" window and click the "OK" button.
5. Close the "Transfer setup" window, and transfer setup CPU is displayed.
6. Click the "Next" button.
7. "Upload" window (Select the Symbolic Data...) is displayed.
( "DISPLAY/SETTING SCREEN" of (3) in this section)

 **DISPLAY/SETTING SCREEN**



 **DISPLAY/SETTING DATA**

No.	Item	Description
1)	PLC Type	To select PLC type of PLC CPU to be connected.
2)	Transfer Setup	To specify connected PLC CPU. To click the button  and display "Transfer setup" window.
3)	Next	To display the "Upload" window (Select the Symbolic Data...).
4)	Cancel	To close the "Upload" window after making the setting contents invalid.


POINT
 When changing PLC type, multiple PLC setting becomes "Not specified", and Target system becomes "Not specified".

(3) Select the symbolic data.

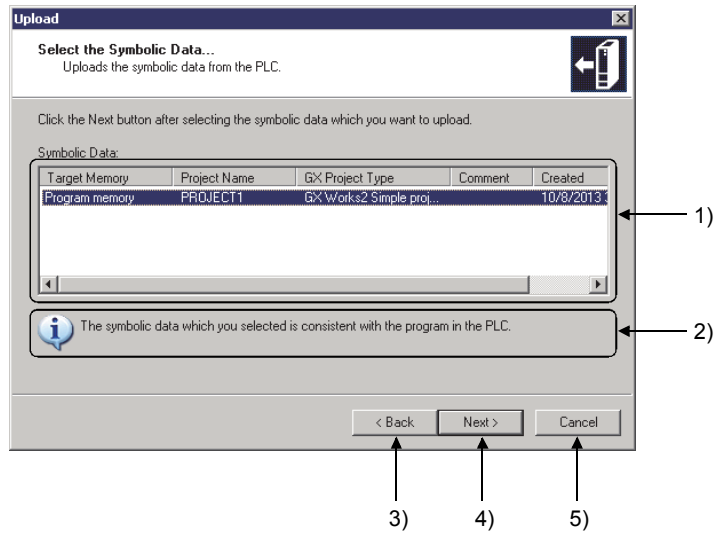
 **PURPOSE**

Select the symbolic data to be uploaded from connected PLC CPU.







 **BASIC OPERATION**

1. Display the "Upload" window (Select the Symbolic Data...) with the operation of (2) in this section.
 Target memory in which symbolic data exist is displayed as a list.
 (The progress display window is displayed on processing.)
2. Select symbolic data to be uploaded, click the "Next" button.
3. The "Upload" window (Input a new Project Name...) is displayed.
 ( "DISPLAY/SETTING SCREEN" of (4) in this section)

 **DISPLAY/SETTING SCREEN**



 **DISPLAY/SETTING DATA**

No.	Item	Description									
1)	Symbolic data list	A list of symbolic data stored in target memory connected PLC CPU is displayed. Only one symbolic data to be uploaded can be selected. Default allows selecting symbolic data that match to program to be operated on PLC CPU.									
2)	Message display	To display the result as a message after comparing symbolic data selected with the list to program operated on PLC CPU. <table border="1"> <thead> <tr> <th></th> <th>Icon</th> <th>Message</th> </tr> </thead> <tbody> <tr> <td>Matched</td> <td></td> <td>The symbolic data which you selected is consistent with the program in the PLC.</td> </tr> <tr> <td>Mismatched *1</td> <td></td> <td>The symbolic data which you selected is not consistent with the program in the PLC.</td> </tr> </tbody> </table> <p>*1: contains the case that symbolic data is broken down as well. The symbolic data cannot be uploaded if GX application which is required to upload the selected symbolic data in the list is not installed, or the project type is unknown.</p>		Icon	Message	Matched		The symbolic data which you selected is consistent with the program in the PLC.	Mismatched *1		The symbolic data which you selected is not consistent with the program in the PLC.
	Icon	Message									
Matched		The symbolic data which you selected is consistent with the program in the PLC.									
Mismatched *1		The symbolic data which you selected is not consistent with the program in the PLC.									
3)	Back	To display the "Upload" window (Transfer Setup PLC CPU).									
4)	Next	To display the "Upload" window (Input a new Project Name...). However, when symbolic data is not selected or symbolic data selected is illegal, the "Next" button cannot be selected.									
5)	Cancel	To close the "Upload" window after making the setting contents invalid.									

POINT
<ul style="list-style-type: none"> ● When project name of symbolic data contains 32 characters or more, project name will be performed omission display. ● The information whether labels are used in the symbolic data, which has been downloaded to PLC using PX Developer Version 1.34L or earlier, is not displayed to "GX Project Type" column.

(4) Input a new Project Name



PURPOSE

Based on symbolic data, set PX Developer project name to be newly created (restored).

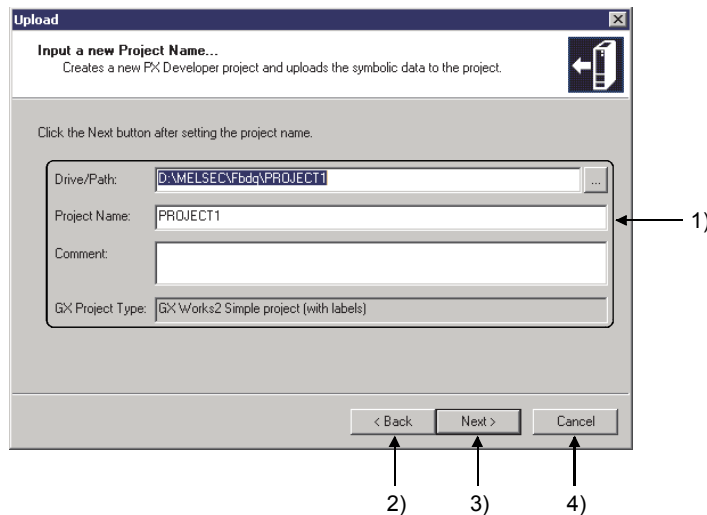


BASIC OPERATION

1. Display "Upload" window (Input a new Project Name...) with operation of (3) in this section.
Drive/path, project name and comment of PX Developer project to uploaded symbolic data are initially displayed.
2. Change drive/path, project name and comment if necessary and click the "Next" button.
3. The progress display window is displayed.
(Hand cursor icon) "DISPLAY/SETTING SCREEN" of (5) in this section)



DISPLAY/SETTING SCREEN



DISPLAY/SETTING DATA

No.	Item	Description
1)	Drive/Path, Project Name, Comment, GX Project Type	To set drive/path, project name and comment of project to be newly created (restored). To display GX project type to be uploaded. When project name of symbolic data to be uploaded is 32 characters or more, abbreviate it to 32 characters.
2)	Back	To display the "Upload" window (Select the Symbolic Data...).
3)	Next	To upload symbolic data with displaying progress display window.
4)	Cancel	To close the "Upload" window after making the setting contents invalid.

POINT

Restriction on setting drive / path and project name is the same as that for creating new project. (Hand cursor icon) Section 6.2)

(5) Execute uploading from PLC



PURPOSE

Upload symbolic data from connected PLC CPU and newly create (restore) PX Developer project.



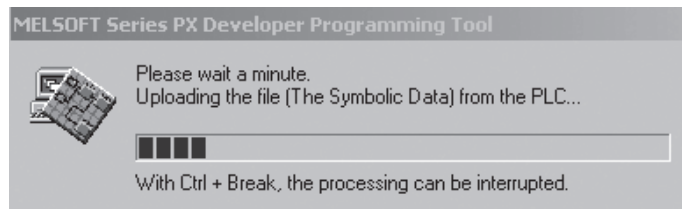
BASIC OPERATION

1. Progress display window (uploading the symbolic data) is displayed by the operation of (4) in this section, and symbolic data is uploaded.
 Uploading of symbolic data can be interrupted with pressing the "Ctrl" + "Break" key.
2. Restore [PX Developer project file] and [assigned information database] from symbolic data and save them into the specified drive/path after completing upload of symbolic data.
 While executing this processing, progress display window (Creating the PX Developer project) is displayed.
3. When completing the upload processing, the "Upload" window (completion of upload) is displayed. (Hand cursor icon "DISPLAY/SETTING SCREEN" of (6) in this section.)

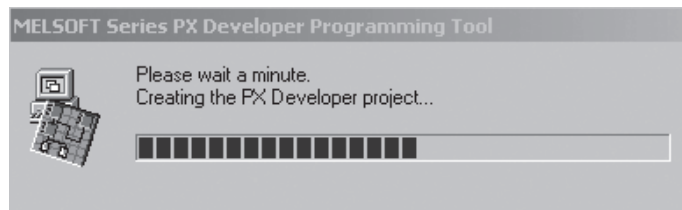


DISPLAY/SETTING SCREEN

- 1) Progress display window (uploading the symbolic data)



- 2) Progress display window (Creating the PX Developer project)



(6) Complete uploading from PLC



PURPOSE

Complete the upload.



BASIC OPERATION

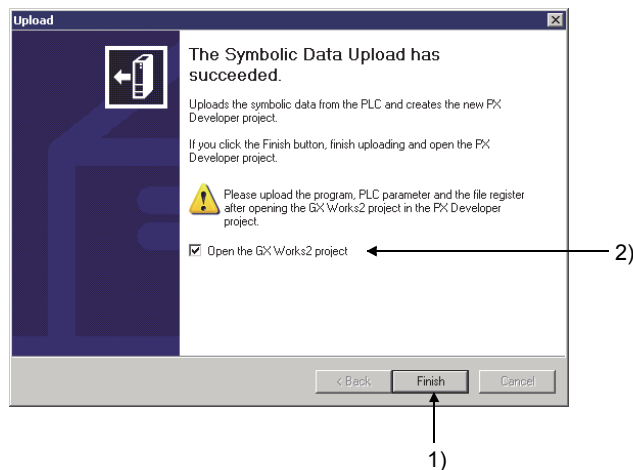
1. The "Upload" window (completion of upload) is displayed by the operation of (5) in this section.
2. Click the "Finish" button and close the "Upload" window (completion of upload).
3. The newly created (restored) PX Developer project is opened.
4. Open the GX project from PX Developer and execute upload of symbolic information, executable program, parameter, and file register*1, *2

*1: When debugging PX Developer project which is uploaded from PLC CPU with GX Simulator, uploading file register from PLC CPU is needed.

*2: When labels are not used in the PX Developer project, data other than symbolic information become the target.



DISPLAY/SETTING SCREEN



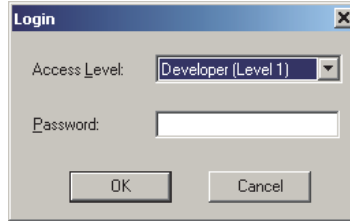
DISPLAY/SETTING DATA

No.	Item	Description
1)	Finish	To close the "Upload" window (completion of upload) and open the created PX Developer project.
2)	Open the GX Works2 project*1	To open PX Developer project and go on to open GX project when selection mark is input in check box. When GX project type is GX Works2 project, the "Upload" window is displayed as well.

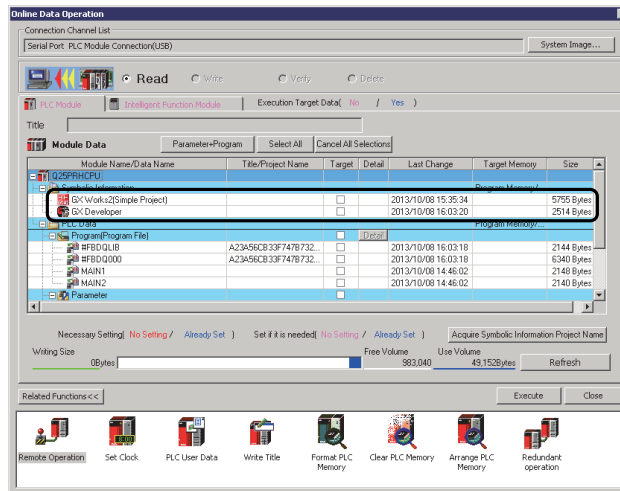
*1: When GX project type is GX Developer project, [Open the GX Developer project] is displayed.

POINT

- When password is set in the newly created (restored) PX Developer project, confirm password dialog box to be shown below is displayed at closing the "Upload" window (completion of upload).
Input the password.



- When the GX project type is GX Works2 project, the symbolic information of GX Works2 and GX Developer may both exist in the PLC CPU*1 when opening the GX Works2 project and uploading the data with GX Works2 after uploading the symbolic data from PLC. In such case, select the source information of GX Works2 even though the source information of GX Developer can be selected. (If the source information of GX Developer is uploaded, PX Developer project cannot be restored.)



*1: The source information will be exist only when the label program of GX Developer has been downloaded to PLC after downloading the source information of GX Works2.

12.6 Deleting the PLC Data



PURPOSE

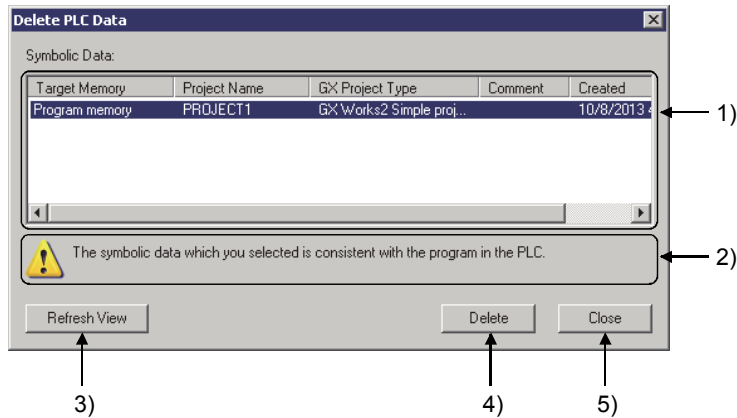
Delete the symbolic data stored into memory within PLC CPU that is specified by transfer setup.









BASIC OPERATION

- (1) Display operation of the Delete PLC Data deletion window
 1. Click [Online] – [Delete PLC Data] on the menu.
 2. Upload symbolic data. (☞ 3. in (3) in this section)
 3. Delete PLC Data window is displayed.
- (2) Deletion operation of symbolic data
 1. Select symbolic data to be deleted in symbolic data list of Delete PLC Data window.
 2. Click the "Delete" button.
 3. Message box to confirm the deletion is displayed.
 4. Click the "YES" button on message box to execute deletion of symbolic data.
 5. Symbolic data list is updated. (☞ 2 to 4. in (3) in this section)
- (3) Update of symbolic data list.
 1. Click the "Refresh View" button on Delete PLC Data window.
 2. Display contents on symbolic data list are erased.
 3. Whether symbolic data exists or not into memory (program memory or memory card) within connected PLC CPU can be confirmed.
(Progress display window is displayed on processing.)
 4. Memory in which symbolic data exists is displayed on symbolic data list.

 **DISPLAY/SETTING SCREEN**



 **DISPLAY/SETTING DATA**

No.	Item	Description									
1)	Symbolic data list	To display a list of memory connected PLC CPU which symbolic data is stored. Only one symbolic data to be deleted can be selected.									
2)	Message display	To display the result as a message after comparing symbolic data selected with the list to program operated on PLC CPU. <table border="1" style="margin: 10px auto;"> <thead> <tr> <th></th> <th>Icon</th> <th>Message</th> </tr> </thead> <tbody> <tr> <td>Matched</td> <td></td> <td>The symbolic data which you selected is consistent with the program in the PLC.</td> </tr> <tr> <td>Mismatched*1</td> <td></td> <td>The symbolic data which you selected is not consistent with the program in the PLC.</td> </tr> </tbody> </table> <p>*1: contains the case that symbolic data is broken down as well.</p>		Icon	Message	Matched		The symbolic data which you selected is consistent with the program in the PLC.	Mismatched*1		The symbolic data which you selected is not consistent with the program in the PLC.
	Icon	Message									
Matched		The symbolic data which you selected is consistent with the program in the PLC.									
Mismatched*1		The symbolic data which you selected is not consistent with the program in the PLC.									
3)	Refresh View	To update display contents for symbolic data list.									
4)	Delete	To delete symbolic data which exist in target memory selected from connected PLC CPU. However, "Delete" button cannot be selected when symbolic data that becomes deletion target is not displayed on symbolic data list.									
5)	Close	To close Delete PLC Data window.									

POINT

- When project name of symbolic data is 32 characters or more, project name will be performed omission display.
- In the Redundant CPU, deletion target CPU will vary depending on operation mode as the following list.

Operation mode	Deletion target CPU
Backup mode	PLC CPU of both systems *1 (Target PLC only when tracking is generated illegally.)
Separate mode	PLC CPU of target system
Debug mode	PLC CPU of transfer setup

*1: Deletes both even if project contents that are stored in target memory will vary depending on target PLC or the other Redundant CPU on normally tracking.

12.7 Checking Project Consistency

Following paragraphs explain project consistency check function of programming tool (abbreviation: Project consistency check).

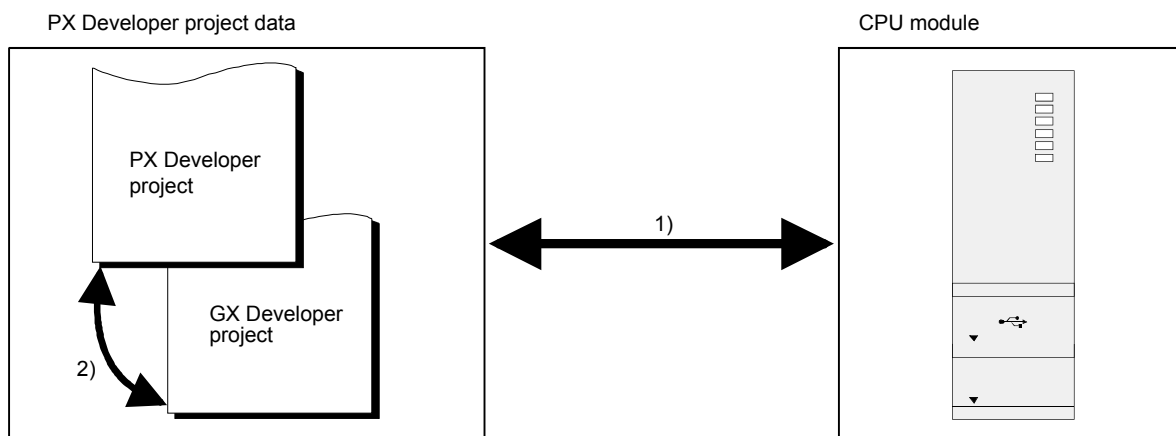
To execute project consistency check is to check whether the data of PX Developer project match that of CPU module.

In this way, PX Developer project data can be confirmed whether it is identical with data in CPU module.

12.7.1 Range of project consistency check

The project consistency check only checks the consistency between data in PX Developer project and that in CPU module.



Contents of ladder program created by programming tool compile, user-created ladder program and parameter (PLC parameter and network parameter) are verified with PLC of GX application.



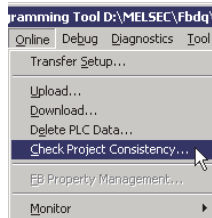
- 1) Only properties of PX Developer project data and data in property in CPU module are checked. Contents of ladder program created by programming tool compile and user-created ladder program and parameter (PLC parameter and network parameter) user-treated are verified with PLC of GX application.
- 2) Only attributes consistency of PX Developer project and GX project are checked.

12.7.2 Method of project consistency check

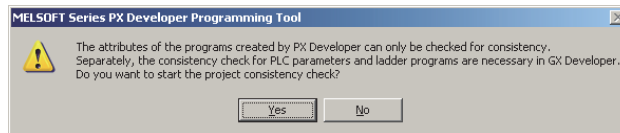
 **BASIC OPERATION**

1. Click [Online] → [Check Project Consistency] () on the menu.
2. Dialog box for confirming starting project consistency check is displayed. Click the "Yes" button to start project consistency check.
3. The result of "Project Consistency Check" is displayed on the output window. ( Section 5.1)
4. In case of checking project for the part which has not been checked by the above "Project Consistency Check" function, execute "Verify with PLC" in GX application according to needs. For details of check range of Project Consistency Check, refer to Section 12.7.1.

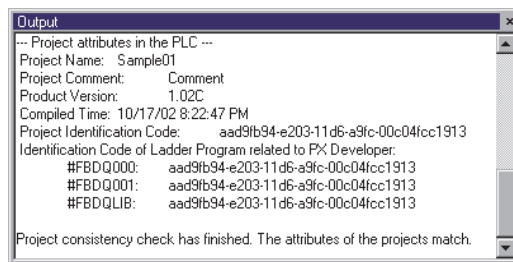
 **DISPLAY/SETTING SCREEN**



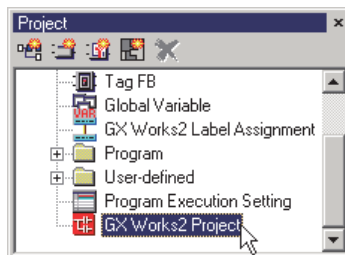
Click [Online] → [Check Project Consistency] on the menu or click  on the toolbar.



Click the "Yes" button on the dialog box to confirm starting project consistency check.



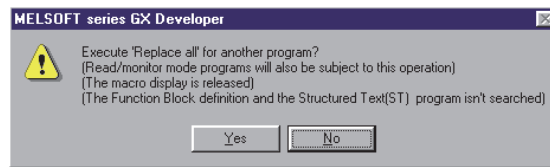
The result is displayed on the output window.



If the result of project consistency check is consistent, execute "Verify with PLC" after starting GX application from project window according to needs.

POINT

- Please do not edit the programs named [#FBDQ...] as indicated below.
When the program named [#FBDQ...] is edited, the result of project consistency check may be identical even if not identical. (Correct project consistency check cannot be executed)
 - 1) Do not upload the programs named [#FBDQ...] during PLC downloading of individually started GX Developer.
Project consistency cannot be checked correctly if the program named [#FBDQ...] is edited.
 - 2) Do not replace the device of [#FBDQ...] programs in the GX Developer device replacement.
For example, when executing device replacement in user-created ladder programs, the following windows will be displayed if clicking "Replace all" button.

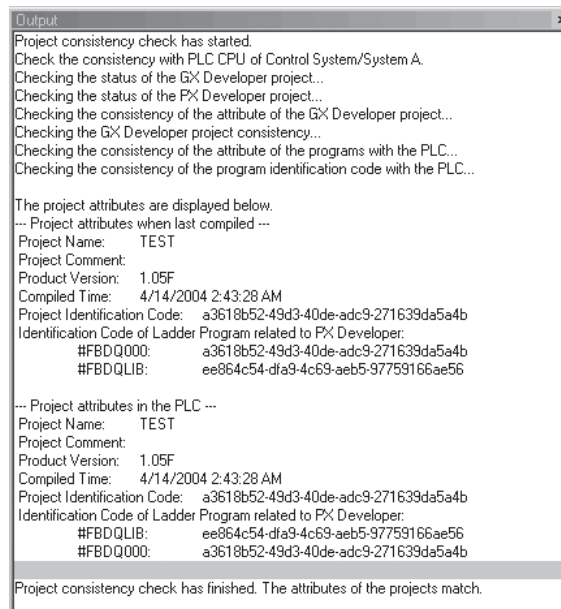


At this time, please click "No" button.

If the "YES" button is clicked, the device of the ladder program ([#FBDQ...]) created by programming tool compile will be replaced too. Therefore the project consistency check cannot be executed correctly.

In addition, please do not replace the device of [#FBDQ...] program when clicking "Replace" button during device replacement.

- After the project consistency check, the CPU module project attribute is displayed in the output window.



The project name and comment of the data in CPU module can be confirmed. For Redundant CPU, the system status (Control system/Standby system, system A/system B) is displayed.

However, "Unknown" is displayed if the system cannot be identified.

12.7.3 Operations for check failure and unmatched check

The following operation will cause inconsistency:

Operating area	The operation causing check inhibition or inconsistency
Programming tool	<ul style="list-style-type: none">● Project is not compiled.
GX Works2/ GX Developer	<ul style="list-style-type: none">● Open GX application from other project, then download ladder programs to PLC.● Delete program files by "Delete PLC data".● Delete file registers during PLC data deletion.● Set the content of file register.
Explorer of Microsoft® Windows® Operating System	<ul style="list-style-type: none">● Overwrite the GX project which PX Developer project has with another GX project.● Overwrite the PX Developer [#FBDQ***.wpg] which PX Developer project has with another GX project files.

MEMO

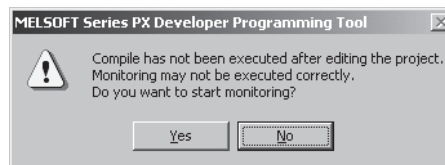
13 ONLINE MONITOR

Once PX Developer programming tools are used, real time monitoring of the current value of each variable and the I/O values of tag FB are both available through online connection with CPU module, and, it is also applicable to change the current values of variables during online monitoring.

This chapter illustrates the operation procedure and functions of online monitoring.

⚠ CAUTION

- The assignment information database file (*.mdb) at the point of PLC download to the CPU module of the monitor target is required for online monitor. (☞ Section 6.1)
If monitor is started after modifications made to FBD programs, etc. following PLC download, the following dialog box is displayed since the contents of the assignment information database file are not the latest.



If the "Yes" button is clicked to start monitor, an incorrect assignment target device may be monitored or data may be changed.

The PLC system may malfunction if an incorrect assignment target device is monitored or data is changed.

When the above dialog box is displayed, perform compile again, download data to the PLC, and then start online monitor.

13.1 Starting/Stopping Online Monitor

As to all displayed windows (Program/FB definition window and entry variable monitor) and each selected window (every program/FB definition window, Module FB/Tag FB declaration window, entry variable monitor), starting/stopping the online monitoring can be performed.

This section explains the method for starting/stopping online monitor.

13.1.1 Starting online monitor




PURPOSE

To real-time monitor current values of variables in real time so as to confirm states of FBD programs.



BASIC OPERATION

1. If the programming tools cannot communicate with CPU module, please specify connection destination first so as to enable communication between them. (Section 12.3)
2. If monitoring of all windows is required, please click [Online] → [Monitor] → [Start Monitor (All windows)] in the menu or press the "Ctrl"+"F3" keys. Or if monitoring of each selected window is required, please activate this window, and then click [Online] → [Monitor] → [Start Monitor] () in menu, or press the "F3" key.
3. Online monitoring will be started and switching the mode is switched from Edit Mode to Monitor Mode as well.

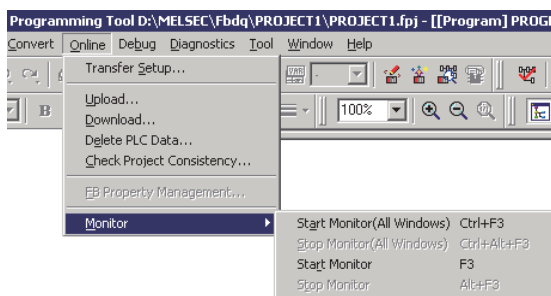
After running monitoring and from Edit mode to Monitor mode as well, the current values of variables will appear under variable parts, refer to POINT in this section the display format of the current value.

When it is to restart monitoring, please follow the same procedure as mentioned before.

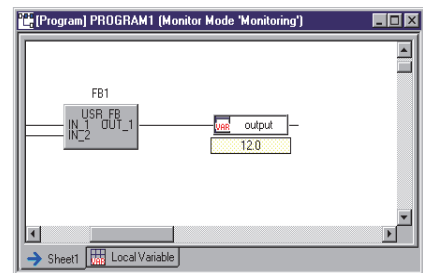
In Monitor mode, FBD sheets and each declaration window (except for entry variable monitor window) cannot be edited, some menus (change PLC type, error check) are also unavailable.



DISPLAY/SETTING SCREEN



Click [Online] → [Monitor] → [Start Monitor (All windows)]/
[Start Monitor] in the menu



Start monitor (switch to monitor mode)

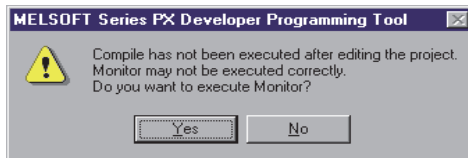
POINT

- If programming tools cannot communicate with the CPU module (In "Section 12.3 Specifying PLC Transfer Setup", if no connection destination have been correctly set, or the CPU module is in reset status) monitoring cannot be started.
- The number of variable points (monitor points) that can be monitored is limited. When the number of monitor points exceeds the limit, corresponding messages will appear and monitoring will be stopped. In this case, please zoom out windows or close unnecessary windows to reduce the number of displayed variable parts.

Standard number of monitoring points (maximum number of monitoring points=1024 points).

Data type	Points
INT	1
BOOL	1
DWORD	2
STRING (25)	13

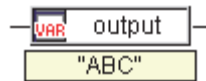
- After PLC downloading, if FBD programs are changed and monitoring is started, such dialog boxes will appear as below.



In order to execute monitoring exactly, please start monitoring after compiling the project and downloading it to the PLC.

- If a user-defined FB/tag FB is not used in any program/FB type monitoring of the user-defined FB type/Tag FB type cannot be started.
- In monitor mode, the current values of variables will appear under variable parts or in entry variable monitor window (Section 13.7).

In this case, current values of variables will be displayed via their data type in the format as shown below.



(The above figure shows the case of STRING type.)

Data type	Display sample
REAL	1.23,1.005E+0.08
INT, DINT	123 (Decimal display)
WORD, DWORD	H001F (hexadecimal display)
STRING	"ABC"
BOOL	TRUE, FALSE
ADR_REAL	[This data type value is not accessible] appears

13.1.2 Stopping online monitor




PURPOSE

To stop refreshing of monitored value during online monitoring.



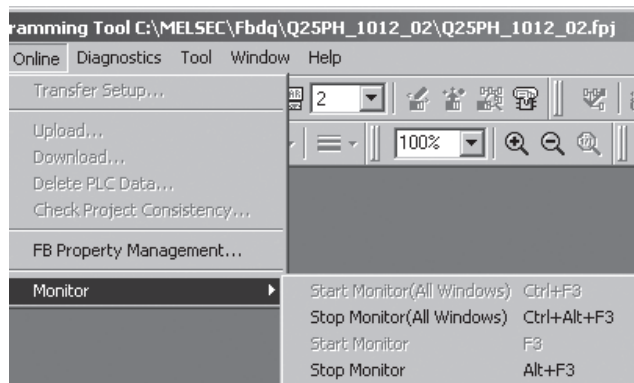
BASIC OPERATION

1. If it is desirable to stop monitoring all of the displayed windows, please click [Online] → [Monitor] → [Stop Monitor (All windows)] in the menu or press the "Ctrl"+"Alt"+"F3" keys. And if it is desirable to stop monitoring each selected window, please activate this window first, then click [Online] → [Monitor] → [Stop Monitor] () in the menu or press the "Alt"+ "F3" key.
2. Online monitor will be stopped.

If it is desired to restart monitoring after the previous monitoring is terminated, please execute the operation described in "Section 13.1.1 Starting online monitor".



DISPLAY/SETTING SCREEN



POINT

Even if all window monitoring is stopped, the monitor mode will not be cancelled. (It is the same as the case of closing all windows that are being monitored). For details of switching from Monitor mode back to Edit mode, refer to Section 13.1.3.

13.1.3 Switching from monitor mode to edit mode



PURPOSE

To shift Monitor mode to Edit mode.



BASIC OPERATION

Select [Edit] → [Edit Mode] () in the menu and shift to Edit Mode.

Switch to Edit mode by pressing the "F2" key.

POINT
When switching from Monitor mode to Edit mode, displayed entry variable monitor window, I/O simulation setting window, faceplate and "FBD Program Diagnostics" dialog box will be automatically closed.

13.2 Program/FB Monitor

This section describes the monitoring procedures and functions on FBD sheet.

13.2.1 FBD sheet monitor



PURPOSE

To monitor current values of variables on FBD sheets, as well as to confirm the status of FBD programs. This section explains various monitoring procedures on FBD sheets.

(1) Display monitor value of variable parts

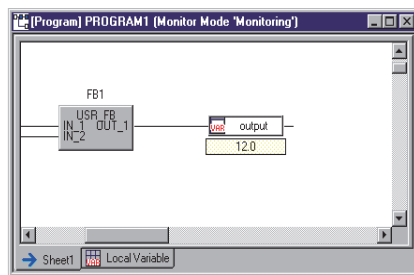


BASIC OPERATION

1. If it is in Edit mode, refer to Section 13.1.1 to switch to Monitor mode.
2. The current values of variables will appear under variable parts.



DISPLAY/SETTING SCREEN



DISPLAY/SETTING DATA

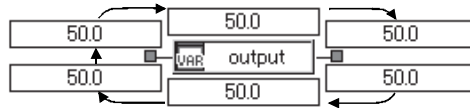
Variable current value can be showed in the following formats.

Data Type	Display Sample
REAL	1.23, 1.005E+0.08 *1
INT, DINT	123 (Decimal display)
WORD, DWORD	H0001F (Hexadecimal display)
STRING	"ABCDEF"
BOOL	TRUE, FALSE
ADR_REAL, Structure type	[This data type value is not accessible] appears

*1: Specifying the number of digits after the decimal point for REAL type changes the format. For details, refer to Section 13.2.3.

POINT

- When current values of variables in FBD sheets are displayed, their display locations can be moved by double clicking the variable parts. This operation is to remove the overlapped monitor values of other parts that are arranged in a nearby place.





Double click variable part!

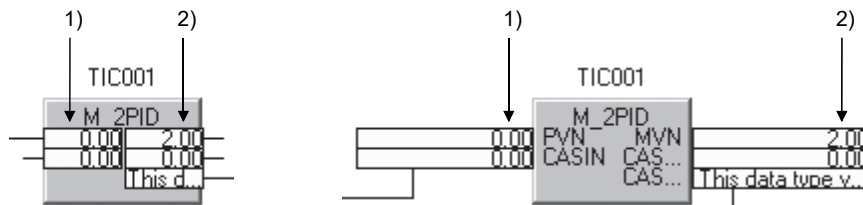
- For BOOL type, current value can be changed to TRUE/FALSE by double-clicking the selected variable part while pressing "Shift" key.
For data types other than BOOL type, the "Change Current Value" dialog box is displayed.

(2) Monitor display for Input / Output variable of FB parts.

 **BASIC OPERATION**

- (a) Operation for displaying current value of FB parts.
 1. Switch to monitor mode. (☞ Section 13.1.1)
 2. Switch to display / hide for current value of FB parts by clicking the  button on the online toolbar.
- (b) Operation for changing display position for current value of FB parts.
 1. Switch to monitor mode. (☞ Section 13.1.1)
 2. Current value of FB parts is displayed with the  button on the online toolbar.
 3. Switch display position current value of FB parts to the top of FB parts or pin by double-clicking on FB parts.

 **DISPLAY/SETTING SCREEN**

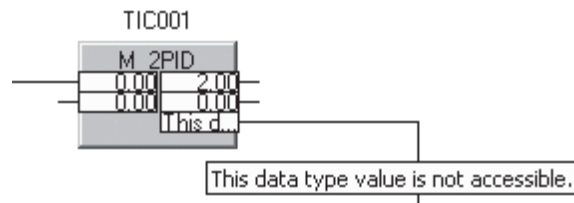



 **DISPLAY/SETTING DATA**

No.	Item	Description
1)	FB current value (input variable)	To display current value for input variable of FB parts. Display format for each data type is the same display as the current values of variables. (☞ (1) in this section)
2)	FB current value (output variable)	To display current value for output variable of FB parts. Display format for each data type is the same display as the current values of variables. (☞ (1) in this section)

POINT

- As shown in the following figure, when moving the mouse to current value of FB parts with monitor mode, display current value without omission.



- When maximum monitor points are exceeded by current value display of FB parts, error message is displayed, and status of stop monitor is switched. In this case, proceed with monitor after executing next operation.
 - Close unnecessary window.
 - Hide the current value with the  button on the online toolbar.
 - When double-clicking (or pressing "Enter" key) on the selected FB part while pressing "Shift" key, the "Change Current Value" dialog box is displayed.

(3) Monitor current value with connector.

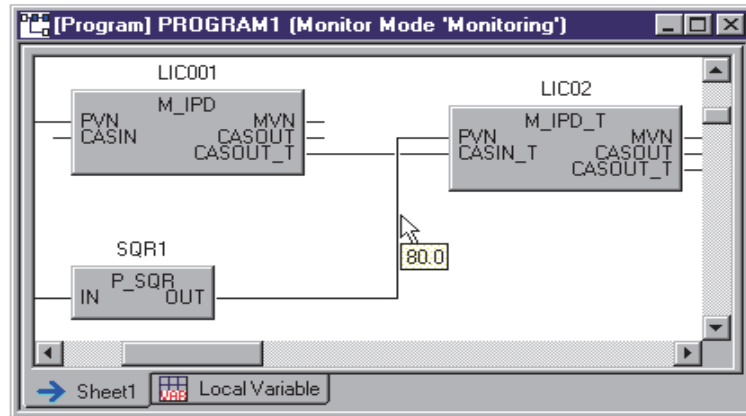


BASIC OPERATION

1. Place the mouse cursor on connector.
2. Display current values of variables on the connector by Tooltip.

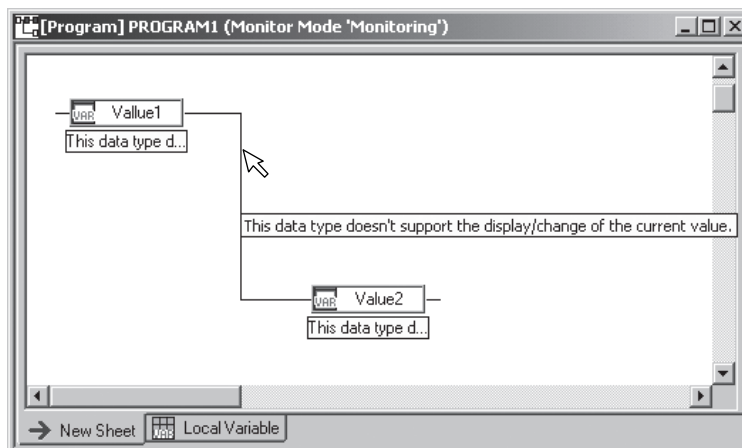


DISPLAY/SETTING SCREEN



POINT

- If the variable type is ADR REAL or structure type (when structure member is not specified), [This data type value is not accessible] will appear in the Tooltip. While in the case of constant parts, [Output value of constant part cannot be monitored] will appear. And in the case of functions [The output value of the function cannot be monitored] will appear as well.



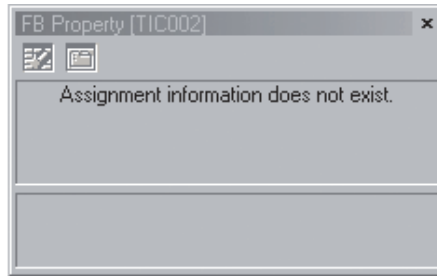
- The current value of the variable that is displayed on the tooltip is not updated. The current value of the moment when mouse cursor is placed on the connector is displayed.



HELPFUL OPERATION

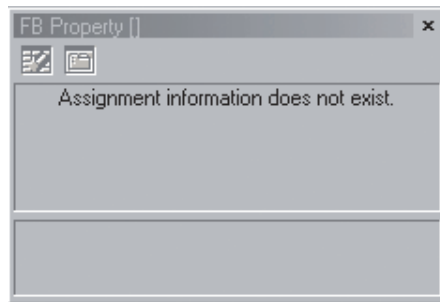
When selecting FB parts on the FBD sheet while monitoring, as shown below, [Assignment information does not exist.] may be displayed on FB Property window or [No property exists.] may be displayed even if FB property exists.

- (a) If adding FB part with FB property to FBD sheet after compile, and selecting its part on monitoring.

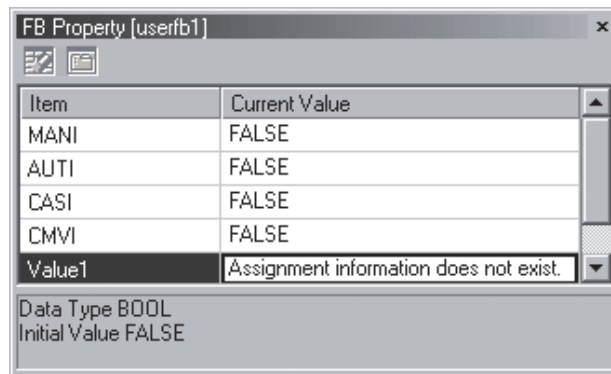


For monitoring added FB variable, execute download after compile.

- (b) If deleting the FB variable name of FB part with FB property by using declaration window, and selecting its FB part on monitoring.

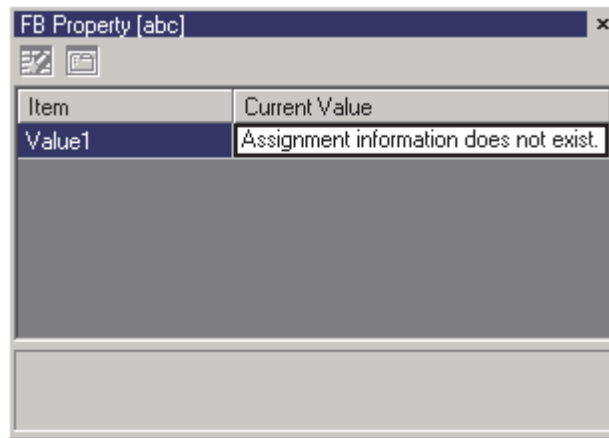


- (c) If adding the public variable to be FB property to FB type after compilation, and selecting its FB part on monitoring.



Execute download to PLC to monitor the current value of added public variable after compilation.

- (d) If changing program/FB hierarchy by operation such as rename FBD program after compilation, and selecting its ST part in monitoring.



Execute download to PLC to monitor the changed inline ST parts after compilation.

13.2.2 Specifying the monitor target FB



PURPOSE

User defined FB/Tag FB can be used in more than one programs or in user-defined FB type. If one user-defined FB/Tag FB is used in more than one programs/FB, it will be applicable to monitor the current value of each user defined FB/Tag FB being used.

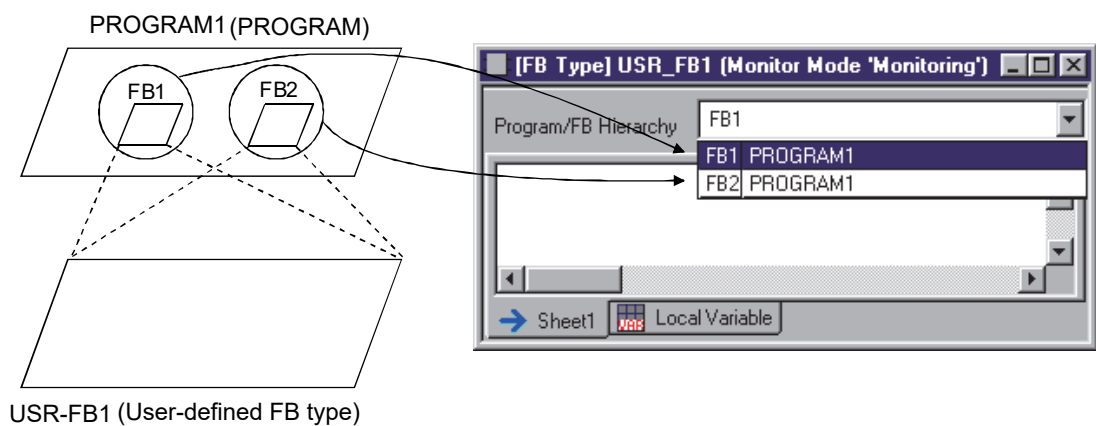


BASIC OPERATION

1. Display definition windows of user defined FB/Tag FB types that are to be monitored.
2. Refer to Section 13.1.1 to switch the mode to Monitor Mode.
3. Once monitoring is started, a list box will appear in the user-defined FB/Tag FB window.
4. A variable name in programs/FB and of program/FB hierarchy list will appear after clicking the list box.
5. Select program/FB hierarchy of user-defined FB/Tag FB to be monitored from the list.

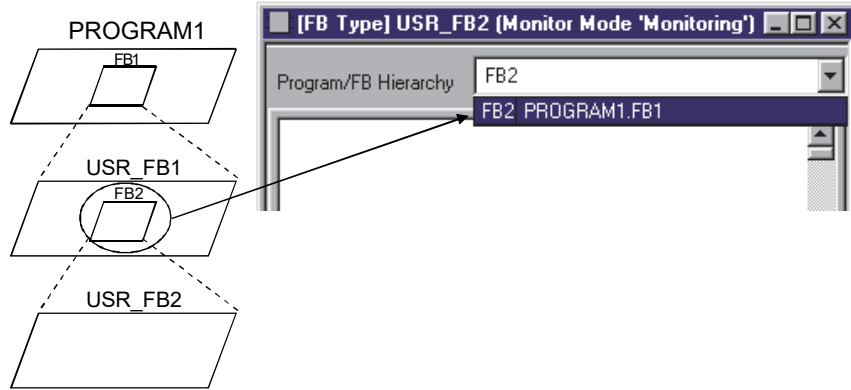


DISPLAY/SETTING SCREEN



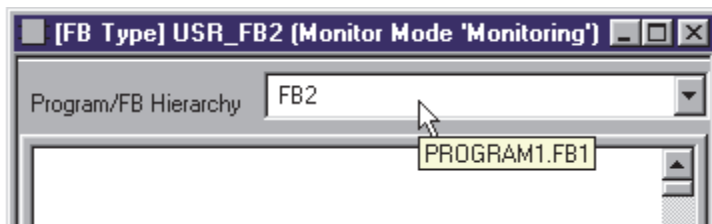
POINT

- When the program/FB hierarchy of user-defined FB/Tag FB being monitored are relatively deeper, [.] will be used for displaying the hierarchy.



[PROGRAM1.FB1] in the figure shown above displays the part named [FB1] that is used in [PROGRAM1].

- If the list box of the program/FB hierarchy is not extended, only the variable name of user-defined FB/Tag FB will be displayed. After placing the mouse cursor on the display area, the program/FB hierarchy will be displayed in the Tool tip.



13.2.3 Specifying the number of decimal points in monitor value

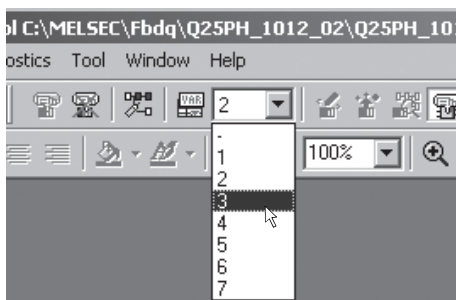
**PURPOSE**

To specify the number of decimal points in the current variable value during monitoring.

**BASIC OPERATION**

1. The number of decimal points can be specified in the monitor mode only.
If the edit mode has been selected, shift to the monitor mode by reference to Section 13.1.1.
2. In the list box (Number of digits after the decimal point for REAL type) on the monitor tool bar, specify the number of decimal points in the current variable value.

The change in the number of decimal points will be reflected immediately.

**DISPLAY/SETTING SCREEN****DISPLAY/SETTING CONTENTS**

Item	Description
—	The number of decimal points is not specified. If this is selected, the number of decimal points will be automatically set according to that used in the monitor value. (Up to 7)
1 to 7	Select the number of decimal points within the range of 1 to 7.

POINT

- The specification of the number of decimal points is allowed for the REAL type (single precision floating point) current value display only.
- It is not necessary to execute compile or PLC download after specifying the number of decimal points. (This will not result in the uncompiled status.)
- If the number of decimal points is specified, the monitor value is rounded off at the (the specified number minus 1) th decimal points and displayed during monitoring.
- If the integer part of the monitor value exceeds the number of effective (7 digits) digits for the REAL type, the monitor value is displayed in exponent format.
- When the current variable value is changed in the "Change Current Value" dialog box, the actually entered value is stored into the CPU module. On the programming tool, the monitor value is displayed with the specified number of decimal points (rounded off value).
- When the current value is read (the "Substitute" button is clicked) in the "Reading Out FB Property" dialog box, the current value displayed in the current value field will be used as the initial value of the FB property.

Substitute	Program/Declaration Table	FB Variable Name	Item	Current Value	Initial Value
<input checked="" type="checkbox"/>	PROGRAM1	LIC001	IN_NMAX	100.0	100.0
<input checked="" type="checkbox"/>	PROGRAM1	LIC001	IN_NMIN	0.0	0
<input checked="" type="checkbox"/>	PROGRAM1	LIC001	IN_HH	102.0	02.0
<input checked="" type="checkbox"/>	PROGRAM1	LIC001	IN_H	100.0	00.0
<input checked="" type="checkbox"/>	PROGRAM1	LIC001	IN_LL	0.0	0
<input checked="" type="checkbox"/>	PROGRAM1	LIC001	IN_LL	-2.0	0
<input checked="" type="checkbox"/>	PROGRAM1	LIC001	PID_MTD	8.0	0
<input checked="" type="checkbox"/>	PROGRAM1	LIC001	PID_DVLS	2.0	0
<input checked="" type="checkbox"/>	PROGRAM1	LIC001	PID_FN	0	0
<input checked="" type="checkbox"/>	PROGRAM1	LIC001	PID_SVPTN	TRUE	TRUE
<input checked="" type="checkbox"/>	PROGRAM1	LIC001	OUT1_NMAX	100.0	00.0
<input checked="" type="checkbox"/>	PROGRAM1	LIC001	OUT1_NMIN	0.0	0
<input checked="" type="checkbox"/>	PROGRAM1	LIC001	MANI	FALSE	FALSE
<input checked="" type="checkbox"/>	PROGRAM1	LIC001	AUTI	FALSE	FALSE
<input checked="" type="checkbox"/>	PROGRAM1	LIC001	CASI	FALSE	FALSE
<input checked="" type="checkbox"/>	PROGRAM1	LIC001	CMVI	TRUE	TRUE

The current value displayed in the current value field by specification of the number of decimal points will be used as the initial value of the FB property. The figure on the left shows the case where the number of decimal points is 2.

13.3 Changing a Current Value



PURPOSE

To check an FBD program operation through alter current values of variables in Monitor mode.




BASIC OPERATION


To change current values of variables in Monitor mode. If not in Monitor mode, refer to Section 13.1.1 to switch the mode to Monitor mode.

To change current values of variables in "Change Current Value" dialog box. There are three ways of displaying the dialog box.

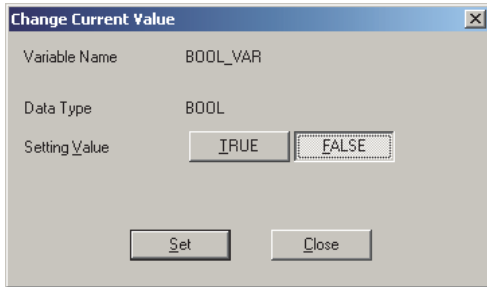
- Display/change through FBD sheets
 1. Right click the variable/FB part whose current value is to be changed.
 2. Click [Change Current Value] from the displayed pop-up menu.
 3. The "Change Current Value" dialog box is displayed.
 4. Change the current value of the variable and click the "Set" button.

- Display/change through entry variable monitor window
 1. In the entry variable monitor window ( Section 13.7), click the cell [Current Value].
 2. Click "...".
 3. The "Change Current Value" dialog box is displayed.
 4. Change the current value of the variable and click the "Set" button.

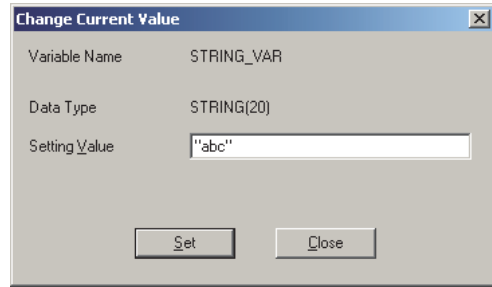
- Display/alter through [Online] menu
 1. Click the variable/FB part whose current value is to be changed.
 2. Click [Online] → [Monitor] → [Change Current Value] in the menu.
 3. The "Change Current Value" dialog box is displayed.
 4. Change the current value of the variable and click the "Set" button.

- Changing method through FB property window
 1. In the FB property window ( Section 5.7.4), select the item of which current value is to be modified.
 2. Click the button "...".
 3. The "Change Current Value" dialog box is displayed.
 4. Change the current value of the variable and click the "Set" button.

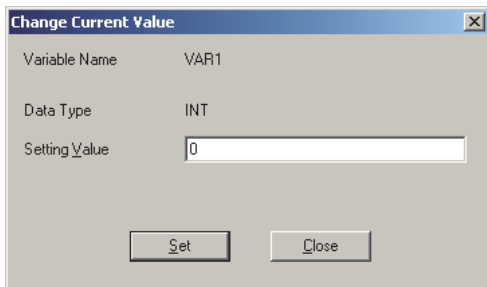
 **DISPLAY/SETTING SCREEN**



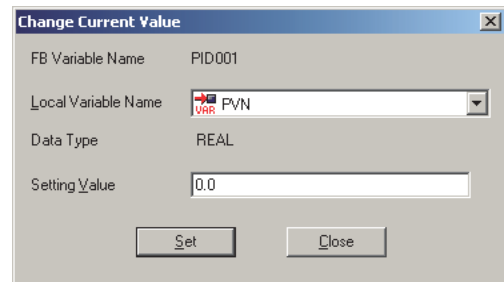
(BOOL type)



(STRING type)









(In the case of INT, DINT, WORD, DWORD, REAL type)



(In the case of FB part)

 **DISPLAY/SETTING DATA**

Selected variable parts/FB parts	Item	Display/Setting data
BOOL	Variable Name	Display the variable names of the selected variable parts.
	Data Type	Display the data type of the selected variable parts.
	Setting Value	Click the toggle button () to select TRUE or FALSE.
STRING	Variable Name	Display the variable names of the selected variable parts.
	Data Type	Display the data type of the selected variable parts.
	Setting Value	Input character strings with " ". Example: "abc". The No. of characters that can be input is referred to as the number of characters set in the "select data type" dialog box ( Section 7.11.4) when defining a variable part.
INT, DINT, WORD, DWORD, REAL	Variable Name	Display the variable names of selected variable parts.
	Data Type	Display the data type of selected variable parts.
	Setting Value	Input values When inputting hexadecimal values, please add "H" before the values (Please input Capital H). Example: H1F. When inputting decimal values, please input directly. Example: 10.
FB parts	FB Variable Name	Display the variable names of selected variable parts.
	Local Variable Name	Click the list box () and select the variable name which current value is to be input. Variables are shown with the following icons. Input variable:  Output variable:  Public variable:  (Specific to items that appear in FB property window.)
	Data Type	Display the data types of I/O variables selected in the above variable name item.
	Setting Value	Input data (value). The method for input is the same as that for selecting variable parts.

POINT

- The value will be displayed in form shown as the following table, when current values of INT type, DINT type, WORD type, DWORD type, or REAL type is changed.

(Display sample)

Data type	Input value	Monitored value
REAL	15	15.0
INT, DINT	HF	15
WORD, DWORD	15	In the case of WORD type: H000F In the case of DWORD type: H0000000F

- If the data type is ADR_REAL type, the current value of variable can not be changed.
- Current value of structure type variable cannot be changed if changed member is not specified.
- When the input variable of the variable part or FB part which you want to change value to is connected to the output variable of other function/FB part, current value is overwritten by the output variable even if you change the value by the output variable.
- "Change Current Value" dialog box is not closed until the "Close" button is pressed. Therefore current value can be changed continuously.
- Do not change data (values) of devices used in the programming tool system. For details of the device used in the system, refer to POINT in Section 8.2.2 (2).

13.4 Pause/Restart of FB Execution

13.4.1 Pausing an FB



PURPOSE

To pause the operation of the specified FB parts during monitoring and check the operation of FBD program.



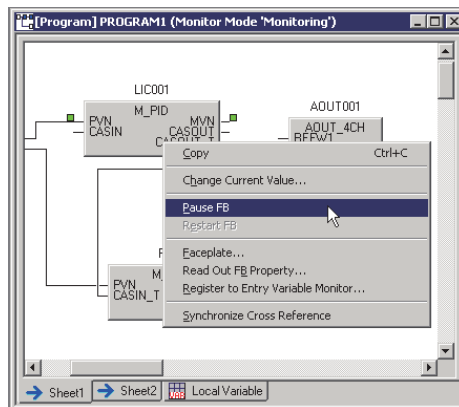
BASIC OPERATION

Pause operation on FB parts is executed in monitor mode. If it is not in monitor mode, refer to Section 13.1.1 and switch the mode to monitor mode.

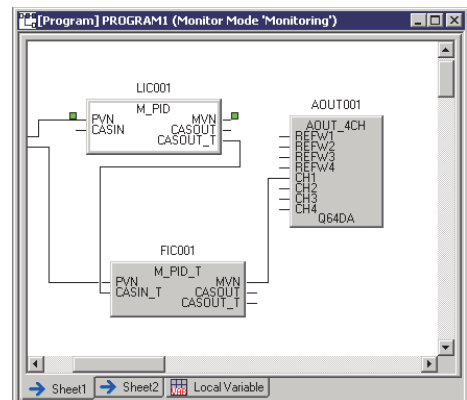
1. Right click the variable part with its operation to be paused.
2. Click [Pause FB] in the displayed pop-up menu or click [Online] → [Monitor] → [Pause FB] in the menu.
3. Now the color of FB part will turn white and pause the operation of FB part.



DISPLAY/SETTING SCREEN



Right click the variable part with its operation to be paused and click [Pause FB].



Pause operation of FB part.
(The color of FB part turns white)



HELPFUL OPERATION

The figure shown below illustrates the method of changing current value of FB input variable (IN) in order to check the operation of FBD program.

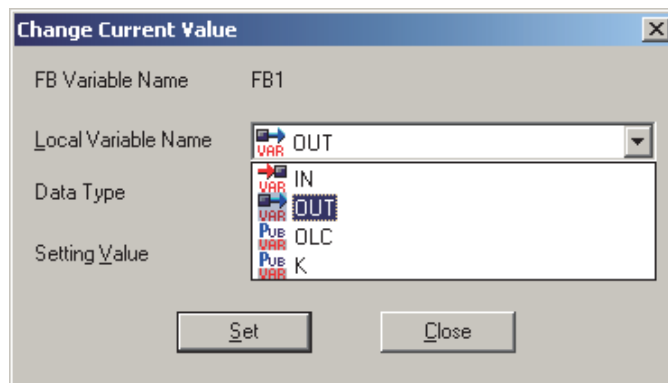


In the above figure, even if the current value of FB2 input variable (IN) is changed through the "Change Current Value" dialog box, it will also be overwritten by the output variable value of FB1. This is because FB1 is active.

In order to change the current value of FB2 input variable, the operation of FB1 must be paused.



Change the current value of FB1 output variable (OUT) after the operation of FB1 is paused. (☞ Section 13.3)



Change the current value of FB2 input variable.

POINT

When Tag FB/Module FB of that are global part are pasted into multiple programs, if the operation of one Tag FB/Module FB is paused, then operation of Tag FB/Module FB pasted in other programs/FB will be paused accordingly.

13.4.2 Restarting an FB



PURPOSE

To restart operation of the FB part which is temporarily paused.



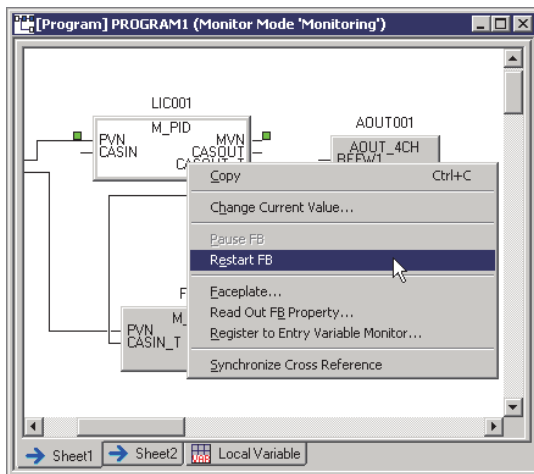
BASIC OPERATION

Restart operation of FB part in monitor mode. If it is not in monitor mode, refer to Section 13.1.1 and switch the mode into monitor mode.

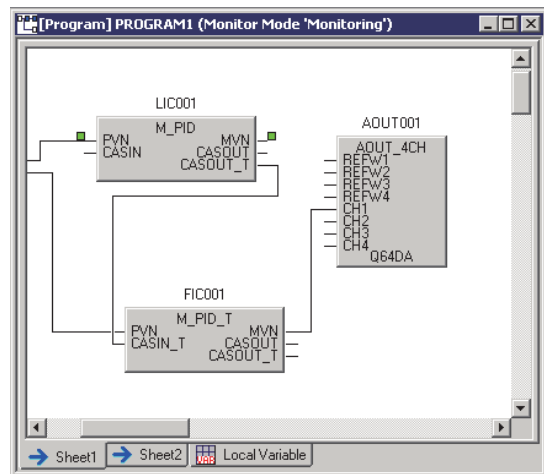
1. Right click the FB part that is to be restarted.
2. Click [Restart FB] in the displayed pop-up menu or click [Online] → [Monitor] → [Restart FB].
3. Now the color of FB part will turn from white to another color (the color will turn gray in the case of initial settings), which means restarting the operation of FB part.



DISPLAY/SETTING SCREEN



Right click the FB part that is to be restarted and click [Restart FB].



Restart operation of FB part. (The color of FB part will turn from white another color)

POINT

When Tag FB/Module FB that are global parts are pasted into multiple programs, if operation of one Tag FB/Module FB is restarted, then operation of Tag FB/Module FB pasted in other programs/FB will be restarted accordingly.

13.4.3 Displaying a paused FB list

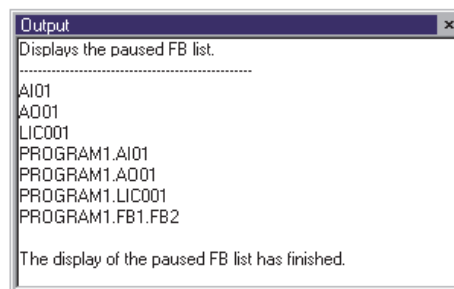
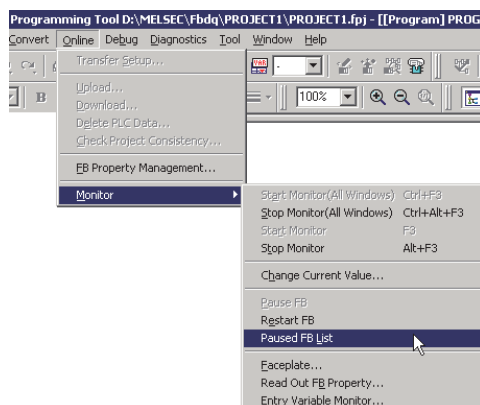
**PURPOSE**

To display the list of paused FB parts in output window (☞ Section 5.1).

**BASIC OPERATION**

1. If it is not in monitor mode, refer to Section 13.1.1 and switch the mode into monitor mode.
2. Click [Online] → [Monitor] → [Paused FB List] in the menu.
3. The list of paused FB will be displayed in the output window.

For details of restarting operation of FB parts, refer to Section 13.4.2.

**DISPLAY/SETTING SCREEN**

Click [Online] → [Monitor] → [Paused FB List] in the menu.

The paused FB list will be displayed in the output window.

POINT

- In the output window, the hierarchy of paused FB will be shown by using [.] (refer to the figure shown above).
- If the paused FB contains Tag FB/Module FB of global part, not only variable name of Tag FB/Module FB but also list that contains program/FB will be displayed.

13.5 Monitoring a Tag FB with Faceplate



PURPOSE

The faceplate of programming tool is used for monitoring state of Tag data and for changing SV value and MV value. Use monitor tool to execute more practical monitoring/controlling with faceplate.



BASIC OPERATION

1. If it is in Edit mode, refer to Section 13.1.1 and switch the mode to monitor mode.
2. Right-click the Tag FB on the FBD sheet.
3. Click [Faceplate] in the displayed pop-up menu, or click [Online] → [Monitor] → [Faceplate].
4. The faceplate is displayed.



DISPLAY/SETTING SCREEN

The image shows the software interface for monitoring a Tag FB. On the left, the FBD sheet displays a LIC001 block with a context menu open over the M_PID tag. The menu options include Copy, Change Current Value..., Pause FB, Restart FB, Faceplate..., Read Out FB Property..., Register to Entry Variable Monitor..., and Synchronize Cross Reference. The Faceplate screen on the right shows the following elements:

- 1) Faceplate window title bar
- 2) NOR button
- 3) LIC001 tag name
- 4) Level Control L... label
- 5) PVA DVA MVA labels and a vertical bar chart showing a value of 100.0
- 6) PV 0.0, SV 0.0, and MV 0.0 % labels
- 7) MANUAL button, SPA SEA OOA labels, and PID label
- 8) Stop Monitor button

Loop tag (M_PID)



DISPLAY/SETTING DATA

No.	Item	Description
1)	Title bar	To display titles. When a title is present with * flickering nearby, which indicates refreshing interval. Moreover, when monitoring is stopped, no * appear.
2)	I/O mode indication area	To display current mode when tag type is loop type or state type. Please refer to "PX Developer Version 1 Operating Manual (Monitor Tool)" for details of I/O Mode.
3)	Tag FB variable name display area.	To display Tag name (Tag FB variable name) which is currently being monitored.
4)	Tag comment display area	To display tag comment.
5)	The displayed contents in the faceplate vary depending on different tag type of tag FB. Please refer to "PX Developer Version 1 Operating Manual (Monitor Tool)" for details.	
6)	Tag type display area	To display tag type.
7)	Start monitor (all windows)/stop button	Click this button to start/stop monitor.

POINT

- The faceplate cannot be used for other FB except tag FB.
 - Maximum number of displayed faceplate is 2.
 - When a command button is clicked, a faceplate whose tag type is PB operates as if the ON/OFF history type is "Only ON".
 - The displayed character string which indicates ON/OFF status of the button is fixed to "ON".
 - The confirmed message displayed when the button is clicked is fixed to "Do you want to execute 'Command'?".
- *1: When a faceplate is displayed from the monitor tool, operation at click of button can be changed by specifying the ON/OFF history type of a command button in the faceplate display pattern setting of the monitor tool. For the ON/OFF history type, refer to "PX Developer Version 1 Operating Manual (Monitor Tool)".

13.6 Reading Current Value of FB Property

The FB property is the value, which the public variable of FB parts preserves, and is used as a parameter to determine the operation of FB parts.

This section describes the reading current value of FB property for performing the backup of FB parts executed on PLC CPU or using as initial value.

(1) Overview

This function is designed to read the current value of FB property from the PLC CPU on executing into PX Developer projects.

By using this function, the current value of FB property changed during the execution of PLC CPU can be saved (Backup) as initial value in programming tool side.

Moreover, the saved current value can be written as initial value of FB parts executed on PLC CPU after the cold-start compile. *1

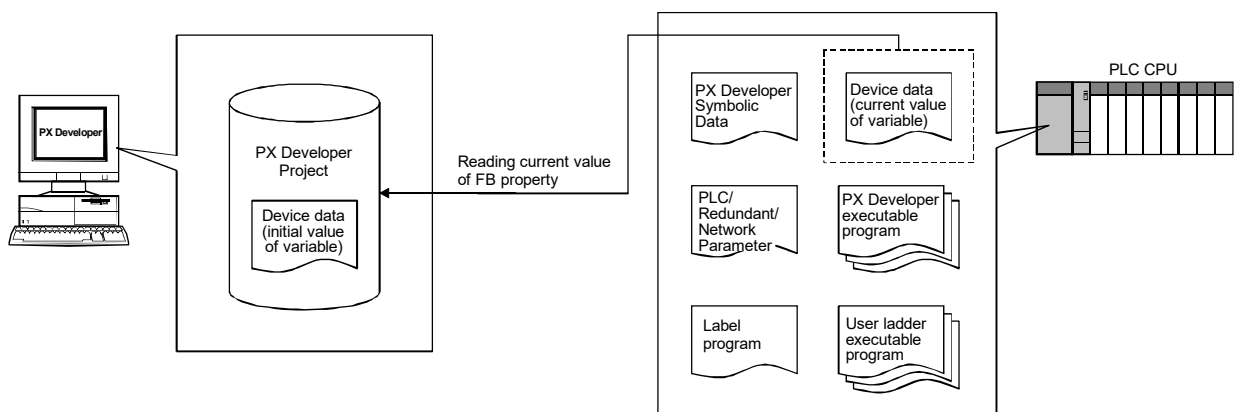
*1: By performing cold-start compile with programming tool and downloading the project, the current value of FB property in PLC CPU is overwritten with initial value in the project, and PID constant value modified by auto tuning will be lost.

(Example of use)

If performing auto tuning by tag FB for basic PID control of monitoring tool (Tag type: PID), 2-degree-of-freedom PID control (Tag type: 2PID) or 2-degree-of-freedom advanced PID control (Tag type: 2PIDH), PID constant will be adjusted to approximately optimized value.

By performing the reading current value of FB property to this adjusted value, the adjusted value can be saved in programming tool side.

Moreover, operation can be started with the adjusted value as initial value for FB parts executed on PLC CPU.



(2) Method for Reading Current Value of FB Property

The reading current value of FB property can be performed by the methods of batch reading with the FB Property Management window or reading from specified FB parts with the Reading Out FB property window.

Method for reading	Description	Reference
Batch reading with the FB Property Management window	<p>For the following FB variables, the reading current value of FB property and the substitution for initial value can be performed in a batch.</p> <ul style="list-style-type: none"> • FB variables defined on the module FB declaration table • FB variables defined on the tag FB declaration table • FB variables used with programs <p>As operating in a batch, operation can be performed efficiently, and substitution failure can be prevented.</p>	Section 13.6.1
Reading from specified FB parts with the Reading Out FB Property window	<p>For FB parts directly specified on the FBD Sheet, the reading current value of FB property and substitution for initial value can be performed.</p> <p>For FB variables*1 that cannot be read with the FB Property Management window in a batch, the operation for reading/substitution current value of FB property can also be performed.</p>	Section 13.6.2

*1: This indicates FB variables used with user-defined FB type.

13.6.1 Reading current value of FB property in a batch



PURPOSE

The current value of FB property in PLC CPU can be read in a batch and substituted as initial value in project.

This section describes the following operations with the FB Property Management window.

- Reading current value of FB property in a batch
- Substitution for initial value of FB property

The FB Property Management window can be used with monitor mode only. For switching to monitor mode, refer to Section 13.1.1.

(1) Reading current value of FB property in a batch



BASIC OPERATION

1. Click [Online] → [FB Property Management...] in the menu.
2. The FB Property Management window is displayed.
3. Click the Read All button on the tool bar.
4. The confirmation message for starting the reading current value of FB property in a batch is displayed.
Click the "Yes" button to start the reading current value of FB property in a batch.
5. The current value of FB property in PLC CPU can be read in a batch. During the batch reading, the progress display window is displayed. The batch reading can be interrupted with the "Ctrl" + "Break" keys.
6. The completion message for the reading current value of FB property in a batch is displayed, and then the list of FB property items is displayed in the FB Property Management window.



DISPLAY/SETTING SCREEN

Substitute	Program/Declaration Table	FB Variable Name	Item	Current Value	Initial Value
<input checked="" type="checkbox"/>	(Tag FB)	C2PIDH_2	IN_NMAX	100.0	100.0
<input checked="" type="checkbox"/>	(Tag FB)	C2PIDH_2	IN_NMIN	0.0	0.0
<input checked="" type="checkbox"/>	(Tag FB)	C2PIDH_2	IN_HH	102.0	102.0
<input checked="" type="checkbox"/>	(Tag FB)	C2PIDH_2	IN_H	100.0	100.0
<input checked="" type="checkbox"/>	(Tag FB)	C2PIDH_2	IN_L	0.0	0.0
<input checked="" type="checkbox"/>	(Tag FB)	C2PIDH_2	IN_LL	-2.0	-2.0
<input checked="" type="checkbox"/>	(Tag FB)	C2PIDH_2	TPC_SQR	0	0
<input checked="" type="checkbox"/>	(Tag FB)	C2PIDH_2	TPC_PVTEMP	0.0	0.0
<input checked="" type="checkbox"/>	(Tag FB)	C2PIDH_2	TPC_PVPRES	0.0	0.0
<input checked="" type="checkbox"/>	(Tag FB)	C2PIDH_2	TPC_TEMP	0.0	0.0
<input checked="" type="checkbox"/>	(Tag FB)	C2PIDH_2	TPC_B1	273.15	273.15
<input checked="" type="checkbox"/>	(Tag FB)	C2PIDH_2	TPC_PRES	0.0	0.0
<input checked="" type="checkbox"/>	(Tag FB)	C2PIDH_2	TPC_B2	10332.0	10332.0
<input checked="" type="checkbox"/>	(Tag FB)	C2PIDH_2	SQR_OLC	0.0	0.0
<input checked="" type="checkbox"/>	(Tag FB)	C2PIDH_2	SQR_K	10.0	10.0
<input checked="" type="checkbox"/>	(Tag FB)	C2PIDH_2	SQR_DENSIT	1.0	1.0












Data Type of Initial Value REAL
Data Type of Current Value REAL
Input High Limit

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DISPLAY/SETTING DATA



No.	Item	Description												
1)	FB Property List	<p>The list of FB property items read by the batch reading is displayed.</p> <p>The following FB variables will be a target.</p> <ul style="list-style-type: none"> • FB variables on the module FB declaration table • FB variables on the tag FB declaration table • FB variables within the program internal variables <p>Property item of which data type is ADR_REAL type or structure is not displayed.</p> <p>The current value and initial value of difference line (The line that the current value and the initial value are different) is shown in red.</p>												
	Substitute Check Box	<p>Clicking the mouse or pressing the space key checks FB property items which substitutes current value for initial value.</p> <p>By clicking the Substitute All button on the tool bar, the current value of checked FB property item is substituted for initial value collectively.</p> <p>Although the check condition for FB property items becomes "Checked" for the first time, the condition when the FB Property Management window is closed will be kept after that.</p> <p>However, for the line which displays current value as follows (Invalid line) the error icon () is displayed at the head of line, and the item of FB property is not be a target for the substitution in a batch.</p> <table border="1"> <thead> <tr> <th>Display current value</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Assignment information does not exist.</td> <td>Corresponding property information does not exist in assignment information.</td> </tr> <tr> <td>This data type value is not accessible.</td> <td>Data type of current value is other than elementary data type (except ADD_REAL type).</td> </tr> <tr> <td>This data type of this project does not match the data type of the assignment information.</td> <td>On the project information and assignment information, the data type of corresponding property does not match.</td> </tr> <tr> <td>This current value is invalid as initial value.</td> <td>This current value cannot be input as initial value. Or with REAL type binary value cannot be represented as real number data.</td> </tr> <tr> <td>The length of string exceeds 32 characters.</td> <td>As the string length of current value exceeds 32 characters, the current value cannot be substituted for initial value.</td> </tr> </tbody> </table>	Display current value	Description	Assignment information does not exist.	Corresponding property information does not exist in assignment information.	This data type value is not accessible.	Data type of current value is other than elementary data type (except ADD_REAL type).	This data type of this project does not match the data type of the assignment information.	On the project information and assignment information, the data type of corresponding property does not match.	This current value is invalid as initial value.	This current value cannot be input as initial value. Or with REAL type binary value cannot be represented as real number data.	The length of string exceeds 32 characters.	As the string length of current value exceeds 32 characters, the current value cannot be substituted for initial value.
	Display current value	Description												
	Assignment information does not exist.	Corresponding property information does not exist in assignment information.												
	This data type value is not accessible.	Data type of current value is other than elementary data type (except ADD_REAL type).												
This data type of this project does not match the data type of the assignment information.	On the project information and assignment information, the data type of corresponding property does not match.													
This current value is invalid as initial value.	This current value cannot be input as initial value. Or with REAL type binary value cannot be represented as real number data.													
The length of string exceeds 32 characters.	As the string length of current value exceeds 32 characters, the current value cannot be substituted for initial value.													
Program/Declaration Table	<p>Where FB variable is declared is displayed.</p> <p>The displaying order will be Module FB > Tag FB > FB in program.</p> <p>Display contents are as follows.</p> <table border="1"> <thead> <tr> <th>Display contents</th> <th>Where FB variable is declared</th> </tr> </thead> <tbody> <tr> <td>(Module FB)</td> <td>Module FB declaration table</td> </tr> <tr> <td>(Tag FB)</td> <td>Tag FB declaration table</td> </tr> <tr> <td>Program name</td> <td>FB in program</td> </tr> </tbody> </table>	Display contents	Where FB variable is declared	(Module FB)	Module FB declaration table	(Tag FB)	Tag FB declaration table	Program name	FB in program					
Display contents	Where FB variable is declared													
(Module FB)	Module FB declaration table													
(Tag FB)	Tag FB declaration table													
Program name	FB in program													
FB variable Name	FB variable name is displayed.													
Item	Name of FB property item in FB variable is displayed.													
Current Value	The current value of FB property read from PLC CPU is displayed. For specification with data type, refer to POINT in Section 13.1.1.													
Initial Value	Initial value of FB property obtained from project is displayed. Display specification is the same as that of FB property window.													

No.	Item	Description
2)	Tool Bar	The operation button for the FB Property Management window
	 Previous Difference Line	Transfer the cursor from the current cursor position on the FB property list to previous difference line (Line of which current value and initial value are different) or invalid line.
	 Next Difference Line	Transfer the cursor from the current cursor position on the FB property list to next difference line (Line of which current value and initial value are different) or invalid line.
	 Select All	Input the selection mark in all substitute columns on FB property list. This is valid when there is a line for which the selection mark can be inputted in substitute column.
	 Cancel All Selections	Remove the selection mark from all substitute columns on FB property list. This is valid when there is a line for which the selection mark can be inputted in substitute column.
	 Read All	Read the current value of FB property from PLC CPU.
	 Substitute All	Substitute the current value of FB property inputted the selection mark in substitute column for initial value.
	 1  Number of digits after the decimal point for REAL type	Specify number of digits after the decimal point for the current value of REAL type. (Without specifying: -, With specifying : 1 to 7) Contents are the same as number of digits after the decimal point for monitor value. Refer to Section 13.2.3. This item is valid when the filter display of difference lines is disabled.
 Only Difference Lines  Only Difference Lines Enabling/disabling filter display of difference lines	Select to enable/disable the filter display of only difference lines by the toggle operation.	
3)	Property information display area	Display the information of FB property in cursor position.
	Data Type of Initial Value	Display data type of initial value for FB property item.
	Data Type of Current Value	Display data type of current value for FB property item.
	Comment	Display comments of FB property item.
4)	Status Bar	
	Display of invalid line number	Display the error icon () and number of invalid line, when invalid line exists.
	Display of reading date and time	Display the reading date and time for current value of FB property on the FB property list.
5)	Close	Close the FB Property Management window.



HELPFUL OPERATION

Perform Save/Print of FB property list with the following procedure.


1. Select a target line. ( Section 5.8.1)
2. Copy the selected line. ( Section 5.8.1)
3. Paste the copied data on application such as Excel® and perform Save/Print.

POINT

- When opening the FB Property Management window, Module FB declaration window, Tag FB declaration window and Program/FB defined window are automatically closed.
- If monitoring with the following windows when reading current value of FB property in a batch, processing time will be longer.
For shortening processing time of batch reading, stop these monitoring or close the windows.
 - Faceplate
 - Entry Variable Monitor Window
 - FBD Program Diagnostics
- As shortcut keys, "Shift" + "F7" for previous difference line and "F7" for next difference line can be used.
- If number of digits is specified by number of digits after the decimal point for REAL type, the value displayed in the current value column is substituted for initial value when substituting in a batch.

(2) Substitute for initial value of FB property in a batch

**BASIC OPERATION**

1. Select FB property item to perform the substitution in a batch from FB property list.
The line of which the selection mark is input in substitute check box will be a target for the substitution in a batch.
2. Click the  Substitute All button on the tool bar.
3. The confirmation message for starting the substitution of FB property in a batch is displayed.
Click "Yes" to start the substitution of FB property in a batch.
4. Substitute the current value of FB property on FB property list for initial value of project in a batch.
5. The completion message for the substitution of FB property in a batch is displayed.

POINT

- When performing the download project executable data after the substitution in a batch, perform the compile.
- For writing the initial value of FB property substituted in a batch into PLC CPU, perform the download after Cold-start Compile.
If performing the following operations after the substitution in a batch, initial value of FB property substituted in a batch cannot be written into PLC CPU.
 - 1) Download after Hot-start Compile
 - 2) Compile (Online Change)
- The display specification for current value of REAL type FB property follows the setting of number of digits after the decimal point for REAL type on the tool bar.
At the substitution in a batch, the displayed current value is set as initial value.

13.6.2 Reading current value of FB property from specified FB parts



PURPOSE

Specify FB parts monitored on FBD sheet respectively, read the current value of FB property from PLC CPU, and then substitute for initial value in project.

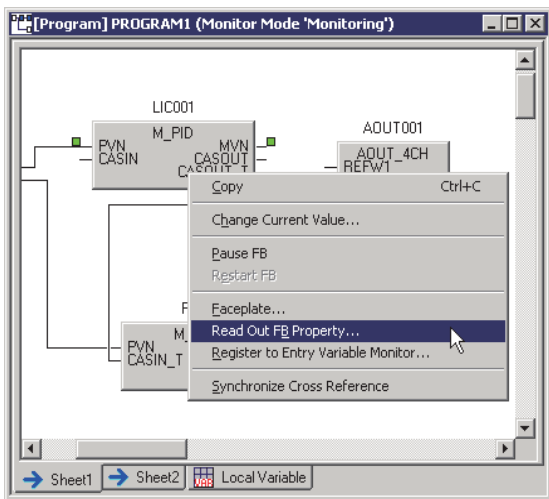


BASIC OPERATION

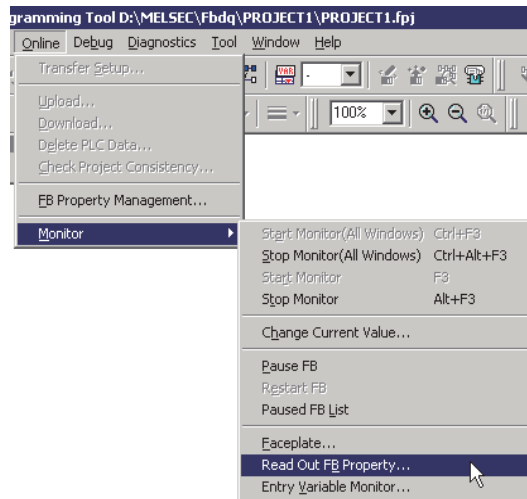
1. In Edit mode, refer to Section 13.1.1 and shift the mode to monitor mode.
2. Right click the FB part in FBD sheet, and click [] in the displayed pop-up menu or click [Online] → [Monitor] → [Read Out FB Property].
3. Read out FB property after dialog box of read out FB property is displayed.



DISPLAY/SETTING SCREEN



Right click variable part or FB part



Click [Online] → [Monitor] → [Read Out FB Property] in the menu

Read Out FB Property [LIC001]

Read All Substitute All Only Difference Lines

Substitute	Program/Declaration Table	FB Variable Name	Item	Current Value	Initial Value
<input checked="" type="checkbox"/>	PROGRAM1	LIC001	IN_NMAX	100.0	100.0
<input checked="" type="checkbox"/>	PROGRAM1	LIC001	IN_NMIN	0.0	0.0
<input checked="" type="checkbox"/>	PROGRAM1	LIC001	IN_HH	102.0	102.0
<input checked="" type="checkbox"/>	PROGRAM1	LIC001	IN_H	100.0	100.0
<input checked="" type="checkbox"/>	PROGRAM1	LIC001	IN_L	0.0	0.0
<input checked="" type="checkbox"/>	PROGRAM1	LIC001	IN_LL	-2.0	-2.0
<input checked="" type="checkbox"/>	PROGRAM1	LIC001	PID_MTD	8.0	8.0
<input checked="" type="checkbox"/>	PROGRAM1	LIC001	PID_DVLS	2.0	2.0
<input checked="" type="checkbox"/>	PROGRAM1	LIC001	PID_PN	0	0
<input checked="" type="checkbox"/>	PROGRAM1	LIC001	PID_SVPTN	TRUE	TRUE
<input checked="" type="checkbox"/>	PROGRAM1	LIC001	OUT1_NMAX	100.0	100.0
<input checked="" type="checkbox"/>	PROGRAM1	LIC001	OUT1_NMIN	0.0	0.0
<input checked="" type="checkbox"/>	PROGRAM1	LIC001	MANI	FALSE	FALSE
<input checked="" type="checkbox"/>	PROGRAM1	LIC001	AUTI	FALSE	FALSE
<input checked="" type="checkbox"/>	PROGRAM1	LIC001	CASI	FALSE	FALSE
<input checked="" type="checkbox"/>	PROGRAM1	LIC001	CMVI	TRUE	TRUE

Data Type of Initial Value REAL
Data Type of Current Value REAL
Input High Limit

Close

Uploaded:10/27/2010 2:27:27 PM

For the items displayed on the "Read Out FB Property" dialog box, refer to Section 13.6.1.

13.7 Monitoring with Entry Variable Monitor Window



PURPOSE

Display list of current value in entry variable monitor window and execute monitoring.

In order to execute monitoring in entry variable monitor window, the variable of object to be monitored must be registered. Once registration is completed, monitoring will be started. This section illustrates the methods for variable entry and monitoring in entry variable monitor window.

Entry variable monitor window is only applicable for monitor mode. If it is not in monitor mode, please refer to "Section 13.1.1 Starting online monitor" to shift the mode to monitor mode and start monitoring.

(1) Local variable (Variable part or FB) registration



BASIC OPERATION

1. In FBD sheet, right click the local variable (Variable part or FB) to be added in the entry variable monitor window.
2. Click [Register to Entry Variable Monitor] in the displayed pop-up menu.
3. After the entry variable monitor window appears, variable registration is to be started.

It is necessary to refer to input variable, output variable and public variable in the case of FB. And in the case of structure type variable, please be sure to refer to structural member.



Herein below are the methods for reference to various variables or structural member.

4. Double click the cell of variable name to be added after variable registration.
5. Input [.Variable name for reference (It should be structural member name in the case of structure type variable)] at the rear of variable name. For details of variable name input with reference operator [.] , refer to Section 7.3.4.
(Example) In the case of reference to input variable [PVN] of FB part,
[Variable name.PVN]

The variables in user-defined FB type/tag FB type can be registered by right-clicking the variable in the definition window of user-defined FB type/Tag type. In this case, select a program/hierarchy from the list box at top of the definition window (← Section 13.2.2) before registering the variable.

(2) Overall part (Global variable, module FB, Tag FB) registration

 **BASIC OPERATION**

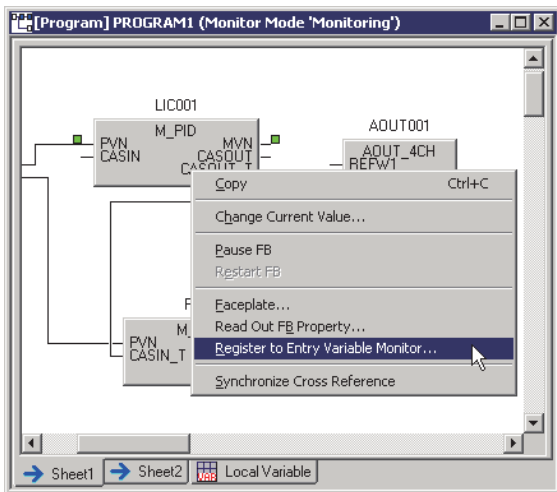
1. Click [Online] → [Monitor] → [Entry Variable Monitor] ().
2. Entry variable monitor window appears.
3. Input variable name and press the "Enter" key.
 Or if you select cell of variable name, button "..." will appear. Click this button and then select global part to be registered from displayed variable reference dialog box. ( Section 7.11.3)

It is necessary to refer to input variable and output variable in the case of module FB.

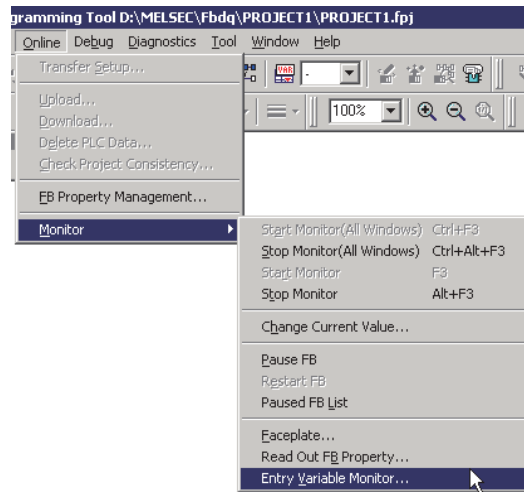
And be sure to refer to input variable, output variable and public variable in the case of Tag FB. For details of reference method of variable, refer to 4. and 5. in (1) in this section.

After completion of variable registration, current value of variable will be displayed in the cell for [Current Value].

 **DISPLAY/SETTING SCREEN**



Right click variable part or FB part



Click [Online] → [Monitor] → [Entry Variable Monitor] in the menu



Variable Name	Program/FB Hierarchy	Data Type	Current Value
LIC001.MANI	PROGRAM1	BOOL	FALSE
AI01.CH1		REAL	0.0
VAR1	PROGRAM1	INT	0
LIC001.PVN	PROGRAM1	REAL	0.0



DISPLAY/SETTING DATA

Item	Description
Variable Name	Display/name of input variable. Use reference operator [.] to input when monitoring input variables, output variables, public variables and structural member. (☞ Section 7.3.4) The maximum level of hierarchy where the variables can be referred with reference operator is three (up to two dot characters can be used).
Program/FB Hierarchy	Display/Input program/FB hierarchy of variable that has been registered. The maximum level of hierarchy where the variables can be referred with reference operator eight (up to seven dot characters can be used).
Data Type	Display registered variable data types.
Current Value	Display current values of registered variables. *1

*1: To alter current value in the "Change Current Value" dialog box (☞ Section 13.3), once the cell of [Current Value] is selected, the button "..." will appear. By clicking the button, the "Change Current Value" dialog box for current value will appear.

POINT
<ul style="list-style-type: none"> ● In structure type variable part, if structural member (variable part in the format of [Structure type variable name. Structural member name]) of structure type has been referred to, it is not necessary to specify structure type member within entry variable monitor window. ● It is not necessary to set items for program/FB hierarchy in the case of global part registration in entry variable monitor window. ● When inputting variable name of FB part or of structure type only, [This data type value is not accessible.] will appear in item current value. In this case, refer to 4. and 5. in (1) in this section and use reference operator [.] to input variable name. ● When arrangement variable part after compile and executing monitor in this status, [Assignment information does not exist.] will appear in the current value of the part. ● When using "Delete" key to delete items of variable names, program/FB hierarchy, the row of variable will be deleted too. ● For BOOL type, current value can be changed to TRUE/FALSE by double-clicking the selected "Current Value" cell while pressing "Shift" key. For data types other than BOOL type, the "Change Current Value" dialog box is displayed.

13.8 Online Operation to Redundant CPU

13.8.1 Route switching in the Redundant CPU system

If a communication failure occurs due to disconnection during online monitor of the Redundant CPU connected to one of the CC-Link IE Controller Network, MELSECNET/H or Ethernet network, the communication route is automatically switched so that the programming tool can continue the online monitor. The automatic switching of communication route is hereinafter referred to as route switching.

The conditions of route switching and an example of online monitor by route switching are explained below.

(1) Route switching conditions

When a communication failure occurs during monitoring under the following conditions, route switching occurs and the programming tool continues the online monitor of the Redundant CPU.

	Conditions for continuation of online monitor
Mounting location of network module	When connecting to the Redundant CPU via a CC-Link IE Controller Network module, MELSECNET/H module or Ethernet module mounted to the main base unit
Operation mode	Backup mode, Separate mode
Target System*1	Control System, Standby System, System A, System B

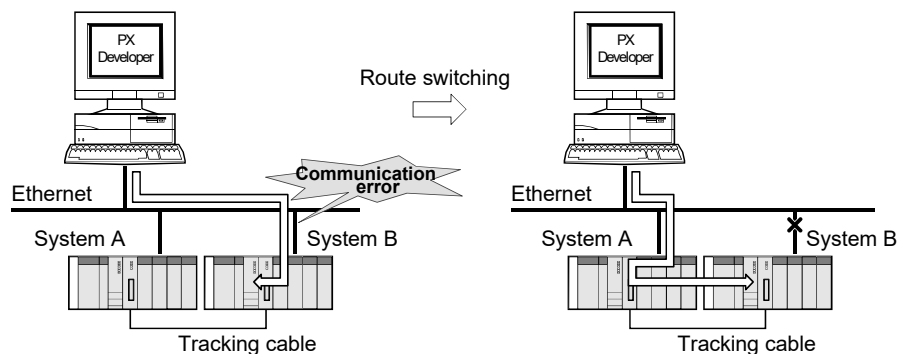
However, when a tracking failure*2 has occurred at the time of monitoring start, the programming tool cannot continue the online monitor through route switching even after the tracking is restored.

*1: Set the target system in "Transfer Setup" screen as explained in Section 12.3.

*2: Includes the cases where either Redundant CPU has been powered OFF, or has been reset.

(2) Example of online monitor by route switching

The example of monitoring the Redundant CPU of system B through Ethernet connection is provided below.



POINT

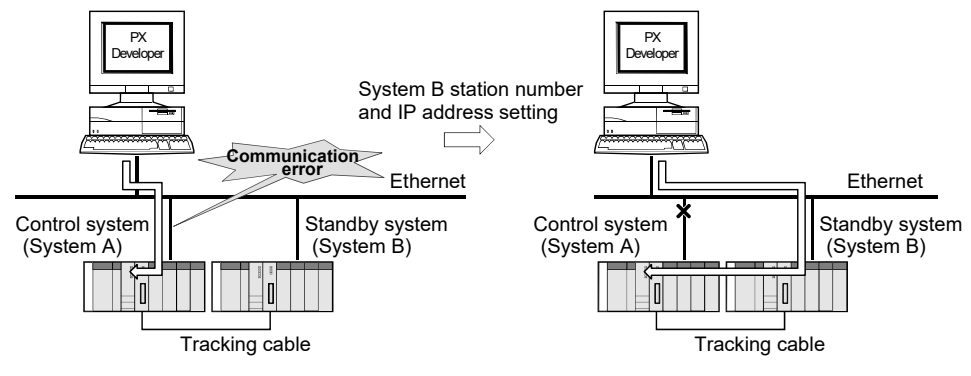
- (1) If a trouble has occurred in the communication with the target system at the time of monitor start, route switching will not occur. (This results in a communication error.)
- (2) Route switching will not occur during the following operations.
If any of the following operations is performed during route switching, this results in a communication error.
 - Displaying the "PLC Diagnostics" screen of the GX application that has been called from the "FBD Program Diagnostics" screen.
 - Performing an online operation other than monitor, such as Write to PLC, Convert (Online change).
- (3) When performing any of the following operations in the condition where route switching might occur, note that the programming tool responds to the operations slower than usual, as taking long time to detect the communication failure.

Function	Operation
FBD Program Diagnostics	Open the screen.
	Click the "Refresh" button.
	Click the "Refresh Error Status" button.
Change Current Value	Open the screen.
	Click the "Set" button.
	Select an item in the "Local Variable Name" field.
Change Current Value from the faceplate	Click the "Set" button.
	Click the updown button.
Read Out FB Property	Open the screen.
Pause FB/Restart FB	Execute the function from the menu.
Pause FB List	Execute the function from the menu.

- (4) If the case of (1) to (3), remove the communication failure, or change the connection target to the station No. of the other Redundant CPU and resume the communication.

<Example> When the control system is set as the target system and the station number and IP address (host name) of the Ethernet module in System A is set as the PLC side I/F on the transfer setup screen
If communication cannot be made with the Ethernet module of System A at the first connection to the programming tool, a communication error occurs without route switching being executed.

To start communication in this case, set the station number and IP address of the Ethernet module in System B as the PLC side I/F.



13.8.2 Automatic change of project identification codes in Redundant CPUs

If the following operations are performed for the Redundant CPU, PX Developer changes the project identification codes recorded in the Redundant CPUs in both systems.

No.	Redundant CPU operation	Redundant CPU project identification code after operation	Change of assignment information database
1	Copying memory to the Redundant CPU in standby system	The project identification code of control system is also recognized as that of standby system.	The project identification code of control system is overwritten to standby system.
2	Re-inserting both connectors of tracking cable into the different systems (Reset and Re-power operations are included.)	The project identification code of control system is recognized as that of standby system; the project identification code of standby system is recognized as that of control system.	Project identification codes of the systems are exchanged.
3	Changing the Redundant CPU in system B to the debug mode (Reset and Re-power operations are included.)	The project identification code of system B is recognized as that of system A. In the debug mode, the project identification code of the other system cannot be read.	
4	Powering off the control system after copying memory to the Redundant CPU in standby system	The project identification code of control system is recognized as that of the other system (new control system). As the previous control system power is off, the project identification code of the other system cannot be read.	

Use "Redundant operation" dialog box of GX Works2 or GX Developer Version 8.18U or later to change the operation mode (Debug mode/Backup mode/Separate mode) and to copy memory into the Redundant CPU of standby system.

For details, refer to the following manuals:

- GX Works2 Version 1 Operating Manual (Common)
- GX Developer Version 8 Operating Manual

PX Developer determines if automatic change of assignment information database is necessary or not according to the Redundant CPU when online operation is started, displays the confirmation message as necessary and executes the change. Even if "No" is selected in the confirmation message and the change of assignment information database is not executed, online operation will be continued.

1) Project identification code

PX Developer uses the identification code to manage compiled projects. By executing download to PLC, the code is recorded into CPU module and the assignment information database of PX Developer project.

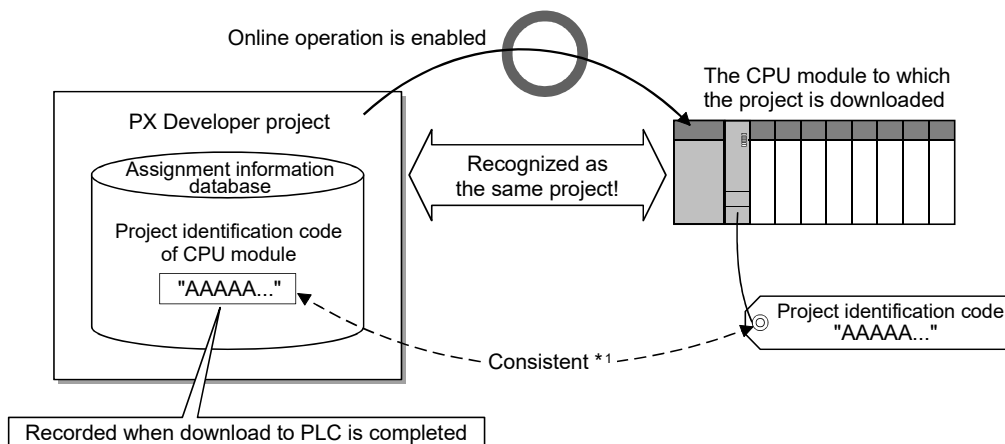
2) Application of project identification codes

The code is used to check if it is the CPU module for which PX Developer performed download to PLC at the previous time. With this operation, the online operation for wrong target CPU module can be prevented. The following online operations can be performed via PX Developer projects for only the CPU module to which PX Developer projects have been downloaded.

- Download to PLC after hot-start compile
- Online change

PX Developer determines if download to PLC was previously performed for the CPU module or not by checking if the project identification code recorded in the CPU module is consistent with that recorded in the assignment information database of PX Developer project.

Online operation is enabled (Consistent in project identification code)



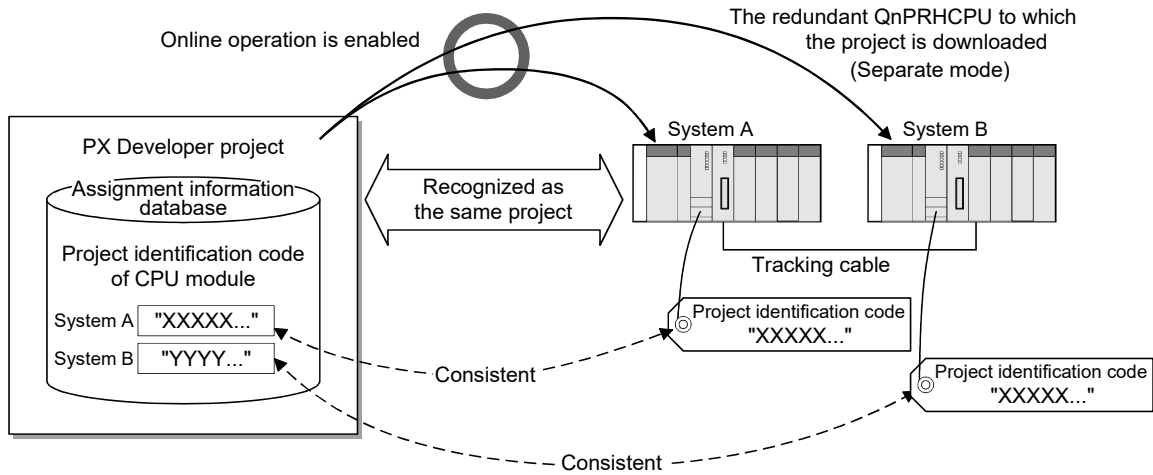
*1: By using project consistency check function, the consistency between the project identification code of CPU module and that of PX Developer project can be confirmed. When the check results in "Inconsistent", online operation is disabled.

REMARK

When download to PLC or online change is executed after hot-start compile, only program change will be reflected on a CPU module. Therefore, online operation can be executed only for the CPU module for which download to PLC was executed at the previous time.

3) Management of project identification codes for Redundant CPU

Project identification codes for Redundant CPU are recorded in the assignment information database as system A/system B-peculiar information.



POINT

- The assignment information database compatible with Redundant CPU is inapplicable with the version 1.04E programming tool.
- When project consistency check function or online monitor is started, automatic change of assignment information database is not executed according to the Redundant CPU.

14 FBD PROGRAM DIAGNOSTICS

PX Developer programming tool can be used to confirm errors related to FBD programs occurring on CPU module.

This section explain how to confirm FBD program errors.

14.1 FBD Program Diagnostics



PURPOSE

To display the current status and the history of FBD program error.



BASIC OPERATION

FBD program diagnostics is executed through the "FBD Program Diagnostics" dialog box.

FBD program diagnostics can be executed in monitor mode. If in other mode than monitor mode, first switch the mode to monitor mode with the reference to Section 13.1.1.

1. Click [Diagnostics] → [FBD Program Diagnostics] in the menu.
2. The "FBD Program Diagnostics" dialog box is displayed.
3. Click the <<Current Error>> tab if the current error content is to be seen. Click <<Error History>> tab if the current error is not completely displayed or the error history needs to be displayed.
4. Click the "Close" button to close the "FBD Program Diagnostics" dialog box.

An error occurs in a CPU module ([ERR.] LED on or flicker), without being displayed in the "FBD Program Diagnostics" dialog box. That means an unrelated error with FBD programs occurs. At this time, click the "GX Works2 PLC Diagnostics" button*¹ to execute CPU module PLC diagnostics from the diagnostics window in GX application.

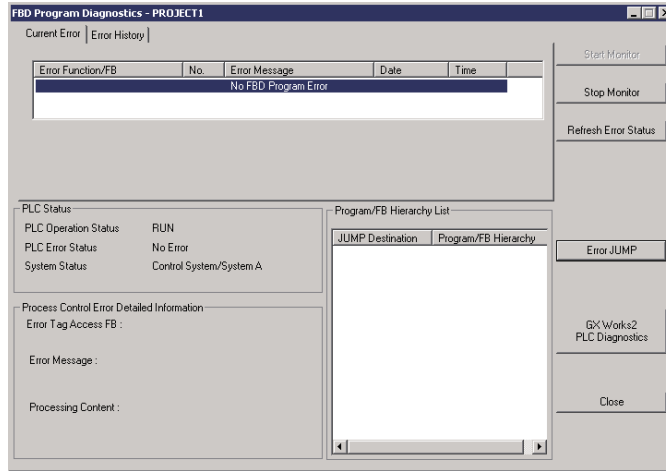
For details of PLC Diagnostics dialog box in GX application, refer to the following manuals:

- GX Works2 Version 1 Operating Manual (Common)
- GX Developer Version 8 Operating Manual

*1: When GX project type is GX Developer project, click the "GX Developer PLC Diagnostics" button.



DISPLAY/SETTING SCREEN



*1:For Redundant CPU, the system status is displayed.



DISPLAY/SETTING DATA

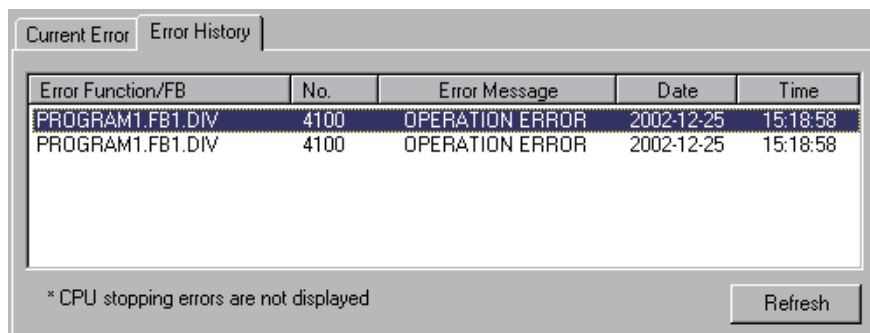
Item	Description
<<Current Error>> tab	<p>The current error content appears. This error will continue to be displayed even if it is cleared. Please click the "Refresh Error Status" button if only the current error needs to be displayed instead of the error display. Program/FB will be displayed with double clicking on error content when program/FB exists.</p> <p>[Error Function/FB] To display the program/FB hierarchy of the error occurrence. The error position cannot be displayed when an error occurs without program/FB hierarchy. While [SYSTEM] will be displayed in the error position when an error occurs in the ladder code (schedule part) without program/FB.</p> <p>[No.] To display the CPU module error code .The code and content of CPU module error can be referred to by clicking [Help] → [PLC Error] in the menu.</p> <p>[Error Message] To display the error message of CPU module.</p> <p>[Date] To display the occurrence date.</p> <p>[Time] To display the time of error occurrence.</p>
<<Error History>> tab	<p>Up to 5 errors can be displayed according to the recorded time sequence. This error will continue to be displayed even if being cleared. Please click the "Refresh Error Status" button if only the current error needs to be displayed instead of the error display. Please refer to Item [Current Error] in this table for details about some items (such as error position). Program/FB will be displayed with double clicking on error content when program/FB exists.</p>
"Refresh" button (Only displayed when selecting <<Error History>> tab)	To update displayed contents of the error history. After the displayed error is cleared, the error contents will not disappear even the button is clicked. (It is kept as history)
PLC status	To display the operation status of CPU module and in connection, and display (RUN/STOP, etc) and whether an error occurs in CPU module. For Redundant CPU, the system status (Control system/Standby system, System A/System B, Unknown) is displayed.
Process Control Error Detailed Information	To display the detailed error information of tag-accessing FB in tag FB when selecting tag FB item in [Current Error] or [Error History]. Nothing will display when items beyond tag FB are selected.

Item	Description
Program/FB Hierarchy List	To display the selected error JUMP place and program/FB hierarchy in [Current Error] or [Error History]. The program/FB will be displayed by double clicking the item display when program/FB exists in JUMP place. Errors are displayed according to hierarchy sequence in the program/FB hierarchy list. Please first examine the function/ FB part (hierarchy displayed at the top of the list) of the error target if the error position needs to be specified. Please jump to the higher hierarchy and specify the error position if the error does not occur in this part but in the call source of user-defined FB part.
"Start Monitor" button	To start the communication with a CPU module and monitoring the FBD Program Diagnostics.
"Stop Monitor" button	To stop the communication with a CPU module and monitoring the FBD Program Diagnostics.
"Refresh Error Status" button	Click this button to clear the [Error History] contents. The current error appears once again. Please click this button if the current error needs to be displayed.
"Error JUMP" button	To display program/FB at the error position by clicking any one of the items [Current Error], [Error History], [Program/FB Hierarchy] after selecting the error contents.
"GX Works2 PLC Diagnostics" button *1	To display the PLC Diagnostics dialog box in GX application. An error occurs in a CPU module ([ERR.] LED on or flicker) without error message appearing in the "FBD Program Diagnostics" dialog box (an error occurs beyond the FBD program). At this time, please execute PLC diagnostics from the PLC diagnostics window in GX application.
"Close" button	Close the "FBD Program Diagnostics" dialog box.

*1: When GX project type is GX Developer project, "GX Developer PLC Diagnostics" button is displayed.

POINT

- When an error occurs in user-defined FB type/tag FB type, FBD parts used in the type will be displayed in the "FBD Program Diagnostics" dialog box.
- In case that several function parts or FB parts (tag FB, module FB, tag access FB) are used in one program/FB, sometimes it is very difficult to recognize which part is with an error in the display of "FBD Program Diagnostics" dialog box when an error occurs.



- In this case, the error part can be jumped to with "Error JUMP" button. After PLC download, the closest hierarchy displayed can be jumped to by deleting the error FBD part and jumping to the part by FBD program diagnostics.
- FBD program diagnostics cannot be executed correctly without compile or the PLC download after that. Therefore, the FBD program diagnostics should be executed after compile and PLC download.
 - Update the [Error History] displayed in "FBD Program Diagnostics" dialog box by clicking the "Refresh" button.
 - In the status of being displayed, the "FBD Program Diagnostics" dialog box will be automatically closed after the mode is changed into the edit mode.

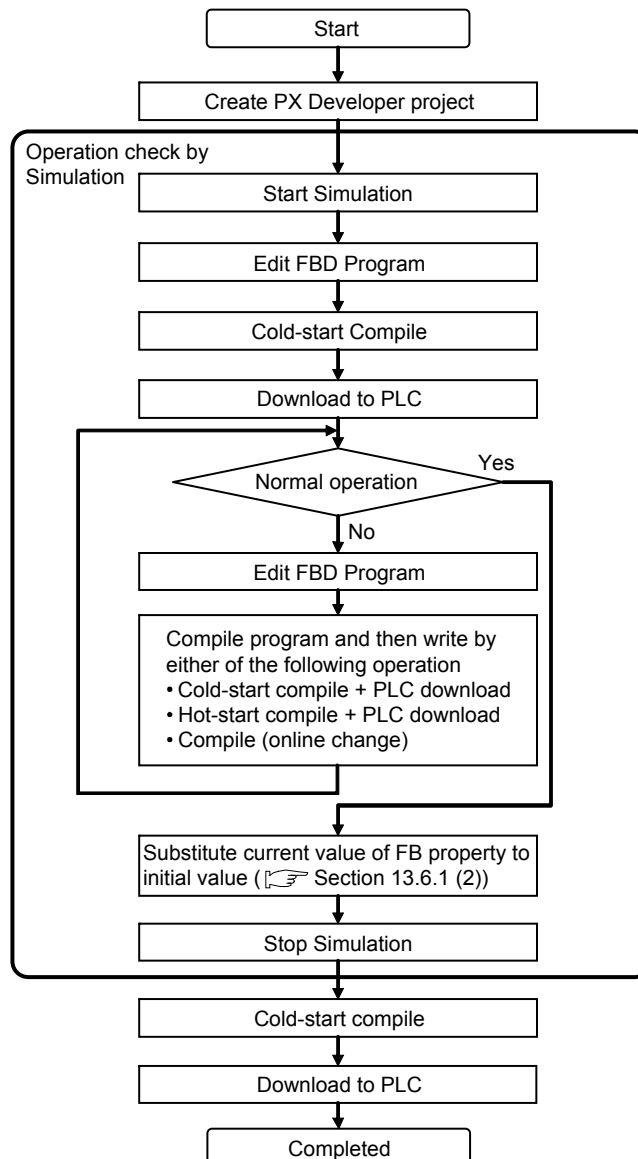
15 SIMULATION FUNCTION

15.1 Offline Debugging with Simulator

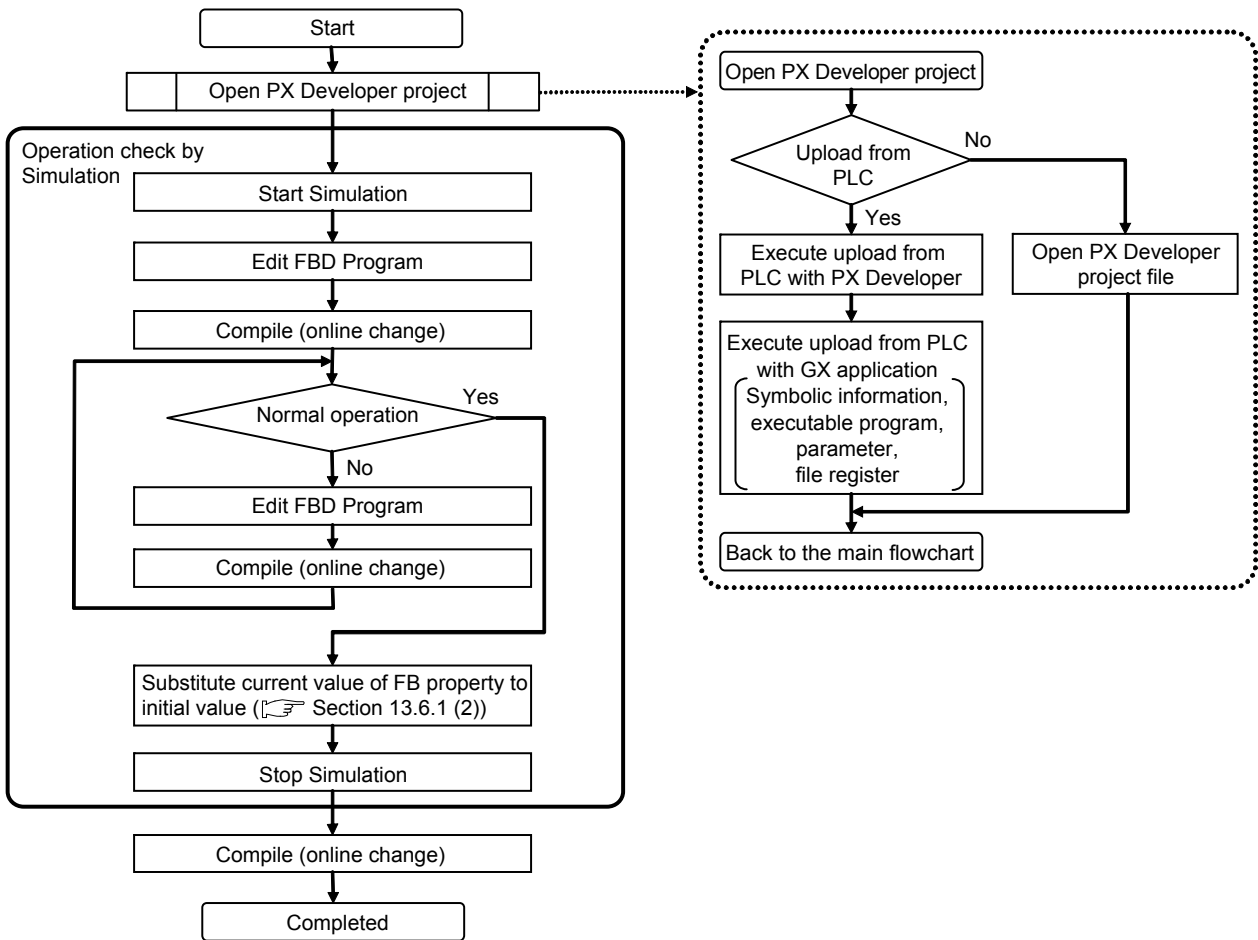
Process control program operation can be checked without connecting to CPU module with PX Developer programming tool.

This section explains a setting and an operation method of programming tool simulation function.

Procedure for new PX Developer project



Procedure for PX Developer project being downloaded to CPU module



15

POINT

If the project setting change which causes a compile (online change) error is done during the simulation, compilation (online change) to CPU module after stopping Simulator cannot be executed.

In this case, the following operation is required.

- When GX project type is GX Works2 project, execute whether to download to PLC after cold-start compile/hot-start compile.
- When GX project type is GX Developer project, execute whether to download to PLC after cold-start compile/hot-start compile or undo the changed content.

For details of setting change which causes a compile error, refer to Section 11.6.2.

15.1.1 Starting Simulator




PURPOSE

Start Simulator with PX Developer.

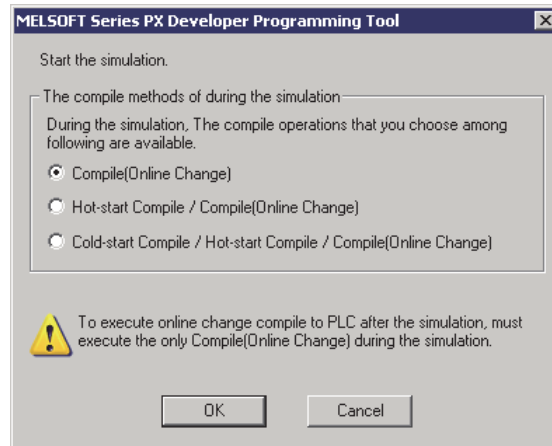


BASIC OPERATION

1. Select [Debug] → [Start Simulation] () on the menu.
2. The dialog box to start simulation is displayed. Select the compile operation which can be executed during simulation, click the "OK" button.
3. Simulator is opened and monitoring the active window is started.
If the monitoring is not started, edit mode is started.
"Simulation" is displayed on the connection destination of the status bar.





DISPLAY/SETTING SCREEN



<Display example of the status bar after starting Simulation>

POINT

- When GX project type is GX Developer project, GX Simulator is required to be installed to use [Start GX Simulator] menu and the toolbar button ().
- The maximum of 4 projects can be simulated simultaneously by starting the simulation of other project during the simulation using GX Simulator2. GX Simulator cannot simulate the multiple projects simultaneously.
- For simulating FBD program, the following software is required.
 - When GX project type is GX Works2 project
 - <When Process CPU or Redundant CPU is selected as PLC type>
GX Works2 Version 1 (SW1DNC-GXW2 Version 1.98C or later)
 - <When Universal model process CPU is selected as PLC type>
GX Works2 Version 1 (SW1DNC-GXW2 Version 1.501X or later)
 - When GX project type is GX Developer project
 - GX Developer Version 8 (Version 8.94Y or later)
 - GX Simulator Version 7 (Version 7.27D or later)
- To simulate an FBD program, device memory with file register to which validated initial value is set is required for GX project. When simulating with PX Developer project which is restored by uploading from PLC, open a GX project after uploading from PLC with PX Developer, and then execute uploading programs, parameters, and file register from PLC.
- When setting file register (ZR) data to be used in ladder program to device memory of GX application, set it before starting Simulator with PX Developer. When setting file register data (ZR) of device memory during the simulation, the setting will be destroyed in stopping Simulator.
- When compiling (online change) to CPU module after stopping simulation, select "Compile (Online Change)" on the dialog box displayed at start simulation.
- On the dialog box displayed at start simulation, the compile operation, which can be performed during simulation, can be specified depending on the compile operation settings ( Section 5.11 (3)) whose option setting is enabled. Even when the compile operation is set to option setting, the setting on the dialog box displayed at start simulation is enabled.

15.1.2 Stopping Simulator




PURPOSE

Stop Simulator with PX Developer.



BASIC OPERATION

1. Select [Debug] → [Stop Simulation] () on the menu.
2. Simulator is stopped and edit mode is started.
CPU module being connected is displayed on connection destination of the status bar.



DISPLAY/SETTING SCREEN



<Display example of the status bar after stopping Simulator>

POINT

- The current value of FB property which was changed during the simulation will be destroyed in stopping Simulator.
When substituting the current value to initial value, read the current value of FB property before stopping Simulator.
- Simulation status at GX project end
 - When GX project type is GX Works2 project
If GX Works2 is closed during the simulation, Simulator is not stopped.
 - When GX project type is GX Developer project
If GX Developer is closed during the simulation, Simulator is also stopped.

POINT

- When compiling during the simulation, the compilation status becomes "Uncompiled" and the PX Developer project will be saved.
To download PX Developer project whose compilation status is Uncompiled after stopping Simulator to CPU module, execute the following compilation in accordance with the project status.
 - Cold-start compile for new project (a project which has not been downloaded to CPU module)
 - Compile (online change) for a project which has been downloaded to CPU module *1
- *1: If the project setting change which causes a compile (online change) error is done during the simulation, compilation (online change) to CPU module after stopping Simulator cannot be executed.
In this case, the following operation is required.
- When GX project type is GX Works2 project, execute whether to download to PLC after cold-start compile/hot-start compile.
 - When GX project type is GX Developer project, execute whether to download to PLC after cold-start compile/hot-start compile or undo the changed content.
- For details of setting change which causes a compile error, refer to Section 11.6.2.
- When downloading "PX Developer project which has been downloaded to CPU module" that became the uncompiled status as mentioned above to CPU module with "hot-start compile + download to PLC" or "compile (online change)", initial values for all variables which are added after downloading to PLC most recently are reflected to CPU module.
- When setting file register (ZR) data to be used in ladder program to device memory of GX application, execute it before starting Simulator with PX Developer.
When setting file register data (ZR) of device memory during the simulation, the setting will be destroyed when stopping Simulator.


15.1.3 Function restricted during the simulation

The following shows the PX Developer functions which are restricted during the simulation

Function of PX Developer	Availability	Restrictions
Save as	×	Unavailable
Transfer setup	×	
Change PLC type	×	
Project consistency	×	
Upload from PLC	×	
Delete PLC data	×	
Download to PLC	△	<ul style="list-style-type: none"> • Cannot download symbolic data. • A method to stop the action status for downloading to PLC after hot-start compilation is remote STOP, not remote PAUSE. • After downloading to Simulator with STEP → RUN status, the status will be RUN. • When downloading to Simulator with GX Works2 which has been started from programming tool, the range of the device value set to the Automatic-Assign setting of GX Works2 may not be cleared to '0'. To clear the device value to '0', startup GX Works2 from the project window first, and perform "Rebuild All" and then download to PLC.
Compile (online change)	△	<ul style="list-style-type: none"> • A method to write a program is downloading to PLC after remote STOP, not online change of file. • After compiling (online change) is performed with STEP → RUN status, the status will be RUN. • When downloading to Simulator with GX Works2 which has been started from programming tool, the range of the device value set to the Automatic-Assign setting of GX Works2 may not be cleared to '0'. To clear the device value to '0', startup GX Works2 from the project window first, and perform "Rebuild All" and then download to PLC.

×: Unavailable, △: Partly unavailable

15.1.4 Restrictions when debugging programs using Simulator

 CAUTION
<ul style="list-style-type: none"> • Simulator simulates the actual CPU module to debug a sequence program. However, this function does not guarantee the operation of the debugged sequence program. • The operation result may differ from the actual result since Simulator does not access input/output modules or special function modules, and it does not support some instructions and device memory.

POINT
After debugging programs using Simulator, those programs must be debugged online before operating them actually on the CPU module.

This section explains restrictions when debugging programs in PX Developer programming tool.
 The concept of time in Simulator is different from the actual time in CPU module. Therefore, the program operation timing in a CPU module is different from that in Simulator.
 For other restrictions when using Simulator, refer to the following manuals:
 GX Works2 project : GX Works2 Version 1 Operating Manual (Common)
 GX Developer project : GX Simulator Version 7 Operating Manual

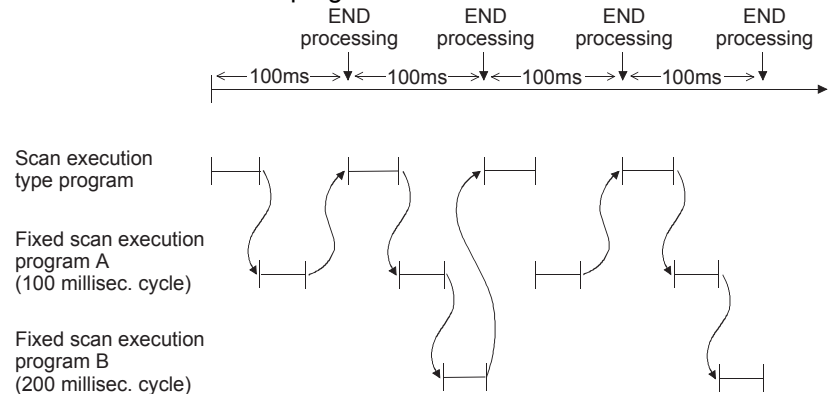
(1) Processing time in Simulator

The scan time is processed as a constant scan in the Simulator debugging function.

The following table shows restrictions on the execution types regarding the program execution setting of FBD program created in the programming tool.

Execution type		Restrictions
Timer execution	Scan	<ul style="list-style-type: none"> • When GX project type is GX Works2 project The scan time is processed in accordance with the settings of constant scan time. When the constant scan setting is not set, it will be processed regarded as 100ms. Therefore, the processing timing is different from that in the actual environment. • When GX project type is GX Developer project Scan time is processed as a constant scan of 100ms. Therefore, the processing timing is different from that in the actual environment.
	High speed, Normal speed, Low speed	Scan is processed in each specified cycle. (No restrictions)
Fixed scan execution		Program execution is determined by calculating the elapsed time after the operation of a scan execution program. <ul style="list-style-type: none"> • When GX project type is GX Works2 project The fixed scan program whose interruption interval is shorter than the constant scan setting is not operate properly. (Because the fixed scan execution program is executed after the scan programs are executed with the cycle set to the constant scan setting.) • When GX project type is GX Developer project A fixed scan program does not operate normally when the interruption interval is less than 100ms. (This is because a fixed scan execution program is executed after the program is executed in a cycle of 100ms.)
Interrupt pointer execution		Program is not processed. (This is because interrupt programs are not processed in Simulator.)

The following figure shows processing timings when 100ms and 200ms cycles are set in the fixed scan execution program.



(2) The debugging function of GX application

● When GX project is GX Works2 Simple project

By performing the simulation function of GX Works2, the user-created programs*1 can be debugged using the debugging function (step execution, skip execution, or partial execution).

The following shows the procedure for performing the simulation function.

- 1) Startup GX Works2 project from PX Developer.
- 2) Start simulation with GX Works2 project.
- 3) Start simulation with PX Developer.

Note that, however, if the simulation has been started with the method other than above, the debugging function cannot be used.

● When GX project type is GX Developer project

By performing the ladder logic test, the user ladder programs*1 can be debugged using the debugging function (step execution, skip execution, or partial execution).

*1: These debugging functions cannot be performed on FBD programs of PX Developer.

(3) Module FB

- The debugging function cannot be performed on analog module FB, temperature input module FB, counter module FB, and CC-Link module FB. The debugging function can be performed by performing any of the following operation:

- Use the I/O Simulation function (☞ Section 15.2)
- Change the current value of output pin of module FBs

Note that, when using the simulation function with GX Works2 project, set the I/O assignment setting in the PLC parameter of GX Works2.

- I/O module FB performs data input/output to X/Y devices. Programs can be debugged using the I/O system setting.

(4) Buffer memory

When using the buffer memory (U□\G□) for assignment device setting of device variable or global variable, the I/O assignment must be set in GX application.

For details, refer to the following manuals:

- GX Works2 Version 1 Operating Manual (Common)
- GX Developer Version 8 Operating Manual

If the I/O assignment is not set, data cannot be written to/read from the buffer memory.

(5) Communication control FB

Communication control FB is not processed. Simulator does not support network modules.

(6) Using character string constant

The maximum number of characters in character string constant that can be used in a program is 32 for CPU module, and 16 for GX Simulator. The 17th and subsequent characters are ignored.

This restriction is not applied to character string type variables used in global variables and local variables.

(7) Unsupported instructions in FBD programs of PX Developer

Unsupported instructions in FBD programs created in PX Developer (programs start with #FBDQ) are not displayed in the unsupported instruction list of Simulator.

(8) Monitoring FBD programs of PX Developer

Program monitoring may be interrupted when a program created in PX Developer (a program starts with #FBDQ) is monitored on GX Developer using GX Simulator.

For debugging FBD programs, monitor programs on the FBD sheet in PX Developer programming tool.

(9) Primary loop tracking

When performing the simulation function with GX Simulator, INSTRCT. CODE ERR, occurs if a connector is not connected to the primary loop for a program tracking to the primary loop.

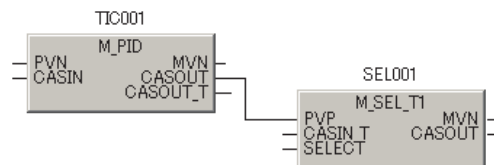
For loop tag FB with tracking to primary loop, write a program according to the tag type as shown below.

• Loop selector FB

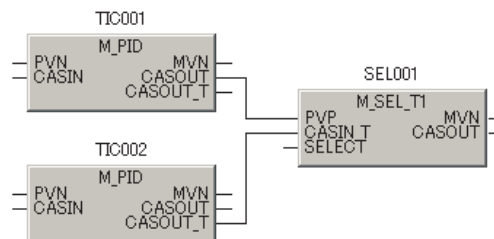
A connector must be connected to the primary loop.

<Example> Loop selector

× Without a connection to primary loop
(INSTRCT. CODE ERR occurs.)



○ With a connection to primary loop



• Loop tag FB other than loop selector

Perform either of the following operations.

(a) Connect a connector to the primary loop.

(b) When a connector is not required to connect to the primary loop, set 'Setting value (SV) used' (**SVPTN_B0) to TRUE (Not used).

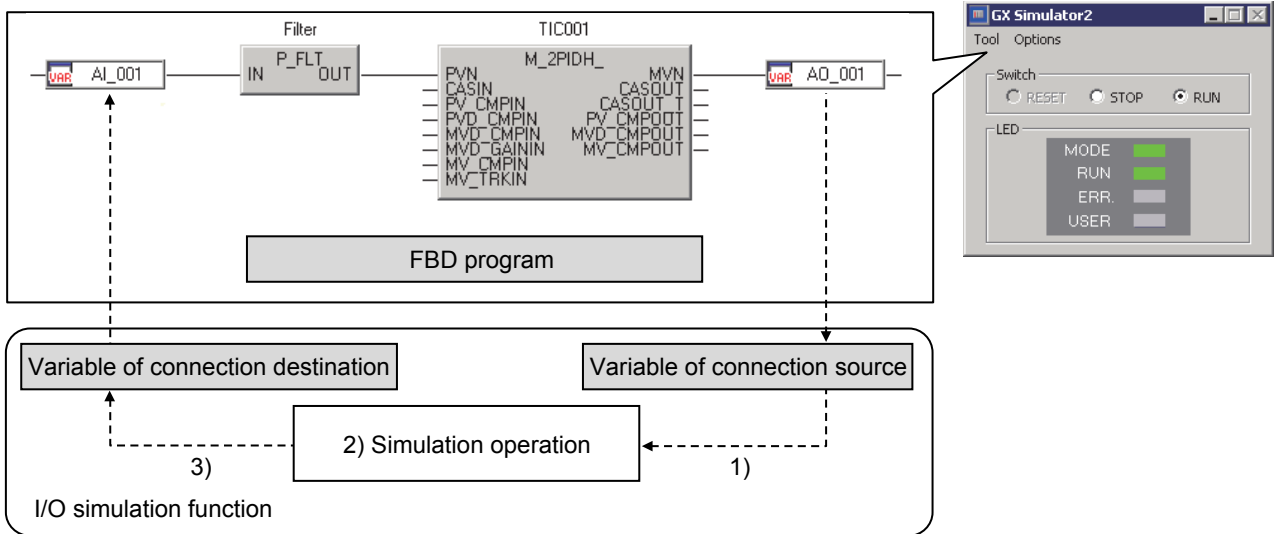
15.2 I/O Simulation Function

FBD program operation can be checked by simulating the input/output with simple setting in offline debugging by the simulation function of GX Developer.

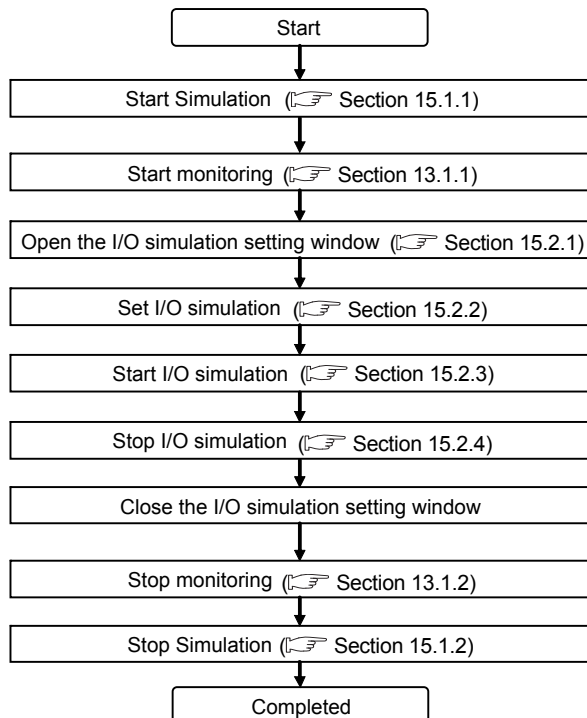
(When a program is created for PID loop control, simulating such as first order lag with the output value of loop, and executing feedback to the input of loop are possible.)

The following shows the overview of processing for I/O simulation.

- 1) Read a current value of variable from the connection source.
- 2) Execute the simulation operation with a read value.
- 3) Write the operation result to the variable of the connection destination.



The following shows the basic operations for I/O simulation function.




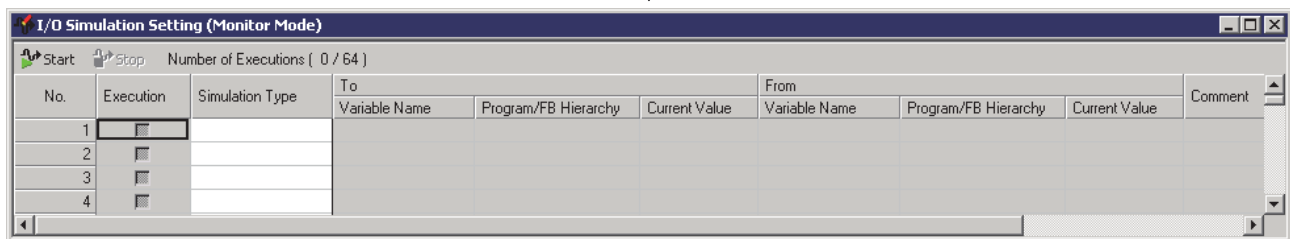
15.2.1 Displaying I/O simulation setting window


**PURPOSE**

To display the I/O simulation setting window.

**BASIC OPERATION**

1. Select [Debug] → [I/O Simulation Setting...] () on the menu.
2. The I/O simulation setting window is displayed.

**DISPLAY/SETTING SCREEN****POINT**

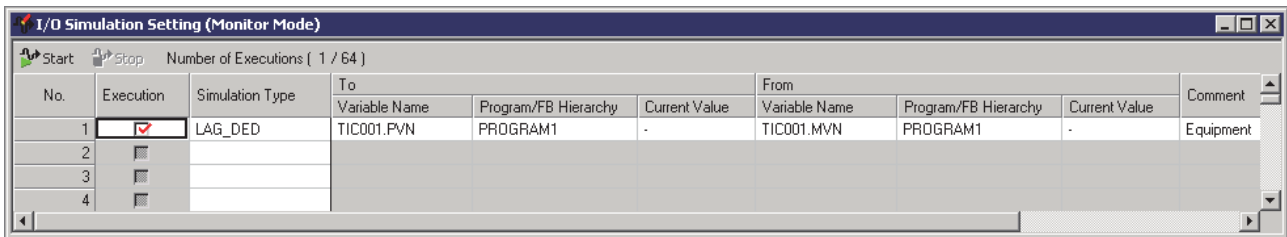
When GX project type is GX Developer project, [I/O Simulation Setting...] menu and the toolbar button () cannot be used without installing GX Simulator.

15.2.2 Setting I/O simulation







This section explains the items and display/setting description on the I/O simulation setting window.

(1) Items and display/setting description on the I/O simulation setting window

 DISPLAY/SETTING SCREEN



 DISPLAY/SETTING CONTENTS

Item	Description
	Start the I/O simulation.
	Stop the I/O simulation.
Number of Executions	Display the number of executions in I/O simulation. Display in [number of executions/maximum number] format.
No.	Indicate a row number. Up to No.100 can be defined. If a setting value in the row is incorrect, the icon () will be displayed. When an error occurs during I/O simulation execution, the icon () will be displayed on the corresponding row.
Execution check box	Check a target row of I/O simulation. Maximum of 64 rows can be checked. When the number of executions equals the maximum number of executions, the check boxes with unchecked status are invalidated.
Simulation Type	Select a type of simulation operation. For selectable simulation type, refer to (2) in this section.
To	Variable Name Display/set a variable name to be the connection destination. 1. Select cell of Variable Name and press "...". 2. The "Variable Reference" dialog box ( Section 7.11.3) is displayed. 3. Select variable name and click the "OK" button. Variable name can also be set by inputting directly. As shown in the above window, when setting module FB, tag FB and structure type variable, reference operator ( Section 7.3.4), reference public variable or member should be applied in it. The maximum level of hierarchy where the variables can be referred with reference operator is three (up to two dot characters can be used).
	Program/ FB Hierarchy Display/set a program/FB hierarchy of variable to be the connection destination. The maximum level of hierarchy where the variables can be referred with reference operator is eight (up to seven dot characters can be used).
	Current Value Display a value to be output to variable of connection destination after starting I/O simulation.

(To the next page)

Item		Description
From	Variable Name	Display/set a variable name to be the connection source. For details of setting method, refer to the item "Variable Name" of "To".
	Program/ FB Hierarchy	Display/set a program/FB hierarchy of variable to be the connection source. The maximum level of hierarchy where the variables can be referred with reference operator is eight (up to seven dot characters can be used).
	Current Value	Display a value to be input for simulation operation after starting I/O simulation.
Comment		Display/set the comments of simulation operation. Comments should be input within 64 characters.

POINT
<ul style="list-style-type: none"> • I/O simulation setting can be defined a maximum of 100 rows. • When a simulation type is deleted, the setting content of corresponding row are discarded.

(2) List of simulation types

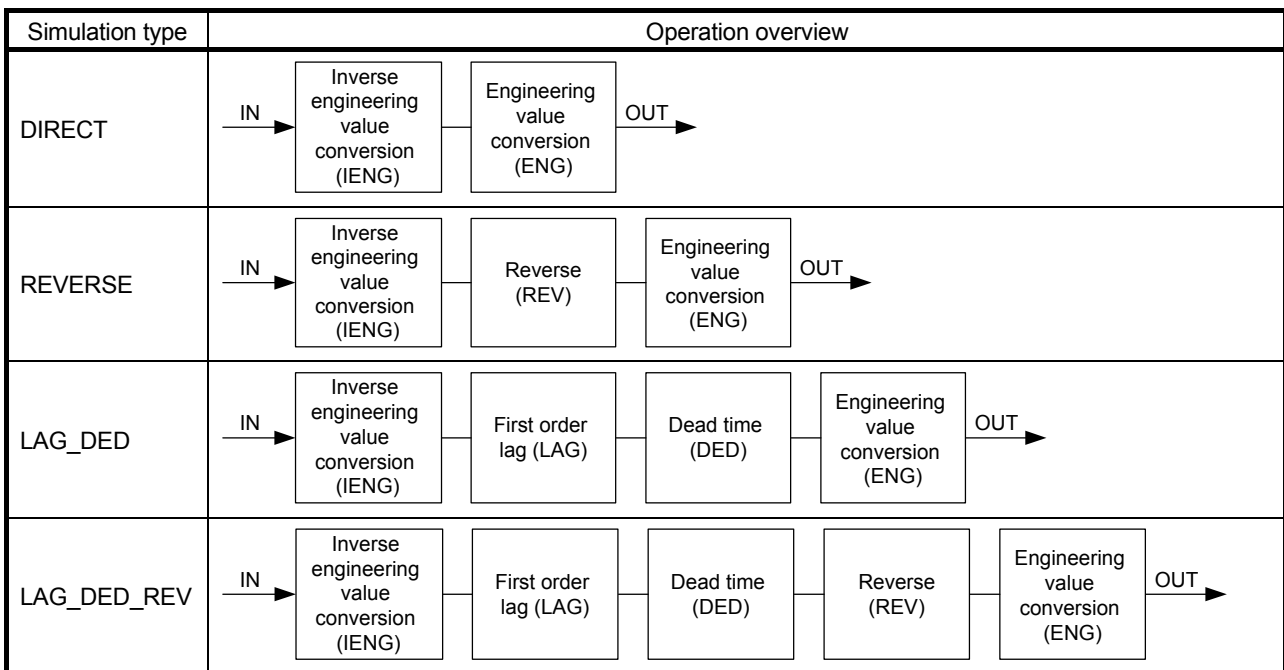
The following table shows the list of simulation operation types.

Item	Simulation type	Operation description	Corresponding processing				
			ENG	IENG	LAG	DED	REV
Direct	DIRECT	Direct	○	○	—	—	—
	REVERSE	Direct (Reverse)	○	○	—	—	○
First order lag + dead time	LAG_DED	First Order Lag + Dead Time	○	○	○	○	—
	LAG_DED_REV	First Order Lag + Dead Time (Reverse)	○	○	○	○	○

(3) Overview of simulation operation

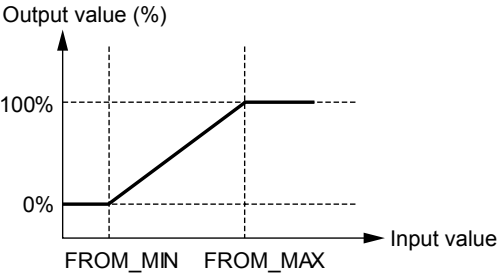
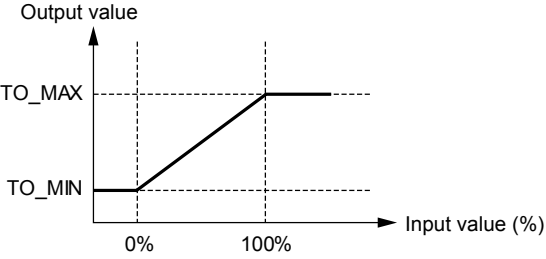
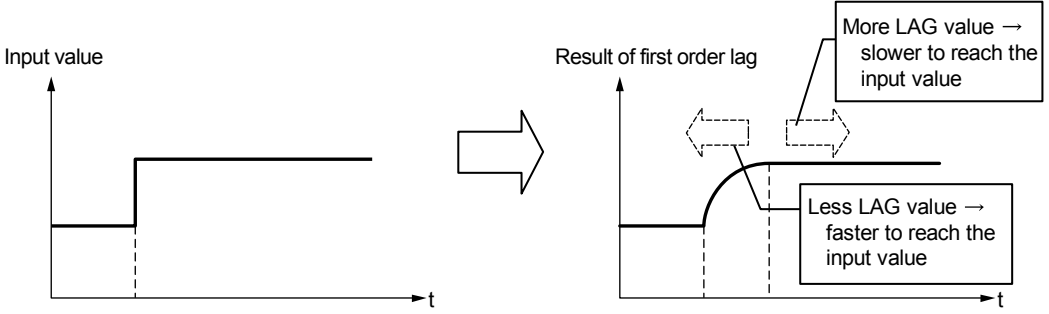
The following shows the flowcharts for simulation types.

For details of processing for operation flowcharts, refer to (4) in this section.



(4) Description of operation processing

The following shows the overview of processing for simulation operation.

Processing name	Processing description
<p>Inverse engineering value conversion (IENG)</p>	<p>Convert the input value into percentage (%). When a value that exceeds the high/low limit value is input, the operation is executed with the high/low limit value.</p> $\text{Output value (\%)} = \frac{\text{Input value (engineering value)} - \text{FROM_MIN}}{\text{FROM_MAX} - \text{FROM_MIN}} \times 100$  <p>FROM_MAX: range high limit of connection source (From), FROM_MIN: range low limit of connection source (From)</p>
<p>Engineering value conversion (ENG)</p>	<p>Convert the input value (%) into engineering value. When a conversion result exceeds the high/low limit value, the high/low limit value is output as the operation result.</p> $\text{Output value (engineering value)} = \left\{ (\text{TO_MAX} - \text{TO_MIN}) \times \frac{\text{Input value (\%)}}{100} \right\} + \text{TO_MIN}$  <p>TO_MAX: range high limit of connection destination (To), TO_MIN: range low limit of connection destination (To)</p>
<p>First order lag (LAG)</p>	<p>Execute first order lag compensation for the input value, and output.</p> 

Processing name	Processing description
Dead time (DED)	<p>Execute the dead time processing for the input value, and output.</p> <p>The graph plots 'Input value/result of dead time compensation' on the y-axis against time 't' on the x-axis. The input value is a step function that increases in steps. The result of dead time compensation is a similar step function but delayed by a period labeled 'DED' for each step. Vertical dashed lines mark the start of each dead time interval.</p>
Reverse (REV)	<p>Execute the reverse processing for the input value (%).</p> <p>When a value that exceeds the high/low limit value (0 to 100%) is input, the operation is executed with the high/low limit value.</p> <p>Output value (%) = 100 – input value (%)</p> <p>The graph plots 'Output value (%)' on the y-axis against 'Input value (%)' on the x-axis. The y-axis has 0% at the top and 100% at the bottom. The x-axis has 0% and 100% marked. The output is 0% for input values from 0% to 100%. For input values above 100%, the output decreases linearly to 100%.</p>

(5) Switching setting items (simulation type)

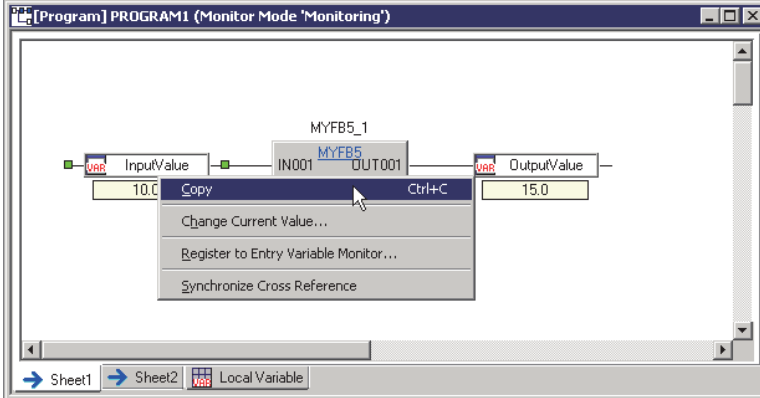
The setting items of the FB property window (see Section 5.7.4) are switched in accordance with simulation type.

The following table shows the setting items for simulation types.

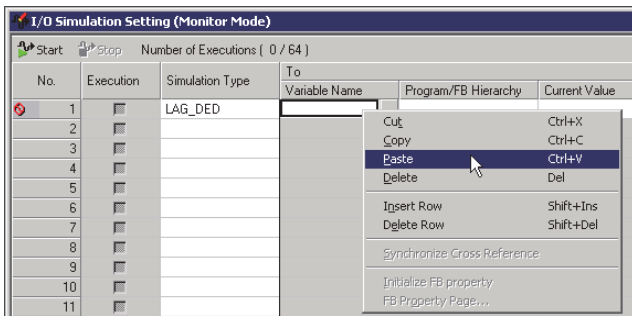
Simulation type	Item	Data type	Description	Range	Initial value
DIRECT REVERSE	TO_MAX	REAL	'To' Range High Limit	TO_MIN < TO_MAX ≤ 999999.0	100.0
	TO_MIN	REAL	'To' Range Low Limit	-999999.0 ≤ TO_MIN < TO_MAX	0.0
	FROM_MAX	REAL	'From' Range High Limit	FROM_MIN < FROM_MAX ≤ 999999.0	100.0
	FROM_MIN	REAL	'From' Range Low Limit	-999999.0 ≤ FROM_MIN < FROM_MAX	0.0
LAG_DED LAG_DED_REV	TO_MAX	REAL	'To' Range High Limit	TO_MIN < TO_MAX ≤ 999999.0	100.0
	TO_MIN	REAL	'To' Range Low Limit	-999999.0 ≤ TO_MIN < TO_MAX	0.0
	FROM_MAX	REAL	'From' Range High Limit	FROM_MIN < FROM_MAX ≤ 999999.0	100.0
	FROM_MIN	REAL	'From' Range Low Limit	-999999.0 ≤ FROM_MIN < FROM_MAX	0.0
	LAG	REAL	Lag Time Constant (s)	0.0 ≤ LAG ≤ 999999.0	1.0
	DED	INT	Dead Time (s)	0 ≤ DED ≤ 999	0

(6) Copying/pasting an FBD part

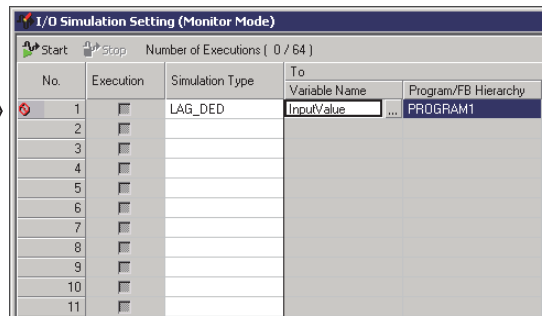
Select and copy the parts from an FBD sheet (variable part, FB, tag FB), and paste on the I/O simulation setting window during the monitor mode.



Right-click a part to be copied, and click [Copy].



Right-click a cell of variable name on the I/O simulation setting window, and click [Paste].



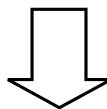
The part is pasted on the selected cell and to the right of that.

(7) Selecting execution target

Check the "Execution" check box to be the execution target of I/O simulation operation.

(a) When switching ON/OFF for multiple check boxes, click either check box of selected rows.

No.	Execution	Simulation Type	To Variable Name	Program/FB Hierarchy	Current Value	From Variable Name	Program/FB Hierarchy	Current Value	Comment
1	<input type="checkbox"/>	LAG_DED	TIC001.FVN		-	TIC001.MVN		-	
2	<input type="checkbox"/>	LAG_DED	TIC002.FVN		-	TIC002.MVN		-	
3	<input type="checkbox"/>	LAG_DED	TIC003.FVN		-	TIC003.MVN		-	
4	<input type="checkbox"/>	LAG_DED	TIC004.FVN		-	TIC004.MVN		-	

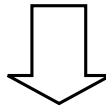


No.	Execution	Simulation Type	To Variable Name	Program/FB Hierarchy	Current Value	From Variable Name	Program/FB Hierarchy	Current Value	Comment
1	<input type="checkbox"/>	LAG_DED	TIC001.FVN		-	TIC001.MVN		-	
2	<input checked="" type="checkbox"/>	LAG_DED	TIC002.FVN		-	TIC002.MVN		-	
3	<input type="checkbox"/>	LAG_DED	TIC003.FVN		-	TIC003.MVN		-	
4	<input checked="" type="checkbox"/>	LAG_DED	TIC004.FVN		-	TIC004.MVN		-	

- (b) When the check box ON/OFF status of selected rows is mixed, the ON/OFF status of all selected rows is switched based on the clicked row status.

No.	Execution	Simulation Type	To			From			Comment
			Variable Name	Program/FB Hierarchy	Current Value	Variable Name	Program/FB Hierarchy	Current Value	
1	<input checked="" type="checkbox"/>	LAG_DED	TIC001.PVN		-	TIC001.MVN		-	
2	<input checked="" type="checkbox"/>	LAG_DED	TIC002.PVN		-	TIC002.MVN		-	
3	<input type="checkbox"/>	LAG_DED	TIC003.PVN		-	TIC003.MVN		-	
4	<input checked="" type="checkbox"/>	LAG_DED	TIC004.PVN		-	TIC004.MVN		-	

The clicked row status is checked.



No.	Execution	Simulation Type	To			From			Comment
			Variable Name	Program/FB Hierarchy	Current Value	Variable Name	Program/FB Hierarchy	Current Value	
1	<input checked="" type="checkbox"/>	LAG_DED	TIC001.PVN		-	TIC001.MVN		-	
2	<input type="checkbox"/>	LAG_DED	TIC002.PVN		-	TIC002.MVN		-	
3	<input type="checkbox"/>	LAG_DED	TIC003.PVN		-	TIC003.MVN		-	
4	<input type="checkbox"/>	LAG_DED	TIC004.PVN		-	TIC004.MVN		-	

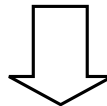
All selected row status is switched to unchecked.

- (c) Click the "Execution" column header, and click any check box of selected rows to switch all check box status to ON/OFF simultaneously.

Click

No.	Execution	Simulation Type	To			From			Comment
			Variable Name	Program/FB Hierarchy	Current Value	Variable Name	Program/FB Hierarchy	Current Value	
1	<input type="checkbox"/>	LAG_DED	TIC001.PVN		-	TIC001.MVN		-	
2	<input type="checkbox"/>	LAG_DED	TIC002.PVN		-	TIC002.MVN		-	
3	<input type="checkbox"/>	LAG_DED	TIC003.PVN		-	TIC003.MVN		-	
4	<input type="checkbox"/>	LAG_DED	TIC004.PVN		-	TIC004.MVN		-	

Click the "Execution" column header, and click any check box of selected rows.



No.	Execution	Simulation Type	To			From			Comment
			Variable Name	Program/FB Hierarchy	Current Value	Variable Name	Program/FB Hierarchy	Current Value	
1	<input checked="" type="checkbox"/>	LAG_DED	TIC001.PVN		-	TIC001.MVN		-	
2	<input checked="" type="checkbox"/>	LAG_DED	TIC002.PVN		-	TIC002.MVN		-	
3	<input checked="" type="checkbox"/>	LAG_DED	TIC003.PVN		-	TIC003.MVN		-	
4	<input checked="" type="checkbox"/>	LAG_DED	TIC004.PVN		-	TIC004.MVN		-	

All check boxes of selected rows are checked.

- (d) When the check box ON/OFF status of selected rows is mixed, the ON/OFF status of all selected row is switched based on the clicked row status as mentioned above (b).

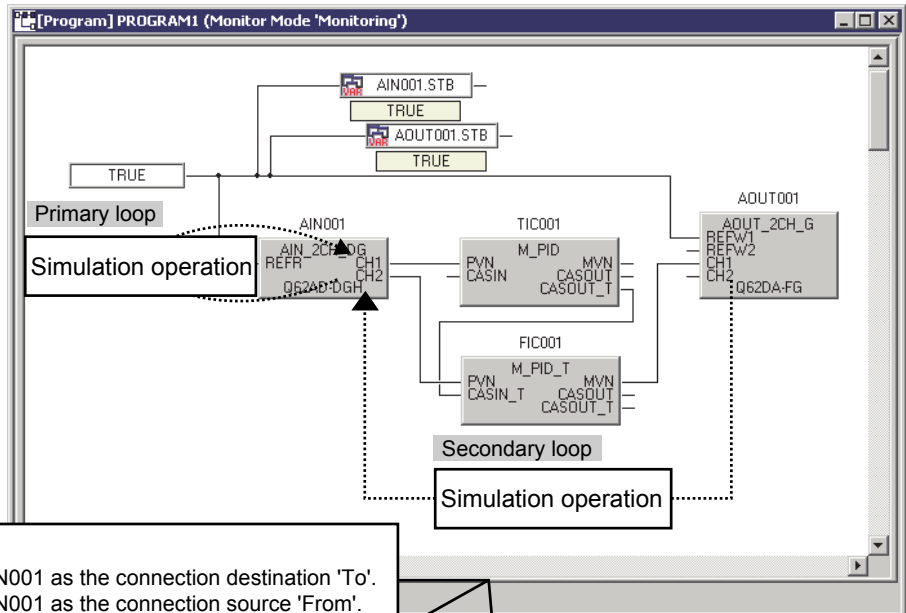
(8) Example of I/O simulation

- (a) Execute the simulation operation for one loop tag with input/output value of module FBs.

1) Set CH1 of module FB variable AIN001 as the connection destination 'To'.
 2) Set CH1 of module FB variable AOUT001 as the connection source 'From'.

No.	Execution	Simulation Type	To Variable Name	Program/FB Hierarchy	Current Value	From Variable Name	Program/FB Hierarchy	Current Value	Comment
1	<input checked="" type="checkbox"/>	LAG_DED	AIN001.CH1	PROGRAM1	50.0	AOUT001.CH1	PROGRAM1	50.0	
2	<input type="checkbox"/>								
3	<input type="checkbox"/>								
4	<input type="checkbox"/>								

- (b) Execute the simulation operation for 2 loop tags in cascade connection with input/output value of module FBs.



I/O simulation of primary loop
 1) Set CH1 of module FB variable AIN001 as the connection destination 'To'.
 2) Set CH2 of module FB variable AIN001 as the connection source 'From'.

No.	Execution	Simulation Type	To Variable Name	Program/FB Hierarchy	Current Value	From Variable Name	Program/FB Hierarchy	Current Value	Comment
1	<input checked="" type="checkbox"/>	LAG_DED	AIN001.CH1	PROGRAM1	50.0	AIN001.CH2	PROGRAM1	50.0	
2	<input checked="" type="checkbox"/>	LAG_DED	AIN001.CH2	PROGRAM1	50.0	AOUT001.CH1	PROGRAM1	50.0	
3	<input type="checkbox"/>								
4	<input type="checkbox"/>								

I/O simulation of secondary loop
 1) Set CH2 of module FB variable AIN001 as the connection destination 'To'.
 2) Set CH1 of module FB variable AOUT001 as the connection source 'From'.

(c) Execute the simulation operation for a value of variable.

The top screenshot shows a ladder logic diagram for a PID controller (TIC001) in Monitor Mode. It features two variable input blocks: VAR_01 (set to 50.0) and VAR_02 (set to 50.0). A box labeled 'Simulation operation' has arrows pointing to both variable blocks. Below this, a text box provides instructions: '1) Set variable VAR_01 as the connection destination 'To'. 2) Set variable VAR_02 as the connection source 'From'.'

The bottom screenshot shows the 'I/O Simulation Setting (Monitor Mode)' dialog box. It includes a table with the following data:

No.	Execution	Simulation Type	To Variable Name	Program/FB Hierarchy	Current Value	From Variable Name	Program/FB Hierarchy	Current Value	Comment
1	<input checked="" type="checkbox"/>	LAG_DED	VAR_01	PROGRAM1	0.0	VAR_02	PROGRAM1	0.0	
2	<input type="checkbox"/>								
3	<input type="checkbox"/>								
4	<input type="checkbox"/>								

POINT
 When executing I/O simulation, do not change the value of variable to be set on the connection destination.
 Otherwise the simulation operation is not executed properly.

15.2.3 Executing I/O simulation



PURPOSE

To execute I/O simulation with setting on the I/O simulation setting window.



BASIC OPERATION

1. Display the I/O simulation setting window. (☞ Section 15.2.1)
2. Set the simulation operation. (☞ Section 15.2.2)
3. Click the Start button.

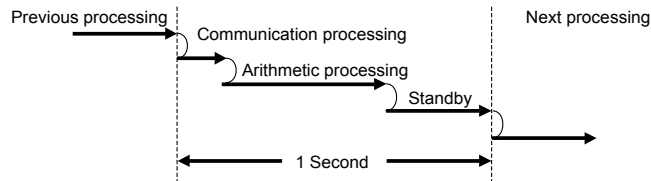
The settings of execution target cannot be changed on the I/O simulation setting window but on the FB property window (☞ Section 5.7.4) during execution of I/O simulation.

ON/OFF of "Execution" check box can be switched during execution of I/O simulation.

The operation processing (such as dead time) is initialized when the check box is unchecked during execution.

POINT

- The I/O simulation processing (reading from connection source to write to connection destination) is executed one-second cycle.



- The I/O simulation can be started when all the following conditions are satisfied.
 - The mode is in the monitor mode. (The I/O simulation setting window cannot be opened in the edit mode.)
 - During offline debugging (during Simulator operation)
- The following are output when starting the I/O simulation.

Item	Simulation type	Initial output value
Direct	DIRECT	Initial input value
	REVERSE	Reversed initial input value
First order lag + dead time	LAG_DED	Initial input value (until dead time has elapsed)
	LAG_DED_REV	Reversed initial input value (until dead time has elapsed)

15.2.4 Stopping I/O simulation



PURPOSE

To stop I/O simulation processing during execution.



BASIC OPERATION

Stop the I/O simulation processing with either of the following operations.

- Click the Stop button on the I/O simulation setting window.
- Stop Simulation. (☞ Section 15.1.2)
- Switch from Monitor mode to edit mode. (☞ Section 13.1.3)

POINT

When either of the following operations is executed in the edit mode, a setting error will occur in a variable of connection source/connection destination being set.

- Execute the compile after changing a variable name set as the connection source/connection destination.
- Execute the compile after deleting a variable set as the connection source/connection destination.

In this case, display the I/O simulation setting window again to change the check box status and the status of project file as shown below.

	Execution target is checked.		Execution target is unchecked.	
	Assignment information of variable exists.	Assignment information of variable does not exist.	Assignment information of variable exists.	Assignment information of variable does not exist.
Checked status	Retained	Unchecked + Invalid	Retained	Invalid
Status of project file	Retained	Unsaved	Retained	Retained

15.2.5 Restrictions when debugging programs using I/O simulation function

 **CAUTION**

- The I/O simulation function simulates the input/output of analog signals on the computer, therefore, the operations may differ from that of input/output device and control device.

POINT

After debugging programs using the I/O simulation function, those programs must be debugged online before operating them actually on the input/output device and control device.

16 PRINT

PX Developer programming tool can be used to print the project contents list, project parameters, global parts and program/FB definition, etc.

This chapter explains setting methods and operating methods for print functions of the programming tool.

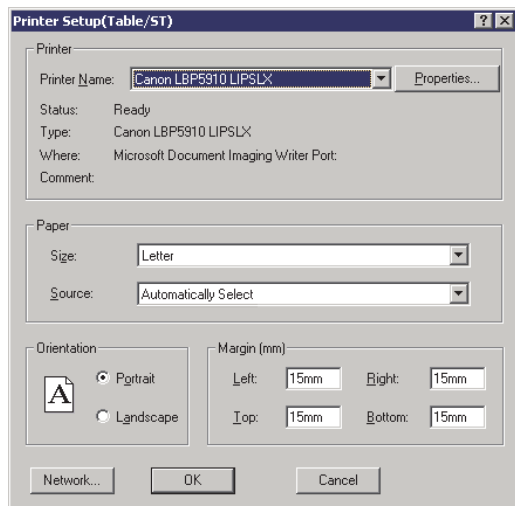
16.1 Print Setting of Table/FBD Sheet

**PURPOSE**

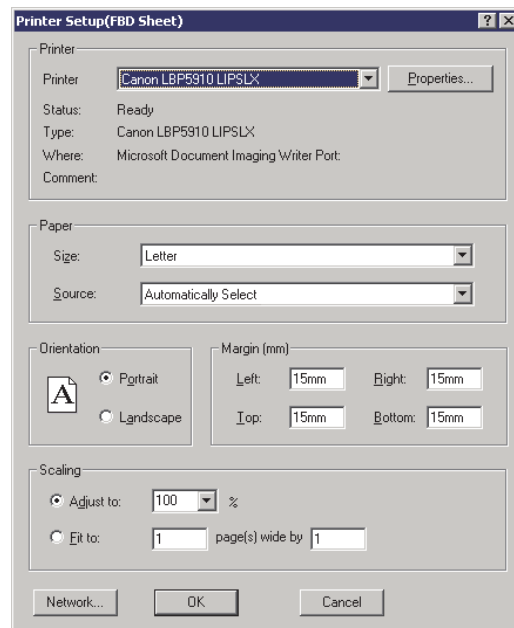
To setup the printer selection, paper size, print orientation, and scaling for printing. Two printer settings can be used separately in programming tool, one is used for tables print such as print global variable declaration window, and the other is used for FBD sheet print.

**BASIC OPERATION**

1. Click [Project] → [Print Setup (Table/ST)] in the menu when executing the print setup (table). Or click the "Printer Setup (Table/ST)" button in the "Print" dialog box displayed by clicking [Project] → [Print] in the menu (Section 16.2). Click [Project] → [Print Setup (FBD Sheet)] when executing the print setup (FBD Sheet). Or click the "Print Setup (FBD Sheet)" button in the "Print" dialog box displayed by clicking [Project] → [Print] in the menu.
2. The "Printer Setting" dialog box is displayed.
3. Execute the printer setting.
4. Click the "OK" button.

**DISPLAY/SETTING SCREEN**

(On the occasion of printer setup (table/ST))



(On the occasion of printer setup (FBD sheet))



DISPLAY/SETTING DATA

Item	Description
Printer	[Printer Name] To select the printer for printing. ["Properties..." button] To execute the setting for the selected printer by printer name. *1
Paper	[Size] To select the paper size. [Source] To select the paper source for printer.
Orientation	To select the print orientation (vertical, horizontal).
Margin	To set the print paper margin with mm as a unit.
Scaling	Specify whether to zoom in or zoom out the project at printing with either of the following items. <ul style="list-style-type: none"> • Setting scaling rate • Specifying the number of pages (the number of width × length) *2

*1: The property setting for a printer varies with the different printer manufacturers and different printer types. Refer to Printer Operating Manual in use for details about setting.

*2: The project is printed within the specified number of pages.

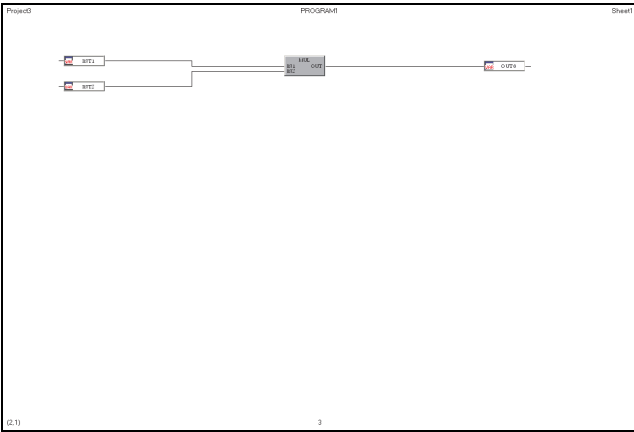
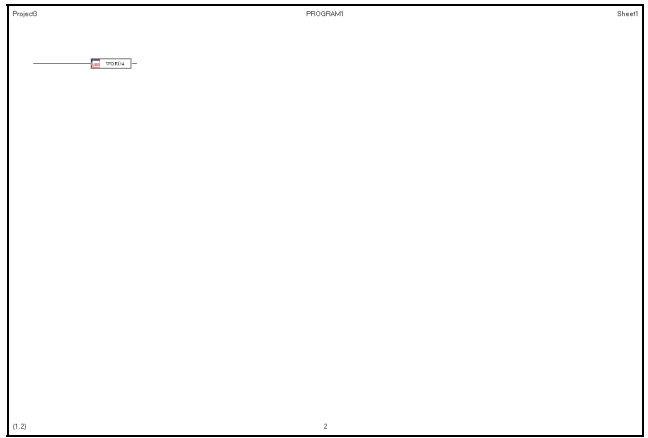
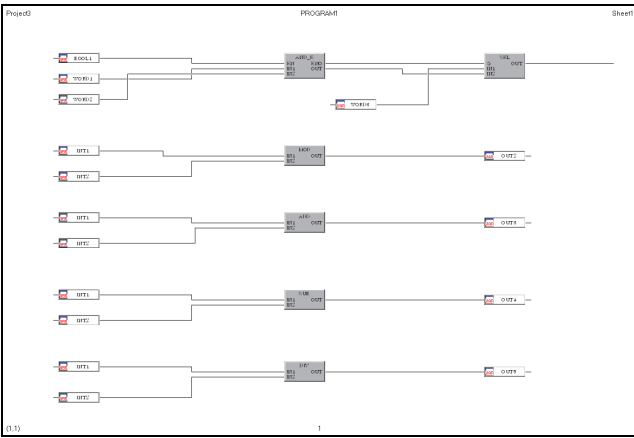
If a project to be printed falls into the specified number of pages, it is not enlarged but printed at the scaling rate of 100 %.

Unnecessary blank pages are not printed.

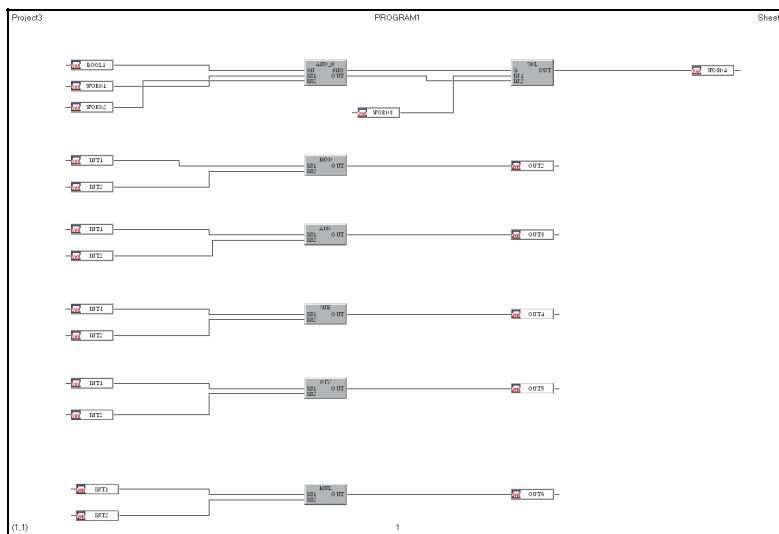
POINT

- The printer setting is saved by each project as a unit.

(Print example of FBD sheet)
Printing a diagram drawn across 3 pages within 1page



Specifying 1 for both width and length



16.2 "Print" Dialog Box



PURPOSE

Print with programming tool is executed through "Print" dialog box.
This section explains how to display "Print" dialog box, as well as its functions.

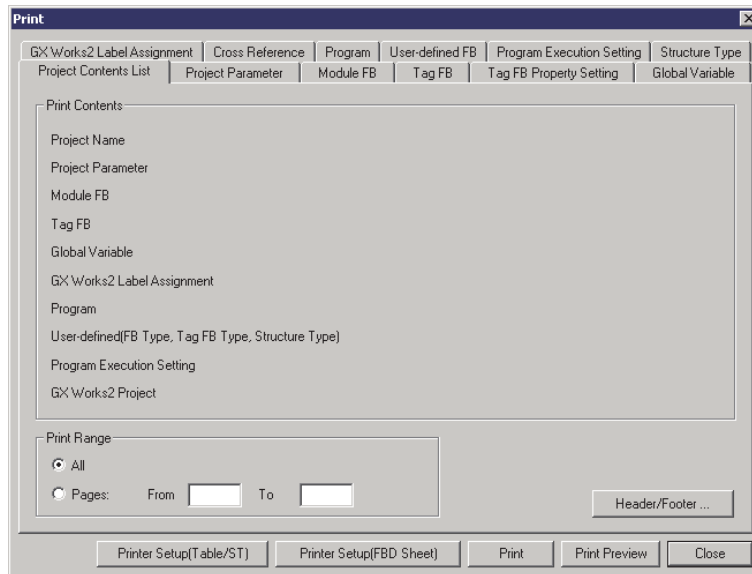
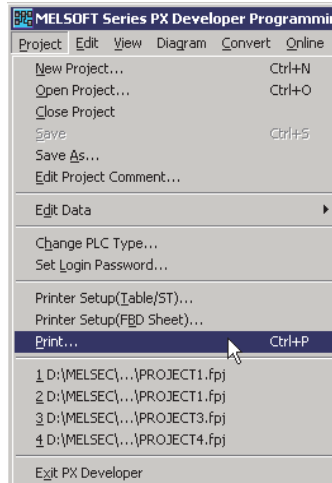


BASIC OPERATION

1. Click [Project] → [Print] in the menu.
2. The "Print" dialog box is displayed.



DISPLAY/SETTING SCREEN





DISPLAY/SETTING DATA

Item	Description
"Printer Setup (Table/ST)" button	To display the "Print Setup (Table/ST)" dialog box. (☞ Section 16.1)
"Printer Setup (FBD Sheet)" button	To display the "Print Setup (FBD Sheet)" dialog box. (☞ Section 16.1)
"Print" button	To execute the printing. (☞ Section 16.5)
"Print Preview" button	To display the print preview. (☞ Section 16.4)
Print Range	Set the print preview range or the range to be printed. Select "All" or "Pages".
"Header/Footer..." button	To display the "Header /Footer Setting" dialog box. (☞ Section 16.3)
"Close" button	To close the "Print" dialog box.
<<Project Contents List>> tab	To select when printing the Project Contents List. (☞ Section 16.5.1)
<<Project Parameter>> tab	To select when printing the Project Parameter List. (☞ Section 16.5.2)
<<Module FB>> tab	To select when printing the Module FB List. (☞ Section 16.5.3 (1))
<<Tag FB>> tab	To select when printing the Tag FB List. (☞ Section 16.5.3 (1))
<<Tag FB Property Setting>> tab	To select when printing the Tag FB Property (Public Variable of Tag FB) List. (☞ Section 16.5.3 (2))
<<Global Variable>> tab	To select when printing the Global Variable List. (☞ Section 16.5.3 (1))
<<GX Works2 Label Assignment >> tab*1	To select when printing the GX Label Assignment List. (☞ Section 16.5.3 (1))
<<Cross Reference>> tab	To select when printing the data displayed in the cross reference window. (☞ Section 16.5.7)
<<Program>> tab	To select when printing the FBD sheet in program definition window or the Local Variable List in use. (☞ Section 16.5.5)
<<User-defined FB>> tab	To select when printing the FBD sheet in FB definition window or the Local Variable List in use. (☞ Section 16.5.5)
<<Program Execution Setting>> tab	To select when printing the Program Execution Setting and Program Execution Timing. (☞ Section 16.5.4)
<<Structure type>> tab	To select when printing the defined Structure Type List. (☞ Section 16.5.6)

*1: When GX project type is GX Developer project, <<GX Developer Label Assignment>> tab is displayed.

16.3 Header and Footer Setting



PURPOSE

To set the paper titles and paper numbers for printing.

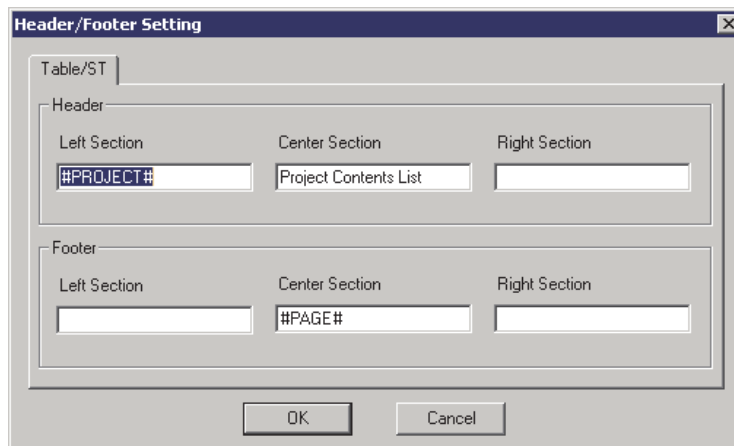
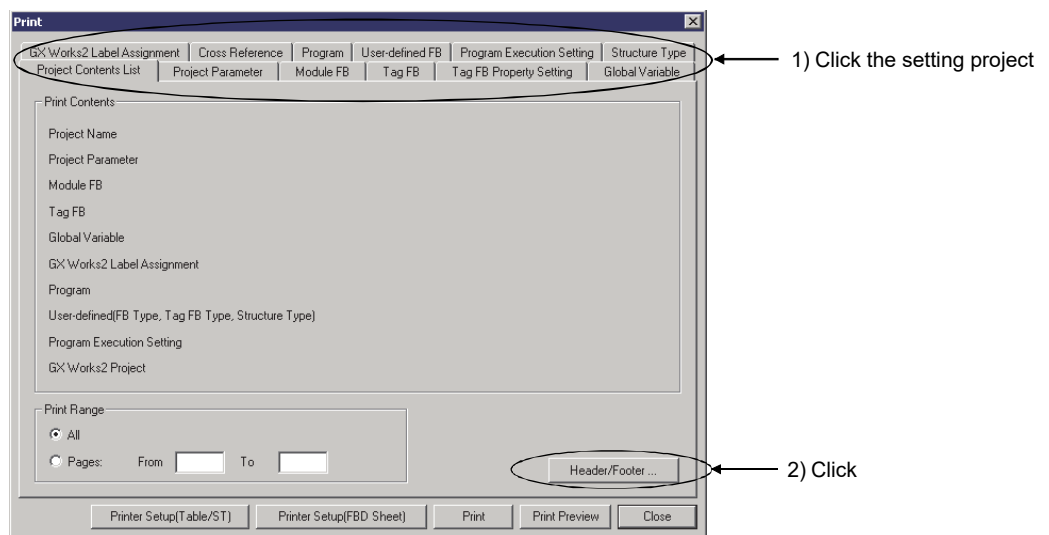


BASIC OPERATION

1. Refer to Section 16.2 to display the "Print" dialog box.
2. Click the project tab for header/footer setting.
3. Click the "Header/Footer" button.
4. The "Header/Footer" dialog box is displayed.
Select the <<Table/ST>> or <<FBD Sheet>> tab when the <<Program>> or <<User-defined FB>> tab has been selected in Step 2.
5. Execute the header/footer setting.
6. Click the "OK" button.



DISPLAY/SETTING SCREEN





DISPLAY/SETTING DATA

- (1) The following form summarizes the character patterns that can be used for inputting in setting header/footer.

If a random character string is input to each textbox, printing can be executed in the status of placing the input string at the header/footer of the page.

Besides, if the following character patterns are input, the page number and date can be easily set.

Input character patterns	Functions/print description	Settable items in "Print" dialog box
#YYYY#	Year (4 digits AD)	All items can be set
#YY#	Year (first 2 digits of AD)	All items can be set
#MM#	Month	All items can be set
#DD#	Date	All items can be set
#PROJECT#	Project name	All items can be set
#PROJECT_COMMENT#	Project comment	All items can be set
#TAG#	Tag FB variable name	Tag FB property setting
#TAG_TYPE#	Tag type	User-defined FB/tag FB property setting
#TAG_COMMENT#	Comment of tag FB	Tag FB property setting
#PROGRAM#	Program name	Program
#PROGRAM_COMMENT#	Comment of program	Program
#FB#	User-defined FB/tag FB type name	User-defined FB
#FB_COMMENT#	Comment of user-defined FB/tag FB	User-defined FB
#SHEET#	FBD sheet name	FBD sheet in program/user-defined FB
#SHEET_PAGE#	FBD sheet page No. (when one FBD sheet is arranged with multiple-page FBD parts)	FBD sheet in program/user-defined FB
#PAGE#	Print page No.	All items can be set
#STRUCT#	Structure type name	Structure type
#STRUCT_COMMENT#	Comment of structure type	Structure type

*: Please input all the character patterns mentioned above with capital characters.

Input examples of the character pattern and the display examples corresponding to these are shown as below.

(Input examples of the character pattern)

(Actual print examples)

#MM##DD##YYYY#

→ 01/01/2002

Year #YYYY#.Month #MM#.Day #DD#

→ Year 2002, Month 01, Day01

[Page - #PAGE#]

→ (Page-1)

(2) Initial values of header/footer setting in each print dialog box

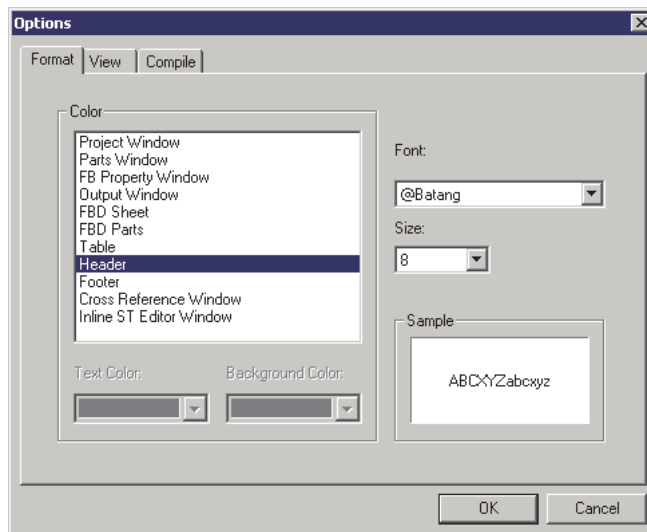
The following table indicates the initial values of the header/footer setting in each print dialog box.

Item	Header			Footer		
	Left Section	Center Section	Right Section	Left Section	Center Section	Right Section
Project contents list	#PROJECT#	Project contents list	—	—	#PAGE#	—
Project parameter	#PROJECT#	Project parameter	—	—	#PAGE#	—
Module FB	#PROJECT#	Module FB	—	—	#PAGE#	—
Tag FB	#PROJECT#	Tag FB	—	—	#PAGE#	—
Tag FB property setting	#PROJECT#	#TAG#	#TAG_TYPE#	—	#PAGE#	—
Global variable	#PROJECT#	Global variable	—	—	#PAGE#	—
GX label assignment	#PROJECT#	GX Works2 label assignment*1	—	—	#PAGE#	—
Cross reference	#PROJECT#	Cross reference	—	—	#PAGE#	—
Program (table)	#PROJECT#	# PROGRAM#	—	—	#PAGE#	—
Program (FBD sheet)	#PROJECT#	# PROGRAM#	#SHEET#	#SHEET_PAGE#	#PAGE#	—
User-defined FB (Table)	#PROJECT#	#FB#	—	—	#PAGE#	—
User-defined FB (FBD sheet)	#PROJECT#	#FB #	#SHEET#	#SHEET_PAGE#	#PAGE#	—
Program execution setting	#PROJECT#	Program execution setting	—	—	#PAGE#	—
Structure type	#PROJECT#	#STRUCT#	—	—	#PAGE#	—

*1: When GX project type is GX Developer project, "GX Developer label assignment" is displayed.

POINT

- There is no limit to the character numbers that can be set in header/footer. However, if the set character string is too long and it cascade with character strings of the header/footer set in other places, printing will be executed in this characters-cascade status.
- Font of the header/footer can be changed through [Tool] → [Options] in the menu. (☞ Section 5.11 (1))



16.4 Print Preview



PURPOSE

To preview the print before printing.

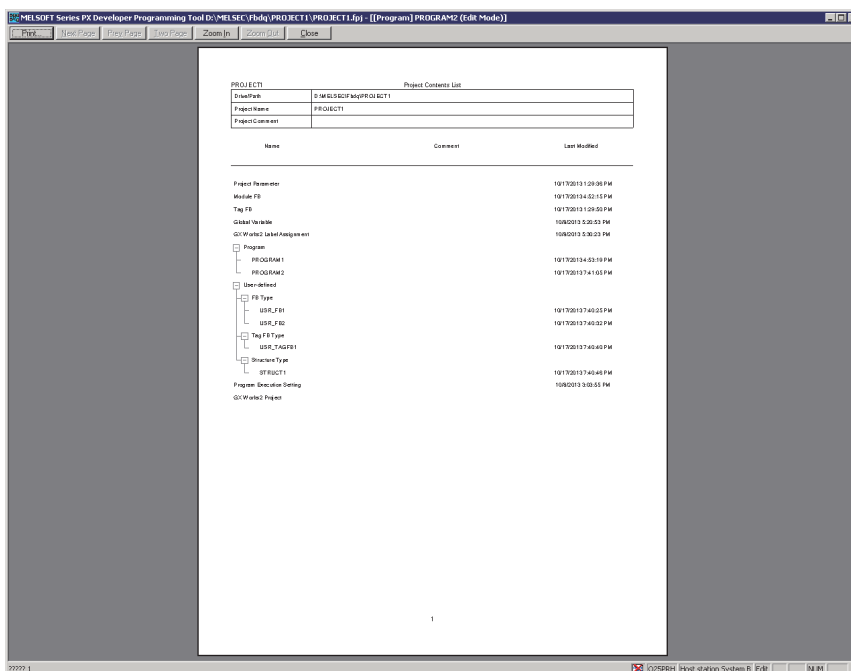
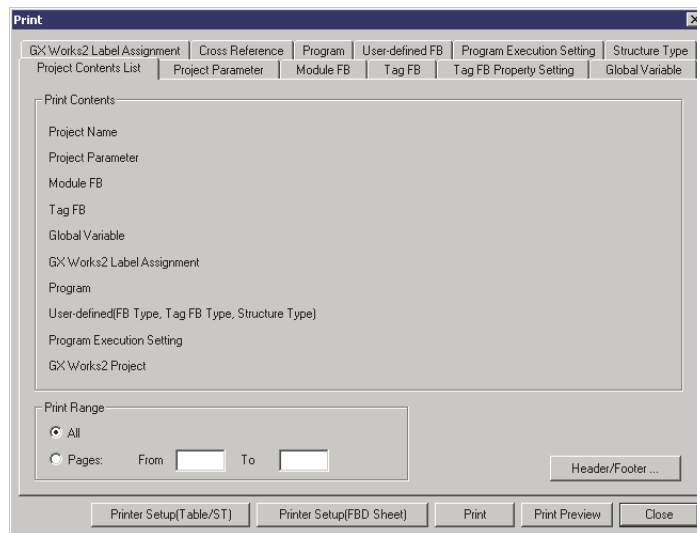


BASIC OPERATION

1. Refer to Section 16.2 to display the "Print" dialog box.
2. Click the tab of print preview item.
3. Specify the print range. (Can be specified with the starting and last pages.)
4. Click the "Print Preview" button.
5. The print preview window is displayed.



DISPLAY/SETTING SCREEN







DISPLAY/SETTING DATA

Item	Description
"Print" button	To execute the printing for data displayed in the print preview window.
"Next Page" button	To display the preview window of the next page.
"Prev Page" button	To display the preview window of the previous page.
"Two Page" button ("1 Page" button in the status of 2 pages display)	To execute the switching of 1 page/2 pages view.
"Zoom In" button	To zoom in the print preview.
"Zoom Out" button	To zoom out the print preview.
"Close" button	To close the print preview window. *1

*1: The print preview window can also be closed by pressing the button "×" or "Esc" key.

POINT

In the print preview window, the display will be zoomed in by clicking the mouse in the  status.

The view will be standard display by clicking the mouse in the  status.

16.5 Print Start

To print the program/FB definition, declaration contents of global parts (global variable, tag FB, module FB), etc.

16.5.1 Printing project contents list



PURPOSE

To print the drive path of a project, project name, project comment, project contents list (project parameter, module FB, etc.), last modified date and time.

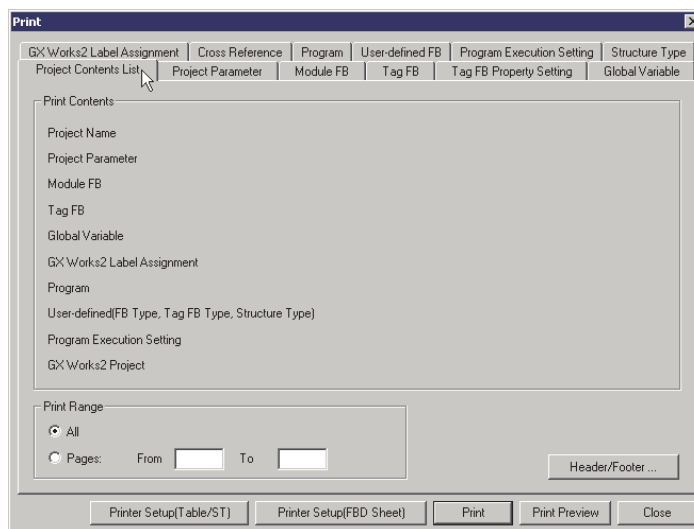


BASIC OPERATION

1. Refer to Section 16.2 to display the "Print" dialog box.
2. Click the <<Project Contents List>> tab.
3. Print contents and print range are displayed. (Can be specified with the starting and last pages.)
4. Click the "Print" button.



DISPLAY/SETTING SCREEN



(Print Example)

PROJECT1 Project Contents List		
Drive/Path	D:\MELSEC\Fb\dq\PROJECT1	
Project Name	PROJECT1	
Project Comment		
Name	Comment	Last Modified
Project Parameter		10/8/2013 1:40:56 PM
Module FB		10/8/2013 1:40:56 PM
Tag FB		10/8/2013 12:11:02 PM
Global Variable		10/8/2013 12:12:02 PM
GX Works2 Label Assignment		10/8/2013 12:26:28 PM
Program		
PROGRAM1		10/8/2013 12:08:53 PM
PROGRAM2		10/8/2013 4:41:37 PM
User-defined		
FB Type		
USR_FB1		10/8/2013 4:42:04 PM
USR_FB2		10/8/2013 4:42:11 PM
Tag FB Type		
USR_TAGFB1		10/8/2013 4:42:21 PM
Structure Type		
STRUCT1		10/8/2013 4:42:28 PM
Program Execution Setting		10/8/2013 3:03:55 PM
GX Works2 Project		

POINT

If labels are not used in the GX project contained in the PX Developer project, "GX Works2 Label Assignment/GX Developer Label Assignment" will not be printed. ("GX Works2 Label Assignment/GX Developer Label Assignment" displayed on the Print dialog box is invalidated and not printed.)

16.5.2 Printing project parameters



PURPOSE

To print the setting contents list of project parameter (see Section 6.14).

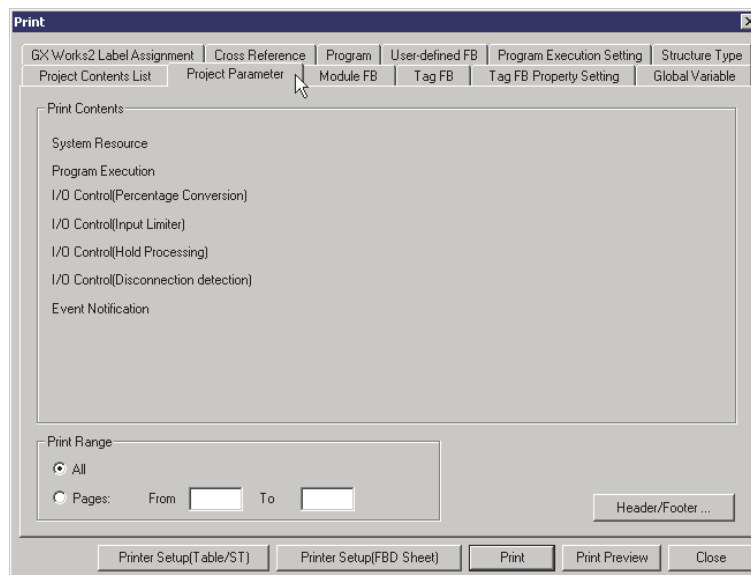


BASIC OPERATION

1. Refer to Section 16.2 to display the "Print" dialog box.
2. Click the <<Project Parameter >> tab.
3. Print contents and print range are displayed. (Can be specified with the starting and last pages.)
4. Click the "Print" button.



DISPLAY/SETTING SCREEN



(Print Example)

PROJECT1 Project Parameter		
System Resource		
File register (ZR)	Start	0
	No. of Points	32768
	End	32767
Timer (T)	Start	0
	No. of Points	64
	End	63
Common pointer (P)	Start	3500
	No. of Points	596
	End	4095
Internal relay (I-M)	Start	0
	No. of Points	400
	End	399
Index register (Z)	Start	0
	No. of Points	7
	End	6
Program Execution		
Low-speed	Interval	4000 ms
Normal-speed	Interval	1000 ms
High-speed	Interval	200 ms
I/O Control (Percentage Conversion)		
The digital value is treated as percentage (X)		No
I/O Control (Input Limiter)		
Execute the input limiter processing of P_IN		Yes
I/O Control (Hold Processing)		
Hold Output of P_IN		Yes
Hold Output of P_OUT1, P_OUT2 and P_DUTY		Yes
I/O Control (Disconnection detection)		
Change the control mode to MANUAL		No
Event Notification		
via CC-Link IE Controller Network	Module Head I/O Address	40
<div style="border: 1px solid black; padding: 2px; display: inline-block;"> When "Group No." is selected, this display changes from Station No. to Group No. </div>	Network No.	1
	Station No.	1
	Channel No.	8

<When the event notification of project parameter setting is selected as "Event Notification via CC-Link IE Controller Network or MELSECNET/10(H)">

16.5.3 Printing global parts/GX label assignment/Tag FB property setting

- (1) Print declaration list of module FB, tag FB, global variable, GX label assignment

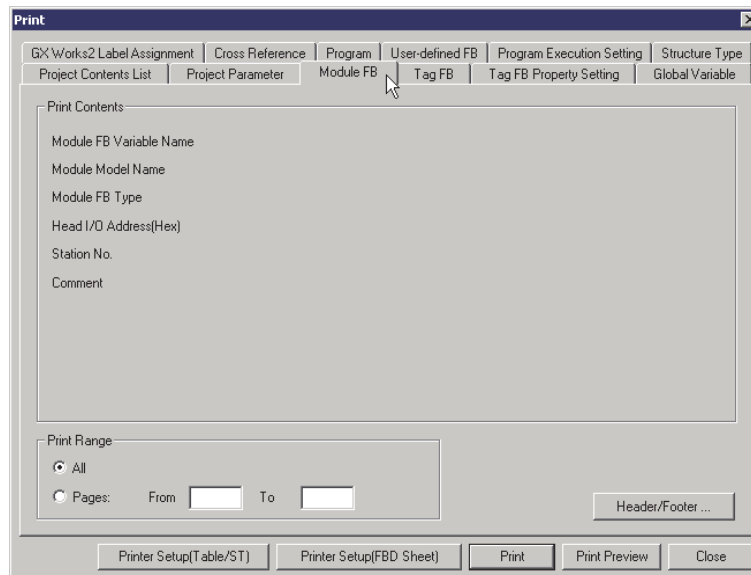
**PURPOSE**

To print declaration list of global parts (module FB, tag FB and global variable) and GX label assignment.

Note that if labels are not used in the GX project contained in the PX Developer project, the tabs are not displayed and those data are not printed since "GX Works2 Label Assignment"/"GX Developer Label Assignment" cannot be used.






**BASIC OPERATION**

1. Refer to Section 16.2 to display the "Print" dialog box.
2. Click project tabs in declaration list of global parts or GX label assignment (one of <<Module FB>> tab, <<Tag FB>> tab, <<Global Variable>> tab, <<GX Works2 Label Assignment>> tab, and <<GX Developer Label Assignment>> tab) that need to be printed.
3. Print contents and print range are displayed. (Can be specified with the starting and last pages.)
4. Click the "Print" button.

**DISPLAY/SETTING SCREEN**

(When the <<module FB>> tab is selected)

(Print Example)

Sample01		Module FB				
No.	Module FB Variable Name	Module Model Name	Module FB Type	Head I/O Address (Hex)	Station No.	Comment
1	 AI001	Q62AD-DGH	AIN_2GH_DG	0000		
2	 CCLink1	QJ61BT11		0020		
3	 Remote1	CC-Link Remote 1-static	CCLINK_1		1	
4	 Remote2	CC-Link Remote 2-static	CCLINK_2		2	
5	 Remote3	CC-Link Remote 1-static	CCLINK_1		3	

POINT

Even though Sort has been performed in the Global Variable Declaration window, the list is printed in ascending order of No.

(2) Tag FB property (public variable of tag FB) List Printing



PURPOSE

To print public variable list in tag FB.

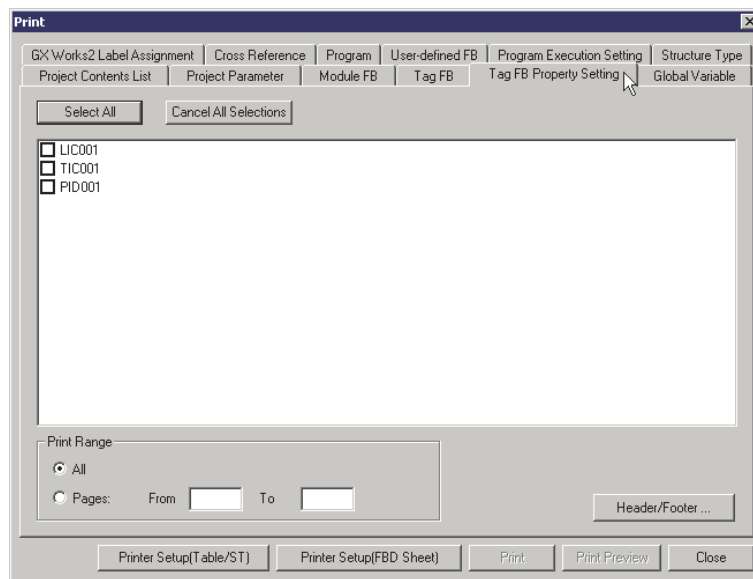


BASIC OPERATION

1. Refer to Section 16.2 to display the "Print" dialog box.
2. Click the <<Tag FB Property Setting>> tab.
3. The print range and list of the tag FB declared on the Tag FB Declaration screen (Section 8.4.1) is displayed. (Can be specified with the starting and last pages.)
4. Select Tag FB variable name to be printed. Click the check box at the left side of tag FB variable name to mark it with .
5. Click the "Print" button.



DISPLAY/SETTING SCREEN



DISPLAY/SETTING DATA

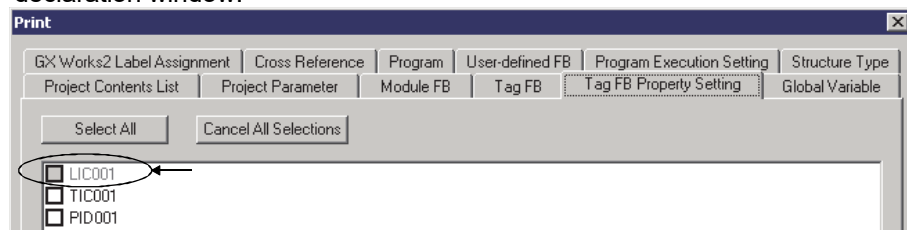
Item	Display/Setting data
"Select All" button	Select all currently displayed tag FB variable names.
"Cancel All Selections" button	Cancel the selection of all tag FB variable names currently displayed.

(Print Example)

Tag FB property setting		
Sample01	PIC001	2PIDType
Item	Setting Value	Comment
IN_NMAX	100.0	Input High Limit
IN_NMIN	0.0	Input Low Limit
IN_HH	102.0	High Limit Range Error
IN_H	100.0	High Limit Range Error Reset
IN_L	0.0	Low Limit Range Error Reset
IN_LL	-2.0	Low Limit Range Error
PID2_MTD	8.0	Derivative Gain
PID2_DVLS	2.0	Large Deviation Alarm Hysteresis
PID2_PN	0	Reverse Action/Direct Action
PID2_SVPTN_B0	TRUE	Setting Value Used
OUT1_NMAX	100.0	Output Conversion High Limit
OUT1_NMIN	0.0	Output Conversion Low Limit
MANI	FALSE	Disable Mode Change: Disable MANUAL
AUTI	FALSE	Disable Mode Change: Disable AUTO
CASI	FALSE	Disable Mode Change: Disable CASCADE
CMVI	TRUE	Disable Mode Change: Disable COMPUTER MV
CSVI	TRUE	Disable Mode Change: Disable COMPUTER SV
ATI	FALSE	Disable Mode Change: Disable Auto Tuning
OVRI	FALSE	Disable Mode Change: Disable OVERRIDE
SIMI	FALSE	Disable Mode Change: Disable SIMULATION
MLI	FALSE	Disable Output Low Limit Alarm
MHI	FALSE	Disable Output High Limit Alarm
DVLI	FALSE	Disable Large Deviation Alarm
DPNI	FALSE	Disable Negative Variation Rate Alarm
DPPI	FALSE	Disable Positive Variation Rate Alarm
PLI	FALSE	Disable Input Low Limit Alarm
PHI	FALSE	Disable Input High Limit Alarm
LLI	FALSE	Disable Input Low Low Limit Alarm
HHI	FALSE	Disable Input High High Limit Alarm

POINT

- Printing one tag per page is set as tag FB property.
- If the item setting of tag FB type in tag FB declaration window (Section 8.4.1) is not correct, the check box at the left side of tag FB variable name cannot be selected. In this case, please current FB type setting in tag FB declaration window.



16.5.4 Printing program execution settings



PURPOSE

To print program execution setting list in "Program Execution Setting" dialog box (see Section 7.13.3).

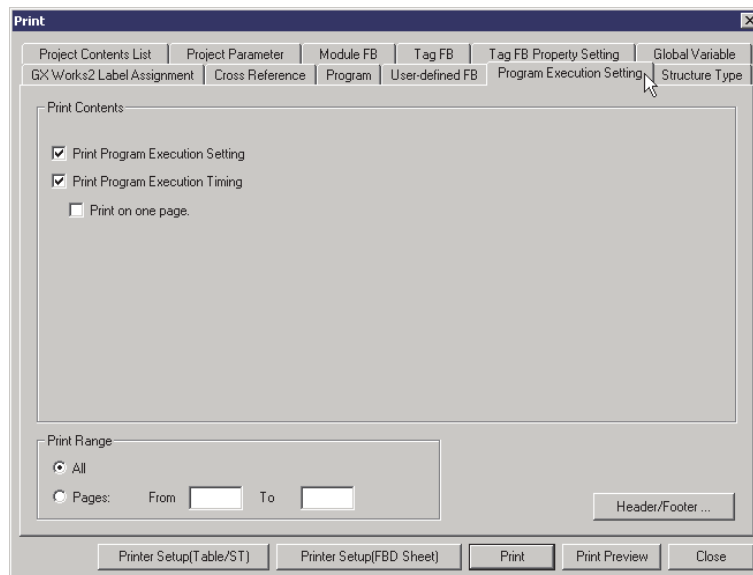


BASIC OPERATION

1. Refer to Section 16.2 to display the "Print" dialog box.
2. Click the <<Program Execution Setting>> tab.
3. Print contents and print range are displayed. (Can be specified with the starting and last pages.)
4. Click the check box at the left side of the item to be printed and mark it with .
5. Click the "Print" button.



DISPLAY/SETTING SCREEN



DISPLAY/SETTING DATA

Item	Description
Print program execution setting	Mark the check box at the left side when printing program execution setting.
Print program execution timing	Mark the check box at the left side when printing program execution timing.
Print on one page	The program execution timing can be printed on one page after being zoomed out. This item can be selected when the "Print Program Execution Timing" check box is selected.

(Print Example)

Sample01		Program Execution Setting		
Program Name	PROGRAM1			
Execution State	Execute conditionally			
Execution Type	Interrupt Pointer Execution			
Interrupt Pointer No.	I0			
Execution Condition	Left Side	Operator	Right Side	
Condition 1	LIC001.PVN	>	10	
Condition 2	AI01	>	0	
Condition 3				
Condition 4				
Condition 5				
Condition 6				
Condition 7				
Condition 8				
Execution Condition Combination	OR condition ->			
Condition 1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Condition 2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Condition 3	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Condition 4	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Condition 5	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Condition 6	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Condition 7	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Condition 8	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

In case of interrupt pointer execution type program (Execute or Execute Conditionally)

The width (number) is the least common multiple of Normal-speed and Low-speed cycle n.

Sample01

program execution setting

Program Name	Priority	Phase	Type	1	2	3	4	5	6	7
PROGRAM1			Interrupt Pointer Execution	->	->	->	->	->	->	->
PROGRAM2	30		Scan	->					->	
PROGRAM4	13	1	Normal Speed	*					*	
PROGRAM5	16	1	Normal Speed	*					*	
PROGRAM3	2	3	Low-speed			*				
Total				2	0	1	0	0	2	0

POINT

The printing order is the same as the order of program displayed on Program Execution Timing window (Section 7.13.2).

16.5.5 Printing programs/User-defined FBs



PURPOSE

To print program or the execution condition setting of FBD sheet, local variable sheet, inline ST, and FBD sheet FB definition window.



BASIC OPERATION

1. Refer to Section 16.2 to display the "Print" dialog box.
2. Click the <<Program>> tab or <<User-defined FB>> tab.
3. Select from a list box of print target (table, FBD sheet, or inline ST).
4. Select the print item. Click the check box at the left side of the item name to mark it with .
5. Specify the print range. (Can be specified with the starting and last pages.)
6. Click the "Print" button.



DISPLAY/SETTING SCREEN

(When <<Program>> tab clicked)



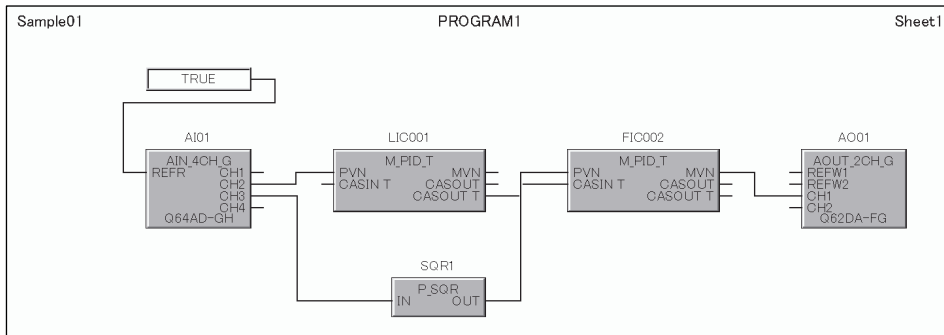
DISPLAY/SETTING DATA

Item	Display/Setting data
"Select All" button	Select all currently displayed programs.
"Cancel All Selections" button	Cancel the selection of all programs currently displayed.

(Print example)

Variable Name	Variable Type	Data Type	Comment
VAR1	Internal Variable	REAL	
BOOL_VAR	Internal Variable	BOOL	
FB1	Internal Variable	USR_FB1	
STRING_VAR	Internal Variable	STRING(20)	
FIC001	External Variable	M_PID_T	
LIC001	External Variable	M_PID	

Sheet (Local Variable Sheet)



FBD sheet

```

Sample01          PROGRAM1

*****
Inline ST Part : TemperatureCorrection
No. of Inputs : 2
No. of Outputs : 1
-----
(* Temperature correction *)
$Q1 = LIMIT (-50.0, ($I1 - $I2) / 10.0, 50.0) ;
    
```

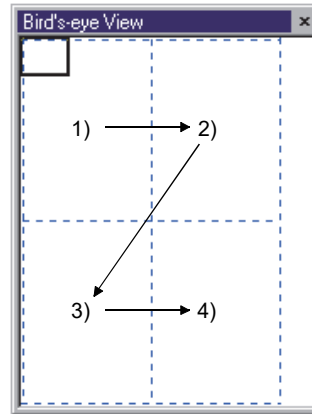
Inline ST

Sheet Name	Sheet1							
Execution State	Execute conditionally							
Execution Condition	Left Side	Operator	Right Side					
Condition1	LIC001.PVN	>	10					
Condition2	AI01	>	0					
Condition3								
Condition4								
Condition5								
Condition6								
Condition7								
Condition8								
Execution Condition Combination	OR condition ->							
Condition1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Condition2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Condition3	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Condition4	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Condition5	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Condition6	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Condition7	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Condition8	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

FBD sheet execution condition setting

POINT

- When the print setup of FBD sheet is executed (☞ Section 16.1), one-page-size print area in dotted blue lines will display on the bird's-eye view window. If the set FBD parts cannot be loaded within one page, multiple pages will be printed in the following order: from left to right, up to down.



Bird's-eye view window

- Display contents on the local variable sheet may differ depending on the selecting status of "Comment Reference" check box (☞ Section 5.11 (2)).
- Check the page number of print area on the initial display of the print preview window when checking with print preview.

16.5.6 Printing structure type



PURPOSE

To print list of structure members, data types and comments defined in structure type definition window (Section 9.1).

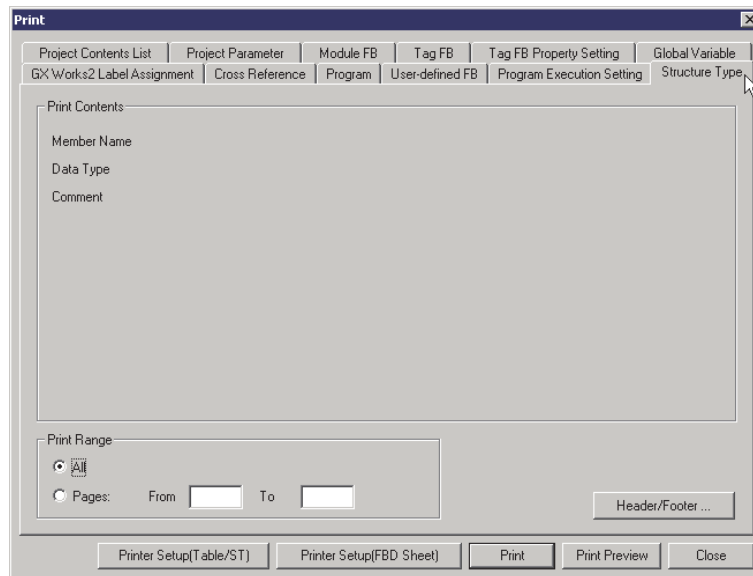


BASIC OPERATION

1. Refer to Section 16.2 to display the "Print" dialog box.
2. Click the <<Structure Type>> tab.
3. Print contents and print range are displayed. (Can be specified with the starting and last pages.)
4. Click the "Print" button.



DISPLAY/SETTING SCREEN



(Print example)

Sample01		STRUCT01	
No.	Member Name	Data Type	Comment
1	STATE1	INT	
2	STATE2	REAL	
3	STATE3	STRING[20]	

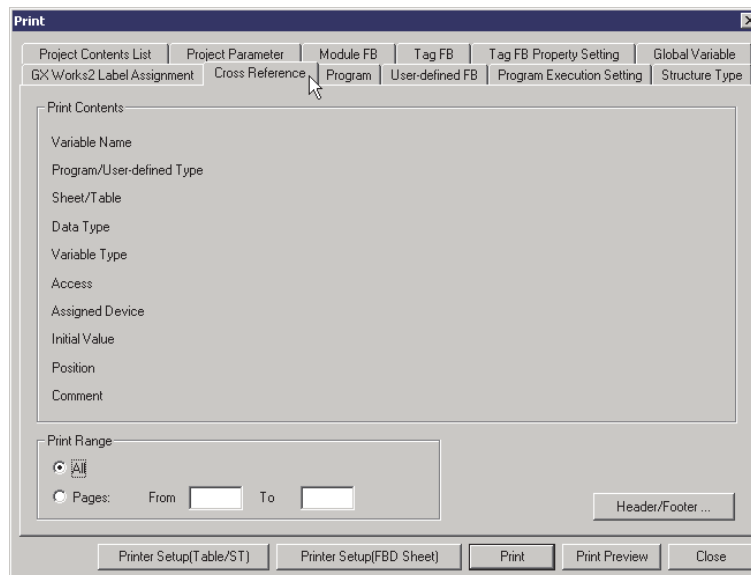
16.5.7 Printing cross reference

**PURPOSE**

To print the data displayed in the cross reference window.

**BASIC OPERATION**

1. Refer to Section 16.2 to display the "Print" dialog box.
2. Click the <<Cross Reference>> tab.
3. Print contents and print range are displayed. (Can be specified with the starting and last pages.)
4. Click the "Print" button.

**DISPLAY/SETTING SCREEN****POINT**

- If the cross reference information is not built in advance, the cross reference will not be printed. Build the information by reference to Section 10.1.2, and then print the cross reference.
- In cross reference printing, the data displayed in the cross reference window are printed as they are.
When the data are displayed using the filter display function, the data displayed under the edited filter condition are printed.
- The filter condition of the cross reference window is not printed.
- While the filter condition is being edited, the cross reference cannot be printed.
Print the cross reference after closing the filter condition editing screen.

(Print example)

Sample01		Cross Reference							
Variable Name	Program/User-defined Type	Sheet/Table	Data Type	Variable Type	Access	Assigned Device	Initial Value	Position	Comment
A1D1	PROGRAM1	(Local Variable)	AIN_4CH_G	External Variable				1	
A1D1	PROGRAM1	Sheet1	AIN_4CH_G	External Variable	FB Call			(100, 80)	
A1D1		(Module FB)	AIN_4CH_G					1	
AOUT001		(Module FB)	AOUT_4CH					2	
AOUT001	PROGRAM1	(Local Variable)	AOUT_4CH	External Variable				2	
AOUT001	PROGRAM1	Sheet1	AOUT_4CH	External Variable	FB Call			(270, 50)	
BOOL_VAR	PROGRAM1	Sheet1	BOOL	Internal Variable				(180, 20)	
BOOL_VAR	PROGRAM1	(Local Variable)	BOOL	Internal Variable				2	
FB1	PROGRAM1	Sheet1	USR_FB1	Internal Variable				(60, 180)	
FB1	PROGRAM1	(Local Variable)	USR_FB1	Internal Variable				3	
F10001	PROGRAM1	(Local Variable)	M_PID_T	External Variable				3	
F10001	PROGRAM1	Sheet1	M_PID_T	External Variable	FB Call			(220, 190)	
F10001		(Tag FB)	M_PID_T			Z83130		2	
F10002		(Tag FB)	M_PID_T			Z83390		4	
L10001	PROGRAM1	(Local Variable)	M_PID	External Variable				4	
L10001		(Tag FB)	M_PID			Z83000		1	
L10001	PROGRAM1	Sheet1	M_PID	External Variable	FB Call			(60, 220)	
P10001		(Tag FB)	M_2PID			Z83200		3	
STRING_VAR	PROGRAM1	Sheet1	STRING(20)	Internal Variable				(260, 280)	
STRING_VAR	PROGRAM1	(Local Variable)	STRING(20)	Internal Variable				4	
VAR1	PROGRAM1	Sheet1	REAL	Internal Variable				(60, 50)	
VAR1	PROGRAM1	(Local Variable)	REAL	Internal Variable				1	

APPENDIX

Appendix 1 Invalid Character Strings in Variable Name

(1) Reserved Words

The following reserved word cannot be used in variable name if they are not sensitive to upper and lower case.

Reserved words list

	Reserved words
A	ACTION, ANY, ANY_BIT, ANY_DATE, ANY_DERIVED, ANY_ELEMENTARY, ANY_INT, ANY-MAGNITUDE, ANY_NUM, ANY_REAL, ANY_SIMPLE, ANY_STRING, ARRAY, AT
B	BOOL, BY, BYTE
C	CASE, CONFIGURATION, CONSTANT
D	DATE, DATE_AND_TIME, DEVICE, DINT, DO, DS, DT, DWORD
E	ELSE, ELSIF, ELSEIF, EN, END_ACTION, END_CASE, END_CONFIGURATION, END_FOR, END_FUNCTION, END_FUNCTION_BLOCK, END_IF, END_PROGRAM, END_REPEAT, END_RESOURCE, END_STEP, END_STRUCTURE, END_TRANSITION, END_TYPE, ENT_VAR, END_WHILE, ENO, EXIT
F	FALSE, F_EDGE, FOR, FROM, FUNCTION, FUNCTION_BLOCK
G	—
H	—
I	IF, INT, INITIAL_STEP
J	—
K	—
L	LINT, LREAL, LWORD
M	—
N	—
O	OF, ON
P	PDD, PROGRAM
Q	—
R	READ_ONLY, READ_WRITE, REAL, R_EDGE, REPEAT, RETAIN, RETURN, RESOURCE
S	SINT, STEP, STRING, STRUCT
T	TASK, THEN, TIME, TIME_OF_DAY, TO, TOD, TRANSITION, TRUE, TYPE
U	UDINT, UINT, ULINT, UNTIL, USINT
V	VAR, VAR_ACCESS, VAR_CONSTANT, VAR_EXT, VAR_EXTERNAL, VAR_EXTERANL_CONSTANT, VAR_DEVICE, VAR_EXTERANAL_FB, VAR_EXTERANL_PG, VAR_GLOBAL, VAR_GLOBAL_CONSTANT, VAR_GLOBAL_FB, VAR_GLOBAL_PG, VAR_IN_OUT, VAR_INPUT, VAR_OUTPUT, VAR_PUBLIC, VAR_TEMP
W	WORD, WHILE, WITH, WSTRING
X	—
Y	—
Z	—

(2) Characters and Symbols That Can Be Used

Characters and symbols that can be used in variable name are as follows.

English alphabets and numbers, underline [_], backslash [\] *1.

*1: Used as a part of a variable name in device variable only. (Example: U□\G□)

(3) Conditions

They cannot be used in the following cases:

- Continual use of underline [_].
- Underline [_] is used at the end of variable name.
- Space between characters is used.
- Numbers (0 to 9) are used in initial character.
- Character string of over 33 characters is used in variable name.
- Constant is used (including [H to] hexadecimal notation).
- Program name, FB type name or function name is used.
- The existing data type is used.

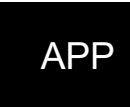
Appendix 2 List of Corresponding Tag Type/Tag Access FB

The following table describes the tag access FBs that can be used in the user-defined tag FB.

Note that the tag types other than mentioned in the table below cannot be used in the user-defined tag FB.

Type	Tag type Tag access FB	Tag type																					
		PID	2PID	2PIDH	PIDP	SPI	IPD	BPI	R	ONF2	ONF3	PFC_SF	PFC_SS	PFC_INT	PGS	PGS2	MOU	MONI	SWM	MWM	SEL	BC	PSUM
I/O control FB	P_IN	○	○	○	○	○	○	○	○	○	○	○	○	○	—	—	—	○	○	○	—	—	—
	P_OUT1	○	○	—	—	○	○	○	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	P_OUT2	—	—	—	—	—	—	—	○	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	P_OUT3	—	—	○	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	P_MOUT	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	○	—	—	○	—	—	—
	P_DUTY	○	○	—	—	○	○	○	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	P_PSUM	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	○	○
	P_BC	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	○	—
	P_MSET_	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	○	—	—	—	—
Loop control operation FB	P_PID(T)	○	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
	P_2PID(T)	—	○	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
	P_2PIDH(T)	—	—	○	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
	P_PIDP(T)	—	—	—	○	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
	P_PIDP_EX(T)	—	—	—	○	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
	P_SPI(T)	—	—	—	—	○	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
	P_IPD(T)	—	—	—	—	—	○	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
	P_BPI(T)	—	—	—	—	—	—	○	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
	P_R(T)	—	—	—	—	—	—	—	○	—	—	—	—	—	—	—	—	—	—	—	—	—	
	P_PHPL	○	○	○	○	○	○	○	○	○	○	○	○	○	○	—	—	○	○	○	—	—	—
	P_ONF2(T)	—	—	—	—	—	—	—	—	○	—	—	—	—	—	—	—	—	—	—	—	—	
	P_ONF3(T)	—	—	—	—	—	—	—	—	—	○	—	—	—	—	—	—	—	—	—	—	—	
	P_PFC_SF	—	—	—	—	—	—	—	—	—	—	○	—	—	—	—	—	—	—	—	—	—	
	P_PFC_SS	—	—	—	—	—	—	—	—	—	—	—	○	—	—	—	—	—	—	—	—	—	
	P_PFC_INT	—	—	—	—	—	—	—	—	—	—	—	—	○	—	—	—	—	—	—	—	—	
P_PGS	—	—	—	—	—	—	—	—	—	—	—	—	—	○	—	—	—	—	—	—	—		
P_PGS2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	○	—	—	—	—	—	—		
P_SEL(T1)(T2)(T3)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	○	—	—	
Special FB	P_MCHG	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	—	○	○	○	—	—

○: Available —: Unavailable



Appendix 3 Functions Added to and Change from Old Version

The following table indicates the functions added to and changed from the old version.

Compatible version ^{*1}	Added/changed function	Description	Reference
Version 1.04E	Microsoft® Windows® XP compatibility	Compatible with Microsoft® Windows® XP Professional and Microsoft® Windows® XP Home Edition.	Section 2.2
	Window toolbar	The window toolbar is added as a new toolbar. The helper window can be displayed/hidden from this toolbar.	Section 5.6.8
	Helper window	The helper window can be displayed/hidden by selecting [View] → [Window] in the menu.	Section 5.7.1
	Cross reference window	The cross reference window is added as a new helper window. This window lists where variables are declared and used in list format.	Section 5.7.7
	Data copy to other project	Program, user-defined FB type/tag FB type/structure type data are copied to the other project.	Section 6.9.2
	Connector	A connector can be drawn from the output pin of an FBD part to connect FBD parts.	Section 7.8.3
	Local variable sheet	<ul style="list-style-type: none"> The icons that indicate the variable types are added to the "Variable Name" field. From this version, the variable data and variable can be changed type can be rearranged in the local variable sheet by dragging and dropping the icon. Multiple lines and multiple items in the local variable sheet can be selected. The selected area can be copied to the other application by selecting [Edit] → [Copy] in the menu. 	Section 7.11
	Global part	<ul style="list-style-type: none"> The module FB is added as a new global part. Compatible module model name: QX82, QX82-S1, Q64RD-G Use of the file register (R) is disabled in the setting of the global variable assigned device. When using the file register, use the ZR device. 	Section 8.3
	Cross reference function	The positions where variables are declared and used are displayed in list format. This function includes the filter display function, which displays only data that satisfy the specified condition, and other functions.	Section 10.1
	Specification of number of digits after the decimal point in monitor value	The number of decimal points in the current value (REAL type only) of the variable displayed in monitor mode can be specified.	Section 13.2.3
Compile function	The program compiled with the programming tool of version 1.04E or later is outperforms the program compiled with the programming tool of version 1.03D or earlier as follows: <ul style="list-style-type: none"> Reduce the number of ladder program generated by compile Reduce the scan time of FBD program 	Appendix 4.6	
Version 1.06G	Initial settings of GX Developer project	Redundant parameter "Tracking setting" has been added.	Section 11.5
	Cold-start compile	<ul style="list-style-type: none"> Tracking processing has been added to ladder programs to generate. The device range with system resource is automatically registered into the Tracking setting of GX Developer project redundant parameters. 	Section 11.5
	Hot-start compile		
	Online change compile	Online change for Redundant CPU has been added.	Section 11.4
	Transfer Setup	"Transfer Setup" screen for Redundant CPU has been added.	Section 12.3
	Download to PLC	Download to PLC function for Redundant CPU has been added.	Section 12.4
	Check Project Consistency	System status of Redundant CPU has been added to the consistency check results.	Section 12.7.2
	Online Monitor	Online monitor for Redundant CPU has been added.	Chapter 13
	FBD Program Diagnostics	System status of Redundant CPU has been added to the diagnostics results.	Section 14.1

*1: The compatible version can be confirmed by selecting About PX Developer. For details, refer to "Section 5.10 Help".

Compatible version ^{*1}	Added/changed function	Description	Reference
Version 1.08J	Status Bar	Invalid initial value is added in compile status.	Section 5.3
	Online toolbar	Upload and FB current value display is added.	Section 5.6.3
	FB property window	It makes current value display/change performed with monitor mode. Toolbar is added.	Section 5.7.4
	Refer to FB parts definition	Operation for referring to FB parts definition is changed from double-clicking the FB parts to clicking user-defined type name that is displayed on FB parts. FB type name of FB parts that can display definition will be displayed in blue and underlined.	Section 7.5.5
	FB property page	The dedicated window for displaying points related to broken line by a graph is added.	Section 10.2
	Online change compile	Online change dialog box is united with download and the required symbolic data download for project restoration is added.	Section 11.4
	Download	The required symbolic data download for project restoration is added.	Section 12.4
	Download setting	When downloading symbolic data on online change/download, the function for setting target memory and compression rate is added.	Section 12.4.3
	Upload	Symbolic data that is stored in the memory of PLC CPU is uploaded, and the function for restoring PX Developer project is added.	Section 12.5
	Delete PLC data	The function for deleting the symbolic data stored in the memory of PLC CPU is added.	Section 12.6
	FBD sheet monitor	The monitor display for input/output variables of FB part is added.	Section 13.2.1
Batch read for FB property current value	FB Property Management Window is added, and Reading Current Value of FB Property in a batch and substitute for initial value in a batch are made to be executed.	Section 13.6.1	
Version 1.10L	Communication route	The following communication paths are extended. <ul style="list-style-type: none"> • C24 connection through serial/USB port, MELSECNET/H remote connection and G4 module connection • CC-Link connection • Q series bus connection • Co-existence network of other station 	Section 2.1.2 Section 12.3
	Opening a Project	The Login screen can be displayed if data protection is enabled.	Section 6.3 Section 6.15.3
	Adding New Data to Project	When data protection is enabled, access permission display of each access level and the permission setting button have been added in the setting screen.	Section 6.8
	Data protection	Data protection can be performed when setting a login password and access permission.	Section 6.15
	Set Login Password	The setting functions of login password for data protection have been added. The conventional project password setting/change functions have been deleted.	Section 6.15.4
	Set Permissions	The setting functions of access permission for data protection have been added. The permission for access level to edit data and the Enable/Disable setting of Read Access for lower levels can be set.	Section 6.15.5
	Variable Reference dialog box	When a variable of a variable part or a FB part is renamed, even if its comment contains 65 characters or more, it will be truncated to 64 characters on the <<New Variable>>tab.	Section 7.3.3 Section 7.5.3
	Display Execution Order of FBD parts	The display function of FB/function parts execution order has been added.	Section 7.5.1 Section 7.6.1
	FB Property Page	The "Show Figure" button has been added. "2-degree-of-freedom advanced PID control FB setting" has been added.	Section 10.2 Section 10.2
	List of Corresponding Tag Type/Tag Access FB	2PIDH has been added.	Appendix 2

*1: The compatible version can be confirmed by selecting About PX Developer. For details, refer to "Section 5.10 Help".

Compatible version ^{*1}	Added/changed function	Description	Reference
Version 1.14Q	FB Property Page	The setting of Multi-point program setter has been added.	Section 10.2
	Download Setting	The "Try compressing" button for checking compressed symbolic data size has been added.	Section 12.4.3
	Print	The Scaling setting and Print Range specification have been added.	Chapter 16
	List of Corresponding Tag Type/Tag Access FB	PGS has been added.	Appendix 2
	Program Execution Setting	Check box "Communicates with peripherals after program execution" has been added for timer execution.	Section 7.13.3
	Communication route	Specifications of redundant type extension base unit are added.	Section 2.1.2 Section 2.2 Section 12.3 Section 13.8.1
	Find	Find is added to the Edit menu and standard toolbar.	Section 3.3 Section 5.6.2
	Sorting global variable declaration	Sort (Ascending, Descending, and Remove Sorting) is added to the pop-up menu for the Global Variable Declaration window.	Section 5.5 Section 8.2.3
Version 1.18U	Supported OS	Windows Vista [®] is supported.	Section 2.2
	Supported CPU	Q02PHCPU and Q06PHCPU are supported.	Section 2.1.1
	Communication route	CC-Link IE Controller Network is supported.	Chapter 2 Section 12.3 Section 13.8.1
	Setting Project Parameters	The <<I/O Control>>tab has been added.	Section 6.14 Section 16.5.2
Version 1.20W	Creating a new project	The function to select whether to use labels in a GX Developer project is added.	Section 6.2
	Setting project parameters	<ul style="list-style-type: none"> A start device number can be changed in the system resource setting. The percentage conversion process of digital I/O value for an analog module FB can be selected. 	Section 6.14
	Online change compile	The function to download label programs to a PLC in a GX Developer project is added.	Section 11.4
	Downloading the symbolic data		Section 12.4.2
	Download setting	The function to set a target memory for online change/downloading of label programs is added.	Section 12.4.3
	Reading all current value of FB property	The function to enable/disable the filtered display of difference lines only is added.	Section 13.6.1
List of Corresponding Tag Type/Tag Access FB	SWM has been added.	Appendix 2	
Version 1.23Z	Parts window	The view format of user-defined FBD parts can be changed.	Section 5.7.3
	FB property window	<ul style="list-style-type: none"> Initial values of public variables can be taken over when a tag FB is modified. The button to initialize the FB property is added. 	Section 5.7.4
	Option setting	The <<View>>tab has been added.	Section 5.11
	Editing declaration information of local variable sheet	Comment reference targets can be selected to conform comments of global parts to those of external variables.	Section 7.11.2
	Update FB	Quickly revise the target User-defined FB/tag FB to reflect internal change.	Section 7.5.6
	Global part	The module FB is added as a new global part. Compatible module model name: Q64AD2DA	Section 8.3
	List of Corresponding Tag Type/Tag Access FB	PFC_SF, PFC_SS and PFC_INT have been added.	Appendix 2

*1: The compatible version can be confirmed by selecting About PX Developer. For details, refer to "Section 5.10 Help".

Compatible version ^{*1}	Added/changed function	Description	Reference
Version 1.28E	Supported OS	Windows [®] 7 is supported.	Section 2.2
	Inline ST editor window	The inline ST editor window has been added to the helper windows.	Section 5.7.8
	Variable part	Device variable is applicable.	Section 7.3.1
	Variable reference dialog box	Variable type can be selected from variable/device.	Section 7.3.3
	Inline ST part	Inline ST part is applicable.	Section 7.7
	Local variable sheet	The <<Device Variable>> tab has been added.	Section 7.11
	Debug	Applicable to the simulation function with GX Simulator	Section 15.1
	Print	Inline ST can be printed.	Section 16.5.5
Version 1.31H	Supported OS	64-bit edition of Windows [®] 7 is supported.	Section 2.2
	Parts window	The button for inserting FBD part with a new name is added.	Section 5.7.3
	Inserting FBD part	A new name and a data type can be set automatically when inserting an FBD part.	Section 7.2.1
	Changing name of FBD part	A name of FBD part can be changed with a shortcut key ("Ctrl" + "Enter" keys).	Section 7.2.3
	Changing data type of variable part	A data type of variable part can be changed on an FBD sheet.	Section 7.3.6
	I/O simulation	The Input/output can be simulated during offline debugging.	Section 15.2
Version 1.42U	Communication route	GOT transparent connection via GOT2000 series is supported.	Section 2.1.2
	Supported CPU	Q04UDPVCPU, Q06UDPVCPU, Q13UDPVCPU and Q26UDPVCPU are supported.	Section 2.1.1
	Supported OS	Windows 8 is supported.	Section 2.2
	Option setting	The <<Compile>>tab has been added.	Section 5.11
	GX Works2 Interacted with GX Works2	Interaction with GX Works2 is supported. <ul style="list-style-type: none"> • Creating a new project • Opening a project • GX label assignment • Compiling FBD program • PLC connection • FBD program diagnostics • Simulation function 	Section 6.2 Section 6.3 Section 8.5.1 Chapter 11 Chapter 12 Chapter 14 Chapter 15
	Changing the displaying magnification of FBD sheet	The magnification of FBD sheet can be changed by pressing "Ctrl" key + turning mouse scroll wheel.	Section 7.10.6
	FB property window	The current values can be changed by double-clicking the cell while pressing "Shift" key.	Section 5.7.4
	FBD sheet		Section 13.2.1
	Entry variable monitor window		Section 13.7
	Global part	The module FB is added as a new global part. Compatible module model name: Q68CT	Section 8.3
	Print	"Select All" and "Cancel All Selections" button are added in the <<Program>> tab and <<User-defined FB> tab.	Section 16.5.5
	Compile function	When FBD part connected from output variable OUT of a function part with EN/ENO pins is variable parts or input variable of FB parts/inline ST parts, the value of variable parts/input variables are not changed.	Appendix 4.8
Version 1.44W	Option setting for the online program change	The option setting for the online program change of a GX Works2 project included in a Universal model process CPU project is improved.	Appendix 4.9
	Supported OS	Windows 8.1 is supported.	Section 2.2
	GX Works2 Interacted with GX Works2	GX Works2 Version 1.513K is supported.	Section 2.2.2
Version 1.46Y	GX Works2 Interacted with GX Works2	GX Works2 Version 1.540N is supported.	Section 2.2.2
Version 1.47Z	Supported OS	Windows 10 is supported	Section 2.2

*1: The compatible version can be confirmed by selecting About PX Developer. For details, refer to "Section 5.10 Help".

Compatible version ^{*1}	Added/changed function	Description	Reference
Version 1.50C	Supported OS	Windows 10 IoT Enterprise is supported	Section 2.2
	GX Works2 Interacted with GX Works2	GX Works2 Version 1.570U is supported.	Section 2.2.2
Version 1.51D	GX Works2 Interacted with GX Works2	GX Works2 Version 1.576A is supported.	Section 2.2.2
Version 1.53F	Supported OS	Windows Vista and Windows XP are no longer supported.	Section 2.2
	GX Works2 Interacted with GX Works2	GX Works2 Version 1.580E is supported.	Section 2.2.2
Version 1.56J	Supported OS	Windows 11	Section 2.2
	GX Works2 Interacted with GX Works2	GX Works2 Version 1.610L is supported.	Section 2.2.2
Version 1.58L	Supported OS	Windows 8.1, Windows 8, and Windows 7 are no longer supported.	Section 2.2

*1: The compatible version can be confirmed by selecting About PX Developer. For details, refer to "Section 5.10 Help".

Appendix 4 Precautions for Differences in Programming Tool Versions

Since the functionality and performance of PX Developer's programming tool have been updated and improved occasionally, the project may have a different internal structure for saving the same program depending on the programming tool version. Therefore, careful attention to the compatibility and performance of each version must be taken when opening a project or downloading data to a PLC by a PX Developer version different from the one in which the project was saved. The following describes precautions for version differences.

Appendix 4.1 Precautions for opening a project

The project may not be used on PX Developer whose version is different from that used to save the project, depending on the combination of the relevant versions. Version compatibility for opening projects is shown below.

(1) Compatibility with supported version

Version in which the project was saved			Version used for opening the project			
			1.02C to 1.18U	1.20W to 1.23Z	1.28E to 1.34L	1.42U or later
1.02C to 1.18U			○	○	○	○
1.20W to 1.23Z	Label setting of GX Developer project	With labels	○	○	○	○
		Without labels	×	○	○	○
	Start device number of system resource	Default value	○	○	○	○
		Other than default value	×	○	○	○
Digital value percentage conversion setting for analog module FB	Not executed	○	○	○	○	
	Executed	×	○	○	○	
1.28E to 1.34L	Device variable in FBD program	Not applied	○	○	○	○
		Applied	×	×	○	○
	Inline ST part in FBD program	Not applied	○	○	○	○
		Applied	×	×	○	○
1.42U or later	GX project type	GX Developer	○	○	○	○
		GX Works2	×	×	×	○

○: Able to open the project., ×: Unable to open the project.

(2) Version compatibility for added tag type

The project defined using user-defined tag FB type with the tag type which is added to version 1.10L or later cannot be opened with version 1.08J or earlier*1.

*1: The following table shows the tag types added to each version.

Added version	Tag type
1.10L	2PIDH
1.14Q	PGS2
1.20W	SWM
1.23Z	PFC_SF, PFC_SS, PFC_INT, PB
1.31H	PVAL, HTCL
1.42U	ALM_64PT, MSG_64PT

(3) Version compatibility for added project parameter setting

Depending on the setting status of project parameter items^{*1}, which are added to version 1.18U or later, a system ladder program according to the setting is created during compilation. When this compiled project file is opened by using a programming tool that is lower than the added version, the system ladder program remains in the #FBDQ000 until compiling. Therefore, when the program is executed, the system may operate unexpectedly.

*1: The following table shows the setting items that differ from the previous versions on the system ladder program processing.

Added version	Setting tab	Item	Setting status
1.18U	I/O Control	Input limiter	Unchecked
		Disconnection detection	Checked

(4) Version compatibility for added reserved word

When a reserved word which is added with upper version is used as a variable name in a project which is created with a programming tool of lower version, a compile error will occur if compiling with opening the project with upper version.^{*1} When using the project with upper version, change the name which occurred a compile error to which is not the same as reserved names.

*1: The following table shows the reserved words added to each version.

Added version	Reserved word	Function which uses reserved word
1.28E	NOT, MOD, AND, XOR, OR	Use as operator in inline ST program.

Appendix 4.2 Precautions for the assignment information database

Operations such as monitoring or downloading to PLC may not be executed when the project was saved on a different PX Developer version, depending on the combination of the relevant versions. Also, in order to perform these operations, conversion of the assignment information database in the project may be required.

(1) Assignment information database

The assignment information database is one of the files included in projects of PX Developer. (☞ Section 6.1) Information such as which variable is assigned to which PLC device is stored in this database, and such information is required to access to a PLC.

The programming tool accesses this assignment information database when performing the following:

- Execute hot-start compile
- Execute online change compile
- Switch to monitor mode
- Execute PLC download

When an access is made to the assignment information database stored by an old version of a different format, the programming tool will automatically activate the conversion function of the assignment information database.

(2) Version compatibility for access to the assignment information database

Depending on the version of the programming tool, there are some restrictions on access to the assignment information database. The following shows the version compatibility.

Version used for last compilation			Version used for access to assignment information database				
			1.02C to 1.04E	1.05F to 1.08J	1.10L to 1.18U	1.20W to 1.23Z	1.28E or later
1.02C to 1.04E			○	△	△	△	△
1.05F to 1.18U			×	○	○	○	○
1.20W to 1.23Z	Start device of system resource	Default value	×	○	○	○	○
		Other than default value	×	×	×	○	○
1.28E or later	Device variable in FBD program	Not applied	×	○	○	○	○
		Applied	×	×	×	×	○

○: Accessible, △: Accessible only after conversion of the assignment information data base, ×: Not accessible

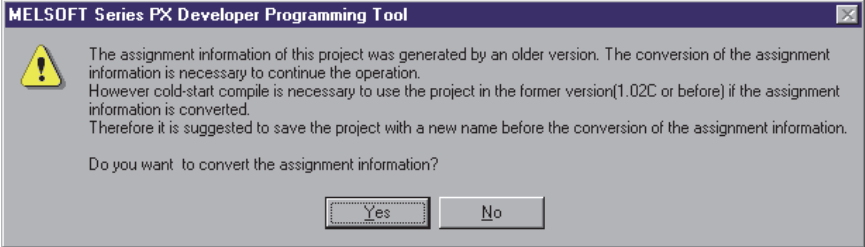
Cannot be used with PX Developer lower than the added version when using tag types added with version 1.10L or later*1 even though satisfying the conditions mentioned above.

*1: The following table shows the tag types added to each version.

Added version	Tag type
1.10L	2PIDH
1.14Q	PGS2
1.20W	SWM
1.23Z	PFC_SF, PFC_SS, PFC_INT, PB
1.31H	PVAL, HTCL
1.42U	ALM_64PT, MSG_64PT

POINT

How to convert the assignment information database is explained below.
 In accessing to the old-version assignment information database file, conversion function of assignment information database file will be started automatically.
 In accessing to old-version assignment information database file, following dialog box will be displayed.



Click the "Yes" button to start converting assignment information database file.
 The converted assignment information database file is not applicable in programming tool that is lower than the version that is used to convert assignment information database file.
 In this case, please execute either of the following operations.

- Use the programming tool that is used for conversion.
- Execute cold-start compile and create new assignment information database file (PLC download is necessary in switching to monitor mode.)

Appendix 4.3 Precautions for cross reference

The created cross reference information may not be used on PX Developer whose version is different from that used to save the project, depending on the combination of the relevant versions.






Version compatibility for using cross reference information is shown below.

Version in which the cross reference information was created			Version used for using the cross reference information		
			1.02C to 1.20W	1.23Z	1.28E or later
1.02C to 1.20W			○	○	△
1.23Z	Comment Reference check box in the option setting	Unchecked	○	○	△
		Checked	△	○	△
1.28E or later			△	△	○

○: Able to use the cross reference information, △: Recreation of the cross reference information is required.

Appendix 4.4 Precautions on the addition of compile status (Invalid initial value)

When a project whose GX project type is GX Developer project is opened in version 1.07H or earlier with its Compile status set to "Invalid initial value", it will be handled as uncompiled. (The "Invalid initial value" option in Compile status was added in version 1.08J.)

Project created in version 1.08J or later	When handled in version 1.07H or earlier
Compiled ()	Compiled ()
Invalid initial value ()	Uncompiled ()
Uncompiled ()	

The Compile status icon is displayed on the status bar. (☞ Section 5.3)

Appendix 4.5 Precautions on the addition of the consistency check before downloading to PLC or online change

For a project version 1.08J or later, whose GX project type is GX Developer project, the data consistency is checked before downloading to PLC or online change. This function checks whether the data produced when the PX Developer project was compiled last (execution data) are correctly contained in the corresponding GX Developer project or not.

This consistency check is not performed in version 1.07H or earlier.

When a GX Developer project inside a PX Developer project was opened to upload a "Label program" from a PLC, it is recommended to ensure the consistency.

Appendix 4.6 Precautions on the compile function improvement

The programming tool includes the improved compile function from the new version (Version 1.04E or later).

Therefore, the FBD programs compiled by the new version outperform those compiled by the old version (version 1.03D or earlier) as follows;

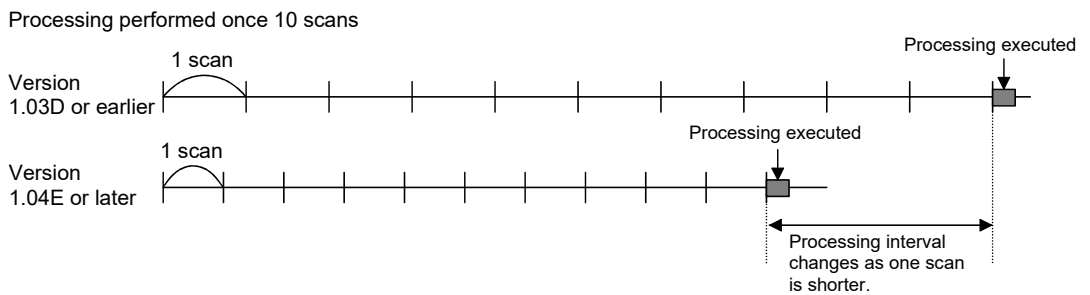
- Reduce the number of ladder program steps generated by compile.
- Reduce the scan time of the FBD program.

Note the following when utilizing the program created by the old version (version 1.03D or earlier).

Precautions on the reduced scan time of FBD program

Executed faster, the FBD programs compiled by the new version (version 1.04E or later) require less scan time as compared with those compiled by the old version (version 1.03D or earlier).

Therefore, if the scan time-dependent processing is executed for scan execution FBD programs or the user-created ladder programs, the processing interval differs between the old version and new version (version 1.04E or later).



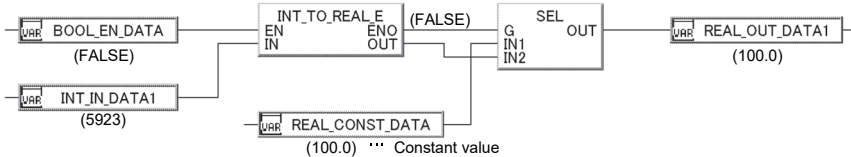
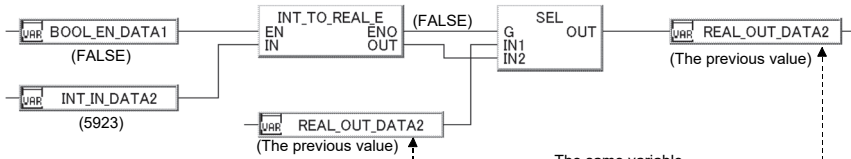
POINT	<p>The scan time can be confirmed on GX application.</p> <p>For the confirmation method, refer to the following manuals:</p> <ul style="list-style-type: none"> ● GX Works2 Version 1 Operating Manual (Common) ● GX Developer Version 8 Operating Manual
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Appendix 4.7 Precautions on the addition of the function to select the view format of the parts window

Project created in Version 1.23Z or later	When handled in 1.20W or earlier
Icons ()	Icons
List ()	
Group ()	

Appendix 4.8 Precautions for Function Parts with EN/ENO Pins

The compile function is improved with programming tool version 1.42U or later. Depending on the version of a programming tool to be compiled, the operation of FBD programs whose ENO (output status) of the function parts with EN/ENO pins is FALSE (abnormal) differs.

Version to be compiled	FBD program operation when ENO of function parts with EN/ENO pins is FALSE
1.02C to 1.34L	<p>The values of input variables of variable parts/function parts/FB parts/inline ST parts connected from output variable OUT of function parts with EN/ENO pins will be undefined value. In this case, the program operation, which is not to use the value output from OUT, is required. The following shows the example of program which is not to use the value output from OUT when ENO is FALSE.</p> <ul style="list-style-type: none"> • The program example that outputs constant value when output variable ENO is FALSE  <ul style="list-style-type: none"> • The program example that outputs the previous value when output variable ENO is FALSE 
1.42U or later	<p>The operation will be differ depending on the FBD parts connected from output variable OUT of the function part with EN/ENO pins.</p> <ul style="list-style-type: none"> • Input variables of variable parts and FB parts/inline ST parts The values of variable parts/input variables connected from output variable OUT of the function part with EN/ENO pins will not be changed. • Input variables of function parts The values of input variables connected from output variable OUT of function part with EN/ENO pins will be undefined value. In this case, the same case as version 1.34L or earlier, the program operation, which is not to use the value output from OUT, is required.

Appendix 4.9 Compatibility of the option setting for a Universal model process CPU project

The option setting for the online program change of a GX Works2 project included in a newly created Universal model process CPU project is improved with programming tool Version 1.44W or later

Option setting for the online program change	Version where a new project is created		Effect of change	Manual
	Earlier than 1.44W	1.44W or later		
Execute fall instruction	ON	OFF	The fall instruction included in the range to be written by the online program change function is not executed even if its execution condition (ON to OFF) is satisfied at the completion of the online program change.	QnUCPU User's Manual (Function Explanation, Program Fundamentals)
Transfer program cache memory to program memory	OFF	ON	The data in the program cache memory is reflected to the program memory at the completion of the online program change. With this function, the changed content is retained even after resetting or powering OFF the CPU.	
Under booting, reflect changes to boot source during online program change	ON	OFF	The changes is not reflected to the boot source at the completion of the online program change. In addition, the boot operation is not performed because the setting in the "Boot File" tab of PLC parameter is not set by default. However, for Universal model process CPU, the boot file setting is not required because data in the program memory (flash ROM) is retained even when its battery voltage drops. For Universal model process CPU, the boot file setting is not required because data in the program memory (flash ROM) is retained even when its battery voltage drops.	GX Works2 Version 1 Operating Manual (Common)

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