

# MITSUBISHI

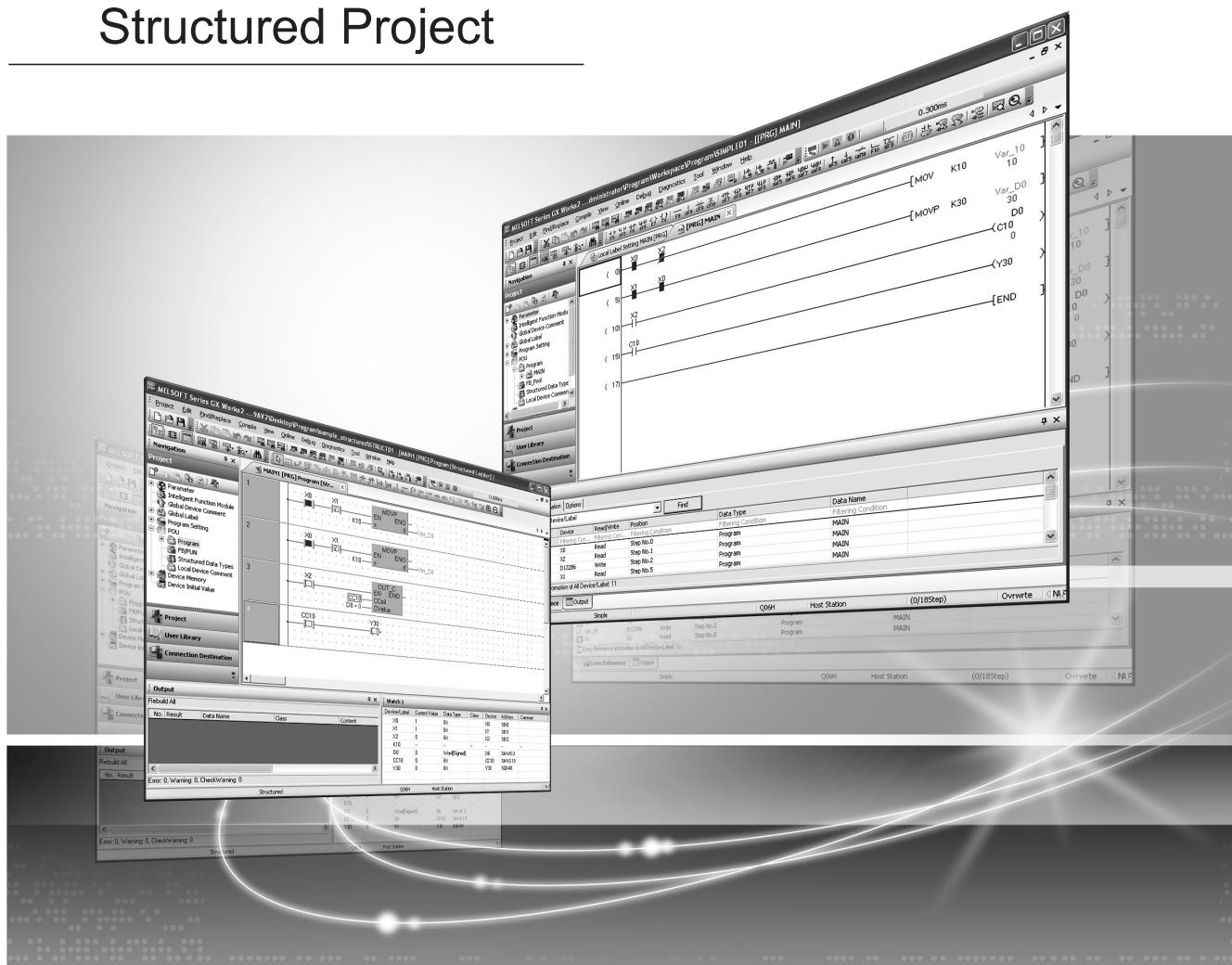


Integrated FA Software

# GX Works2

## Beginner's Manual

### Structured Project



**MELSOFT**  
Integrated FA Software

SW1DNC-GXW2-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. 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.

## [Design Instructions]



### WARNING

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

## [Startup and Maintenance Instructions]



### CAUTION

- The online operations performed from a personal computer to a running programmable controller CPU (Program change when a programmable controller CPU is RUN, operating status changes such as forced input/output operation and RUN-STOP switching, and remote control operation) must be executed after the manual has been carefully read and the safety has been ensured.  
When changing a program while a programmable controller CPU is RUN, it may cause a program corruption in some operating conditions. Fully understand the precautions described in GX Works2 Version 1 Operating Manual (Common) before use.
- The positioning test functions of OPR, JOG, inching or positioning data for QD75/LD75 positioning module must be executed with the programmable controller set to STOP after the manual has been carefully read and the safety has been ensured. Specially when executing the function on the network system, ensure the safety thoroughly since the machinery whose operation cannot be checked by an operator may be activated. The operation failure may cause the injury or machine damage.

# ● CONDITIONS OF USE FOR THE PRODUCT ●

- (1) Mitsubishi 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 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'S USER, 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 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 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 representative in your region.

## REVISIONS

The manual number is written at the bottom left of the back cover.

Print date	Manual number	Revision
Jul., 2008	SH(NA)-080788ENG-A	First edition
Jan., 2009	SH(NA)-080788ENG-B	<p><b>Model Addition</b> Q00UJ, Q00U, Q01U, Q10UDH, Q10UDEH, Q20UDH, Q20UDEH, FXCPU</p> <p><b>Addition</b> MANUALS, Section 1.1, Section 3.6</p> <p><b>Correction</b> GENERIC TERMS AND ABBREVIATIONS IN THIS MANUAL, Section 1, Section 2.2, Section 3, Section 3.2.1, Section 3.2.2, Section 3.2.3, Section 3.2.5, Section 3.2.6, Section 3.2.7, Section 3.3.1, Section 3.3.2, Section 3.4.1, Section 3.4.2, Section 3.7.2, Section 4, Section 4.2.6, Section 4.4.1, Section 4.7, Section 5, Section 5.2.5, Section 5.2.6, Section 5.4.1, Section 5.7</p>
Jul., 2009	SH(NA)-080788ENG-C	<p><b>Model Addition</b> Q00J, Q00, Q01</p> <p><b>Addition</b> MANUALS, Section 1.1</p> <p><b>Correction</b> MANUALS, Section 3.1, Section 3.2, Section 3.3, Section 3.4, Section 3.5, Section 3.6, Section 3.7, Section 3.8, Section 3.9, Section 4.1, Section 4.2, Section 4.4, Section 4.7, Section 5.1, Section 5.2, Section 5.4, Section 5.7</p>
Oct., 2009	SH(NA)-080788ENG-D	<p><b>Correction</b> SAFETY PRECAUTIONS, Section 1.2, Section 3.2.2, Section 3.2.3, Section 3.2.5, Section 3.2.6, Section 3.7.1, Section 3.7.2, Section 3.7.3, Section 3.8, Section 4.9, Section 5.2.6, Section 5.9</p>
Jan., 2010	SH(NA)-080788ENG-E	<p><b>Model Addition</b> L02, L26-BT</p> <p><b>Addition</b> CONDITIONS OF USE FOR THE PRODUCT</p> <p><b>Correction</b> MANUALS, GENERIC TERMS AND ABBREVIATIONS IN THIS MANUAL, Section 3.2.1, Section 3.2.2, Section 3.2.3, Section 3.2.4, Section 3.2.5, Section 3.2.6, Section 3.2.7, Section 3.3.2, Section 3.4.1, Section 3.4.2, Section 3.5, Section 3.6, Section 3.7.2, Section 3.7.4, Section 4.2.5, Section 4.2.6, Section 4.4.1, Section 5.2.5, Section 5.2.6, Section 5.2.7, Section 5.4.1</p>
Apr., 2010	SH(NA)-080788ENG-F	<p><b>Correction</b> SAFETY PRECAUTIONS, MANUALS, GENERIC TERMS AND ABBREVIATIONS IN THIS MANUAL, Section 3.2.1, Section 3.2.2, Section 3.2.3, Section 3.2.7, Section 3.3.1, Section 3.3.2, Section 3.4.1, Section 3.4.2, Section 3.5, Section 3.9, Section 4.2.6, Section 4.4.1, Section 5.4.1</p>

<b>Print date</b>	<b>Manual number</b>	<b>Revision</b>
Sep., 2010	SH(NA)-080788ENG-G	<p><b>Correction</b></p> <p>GENERIC TERMS AND ABBREVIATIONS IN THIS MANUAL, Section 3.2.3, Section 3.2.6, Section 3.3.1, Section 3.3.2, Section 3.5, Section 3.6</p>
Jan., 2011	SH(NA)-080788ENG-H	<p><b>Correction</b></p> <p>MANUALS, Section 2.1, Section 3.2.1, Section 3.2.2, Section 3.2.3, Section 3.2.4, Section 3.2.5, Section 3.2.6, Section 3.2.7, Section 3.3.1, Section 3.3.2, Section 3.4.1, Section 3.4.2, Section 3.5, Section 3.6, Section 3.7.2, Section 3.7.4, Section 3.8, Section 4.2.6, Section 4.4.1, Section 5.2.5, Section 5.2.7, Section 5.4.1</p>
Jul., 2011	SH(NA)-080788ENG-I	<p><b>Addition</b></p> <p>Section 3.2.8</p> <p><b>Correction</b></p> <p>MANUALS, Section 1.1, Section 2.2, Section 3.1.2, Section 3.2.1, Section 3.2.2, Section 3.2.3, Section 3.2.6, Section 3.3.2, Section 3.4.1, Section 3.4.2, Section 3.6, Section 3.7.1, Section 3.7.2, Section 3.7.3, Section 3.8, Section 3.9, Section 4.2.6, Section 4.4.1, Section 5.1.2, Section 5.2.5, Section 5.2.7, Section 5.4.1</p>
Jan., 2012	SH(NA)-080788ENG-J	<p><b>Correction</b></p> <p>MANUALS, GENERIC TERMS AND ABBREVIATIONS IN THIS MANUAL, Section 3.2.3, Section 3.3.1, Section 3.4.1, Section 3.4.2, Section 3.8, Section 4.4.1, Section 5.4.1</p>

Japanese Manual Version SH-080734-M

This manual confers no industrial property rights or any rights of any other kind, nor does it confer any patent licenses. Mitsubishi Electric Corporation cannot be held responsible for any problems involving industrial property rights which may occur as a result of using the contents noted in this manual.

© 2008 MITSUBISHI ELECTRIC CORPORATION

# INTRODUCTION

---

Thank you for purchasing the Mitsubishi integrated FA software, MELSOFT series.  
Before using the product, thoroughly read this manual to develop full familiarity with the functions and performance to ensure correct use.

## CONTENTS

---

SAFETY PRECAUTIONS .....	A - 1
CONDITIONS OF USE FOR THE PRODUCT .....	A - 2
REVISIONS .....	A - 3
INTRODUCTION .....	A - 5
CONTENTS .....	A - 5
MANUALS.....	A - 8
GENERIC TERMS AND ABBREVIATIONS IN THIS MANUAL.....	A - 16

1 OVERVIEW	1 - 1 to 1 - 6
------------	----------------

---

1.1 Simple Project and Structured Project	1 - 2
1.2 Program Creation Procedure	1 - 4

---

2 CREATED PROGRAM AND SYSTEM CONFIGURATION	2 - 1 to 2 - 4
--	----------------

---

2.1 System Configuration	2 - 2
2.2 Overview of Program Creation	2 - 2

---

3 CREATING PROGRAM IN STRUCTURED LADDER/FBD LANGUAGE	3 - 1 to 3 - 48
--	-----------------

---

3.1 Created Program	3 - 2
3.1.1 Operations of program.....	3 - 2
3.1.2 Created program .....	3 - 2
3.2 Creating a Project	3 - 3
3.2.1 Starting GX Works2.....	3 - 3
3.2.2 Screen configuration in GX Works2 .....	3 - 4
3.2.3 Creating a new project.....	3 - 5
3.2.4 Setting parameters .....	3 - 7
3.2.5 Setting labels.....	3 - 8
3.2.6 Creating a program.....	3 - 11
3.2.7 Compiling a program .....	3 - 19
3.2.8 Creating an FBD program .....	3 - 20
3.3 Writing a Project to the programmable controller	3 - 21
3.3.1 Connecting the personal computer to the programmable controller.....	3 - 21
3.3.2 Writing a project to the programmable controller.....	3 - 26
3.4 Monitoring Operations	3 - 29
3.4.1 Monitoring a program .....	3 - 29
3.4.2 Batch monitoring of device values.....	3 - 34

3.5	Diagnosing the programmable controller	3 - 38
3.6	Reading a Project from programmable controller	3 - 39
3.7	Printing	3 - 41
3.7.1	Setting the printer.....	3 - 41
3.7.2	Previewing a program .....	3 - 42
3.7.3	Printing a program.....	3 - 44
3.7.4	Previewing a PLC Parameter.....	3 - 45
3.7.5	Printing a PLC Parameter .....	3 - 46
3.8	Saving a Project	3 - 47
3.9	Exiting GX Works2	3 - 48

---

**4 CREATING PROGRAM IN ST LANGUAGE** 4 - 1 to 4 - 12

---

4.1	Created Program	4 - 2
4.1.1	Operations of program .....	4 - 2
4.1.2	Created program .....	4 - 2
4.2	Creating a Project	4 - 3
4.2.1	Starting GX Works2 .....	4 - 3
4.2.2	Screen configuration in GX Works2 .....	4 - 3
4.2.3	Creating a new project .....	4 - 3
4.2.4	Setting parameters.....	4 - 3
4.2.5	Setting labels.....	4 - 3
4.2.6	Creating a program .....	4 - 4
4.2.7	Compiling a program.....	4 - 6
4.3	Writing a Project to the programmable controller	4 - 7
4.4	Monitoring Operations	4 - 7
4.4.1	Monitoring a program .....	4 - 7
4.4.2	Batch monitoring of device values .....	4 - 10
4.5	Diagnosing the programmable controller	4 - 11
4.6	Reading a Project from programmable controller	4 - 11
4.7	Printing	4 - 11
4.8	Saving a Project	4 - 11
4.9	Exiting GX Works2	4 - 11

---

**5 CREATING TWO OR MORE PROGRAM BLOCKS** 5 - 1 to 5 - 19

---

5.1	Created Program	5 - 2
5.1.1	Operations of program .....	5 - 2
5.1.2	Created program .....	5 - 3
5.2	Creating a Project	5 - 4
5.2.1	Starting GX Works2 .....	5 - 4
5.2.2	Screen configuration in GX Works2 .....	5 - 4
5.2.3	Creating a new project .....	5 - 4
5.2.4	Setting parameters.....	5 - 4

5.2.5	Preparing (creating) the program configuration.....	5 - 5
5.2.6	Setting labels .....	5 - 8
5.2.7	Creating a program.....	5 - 9
5.2.8	Compiling a program .....	5 - 11
5.3	Writing a Project to the programmable controller	5 - 12
5.4	Monitoring Operations	5 - 12
5.4.1	Monitoring a program .....	5 - 12
5.4.2	Batch monitoring of device values.....	5 - 18
5.5	Diagnosing the programmable controller	5 - 18
5.6	Reading a Project from programmable controller	5 - 18
5.7	Printing	5 - 19
5.8	Saving a Project	5 - 19
5.9	Exiting GX Works2	5 - 19

## ■ MANUALS

Related manuals are separately issued according to the purpose of their functions in GX Works2.

### ● Related manuals

The manuals related to this product are shown below.

Refer to the following tables when ordering required manuals.

#### 1) Operation of GX Works2

Manual name	Manual number (Manual code)
GX Works2 Version 1 Operating Manual (Common) Explains the system configuration of GX Works2 and the functions common to a Simple project and Structured project such as parameter setting, operation method for the online function. (Sold separately)	SH-080779ENG (13JU63)
GX Works2 Version 1 Operating Manual (Simple Project) Explains operation methods such as creating and monitoring programs in Simple project of GX Works2. (Sold separately)	SH-080780ENG (13JU64)
GX Works2 Version 1 Operating Manual (Simple Project, Function Block) Explains methods for such as creating function blocks, pasting function blocks to sequence programs, and operating FB library in Simple project of GX Works2. (Sold separately)	SH-080984ENG (13JU72)
GX Works2 Version 1 Operating Manual (Structured Project) Explains operation methods such as creating and monitoring programs in Structured project of GX Works2. (Sold separately)	SH-080781ENG (13JU65)
GX Works2 Version 1 Operating Manual (Intelligent Function Module) Explains operation methods of intelligent function module such as parameter setting, monitoring programs, and predefined protocol support function in GX Works2. (Sold separately)	SH-080921ENG (13JU69)
GX Works2 Beginner's Manual (Simple Project) Explains fundamental operation methods such as creating, editing, and monitoring programs in Simple project for users inexperienced with GX Works2. (Sold separately)	SH-080787ENG (13JZ22)

#### 2) Structured Programming

Manual name	Manual number (Manual code)
MELSEC-Q/L/F Structured Programming Manual (Fundamentals) Explains the programming method, types of programming languages and other information required to create structured programs. (Sold separately)	SH-080782ENG (13JW06)
MELSEC-Q/L Structured Programming Manual (Common Instructions) Explains the specifications and functions of common instructions such as sequence instructions, basic instructions, and application instructions, that can be used in structured programs. (Sold separately)	SH-080783ENG (13JW07)
MELSEC-Q/L Structured Programming Manual (Application Functions) Explains the specifications and functions of application functions that can be used in structured programs. (Sold separately)	SH-080784ENG (13JW08)
MELSEC-Q/L Structured Programming Manual (Special Instructions) Explains the specifications and functions of special instructions such as module dedicated instruction, PID control instruction, and built-in I/O function dedicated instruction, that can be used in structured programs. (Sold separately)	SH-080785ENG (13JW09)
FXCPU Structured Programming Manual [Device & Common] Explains the devices and parameters provided in GX Works2 for structured programming. (Sold separately)	JY997D26001 (09R925)
FXCPU Structured Programming Manual [Basic & Applied Instruction] Explains the sequence instructions provided in GX Works2 for structured programming. (Sold separately)	JY997D34701 (09R926)
FXCPU Structured Programming Manual [Application Functions] Explains the application functions provided in GX Works2 for structured programming. (Sold separately)	JY997D34801 (09R927)

### 3) Operation of iQ Works

Manual name	Manual number (Manual code)
iQ Works Beginner's Manual Explains fundamental operation methods such as managing the system using MELSOFT Navigator and using system labels for users inexperienced with GX Works2.	SH-080902ENG (13JZ44) (Sold separately)



**The Operating Manuals are included on the CD-ROM of the software package in a PDF file format.  
Manuals in printed form are sold separately for single purchase. Order a manual by quoting the manual number (model code) listed in the table above.**

### ● Purpose of this manual

This manual explains the operation for creating sequence programs in Structured project, one of the functions supported with GX Works2.

Manuals for reference are listed in the following table according to their purpose.

For information such as the contents and manual number of each manual, refer to the list of 'Related manuals'.

### 1) Installation of GX Works2 and USB driver

Purpose	GX Works2 Installation Instructions	GX Works2 Version 1 Operating Manual	
		Common	
Learning the operating environment and installation method			
Learning a USB driver installation method			

### 2) Operation of GX Works2

Purpose	GX Works2 Beginner's Manual		GX Works2 Version 1 Operating Manual				
	Simple Project	Structured Project	Common	Simple Project	Function Block	Structured Project	Intelligent Function Module
Learning all functions of GX Works2							
Learning the project types and available languages in GX Works2							
Learning the basic operations and operating procedures when creating a simple project for the first time							
Learning the basic operations and operating procedures when creating a structured project for the first time							
Learning the operations of available functions regardless of project type.							
Learning the functions and operation methods for programming							
Learning the operations and operating procedures when creating function blocks (FB) in Simple project.							
Learning data setting methods for intelligent function module							

3) Operations in each programming language

For details of instructions used in each programming language, refer to the section 4 / section 5 on the next page.

Purpose		GX Works2 Installation Instructions	GX Works2 Beginner's Manual		GX Works2 Version 1 Operating Manual			
			Simple Project	Structured Project	Common	Simple Project	Structured Project	Intelligent Function Module
Simple Project	Ladder							
	SFC		 *1					
	ST							
Structured Project	Ladder							
	SFC		 *1					
	Structured Ladder/FBD							
	ST							

\*1: MELSA3 and FX series SFC only

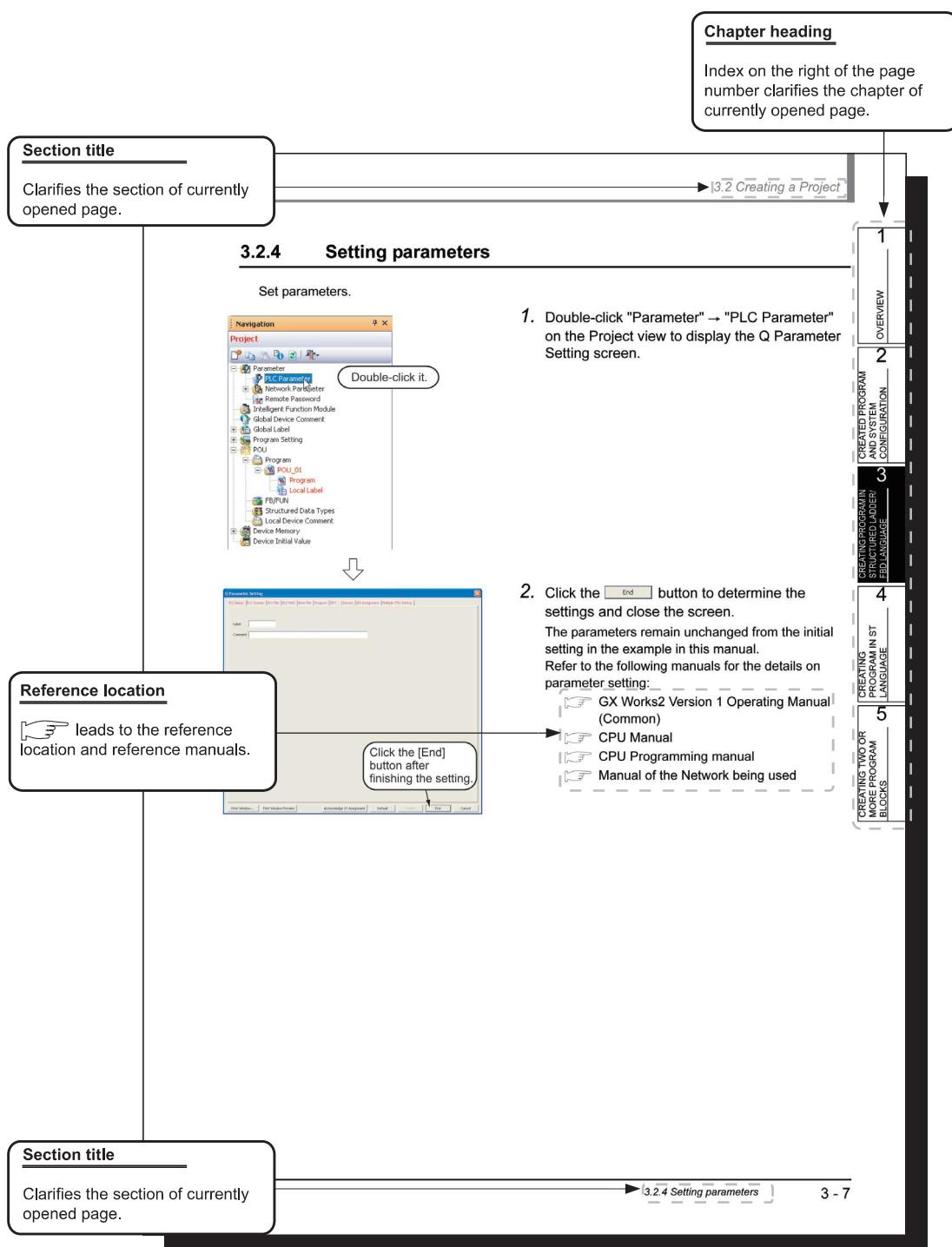
4) Details of instructions in each programming language (for QCPU (Q mode)/LCPU)

Purpose		MELSEC-Q/L/F Structured Programming Manual	MELSEC-Q/L Structured Programming Manual			MELSEC-Q/L Programming Manual	MELSEC-Q/L/QnA Programming Manual		Manual for module to be used
		Fundamentals	Common Instructions	Special Instructions	Application Functions	Common Instructions	PID Control Instructions	SFC	-
All languages	Learning details of programmable controller CPU error codes, special relays, and special registers								
Using ladder language	Learning the types and details of common instructions								
	Learning the types and details of instructions for intelligent function modules								
	Learning the types and details of instructions for network modules								
	Learning the types and details of instructions for the PID control function								
Using SFC language	Learning details of specifications, functions, and instructions of SFC (MELSAPI3)								
Using Structured Ladder/ FBD or ST language	Learning the fundamentals for creating a structured program								
	Learning the types and details of common instructions								
	Learning the types and details of instructions for intelligent function modules								
	Learning the types and details of instructions for network modules								
	Learning the types and details of instructions for the PID control function								
	Learning the types and details of application functions								

5) Details of instructions in each programming language (for FXCPU)

Purpose		MELSEC-Q/L/F Structured Programming Manual	FXCPU Structured Programming Manual			FXCPU Programming Manual			
			Fundamentals	Device & Common	Basic & Applied Instruction	Application Functions	FX0, FX0s, FX0N, FX1, FXU, FX2C	FX1S, FX1N, FX2N, FX1NC, FX2NC	FX3G, FX3U, FX3GC, FX3UC
Using ladder language	Learning the types and details of basic/application instructions, descriptions of devices and parameters								
Using SFC language	Learning details of specifications, functions, and instructions of SFC								
Using Structured Ladder/FBD or ST language	Learning the fundamentals for creating a structured program								
	Learning the descriptions of devices, parameters, and error codes								
	Learning the types and details of sequence instructions								
	Learning the types and details of application instructions								

## ● How to read this manual



\* Since the above page was created for explanation purpose, it differs from the actual page.

This manual also uses the following columns:

### Point

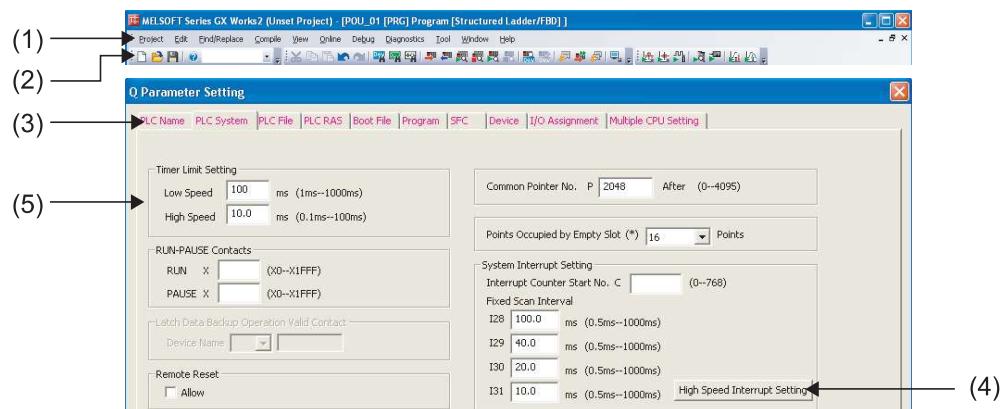
This explains notes for requiring attention or useful functions relating to the information given on the same page.

### Restrictions

This explains restrictions relating to the information given on the same page.

#### ● Symbols used in this manual

The following shows the symbols used in this manual with descriptions and examples.



No.	Symbol	Description	Example
(1)	[ ]	Menu name on a menu bar	[Project]
(2)		Toolbar icon	
(3)	<< >>	Tab name in a screen	<<PLC System>>
(4)		Button on a screen	
(5)	" "	Item name in a screen	"Timer Limit Setting"
-		Keyboard key	

## ■ GENERIC TERMS AND ABBREVIATIONS IN THIS MANUAL

---

This manual uses the generic terms and abbreviations listed in the following table to discuss the software packages and programmable controller CPUs. Corresponding module model names are also listed if needed.

Generic terms and Abbreviations	Description
GX Works2	Generic product name for SWnDNC-GXW2-E model (n: version)
Existing application	-
GX Developer	Generic product name for SWnD5C-GPPW-E, SWnD5C-GPPW-EA, SWnD5C-GPPW-EV, and SWnD5C-GPPW-EVA (n: version)
GX Simulator	Generic product name for SWnD5C-GPPW-E, SWnD5C-GPPW-EA, SWnD5C-GPPW-EV, and SWnD5C-GPPW-EVA (n: version)
iQ Works	Abbreviation for iQ platform supporting engineering environment MELSOFT iQ Works
Personal computer	Generic term for personal computers on which Windows® operates
Q series	Abbreviation for Mitsubishi programmable controller MELSEC-Q series
L series	Abbreviation for Mitsubishi programmable controller MELSEC-L series
FX series	Abbreviation for Mitsubishi programmable controller MELSEC-F series
Basic model QCPU	Generic term for Q00J, Q00, Q01
High Performance model QCPU	Generic term for Q02, Q02H, Q06H, Q12H, and Q25H
Universal model QCPU	Generic term for Q00UJ, Q00U, Q01U, Q02U, Q03UD, Q03UDE, Q04UDH, Q04UDEH, Q06UDH, Q06UDEH, Q10UDH, Q10UDEH, Q13UDH, Q13UDEH, Q20UDH, Q20UDEH, Q26UDH, Q26UDEH, Q50UDEH, and Q100UDEH
QCPU (Q mode)	Generic term for Basic model QCPU, High Performance model QCPU, and Universal model QCPU
LCPU	Generic term for L02, L02-P, L26-BT and L26-PBT
FXCPU	Generic term for FX0, FX0s, FX0N, FXU, FX2C, FX1S, FX1N, FX1NC, FX2N, FX2NC, FX3G, FX3GC, FX3U, and FX3UC
CPU module	Generic term for QCPU (Q mode), LCPU, and FXCPU
SFC	Generic term for MELSAP3, MELSAP-L, and FX series SFC



# 1 OVERVIEW

This manual explains the procedures to actually create a program (Structured Project) using GX Works2 and operate the programmable controller using the created program.

If this is your first time creating a Structured Project using GX Works2, you are recommended to read this manual first, and then use GX Works2.

Refer to the following manual for Simple Projects:

GX Works2 Beginner's Manual (Simple Project)

1.1 Simple Project and Structured Project .....	1-2
1.2 Program Creation Procedure .....	1-4

## 1.1 Simple Project and Structured Project

### ■ Simple Project

In a Simple Project, you can create sequence programs using instructions for the Mitsubishi programmable controller CPU.

The Simple Project offers the same operability for program creation as the conventional GX Developer.

You can create sequence programs using the following programming languages:

#### ● Graphic languages

- Ladder

Use this graphic language to describe programs as ladders consisting of contacts, coils, etc., using the same operating procedures as the conventional GX Developer.

- SFC

Use this graphic language to describe sequence control in a way easy to understand.

Describe steps which specify the processing and transition conditions which specify conditions for proceeding to the next step.

You can describe steps and transition conditions using the ladder language.

#### ● Text language

- ST (Structured Text)

This text language allows you to describe controls by syntax including alternative sequences offered by conditional sentences and repetition offered by repetition sentences in the same way as high-level languages such as the C language. Accordingly, you can briefly create programs easy to look at.

### ■ Structured Project

In a Structured Project, you can create programs by structured program.

By dividing controls into small portions and making parts of common contents, you can create programs easy to understand and applicable to many cases (by structured program.)

You can create sequence programs using the following programming languages:

#### ● Graphic languages

- Ladder

Use this graphic language to describe programs as ladders consisting of contacts, coils, etc., using the same operating procedures as the conventional GX Developer.

- Structured Ladder/FBD

Structured Ladder is created based on the relay circuit design technology. Because this language is easy to understand intuitively, it is used generally for sequence programs.

Every ladder always starts from a base line on the left.

Structured Ladder consists of contacts, coils, function blocks and functions which are connected each other with vertical lines and horizontal lines.

FBD connects functions and function blocks with ruled lines to describe ladders.

- SFC

Use this graphic language to describe sequence control in a way easy to understand.

Describe steps which specify the processing and transition conditions which specify conditions for proceeding to the next step.

You can describe steps and transition conditions using the ladder language.

### ● Text language

- ST (Structured Text)

This text language allows you to describe controls by syntax including alternative sequences offered by conditional sentences and repetition offered by repetition sentences in the same way as high-level languages such as the C language. Accordingly, you can briefly create programs easy to look at.

### Restrictions!

The FXCPU does not support the ST language in Simple Project, and does not support the ladder language and SFC language in Structured Project.

## 1.2 Program Creation Procedure

The figure below shows how to create a program with a Structured Project and execute it in a programmable controller CPU.

### 1. Opening a project

Procedure	Reference
Start GX Works2.	3.2.1
Create a new Structured Project. Or open an existing Structured Project.	3.2.3



### 2. Setting parameters

Procedure	Reference
Set the parameters.	3.2.4



### 3. Creating the program configuration

Procedure	Reference
Create Program File.	--
Create Task in Program File.	--
Create POU.	5.2.5
Register program block of POU to Task in Program File.	



### 4. Setting labels

Procedure	Reference
Define global labels.	3.2.5
Define local labels.	--



### 5. Editing the program

Procedure	Reference
Edit the program in each POU.	3.2.6
	4.2.6
	5.2.7



(To the next page)



## 6. Conversion

Procedure	Reference
Compile the program.	3.2.7



## 7. Connecting the programmable controller CPU

Procedure	Reference
Connect the personal computer to the programmable controller CPU.	3.3.1
Set the connection destination.	



## 8. Writing to the programmable controller

Procedure	Reference
Write the parameters to the programmable controller CPU.	3.3.2
Write the program to the programmable controller CPU.	



## 9. Checking operations

Procedure	Reference
Monitor the sequence program execution status, and check operations.	3.4 4.4 5.4
Check for errors in the programmable controller.	3.5



## 10. Printing

Procedure	Reference
Print the program and parameters.	3.7 4.7 5.7



## 11. Exiting GX Works2

Procedure	Reference
Save the project.	3.8
Exiting GX Works2.	3.9

# MEMO



## 2

# CREATED PROGRAM AND SYSTEM CONFIGURATION

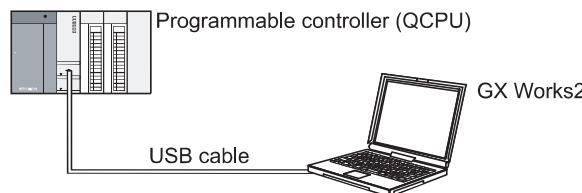
This chapter explains the system configuration and gives an overview of the program created by using this manual.

2.1 System Configuration.....	2-2
2.2 Overview of Program Creation.....	2-2

CREATING PROGRAM AND SYSTEM CONFIGURATION	1
OVERVIEW	2
STRUCTURED LADDER/ FBD LANGUAGE	3
CREATING PROGRAM IN ST LANGUAGE	4
CREATING TWO OR MORE PROGRAM BLOCKS	5

## 2.1 System Configuration

This manual uses GX Works2 and the Q Series programmable controller for explanation.



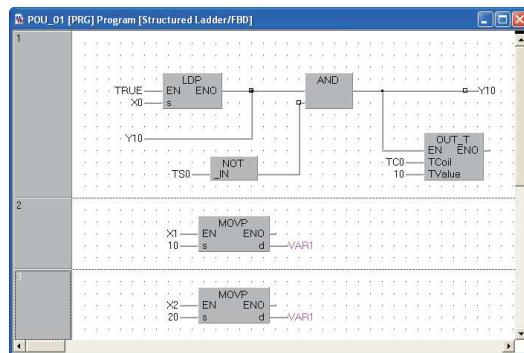
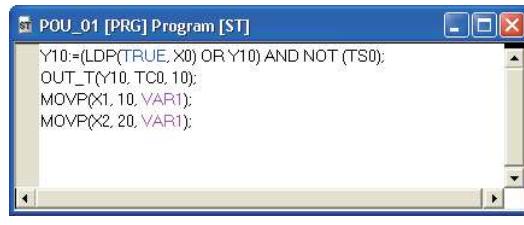
## 2.2 Overview of Program Creation

This manual explains the following program creation procedures using the simple example program shown in the table below.

- Creating a new project
- Setting parameters
- Setting labels
- Creating a program (inputting contacts and application instructions, converting ladder blocks and compiling the program)
- Writing to the programmable controller
- Monitoring ladder, etc.
- Preview, Printing

Table 2.1 Overview of created program

Program language	Number of program blocks	Operation overview	Reference
Structured Ladder	1		Chapter 3
Structured Ladder	3		Chapter 5

Program language	Number of program blocks	Operation overview	Reference
FBD	1		Chapter 3
ST	1		Chapter 4
Ladder		<p>Refer to the following manual.</p> <p> <a href="#">GX Works2 Beginner's Manual (Simple Project)</a></p> <p>You can create the <b>Inline ST Box</b> that displays ST language programs in the Ladder Editor, and edit and monitor ST language programs.</p> <p>Refer to the following manual for the details.</p> <p> <a href="#">GX Works2 Version 1 Operating Manual (Simple Project)</a></p>	
SFC		<p>Refer to the following manual.</p> <p> <a href="#">GX Works2 Beginner's Manual (Simple Project)</a></p>	

## MEMO



### 3

# CREATING PROGRAM IN STRUCTURED LADDER/ FBD LANGUAGE

This chapter explains how to create a program in the Structured Ladder/FBD language with a Structured Project using a simple Structured Ladder program.

Refer to the following manuals for the details on structured programs including programming languages, labels, data types and functions (instructions):

- ☞ MELSEC-Q/L/F Structured Programming Manual (Fundamentals)
- ☞ Structured Programming Manual of the programmable controller CPU

3.1 Created Program .....	3-2
3.2 Creating a Project .....	3-3
3.3 Writing a Project to the programmable controller .....	3-21
3.4 Monitoring Operations .....	3-29
3.5 Diagnosing the programmable controller .....	3-38
3.6 Reading a Project from programmable controller .....	3-39
3.7 Printing .....	3-41
3.8 Saving a Project .....	3-47
3.9 Exiting GX Works2 .....	3-48

## 3.1 Created Program

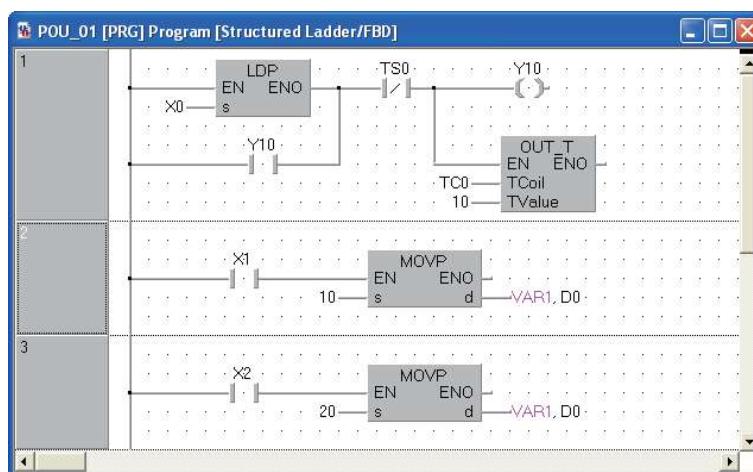
This section explains the operations of the program to be created and ladder programs.

### 3.1.1 Operations of program

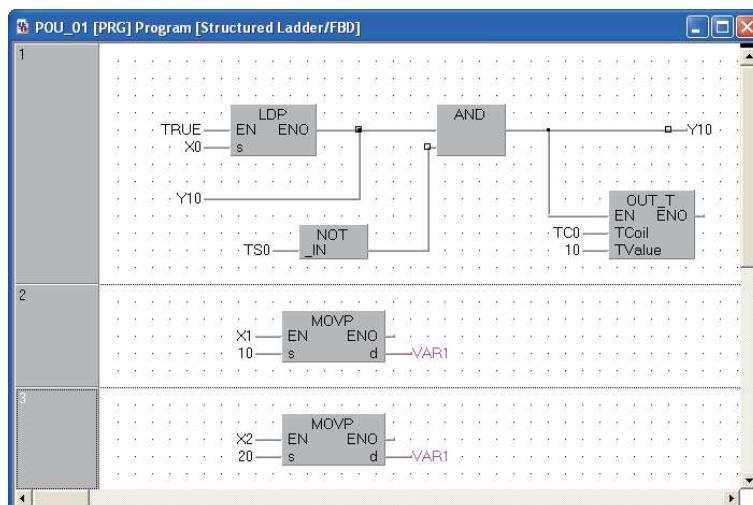
- When X0 turns ON, the programmable controller turns ON Y10, and then turns OFF Y10 1 second later.
- When X1 turns ON, the programmable controller transfers K10 to D0 (which is defined with the LABEL "VAR1").
- When X2 turns ON, the programmable controller transfers K20 to D0 (which is defined with the LABEL "VAR1").

### 3.1.2 Created program

#### ■ In the case of Structured Ladder



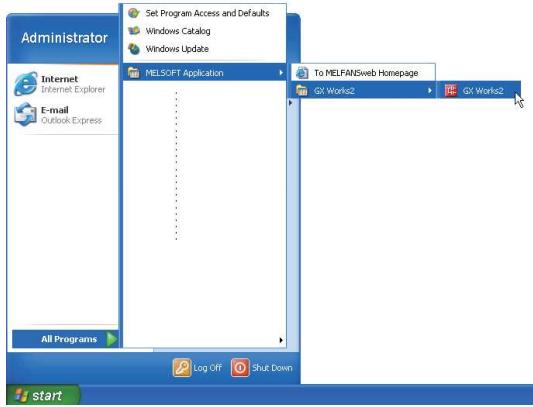
#### ■ In the case of FBD



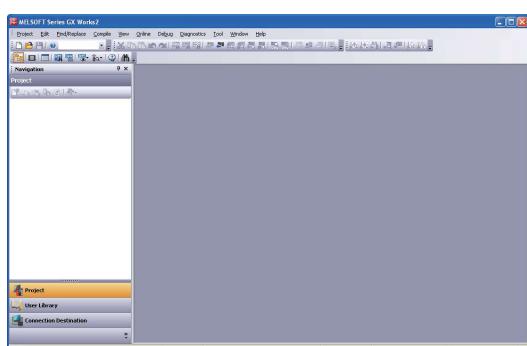
## 3.2 Creating a Project

Create a project using Structured Ladder programs.  
Refer to Section 3.2.8 for creating an FBD program.

### 3.2.1 Starting GX Works2



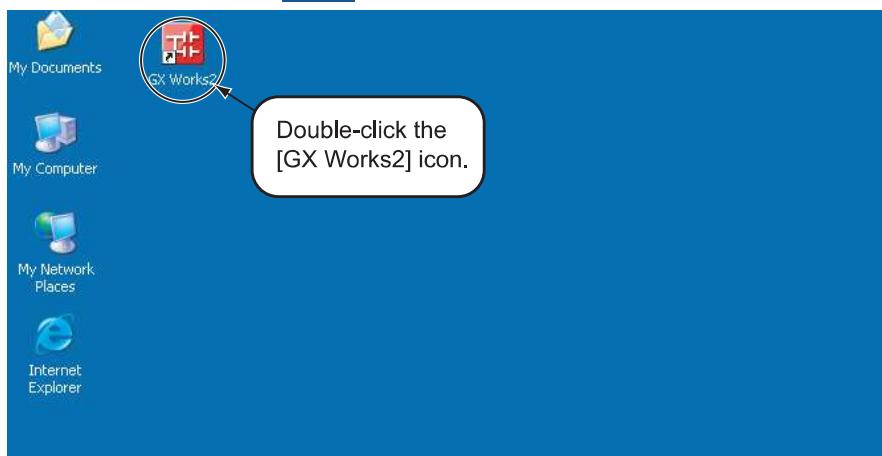
1. Select the software package menu to be started.



2. The selected software package is started.

#### Point

You can double-click the  icon on the desktop to start the software package.

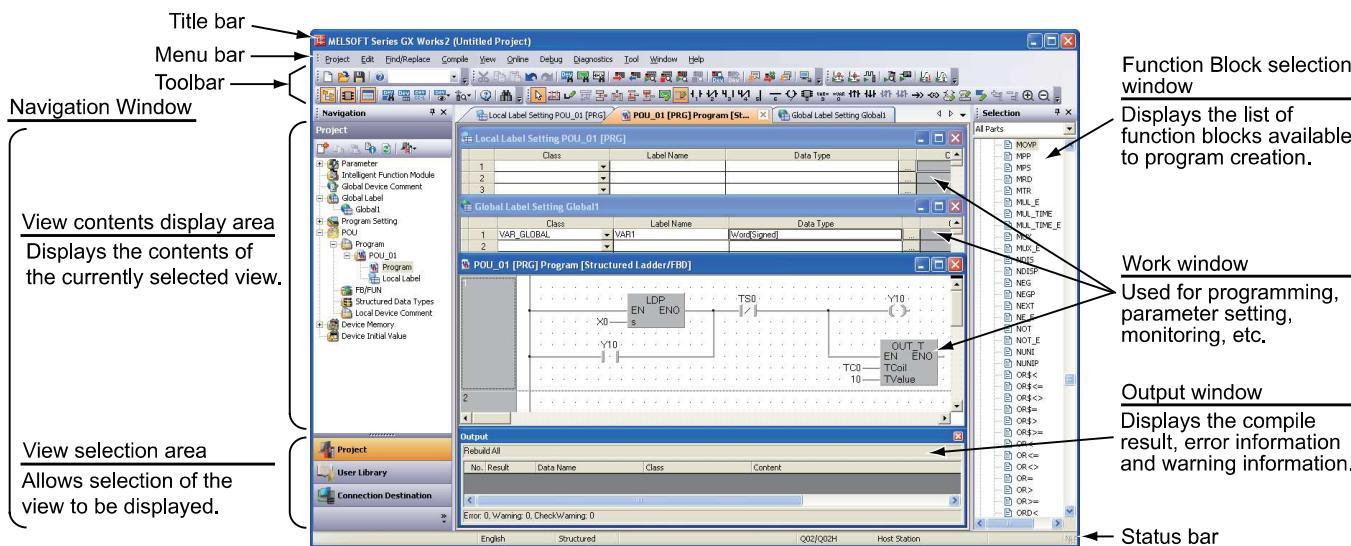


### **3.2.2 Screen configuration in GX Works2**

The GX Works2 screen has the following configuration.

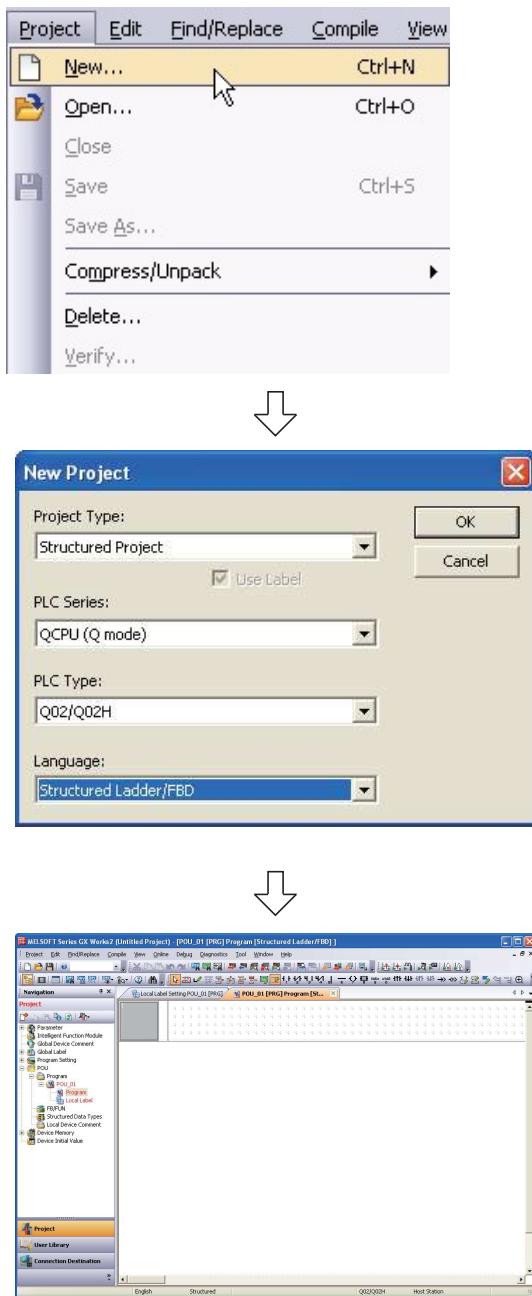
Select "View" or "Hide" in the [View] menu for each of the Toolbar, Status bar, Navigation Window, Function Block Selection window and Output window.

Refer to the following manual for the details on the GX Works2 screen configuration:



### 3.2.3 Creating a new project

At first, create a project.



1. Perform either procedure below to display the New Project screen.

- Select [Project] → [New].
- Click (New).

2. Select the "Project Type", "PLC Series", "PLC Type" and "Language" from the list boxes for the new project to be created.

After the setting, click the button.

#### Settings

- Project Type : Structured Project<sup>\*1</sup>
- PLC Series : QCPU (Q mode)
- PLC Type : Q02/Q02H
- Language : Structured Ladder/FBD

<sup>\*1</sup>: Labels are always available in structured projects. You do not have to check "Use Label".

3. GX Works2 creates a new project.

**Point****Opening an existing project**

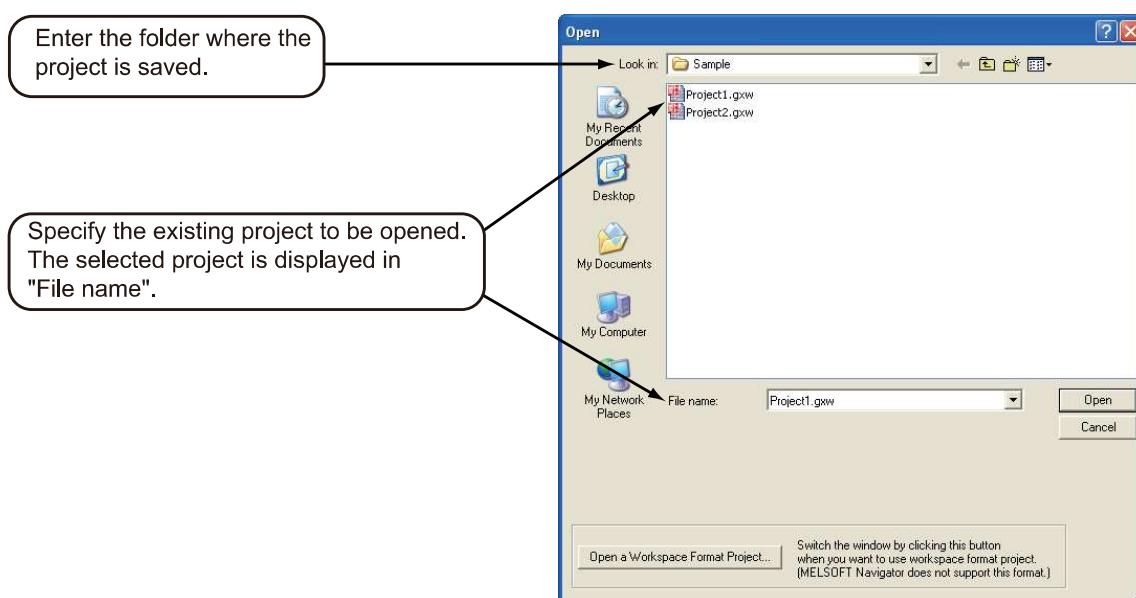
The Opening an existing project function has the single file format and workspace format screens. Refer to the following manual for the details on the existing project opening procedure:

 GX Works2 Version 1 Operating Manual (Common)

1. Perform either operation below.

- Select [Project] → [Open].
- Click  (Open).

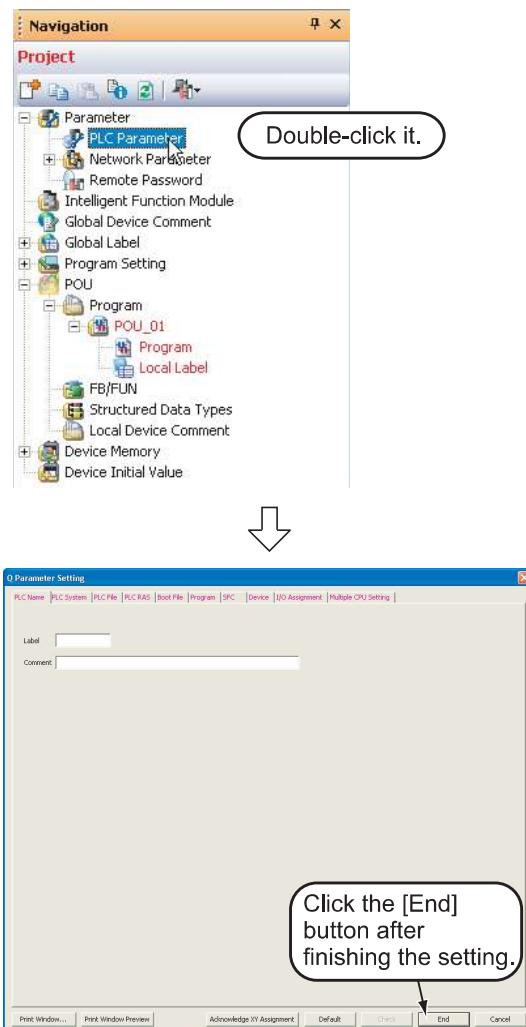
2. The Open Project screen appears.



3. Click the  button to open the selected project.

## 3.2.4 Setting parameters

Set parameters.



1. Double-click "Parameter" → "PLC Parameter" on the Project view to display the Q Parameter Setting screen.

2. Click the **End** button to determine the settings and close the screen.

The parameters remain unchanged from the initial setting in the example in this manual.

Refer to the following manuals for the details on parameter setting:

- ☞ GX Works2 Version 1 Operating Manual (Common)
- ☞ CPU Manual
- ☞ CPU Programming manual
- ☞ Manual of the Network being used

1

OVERVIEW

2

CREATING PROGRAM AND SYSTEM CONFIGURATION

3

CREATING PROGRAM IN STRUCTURED LADDER/FBD LANGUAGE

4

CREATING PROGRAM IN ST LANGUAGE

5

CREATING TWO OR MORE PROGRAM BLOCKS

### 3.2.5 Setting labels

Set Global Labels.



1. Double-click "Global Label" → "Global1" on the Project view to display the Global Label Setting screen.

2. Select the "Class" from the list box on the Global Label Setting screen.

#### Settings

- Class: VAR\_GLOBAL

3. Directly input the "Label Name" on the Global Label Setting screen.

#### Settings

- Label Name: VAR1

#### Restrictions!

##### ● Characters available for the label name

You can enter up to 32 characters as the label name.

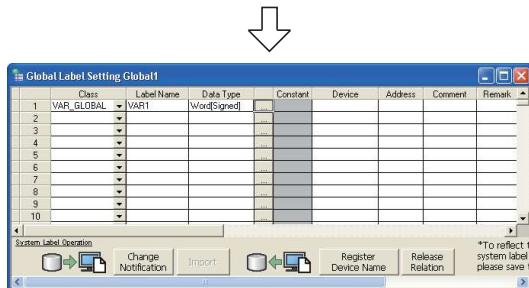
However, note that the following label name will cause a compile error.

- Label name which contains space
- Label name whose first character is a number
- Label name equivalent to a device name

For other characters unavailable for the label name, refer to the following manual.

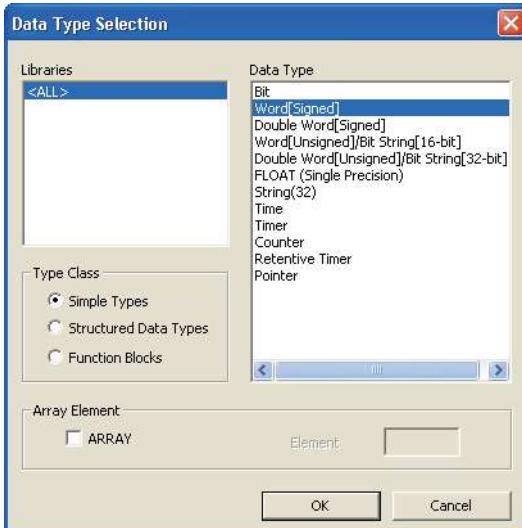
GX Works2 Version 1 Operating Manual (Common)

(To the next page)



### Point

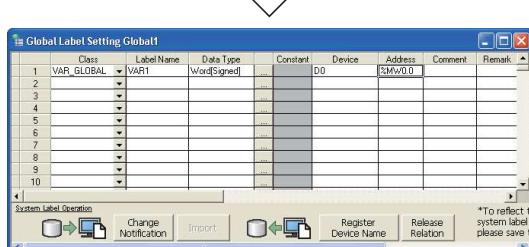
You can click [...] to display the Type Selection screen, and then select the Types on this screen.



4. Directly input the "Date Type" on the Global Label Setting screen.

#### Settings

- Date Type: Word [Signed]



(To the next page)

5. Directly input the "Device" on the Global Label Setting screen.

Inputting "Device" in GX Works2 automatically sets "Address".

In the same way, inputting "Address" automatically sets "Device".

#### Settings

- Device: D0



	Class	Label Name	Data Type	Constant	Device	Address	Comment	Remark
	VAR_GLOBAL	VAR1	Word(Signed)	...	D0	I3M#0.0		
1	▼		...	...				
2	▼		...	...				
3	▼		...	...				
4	▼		...	...				
5	▼		...	...				
6	▼		...	...				
7	▼		...	...				
8	▼		...	...				
9	▼		...	...				
10	▼		...	...				

6. Set the "Constant", "Comment" and "Remark" on the Global Label Setting screen.

"Relation with System Label", "System Label Name" and "Attribute" are not used in examples shown in this manual.

#### Settings

- Constant : When the label class is "VAR\_GLOBAL", you cannot set or change the initial value.
- Comment : No setting
- Remark : No setting

Refer to the following manual for the details on the global label/local label setting procedure:

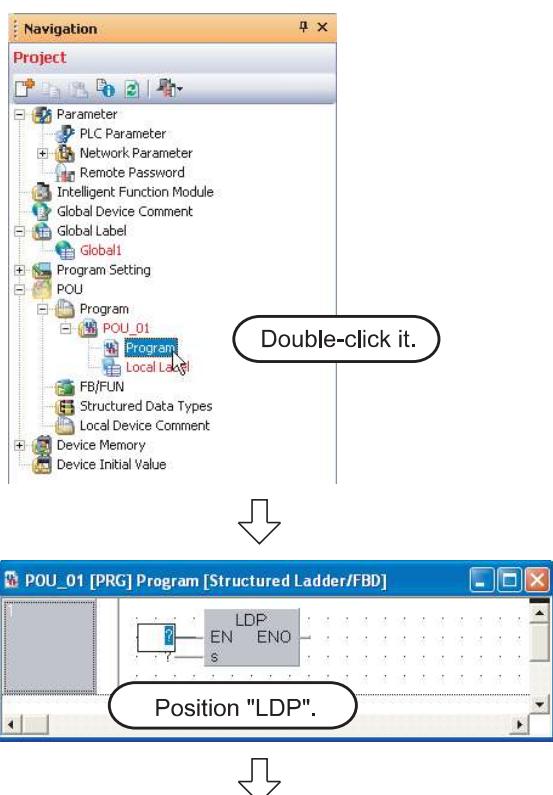
GX Works2 Version 1 Operating Manual (Structured Project)

Refer to the following manual for the details on the programming of global labels and labels:

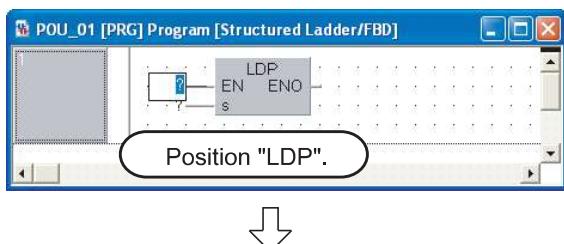
MELSEC-Q/L/F Structured Programming Manual (Fundamentals)

## 3.2.6 Creating a program

Create the Structured ladder/FBD program shown in Section 3.1.2.



1. Double-click "POU" → "Program" → "POU\_01" → "Program" on the Project view to display the POU\_01 [PRG] Program [Structured Ladder/FBD] screen.



2. Drag "Function" → "LDP" from the Function Block Selection window, and drop it on the POU\_01 [PRG] Program [Structured Ladder/FBD] screen to position it there.

**Point**

**Positioning Function and Function block using the Function Block Selection window**

You can easily position Function and Function block by dragging them from the Function Block Selection window.

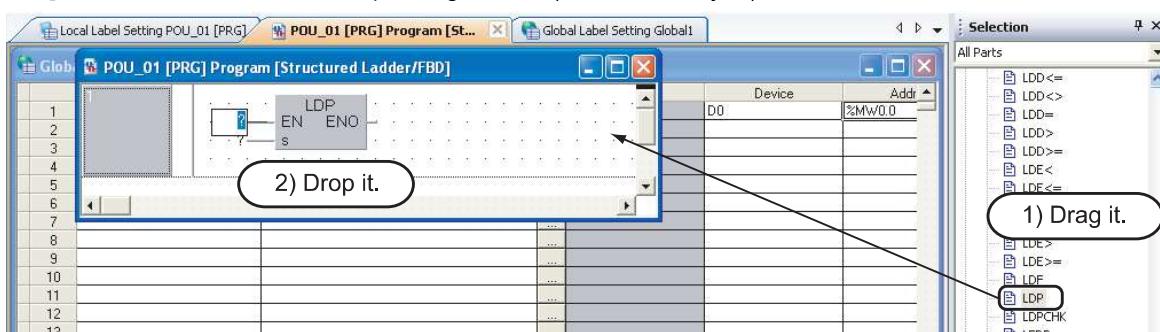
Perform the following procedure to display the Function Block Selection Window:

Select "View" → "Docking window" → "Function Block Selection Window".

In the example below, drag the Function "LDP" from the Function Block Selection window, and drop it on the POU\_01 [PRG] Program [Structured Ladder/FBD] screen to position it there.

Refer to the following manual for the details:

GX Works2 Version 1 Operating Manual (Structured Project)



### Using ladder symbols instead of the Function "LDP (Rising Edge)"

Click (Rising Edge) on the structured ladder/FBD toolbar, and then click a desired location to position the Rising Edge there.

(To the next page)

1

2

OVERVIEW

3

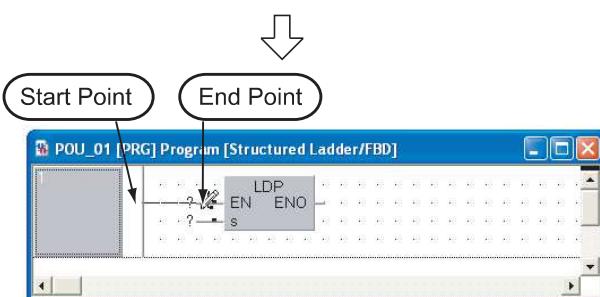
4

5

CREATED PROGRAM AND SYSTEM CONFIGURATION

CREATING PROGRAM IN STRUCTURED LADDER/FBD LANGUAGE

CREATING TWO OR MORE PROGRAM BLOCKS



- Click (Interconnect Mode) on the Structured Ladder/FBD toolbar to specify the Interconnect mode.

Click the start point and end point in this order to draw a grid line as shown left.

(GX Works2 is using the Auto Connect function described in "Point".)

**Point**

Connection with grid line

Connect ladder symbols such as contacts, coils, Function and Function block with grid lines.

Click (Interconnect Mode), and draw a grid line.

Turn ON the Auto Connect function in the interconnect mode to easily draw a grid line only by specifying the start point and end point using the mouse.

Refer to the following manual for the details:

GX Works2 Version 1 Operating Manual (Structured Project)

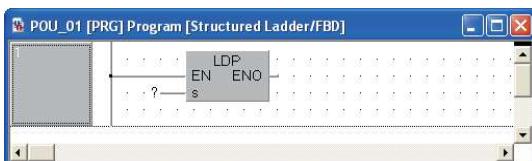
The screenshot shows the GX Works2 interface with a ladder logic program titled "POU\_01 [PRG] Program [Structured Ladder/FBD]". The toolbar at the top has two buttons highlighted with ovals: "Start Point" and "End Point". A large downward arrow is positioned above the toolbar, pointing towards these buttons.

Perform either of the following procedures to turn ON the Auto Connect function.

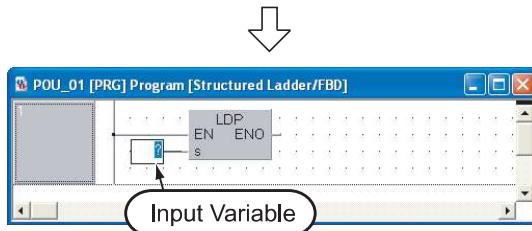
- Select [Edit] → [Auto Connect] to put a check mark.
- Right-click the Structured Ladder/FBD work window to display the menu, and select "Auto Connect" to put a check mark.

The screenshot shows a context menu for the GX Works2 editor. The "Auto Connect" option is highlighted with a yellow oval and labeled "Click it.". Other options in the menu include Undo, Redo, Cut, Copy, Paste, and various modes like Interconnect Mode, Guided Mode, and Select Mode.

- Click (Select Mode) on the Structured Ladder/FBD toolbar to specify the Select mode.



(To the next page)



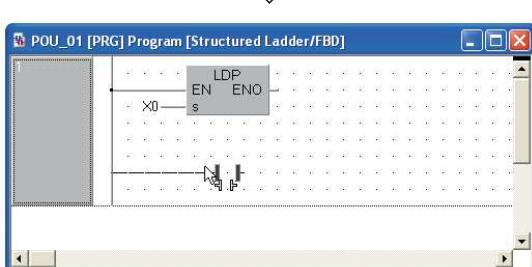
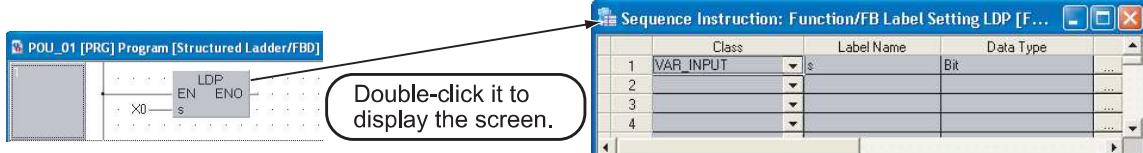
### Point

#### Referring to the data type of input/output labels in a Function or Function block

Double-click a positioned function or function block to display the Function/FB Label Setting screen where you can refer to the data type of labels.

Refer to the following manual for the details:

GX Works2 Version 1 Operating Manual (Structured Project)



- Set the function "LDP".
- Click the input variable "?" of "s", and set the input variable.  
**Settings**
  - s: X0
- Click (Open Contact) on the Structured Ladder/FBD toolbar, and then move the cursor to a desired position to display an open contact there. Click the open contact to connect it with the left bus line and enable setting of a variable. (GX Works2 is using the Auto Connect function described in "Point".)

### Settings

- Variable: Y10

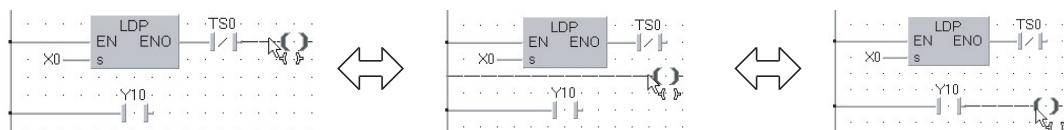
### Point

#### Automatic connection with grid lines

While the Auto Connect function is ON, you can easily connect network elements such as contacts and coils with connection points on the right side of left bus lines, vertical grid lines, contacts, coils, functions and function blocks.

Refer to the following manual for the details.

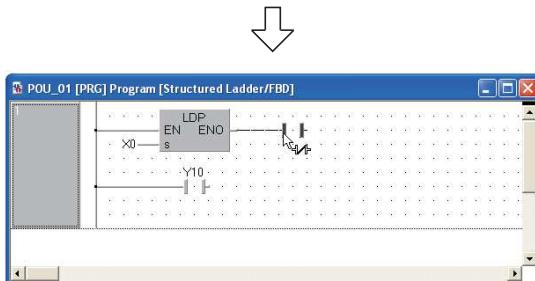
GX Works2 Version 1 Operating Manual (Structured Project)



Select a connection point by moving the cursor, and click there to automatically connect the connection point.

For avoiding automatic connection, lay out network elements while pressing and holding the button.

(To the next page)



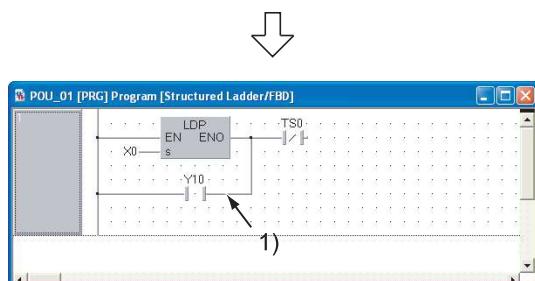
7. Click (Close contact) on the Structured Ladder/FBD toolbar, and then move the cursor to a desired position to display a close contact there.

Click the close contact to connect it with a function of the LDP and enable setting of a variable.

#### Settings

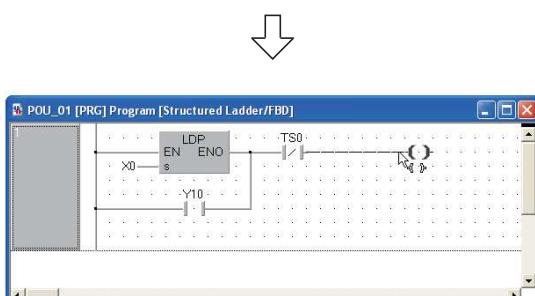
- Variable: TS0<sup>\*1</sup>

\*1: "TS0" indicates a contact of the timer T0.



8. Draw a grid line on the left figure (position 1) using the procedure described in the step 3.

After drawing grid lines, click (Select Mode) on the Structured Ladder/FBD toolbar to specify the Select mode.



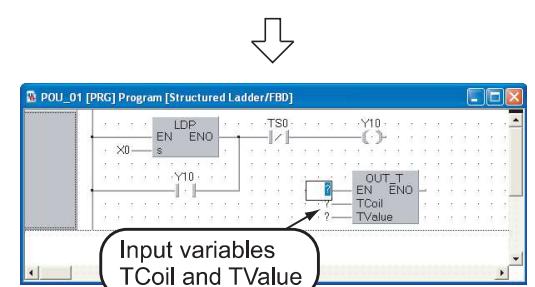
9. Click (Coil) on the Structured Ladder/FBD toolbar, and then move the cursor to a desired position to display a coil there.

Click the coil to connect it with the close contact "TS0" and enable setting of a variable.

After drawing grid lines, click (Select Mode) on the Structured Ladder/FBD toolbar to specify the Select mode.

#### Settings

- Variable: Y10



10. Select "Function" → "OUT\_T" on the Function Block Selection window, drag it, and drop it in a desired position to position "OUT\_T" there.

Click "?" of "TCoil"<sup>\*1</sup> and "TValue"<sup>\*2</sup>, and set the input variables.

#### Settings

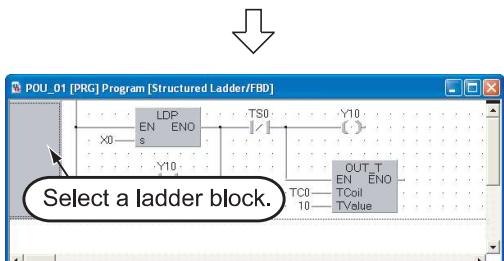
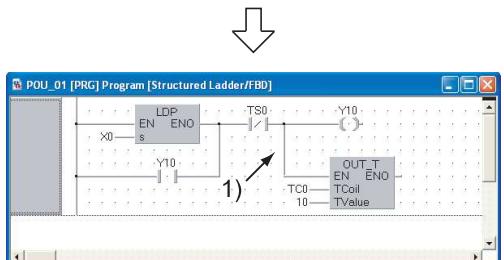
- TCoil : TC0<sup>\*3</sup>
- TValue : 10

\*1: Set a coil of the timer to "TCoil".

\*2: Set the set value of the timer to "TValue".

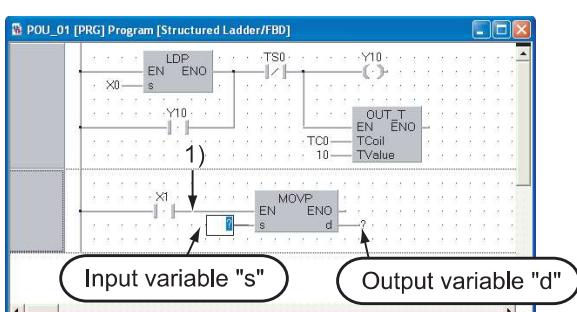
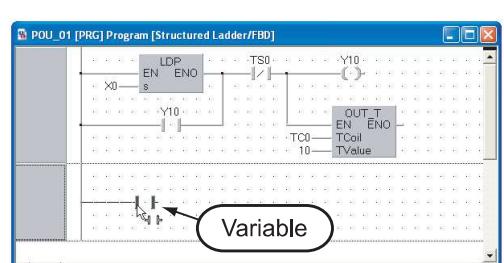
\*3: "TC0" indicates a coil of the timer T0.

(To the next page)



### Point

Create a one Structured Ladder program in one ladder block.



(To the next page)

**11.** Draw a grid line (1) using the procedure described in the step 3.

- After drawing a grid line, click (Select Mode) on the Structured Ladder/FBD toolbar to specify the Select mode.

**12.** Select a ladder block, and click (New Ladder Block After) on the Structured Ladder/FBD toolbar to add a ladder block.

**13.** Click (Open Contact) on the Structured Ladder/FBD toolbar, and then move the cursor to a desired position to display an open contact there.

Click the open contact to connect it with the left bus line and enable setting of a variable.

#### Settings

- Variable: X1

**14.** Select "Function" → "MOVP" on the Function Block Selection window, drag it, and drop it in a desired position to position "MOVP" there.

Draw a grid line on the left figure (position 1) using the procedure described in the step 3.

Click "?" of "s" and "d", and set the input and output variables.

#### Settings

- s: 10
- d: VAR1<sup>\*1</sup>

\*1: The label VAR1 is set in Section 3.2.5.


**Point**

Selecting a label from the Label Registration/Selection screen

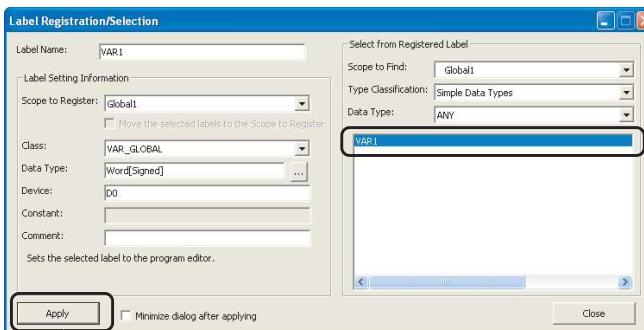
You can input a label also by selecting it from the Label Registration/Selection screen.

Perform the following procedure to display the Label Registration/Selection screen.

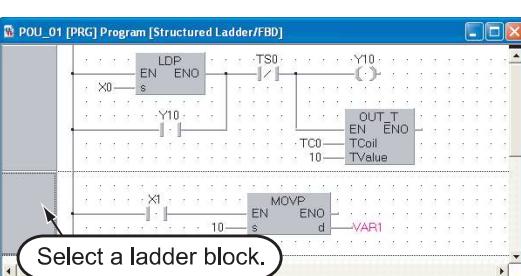
- Select "Edit" → "List Operands".
- Click (List Operands).

Refer to the following manual for the details on the Label Registration/Selection screen:

GX Works2 Version 1 Operating Manual (Structured Project)



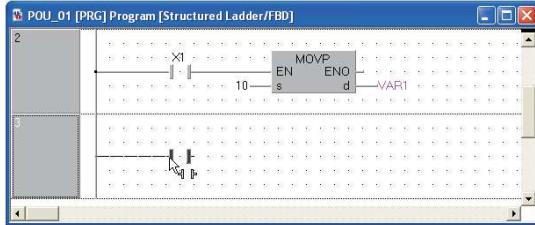
- 2) Click the Apply button to set the selected.



15. Select a ladder block, and click (ADD Ladder Block After) on the Structured Ladder/FBD toolbar to add a ladder block.



(To the next page)

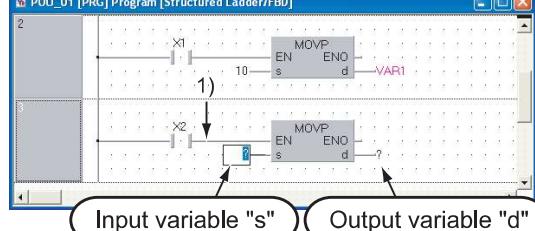


- 16.** Click (Open Contact) on the Structured Ladder/FBD toolbar, and then move the cursor to a desired position to display an open contact there.

Click the open contact to connect it with the left bus line and enable setting of a variable.

#### Settings

- Variable: X2



- 17.** Select "Function" → "MOVP" on the Function Block Selection window, drag it, and drop it in a desired position to position "MOVP" there.

Draw a grid line on the left figure (position 1) using the procedure described in the step 3.

Click "?" of "s" and "d", and set the input and output variables.

#### Settings

- s: 20
- d: VAR1<sup>\*1</sup>

\*1: The label VAR1 is set in Section 3.2.5.

(To the next page)

1  
OVERVIEW

2

3

4

5

CREATED PROGRAM AND SYSTEM CONFIGURATION

CREATING PROGRAM IN STRUCTURED LADDER/ FBD LANGUAGE

CREATING PROGRAM IN ST LANGUAGE

CREATING TWO OR MORE PROGRAM BLOCKS

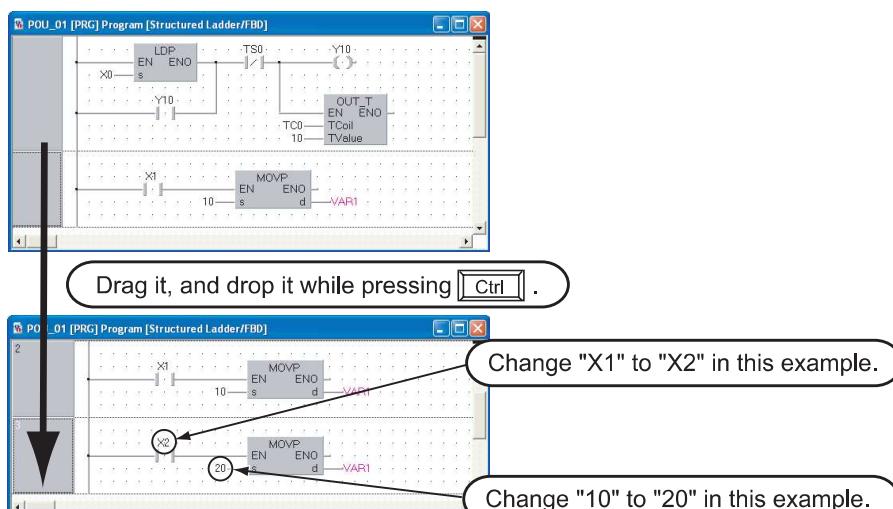


### Point

#### Copying a ladder block by drag & drop

When there is a similar ladder block, you can create a new ladder block efficiently by copying the existing similar ladder block and editing necessary portions.

Drag an existing ladder block, and drop it while pressing the **Ctrl** key to copy the existing ladder block.



#### Changing over the device display format

You can check a program by changing over the device display format between "Device" and "Address". Switch the device display format after performing compiling or compiling all when using local labels. Refer to the following section for compiling:

##### 3.2.7 Compiling a program

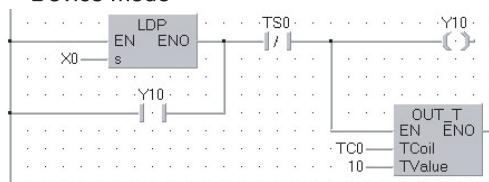
###### ● Procedure to display Device

Select [View] → [View Mode] → [Device].

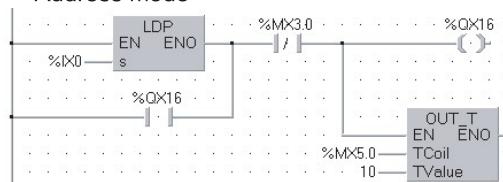
###### ● Procedure to display Address

Select [View] → [View Mode] → [Address].

< Device mode >



< Address mode >



#### Displaying labels and devices at the same time

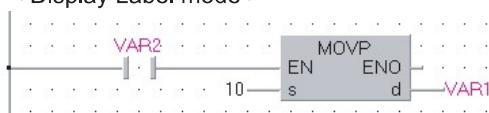
You can display devices also in the label display mode by adding an optional setting.

Select [Tool] → [Options] to display the Options screen.

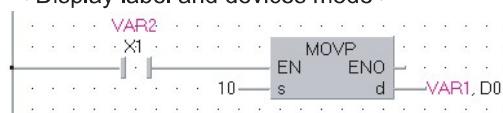
On the Options screen, select "Program Editor" → "Structured Ladder/FBD" → "Label", and check "Display label and devices".

In the example below, "X1" and "D0" are labels.

< Display Label mode >



< Display label and devices mode >



## 3.2.7 Compiling a program

There are two types of compiling shown below. The compile target is different between the two types. Select "Rebuild All" here.

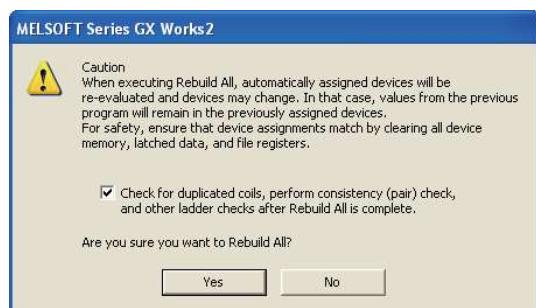
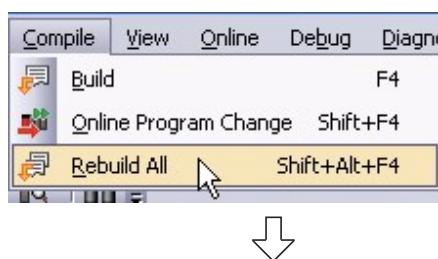
The "Rebuild All" procedure is described below.

Refer to the following manual for compiling:

 GX Works2 Version 1 Operating Manual (Structured Project)

Table 3.1 Compiling type and target program

	<b>Target program to be compiled</b>
Build	Converts non-compiled program blocks among program blocks registered in the task into sequence program. (Does not compile already compiled program blocks.)
Rebuild All	Converts all program blocks registered in the task into sequence program. (Compiles already compiled program blocks also.)



1. Select [Compile] → [Rebuild All] to execute "Rebuild All".

You can click  (Rebuild All) to execute "Rebuild All".

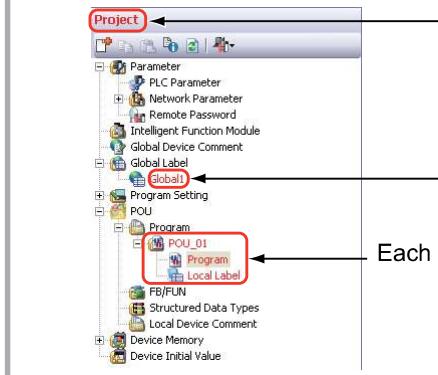
2. The screen shown on the left appears.

Click the  button to execute "Rebuild All". If an error is detected, the Output window is displayed.

### Point

- Make sure to compile the created or edited program to make it a sequence program executable in the programmable controller CPU.
- "Warning C9062" is compiled correctly as a program, and can be monitored.
- Compile status checking method

You can check the compile status on the Project view.



### 3.2.8 Creating an FBD program

Create an FBD program using the same procedure for Structured Ladder programs without using left power rail on the left for Structured Ladder.

Display or hide left power rail by selecting [Edit] on the menu bar, selecting [Ladder Symbol], and clicking [Left Power Rail].

Or hide Left Power Rail by clicking  on the Structured Ladder/FBD tool bar.

Refer to 3.1.2 for an FBD program.

#### Point

##### Displaying or hiding left power rail

- Even while left power rail are displayed, you can create an FBD program by ignoring left power rail.
- If you try to delete a left power rail to which a function, etc. is already connected, the left power rail is not deleted.  
Delete a connection to the left power rail first, and then delete the left power rail.
- It is not possible to create programs in the symbolic expression using FBD.  
When using FBD, create programs in the functional expression using functions and operators.

##### Creating two or more ladders in one ladder block

When creating an FBD program, you can create two or more ladders in one ladder block. In this case, a warning is displayed during compiling.

It is possible to hide this warning by adding an optional setting.

Select [Tool] → [Options] to display the Options screen.

On the Options screen, select "Compile" → "Output Result" → "Disable Warning Codes", enter "C2034", and click the  button →  button.

## 3.3 Writing a Project to the programmable controller

Write a project to the programmable controller CPU.

### 3.3.1 Connecting the personal computer to the programmable controller

Connect the personal computer and a programmable controller with a cable, and set the connection channel.

#### ■ Connecting the personal computer to the programmable controller

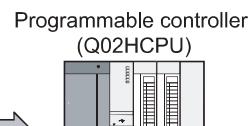
Make sure to turn OFF the power of all units before connecting the personal computer to the programmable controller CPU.

Refer to the following manual for the details on setting when using another channel or using the FXCPU for connection.

Notebook personal computer



USB Cable



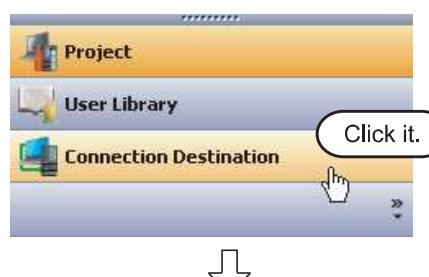
Programmable controller  
(Q02HCPU)

#### ■ Setting the Transfer Setup

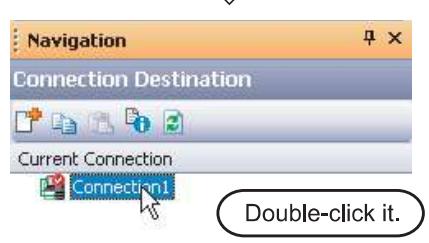
Set the channel to connect the personal computer to the programmable controller CPU (Q02HCPU) with a USB cable.

Refer to the following manual for the details on setting when using another channel or using the FX CPU for connection.

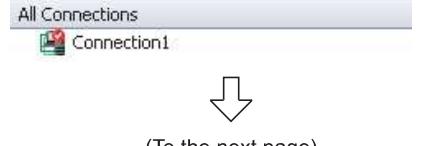
GX Works2 Version 1 Operating Manual (Common)



1. Click "Connection Destination" in the view selection area on the Navigation window to display the Connection Destination view.

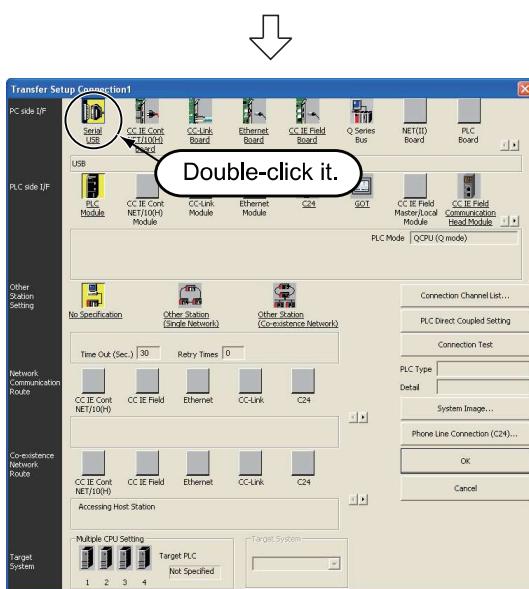


2. Double-click "Connection1" in the Current Connection on the Connection Destination view to display the Transfer Setup screen.

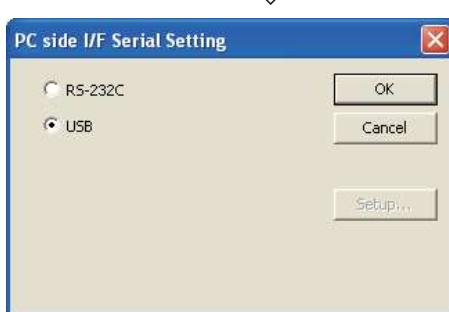


(To the next page)

### 3 CREATING PROGRAM IN STRUCTURED LADDER/FBD LANGUAGE



3. Double-click (Serial USB) in "PC side I/F" to display the PC side I/F Serial setting screen.

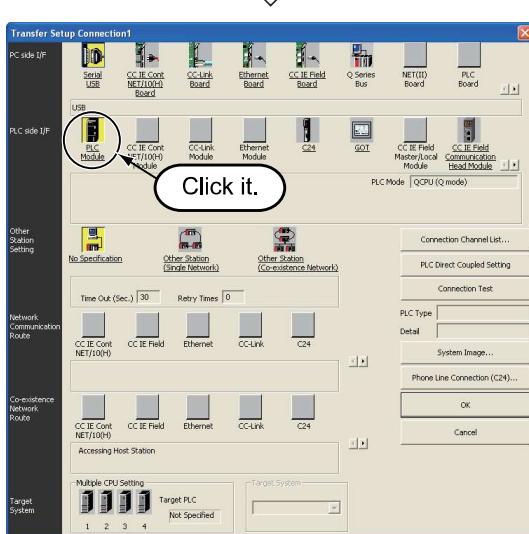


4. Set the PC side I/F.

After the setting, click the button to complete the setting and close the screen.

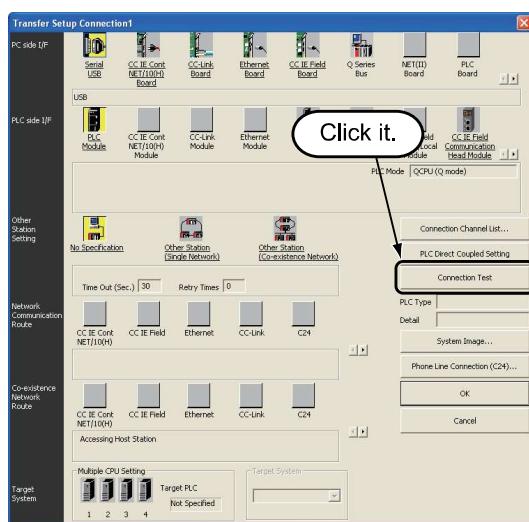
#### Settings

- Select "USB".

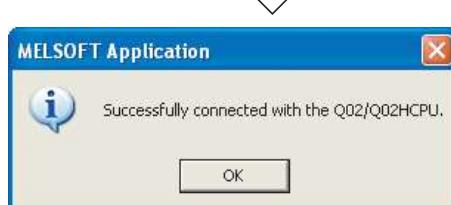


5. Click (PLC Module) in "PLC side I/F" to select the interface to be used.

(To the next page)

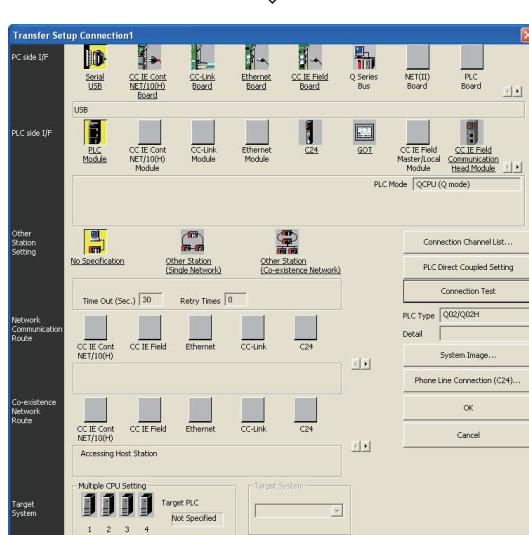


6. Click the **Connection Test** button to execute a communication test with the programmable controller through the specified connection channel.



7. When communication with the programmable controller is finished normally, the left screen appears, and the "PLC Type" field screen the programmable controller CPU model name.

Click the **OK** button to close the screen.  
If communication with the programmable controller has failed, the screen below appears.  
Check the connection destination, connection cable, etc.



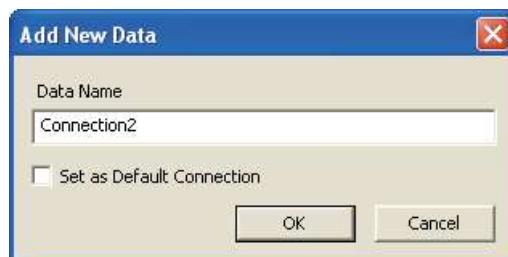
8. Click the **OK** button to finish "Transfer Setup" and close the screen.

**Point**

- You can set two or more connection destinations and change them over if there are two or more connection destinations.



- Select "Connection1" in the Current Connection on the Connection Destination view, right-click it, and then select the menu item "Add New Data". The Add New Data screen will appear.



- Set "Data Name", and uncheck "Set as Default Connection". Click the **OK** button to display the newly created connection destination in "All Connections" on the Connection Destination view.

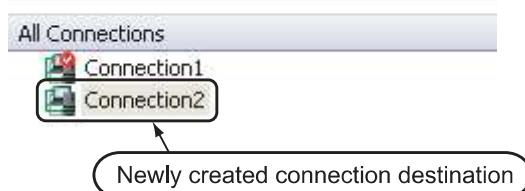
**Settings**

- Data Name : Connection2
- Set as Default Connection: Unchecked



- Set the connection destination. Double-click "Connection2" in "All Connections" to display the Transfer Setup screen.

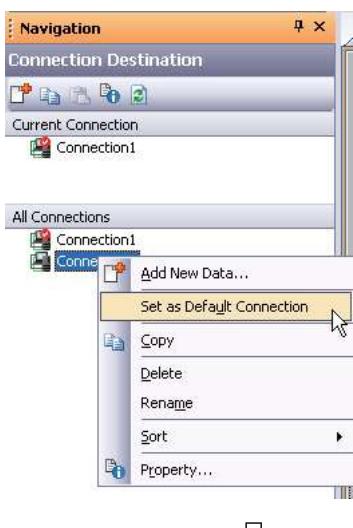
3.3.1 Step3 in the Setting the Transfer Setup



- For selecting the newly created connection destination, check "Set as Default Connection" while creating the data, or set the newly created connection destination as the default connection destination as described below.

Then, the newly created connection destination will be selected as the connection destination for communication with the programmable controller CPU (for "Read from PLC", "Write to PLC", etc).

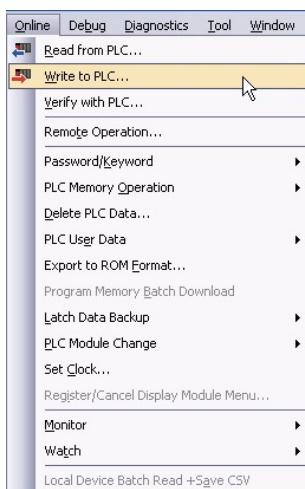
- Select "Connection2" in the All Connections on the Connection Destination view, right-click it, and then select the menu item "Set as Default Connection".



- The connection destination set as the default connection destination is displayed in "Current Connection" on the Connection Destination view.

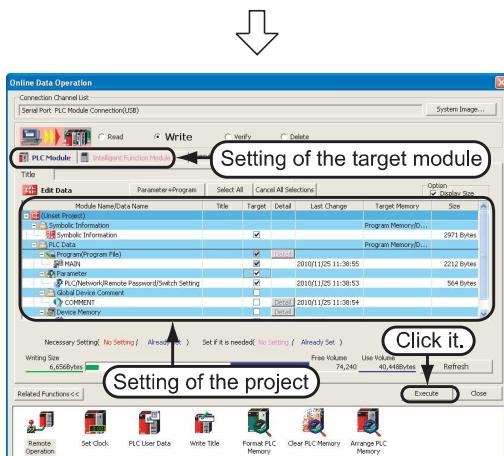
### 3.3.2 Writing a project to the programmable controller

Write the project data to the programmable controller CPU set as the connection destination in Section 3.3.1.



1. Select "Online" → "Write to PLC" to display the Online Data Operation screen.

You can click (Write to PLC) to display the Online Data Operation screen.



2. Set the "Target module" and "Target project" on the Online Data Operation screen.

After the setting, click the Execute button.

#### Setting of the target module

- Target module: Select <<PLC Module>>

#### Setting of the project

- Symbolic Information : Select "Program Memory/Device Memory" in "Target Memory", and check "Symbolic Information" in "Target".  
"Program (Program File)" and "MAIN" are checked in "PLC Data", and change into gray.  
"Symbolic Information" contains program files and variables.
- PLC Data : Select "Program Memory/Device Memory" in "Target Memory", and check "PLC/Network/Remote Password/Switch Setting" in "Target". Do not check "Global Device Comment" or "Device Memory".



(To the next page)

## Restrictions

### In the case of FXCPU

- The symbolic information is displayed only in the FX3U and FX3UC Series version 3.00 or later.
  - In the case of structured project, data can be read from the FXCPU only in the FX3U and FX3UC Series version 3.00 or later.
- When data cannot be read from the FXCPU, carefully store projects written in the programmable controller.



### 3. The left screen is displayed.

Click the **Yes** button to write the project (program).

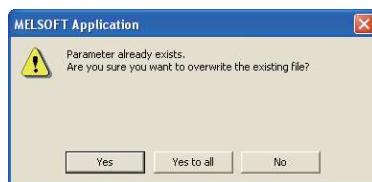
## Point

If a program or parameters already exist in the programmable controller, the following screen appears.

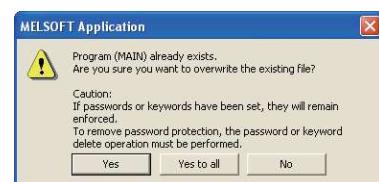
Click the **Yes** or **Yes to all** button to overwrite the existing program or parameters.

When you click the **Yes to all** button, GX Works2 overwrite the existing program or parameters without displaying the overwrites confirmation screen for other data.

When parameters already exist



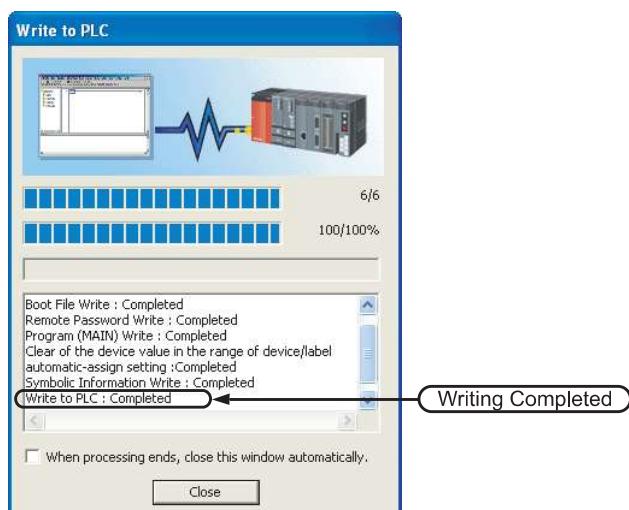
When a program already exists



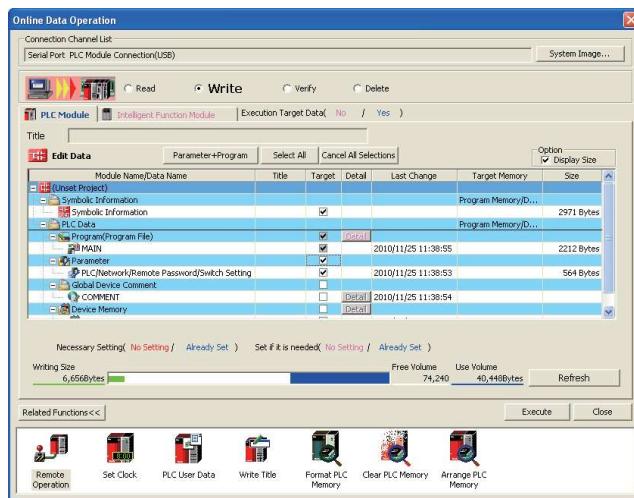
### 4. The left screen is displayed during writing.

When writing is finished, "Write to PLC: Completed" appears.

Click the **Close** button to close the Write to PLC screen.



(To the next page)



5. Click the **Close** button to close the Online Data Operation screen.

## 3.4 Monitoring Operations

Execute "Monitor" to check the operations.

In some monitor screen display examples, colors are changed for the convenience of printing.

GX Works2 has the function to simulate programmable controller operations in the offline mode.

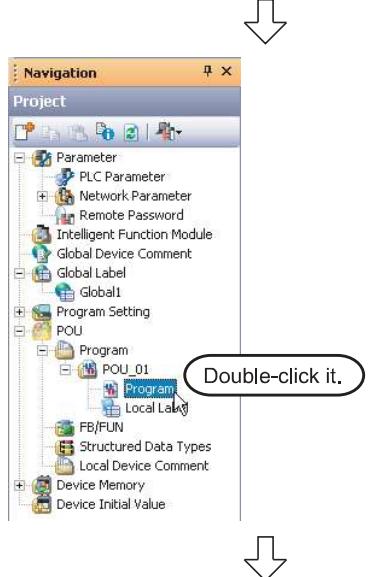
Refer to the following manual for the simulation function:

 GX Works2 Version 1 Operating Manual (Common)

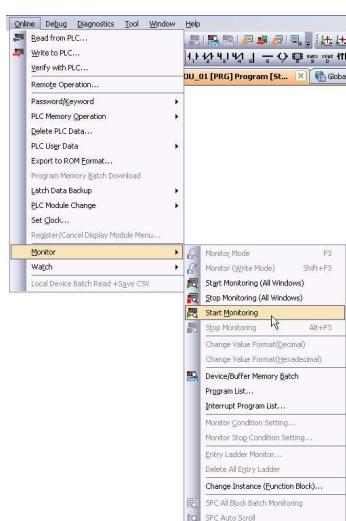
### 3.4.1 Monitoring a program



1. Click "Project" in the view selection area on the Navigation window to display the Project view.



2. Double-click "POU" → "Program" → "POU\_01" → "Program" on the Project view to display the POU\_01 [PRG] Program [Structured Ladder/FBD] screen.



3. Select [Online] → [Monitor] → [Start Monitoring] to switch the POU\_01 [PRG] Program [Structured Ladder/FBD] screen to the monitoring status.

You can also click  (Start Monitoring) to switch the POU\_01 [PRG] Program [Structured Ladder/FBD] screen to the monitoring status.

4. Set the programmable controller CPU to RUN. Set the RUN/STOP switch on the programmable controller CPU to "RUN".

(To the next page)

### Point

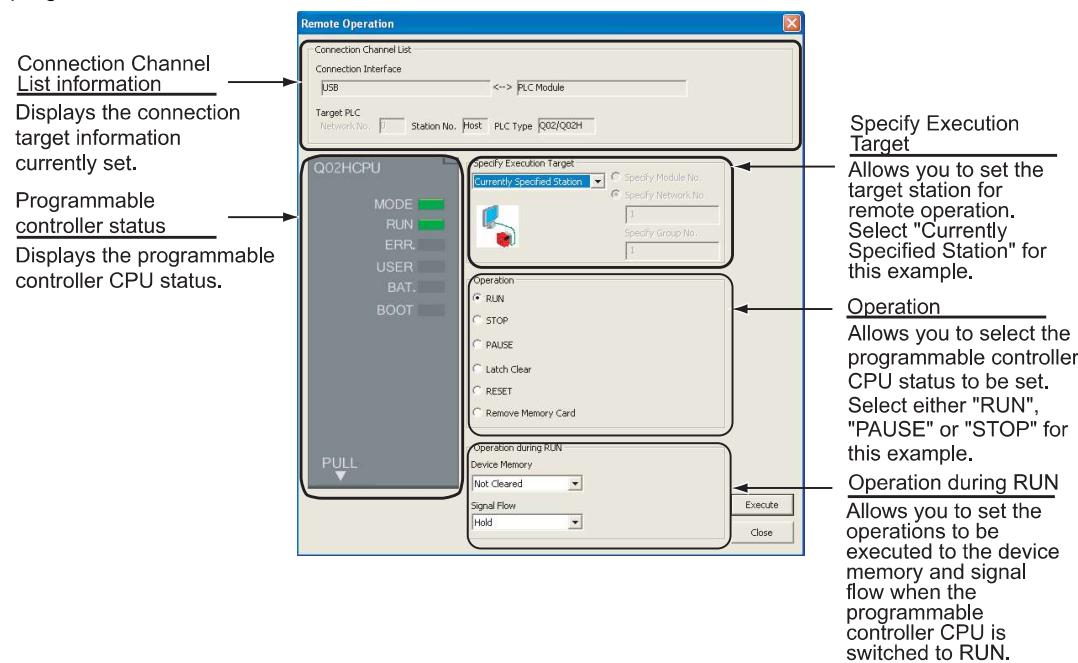
You can switch the programmable controller status between "RUN" and "STOP" using remote operation as follows.

The Settings of the remote operation may vary depending on the programmable controller used.

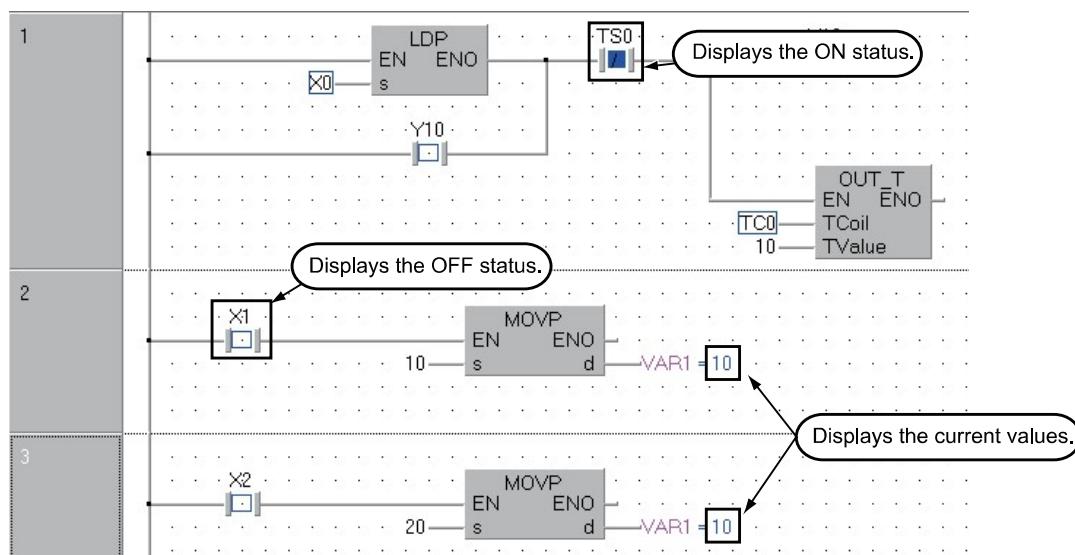
Refer to the following manual for the details on the remote operation:

 GX Works2 Version 1 Operating Manual (Common)

Select [Online] → [Remote Operation] to display the Remote Operation screen. You can switch the programmable controller status between "RUN" and "STOP" on this screen.



### Monitor status display example



(To the next page) 

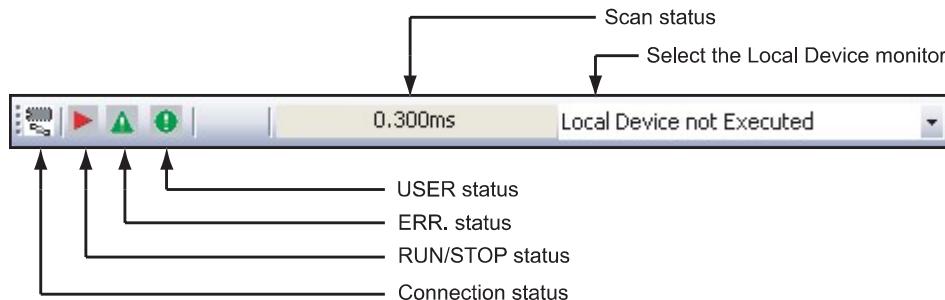
## Point

### Monitor status

GX Works2 displays the Monitor status while it is executing the work window monitor.

The Monitor status disappears when GX Works2 stops all types of monitoring.

The Monitor status indicates the programmable controller CPU, simulator scan time, RUN/STOP status, etc.



Refer to the following manual for the Monitor status:

GX Works2 Version 1 Operating Manual (Common)

### Monitor status display

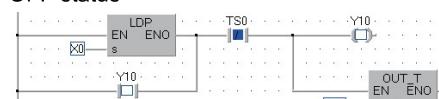
#### ● Display of bit value status (ON/OFF status)

GX Works2 displays the ON/OFF status (bit values) of contacts, coils, etc. as the ON/OFF status of devices and labels.

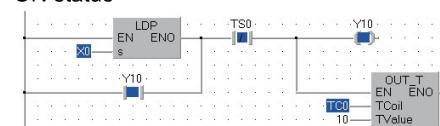
Refer to the following manual for the bit value ON/OFF status display:

GX Works2 Version 1 Operating Manual (Common)

OFF status



ON status



#### ● Display of contents status (current value) other than bit values

GX Works2 displays the current values (of non-bit devices for) of contacts, coils, etc. and the contents of character strings as shown below.



#### ● Switching of the current value display between decimal and hexadecimal

You can switch the current value display between decimal and hexadecimal using the following operations.

##### Operation to switch the current value display to decimal

Select [Online] → [Monitor] → [Change Value Format (Decimal)].

##### Operation to switch the current value display to hexadecimal

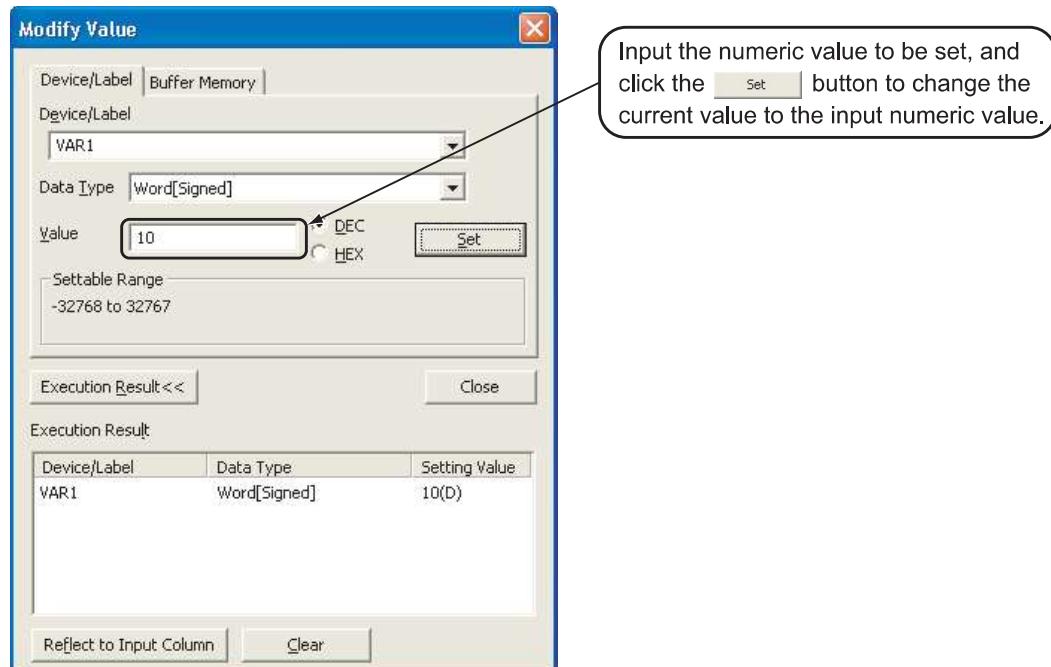
Select [Online] → [Monitor] → [Change Value Format (Hexadecimal)].

**Test operation****● Forcing a contact ON/OFF**

Double-click a monitored device or label while pressing the **Shift** key to force a device in the programmable controller ON/OFF.

**● Changing the current value of a word device**

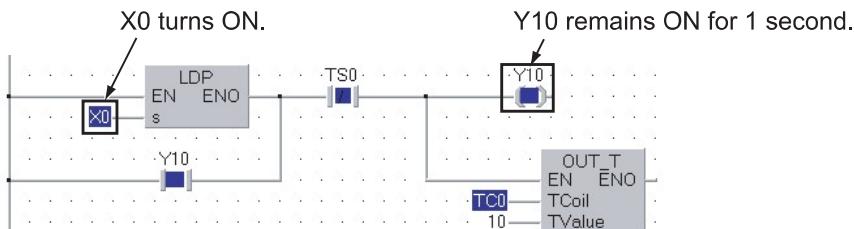
Double-click a monitored word device to display the Modify Value screen where you can change the current value.



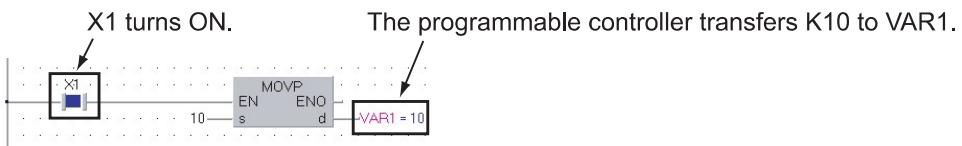
- 5.** Turn ON inputs X0, X1 and X2 in the programmable controller, and check the following operations.

You can turn ON inputs X0, X1 and X2 using the test operation above.

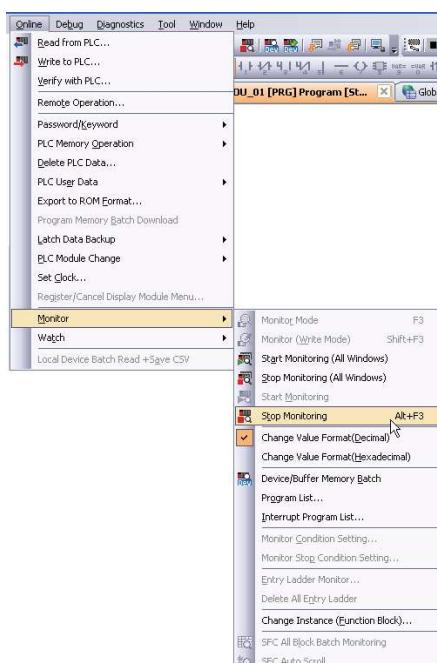
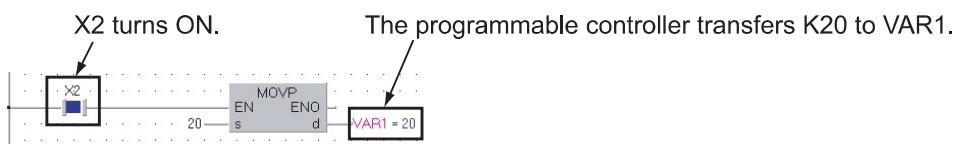
- When X0 turns ON, the programmable controller turns ON Y10, and then turns OFF Y10 1 second later.



- When X1 turns ON, the programmable controller transfers K10 to VAR1 (device: D0).



- When X2 turns ON, the programmable controller transfers K20 to VAR1 (device: D0).



- 6.** Select [Online] → [Monitor] → [Stop Monitoring] to reset the monitor status of the POU\_01 [PRG] Program [Structured Ladder/FBD] screen.

You can click (Stop Monitoring) to reset the monitor status of the POU\_01 [PRG] Program [Structured Ladder/FBD] screen.

- 7.** Set the programmable controller CPU to STOP.

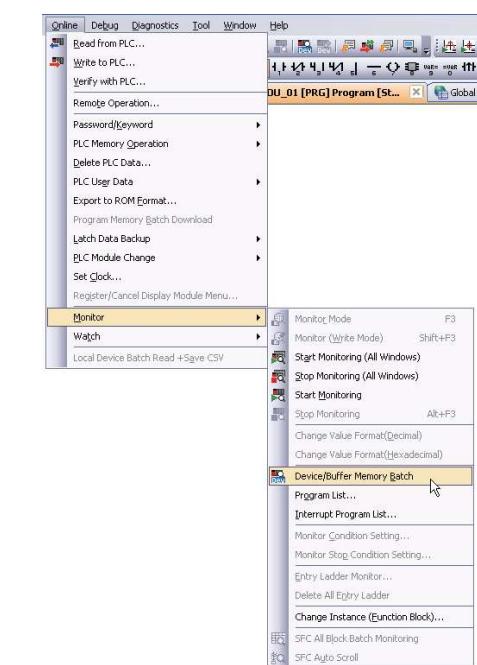
Set the RUN/STOP switch on the programmable controller CPU to "STOP".

You can switch the programmable controller status between "RUN" and "STOP" using remote operation.

For the remote operation, refer to the following.

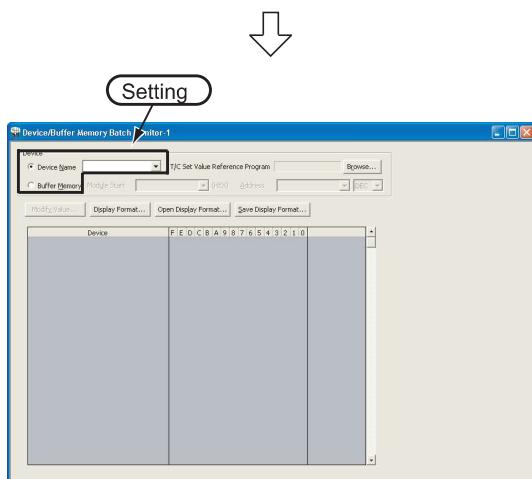
"Point" in the step4

### 3.4.2 Batch monitoring of device values



1. Select [Online] → [Monitor] → [Device/Buffer Memory Batch] to display the Device/Buffer Memory Batch Monitor screen.

Or click (Device/Buffer Memory Batch Monitor) to display the Device/Buffer Memory Batch Monitor screen.



2. Set a device to be monitored.  
Select D0 in this example.

#### Setting of "Device"

- Device : Select "Device Name".
- Device Name : D0

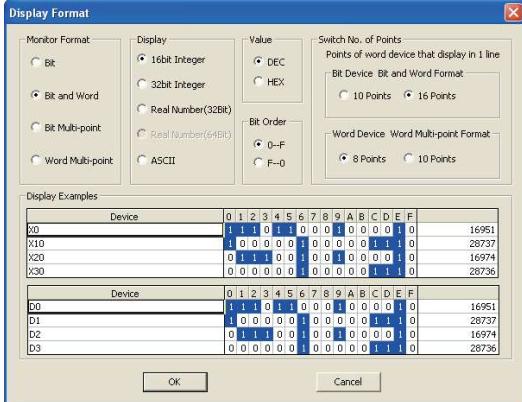
3. Click the **Display Format...** button to display the Display Format screen.

#### Restrictions!

Set a device/address to be monitored.  
Label Name is not available.



(To the next page)



4. Set the Display Format of the device to be monitored.

#### Setting on the Display Format screen

- Monitor Format : Bit and Word
- Display : 16 bit Integer
- Value : DEC
- Bit Order : 0-F
- Switch No. of Points : Bit Device Bit and Word Format 16 Points

After the setting, click the **OK** button to close the Display Format screen.

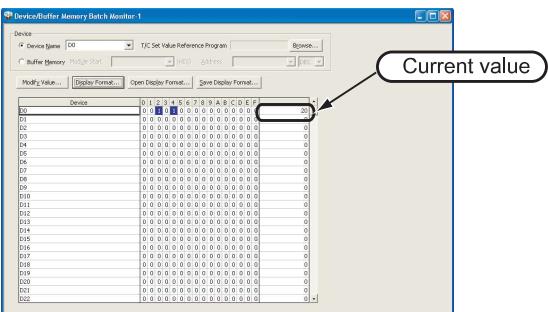
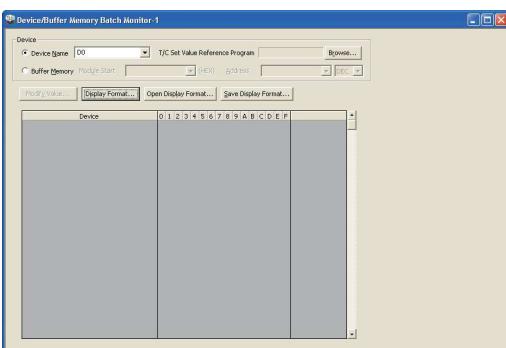
Refer to the following manual for the details on Display Format.

GX Works2 Version 1 Operating Manual (Common)

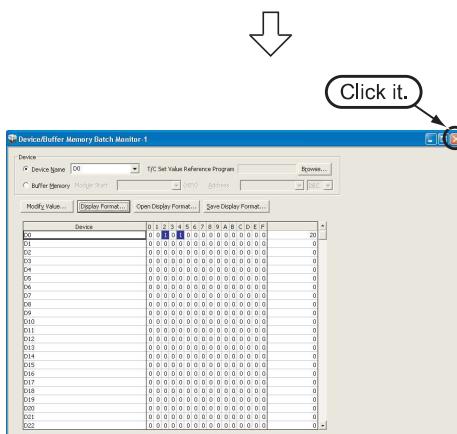


- You can save the contents set on the Display Format screen.

When the monitoring screen is opened again, the contents set previously on the Display Format screen will not be displayed. (The default setting will be displayed.) To display the previous setting, you can save the setting to a file, and read the file. To save the setting, click Save Display Format on the Device/Buffer Memory Batch Monitor screen. To read the saved setting, click Open Display Format on the Device/Buffer Memory Batch screen Monitor.



(To the next page)

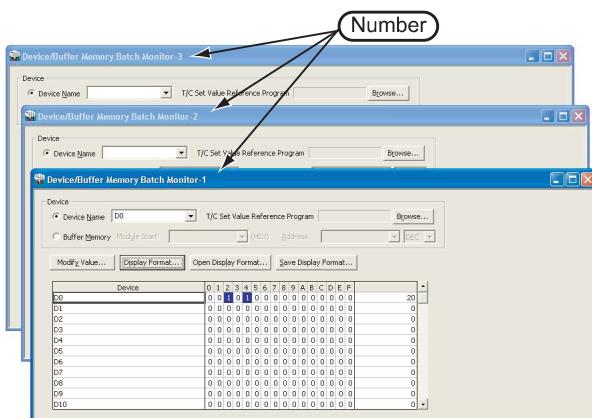


8. Click  on the screen to close the Device/Buffer Memory Batch Monitor screen.
9. Set the programmable controller CPU to STOP.  
Set the RUN/STOP switch on the programmable controller CPU to "STOP".  
You can switch the programmable controller status between "RUN" and "STOP" using remote operation.  
For the remote operation, refer to the following.

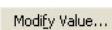
 "Point" in the 3.4.1

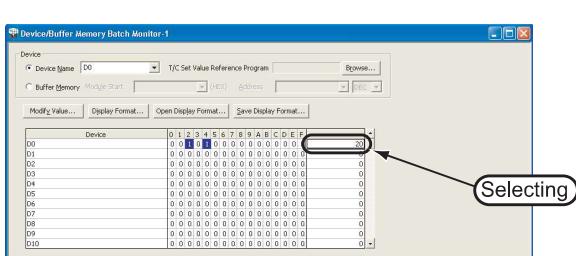
### Point

- Opening two or more Device/Buffer Memory Batch Monitor screens  
You can open two or more Device/Buffer Memory Batch Monitor screens.  
The screen number is indicated at the end of the screens title.



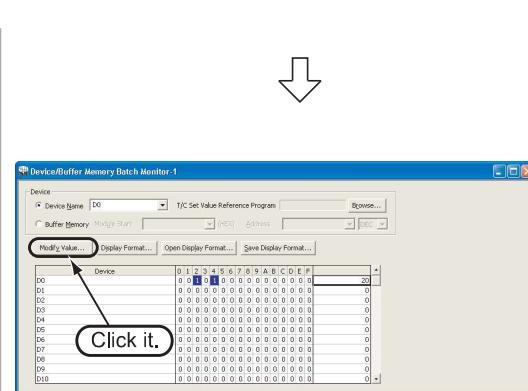
- Changing the current value

Click the  button on the Device/Buffer Memory Batch Monitor screen to display the Modify Value screen which allows you to change the current value.



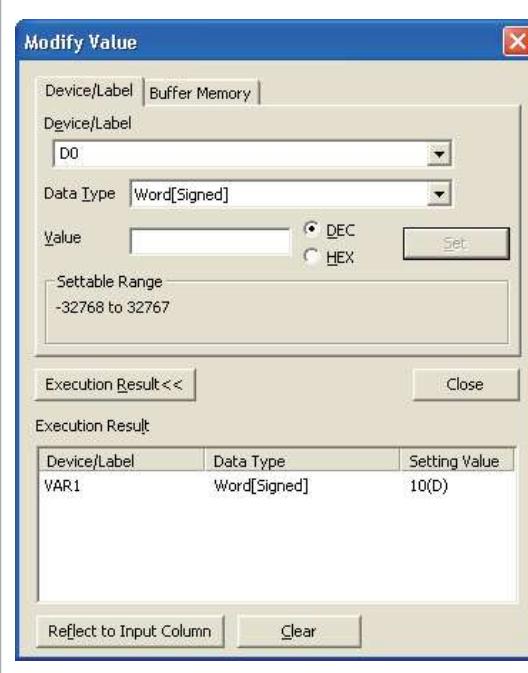
1. Select a device whose current value is to be changed.

  
(To the next page)



2. Click the **Modify Value...** button to display the Modify Value screen.

Or click (Modify Value) to display the Modify Value screen.



3. Change the current value.

For the change procedure, refer to the following.

"Point" in the 3.4.1

1

OVERVIEW

2

CREATING PROGRAM AND SYSTEM CONFIGURATION

3

CREATING PROGRAM IN ST STRUCTURED LADDER/ FBD LANGUAGE

4

CREATING TWO OR MORE PROGRAM BLOCKS

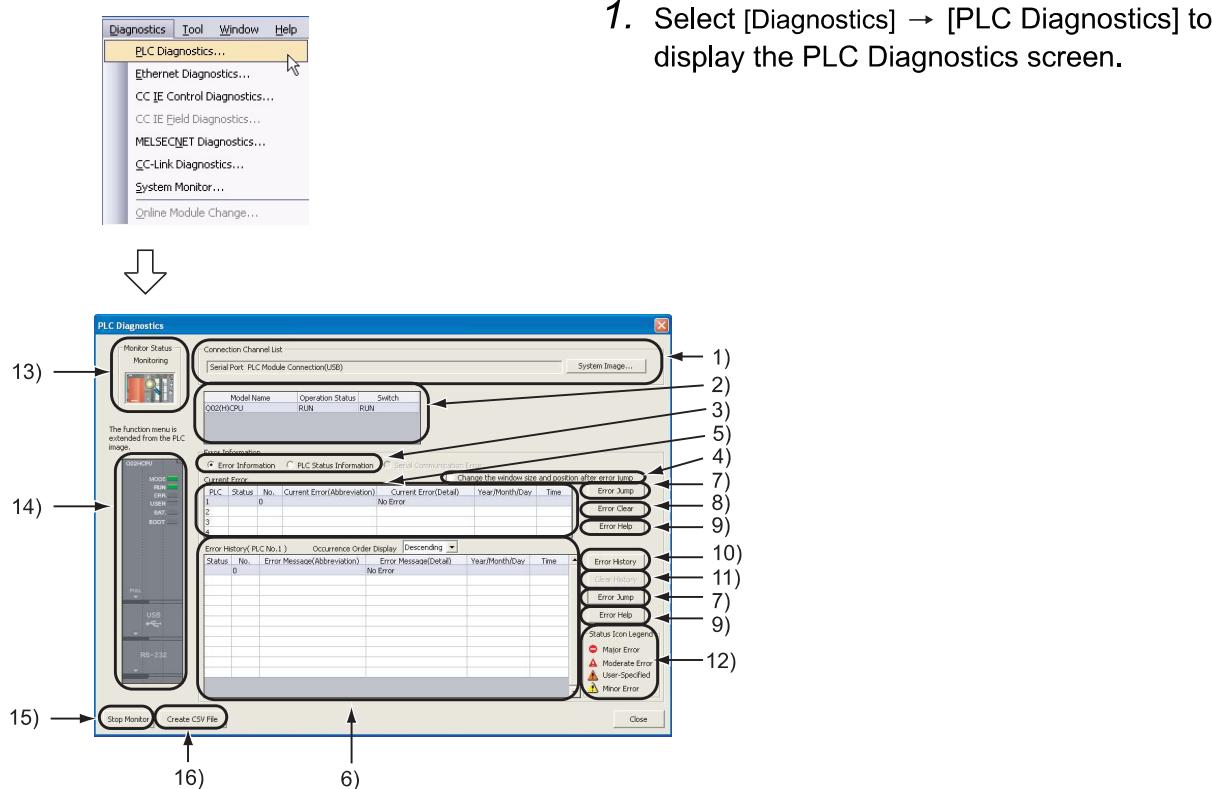
5

### 3.5 Diagnosing the programmable controller

You can check the programmable controller RUN/STOP status and error status.

Refer to the following manual for the details on Network Diagnostics, Ethernet Diagnostics and CC-Link IE Control Diagnostics.

 GX Works2 Version 1 Operating Manual (Common)

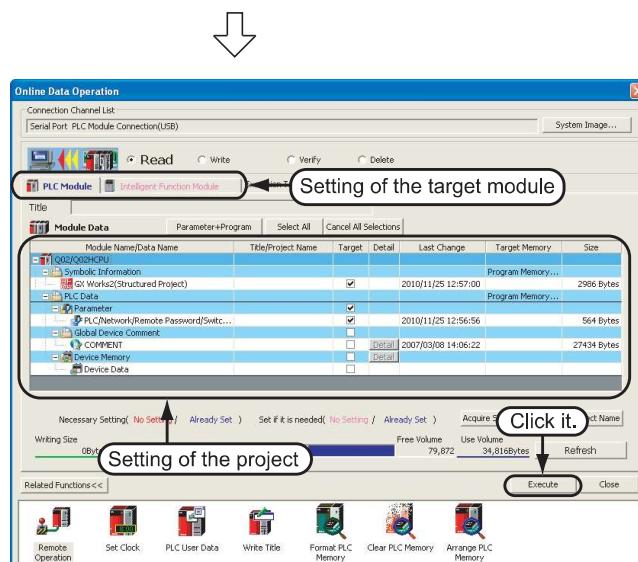
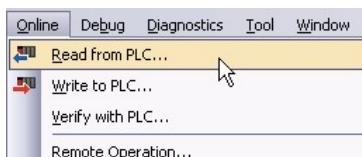


No.	Item	Description
1)	Connection Channel List	Connection Channel List: Displays the information on connection between the personal computer and the programmable controller CPU. System Image: Displays visually the Connection Channel List.
2)	CPU information of connected station	Displays the model name, operation status and switch status.
3)	Displayed information selection	Select a radio button to display Error Information (Current Error and Error History)/PLC Status Information/Serial Communication Error.
4)	Setting for Error Jump	Check this check box to reduce the PLC Diagnostics screen size and adjust the display position at the time of Error Jump.
5)	Current Error	Displays the current CPU error information.
6)	Error History	Displays the error history.
7)	Error Jump	Jumps to the ladder step number which contains the error corresponding to the currently selected error number.
8)	Error Clear	Clears the error information displayed in "Current Error".
9)	Error Help	Displays the explanation window for the currently selected error number.
10)	Error History	Displays the latest error history.
11)	Clear History	Deletes the error history list in "Error History".
12)	Status Icon Legend	Indicates icons corresponding to errors displayed in the "Status" column of the "Error Information".
13)	Monitor Status	Indicates the monitoring status (executed or stopped).
14)	Programmable controller CPU information	Displays the programmable controller CPU status.
15)	Stop Monitor	Starts or stops monitoring.
16)	Create CSV File	Saves the error information to a CSV file.

2. Click the  button to close the PLC Diagnostics screen.

## 3.6 Reading a Project from programmable controller

You can read data to a project from the programmable controller CPU selected as the connection destination in Section 3.3.1.



### Setting of the target module

- Target module: Select <>PLC Module>>.

### Setting of the project

- Symbolic Information : Select "Program Memory/Device Memory" in "Target Memory", and check "GX Works2 (Structured Project)" in "Target".  
"Symbolic Information" contains program files and variables.
- PLC Data : Select "Program Memory/Device Memory" in "Target Memory", and check "PLC/Network/Remote Password/Switch Setting" in "Target". \*1  
Do not check "Global Device Comment" and "Device Memory".

\*1: If you have checked desired items for the Write to PLC setting, such items are checked as the default for the Read from PLC setting.



(To the next page)

### Restrictions!

#### In the case of FXCPU

- In the case of structured project, data can be read from the FXCPU only in the FX3U and FX3UC Series version 3.00 or later.  
When data cannot be read from the FXCPU, carefully store projects written in the programmable controller.

1. Select [Online] → [Read from PLC] to display the Online Data Operation screen.

You can click (Read from PLC) to display the Online Data Operation screen.

2. Set the "Target module" and "Target project" on the Online Data Operation screen.

After the setting, click the button to read the project (program) from the programmable controller.

### 3 CREATING PROGRAM IN STRUCTURED LADDER/FBD LANGUAGE

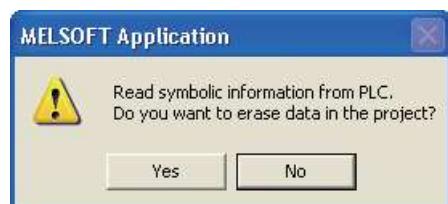
#### Point

If a program or parameters already exist in the GX Works2, the following screen appears.

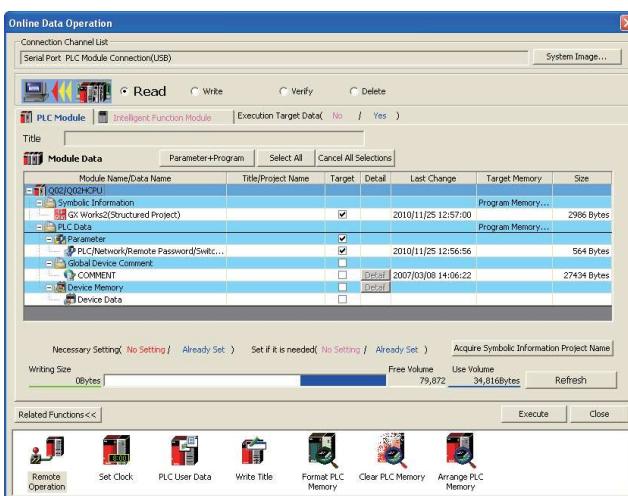
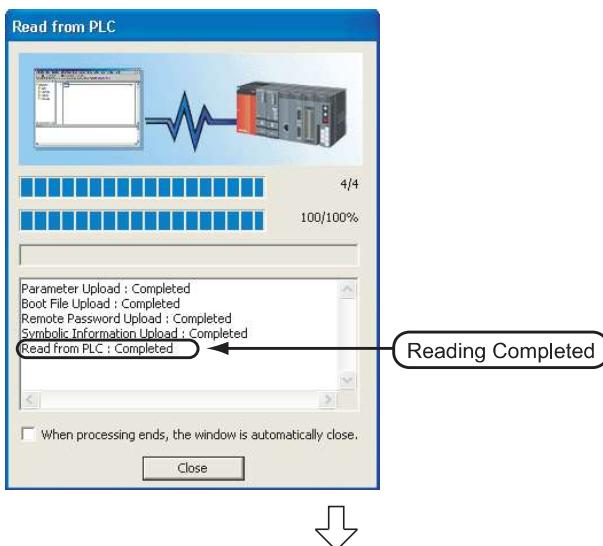
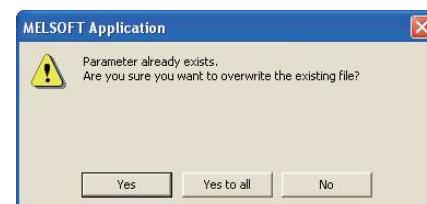
Click the **Yes** or **Yes to all** button to overwrite the existing program or parameters.

When you click the **Yes to all** button, GX Works2 overwrite the existing program or parameters without displaying the overwrites confirmation screen for other data.

When symbolic information already exists



When parameters already exist



#### 3. The left screen is displayed during reading.

When reading is finished, "Read from PLC: Completed" appears.

Click the **Close** button to close the Read from PLC screen.

#### 4. Click the **close** button to close the Online Data Operation screen.

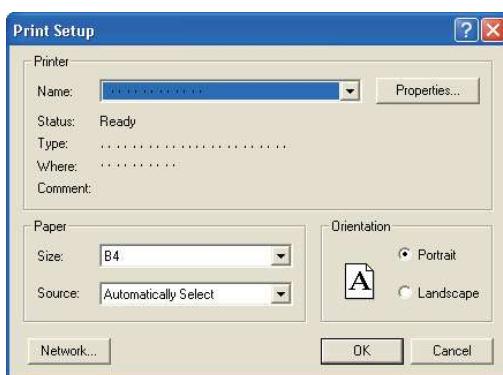
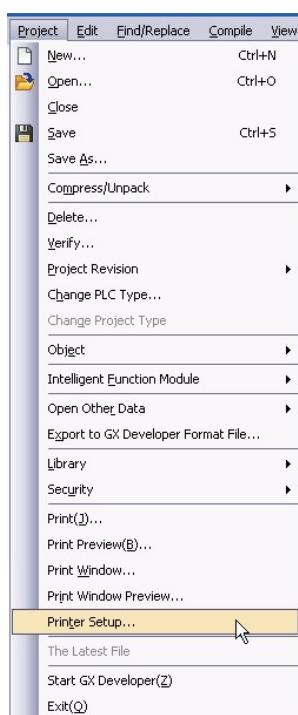
## 3.7 Printing

You can print programs and parameters created using GX Works2 in a printer. The print function consists of Batch print and print. This section explains print. For details of printing, refer to the following manual.

 GX Works2 Version 1 Operating Manual (Common)

### 3.7.1 Setting the printer

The printer which prints is set up.



1. Select [Project] → [Printer Setup] to display the Printer Setup screen.

2. Select the Printer, Paper size, Orientation, etc.

After the setting, click the  button to close the Printer Setup screen.

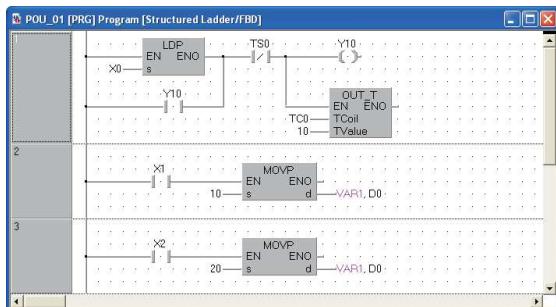
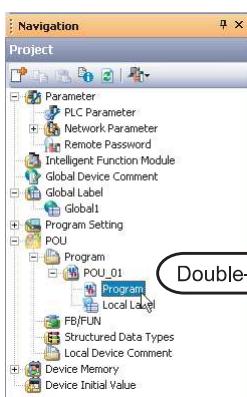
### 3.7.2 Previewing a program

You can display a program in the image of printing.

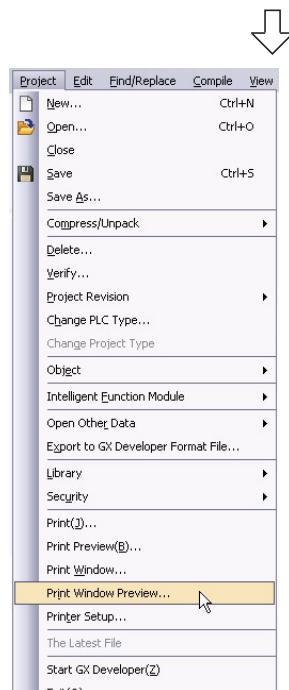
1. Click "Project" in the view selection area on the Navigation window to display the Project view.



2. Double-click "POU" → "Program" → "POU\_01" → "Program" on the Project view to display the POU\_01 [PRG] Program [Structured Ladder/FBD] screen.



(To the next page)



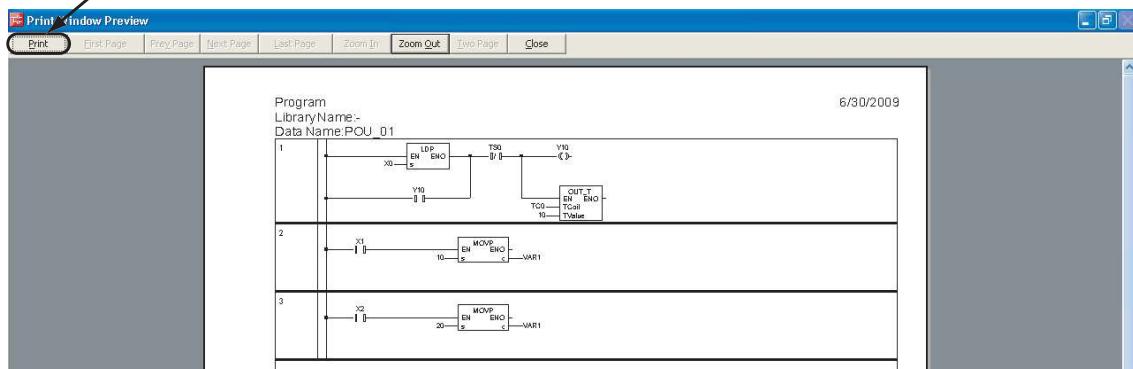
3. Select [Project] → [Print Window Preview] to display the Print Window Preview screen.



4. After checking the contents, click the **Print** button to print the program.

Click the **Close** button to close the Print Window Preview screen.

**Click button to print the program.**



1

OVERVIEW

2

CREATED PROGRAM AND SYSTEM CONFIGURATION

3

CREATING PROGRAM IN STRUCTURED LADDER/FBD LANGUAGE

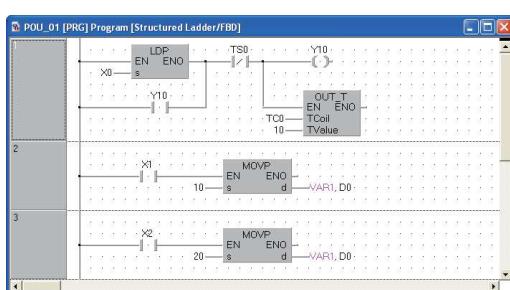
4

CREATING PROGRAM IN ST LANGUAGE

5

CREATING TWO OR MORE PROGRAM BLOCKS

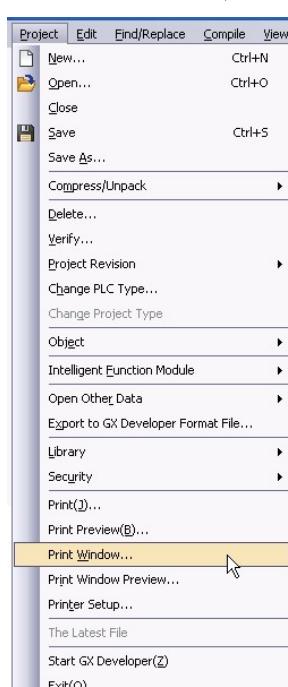
### 3.7.3 Printing a program



**1. Display a program.**

For the display procedure, refer to the following.

→ 3.7.2 Previewing a program



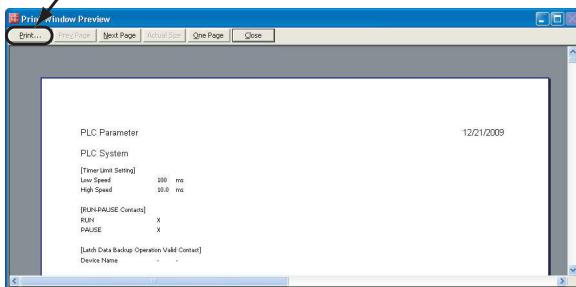
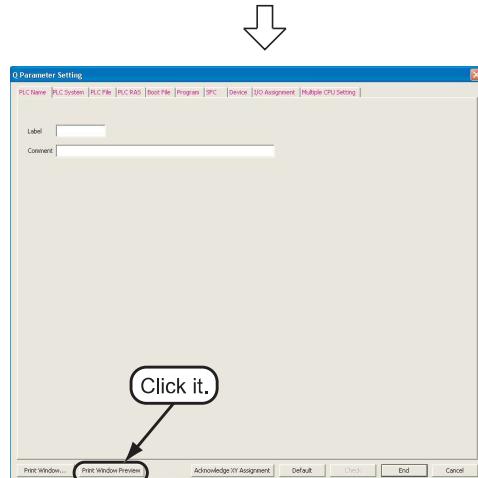
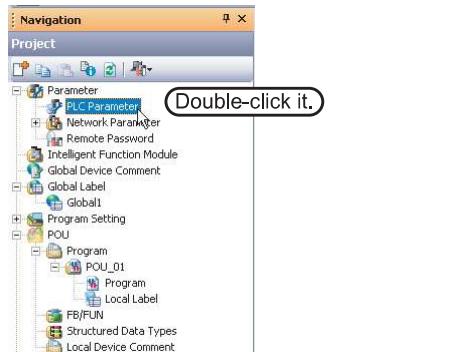
**2. Select [Project] → [Print Window] to display the Print Window screen.**



**3. Click the **OK** button to start printing.**

## 3.7.4 Previewing a PLC Parameter

You can display PLC Parameter in the image of printing.



### 1. Display PLC parameters.

Double-click "Parameter" → "PLC Parameter" on the Project view to display the Q Parameter Setting screen.

### 2. Click the Print Window Preview button.

### 3. After checking the contents, click the Print... button to print PLC Parameter.

Click the Close button to close the Print Window Preview screen.

1

OVERVIEW

2

3

4

5

CREATING TWO OR  
MORE PROGRAM  
BLOCKS

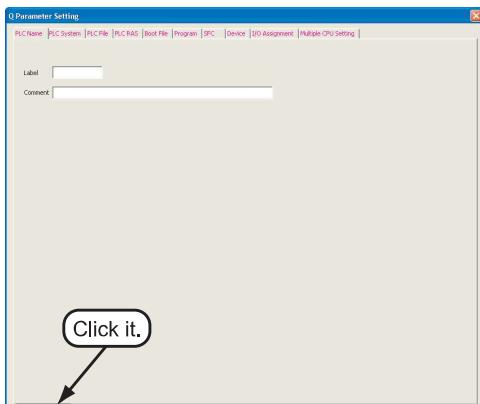
### 3.7.5 Printing a PLC Parameter

#### 1. Display a PLC Parameter.

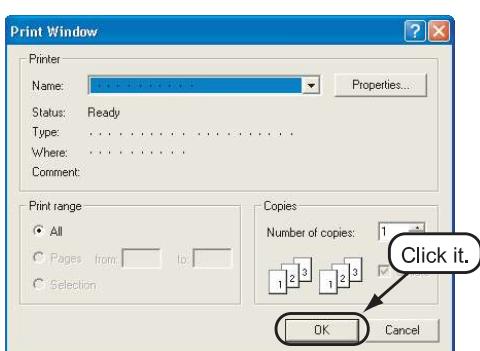
For the display procedure, refer to the following.

##### 3.7.4 Previewing a PLC Parameter

#### 2. Click the **Print Window...** button.



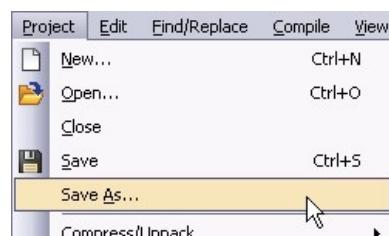
#### 3. Click the **OK** button to start printing.



## 3.8 Saving a Project

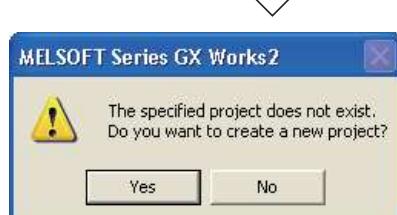
You can save a project.

When saving a newly created project, use the menu item [Save as].



### Restrictions

- Input within 128 characters to "Title".
- Make sure that the total characters of "Save Folder Path", "Workspace Name" and "Project Name" is 200 or less.
- You cannot save any project to route directories such as "C:\\" or "D:\\".



1. Select [Project] → [Save As] to display the Save As screen.

2. Set the "Save Location", "Workspace Name", "Project Name", "Title", etc.

After the setting, click the **Save** button to save the project (program).

Refer to the following manual for the details:

GX Works2 Version 1 Operating Manual (Common)

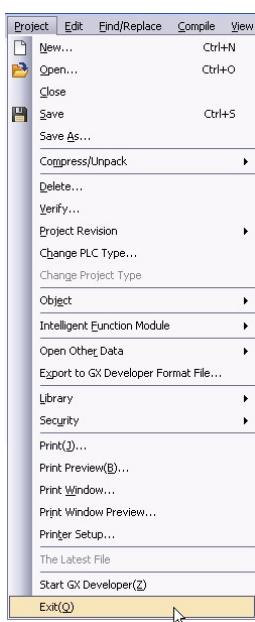
#### Settings

- Save in : Specify the save destination folder.
- File name : Specify the file name.
- Title : Specify the title.  
You can save a project without specifying a title.

3. Click the **Yes** button to save the new project.

## 3.9 Exiting GX Works2

End the project.



1. Select [Project] → [Exit (Q)].



2. Click the  button to exit GX Works2.

### Point

If you have not saved the project, the following message appears.

Click the  button to save the project.

Click the  button to exit GX Works2 without saving the project.





## 4 CREATING PROGRAM IN ST LANGUAGE

This chapter explains how to create a program in the ST language with a Structured Project using a simple ST program.

Refer to the following manuals for the details on structured programs including programming languages, labels, data types and functions (instructions):

- ☞ MELSEC-Q/L/F Structured Programming Manual (Fundamentals)
- ☞ Structured Programming Manual of the programmable controller CPU

4.1 Created Program .....	4-2
4.2 Creating a Project .....	4-3
4.3 Writing a Project to the programmable controller .....	4-7
4.4 Monitoring Operations .....	4-7
4.5 Diagnosing the programmable controller .....	4-11
4.6 Reading a Project from programmable controller .....	4-11
4.7 Printing .....	4-11
4.8 Saving a Project .....	4-11
4.9 Exiting GX Works2 .....	4-11

1	OVERVIEW
2	CREATED PROGRAM AND SYSTEM CONFIGURATION
3	CREATING PROGRAM IN STRUCTURED LADDER/ FBD LANGUAGE
4	CREATING PROGRAM IN ST LANGUAGE
5	CREATING TWO OR MORE PROGRAM BLOCKS

## 4.1 Created Program

This section explains the operations of the program to be created and ST programs.

### 4.1.1 Operations of program

---

- When X0 turns ON, the programmable controller turns ON Y10, and then turns OFF Y10 1 second later.
- When X1 turns ON, the programmable controller transfers K10 to D0 (which is defined with the LABEL "VAR1").
- When X2 turns ON, the programmable controller transfers K20 to D0 (which is defined with the LABEL "VAR1").

### 4.1.2 Created program

---

```
Y10:=(LDP(TRUE, X0) OR Y10) AND NOT (TS0);
OUT_T(Y10, TCO, 10);
MOVP(X1, 10, VAR1);
MOVP(X2, 20, VAR1);
```

## 4.2 Creating a Project

Create a project using ST program.

### 4.2.1 Starting GX Works2

Refer to the following section for the GX Works2 startup procedure:

-  3.2.1 Starting GX Works2

### 4.2.2 Screen configuration in GX Works2

Refer to the following section for the GX Works2 screen configuration:

-  3.2.2 Screen configuration in GX Works2

### 4.2.3 Creating a new project

Refer to the following section for the new project creation procedure:

-  3.2.3 Creating a new project

### 4.2.4 Setting parameters

Refer to the following section for the parameter setting procedure:

-  3.2.4 Setting parameters

Refer to the following manuals for the details on parameter setting:

-  GX Works2 Version 1 Operating Manual (Common)
-  CPU Manual
-  CPU Programming manual

### 4.2.5 Setting labels

Refer to the following section for the global label setting procedures:

-  3.2.5 Setting labels

Refer to the following manual for the details on global/local label setting procedures:

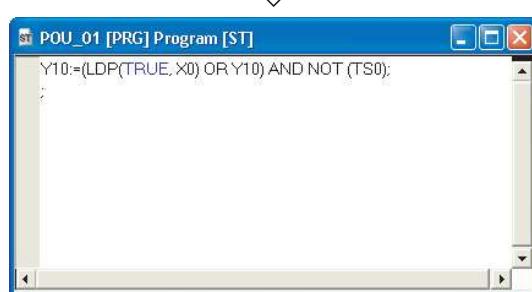
-  GX Works2 Version 1 Operating Manual (Structured Project)

Refer to the following manual for the details on programming of global labels and local labels:

-  MELSEC-Q/L/F Structured Programming Manual (Fundamentals)

## 4.2.6 Creating a program

Create the ST program shown in Section 4.1.2.



(To the next page)

### Point

#### Basic description and display colors

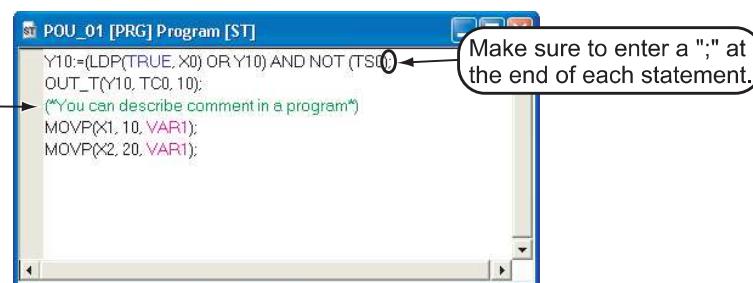
Programming in the ST language consists of syntaxes, operators, function, function block, devices, labels, etc. Refer to the following manual for syntaxes, operators and programming:

 MELSEC-Q/L/F Structured Programming Manual (Fundamentals)

- Make sure to write ";" at the end of a statement.
- Comment

You can describe comments in a program.

You can describe comments within program.



● Display colors

GX Works2 displays syntax, operators, comments, constants, string constants, devices and labels using the following colors (in the initial setting).

- Syntax: (  blue )
- Operator: (  black )
- Comment: (  dark green )
- Constant: (  black )
- String constant: (  black )
- Device: (  black )
- Global label: (  magenta )
- Local label: (  magenta )

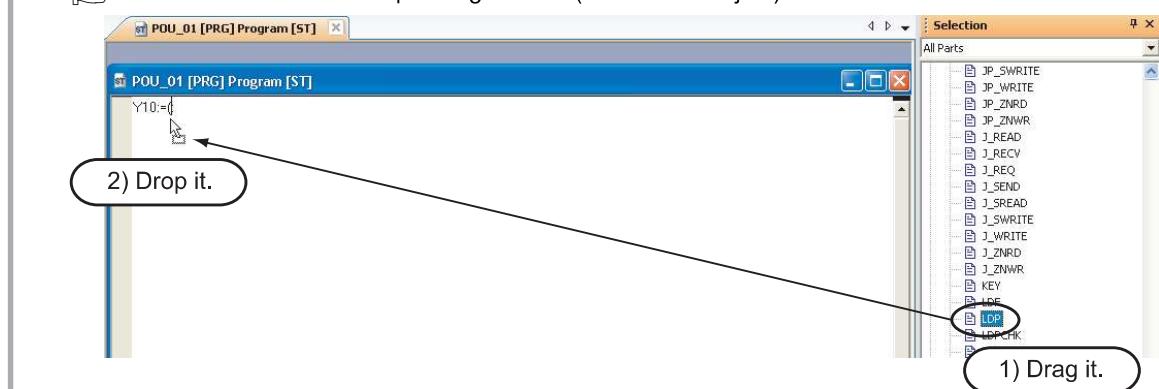
**Input using the FB Selection window**

You can easily input the function name of a Function or Function block by dragging it to the cursor position from the Function Block Selection window.

In the example below, drag the function "LDP" from the Function Block Selection window, and drop it on the POU\_01 [PRG] Program [ST] screen to input it there. After that, input the parameters of the function.

Refer to the following manual for the details:

 GX Works2 Version 1 Operating Manual (Structured Project)



```
POU_01 [PRG] Program [ST]
Y10:=(LDP(TRUE, X0) OR Y10) AND NOT (TS0);
OUT_T(Y10, TC0, 10);
```

```
POU_01 [PRG] Program [ST]
Y10:=(LDP(TRUE, X0) OR Y10) AND NOT (TS0);
OUT_T(Y10, TC0, 10);
MOVP(X1, 10, VAR1);
```

(To the next page)

**3. Input "OUT\_T(Y10,TC0<sup>\*1</sup>,10);" directly, and click the  key.**

You can select "Function" → "OUT\_T" on the Function Block Selection window.

**Settings**

- OUT\_T(Y10,TC0<sup>\*1</sup>,10);

\*1: "TC0" indicates the coil of timer T0.

**4. Input "MOVP(X1,10,VAR1<sup>\*2</sup>);" directly, and click the  key.**

You can select "Function" → "MOVP" on the Function Block Selection window.

**Settings**

- MOVP(X1,10,VAR1<sup>\*2</sup>);

\*2: The label VAR1 is set in Section 4.2.5.

### Point

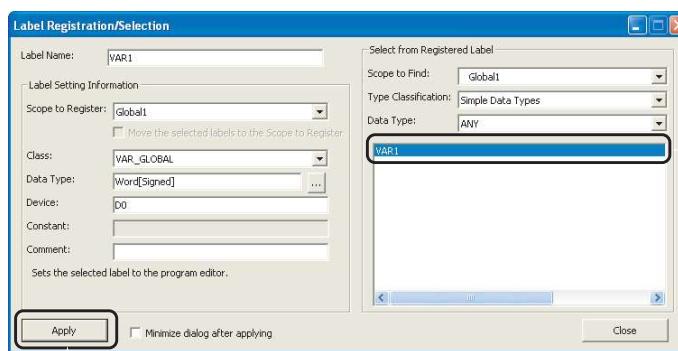
#### Selecting a label from the Label Registration/Selection screen

You can input a label also by selecting it from the Label Registration/Selection screen.  
Perform the following procedure to display the Label Registration/Selection screen.

- Select "Edit" → "List Operands".
- Click  (List Operands).

Refer to the following manual for the details on the Label Registration/Selection screen:

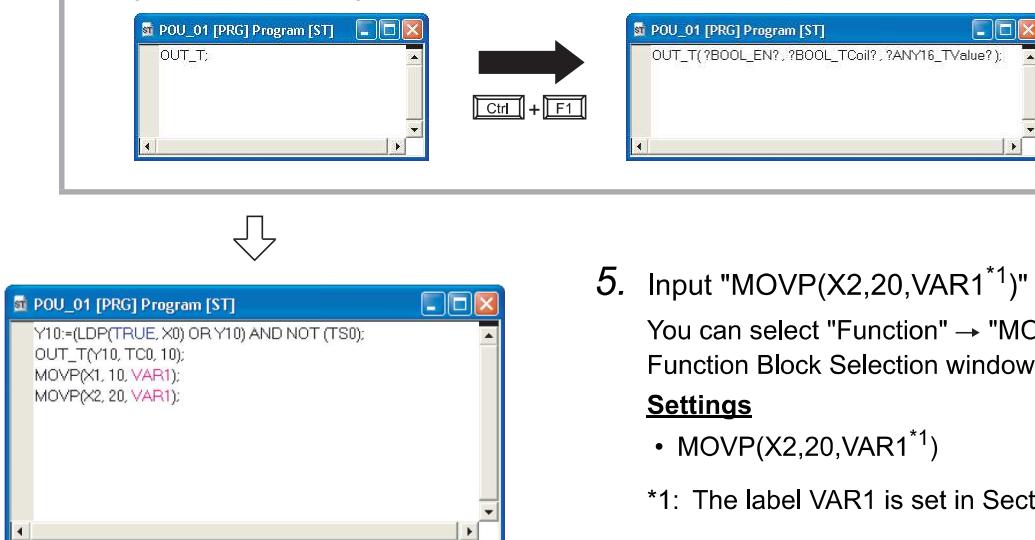
 GX Works2 Version 1 Operating Manual (Structured Project)



 Click the Apply button to set the selected label.

#### Using templates

Using templates according to the instructions/functions.



#### 5. Input "MOVP(X2,20,VAR1<sup>\*1</sup>)" directly .

You can select "Function" → "MOVP" on the Function Block Selection window.

#### Settings

- MOVP(X2,20,VAR1<sup>\*1</sup>)

\*1: The label VAR1 is set in Section 4.2.5.

## 4.2.7 Compiling a program

Refer to the following section and manual for compiling:

 3.2.7 Compiling a program

 GX Works2 Version 1 Operating Manual (Structured Project)

## 4.3 Writing a Project to the programmable controller

Refer to the following section for the procedure to write a project to the programmable controller CPU.

 3.3 Writing a Project to the programmable controller

## 4.4 Monitoring Operations

Execute "Monitor" to check the operations.

Note that some screen shot colors have been changed for printing convenience.

GX Works2 is able to simulate the programmable controller operations in offline mode.

Refer to the following manual for the simulation function:

 GX Works2 Version 1 Operating Manual (Common)

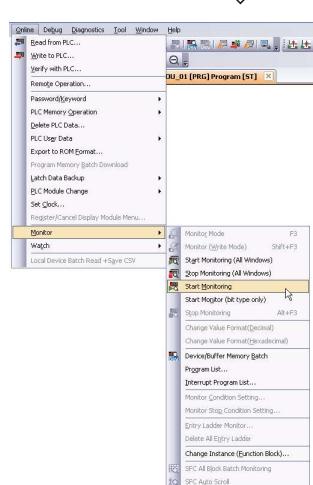
### 4.4.1 Monitoring a program



1. Click "Project" in the view selection area on the Navigation window to display the Project view.



2. Double-click "POU" → "Program" → "POU\_01" → "Program" on the Project view to display the POU\_01 [PRG] Program [ST] screen.



3. Select [Online] → [Monitor] → [Start Monitoring] to switch the POU\_01[PRG]Program[ST] screen to the monitoring status.

You can also click  (Start Monitoring) to switch the POU\_01[PRG]Program[ST] screen to the monitoring status.

4. Set the programmable controller CPU to RUN.  
Set the RUN/STOP switch on the programmable controller CPU to "RUN".

(To the next page)

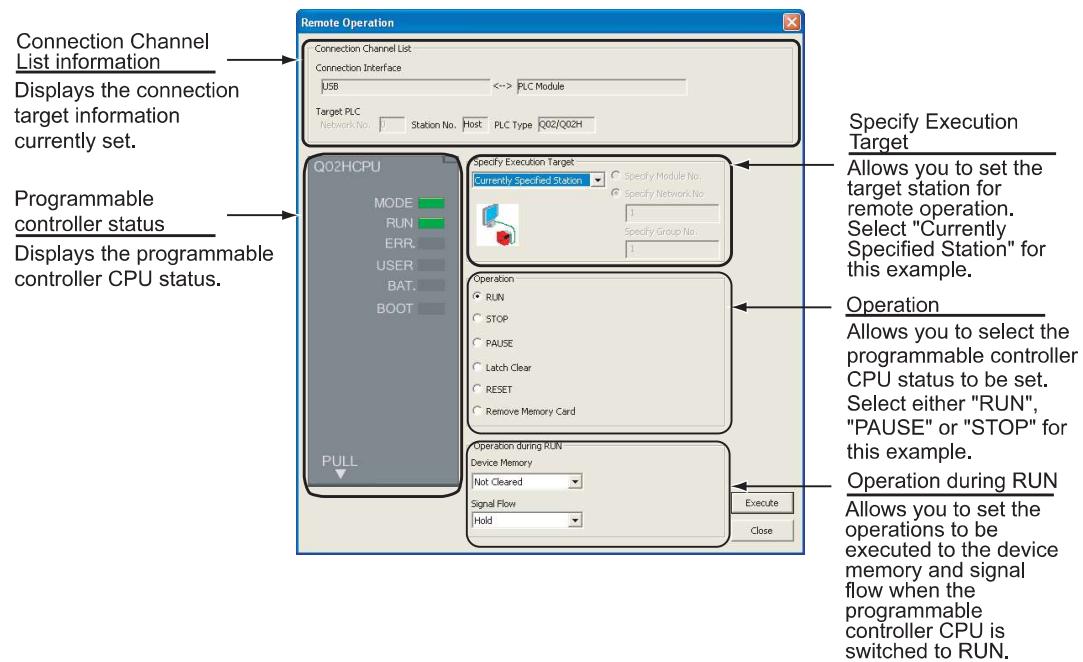
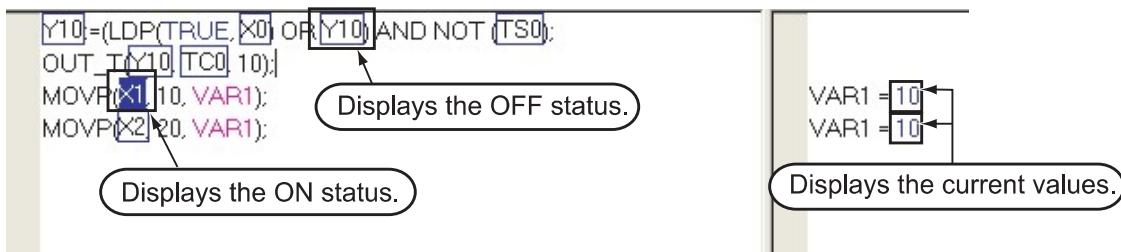
**Point**

You can switch the programmable controller status between "RUN" and "STOP" using remote operation as follows.

The Settings of the remote operation may vary depending on the programmable controller used.  
Refer to the following manual for the details on the remote operation:

** GX Works2 Version 1 Operating Manual (Common)**

Select [Online] → [Remote Operation] to display the Remote Operation screen. You can switch the programmable controller status between "RUN" and "STOP" on this screen.

**Monitor status display example**

(To the next page)

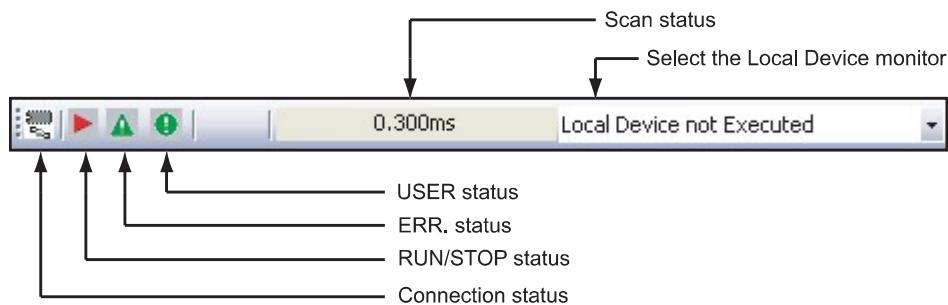
## Point

### Monitor status

GX Works2 displays the Monitor status while it is executing the work window monitor.

The Monitor status disappears when GX Works2 stops all types of monitoring.

The Monitor status indicates the programmable controller CPU, simulator scan time, RUN/STOP status, etc.



Refer to the following manual for the Monitor status:

GX Works2 Version 1 Operating Manual (Common)

### Monitor status display

#### ● Switching of the current value display between decimal and hexadecimal

You can switch the current value display between decimal and hexadecimal using the following procedure.

#### Procedure to switch the current value display to decimal:

Select [Online] → [Monitor] → [Change Value Format(Decimal)].

#### Procedure to switch the current value display to hexadecimal:

Select [Online] → [Monitor] → [Change Value Format(Hexadecimal)].

Refer to the next page for the test operation.

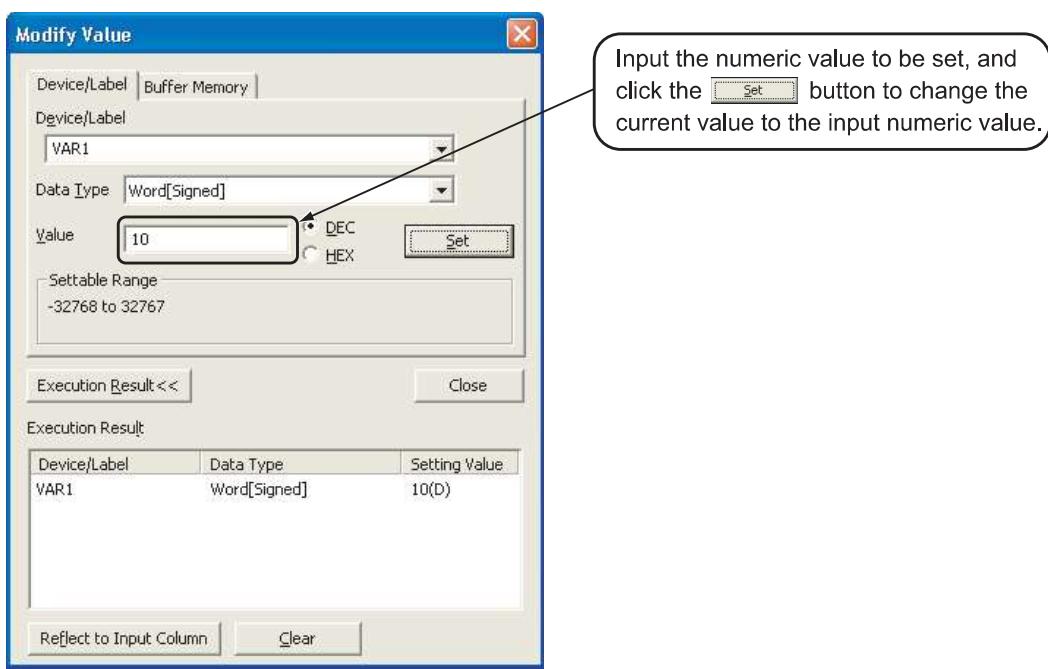
### Test operation

#### ● Forcing a contact ON/OFF

Double-click a monitored device or label while pressing the key to force a device in the programmable controller ON/OFF.

#### ● Changing the current value of a word device

Double-click a monitored word device to display the Modify Value screen where you can change the current value.



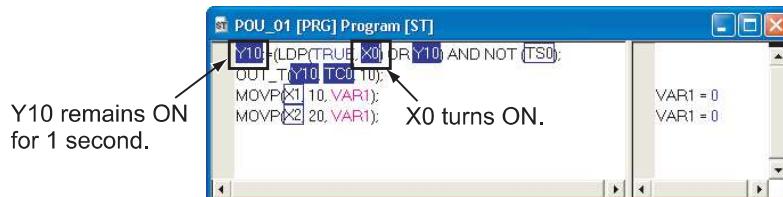
## 4 CREATING PROGRAM IN ST LANGUAGE



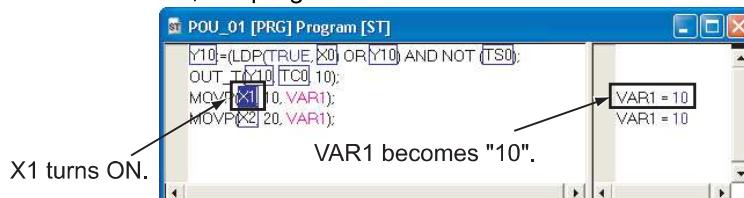
5. Turn ON inputs X0, X1 and X2 in the programmable controller, and check the following operations.

You can turn ON inputs X0, X1 and X2 using the test operation above.

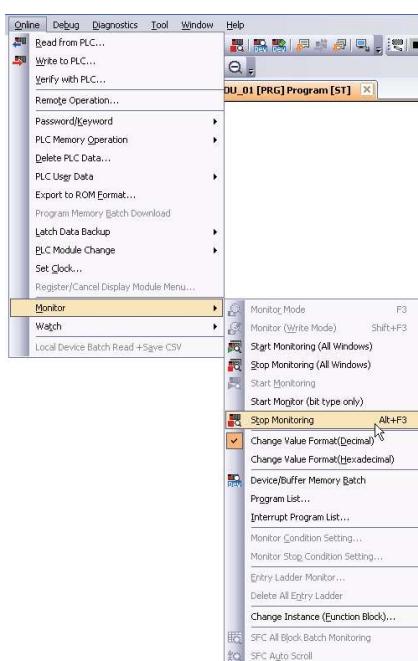
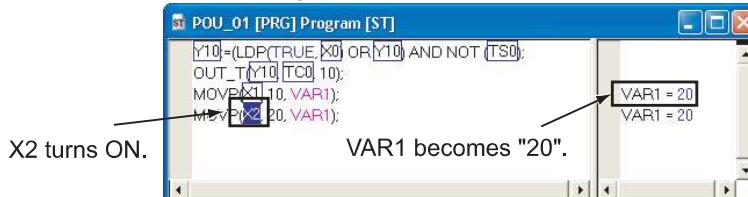
- When X0 turns ON, the programmable controller turns ON Y10, and then turns OFF Y10 1 second later.



- When X1 turns ON, the programmable controller transfers K10 to VAR1 (device: D0).



- When X2 turns ON, the programmable controller transfers K20 to VAR1 (device: D0).



6. Select [Online] → [Monitor] → [Stop Monitoring] to stop (pause) the monitor status on the POU\_01 [PRG] Program [ST] screen.

You can click (Stop Monitoring) to reset the POU\_01 [PRG] Program [ST] screen.

7. Set the programmable controller CPU to STOP.

Set the RUN/STOP switch on the programmable controller CPU to "STOP".

You can switch the programmable controller status between "RUN" and "STOP" using remote operation.

"Point" in the step4

### 4.4.2 Batch monitoring of device values

For the Batch monitoring of device values procedure, refer to the following.

3.4.2 Batch monitoring of device values

## 4.5 Diagnosing the programmable controller

You can check the programmable controller RUN/STOP status and error status.

Refer to the following section for the diagnosis procedure:

 3.5 Diagnosing the programmable controller

## 4.6 Reading a Project from programmable controller

Refer to the following section for the procedure to read a project from the programmable controller:

 3.6 Reading a Project from programmable controller

## 4.7 Printing

For the Saving a Project procedure, refer to the following.

 3.7 Printing

## 4.8 Saving a Project

Refer to the following section for the project saving procedure:

 3.8 Saving a Project

## 4.9 Exiting GX Works2

Refer to the following section for the project ending procedure:

 3.9 Exiting GX Works2

## MEMO



# 5 CREATING TWO OR MORE PROGRAM BLOCKS

This chapter explains how to create a Structured Project in which two or more program blocks are made into one program using a simple example.

Refer to the following manuals for the details on structured programs including programming languages, labels, data types and functions (instructions):

- ☞ MELSEC-Q/L/F Structured Programming Manual (Fundamentals)
- ☞ Structured Programming Manual of the programmable controller CPU

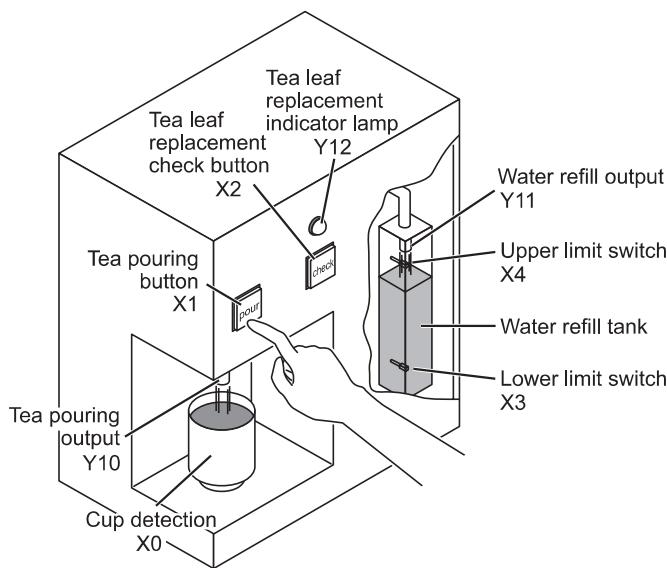
5.1 Created Program .....	5-2
5.2 Creating a Project .....	5-4
5.3 Writing a Project to the programmable controller .....	5-12
5.4 Monitoring Operations .....	5-12
5.5 Diagnosing the programmable controller.....	5-18
5.6 Reading a Project from programmable controller .....	5-18
5.7 Printing.....	5-19
5.8 Saving a Project .....	5-19
5.9 Exiting GX Works2 .....	5-19

1	OVERVIEW
2	CREATED PROGRAM AND SYSTEM CONFIGURATION
3	CREATING PROGRAM IN STRUCTURED LADDER/ FBD LANGUAGE
4	CREATING PROGRAM IN ST LANGUAGE
5	CREATING TWO OR MORE PROGRAM BLOCKS

## 5.1 Created Program

This section explains how to create a program for controlling a tea server system which consists of a tea pouring operation, water refilling operation and warning indicating operation. This section also explains a program which works as one Structured Project, and the program operations.

### 5.1.1 Operations of program



#### ■ Tea pouring operation

When a user presses the tea pouring button X1 (that is, when X1 turns ON) while the cup detection X0 is ON, the tea pouring output Y10 turns ON and the tea server pours tea into the cup. The tea server pours tea while the user is pressing and holding the button, and stops pouring when the user releases the button.

The tea server does not pour tea when the user presses the tea pouring button X1 if the cup detection X0 is OFF.

#### ■ Water refilling operation

When water inside the water refill tank is running low, the lower limit switch X3 turns ON, and the water refill output Y11 turns ON.

When the water refill output Y11 is ON and the water supply to the tank is sufficient, the upper limit switch X4 turns ON and the water refill output Y11 turns OFF.

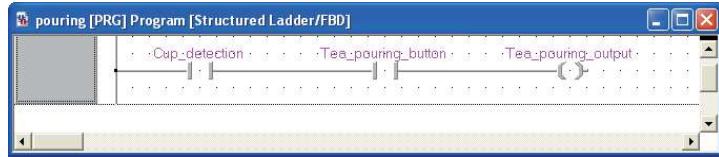
#### ■ Warning indicating operation

- When the tea server performs the water refilling operation 5 times, the tea leaf replacement indicator lamp Y12 turns ON.
- When a user presses the tea leaf replacement check button X2, the tea leaf replacement indicator lamp Y12 turns OFF.

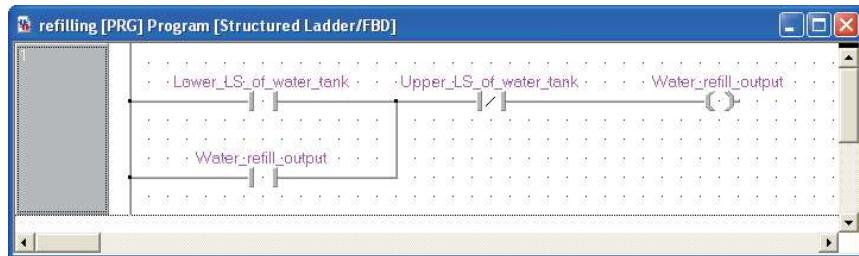
## 5.1.2 Created program

Create the following program blocks.

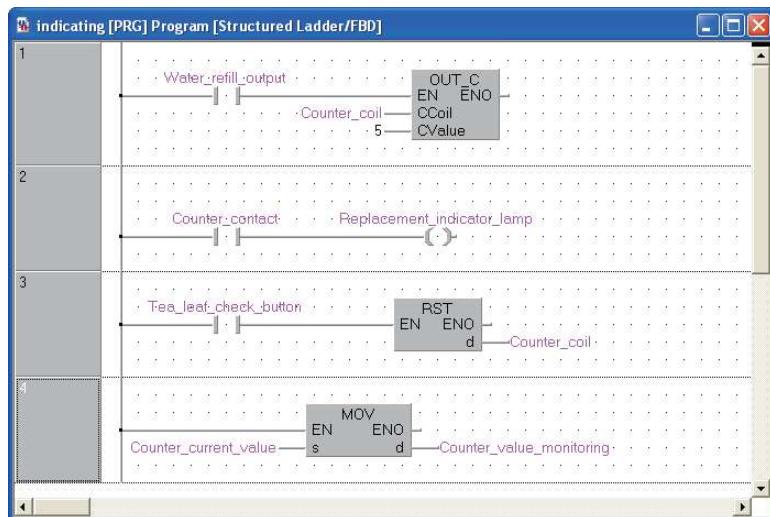
### ■ Program block for the tea pouring operation



### ■ Program block for the water refilling operation



### ■ Program block for the warning indicating operation



## 5.2 Creating a Project

---

Create projects for the tea pouring operation, water refilling operation and warning indicating operation using Structured Ladder program.

### 5.2.1 Starting GX Works2

---

Refer to the following section for the GX Works2 startup procedure:

- ☞ 3.2.1 Starting GX Works2

### 5.2.2 Screen configuration in GX Works2

---

Refer to the following section for the GX Works2 screen configuration:

- ☞ 3.2.2 Screen configuration in GX Works2

### 5.2.3 Creating a new project

---

Refer to the following section for the new project creation procedure:

- ☞ 3.2.3 Creating a new project

### 5.2.4 Setting parameters

---

Refer to the following section for the parameter setting procedure:

- ☞ 3.2.4 Setting parameters

Refer to the following manuals for the details on parameter setting:

- ☞ GX Works2 Version 1 Operating Manual (Common)
- ☞ CPU Manual
- ☞ CPU Programming manual

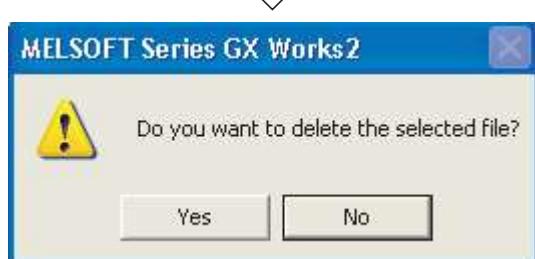
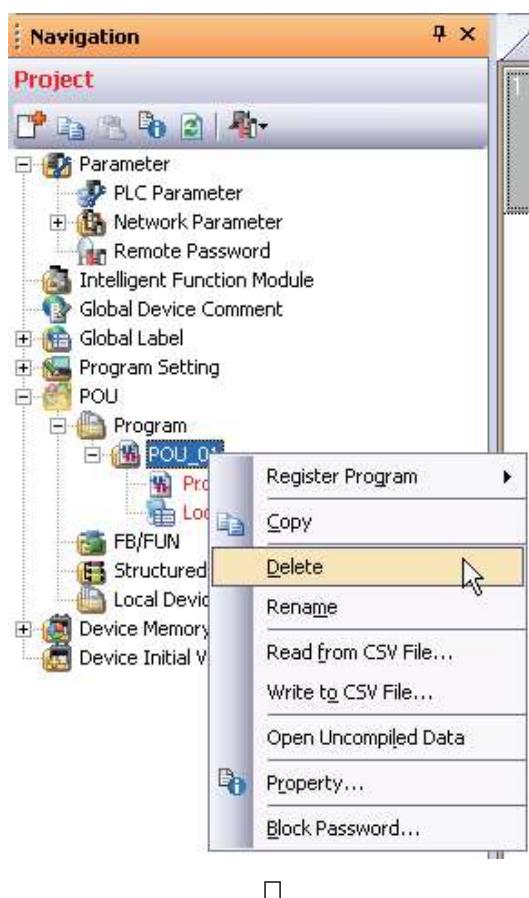
## 5.2.5 Preparing (creating) the program configuration

Create a POU (three program blocks) for Structured Ladder/FBD program, and register the three program blocks created in the POU to a task.

When you create a new project, GX Works2 automatically creates the Program File, Task and POU shown in the table below.

Table 5.1 Name of Program File, Task and POU created automatically

Item	Name
Program Setting (No Execution Type)	MAIN
Task	Task_01 The program block "POU_01" is registered in "Task_01".
POU	POU_01



(To the next page)

1. Select "POU" → "Program" → "POU\_01" on the Project view, right-click "POU\_01", and then select the menu item "Delete".

2. Click the  button to delete the selected data.

## 5 CREATING TWO OR MORE PROGRAM BLOCKS

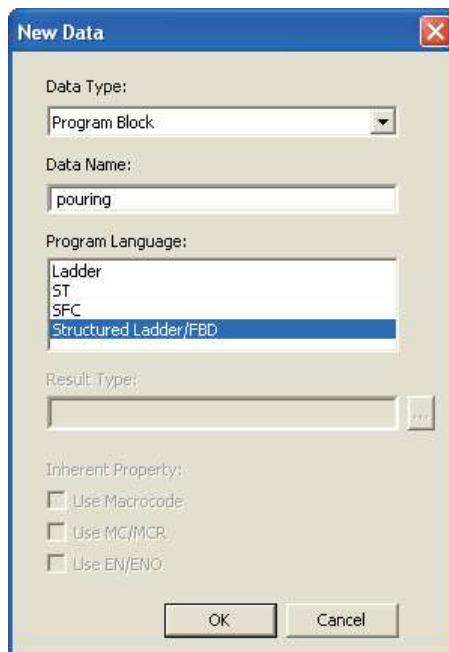


3. Select "POU" → "Program" on the Project view, right-click "Program", and then select the menu item "Add New Data".

The "New Data" screen appears.



When creating a new project, GX Works2 automatically creates "POU\_01 [PRG]" under "POU\_Pool". Because the language (Structured Ladder/FBD) used in this chapter is same as the language adopted in "POU\_01 [PRG]", you can use "POU\_01 [PRG]" by changing its data name instead of deleting it.



4. Set the "Data Type", "Language" and "Data Name".

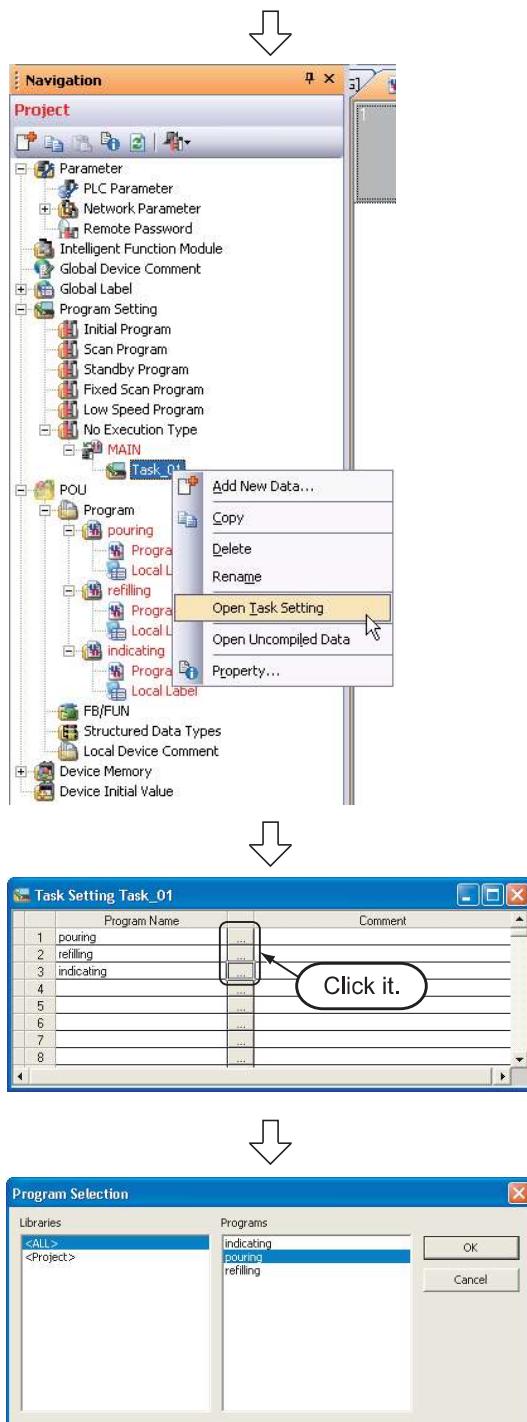
Click the **OK** button to create a program block and close the window.

Repeat the steps 3 and 4, and create three program blocks for the tea pouring operation, water refilling operation and warning indicating operation.

### Settings

- Data Type : Select "Program Block".
- Data Name : Input the following names:
  - 1) pouring
  - 2) refilling
  - 3) indicating
- Language : Select "Structured Ladder/FBD".

(To the next page)



5. Select "Program Setting" → "No Execution Type" → "MAIN" → Task\_01<sup>\*1</sup> on the Project view, right-click the Task\_01, and then select the menu item "Open Task Setting".

The Task Setting (task name<sup>\*1</sup>) window appears.

\*1: The Task Name is "Task\_01" for this example.



6. Click the [...] button to display the Program Selection screen.

7. Select the program block name.

Click the  button to register the selected program block to the Task Setting screen and close the Program Selection screen.

Repeat the steps 6 and 7, and register three program blocks for the tea pouring operation, water refilling operation and warning indicating operation in the following order to the Task Setting screen.

#### **Settings**

- Libraries : Select <ALL>.
- Program : Select the following programs in this order.
  - 1) pouring
  - 2) refilling
  - 3) indicating

Refer to the following manual for the details on registering a program block to a task:

 GX Works2 Version 1 Operating Manual (Structured Project)

## 5.2.6 Setting labels

Refer to the following section for the global label setting procedures:

Refer to the following "Setting global labels" for settings:

 3.2.5 Setting labels

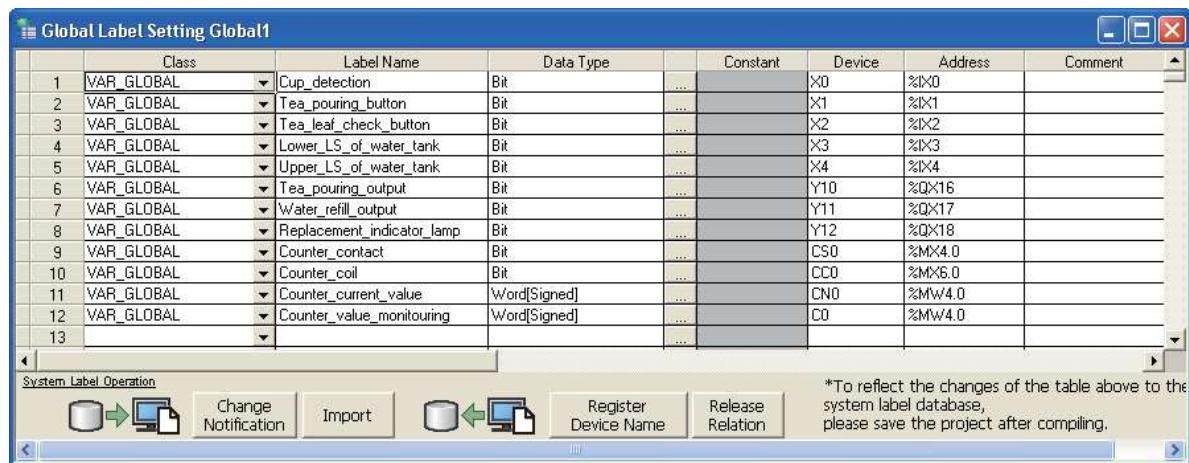
Refer to the following manual for the details on global/local label setting procedures:

 GX Works2 Version 1 Operating Manual (Structured Project)

Refer to the following manual for the details on programming of global labels and local labels:

 MELSEC-Q/L/F Structured Programming Manual (Fundamentals)

### ■ Setting global labels



The screenshot shows the 'Global Label Setting Global1' dialog box. It contains a table with 13 rows of global labels. The columns are: Class, Label Name, Data Type, Constant, Device, Address, and Comment. The data is as follows:

	Class	Label Name	Data Type	Constant	Device	Address	Comment
1	VAR_GLOBAL	Cup_detection	Bit		X0	%IX0	
2	VAR_GLOBAL	Tea_pouring_button	Bit		X1	%IX1	
3	VAR_GLOBAL	Tea_leaf_check_button	Bit		X2	%IX2	
4	VAR_GLOBAL	Lower_LS_of_water_tank	Bit		X3	%IX3	
5	VAR_GLOBAL	Upper_LS_of_water_tank	Bit		X4	%IX4	
6	VAR_GLOBAL	Tea_pouring_output	Bit		Y10	%QX16	
7	VAR_GLOBAL	Water_refill_output	Bit		Y11	%QX17	
8	VAR_GLOBAL	Replacement_indicator_lamp	Bit		Y12	%QX18	
9	VAR_GLOBAL	Counter_contact	Bit		C50	%MX4.0	
10	VAR_GLOBAL	Counter_coil	Bit		CC0	%MW6.0	
11	VAR_GLOBAL	Counter_current_value	Word[Signed]		CN0	%MW4.0	
12	VAR_GLOBAL	Counter_value_monitoring	Word[Signed]		C0	%MW4.0	
13							

Below the table, there is a note: \*To reflect the changes of the table above to the system label database, please save the project after compiling.

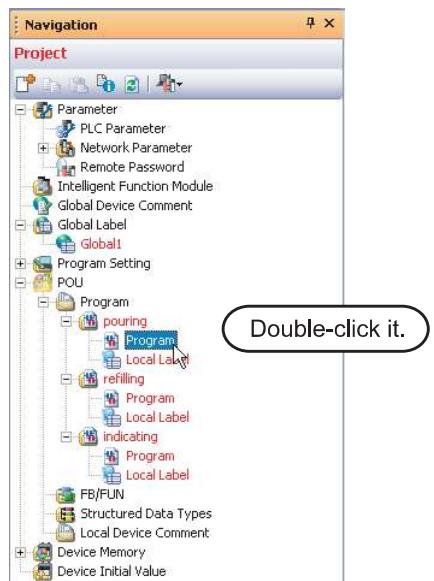
## 5.2.7 Creating a program

Refer to the following section and manual for the program creation procedures:

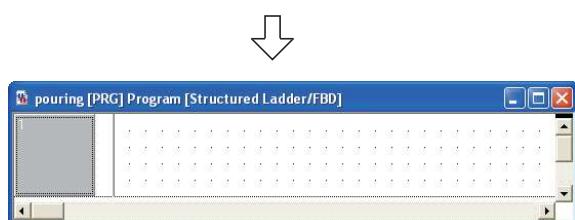
- ☞ 3.2.6 Creating a program
- ☞ GX Works2 Version 1 Operating Manual (Structured Project)

### ■ Creating the program block for the tea pouring operation

Create the program block for the tea pouring operation shown in Section 5.1.2.

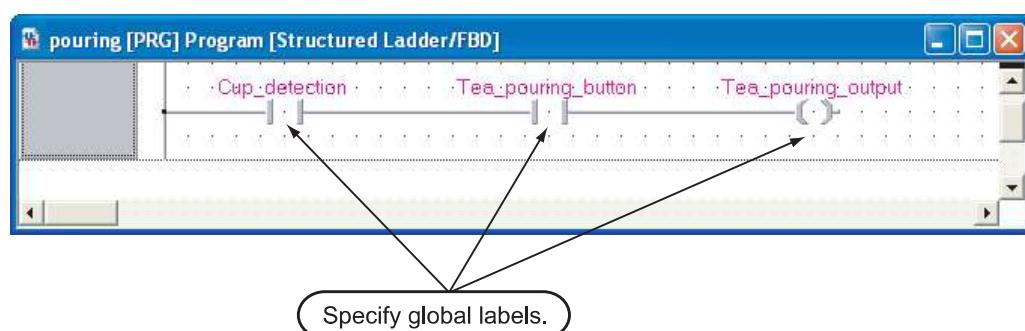


1. Double-click "POU" → "Program" → "pouring" → "Program" on the Project view to display the pouring [PRG] Program [Structured Ladder/FBD] screen.



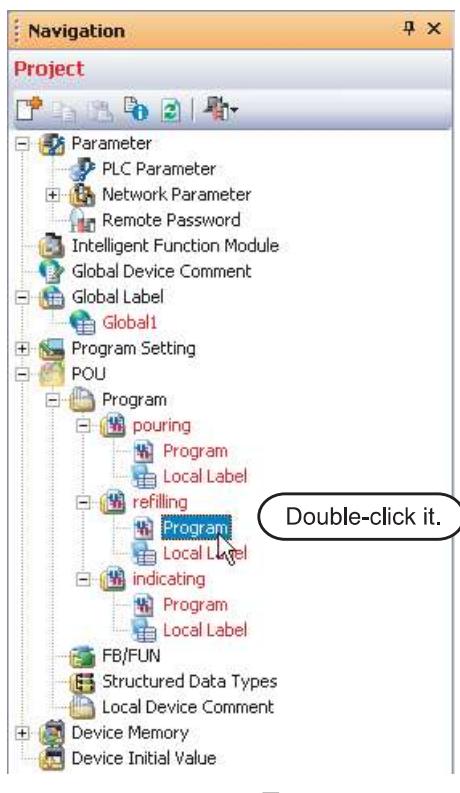
2. Create the program block for the tea pouring operation shown in Section 5.1.2.  
Refer to the following section and manual for the program creation procedures:

- ☞ 3.2.6 Creating a program
- ☞ GX Works2 Version 1 Operating Manual (Structured Project)

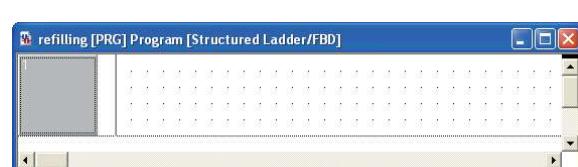


## ■ Creating the program block for the water refilling operation

Create the program block for the water refilling operation shown in Section 5.1.2.

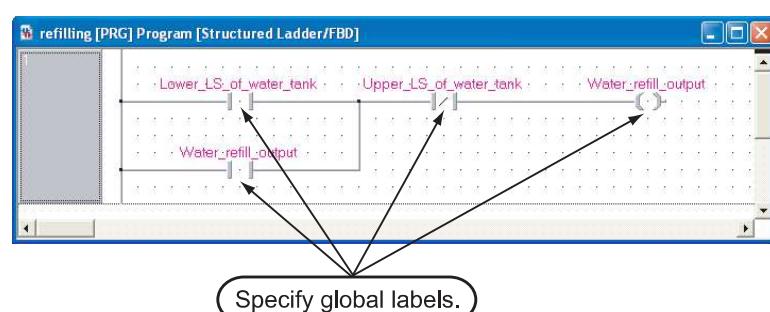


1. Double-click "POU" → "Program" → "refilling" → "Program" on the Project view to display the refilling [PRG] Program [Structured Ladder/FBD] screen.



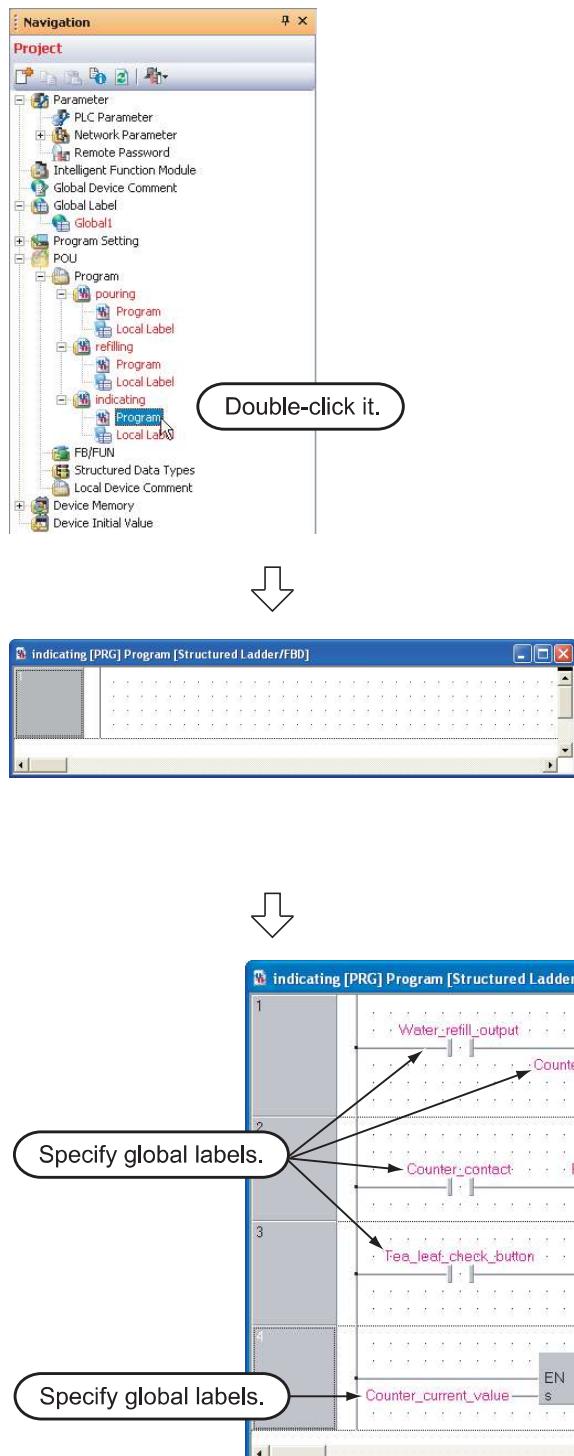
2. Create the program block for the water refilling operation shown in Section 5.1.2.  
Refer to the following section and manual for the program creation procedures:

- ☞ 3.2.6 Creating a program
- ☞ GX Works2 Version 1 Operating Manual (Structured Project)



## ■ Creating the program block for the warning indicating operation

Create the program block for the warning indicating operation shown in Section 5.1.2.



1. Double-click "POU" → "Program" → "indicating" → "Program" on the Project view to display the indicating [PRG] Program [Structured Ladder/FBD] screen.

2. Create the program block for the warning indicating operation shown in Section 5.1.2. Refer to the following section and manual for the program creation procedures:

3.2.6 Creating a program

GX Works2 Version 1 Operating Manual (Structured Project)

### 5.2.8 Compiling a program

Refer to the following section and manual for compiling:

3.2.7 Compiling a program

GX Works2 Version 1 Operating Manual (Structured Project)

## 5.3 Writing a Project to the programmable controller

Refer to the following section for the procedure to write a project to the programmable controller CPU.

 3.3 Writing a Project to the programmable controller

## 5.4 Monitoring Operations

Execute monitoring, and check the operations.

Note that some screen shot colors have been changed for printing convenience.

GX Works2 is able to simulate programmable controller operations in offline mode.

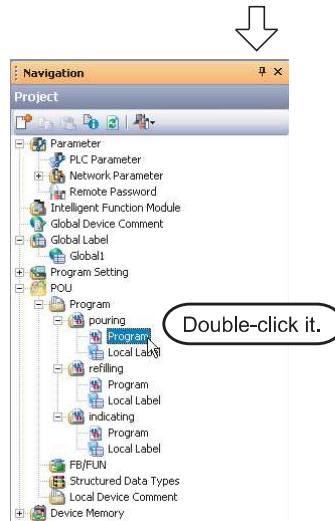
Refer to the following manual for the simulation function:

 GX Works2 Version 1 Operating Manual (Common)

### 5.4.1 Monitoring a program



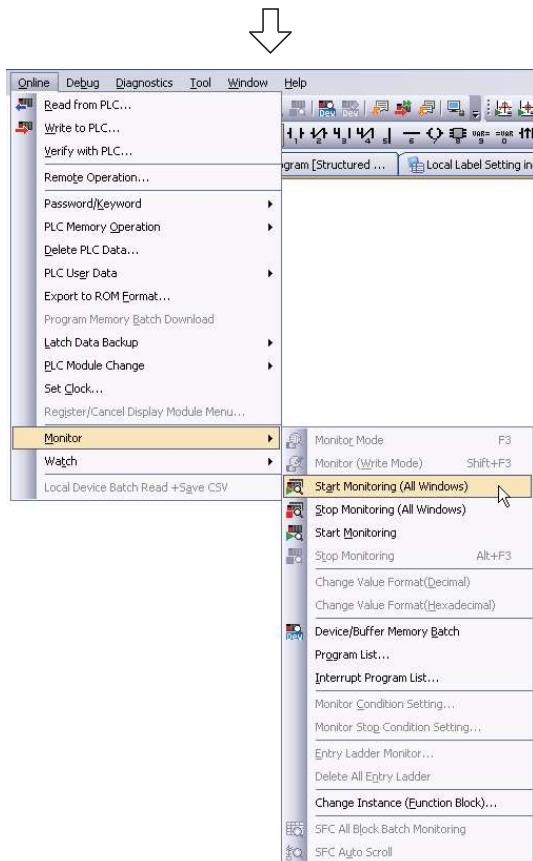
1. Click "Project" in the view selection area on the Navigation window to display the Project view.



2. Double-click "POU" → "Program" → "pouring" → "Program" on the Project view to display the pouring [PRG] Program [Structured Ladder/FBD] screen.

Display the refilling [PRG] program [Structured Ladder/FBD] screen and the indicating [PRG] program [Structured Ladder/FBD] screen in the same way.

(To the next page)



(To the next page)

3. Select [Online] → [Monitor] → [Start Monitoring (All Windows)] to monitor all available screens.

You can also click (Start Monitoring), to switch individual screens to the monitoring status.

4. Set the programmable controller CPU to RUN.

Set the RUN/STOP switch on the programmable controller CPU to "RUN".

You can also switch the programmable controller status between "RUN" and "STOP" using remote operation.

Refer to the next page for remote operation.

1

OVERVIEW

2

CREATED PROGRAM AND SYSTEM CONFIGURATION

3

CREATING PROGRAM IN ST STRUCTURED LADDER/ FBD LANGUAGE

4

CREATING TWO OR MORE PROGRAM BLOCKS

5

## 5 CREATING TWO OR MORE PROGRAM BLOCKS

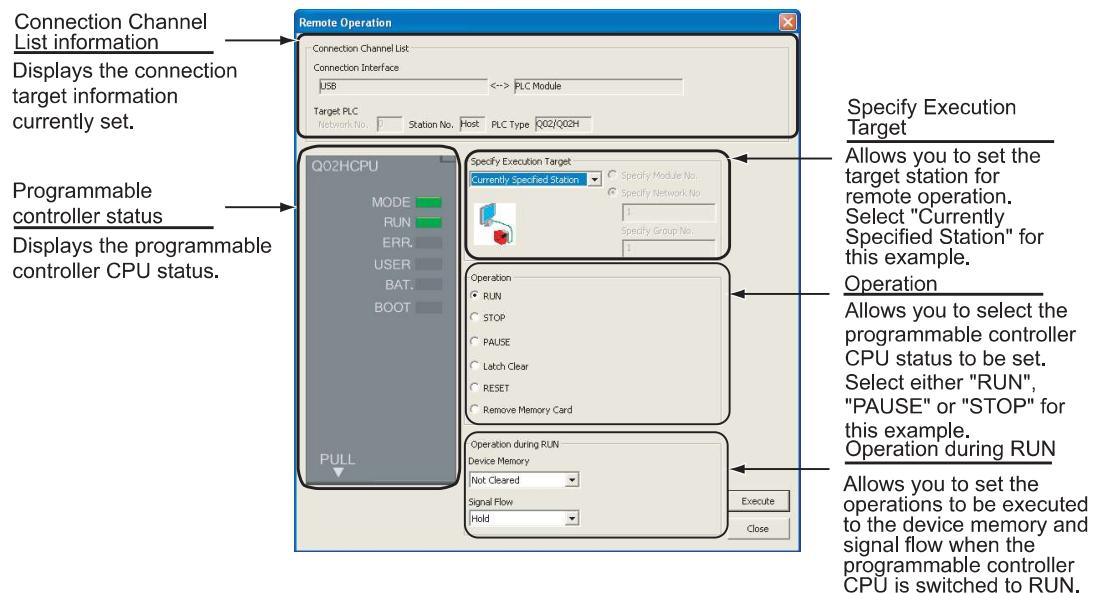
### Point

You can switch the programmable controller status between "RUN" and "STOP" using remote operation as follows.

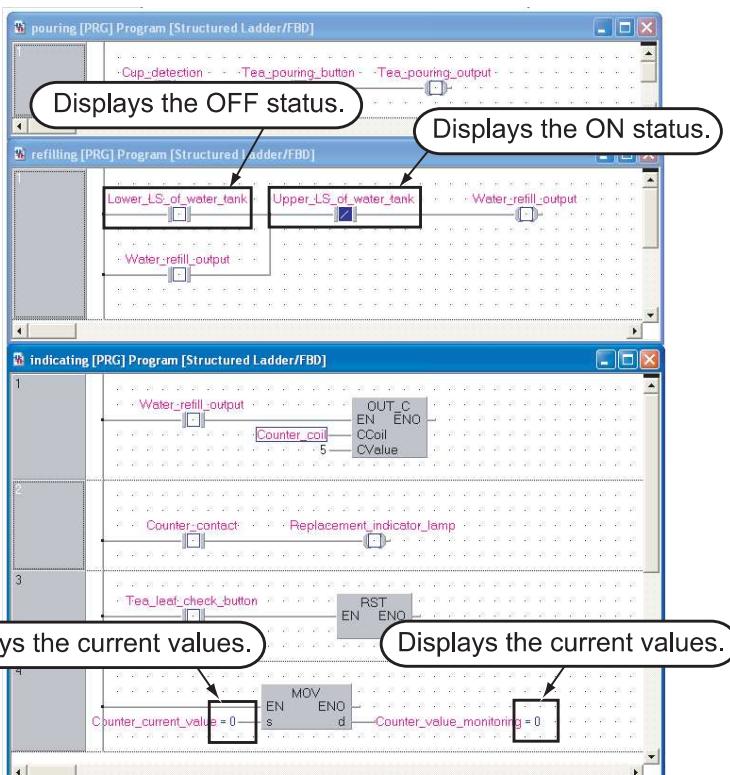
The Settings of the remote operation may vary depending on the programmable controller used.  
Refer to the following manual for the details of the remote operation:

 GX Works2 Version 1 Operating Manual (Common)

Select [Online] → [Remote Operation] to display the Remote Operation screen. You can switch the programmable controller status between "RUN" and "STOP" on this screen.



### Monitor status display example



 (To the next page)

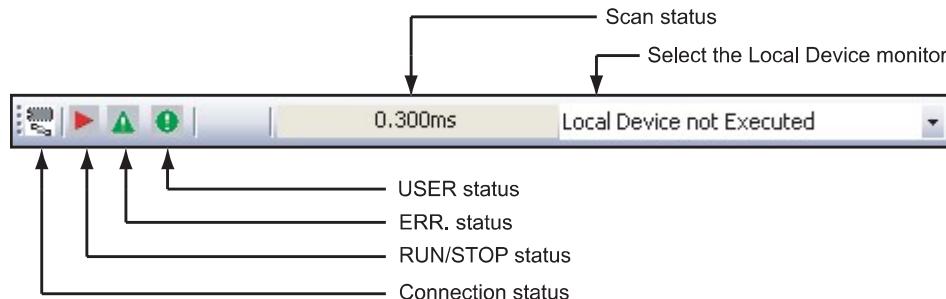
## Point

### Monitor status

GX Works2 displays the Monitor status while it is executing the work window monitor.

The Monitor status disappears when GX Works2 stops all types of monitoring.

The Monitor status indicates the programmable controller CPU, simulator scan time, RUN/STOP status, etc.



Refer to the following manual for the Monitor status:

GX Works2 Version 1 Operating Manual (Common)

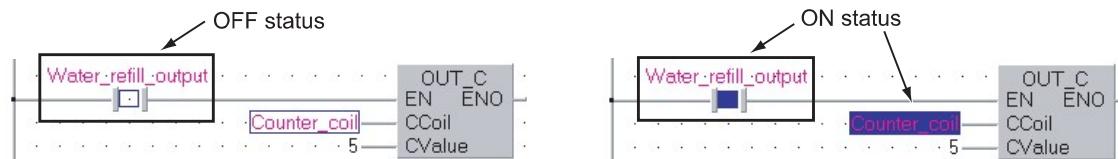
### Monitor status display

#### ● Display of bit value status (ON/OFF status)

GX Works2 displays the ON/OFF status (bit values) of contacts, coils, etc. as the ON/OFF status of devices and labels.

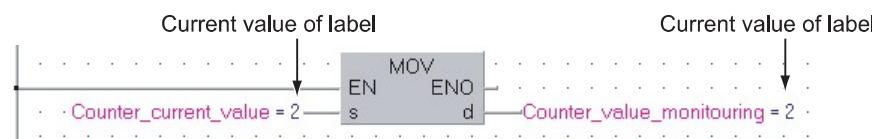
Refer to the following manual for the bit value ON/OFF status display:

GX Works2 Version 1 Operating Manual (Common)



#### ● Display of contents status (current value) other than bit values

GX Works2 displays the current values of non-bit device for contacts, coils, etc. and the contents of character strings as shown below.



#### ● Switching of the current value display between decimal and hexadecimal

You can switch the current value display between decimal and hexadecimal using the following operations.

##### Operation to switch the current value display to decimal

Select [Online] → [Monitor] → [Change Value Format (Decimal)].

##### Operation to switch the current value display to hexadecimal

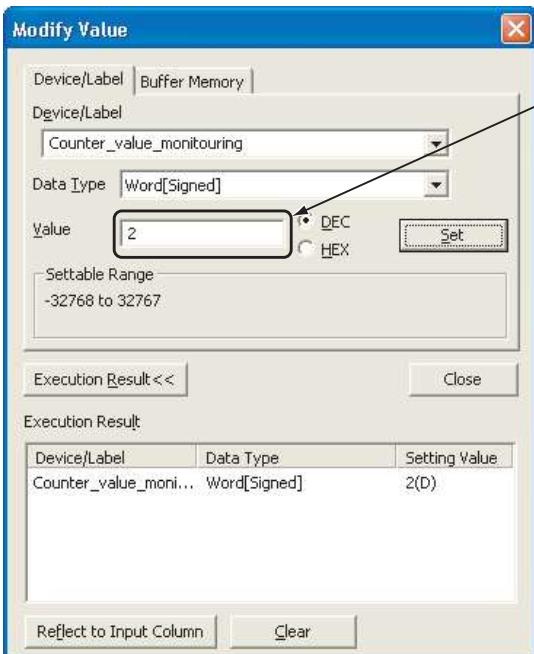
Select [Online] → [Monitor] → [Change Value Format (Decimal)].

**Test operation****● Forcing a contact ON/OFF**

Double-click a monitored device or label while pressing the **Shift** key to force a device in the programmable controller ON/OFF.

**● Changing the current value of a word device**

Double-click a monitored word device to display the Modify Value screen where you can change the current value.



Input the numeric value to be set, and click the **Set** button to change the current value to the input numeric value.

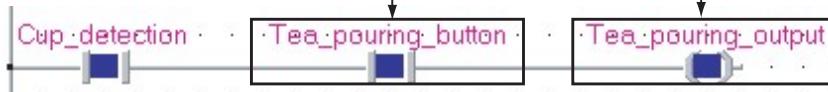


5. Turn ON inputs X0, X1 and X2 in the programmable controller, and check the following operations.

You can turn ON inputs X0, X1 and X2 using the test operation above.

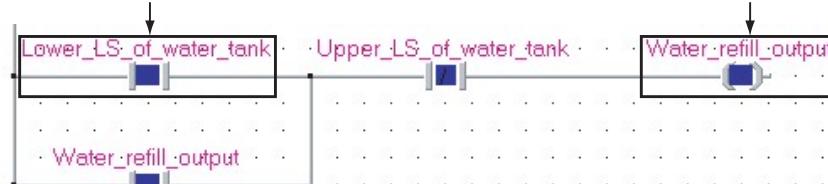
- When X1 turns ON while X0 is ON, the programmable controller turns ON Y10. When X1 turns ON while X0 is OFF, the programmable controller does not turn ON Y10.

X1 (Tea\_pouring\_button) turns ON    The programmable controller turns ON Y10  
while X0 (Cup\_detection) is ON.    (Tea\_pouring\_output).



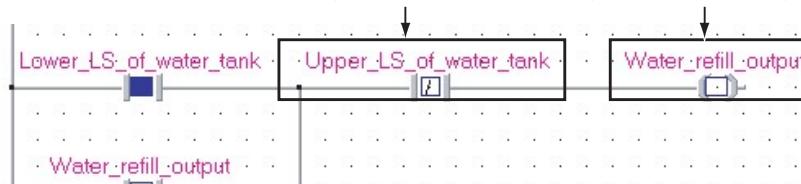
- When X3 turns ON, the programmable controller turns ON Y11.

X3 (Lower\_LS\_of\_water\_tank) turns ON.    The programmable controller turns ON Y11 (Water\_refill\_output).



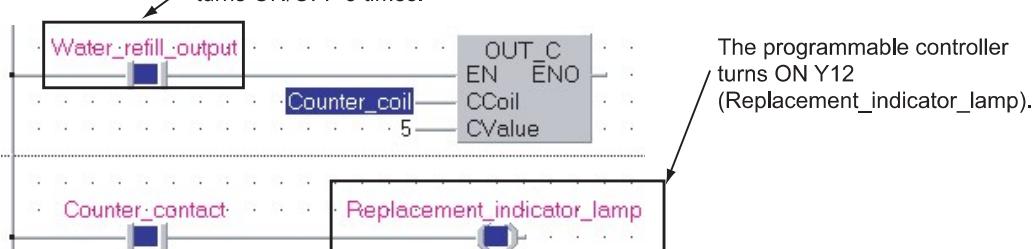
- When X4 turns ON while X3 is ON, the programmable controller turns OFF Y11.

X4 (Upper\_LS\_of\_water\_tank) turns ON.    The programmable controller turns OFF Y11 (Water\_refill\_output).



- When Y11 turns ON/OFF 5 times, the programmable controller turns ON Y12.

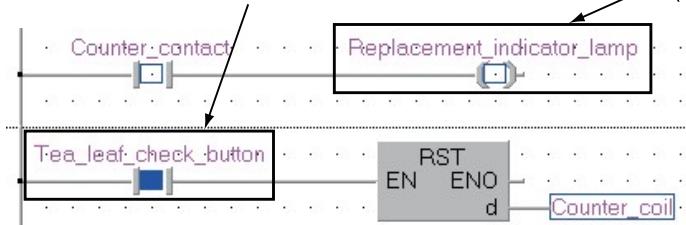
Y11 (Water\_refill\_output) turns ON/OFF 5 times.



- When X2 turns ON, the programmable controller turns OFF Y12.

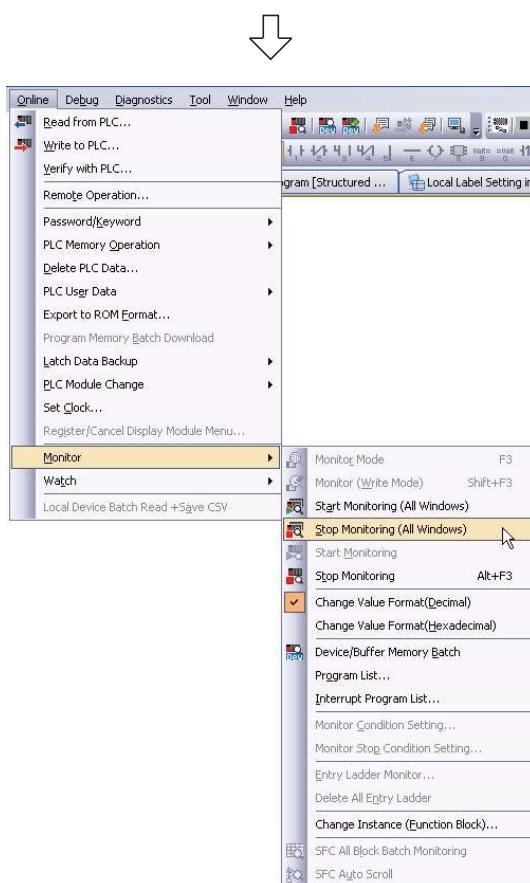
X2 (Tea\_leaf\_check\_button) turns ON.

The programmable controller turns OFF Y12 (Replacement\_indicator\_lamp).



(To the next page)

## 5 CREATING TWO OR MORE PROGRAM BLOCKS



6. Select [Online] → [Monitor] → [Stop Monitoring (All Windows)] to reset the monitor status on all monitored screens.

You can also click Stop Monitoring (All Windows) to reset each monitored screens.

7. Set the programmable controller CPU to STOP.

Set the RUN/STOP switch on the programmable controller CPU to "STOP".

You can switch the programmable controller status between "RUN" and "STOP" using remote operation.

"Point" in the step4

### 5.4.2 Batch monitoring of device values

Refer to the following section for the Batch monitoring of device values.

3.4.2 Batch monitoring of device values

## 5.5 Diagnosing the programmable controller

You can check the programmable controller RUN/STOP status and error status.

Refer to the following section for the diagnosis procedure:

3.5 Diagnosing the programmable controller

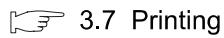
## 5.6 Reading a Project from programmable controller

Refer to the following section for the procedure to read a project from the programmable controller:

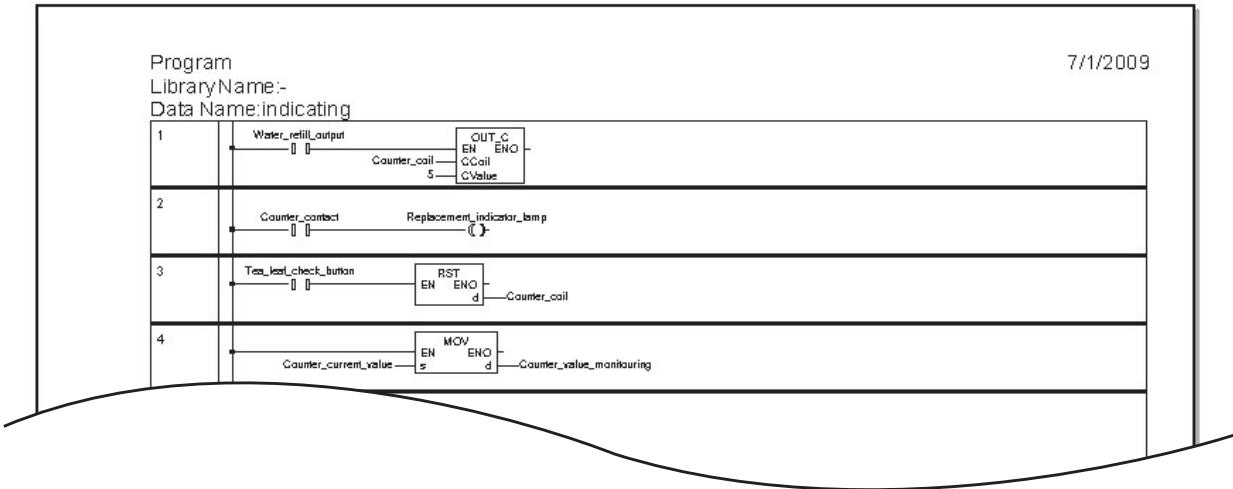
3.6 Reading a Project from programmable controller

## 5.7 Printing

For the Printing a project procedure, refer to the following.



### 3.7 Printing



OVERVIEW

2

CREATED PROGRAM  
AND SYSTEM  
CONFIGURATION

3

CREATING PROGRAM IN  
STRUCTURED LADDER/  
FBD LANGUAGE

4

CREATING  
PROGRAM IN ST  
LANGUAGE

5

## 5.8 Saving a Project

Refer to the following section for the project saving procedure:



### 3.8 Saving a Project

## 5.9 Exiting GX Works2

Refer to the following section for the project ending procedure:



### 3.9 Exiting GX Works2

CREATING TWO OR  
MORE PROGRAM  
BLOCKS

Microsoft, Windows are registered trademarks of Microsoft Corporation in the United States and other countries.

Ethernet is a registered trademark of Xerox Corporation in the United States.

Other company names and product names used in this document are trademarks or registered trademarks of respective companies.



# GX Works2

## Beginner's Manual

### (Structured Project)

MODEL	GXW2-HOW-O-KP-E
MODEL CODE	13JZ23
SH(NA)-080788ENG-J(1201)MEE	



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

When exported from Japan, this manual does not require application to the Ministry of Economy, Trade and Industry for service transaction permission.

Specifications subject to change without notice.