MITSUBISHI

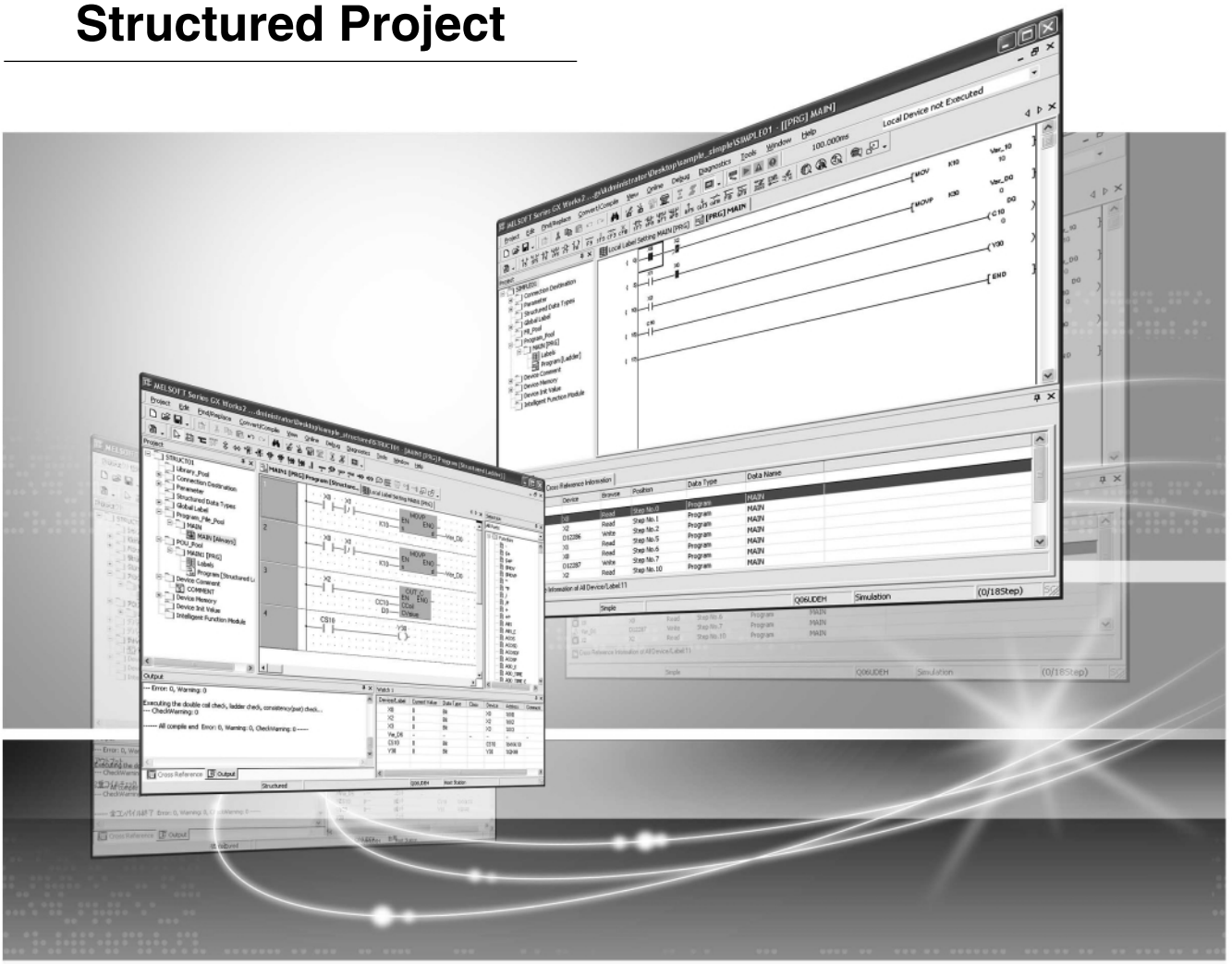
MELSOFT

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 "DANGER" and "CAUTION".

DANGER	Indicates that incorrect handling may cause hazardous conditions, resulting in death or severe injury.
CAUTION	Indicates that incorrect handling may cause hazardous conditions, resulting in medium or slight personal injury or physical 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]

Danger

- **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 change such as RUN-STOP switching, and remote control operation) have to be executed after the manual has been carefully read and the safety has been ensured.**
  When changing a program while a programmable controller CPU is RUN, it may cause a program corruption in some operating conditions. Fully understand the precautions described in GX Works2 Version1 Operating Manual (Common).

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

Japanese Manual Version SH-080734-A

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.

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■ MANUALS

Related manuals are separately issued according to the purpose of their functions for 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 Version1 Operating Manual (Common) Explains the system configuration of GX Works2 and the functions common to a Simple project and Structured project such as parameter setting and the operating method for the online function. (Sold separately)	SH-080779ENG (13JU63)
GX Works2 Version1 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 Version1 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 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)
QCPU Structured Programming Manual (Fundamentals) Explains the programming method, types of programming languages required to create structured programs. (Sold separately)	SH-080782ENG (13JW06)
QCPU Structured Programming Manual (Common Instructions) Explains the specifications and functions of sequence instructions, basic instructions, and application instructions that can be used in structured programs. (Sold separately)	SH-080783ENG (13JW07)
QCPU 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)
QCPU Structured Programming Manual (Special Instructions) Explains the specifications and functions of instructions for network modules, intelligent function modules, and PID control functions that can be used in structured programs.	SH-080785ENG (13JW09)

Point

The Operating Manual is included in the CD-ROM with the software package.
Manuals in printed form are sold separately for single purchase. Order a manual by quoting the manual number (model code) listed in the 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'.

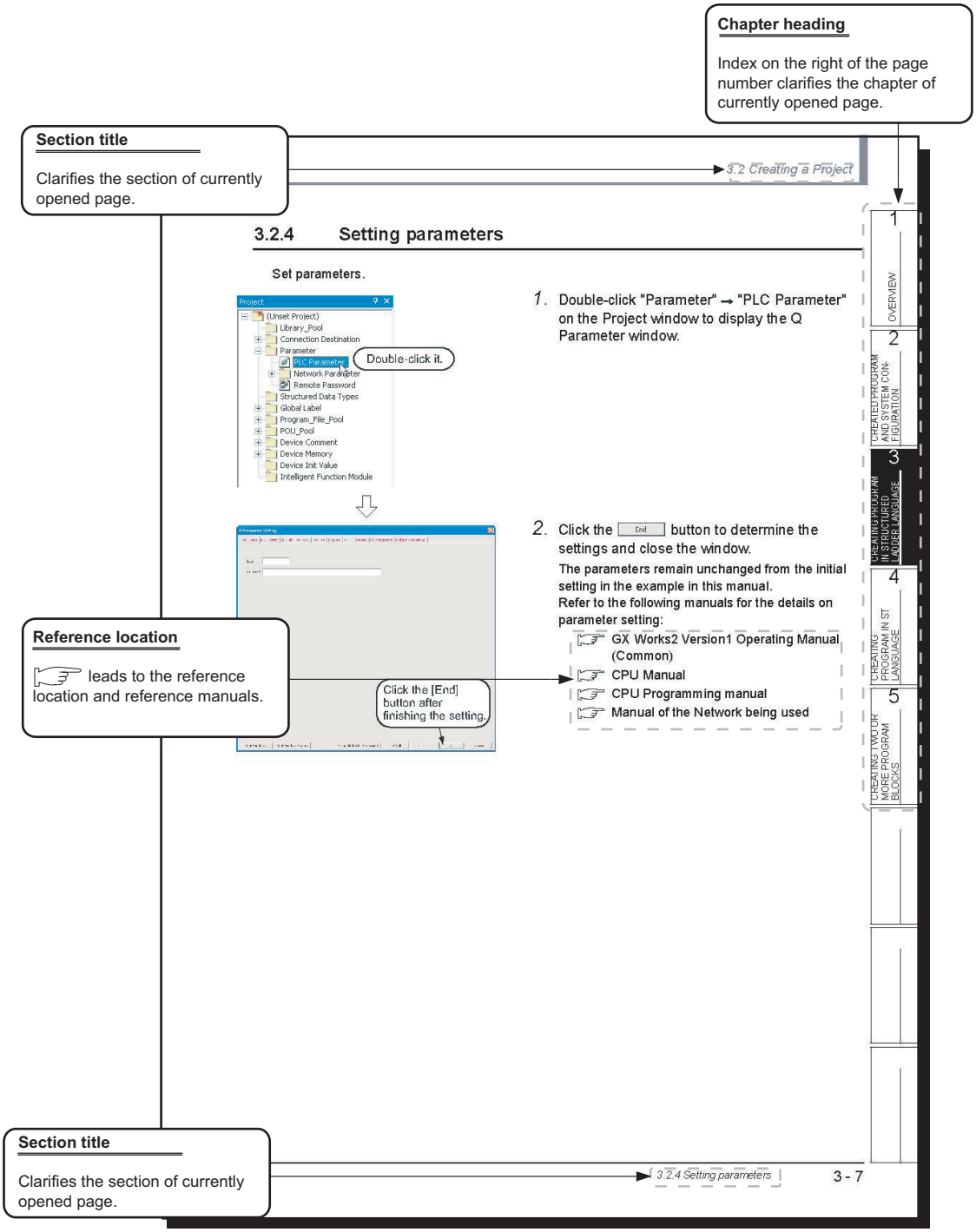
1) Operation of GX Work2

Purpose		GX Works2 Installation Instructions	GX Works2 Beginner's Manual		GX Works2 Version1 Operating Manual		
							
		–	Simple Project	Structured Project	Common	Simple Project	Structured Project
Installation	Learning the system requirements and installation method	Details					
Operation of Simple project	Learning the basic operations and operating procedures		Details		Outline	Outline	
	Learning the functions and operation methods for programming				Outline	Details	
	Learning all functions and operation methods except for programming				Details		
Operation of Structured project	Learning the basic operations and operating procedures			Details	Outline		Outline
	Learning the functions and operation methods for programming				Outline	Details	Details
	Learning all functions and operation methods except for programming				Details		

2) Programming

Purpose		QCPU Structured Programming Manual				QCPU/QnACPU Programming Manual		User's Manual for intelligent function module/ Reference Manual for network module
								
		Fundamentals	Common Instructions	Special Instructions	Application Functions	Common Instructions	PID Control Instructions	–
Programming in Simple project	Learning the types and details of common instructions, error codes and special relays, and special registers					Details		
	Learning the types and details of instructions for intelligent function modules							Details
	Learning the types and details of instructions for network modules							Details
	Learning the types and details of instructions for the PID control function						Details	
Programming in Structured project	Learning the fundamentals for creating a Structured program for the first time	Details						
	Learning the types and details of common instructions		Details					
	Learning the types and details of instructions for intelligent function modules			Details				Details
	Learning the types and details of instructions for network modules			Details				Details
	Learning the types and details of instructions for the PID control function			Details			Details	
	Learning the description of error codes, special relays, and special registers					Details		
	Learning the types and details of application functions				Details			

● 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

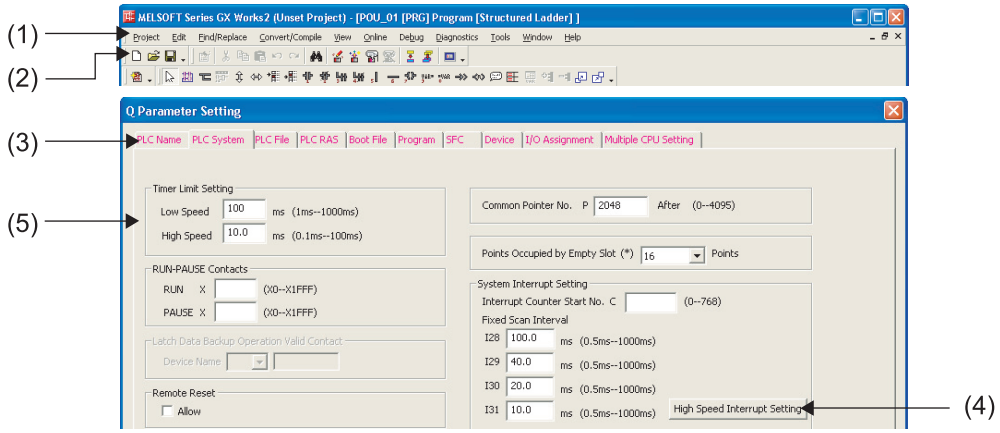
This explains notes for requiring attention or useful functions relating to the information given on the same page.

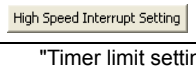
Restrictions

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	<<PLC system>>
(4)		Button on a screen	 button
(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 the SWnDNC-GXW2-E model (n: version)
GX Developer	Generic product name for the SWnD5C-GPPW-E, SWnD5C-GPPW-EA, SWnD5C-GPPW-EV, and SWnD5C-GPPW-EVA (n: version)
Personal computer	Generic term for personal computers on which Windows® operates
High Performance model QCPU	Generic term for the Q02(H), Q06H, Q12H, and Q25H
Universal model QCPU	Generic term for the Q02U, Q03UD, Q03UDE, Q04UDH, Q04UDEH, Q06UDH, Q06UDEH,Q13UDH, Q13UDEH, Q26UDH, and Q26UDEH
QCPU (Q mode)	Generic term for the High Performance model QCPU and the Universal model QCPU

MEMO

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 (Structured Project)

1.1 Simple Project and Structured Project 1-2
1.2 Program Creation Procedure 1-3

1.1 Simple Project and Structured Project

■ Simple Project

In a Simple Project, you can create ladder 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 circuits 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.

■ 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.)

● Graphic languages

- Ladder
  Use this graphic language to describe programs as circuits consisting of contacts, coils, etc, using the same operating procedures as the conventional GX Developer.
- Structured Ladder
  This graphic language is created based on the relay circuit design technology. Because this language is easy to understand intuitively, it is used generally for ladder programs.
  Every circuit always starts from a bus 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.
- 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 language (Structured Text language)
  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.

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 subsection
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 subsection
Set the parameters.	3.2.4

3. Creating the program configuration

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

5. Editing the program

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

(To the next page)

6. Conversion

Procedure	Reference subsection
Compile the program.	3.2.7

7. Connecting the programmable controller CPU

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

8. Writing to the programmable controller

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

9. Checking operations

Procedure	Reference section
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 section
Print the program and parameters.	3.7 4.7 5.7

11. Quitting GX Works2

Procedure	Reference section
Save the project.	3.8
Quit GX Works2.	3.9

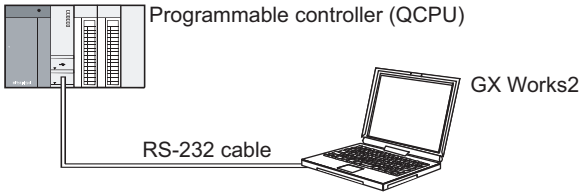
2 CREATED PROGRAM AND SYSTEM CONFIGURATION

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

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

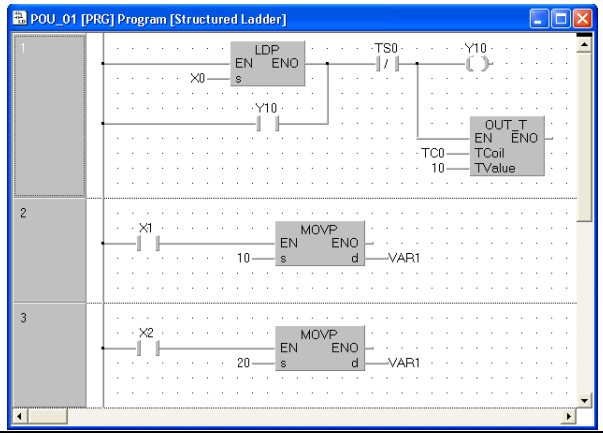
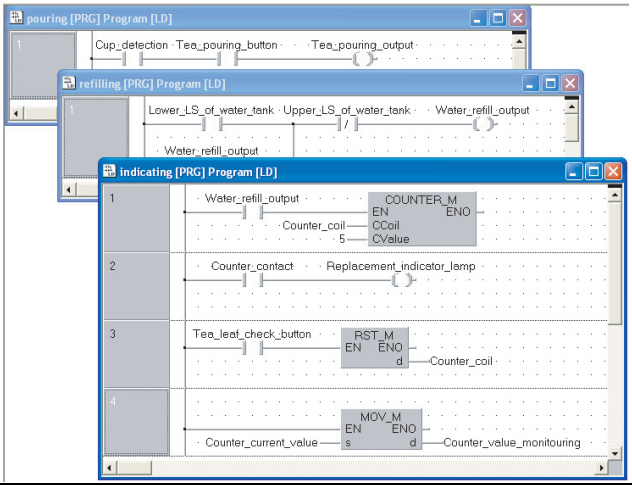
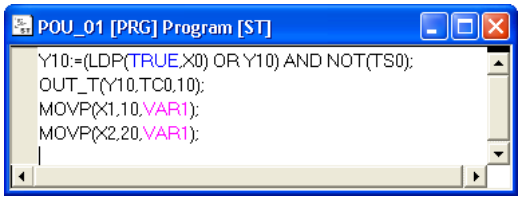
Program language	Number of program blocks	Operation overview	Reference
Structured Ladder	1		Chapter 3
	3		Chapter 5

Table 2.1 Overview of created program

Program language	Number of program blocks	Operation overview	Reference
ST	1		Chapter 4
Ladder	Refer to the following manual. ☞ GX Works2 Beginner's Manual(Simple Project)		
SFC	Refer to the following manual. ☞ GX Works2 Beginner's Manual(Simple Project)		

MEMO

3 CREATING PROGRAM IN STRUCTURED LADDER LANGUAGE

This chapter explains how to create a program in the Structured Ladder 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):

☞ QCPU 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 3-28
3.5 Diagnosing the programmable controller 3-36
3.6 Reading a Project from programmable controller 3-37
3.7 Printing 3-39
3.8 Saving a Project 3-45
3.9 Quitting GX Works2 3-46

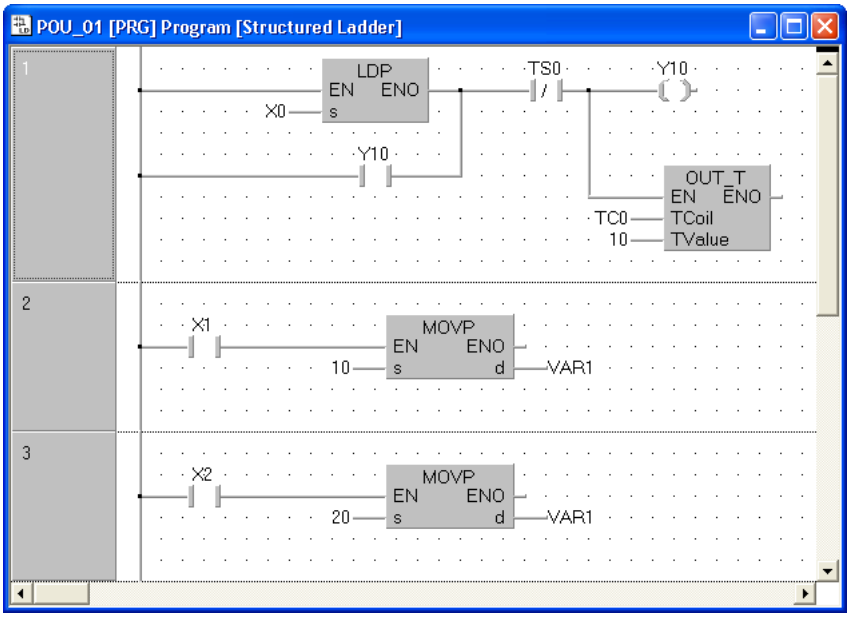
3.1 Created Program

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").

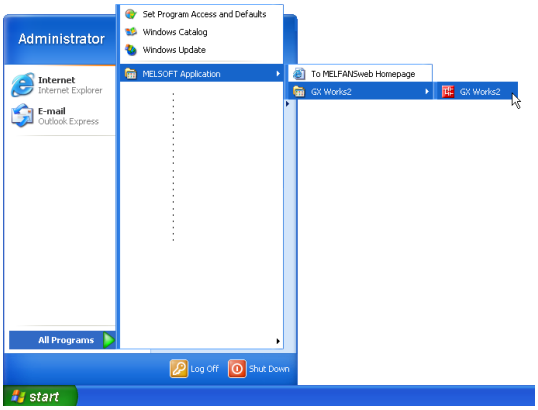
3.1.2 Created program



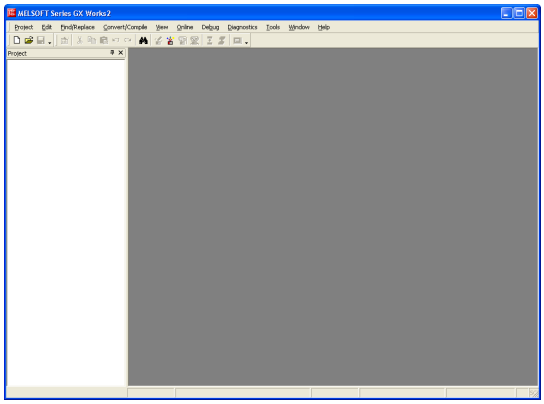
3.2 Creating a Project

Create a project using Structured Ladder programs.

3.2.1 Starting GX Works2



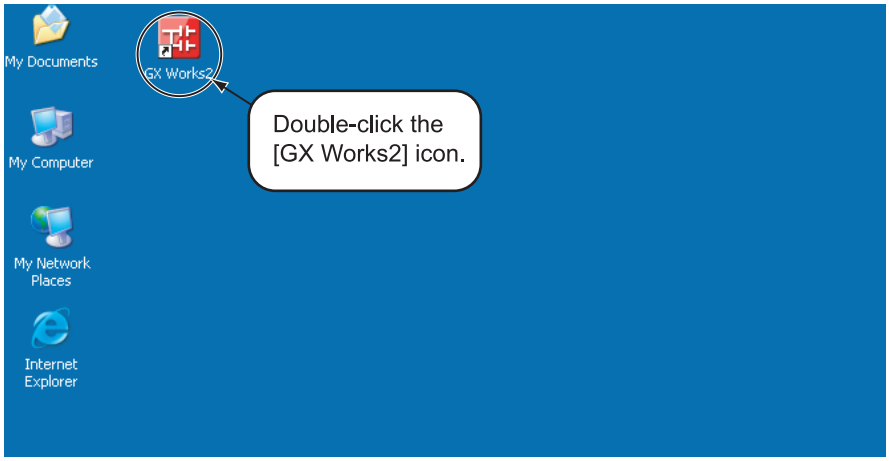
1. Select the software package menu to be started.



2. The selected software package is started.

Point

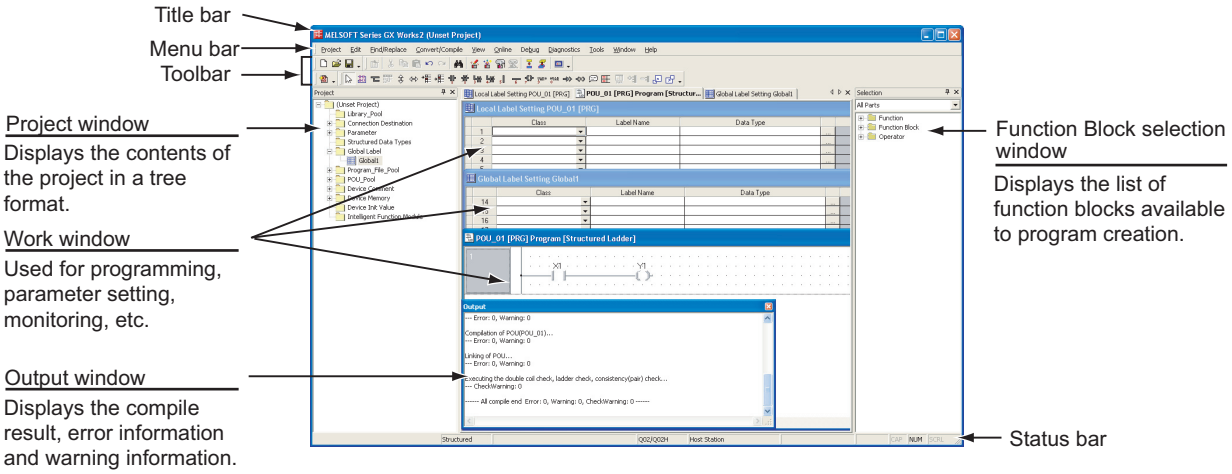
You can double-click the  **icon on the desktop to start the software package.**



3.2.2 Screen configuration in GX Works2

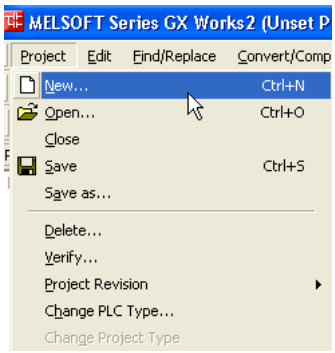
The GX Works2 screen has the following configuration.
Select "View" or "Hide" in the [View] menu for each of the Toolbar, Status bar, Project window, Function Block Selection window and Output window.
Refer to the following manual for the details on the GX Works2 screen configuration:

☞ GX Works2 Version1 Operating Manual (Common)

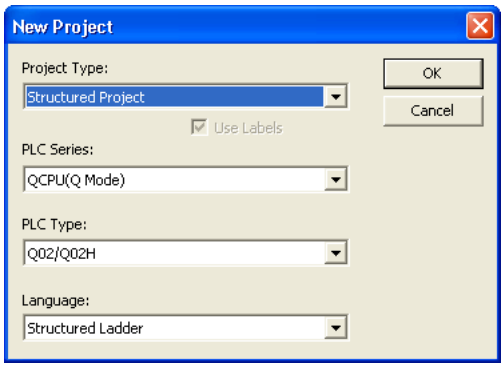


3.2.3 Creating a new project

At first, create a project.



1. Perform either procedure below to display the new project window.
   - Select [Project] → [New].
   - Click (New).



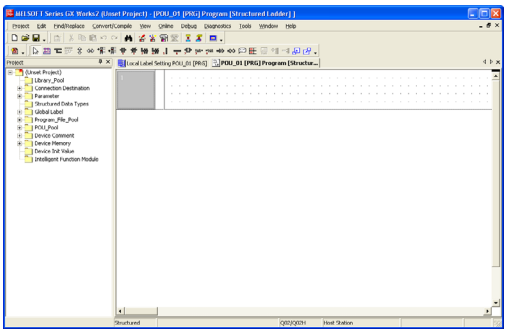
2. Select the "Project Type", "PLC Series" and "PLC Type" from the list boxes for the new project to be created.

   After the setting, click the OK button.

   Settings

   - Project Type : Structured Project*1
   - PLC Series : QCPU (Q mode)
   - PLC Type : Q02/Q02(H)
   - Language : Structured Ladder

   *1: Labels are always available in structured projects. You do not have to check "USE Labels".



3. GX Works2 creates a new project.

Point

Opening an existing project

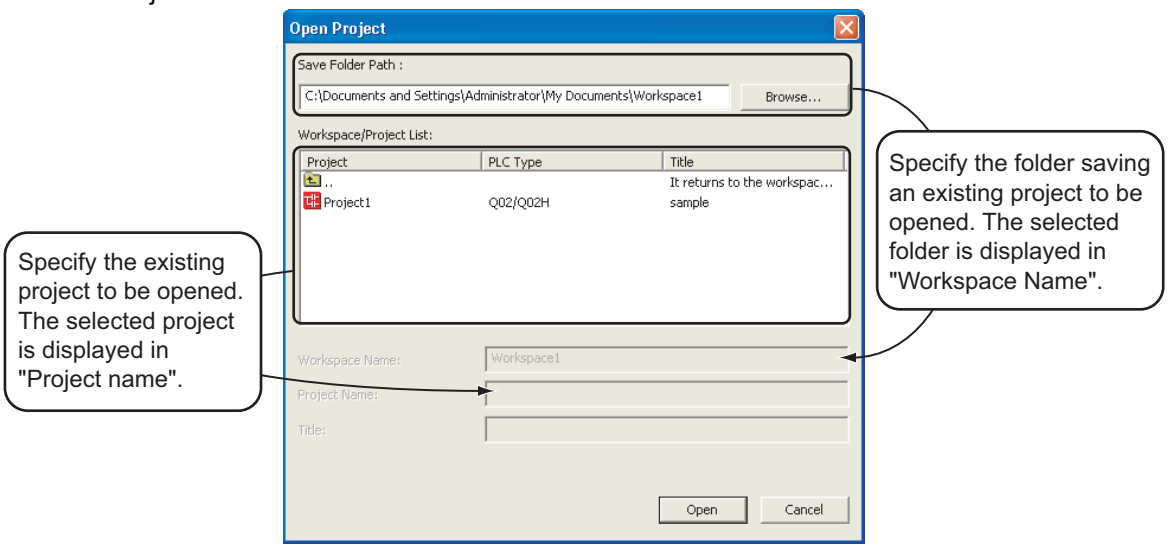
Refer to the following manual for the details on the existing project opening procedure:

GX Works2 Version1 Operating Manual (Common)

1. Perform either operation below.
   - Select [Project] → [Open].
   - Click (Open).

2. The Open project window appears.

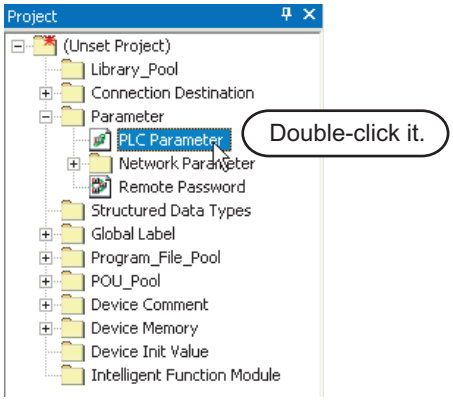
   Select an existing project to be opened in the "Workspace folder path" and "Workspace/Project List".

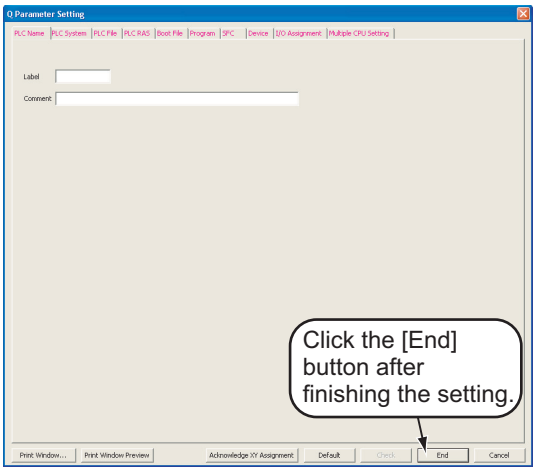


3. Click the Open button to open the selected project.

3.2.4 Setting parameters

Set parameters.





1. Double-click "Parameter" → "PLC Parameter" on the Project window to display the Q Parameter window.

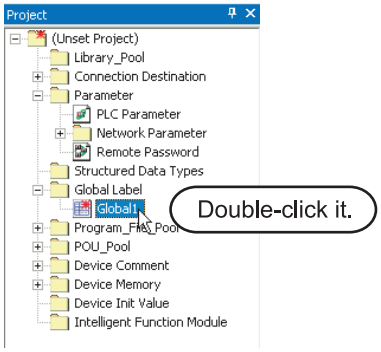
2. Click the [End] button to determine the settings and close the window.

   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:

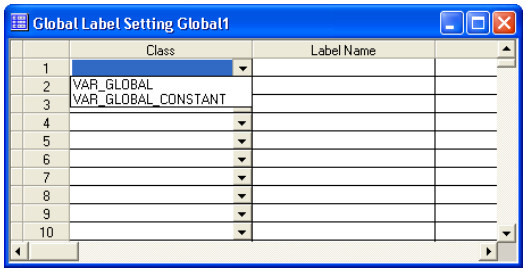
   - GX Works2 Version1 Operating Manual (Common)
   - CPU Manual
   - CPU Programming manual
   - Manual of the Network being used

3.2.5 Setting labels

Set Global Labels.



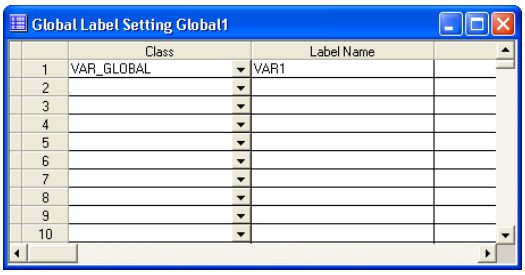
1. Double-click "Global Label" → "Global1" on the Project window to display the Global Label Setting window.



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

Settings

- Class: VAR_GLOBAL



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

Settings

- Label Name: VAR1

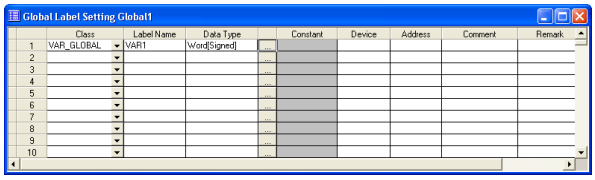
Restrictions

● **Characters available for the label name**
You can enter up to 32 full-width or half-width 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 half-width number
- Label name equivalent to a device name

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

GX Works2 Version1 Operating Manual(Common)

(To the next page)



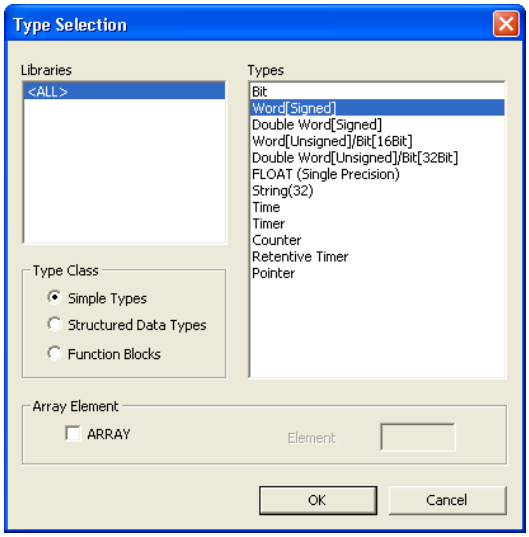
4. Directly input the "Type" on the Global Label Setting window.

Settings

- Date Type: Word[Signed]

Point

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



Settings[*1]

1) Libraries: ALL

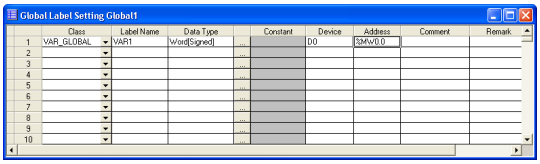
2) Type Class: Simple Types

3) Types: Word[Signed]

4) Array Element: Not checked

*1)Set "Libraries", "Type Class", "Types" and "Array Element" in this order.

After completing the setting, click the [OK] button.



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

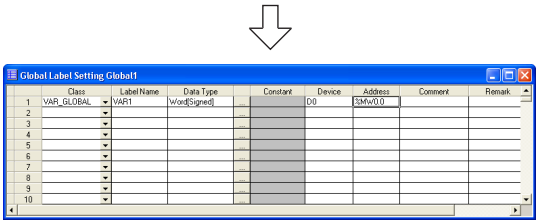
Inputting "Device" in GX Works2 automatically sets "Address".

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

Settings

- Device: D0

(To the next page)



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

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:

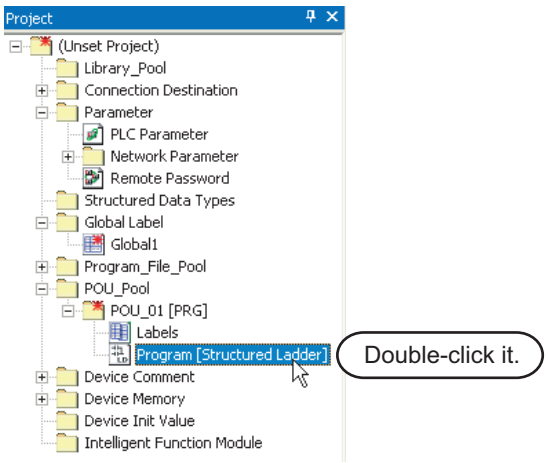
☞ GX Works2 Version1 Operating Manual (Structured Project)

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

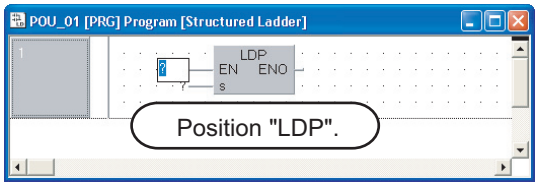
☞ QCPU Structured Programming Manual (Fundamentals)

3.2.6 Creating a program

Create the LD program shown in Subsection 3.1.2.



1. Double-click "Pou_Pool" → "POU_01 [PRG]" → "Program[Structured Ladder]" on the Project window to display the POU_01 [PRG] program [Structured Ladder] window.



2. Drag "Function" → "LDP" from the Function Block Selection window, and drop it on the POU_01 [PRG] program [Structured Ladder] window to position it there.

(To the next page)

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.

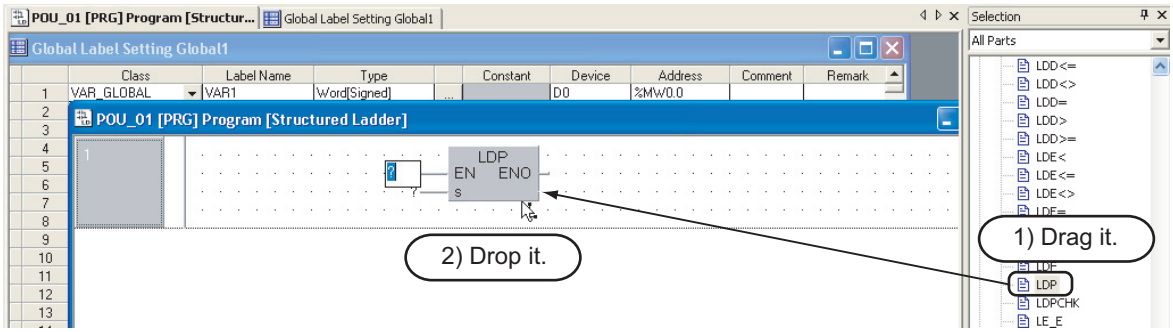
Perform the following procedure to display the Function Block Selection Window:

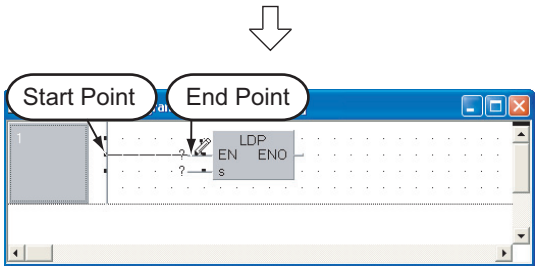
Select "View" → "Docking window" → "Function Block Selection Window".

In the example below, drag the Function "LDP" from the Function Block Selection window, and drop it on the POU_01 [PRG] program [LD] window to position it there.

Refer to the following manual for the details:

GX Works2 Version1 Operating Manual (Structured Project)





3. Click (Interconnect Mode) on the Structured Ladder 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" in the previous page.)

Point

Connection with grid line

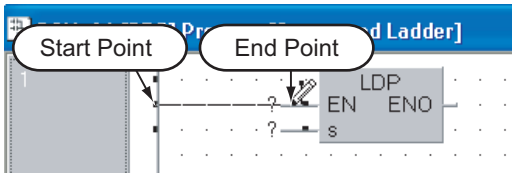
Connect Network Elements such as contacts, coils, Function and Function block with grid lines.

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

Make valid the Auto Connect function to easily draw a grid line only by specifying the start point and end point using the mouse.

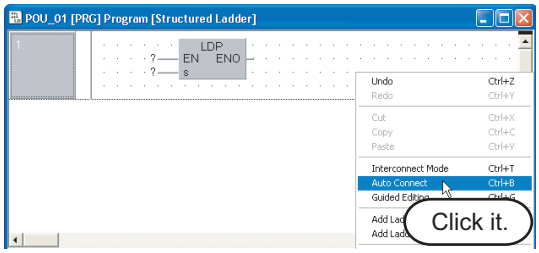
Refer to the following manual for the details:

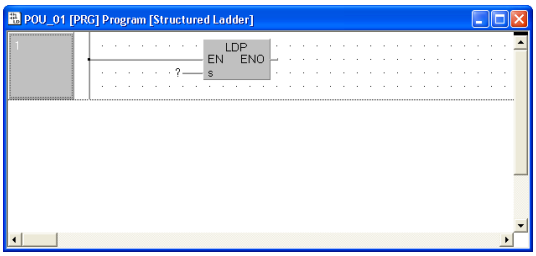
GX Works2 Version1 Operating Manual (Structured Project)



You can easily connect grid lines by making valid the Auto Connect function in the Interconnect Mode.
Perform the following procedure to make valid the Auto Connect function.

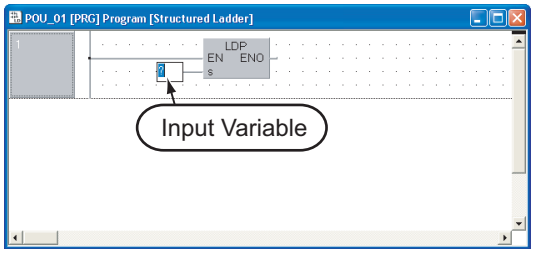
- Select "Edit" → "Auto Connect" to put a check mark.
- Right-click the LD work window to display the menu window, and select "Auto Connect" to put a check mark.





4. Click (Select Mode) on the Structured Ladder toolbar to specify the Select Mode.

(To the next page)



5. Set the function "LDP".

Click the input variable "?" of "s", and set the input variable.

Settings

- s: X0

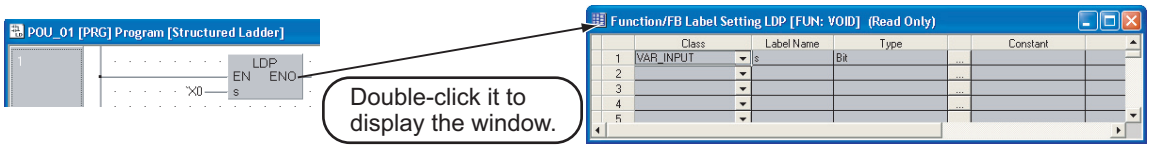
Point

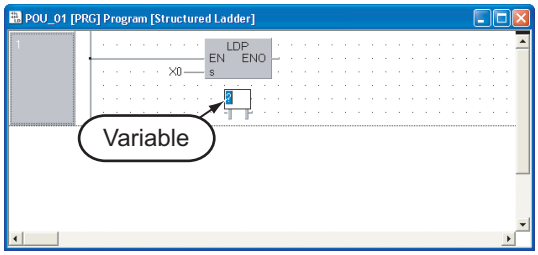
Referring to the data type of input/output labels in a Function or Function block

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

Refer to the following manual for the details:

GX Works2 Version1 Operating Manual (Structured Project)



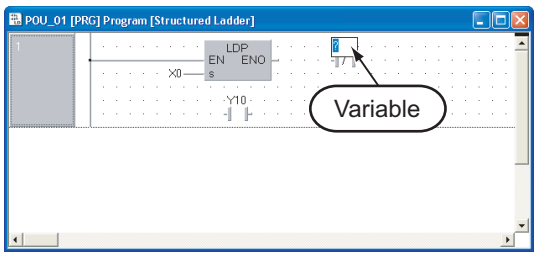


6. Click (Contact) on the Structured Ladder toolbar, and then click a desired position to position a Contact there.

Click "?", and set the variable.

Settings

- Variable: Y10



7. Click (Contact Negation) on the Structured Ladder toolbar, and then click a desired position to position Contact Negation there.

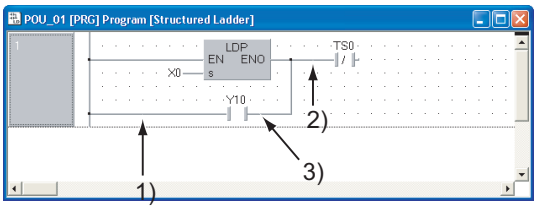
Click "?" and, set the variable.

Settings

- Variable: TS0*1

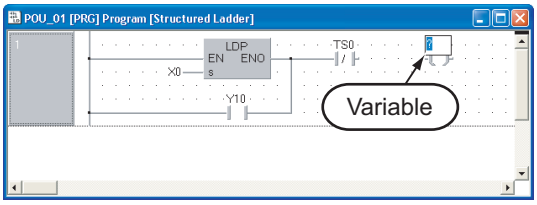
*1. "TS0" indicates a contact of the timer T0.

(To the next page)



8. Draw grid lines in three positions (1), 2) and 3)) using the procedure described in the step 3.

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

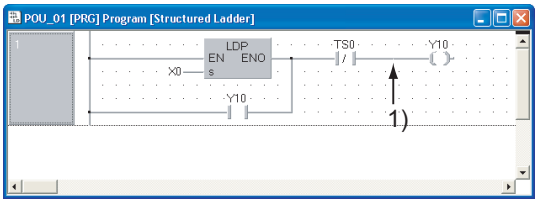


9. Click (Coil) on the Structured Ladder toolbar, and then click a desired position to position a Coil there.

Click "?", and set the variable.

Settings

- Variable: Y10



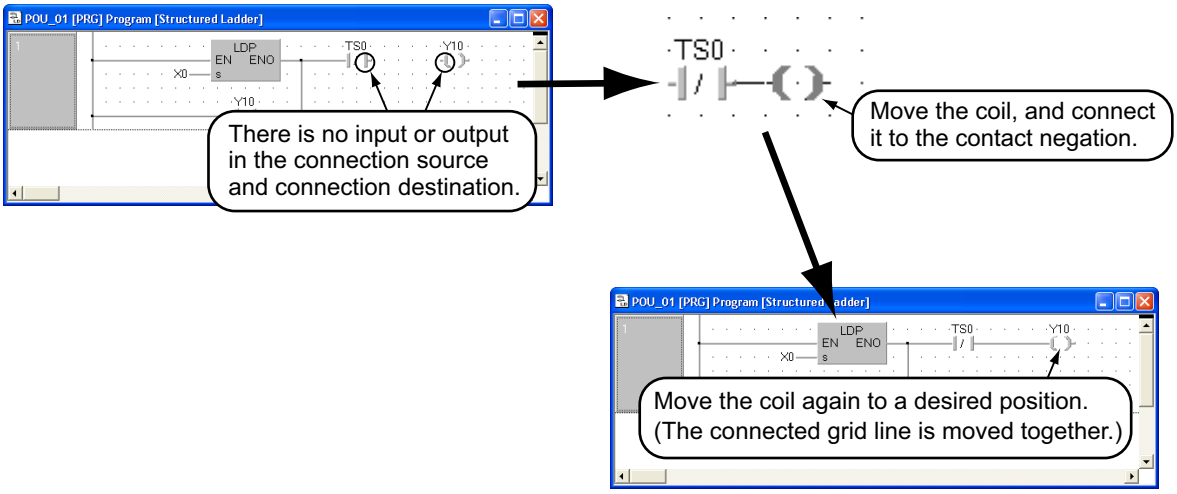
10. Draw a grid line (1)) using the procedure described in the step 3.

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

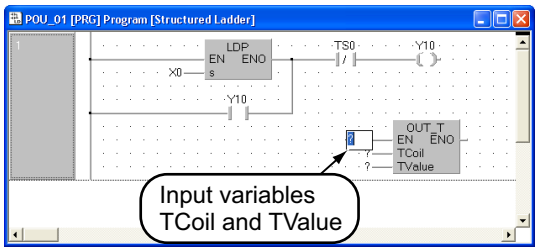
Point

If there is no input or output in the connection source and connection destination as shown below, you can connect a grid line as shown below while the Auto Connect function is valid.
Refer to the following manual for the details:

GX Works2 Version1 Operating Manual (Structured Project)



(To the next page)



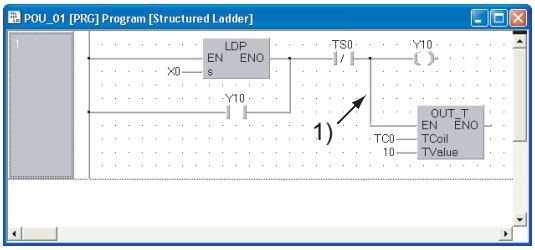
11. Select "Function" → "OUT_T" on the Function Block Selection window, drag it, and drop it in a desired position to position "OUT_T" there.

Click "?" of "TCoil*1" and "TValue*2", and set the input variables.

Settings

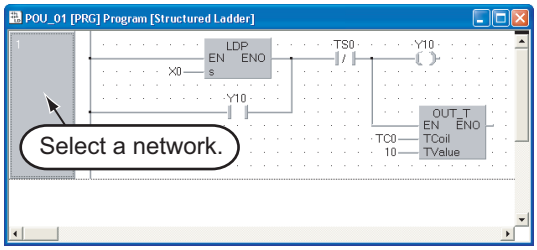
- TCoil : TC0*3
- TValue : 10

*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.



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

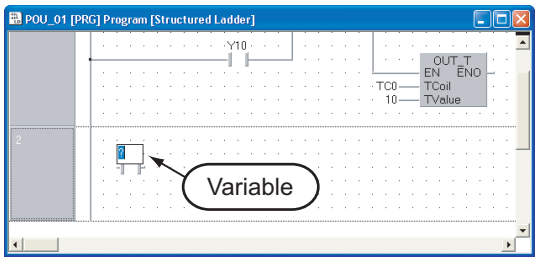
- After drawing a grid line, click (Select Mode) on the Structured Ladder toolbar to specify the Select Mode.



13. Select a network, and click (New Network After) on the Structured Ladder toolbar to add a network.

Point

Create a "one Structured Ladder block" program in one network.



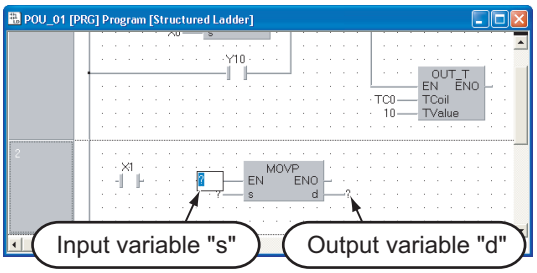
14. Click (Contact) on the Structured Ladder toolbar, and then click a desired position to position a Contact there.

Click "?", and set the variable.

Settings

- Variable: X1

(To the next page)



15. 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 (1),2)) using the procedure described in the step3.
Click "?" of "s" and "d", and set the input and output variables.

Settings

- s: 10
- d: VAR1*1

*1. "VAR1" is the label set in Subsection 3.2.5.

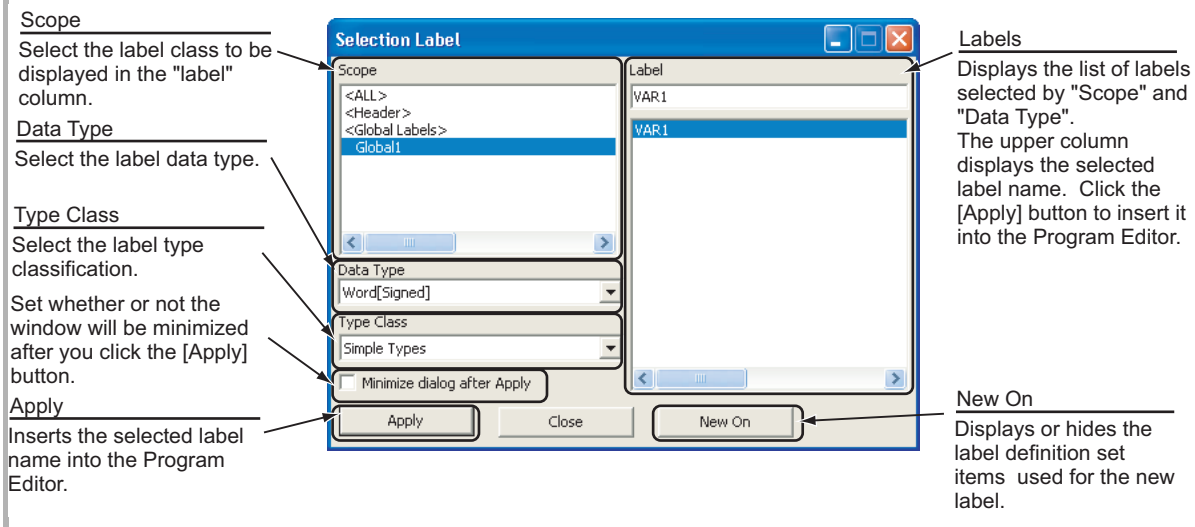
Point

Selecting a label from the Selection Label window
You can input a label also by selecting it from the Selection label window.
Perform the following procedure to display the Selection Label window.

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

Refer to the following manual for the details on the Selection Label window:

GX Works2 Version1 Operating Manual (Structured Project)



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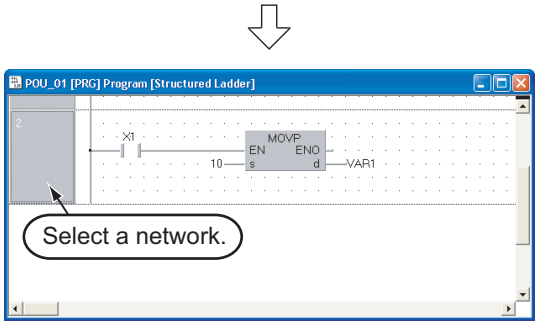
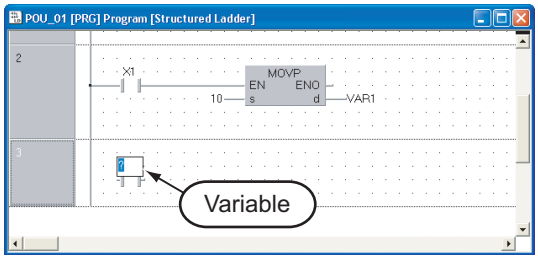


16. Select a network, and click (New Network After) on the Structured Ladder toolbar to add a network.

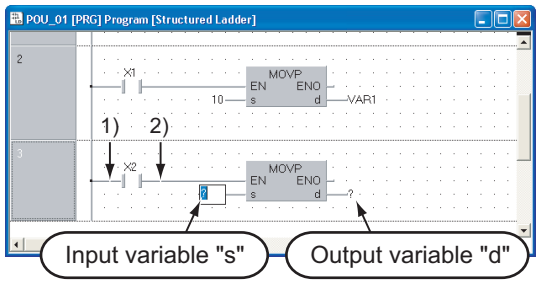


17. Click (Contact) on the Structured Ladder toolbar, and then click a desired position to position a Contact there.

Click "?", and set the variable.

Settings

- Variable: X2



18. 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 (1),2)) using the procedure described in the step3.

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

Settings

- s: 20
- d: VAR1*1

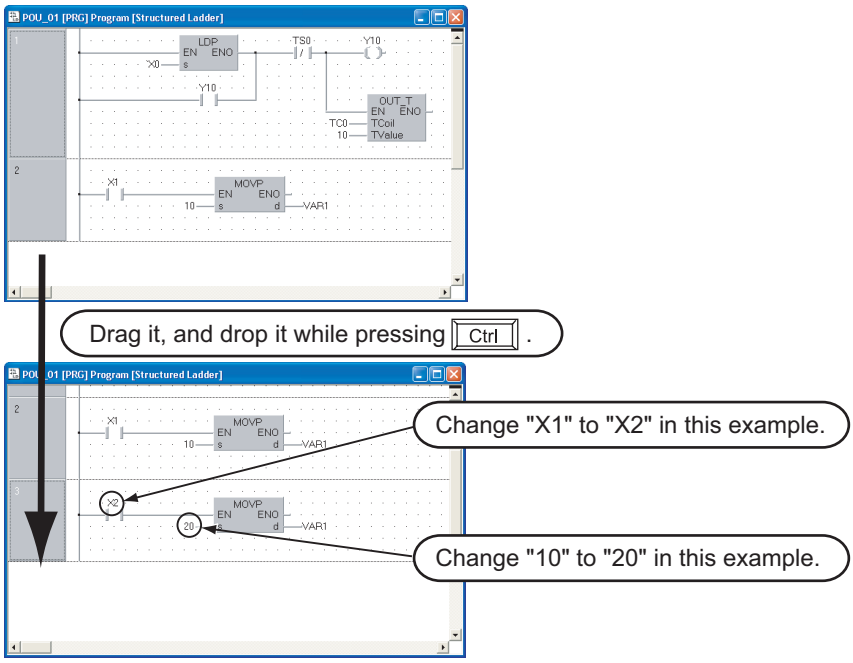
*1. "VAR1" is the label set in Subsection 3.2.5.

Point

Copying a network by drag & drop

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

Drag an existing network, and drop it while pressing the Ctrl key to copy the existing network.



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

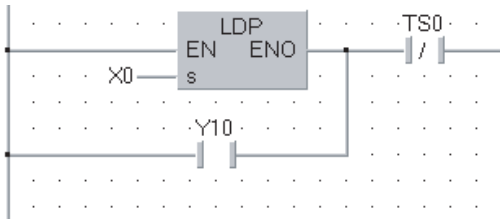
Procedure to display Device

Select "View" → "View Mode" → "Device".

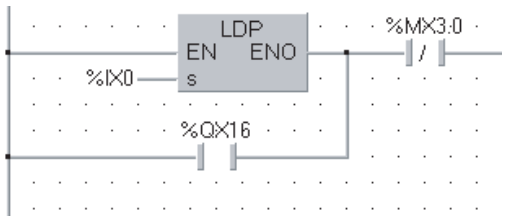
Procedure to display Address

Select "View" → "View Mode" → "Address".

< Device format >



< Address format >

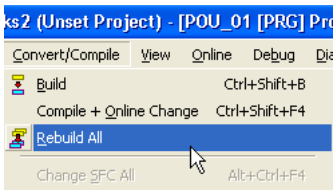


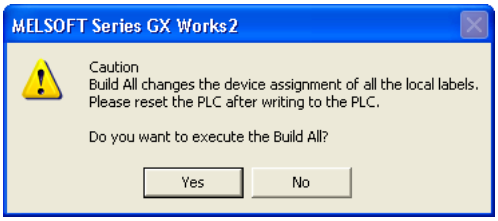
3.2.7 Compiling a program

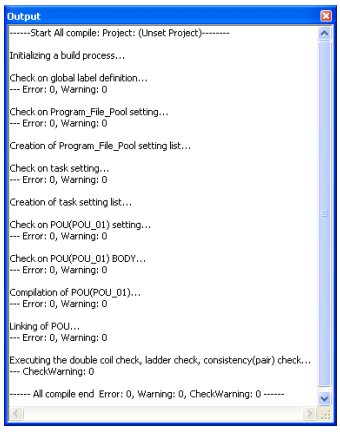
There are two types of compiling shown below. The compile target is different between the two types.
Select "Rebuild All" here.
The "Rebuild All" procedure is described below.
Refer to the following manual for compiling:
☞ GX Works2 Version1 Operating Manual (Structured Project)

Table 3.1 Compiling type and target program

	Target program to be compiled
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 window shown on the left appears.

   Click the Yes button to execute "Build All".

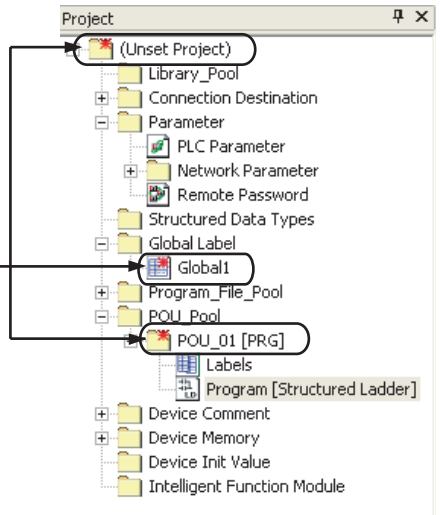
3. When finishing "Build All", GX Works2 displays the result on the output window.

   If an error occurs, check the contents, eliminate the cause of error, and then execute "Build" or "Rebuild All" as described in the step 1.

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 window.

A check mark is added to each non-compiled portion.



3.3 Writing a Project to the programmable controller

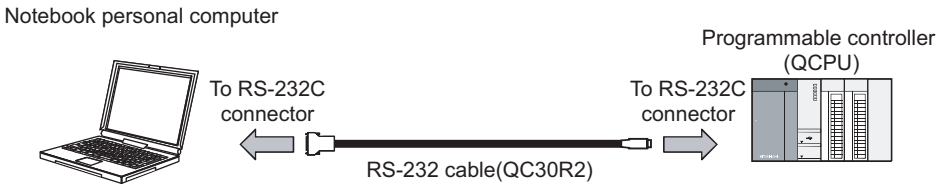
Write a project to the programmable controller CPU.

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

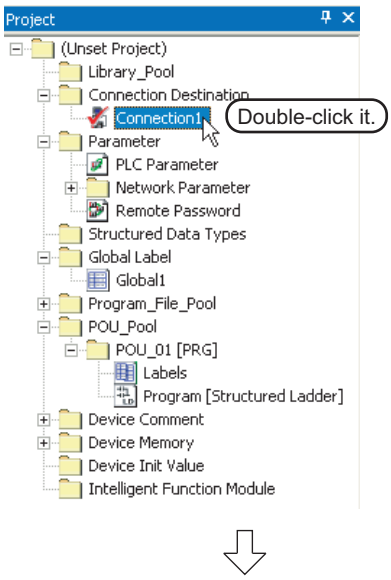
Make sure to turn OFF the power of all units before connecting the personal computer to the programmable controller CPU.
Refer to the manual of the programmable controller for cautions on connection.



■ Setting the Transfer Setup

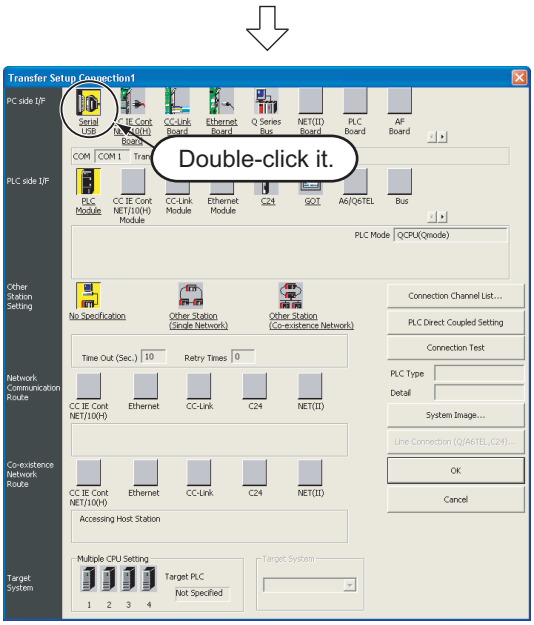
Set the channel to connect the personal computer to the programmable controller CPU by way of RS-232C cable.
Refer to the following manual for the details on setting using another channel:

☞ GX Works2 Version1 Operating Manual (Common)

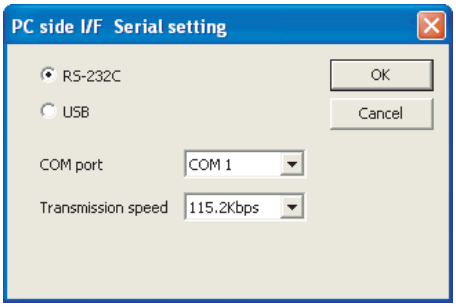


1. Double-click "Connection Destination" → "Connection1" on the Project window to display the Transfer Setup window.

(To the next page)



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

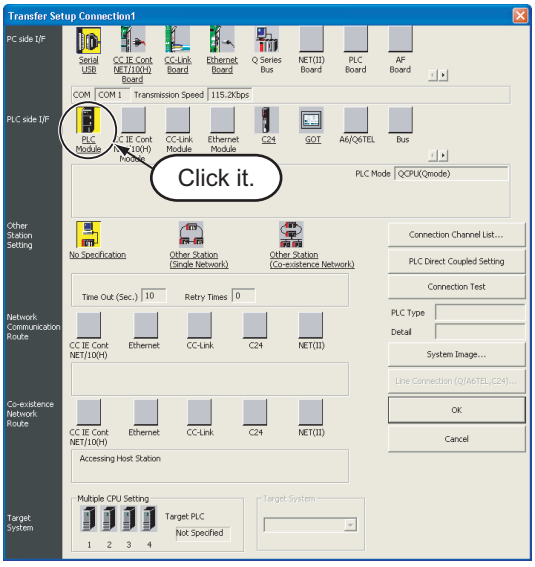


3. Set the PC side I/F.

After the setting, click the OK button to complete the setting and close the window.

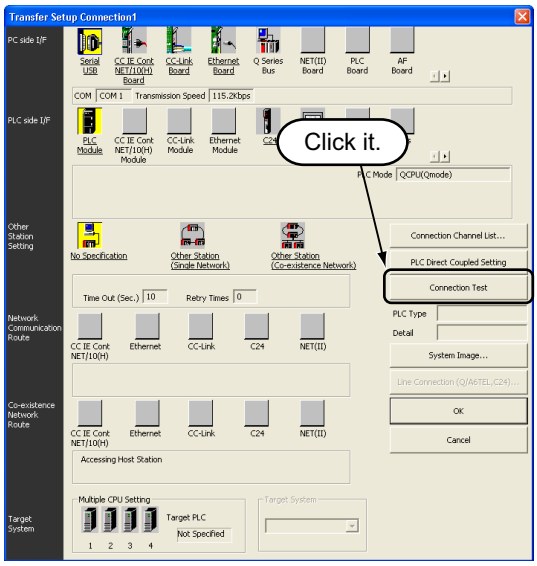
Settings

- Select "RS-232C".
- COM port:
  Input the COM port to which the QC30R2 cable is connected.
- Transmission speed: 115.2 kbps

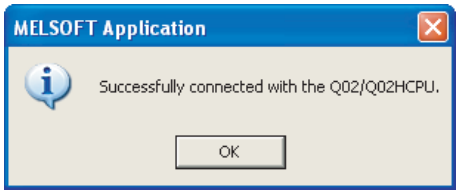


4. Click (PLC module) in "PLC side I/F" to select the interface to be used.

(To the next page)

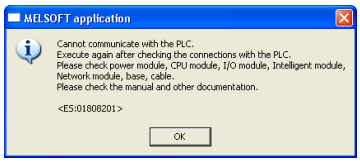


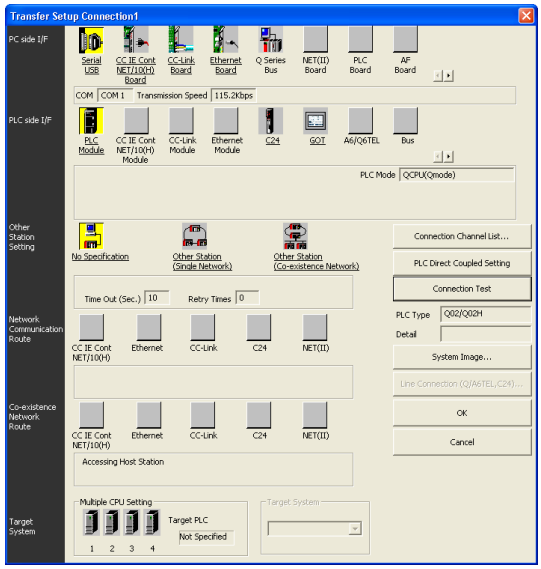
5. Click the Connection Test button to execute a communication test with the programmable controller through the specified connection channel.



6. When communication with the programmable controller is finished normally, the left window appears, and the "PLC type" field displays the programmable controller CPU model name.

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

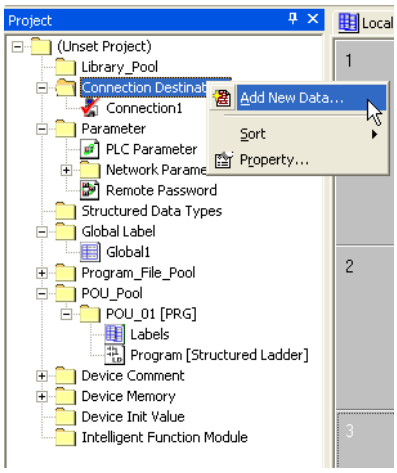




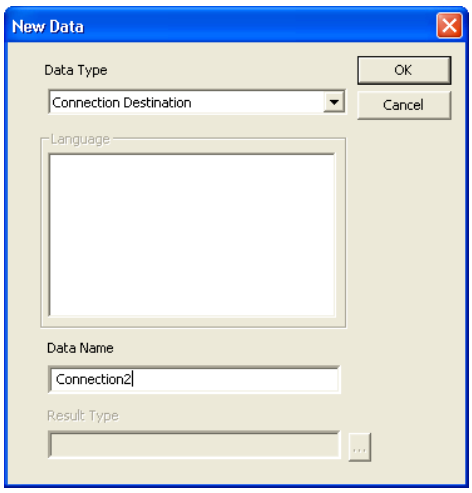
7. Click the OK button to finish "Transfer Setup" and close the window.

Point

● **You can set two or more connection destinations by creating new connection destination data.**

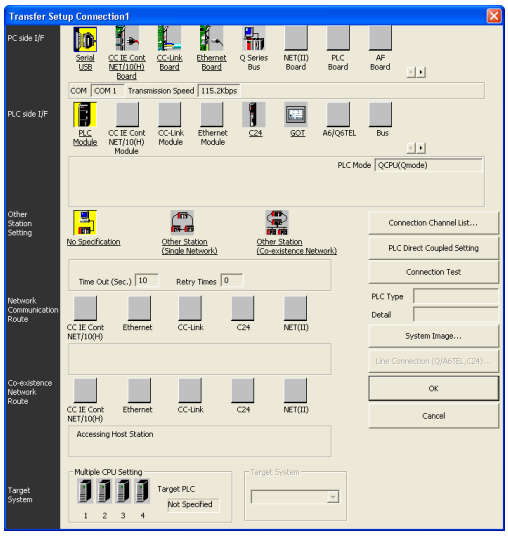


1. Right-click "'Connection Destination" on the Project window to display the pop-up menu, and then select "Add New Data" on the menu.
   The "New Data" window appears.



2. Set "Data Type" and "Data &Name".
   Click the OK button to display the Transfer setup window.

   Settings
   - Data Type: Connection Destination
   - Data & Name: Connection2

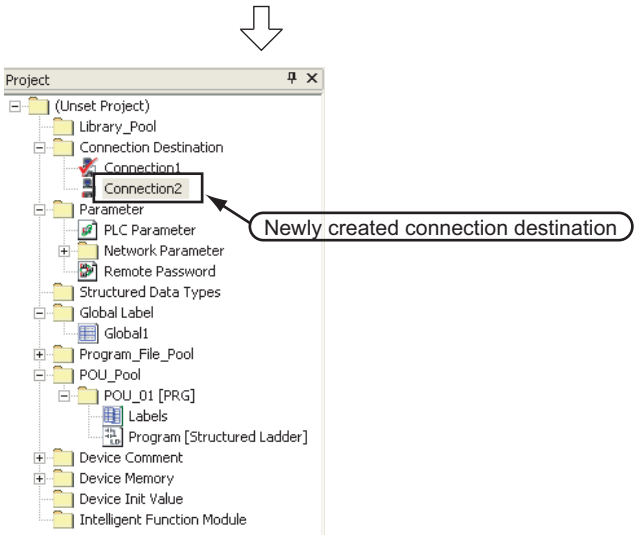


3. Set the connection destination.
   For the setting method, refer to the following.

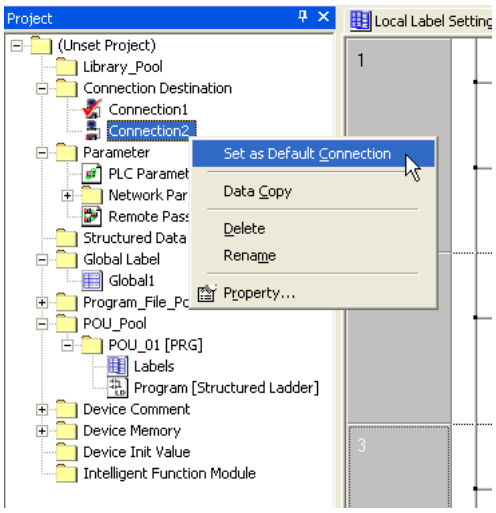
   3.3.1 Step2 in the Setting the Transfer

   After the setting, click the OK button to close the Transfer setup window and register the new connection destination to the Project window.

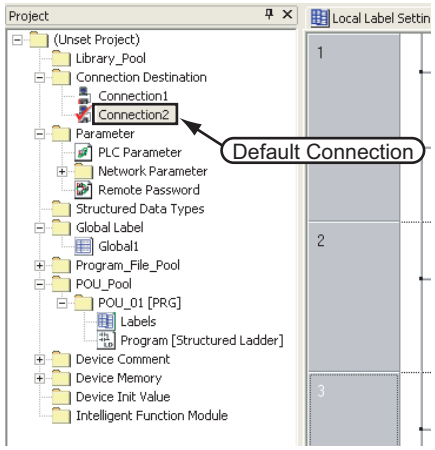
(To the next page)



● **For selecting the newly created connection destination, set it as the normally used connection destination. Then, the newly created connection destination will be selected for communication with the programmable controller CPU (for "Read from PLC", "Write to PLC", etc.).**



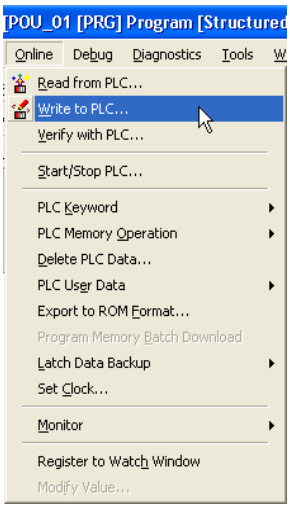
1. Right-click "Connection destination" → "(desired connection destination name)" on the Project window to display the pop-up menu, and then select "Set as Default Connection" on the menu.



2. A check mark is added to the data name icon specified as the Default Connection.

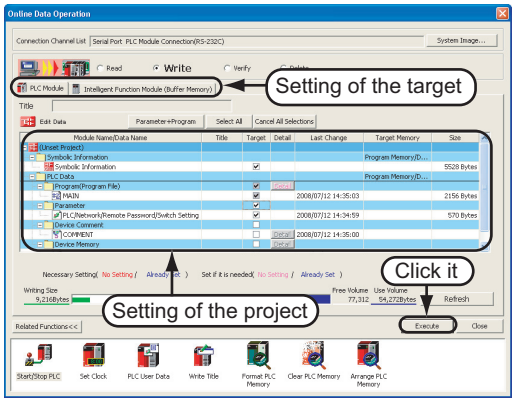
3.3.2 Writing a project to the programmable controller

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



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

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



2. Set the "Target unit" and "Target project" on the Online Data Operation window.

   After the setting, click the Execute button to write the project(program) to the programmable controller.

Setting of the target unit

- Target unit: Select <<PLC Module>>

Setting of the project

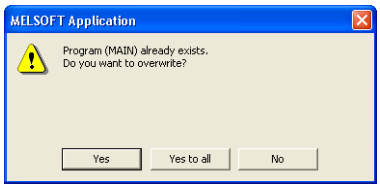
- Symbolic Information : Select "Program Memory/Device Memory" in "Target Memory", and check "Symbolic Information" in "Target".
  "Program (Program File)" and "MAIN" are checked in "PLC Data", and change into gray.
  "Symbolic Information" contains program files and labels.
- PLC Data : Select "Program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

(To the next page)

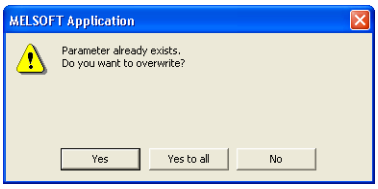
Point

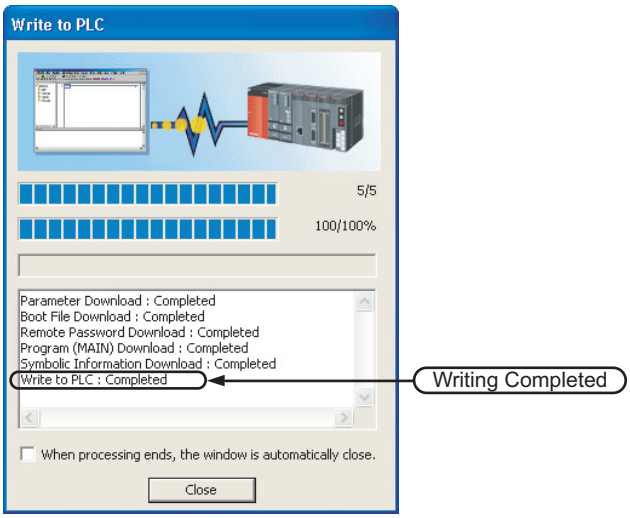
If a program or parameters already exist in the programmable controller, the following window appears.
Click the [Yes] or [Yes to all] button to overwrite the existing program or parameters.
When you click the [Yes to all] button, GX Works2 overwrite the existing program or parameters without displaying the overwrites confirmation window for other data.

When parameters already exist

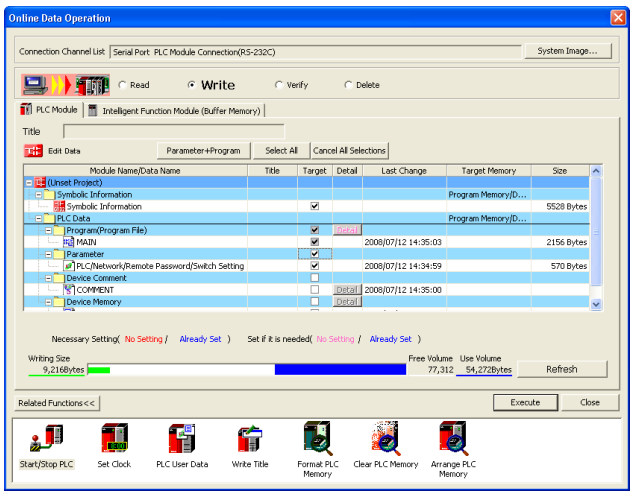


When a program already exists





3. The left window is displayed during writing.
When writing is finished, "Write to PLC: Completed" appears.
Click the [Close] button to close the Write to PLC window.



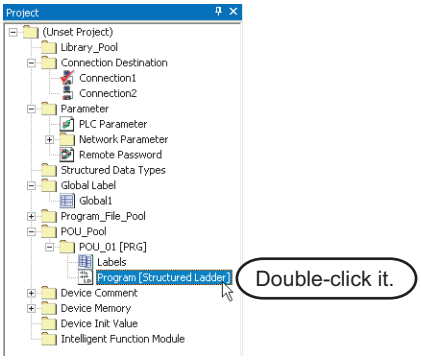
4. Click the [Close] button to close the Online Data Operation window.

3.4 Monitoring Operations

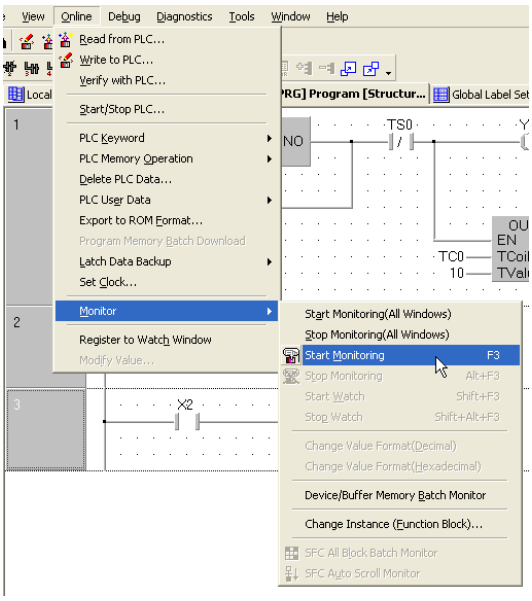
Execute "Monitor" to check the operations.
In some monitor window display examples, colors are changed for the convenience of printing.
GX Works2 has the function to simulate programmable controller operations in the offline mode.
Refer to the following manual for the simulation function:

☞ GX Works2 Version1 Operating Manual (Common)

3.4.1 Monitoring a program



1. Double-click "Pou_Pool" → "POU_01 [PRG]" → "Program [Structured Ladder]" on the Project window to display the POU_01 [PRG] Program [Structured Ladder] window.



2. Select "Online" → "Monitor" → "Start Monitoring" to switch the POU_01 [PRG] Program [Structured Ladder] window to the monitoring status.

   You can also click (Start Monitoring) to switch the POU_01[PRG]Program[Structured Ladder] window to the monitoring status.

3. Set the programmable controller CPU to RUN.

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

(To the next page)

Point

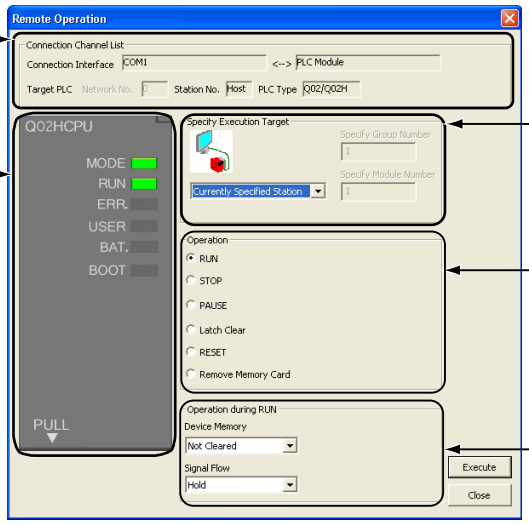
You can switch the programmable controller status between "RUN" and "STOP" using remote operation as follows.
The Settings of the remote operation may vary depending on the programmable controller used.
Refer to the following manual for the details on the remote operation:

☞ GX Works2 Version1 Operating Manual (Common)

Select "Online" → "Start/Stop PLC" to display the remote operation window. You can switch the programmable controller status between "RUN" and "STOP" on this window.

Connection Channel List information
Displays the connection target information currently

Programmable controller Status
Displays the programmable controller CPU status.

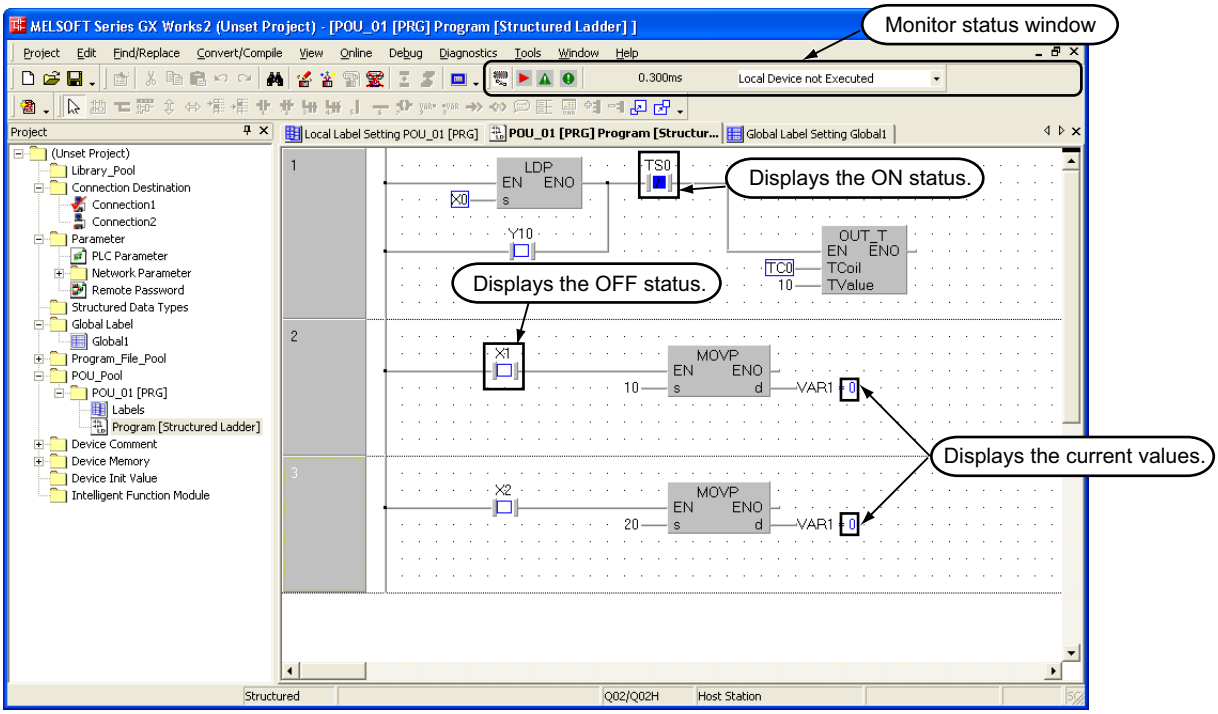


Specify Execution Target
Allows you to set the target station for remote operation. Select "Currently specified station" for this example.

Operation
Allows you to select the programmable controller CPU status to be set. Select either "RUN", "PAUSE" or "STOP" for this example.

Operation during RUN
Allows you to set the operations to be executed to the device memory and signal flow when the programmable controller is switched

Monitor status display example



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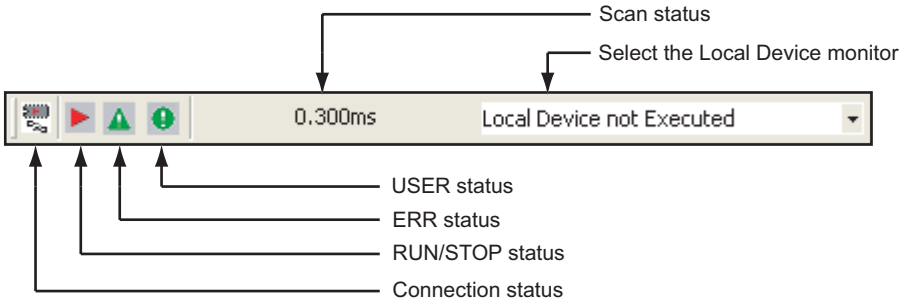
Point

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 Version1 Operating Manual (Common)

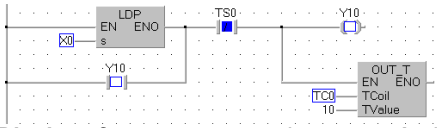
Monitor status display

● **Display of BOOL value status (ON/OFF status)**

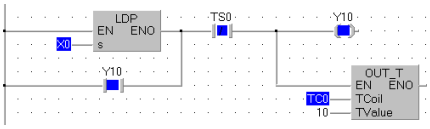
GX Works2 displays the ON/OFF status (BOOL values) of contacts, coils, etc. as the ON/OFF status of devices and labels.
Refer to the following manual for the BOOL value ON/OFF status display:

GX Works2 Version1 Operating Manual (Common)

OFF status

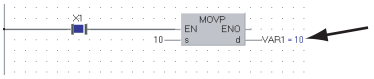


ON status



● **Display of contents status (current value) other than BOOL values**

GX Works2 displays the current values (of non -BOOL 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)".

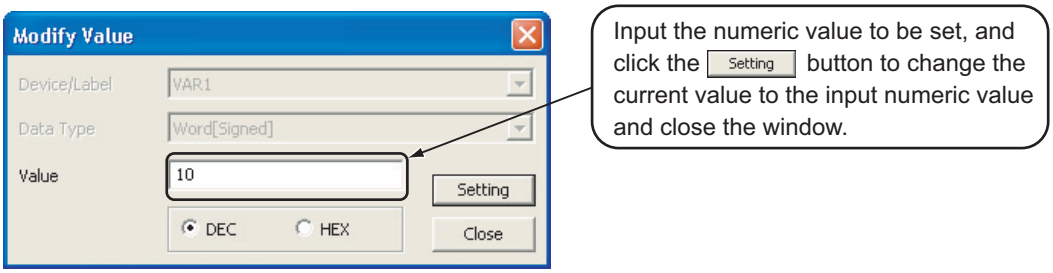
Test operation

● **Forcing a contact ON/OFF**

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

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

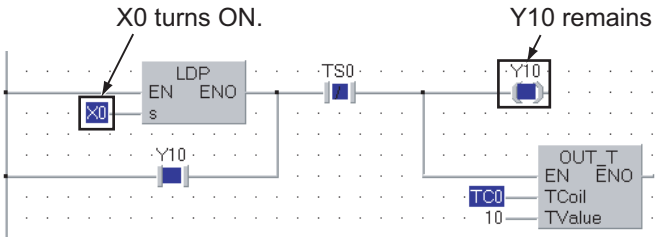
Double-click a monitored word device to display the Modify Value window where you can change the current value.



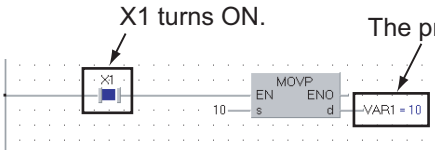
4. Turn ON inputs X0, X1 and X2 in the programmable controller, and check the following operations.

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

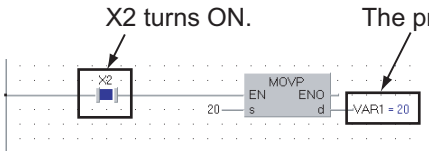
- When X0 turns ON, the programmable controller turns ON Y10, and then turns OFF Y10 1 second later.

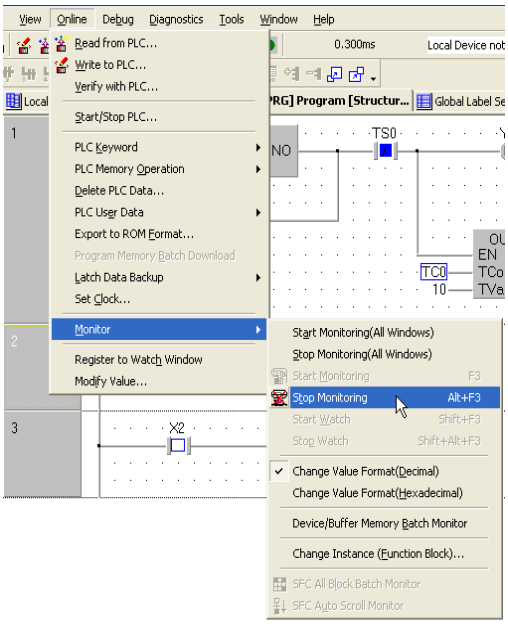


- When X1 turns ON, the programmable controller transfers K10 to VAR1 (device: D0).



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





5. Select "Online" → "Monitor" → "Stop Monitoring" to reset the monitor status of the POU_01 [PRG] Program [Structured Ladder] window.

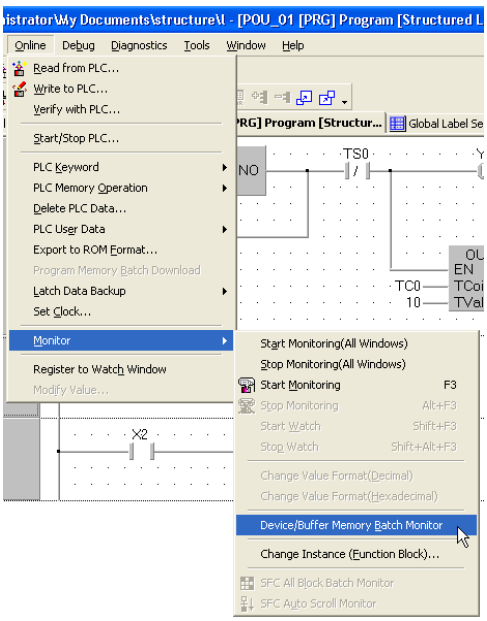
You can click (Stop Monitoring) to reset the monitor status of the POU_01 [PRG] Program [Structured Ladder] window.

6. 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.

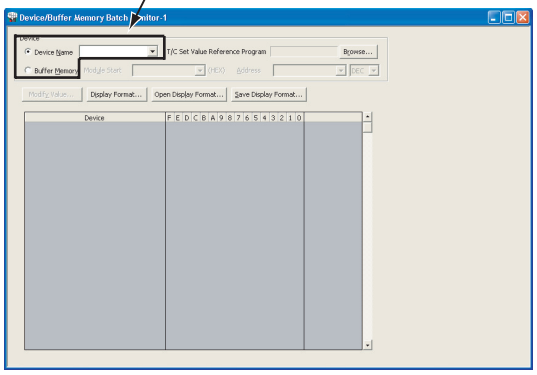
"Point" in the 3.4.1

3.4.2 Batch monitoring of device values



1. Select "Online" → "Monitor" → "Device/Buffer Memory Batch" to display the Device/Buffer Memory Batch Monitor window.

Setting



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

Setting of "Device"

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

3. Click Display Format... to display the Display Format window.

Restrictions

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

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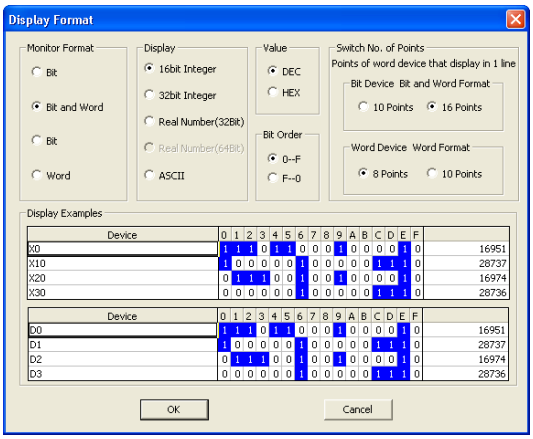


4. Set the Display Format of the device to be monitored.

Setting on the Display Format window

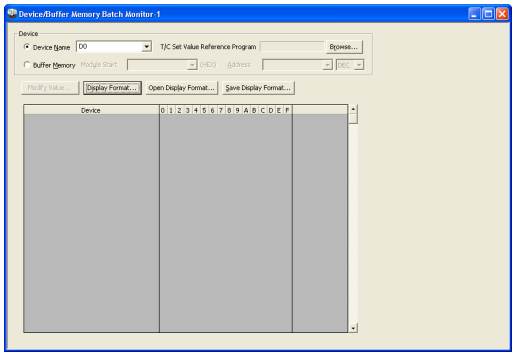
- Monitor Format: Bit and Word
- Display: 16bit Integer
- Value: DEC
- Bit Order: 0-F
- Switch No. of Points: Bit Device Bit and Word Format 16 Points

After the setting, click the OK button to close the Display Format window.
Refer to the following manual for the details on Display Format.

☞ GX Works2 Version1 Operating Manual (Common)

Point

● **You can save the contents set on the Display Format window.**
When the monitor window is opened again, the contents set previously on the Display Format window 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 window. To read the saved setting, click Open Display Format on the Device/Buffer Memory Batch Monitor window.



5. Click (Start Monitoring) on the toolbar to start monitoring.

6. Set the programmable controller CPU to Start

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

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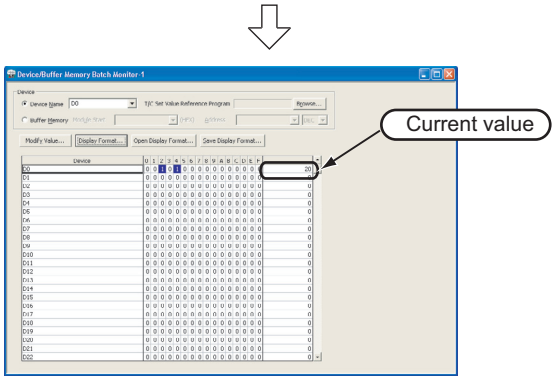
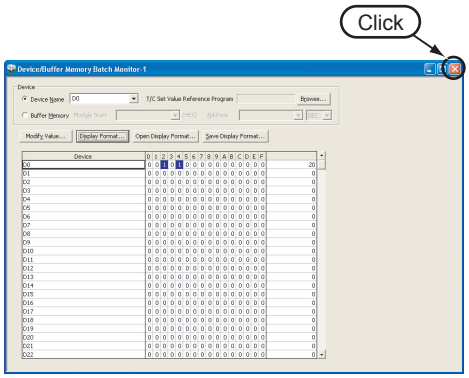


7. Click (Stop Monitoring) on the toolbar to stop monitoring.

   Monitored values remain even after GX Works2 stops monitoring.



8. Click × on the window to close the Device/ Buffer Memory Batch Monitor window.

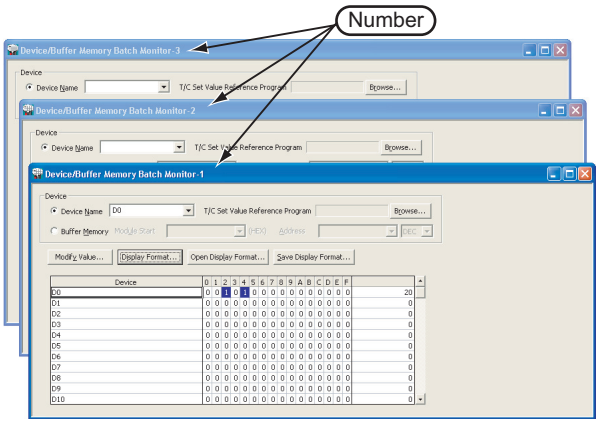
9. Set the programmable controller CPU to Stop

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

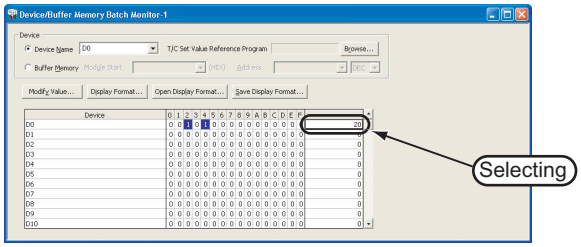
Point

● **Opening two or more Device/Buffer Memory Batch Monitor windows.**
You can open two or more Device/Buffer Memory Batch Monitor windows.
The window number is indicated at the end of the window title.

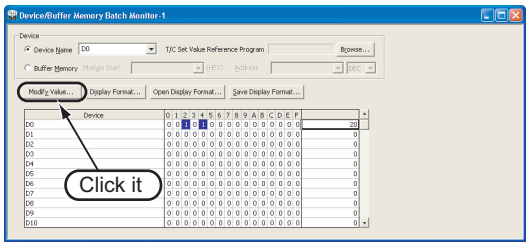


● **Changing the current value**

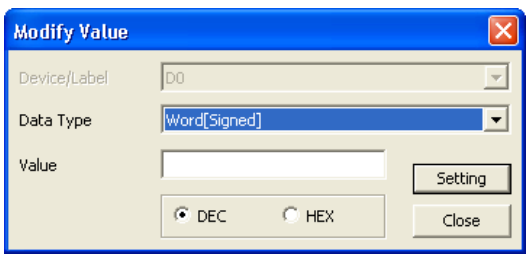
Click the Modify Value... **button on the Device/Buffer Memory Batch Monitor window to display the Modify Value window which allows you to change the current value.**



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



2. Click the Modify Value... button to display the Modify Value window.



3. Change the current value.

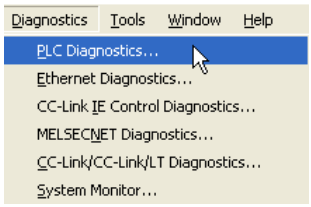
For the change procedure, refer to the following.

☞ "Point" in the 3.4.1

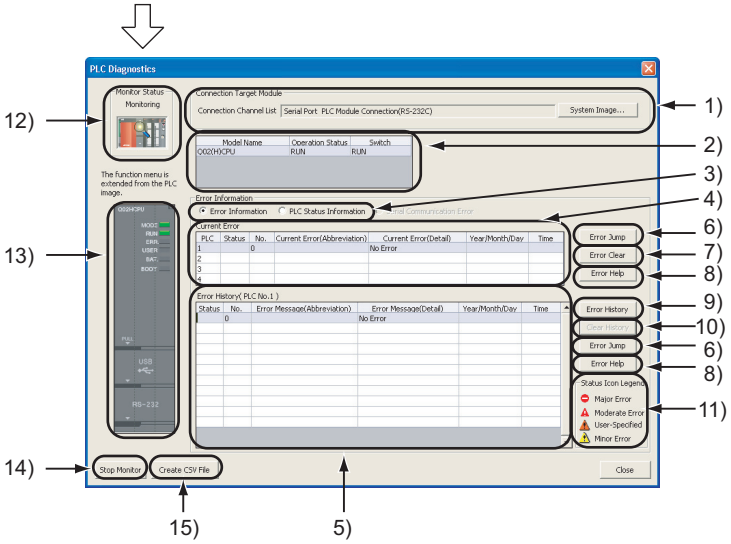
3.5 Diagnosing the programmable controller

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 Version1 Operating Manual (Common)



1. Select "Diagnostics"→"PLC Diagnostics" to display the PLC Diagnostics window.

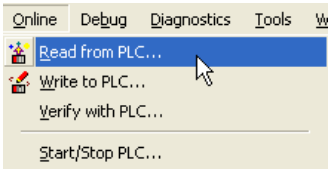


No.	Item	Description
1)	Connection Target Module	Connection Channel List: Displays the information on connection between the personal computer and the programmable controller CPU. System Image:Displays visually the Connection Channel List.
2)	CPU information of connected station	Displays the model name,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

2. Click the Close button to close the PLC Diagnostics window.

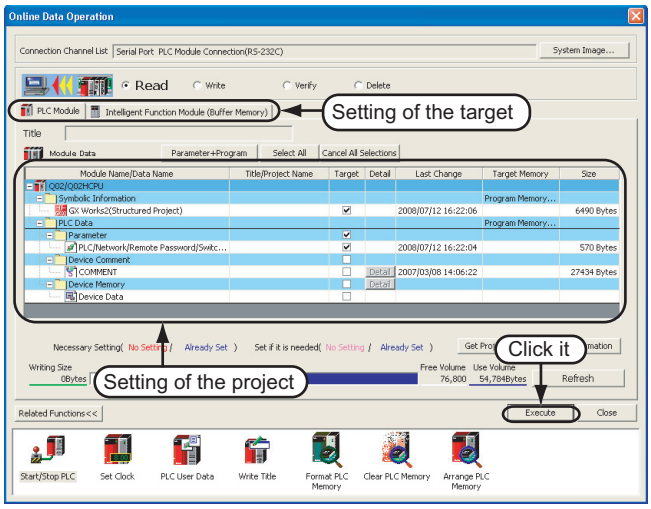
3.6 Reading a Project from programmable controller

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



1. Select "Online" → "Read from PLC" to display the Online Data Operation window.

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



2. Set the "Target unit" and "Target project" on the Online Data Operation window.

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

Setting of the target unit

- Target unit: Select <<PLC Module>>

Setting of the project

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

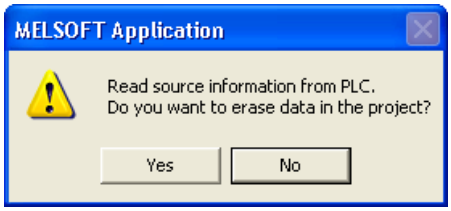
*1: If you have checked desired items during downloading, such items are checked as the default at the beginning of the uploading procedure.

(To the next page)

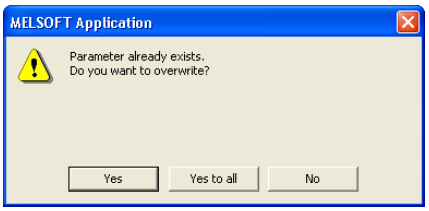
Point

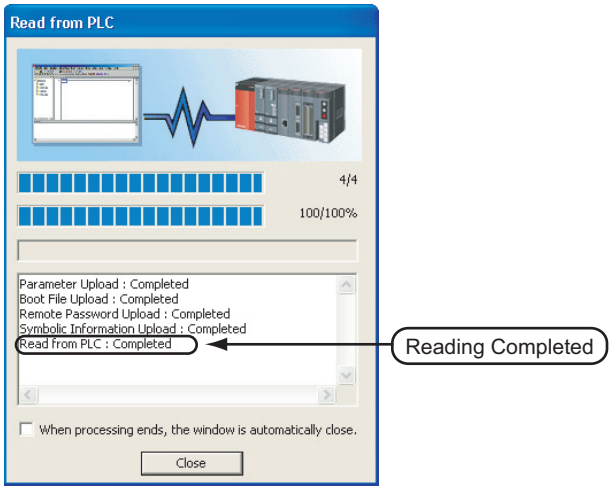
If a program or parameters already exist in the GX Works2, the following window appears.
Click the [Yes] or [Yes to all] button to overwrite the existing program or parameters.
When you click the [Yes to all] button, GX Works2 overwrite the existing program or parameters without displaying the overwrites confirmation window for other data.

When a source information already exists

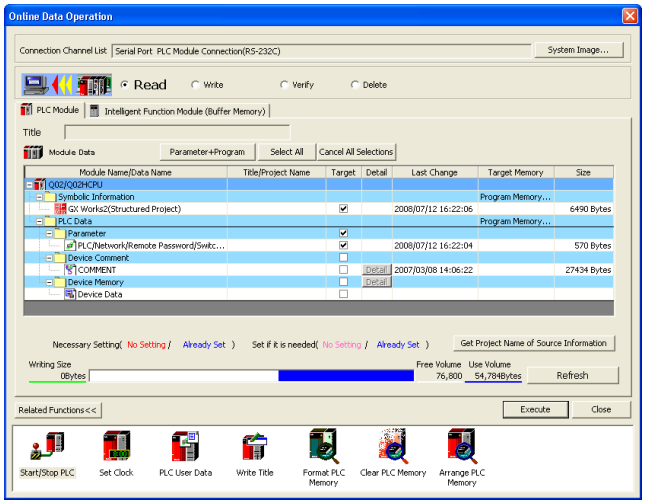


When parameters already exist





3. The left window is displayed during reading.
When reading is finished, "Read from PLC: Completed" appears.
Click the [Close] button to close the Read from PLC window.



4. Click the [Close] button to close the Online Data Operation window.

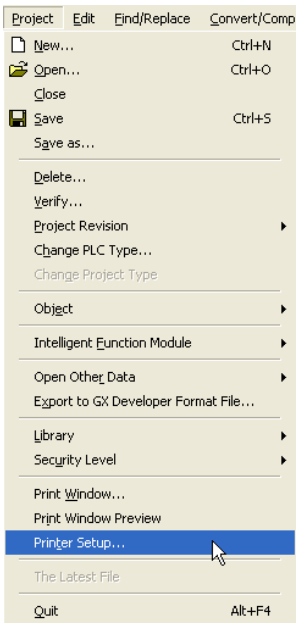
3.7 Printing

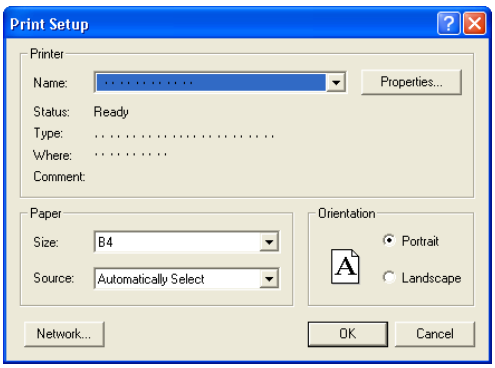
You can print programs and parameters created using GX Works2 in a printer.
For details of printing, refer to the following manual.

☞ GX Works2 Version1 Operating Manual (Common)

3.7.1 Setting the printer

The printer which prints is set up.



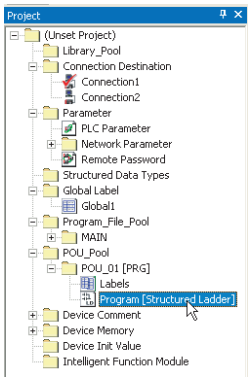


1. Select "Project" → "Printer Setup" to display the Printer Setup window.

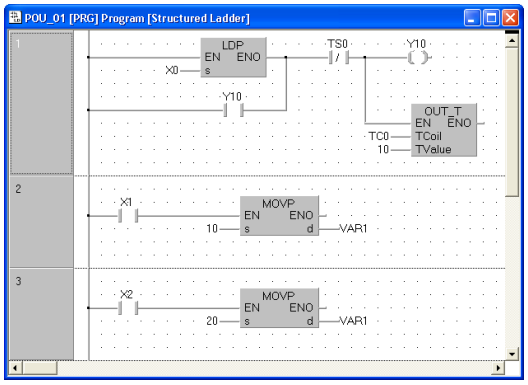
2. Select the Printer, Paper size, Orientation, etc.
After the setting, click the OK button to close the Printer Setup window.

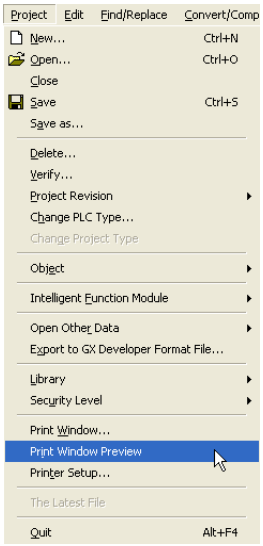
3.7.2 Previewing a program

You can display a program in the image of printing.



Double-click it.





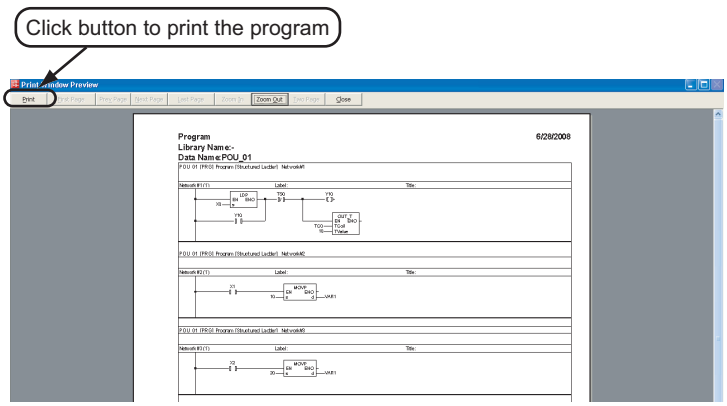
1. Display a program.

   Double-click "Program Pool" → "MAIN [PRG]" → "Program[Ladder]" on the Project window to display the MAIN [PRG] program window.

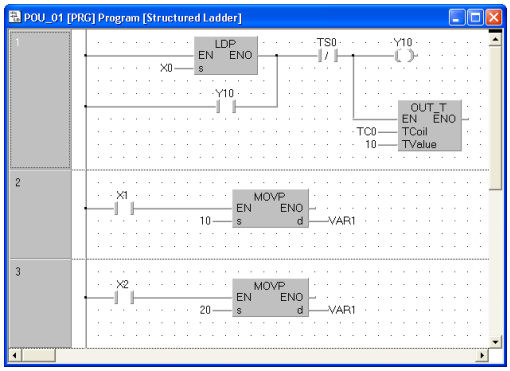
2. Select "Project" → "Print Window Preview" to display the Print Window Preview.

(To the next page)

3. After checking the contents, click the [Print] button to print the program.
Click the [Close] button to close the Print Window Preview .



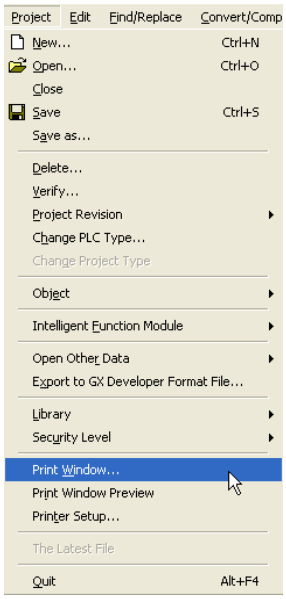
3.7.3 Printing a program



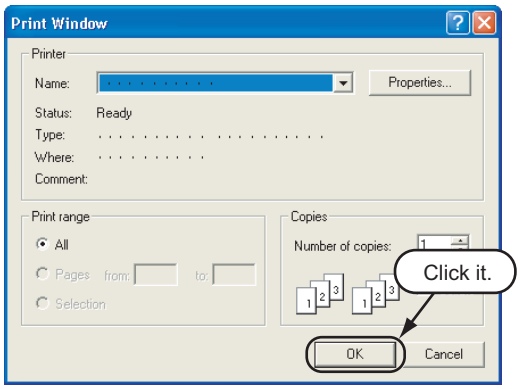
1. Display a program.

   For the display procedure, refer to the following.

   ☞ 3.7.2 Previewing a program



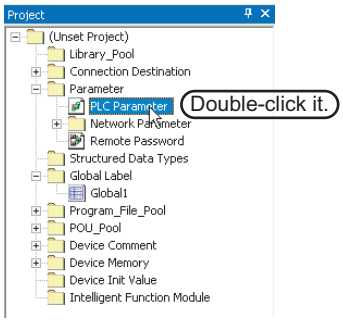
2. Select "Project" → "Print Window " to display the Print Window.



3. Click the OK button to start printing.

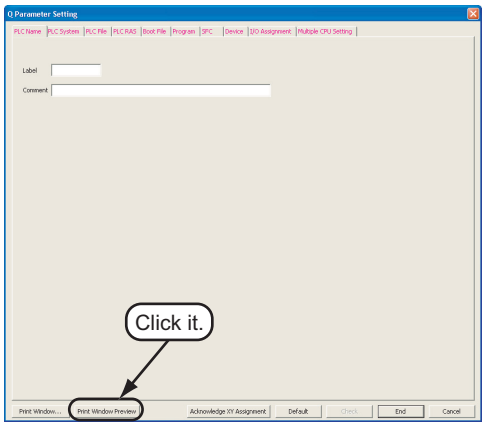
3.7.4 Previewing a PLC Parameter

You can display PLC Parameter in the image of printing.

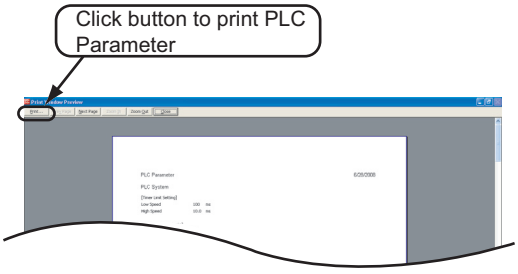


1. Display PLC parameters.

   Double-click "Parameter" → "PLC parameter" on the Project window to display the Q Parameter Setting window.



2. Click the Print Window Preview button.

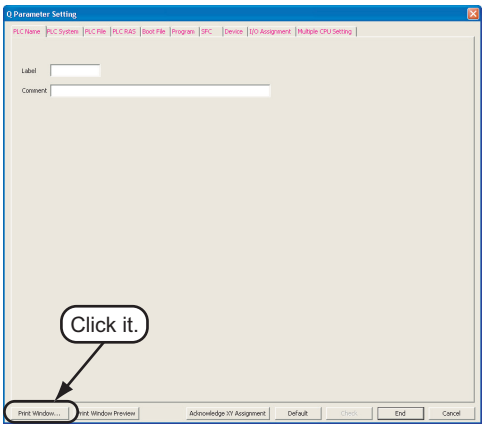


3. After checking the contents, click the Print... button to print PLC Parameter

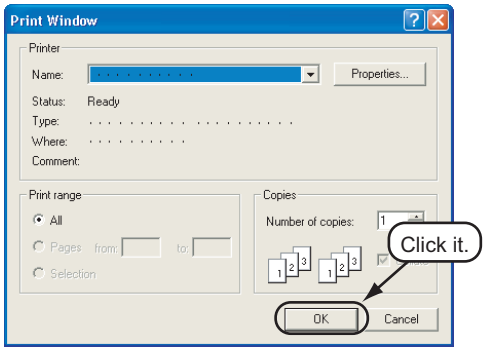
   Click the Close button to close the Q Parameter Setting window.

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



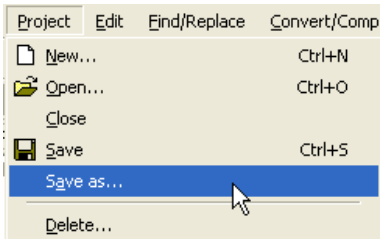
2. Click the [Print Window...] button.



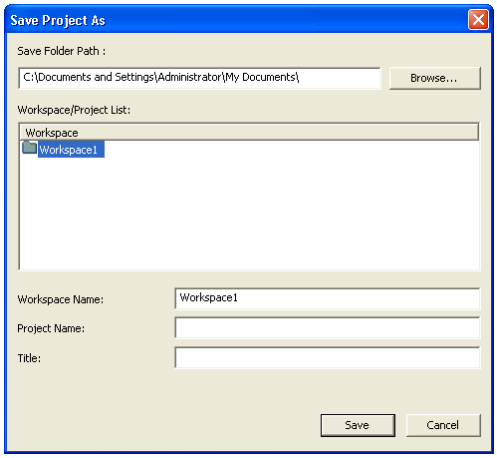
3. Click the [OK] button to start printing.

3.8 Saving a Project

You can save a project.
When saving a newly created project, use the menu item "Save as ".



1. Select "Project" → "Save as" to display the Save project As window.



2. Set the "Workspace folder path", "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:

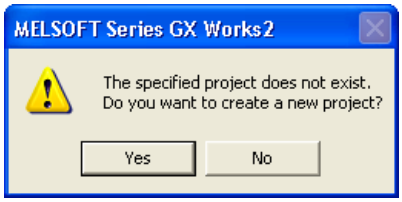
☞ GX Works2 Version1 Operating Manual (Common)

Settings

- Workspace folder path: Specify the save destination folder.
- Workspace Name: Specify the save destination folder name.
- Project Name: Specify the project name.
- Title: Specify the title.
  You can save a project without specifying a title.

Restrictions

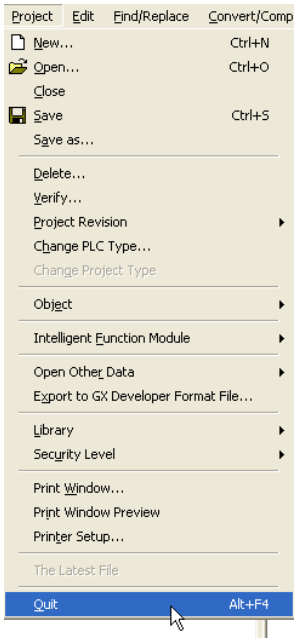
- **Input within 128 characters to "Title".**
- **Make sure that the total characters of "Save Folder path", "Workspace Name" and "Project Name" is 200 or less.**
- **You cannot save any project to route directories such as "C:\" or "D:\".**



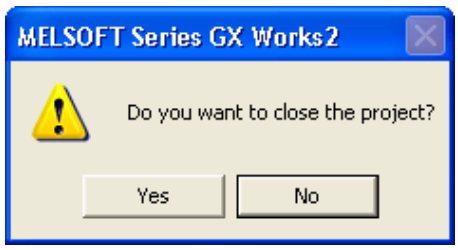
3. Click the [Yes] button to save the new project.

3.9 Quitting GX Works2

Quit a project.



1. Select "Project" → "Quit".



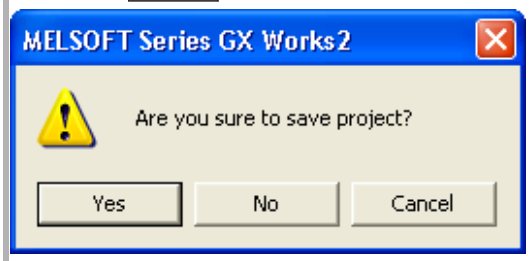
2. Click the [Yes] button to quit GX Works2.

Point

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

Click the [Yes] button to save the project.

Click the [No] 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):

☞ QCPU 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 Quitting GX Works2 4-11

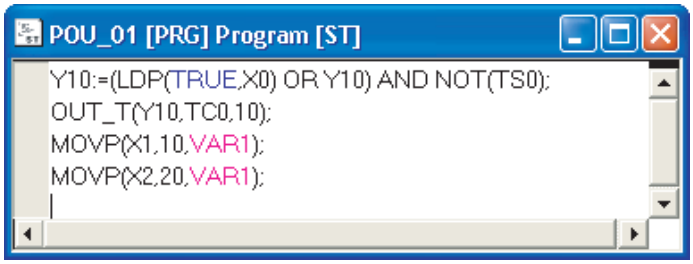
4.1 Created Program

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



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 Version1 Operating Manual (Common)
☞ CPU Manual
☞ CPU Programming manual

4.2.5 Setting labels

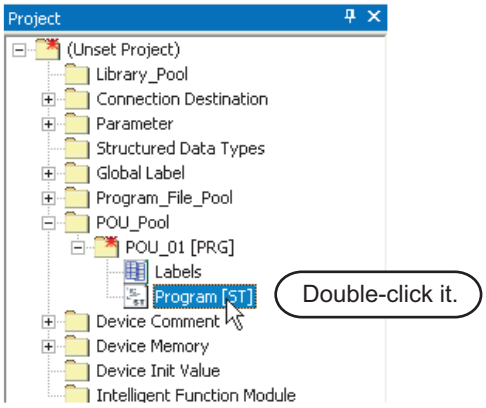
Refer to the following section for the global label setting procedures:
☞ 3.2.5 Setting labels

Refer to the following manual for the details on global/local label setting procedures:
☞ GX Works2 Version1 Operating Manual (Structured Project)

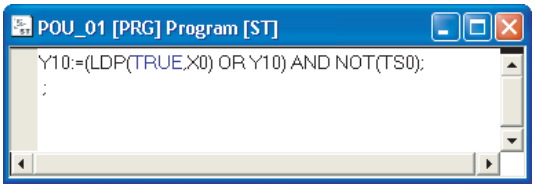
Refer to the following manual for the details on programming of global labels and local labels:
☞ QCPU Structured Programming Manual (Fundamentals)

4.2.6 Creating a program

Create the ST program shown in Subsection 4.1.2.



1. Double-click "Pou_Pool" → "POU_01[PRG]" → "Program [ST]" on the Project window to display the POU_01[PRG]Program[ST] window.



2. Input "Y10:=(LDP(TRUE*1, X0) OR Y10) AND NOT (TS0*2);" directly, and click Enter.
You can use the Function Block Selection window for the input.

Settings

- Y10:= (LDP_M(TRUE*1, X0) OR Y10) AND NOT (TS0*2);

*1. "TRUE" indicates the ON status.
*2. "TS0" indicates the contact of timer T0.

(To the next page)

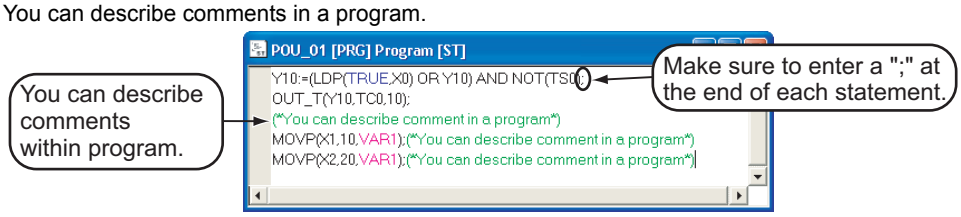
Point

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:

QCPU Structured Programming Manual (Fundamentals)

- Make sure to write ";" at the end of a statement.
- Comment
  You can describe comments in a program.



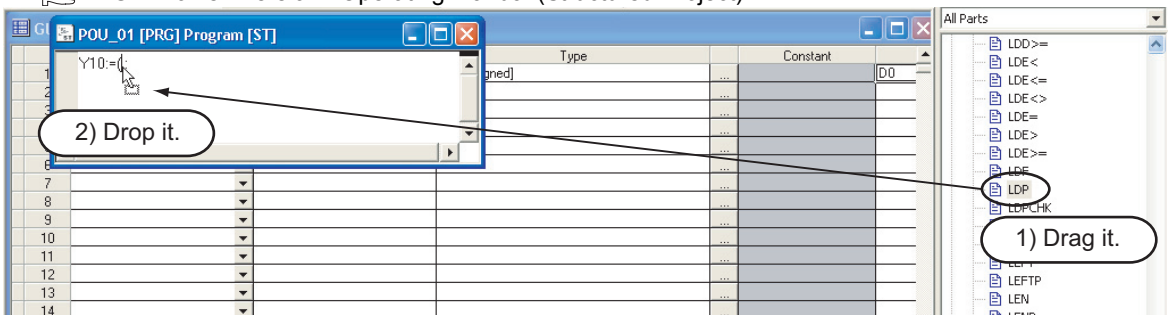
● Display colors
GX Works2 displays keywords, operators, comments, labels, constants and character string labels using the following colors (in the initial setting).

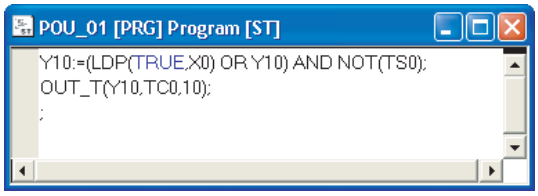
- Keywords: Blue (blue)
- Operators: Black (black)
- Comments: Dark green (dark green)
- Constants: Black (black)
- Character string labels: Black (black)
- Global labels: Reddish violet (reddish violet)
- Local labels: Reddish violet (reddish violet)

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_M" from the Function Block Selection window, and drop it on the MAIN_01 [PRG] program [ST] window to input it there. After that, input the parameters of the function.
Refer to the following manual for the details:

GX Works2 Version1 Operating Manual (Structured Project)





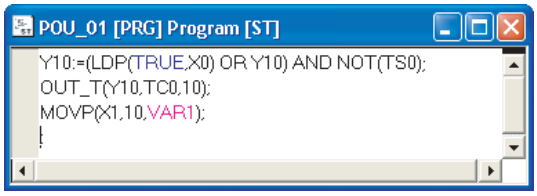
3. Input "OUT_T(Y10,TC0*1,10);" directly, and click Enter.

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

Settings

- OUT_T(Y10,TC0*1,10);

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



4. Input "MOVP(X1,10,VAR1*2);" directly, and click Enter.

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

Settings

- MOVP(X1,10,VAR1*2);

*2. "VAR1" is the label set in Subsection 4.2.5.

(To the next page)

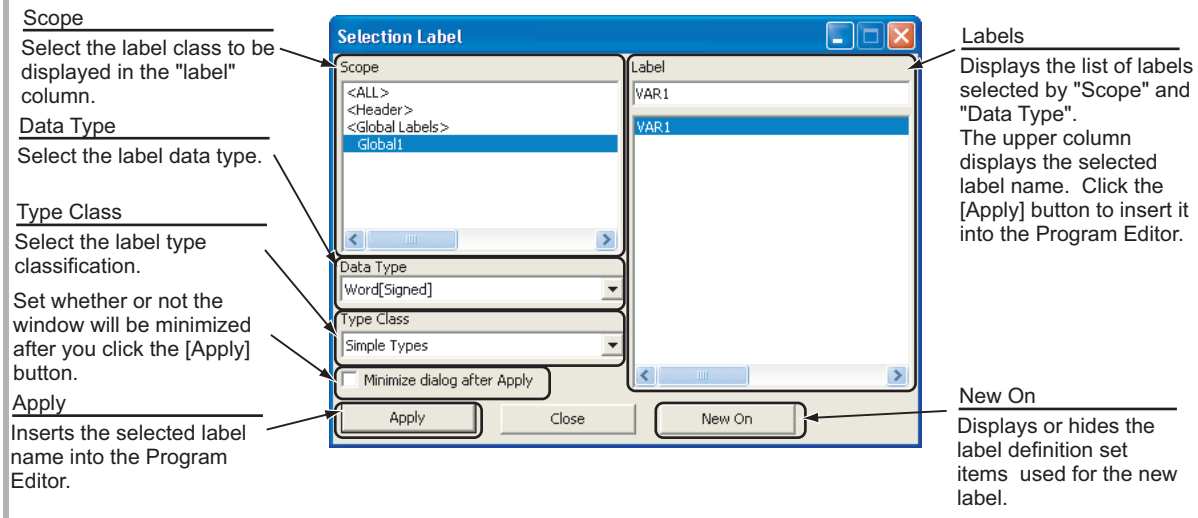
Point

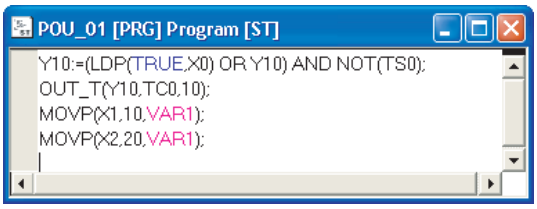
Selecting a label from the Selection Label window
You can input a label also by selecting it from the Selection Label window.
Perform the following procedure to display the Selection Label window.

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

Refer to the following manual for the details on the Selection Label window:

☞ GX Works2 Version1 Operating Manual (Structured Project)





5. Input "MOVP(X2,20,VAR1[*1])" directly .

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

Settings

- MOVP(X2,20,VAR1[*1])

*1. "VAR1" is the label set in Subsection 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 Version1 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.

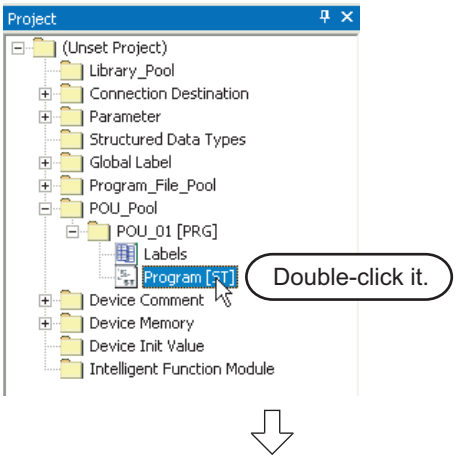
☞ 3.3 Writing a Project to the programmable controller

4.4 Monitoring Operations

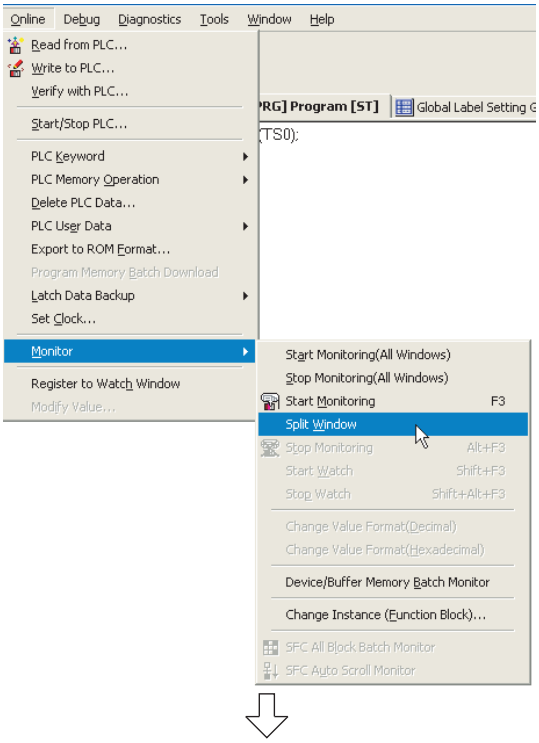
Execute "Monitor" to check the operations.
Note that some screen shot colors have been changed for printing convenience.
GX Works2 is able to simulate the programmable controller operations in offline mode.
Refer to the following manual for the simulation function:

☞ GX Works2 Version1 Operating Manual (Common)

4.4.1 Monitoring a program



1. Double-click "Pou_Pool" → "POU_01[PRG]" → "Program [ST]" on the Project window to display the POU_01[PRG]Program[ST] window.



2. Select "Online" → "Monitor" → "Split Window" to switch the POU_01[PRG]Program[ST] window to the monitoring status.

   You can also click (Start Monitoring) to switch the POU_01[PRG]Program[ST] window to the monitoring status.

3. Set the programmable controller CPU to RUN.

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

(To the next page)

Point

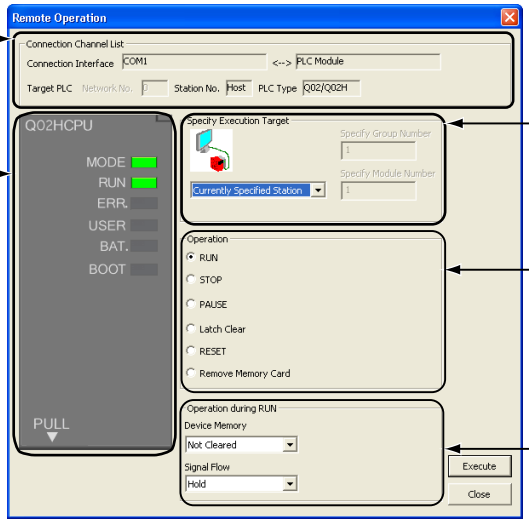
You can switch the programmable controller status between "RUN" and "STOP" using remote operation as follows.
The Settings of the remote operation may vary depending on the programmable controller used.
Refer to the following manual for the details on the remote operation:

☞ GX Works2 Version1 Operating Manual (Common)

Select "Online" → "Start/Stop PLC" to display the remote operation window. You can switch the programmable controller status between "RUN" and "STOP" on this window.

Connection Channel List information
Displays the connection target information currently

Programmable controller Status
Displays the programmable controller CPU status.

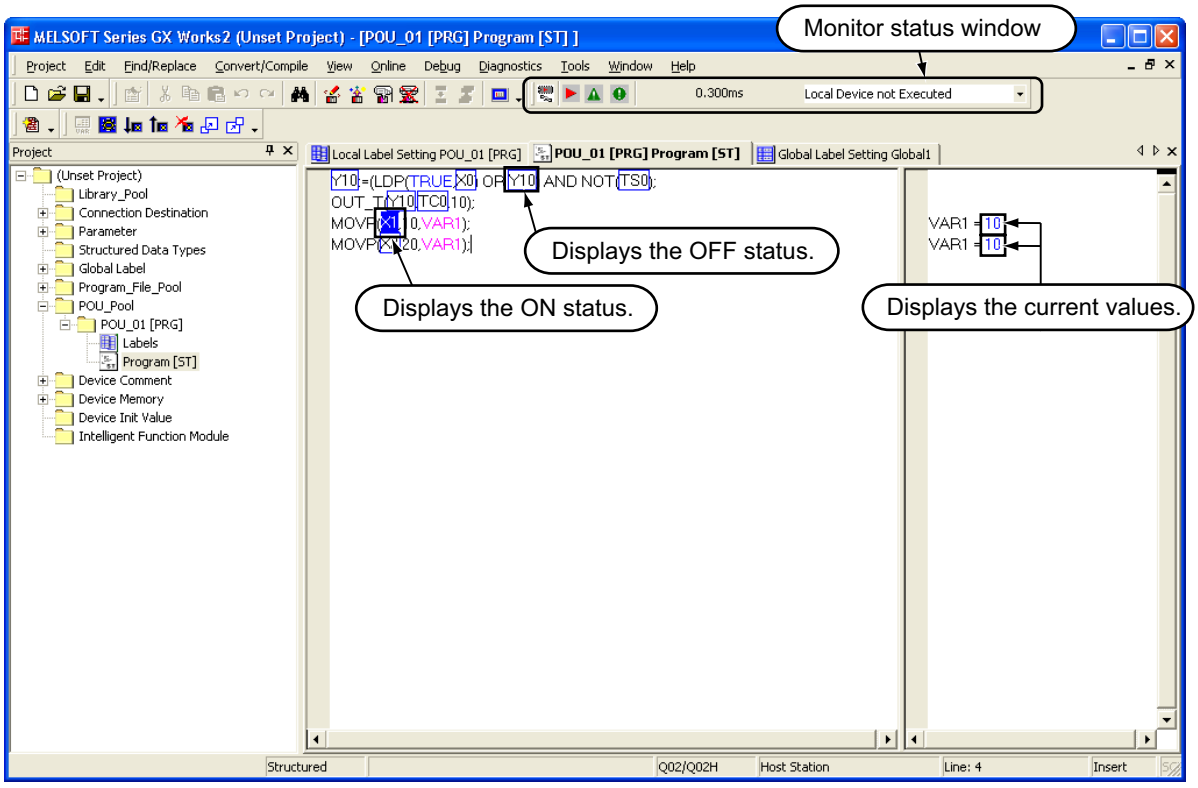


Specify Execution Target
Allows you to set the target station for remote operation. Select "Currently specified station" for this example.

Operation
Allows you to select the programmable controller CPU status to be set. Select either "RUN", "PAUSE" or "STOP" for this example.

Operation during RUN
Allows you to set the operations to be executed to the device memory and signal flow when the programmable controller is switched

Monitor status display example



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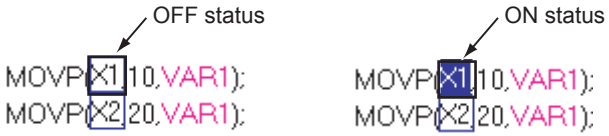
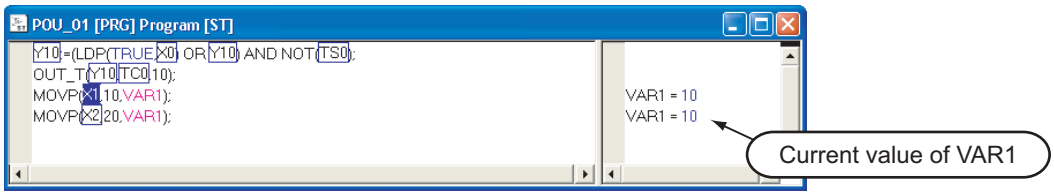
Point

Monitor status display

- **Display of BOOL value status (ON/OFF status)**
  GX Works2 displays the ON/OFF status (BOOL values) of contacts, coils, etc. as the ON/OFF status of devices and labels.



- **Display of contents status (current value) other than BOOL values**
  GX Woks2 displays the current value of non-BOOL devices and the contents of character strings on the divided window.



- **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)".

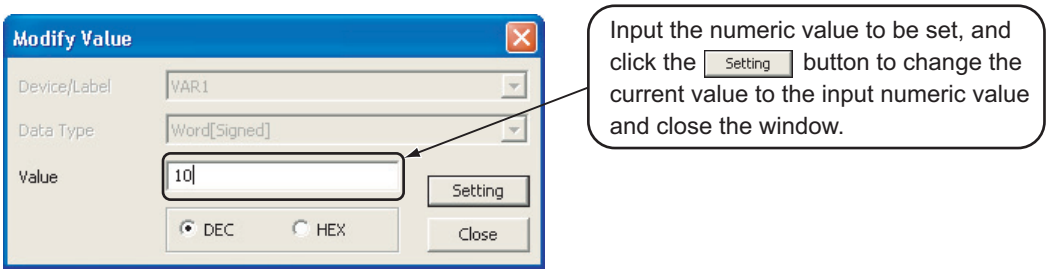
Procedure to switch the current value display to hexadecimal:

Select "Online" → "Monitor" → "Change Value Format(Hexadecimal)".

Refer to the next page for the test operation.

Test operation

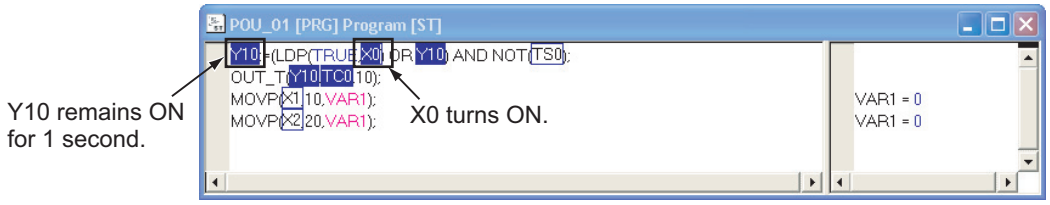
- **Forcing a contact ON/OFF**
  Double-click a monitored device or label while pressing Shift to force a device in the programmable controller ON/OFF.
- **Changing the current value of a word device**
  Double-click a monitored word device to display the Modify Value window where you can change the current value.



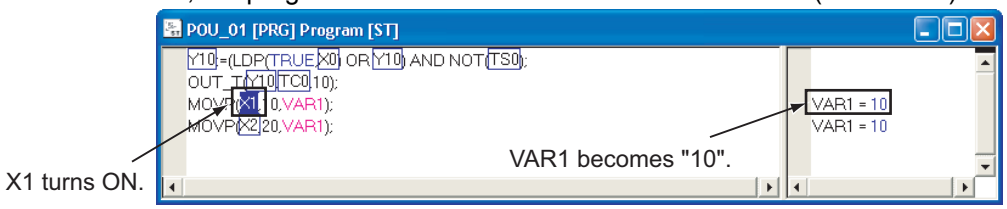
4. Turn ON inputs X0, X1 and X2 in the programmable controller, and check the following operations.

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

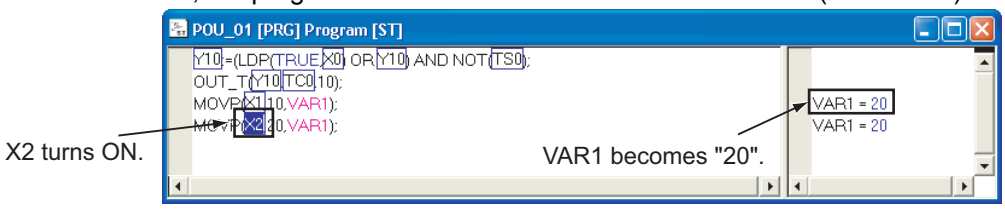
- When X0 turns ON, the programmable controller turns ON Y10, and then turns OFF Y10 1 second later.

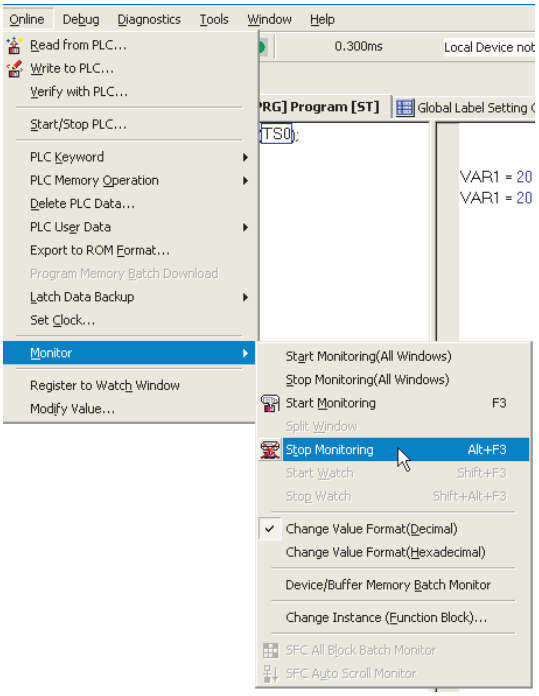


- When X1 turns ON, the programmable controller transfers K10 to VAR1 (device: D0).



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





5. Select "Online" → "Monitor" → "Stop Monitoring" to stop (pause) the monitor status on the MAIN_01 [PRG] program [ST] window.

You can click (Stop Monitoring) to reset the MAIN_01 [PRG] program [ST] window.

6. 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.
Refer to "Point" in step 3 for remote operation.

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

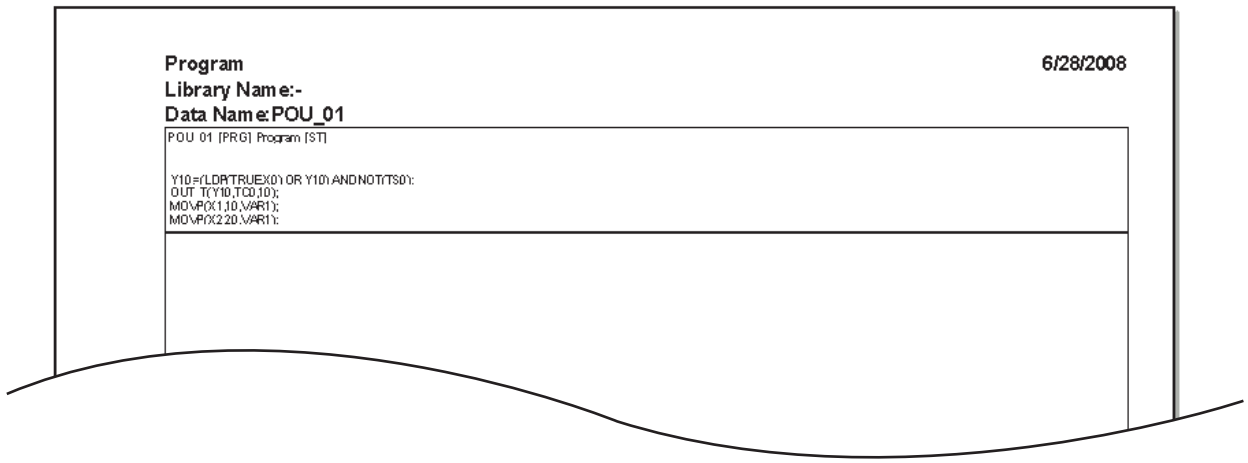
Refer to the following section for the procedure to read a project from the programmable controller:

☞ 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 Quitting GX Works2

Refer to the following section for the project finishing procedure:

☞ 3.9 Quitting 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):

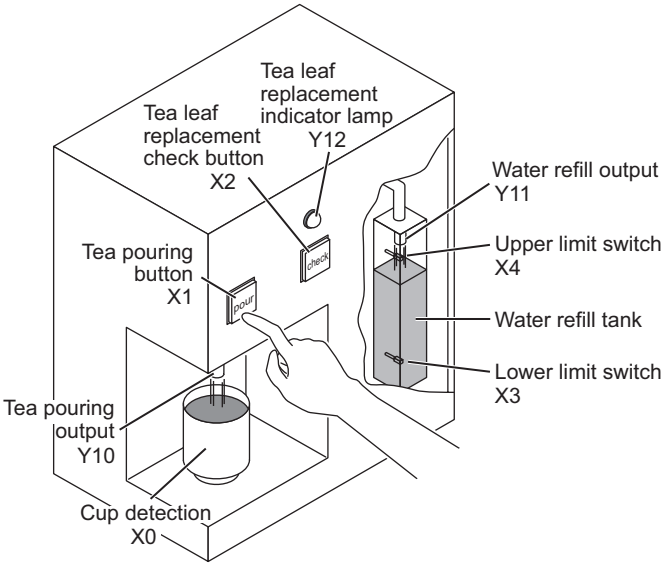
☞ QCPU Structured Programming Manual (Fundamentals)
☞ Structured Programming Manual of the programmable controller CPU

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 5-16
5.6 Reading a Project from programmable controller 5-16
5.7 Printing 5-17
5.8 Saving a Project 5-17
5.9 Quitting GX Works2 5-17

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

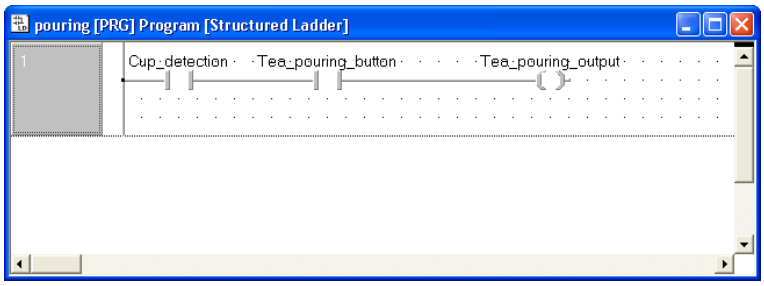
■ Warning indicating operation

- 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.

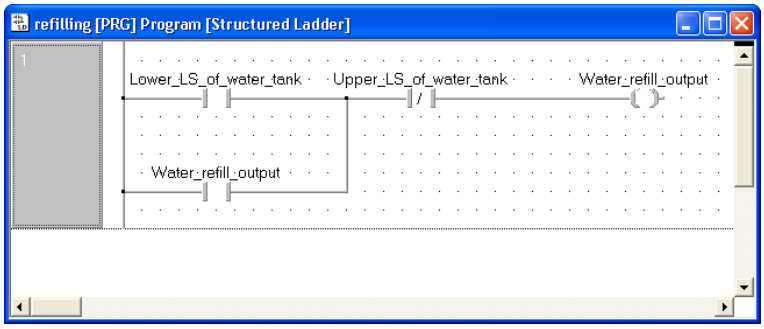
5.1.2 Created program

Create the following program blocks.

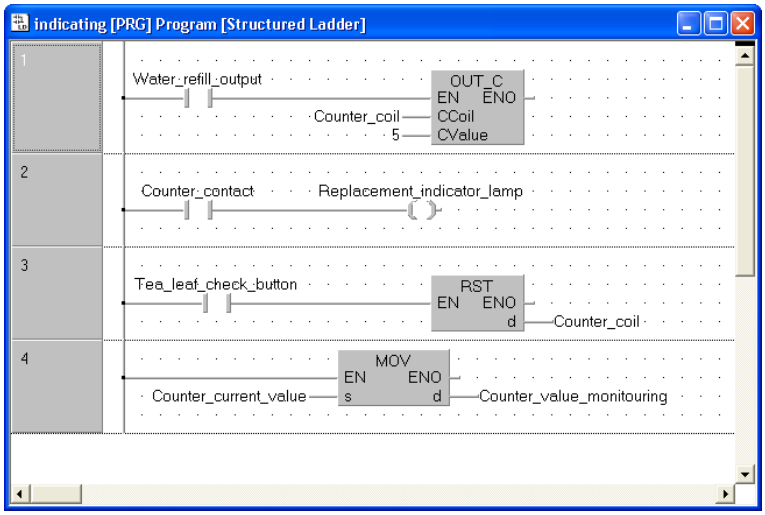
■ Program block for the tea pouring operation



■ 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 fefilling 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 Version1 Operating Manual (Common)

☞ CPU Manual

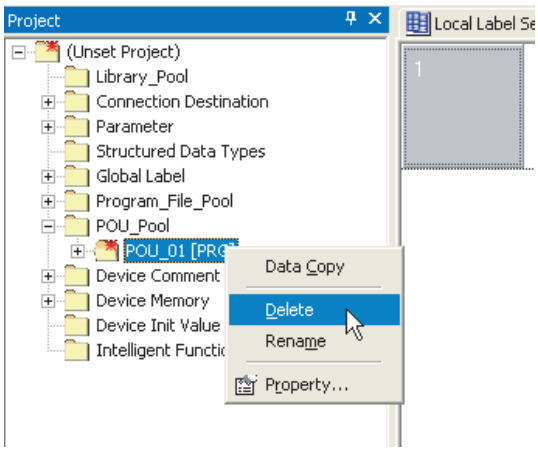
☞ CPU Programming manual

5.2.5 Preparing (creating) the program configuration

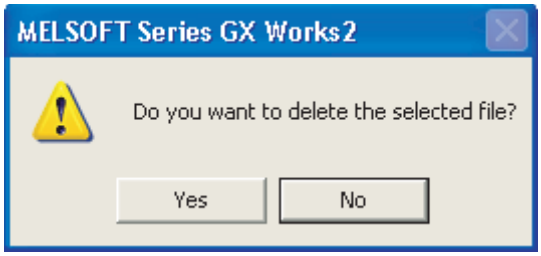
Create a POU (three program blocks) for LD program, and register the three program blocks created in the POU to a task.
When you create a new project, GX Works2 automatically creates the Program File, Task and POU shown in the table below.

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

Item	Name
Program File	MAIN
Task	Task_01 The program block "POU_01" is registered in "Task_01".
POU	POU_01



1. Select "Pou_Pool" → "POU_01 [PRG]" from the Project window, and select "Delete".



2. Click Yes to delete the selected data.

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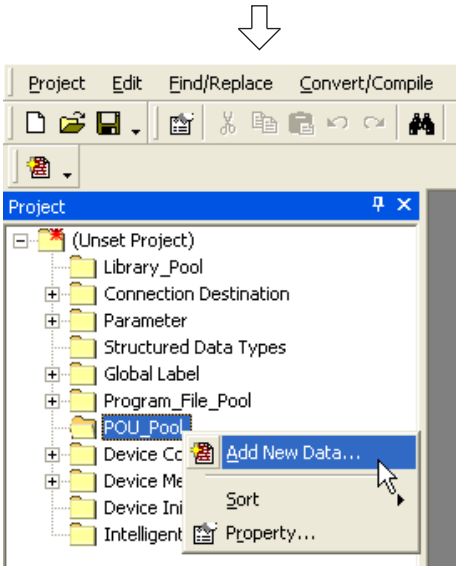
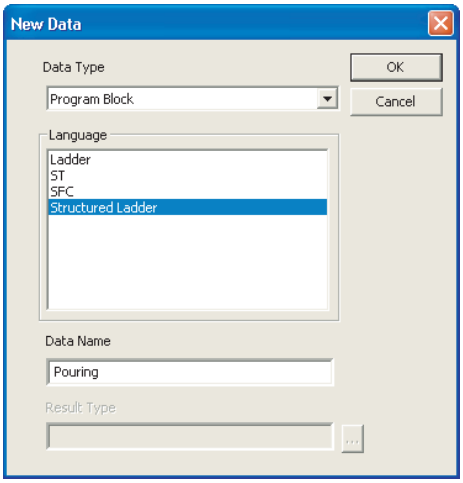


3. Select "POU_Pool" from the Project window, right-click the mouse, and select "ADD New data".

   The "New Data" window appears.

Point

When cleating a new project, GX Works2 automatically creates "POU_01 [PRG]" under "Pou_Pool". Because the language (Structured Ladder) 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.



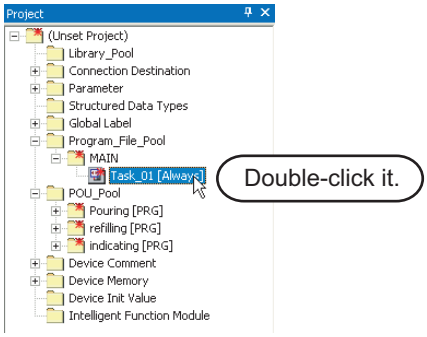
4. Set the "Data Type", "Language" and "Data Name".

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

   Repeat the steps 2 and 3, and create three program blocks for the tea pouring operation, water refilling operation and warning indicating operation.

   Settings

   - Data Type : Select "Program block".
   - Language : Select "LD".
   - Data Name : Input the following names:
     1) pouring
     2) refilling
     3) indicating

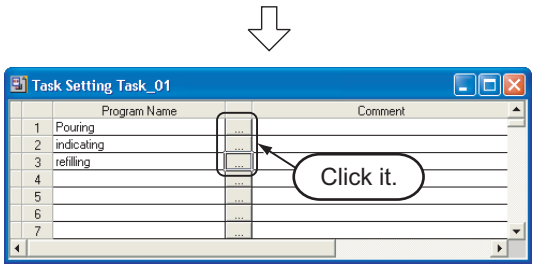


5. Double-click "Resource_Pool" → "MAIN" → "Task Name*1" on the Project window.

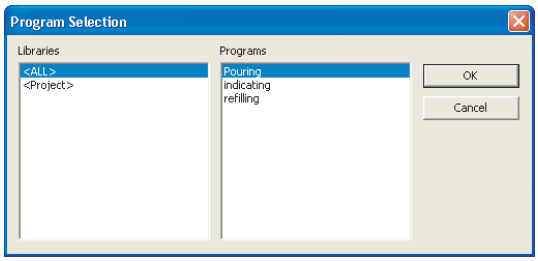
   The task setting task name*1 window appears.

   *1. The Task Name is "Task_01" for this example.

(To the next page)



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



7. Select the program block name.

Click the [OK] button to register the selected program block to the Task Setting window and close the Program Selection window.

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 window.

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 Version1 Operating Manual (Common)

5.2.6 Setting labels

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

☞ 3.2.5 Setting labels

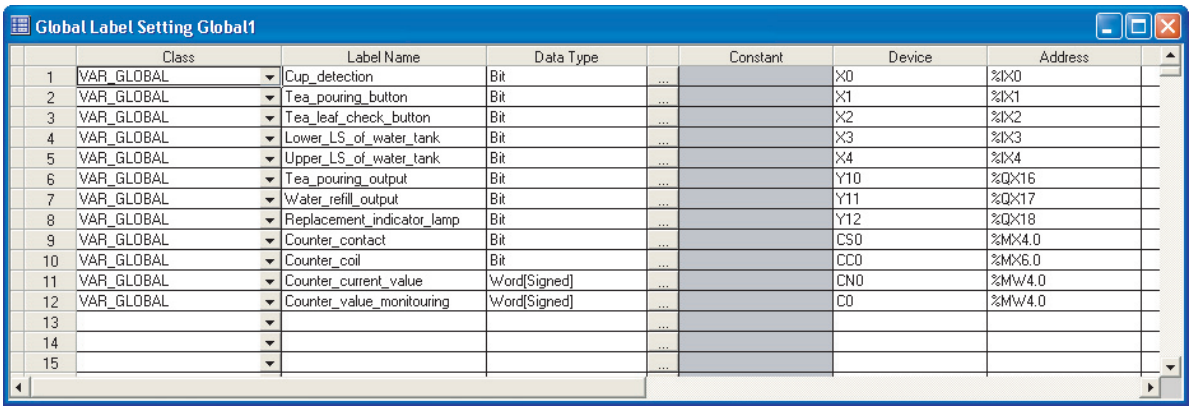
Refer to the following manual for the details on global/local label setting procedures:

☞ GX Works2 Version1 Operating Manual (Structured Project)

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

☞ QCPU Structured Programming Manual (Fundamentals)

■ Setting global labels



	Class	Label Name	Data Type		Constant	Device	Address
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	...		CS0	%MX4.0
10	VAR_GLOBAL	Counter_coil	Bit	...		CC0	%MX6.0
11	VAR_GLOBAL	Counter_current_value	Word[Signed]	...		CN0	%MW4.0
12	VAR_GLOBAL	Counter_value_monitouring	Word[Signed]	...		C0	%MW4.0
13				...			
14				...			
15				...			

5.2.7 Creating a program

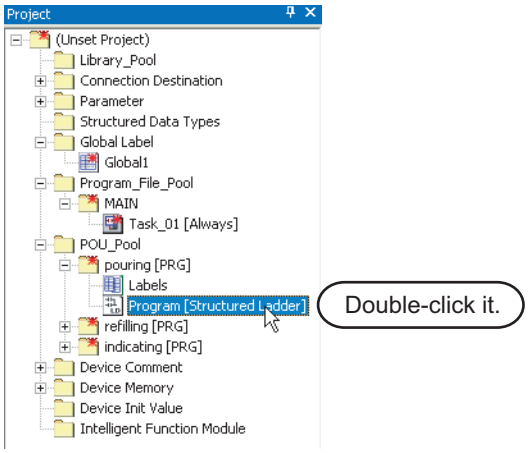
Refer to the following section and manual for the program creation procedures:

☞ 3.2.6 Creating a program

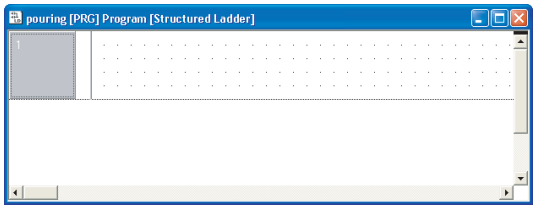
☞ GX Works2 Version1 Operating Manual (Structured Project)

■ Creating the program block for the tea pouring operation

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



1. Double-click "Pou_Pool" → "pouring [PRG]" → "Program [Structured Ladder]" on the Project window to display the pouring [PRG] program [Structured Ladder] window.

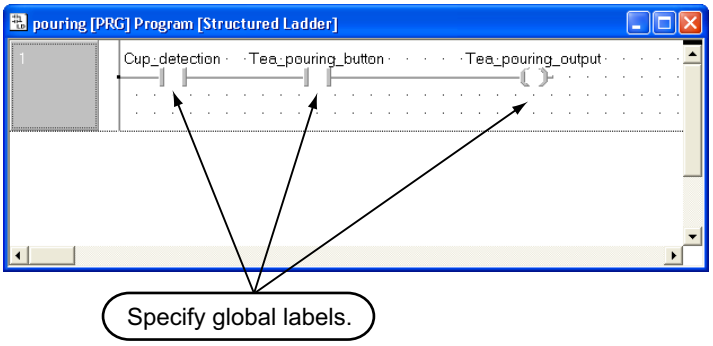


2. Create the program block for the tea pouring operation shown in Subsection 5.1.2.

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

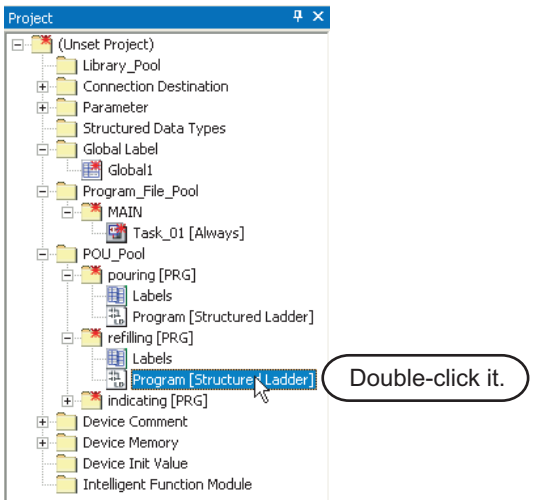
   ☞ 3.2.6 Creating a program

   ☞ GX Works2 Version1 Operating Manual (Structured Project)

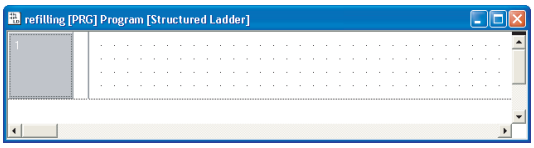


■ Creating the program block for the water refilling operation

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



1. Double-click "Pou_Pool" → "refilling [PRG]" → "Program [Structured Ladder]" on the Project window to display the refilling [PRG] program [Structured Ladder] window.

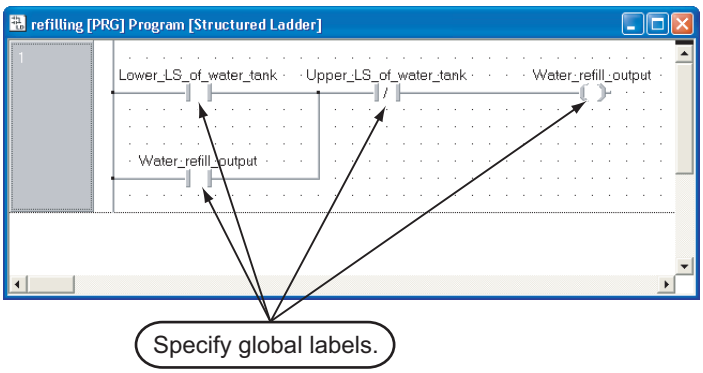


2. Create the program block for the water refilling operation shown in Subsection 5.1.2.

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

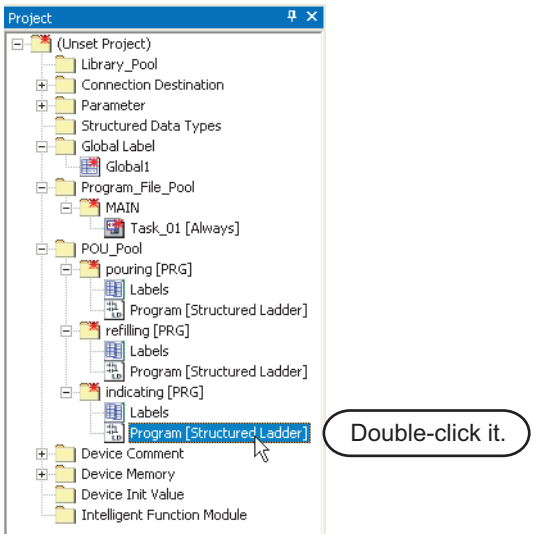
   ☞ 3.2.6 Creating a program

   ☞ GX Works2 Version1 Operating Manual (Structured Project)

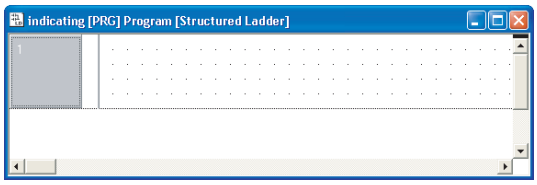


■ Creating the program block for the warning indicating operation

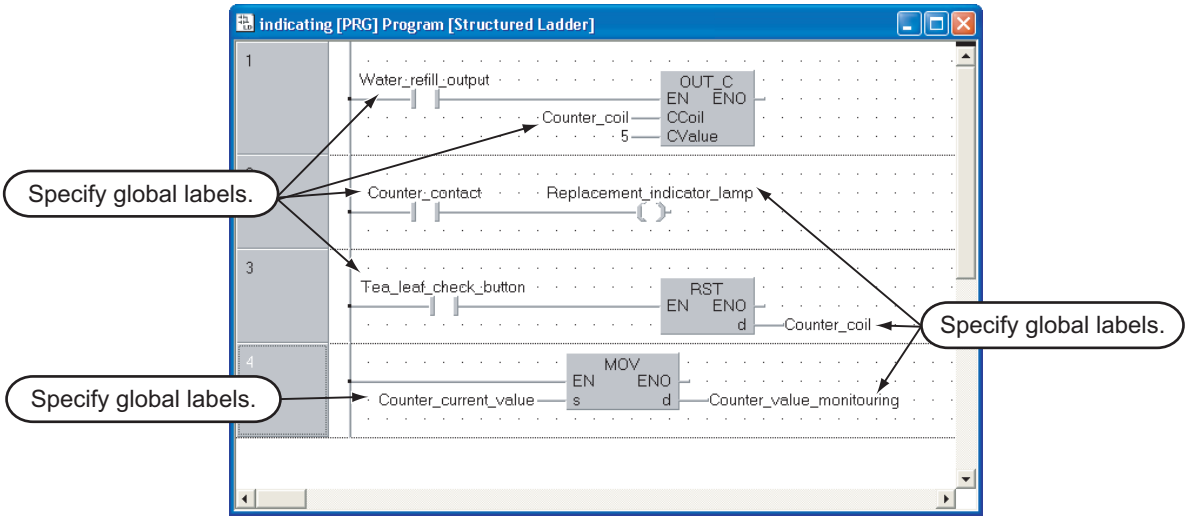
Create the program block for the warning indicating operation shown in Subsection 5.1.2.



1. Double-click "Pou_Pool" → "indicating [PRG]" → "Program [Structured Ladder]" on the Project window to display the indicating [PRG] program [Structured Ladder] window.



2. Create the program block for the warning indicating operation shown in Subsection 5.1.2.
Refer to the following section and manual for the program creation procedures:
☞ 3.2.6 Creating a program
☞ GX Works2 Version1 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 Version1 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.

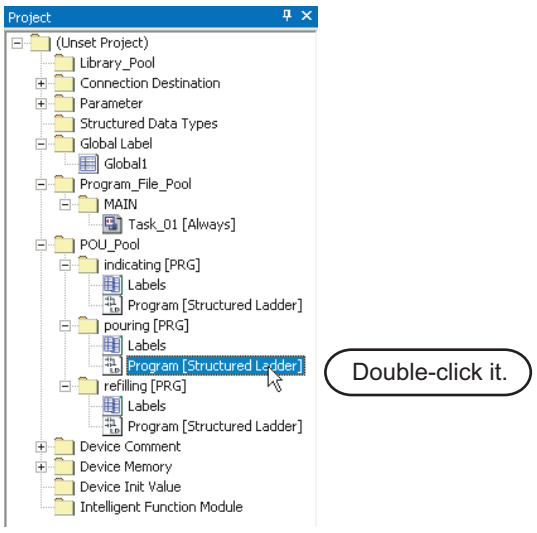
☞ 3.3 Writing a Project to the programmable controller

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:

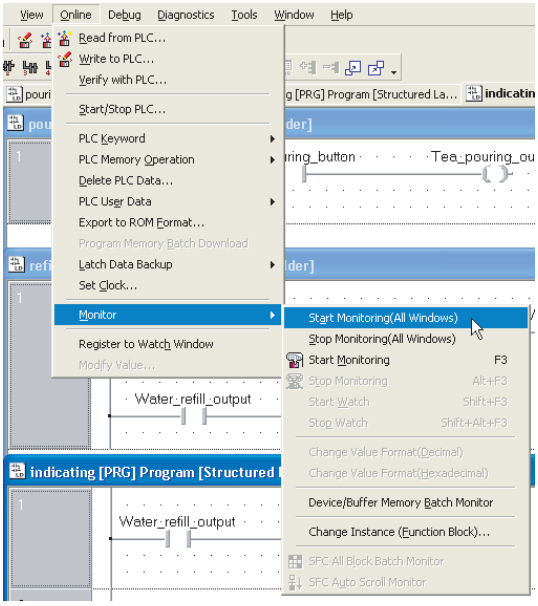
☞ GX Works2 Version1 Operating Manual (Common)

5.4.1 Monitoring a program



1. Double-click "Pou_Pool" → "pouring [PRG]" → "Program [LD]" on the Project window to display the pouring [PRG] program [Structured Ladder] window.

   Display the refilling [PRG] program [Structured Ladder]] window and the indicating [PRG] program [Structured Ladder]] window in the same way.



2. Select "Online" → "Monitor" → "Start Monitoring (All Windows)" to monitor all available windows.

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

3. 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.

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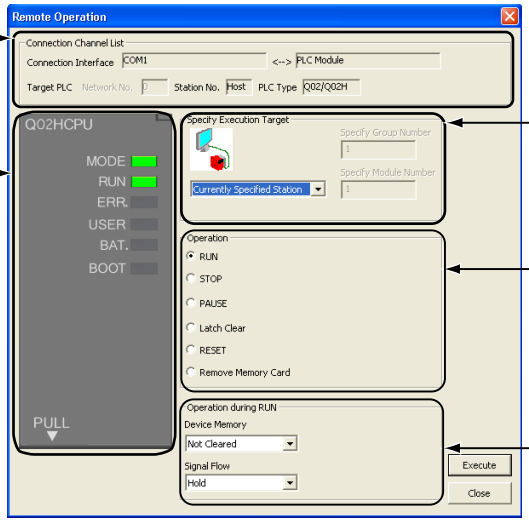
Point

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 Version1 Operating Manual (Common)

Select "Online" → "Start/Stop PLC" to display the remote operation window. You can switch the programmable controller status between "RUN" and "STOP" on this window.



Connection Channel List information
Displays the connection target information currently

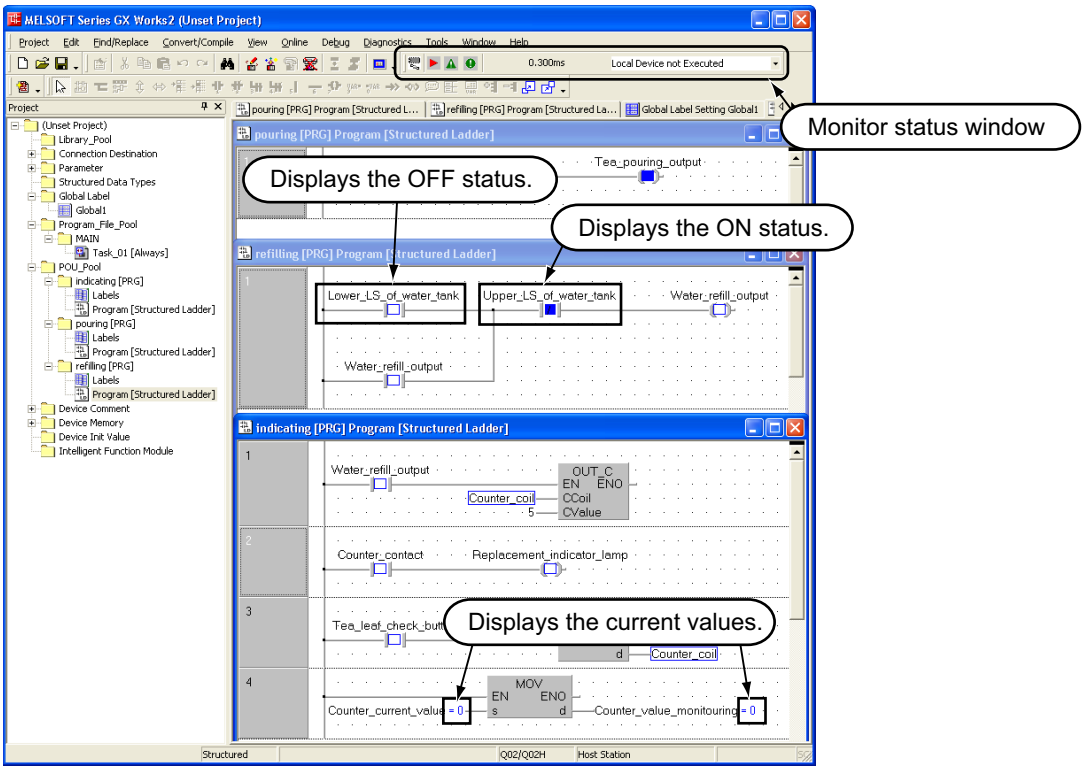
Programmable controller Status
Displays the programmable controller CPU status.

Specify Execution Target
Allows you to set the target station for remote operation. Select "Currently specified station" for this example.

Operation
Allows you to select the programmable controller CPU status to be set. Select either "RUN", "PAUSE" or "STOP" for this example.

Operation during RUN
Allows you to set the operations to be executed to the device memory and signal flow when the programmable controller is switched

Monitor status display example



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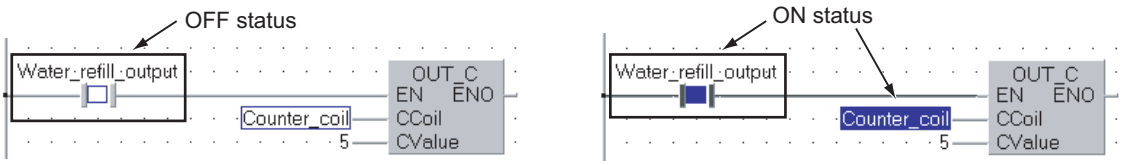
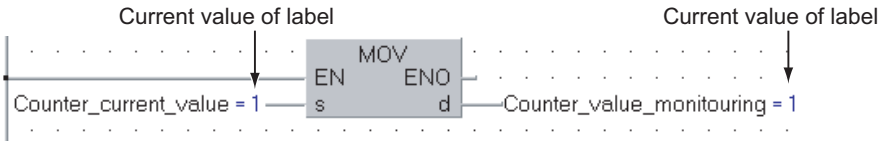
Point

Monitor status display

- **Display of BOOL value status (ON/OFF status)**
  GX Works2 displays the ON/OFF status (BOOL values) of contacts, coils, etc. as the ON/OFF status of devices and labels.
  Refer to the following manual for the BOOL value ON/OFF status display:
  ☞ GX Works2 Version1 Operating Manual (Common)



- **Display of contents status (current value) other than BOOL values**
  GX Works2 displays the current values of non-BOOL 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

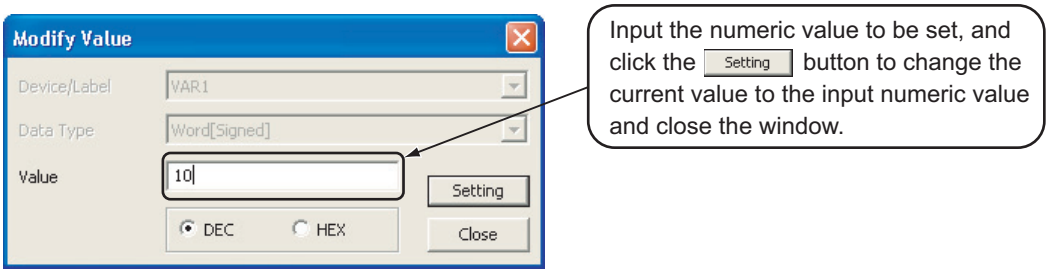
  Select "Online" → "Monitor" → "Change Value Format (Decimal)".

  Operation to switch the current value display to hexadecimal

  Select "Online" → "Monitor" → "Change Value Format (Hexadecimal)".

Test operation

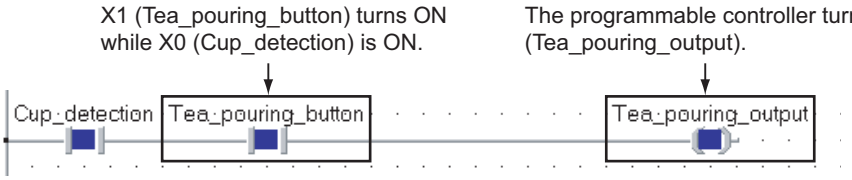
- **Forcing a contact ON/OFF**
  Double-click a monitored device or label while pressing [Shift] to force a device in the programmable controller ON/OFF.
- **Changing the current value of a word device**
  Double-click a monitored word device to display the Modify Value window where you can change the current value.



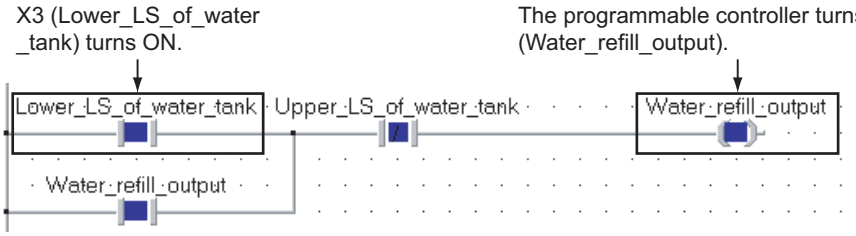
4. Turn ON inputs X0, X1 and X2 in the programmable controller, and check the following operations.

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

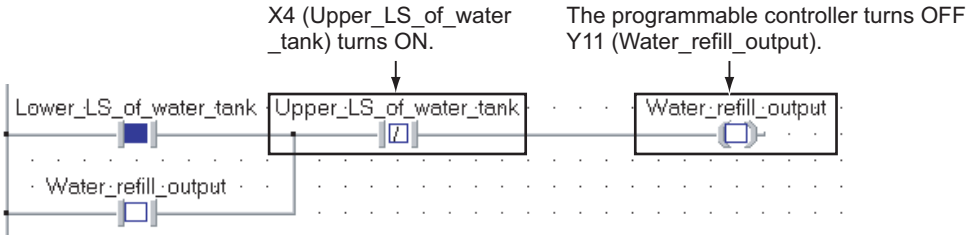
   - When X1 turns ON while X0 is ON, the programmable controller turns ON Y10. When X1 turns ON while X0 is OFF, the programmable controller does not turn ON Y10.



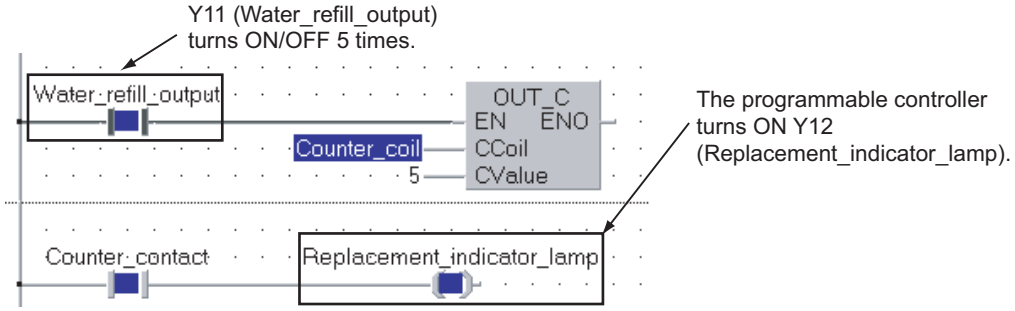
   - When X3 turns ON, the programmable controller turns ON Y11.



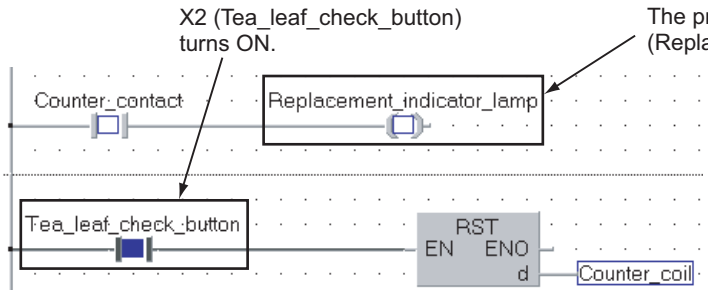
   - When X4 turns ON while X3 is ON, the programmable controller turns OFF Y11.



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



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



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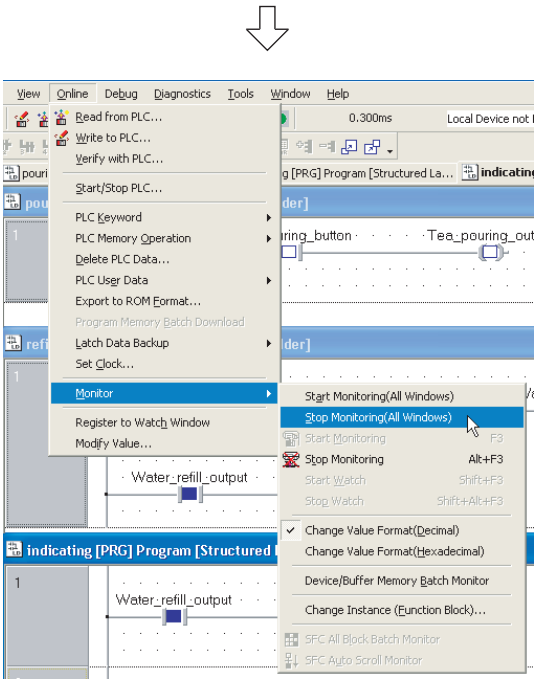


5. Select "Online" → "Monitor" → "Stop Monitoring (All Windows)" to reset the monitor status on all monitored window.

   You can also click (Stop Monitoring) to reset eatch monitored window individually.

6. 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.
   Refer to "Point" in step 3 for remote operation.

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

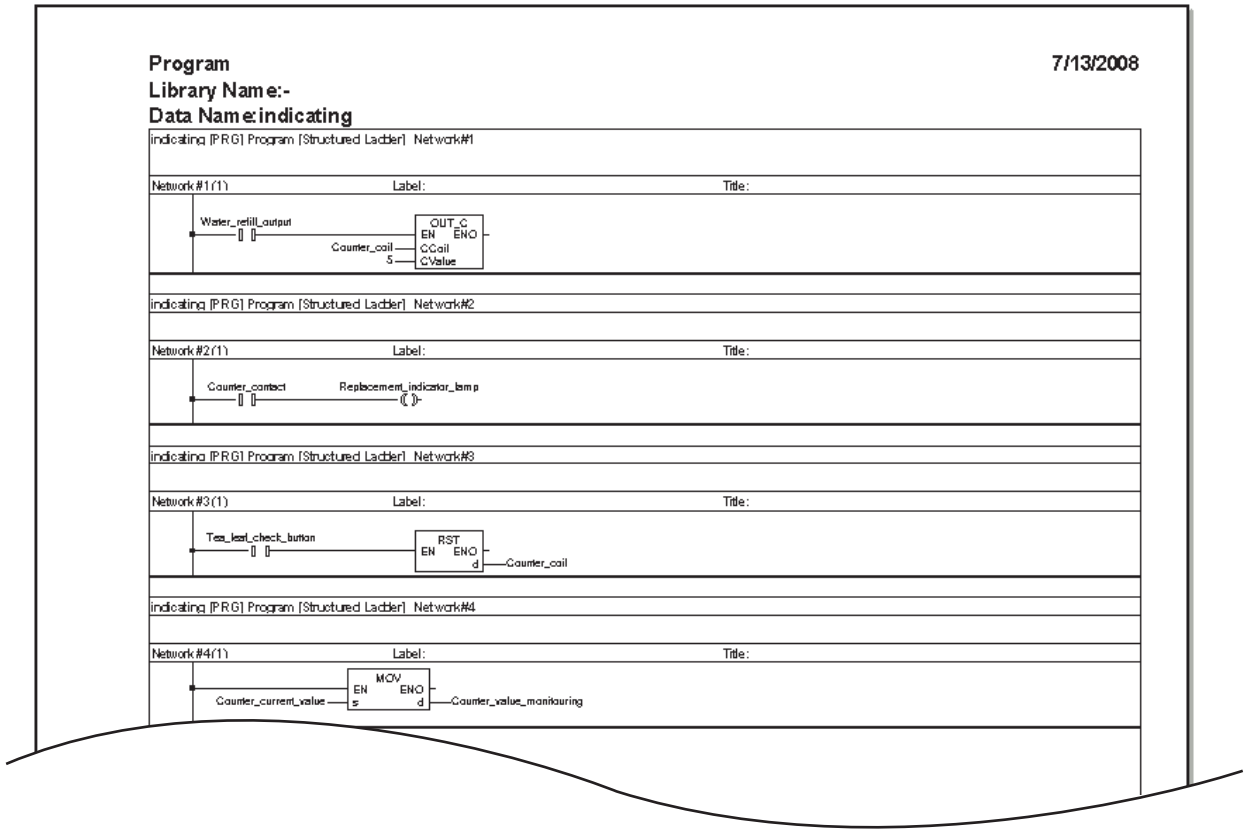
Refer to the following section for the procedure to read a project from the programmable controller:

☞ 3.6 Reading a Project from programmable controller

5.7 Printing

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

☞ 3.7 Printing



5.8 Saving a Project

Refer to the following section for the project saving procedure:

☞ 3.8 Saving a Project

5.9 Quitting GX Works2

Refer to the following section for the project finishing procedure:

☞ 3.9 Quitting GX Works2

SH(NA)-080788ENG-A

GX Works2
Beginner's Manual
(Structured Project)

MODEL	GXW2-HOW-O-KP-E
MODEL CODE	13JZ23
SH(NA)-080788ENG-A(0807)MEE	

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