MELSEC-L Series

Programmable Controllers

Quick Start Guide

15032011
Version A

About this manual

The texts, illustrations, diagrams and examples in this manual are provided for information purposes only. They are intended as aids to help explain the installation, operation, programming and use of the programmable controller of MELSEC L series.

If you have any questions about the installation and operation of any of the products described in this manual please contact your local sales office or distributor (see back cover).

You can find the latest information and answers to frequently asked questions on our website at *www.mitsubishi-automation.com.*

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Quick Start Guide
MELSEC-L Series Programmable Controllers

Version	Revisions / Additions / Corrections
A 03/2011 akl	—

Safety guidelines

For use by qualified staff only

This manual is only intended for use by properly trained and qualified electrical technicians who are fully acquainted with the relevant automation technology safety standards. All work with the hardware described, including system design, installation, configuration, maintenance, service and testing of the equipment, may only be performed by trained electrical technicians with approved qualifications who are fully acquainted with all the applicable automation technology safety standards and regulations. Any operations or modifications to the hardware and/or software of our products not specifically described in this manual may only be performed by authorised Mitsubishi Electric staff.

Proper use of the products

The programmable controllers of the MELSEC L series are only intended for the specific applications explicitly described in this manual. All parameters and settings specified in this manual must be observed. The products described have all been designed, manufactured, tested and documented in strict compliance with the relevant safety standards. Unqualified modification of the hardware or software or failure to observe the warnings on the products and in this manual may result in serious personal injury and/or damage to property. Only peripherals and expansion equipment specifically recommended and approved by MITSUBISHI ELECTRIC may be used with the programmable controllers of the MELSEC L series.

All and any other uses or application of the products shall be deemed to be improper.

Relevant safety regulations

All safety and accident prevention regulations relevant to your specific application must be observed in the system design, installation, configuration, maintenance, servicing and testing of these products. The regulations listed below are particularly important in this regard. This list does not claim to be complete; however, you are responsible for being familiar with and conforming to the regulations applicable to you in your location.

- VDE Standards
  - VDE 0100
    Regulations for the erection of power installations with rated voltages below 1000 V
  - VDE 0105
    Operation of power installations
  - VDE 0113
    Electrical installations with electronic equipment
  - VDE 0160
    Electronic equipment for use in power installations
  - VDE 0550/0551
    Regulations for transformers
  - VDE 0700
    Safety of electrical appliances for household use and similar applications
  - VDE 0860
    Safety regulations for mains-powered electronic appliances and their accessories for household use and similar applications.
- Fire safety regulations
- Accident prevention regulation
  - VBG No. 4
    Electrical systems and equipment

Safety warnings in this manual

In this manual special warnings that are important for the proper and safe use of the products are clearly identified as follows:

DANGER:

Personnel health and injury warnings.
Failure to observe the safety warnings identified with this symbol can result in health and injury hazards for the user.

CAUTION:

Equipment and property damage warnings.
Failure to observe the safety warnings identified with this symbol can result in damage to the equipment or other property.

General safety information and precautions

The following safety precautions are intended as a general guideline for using PLC systems together with other equipment. These precautions must always be observed in the design, installation and operation of all control systems.

DANGER:

- ***Observe all safety and accident prevention regulations applicable to your specific application. Always disconnect all power supplies before performing installation and wiring work or opening any of the assemblies, components and devices.***
- ***Assemblies, components and devices must always be installed in a shockproof housing fitted with a proper cover and fuses or circuit breakers.***
- ***Devices with a permanent connection to the mains power supply must be integrated in the building installations with an all-pole disconnection switch and a suitable fuse.***
- ***Check power cables and lines connected to the equipment regularly for breaks and insulation damage. If cable damage is found immediately disconnect the equipment and the cables from the power supply and replace the defective cabling.***
- ***Before using the equipment for the first time check that the power supply rating matches that of the local mains power.***
- ***Take appropriate steps to ensure that cable damage or core breaks in the signal lines cannot cause undefined states in the equipment.***
- ***You are responsible for taking the necessary precautions to ensure that programs interrupted by brownouts and power failures can be restarted properly and safely. In particular, you must ensure that dangerous conditions cannot occur under any circumstances, even for brief periods. EMERGENCY OFF must be switched forcibly, if necessary.***
- ***Residual current protective devices pursuant to DIN VDE Standard 0641 Parts 1-3 are not adequate on their own as protection against indirect contact for installations with PLC systems. Additional and/or other protection facilities are essential for such installations.***
- ***EMERGENCY OFF facilities conforming to EN 60204/IEC 204 and VDE 0113 must remain fully operative at all times and in all control system operating modes.The EMERGENCY OFF facility reset function must be designed so that it cannot ever cause an uncontrolled or undefined restart.***
- ***You must implement both hardware and software safety precautions to prevent the possibility of undefined control system states caused by signal line cable or core breaks.***
- ***When using modules always ensure that all electrical and mechanical specifications and requirements are observed exactly.***

Precautions to prevent damages by electrostatic discharge

Electronic devices and modules can be damaged by electrostatic charge, which is conducted from the human body to components of the controller. Always take the following precautions, when handling the controller:

CAUTION:

- ***Before touching a module of the controller, always touch grounded metal, etc. to discharge static electricity from human body.***
- ***Wear isolating gloves when touching the powered controller, e. g. at maintenance during visual check.***
- ***You shouldn't wear clothing made of synthetic fibre at low humidity. This clothing gets a very high rate of electrostatic charge.***

Symbols used in the manual

Use of instructions

Instructions concerning important information are marked separately and are displayed as follows:

NOTE	Text of instruction

Use of numbering in the figures

Numbering within the figures is displayed by white numbers within black circles and is explained in a table following it using the same number, e.g.:

① ② ③ ④

Use of handling instructions

Handling instructions are steps that must be carried out in their exact sequence during startup, operation, maintenance and similar operations.

They are numbered consecutively (black numbers in white circles):

① Text.

② Text.

③ Text.

Use of footnotes in tables

Instructions in tables are explained in footnotes underneath the tables (in superscript). There is a footnote character at the appropriate position in the table (in superscript).

If there are several footnotes for one table then these are numbered consecutively underneath the table (black numbers in white circle, in superscript):

① Text
② Text
③ Text

Writing conventions and guidance notes

Keys or key-combinations are indicated in square brackets, such as [Enter], [Shift] or [Ctrl]. Menu names of the menu bar, of the drop-down menus, options of a dialogue screen and buttons are indicated in italic bold letters, such as the drop down menu ***New*** in the ***Project menu*** or the option ***Serial USB*** in the "Transfer Setup Connection" screen.

Explanations of terminology

Explanations concerning the terminology used are displayed as follows:

TERMINOLOGY	Term to be explained	Explanation text

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1 Introduction

1.1 Using the Quick start guide

This Quick start guide explains the basic procedures for the first-time use of the Mitsubishi programmable controller of MELSEC-L series.

You can easily understand how to use the programmable controller with this guide.

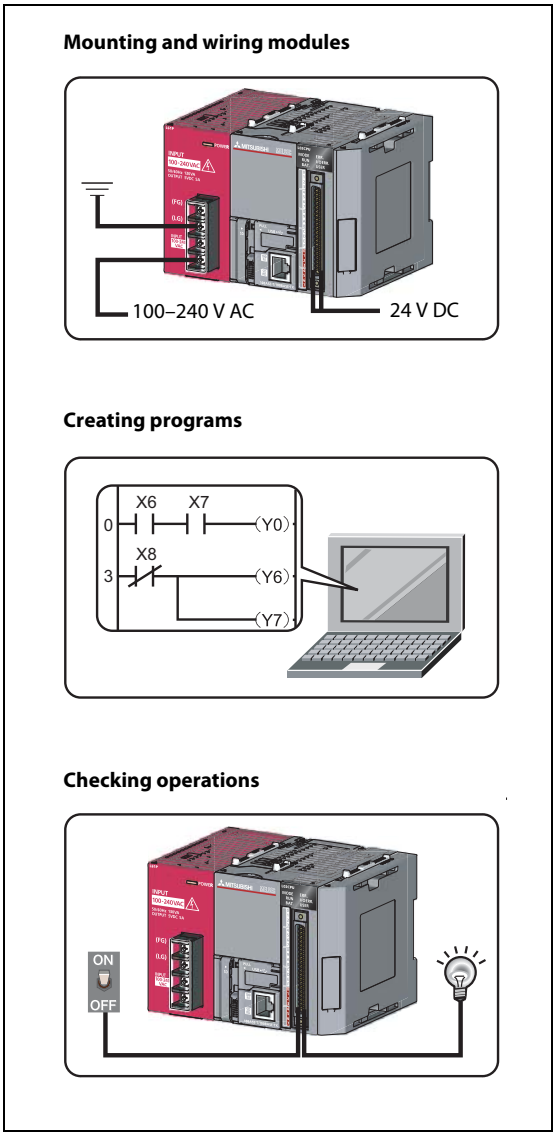


Fig. 1-1:
Overview of explanations supplied with this Quick start guide

1.2 Operations that can be performed using MELSEC-L series

1.2.1 Programmable controllers

The programmable controllers perform sequence control and logical operations by switching the output of output equipment ON/OFF according to the command signal from the input equipment.

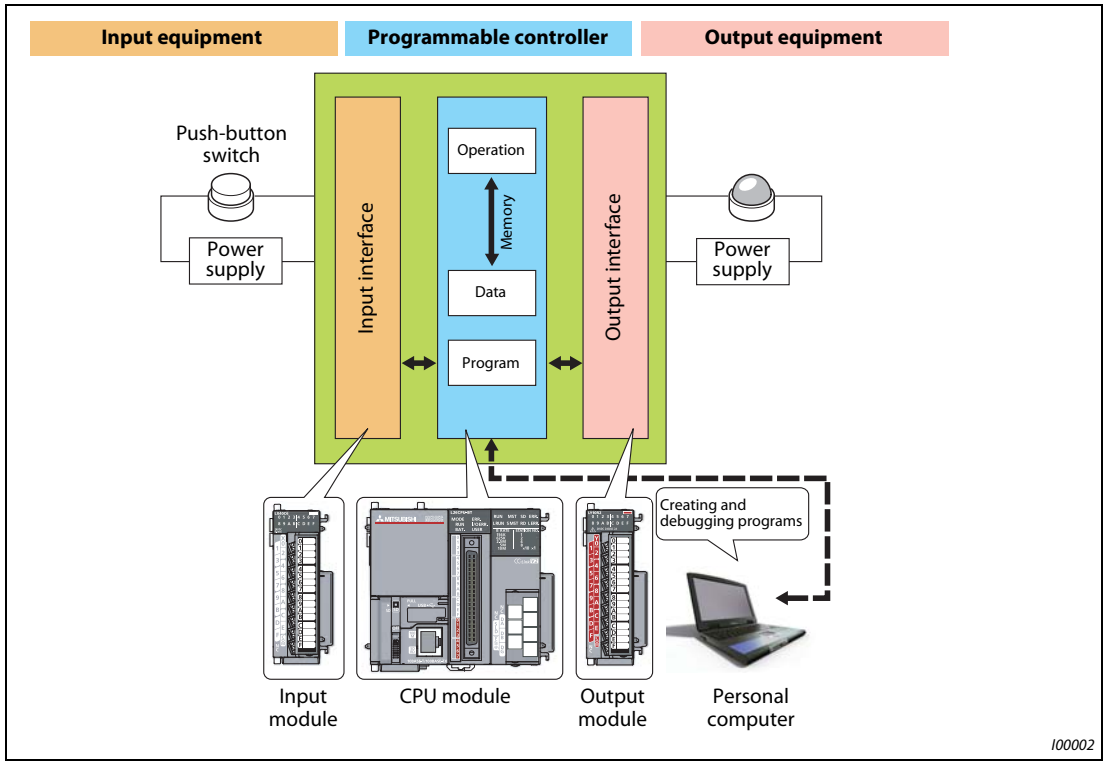


Fig. 1-2: *Performing sequence control and logical operations*

Other equipment is shown below.

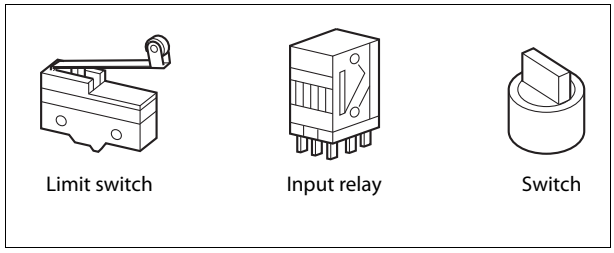


Fig. 1-3:
Examples of input equipment

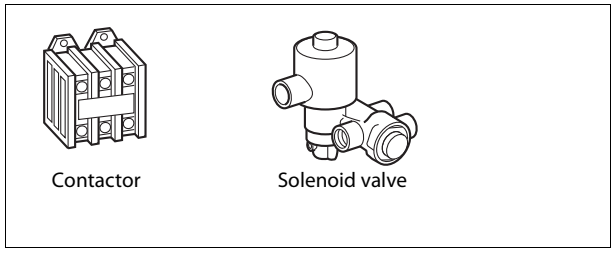


Fig. 1-4:
Examples of output equipment

TERMINOLOGY	Sequence control	Consecutively processes each control step based on the fixed order or procedure.
	Logical operations	One of the basic operation methods in programming. Logical operations consist of three basic operations: logical AND, logical OR, and logical NOT.
	Limit switch	A switch to stop the movement of mobile objects on both sides of a moving apparatus for safety reasons.
	Relay	Breaks/connects the electricity with electrical switching.
	Contactor	Generally called an electromagnetic contactor to break circuits and switch the heater.
	Solenoid valve	An electromagnet with a direct/alternating current. Connected to the output side of the programmable controller.

1.2.2 Features of CPU module

MELSEC-L series programmable controllers are all-in-one programmable controllers that have the following functions built into the CPU module. The use of these built-in functions enables you to design a smaller-scale system.

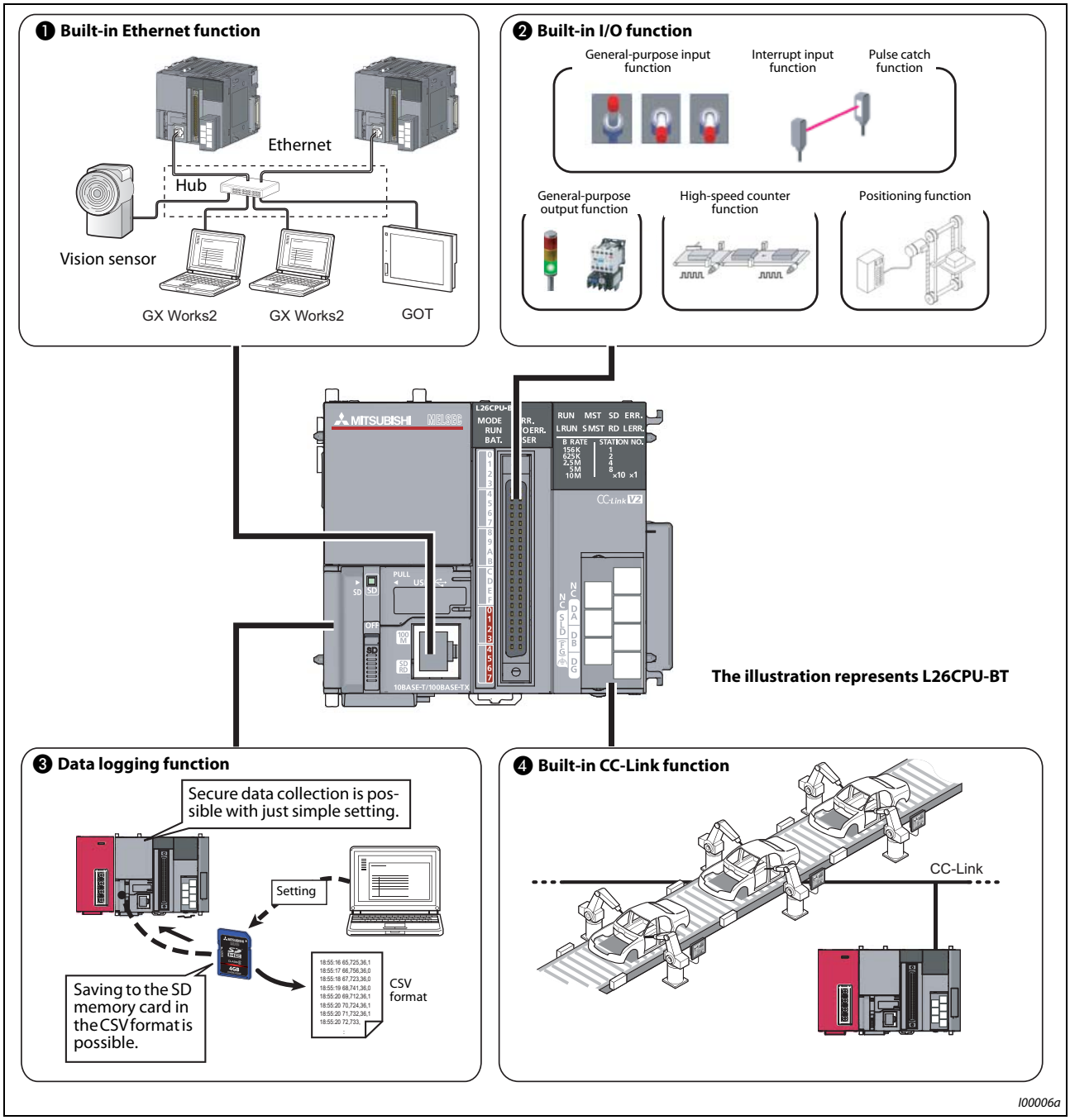


Fig. 1-5: *Functions built into the CPU module*

Refer to the following table for a detailed description of the features.

No.	Built-in function	Description
❶	Ethernet function	A maximum of 16 external devices can be connected via a hub. The reading/writing of the device data of the CPU module and the sending/receiving of the data of the other connected devices can be performed to/from a personal computer and GOT.
❷	I/O function	Single function exclusive modules become unnecessary, and a smaller-scale system can be configured using only LCPU. Therefore, system cost reduction can be realized.
❸	Data logging function	Logging can be performed under various conditions using the exclusive configuration tools. The collected data can be saved to the SD memory card in the CSV format.
❹	CC-Link function	I/O modules, intelligent function modules, and special function modules, which are arranged separately, can be controlled with the CPU module. In addition, a simple separately-configured system can be designed by connecting multiple CPU modules using CC-Link. **NOTE:** CC-Link function is only built into L26CPU-BT.

Tab. 1-1: *Description of the built-in functions of the CPU module*

1.2.3 System enhancement according to application

By connecting various types of modules, the system can be enhanced according to the application. As a baseless structure is employed, the space of the control panel can be used effectively without being limited by the size of the base.

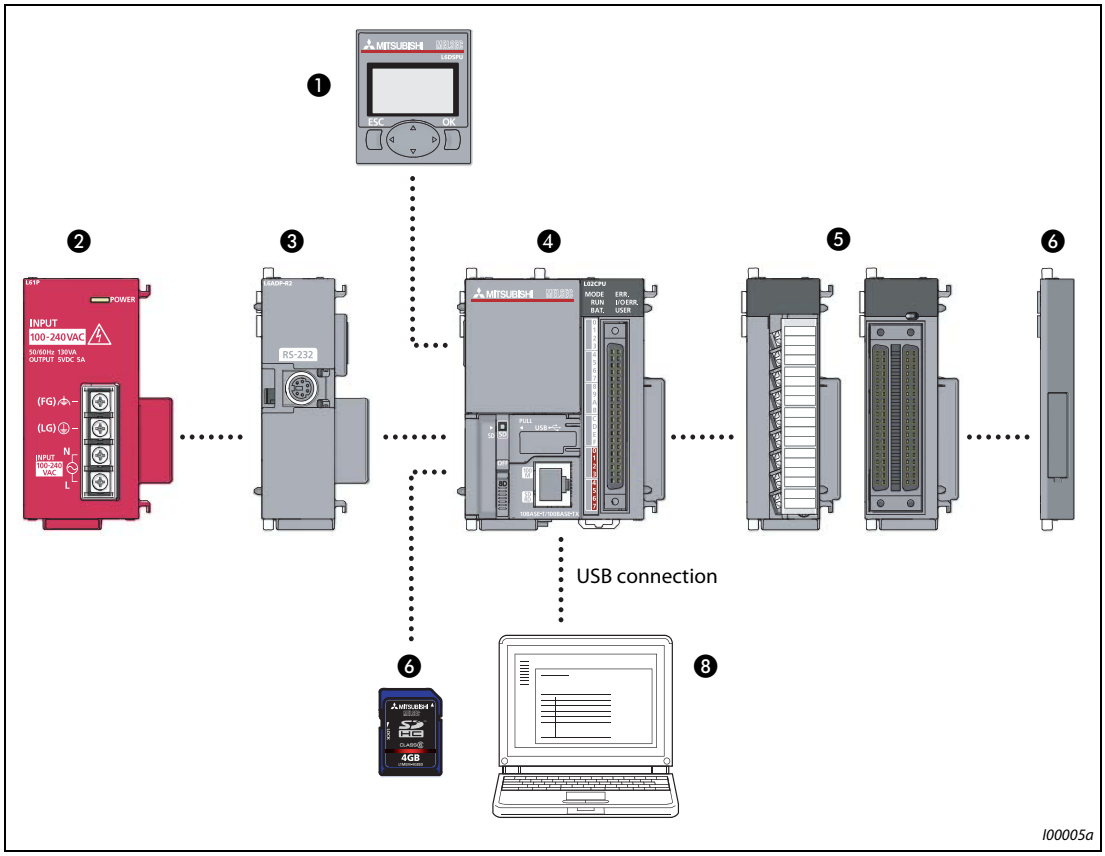


Fig. 1-6: *System enhancement (for an L02CPU CPU module as an example)*

No.	Module	Description
❶	Display unit (optional)	The system status can be confirmed and the system setting values can be changed by attaching this to the CPU module.
❷	Power supply module	—
❸	RS-232 adapter (optional)	Attached when connecting to GOT.
❹	CPU module	—
❺	I/O module or intelligent function module	The following modules can be attached as required. • I/O modules • Analog I/O modules • Serial communication modules
❻	END cover	Provided with the CPU module. Be sure to connect an END cover on the right of the terminal module.
❼	SD memory card (optional)	Using an SD memory card enables the following functions to be used. • Data logging function • Boot operation via the SD memory card • Backing up data to the SD memory card • Restoring backup data
❽	GX Works2	This is a programming tool to design, debug, and maintain sequence programs on a Windows personal computer. Programs can also be created effectively using FB (Function Block).

Tab. 1-2: *Description of various modules connectable to the system*

2 Using programmable controllers

2.1 Preparing for operation

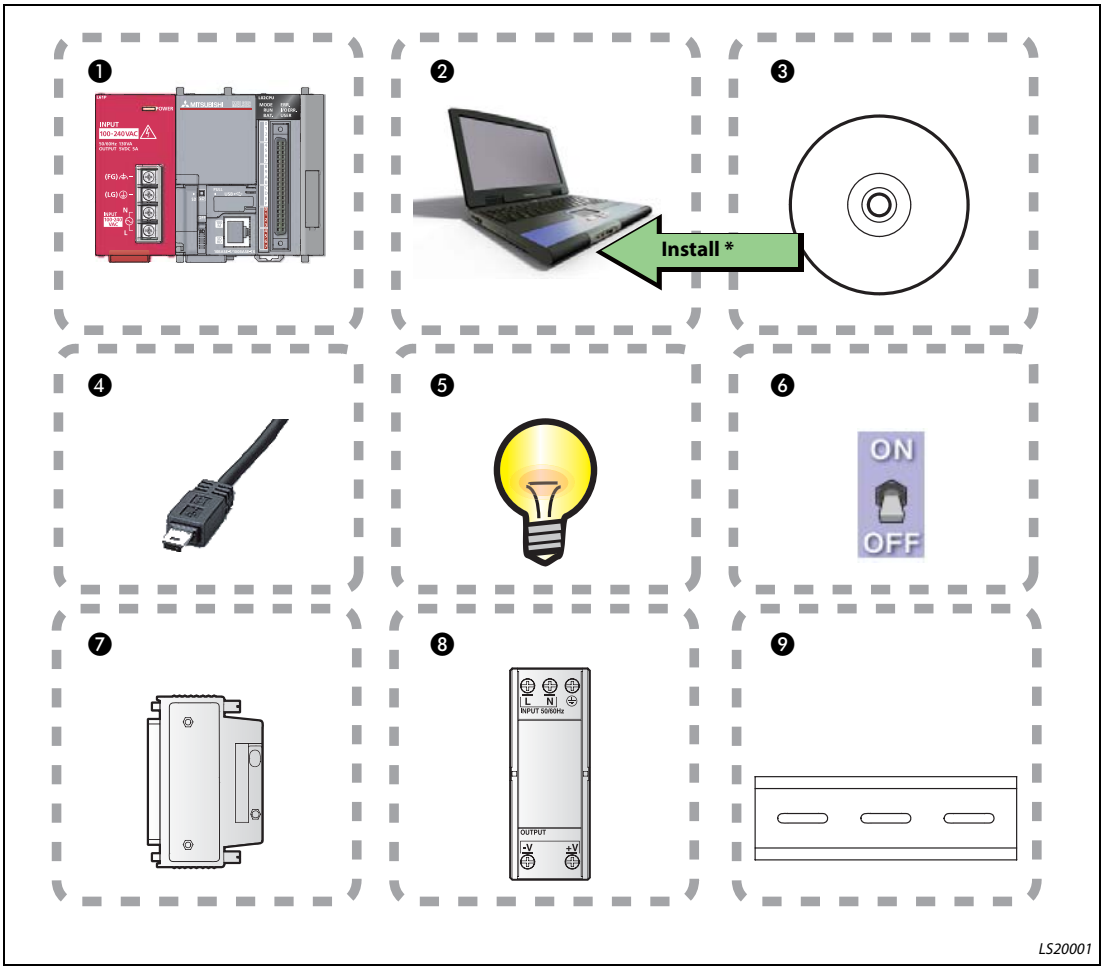


Fig. 2-1: *Prepare necessary equipment*

Refer to the following table for an overview of the necessary equipment to prepare operation.

No.	Description
❶	Programmable controller: Explanations for each module see next page
❷	Windows® personal computer
❸	GX Works2, Version 1.20W * GX Works2, Version 1 needs to be installed in your personal computer in advance
❹	USB cable (USB mini B type)
❺	Lamp
❻	Switch
❼	A6CON1
❽	External power supply
❾	DIN rail (Including DIN rail stopper)

Tab. 2-1: *Description of necessary equipment*

2.2 System configuration

2.2.1 System configuration example

The following system configuration is explained as an example.

Inputs and outputs are configured as switches and lamps respectively.

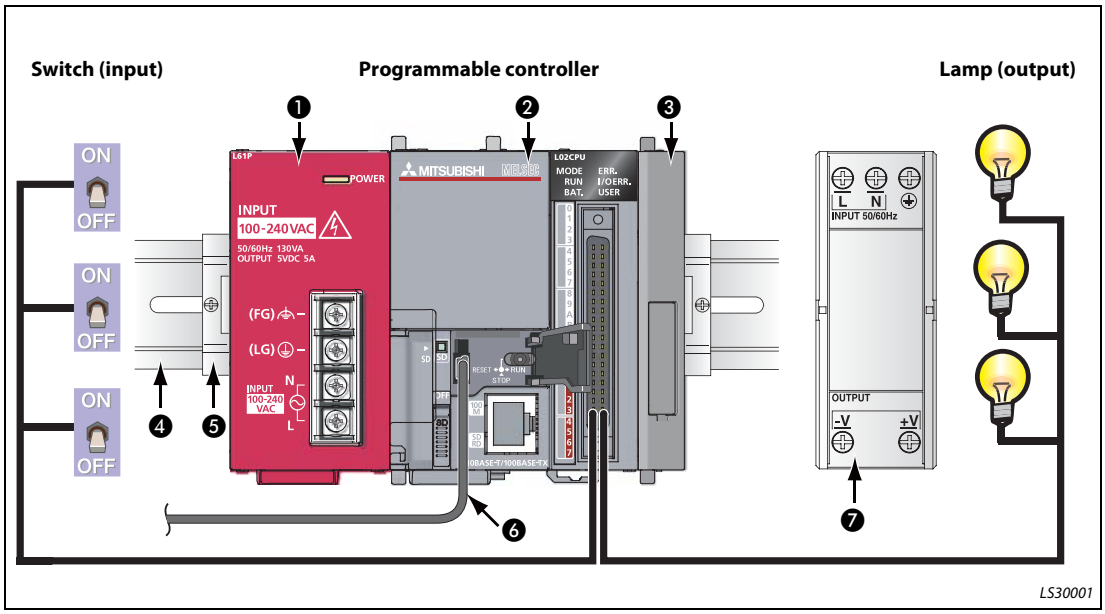


Fig. 2-2: *Example of a system configuration*

NOTE Wires to the power supply module and the power of the external I/O devices are omitted.

No.	Name	Model	Description
❶	Power supply module	L61P	Supplies power to modules such as CPU module.
❷	CPU module	L02CPU	Integrates the control of the programmable controller.
❸	END cover	L6EC	Supplied with the CPU module. Be sure to connect an END cover on the right of the terminal module.
❹	DIN rail	(IEC 60715) • TH35-7.5Fe • TH35-7.5Al • TH35-15Fe	The programmable controller system is secured by attaching it to the DIN rail.
❺	DIN rail stopper	—	Use DIN rail stoppers that can be attached to the DIN rails.
❻	Connection cable (USB cable)	MR-J3USBCBL3M (USB A type - USB mini B type)	Connects the personal computer with GX Works2 installed and the CPU module.
❼	External power supply	—	Supplies power to the external I/O devices. Use the CE marked models and be sure to perform grounding for the FG terminal.

Tab. 2-2: *Description of items in fig. 2-2*

2.3 Mounting modules

CAUTION:
The power supply must be disconnected when mounting modules.

Mount the prepared modules.

A battery connector must be connected when using the CPU module for the first time.

Mounting modules

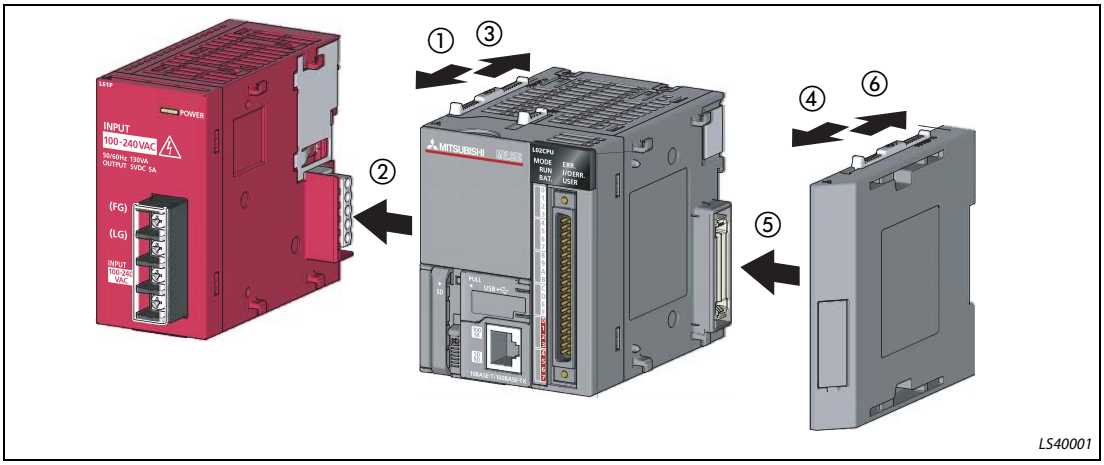


Fig. 2-3: *Mounting modules procedure*

① Release the module joint levers located on the top and bottom of the CPU module. (Slide them towards the front of the module.)

② Install the modules by inserting the connectors of the CPU module and the power supply module straight so that they can be engaged.

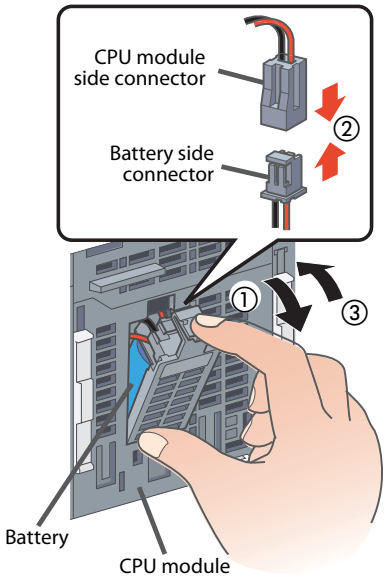
③ Lock the module joint levers located on the top and bottom of the CPU module. (Slide them towards the back of the module.)

④ to ⑥
Using the same procedure, attach the END cover.

Procedure complete.

NOTE

Connect a battery in the CPU module by the following procedure.



① Open the cover at the bottom of the CPU module.

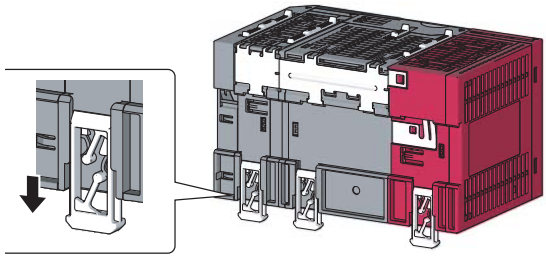
② Confirm the directions of the connectors, and insert the battery side connector into the CPU module side connector.

③ Close the cover at the bottom of the CPU module.

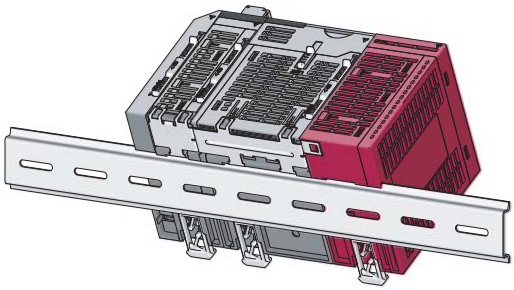
Procedure complete.

Mounting modules to DIN rail

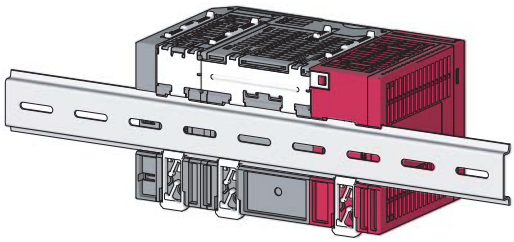
① Pull down all the DIN rail hooks on the back of the modules. (Pull them down until they click.)



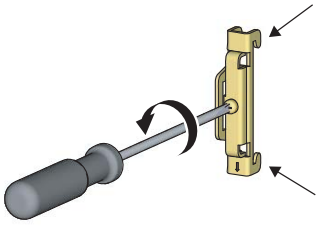
② Engage the claws at the top of the modules with the top of the DIN rail, and then insert the DIN rail to install.



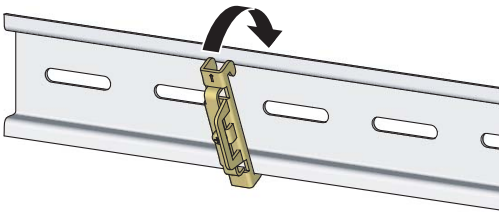
③ Lock the DIN rail hooks of the modules to engage them with the DIN rail.
(Push them up until they click. If your finger does not reach the DIN rail hook, use a screwdriver, etc.)



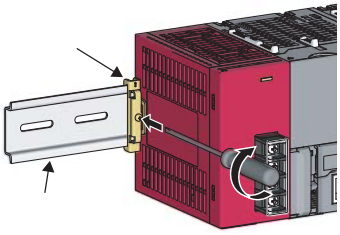
④ Loosen the screws of the DIN rail stoppers.



⑤ Engage the claw at the bottom of a DIN rail stopper with the bottom of the DIN rail, and then engage the claw at the top of the DIN rail stopper with the top of the DIN rail.
(Engage the DIN rail stopper after confirming the arrow indication on the front surface of the DIN rail stopper.)



⑥ Slide the DIN rain stopper to the edge of the module and tighten the screw using a screwdriver.
(Using the same procedure, attach a DIN rail stopper to other side of the module.)



Procedure complete.

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2.4 Wiring modules

This section explains the wiring of the power supply modules and the external I/O devices.

CAUTION:

The power supply must be disconnected when wiring modules.

2.4.1 Wiring the power supply module

The following shows an example of wiring the power line and the ground wire.

Grounding is performed to prevent electric shocks and malfunctions.

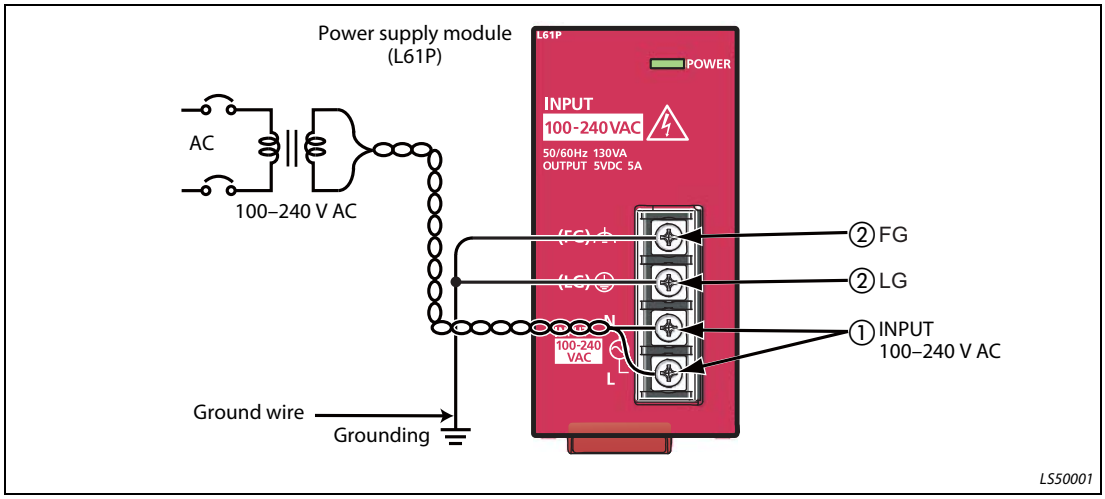


Fig. 2-4: *Example: Wiring power line and ground line*

① Connect the power supply (100–240 V AC) to the power input terminals via the breakers and the isolation transformers.

② Connect the LG and FG terminals to the ground.

2.4.2 Wiring connector for external devices

The following shows an example of wiring the connectors for external devices.

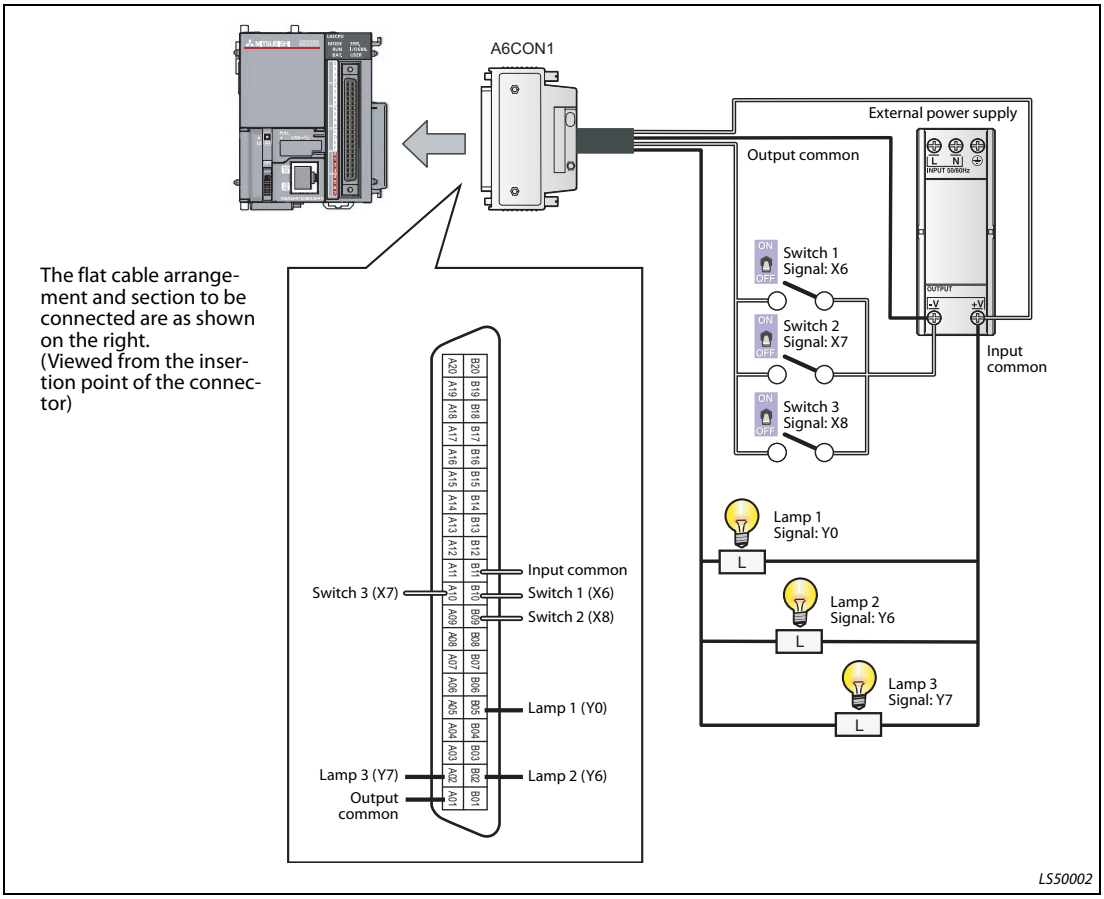


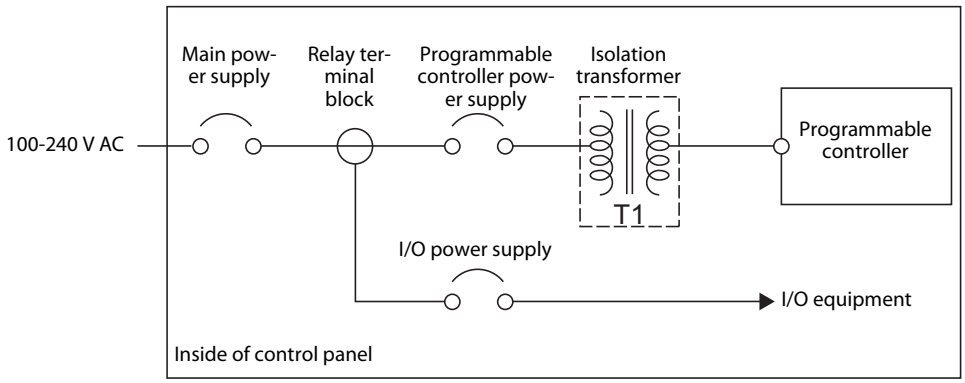
Fig. 2-5: *Example: Wiring the connectors for external devices*

CAUTION:

The pin arrangements of the connectors for external devices differ considerably from those of the I/O modules. Be sure to confirm the flat cable arrangement in the illustration shown above before connection.

NOTE

Wire the power supply lines for the I/O equipment and the programmable controller separately as shown below.



LS50003

TERMINOLOGY

Isolation transformer	A two-winding transformer. The primary and secondary coils are wound separately to protect the secondary load.
Control panel	This is a panel that consists of breakers, switches, protection devices, relays, and programmable controllers, etc. By combining them, the panel performs the following operation. • Receiving signals from external switches and sensors • Supplying electricity to operate motors and solenoid valves of external machines and equipment • Giving the signals to other equipment.

2.5 Checking power supply

Check that the power supply runs normally after configuring the system, mounting modules, and wiring.

Operating procedure

- Check before turning on the power supply.
  - Wiring of the power supply
  - Power supply voltage
- Set the CPU module to STOP.

  Open the cover on the front of the CPU module and set the switch to STOP.

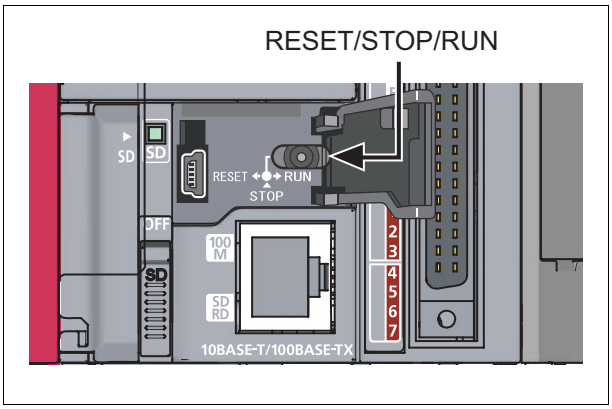


Fig. 2-6:
RESET/STOP/RUN switch

I04001

- Turn on the power supply module.
- Check that the power supply runs normally.

  Check the front LEDs on each module.

  The following shows the normal state of the LEDs.

  – Power supply module: ❶ "POWER" LED lights in green.

  – CPU module: ❷ "MODE" LED lights in green.

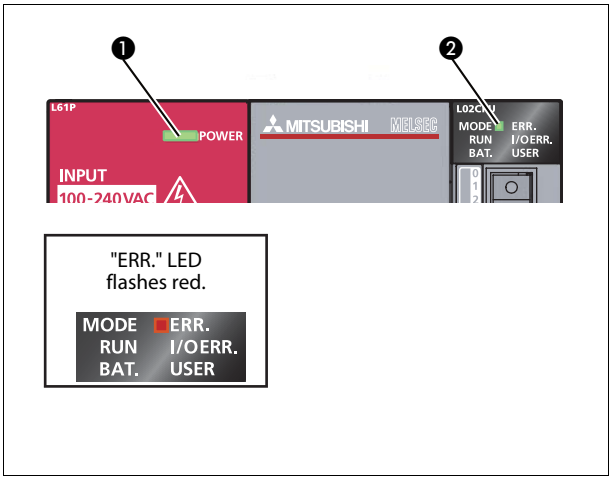


Fig. 2-7:
Normal states of LED

LS600002

When a parameter or program is not written to the CPU module, the "ERR." LED flashes red, but it is not a problem at this stage. The LED goes off when a program is written.
Also refer to section 2.7 "Writing programs".

- Construction of the system is complete. Turn off the power supply.

NOTES

If the "POWER" LED of the power supply module is off, even though the power is turned on, check the wiring and installation statuses to confirm whether or not they are correct.

If the "BAT." LED of the CPU module is flashing, check whether the battery has been correctly connected.

TERMINOLOGY

Parameter	Setup information necessary to operate the programmable controller system. Modules and the network are set by writing parameters to the CPU module.

2.6 Programming

This section explains how to create a program (sequence program) for sequence control.

2.6.1 "Devices" and "Instruction symbols" in programming

Combine "Devices" and "Instruction symbols" to create a sequence program.

Devices

Devices include bit devices and word devices.

- Bit device: Handles one-bit information such as the ON/OFF of a switch or a lamp.

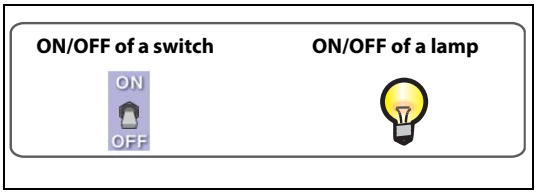


Fig. 2-8: *Examples of bit devices*

LS70001

Device name	Device symbol	Description
Input	X	Receives a signal from an external device such as a switch.
Output	Y	Outputs a signal to an external device such as a lamp.
Internal relay	M	Temporarily saves data status in programs.
Timer (contact)	T	Used to measure time. (When the set time comes, the contact is set to ON.)
Counter (contact)	C	Used to count the number of times the input condition turns from OFF to ON. (When the counter reaches the set number, the contact is set to ON.)

Tab. 2-3: *Description of bit devices*

- Word device: Handles 16-bit information such as numeric values and character strings.

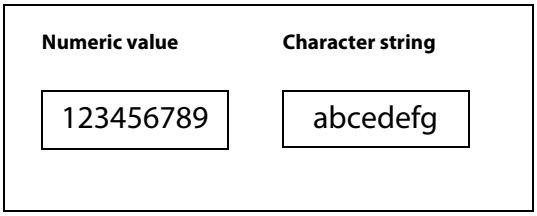


Fig. 2-9: *Examples of word devices*

Device name	Device symbol	Description
Data register	D	Registers numeric values and character strings.
Timer (current value)	T	Used to measure time. (Stores the current value of measuring time.)
Counter (current value)	C	Used to count the number of times the input condition turns from OFF to ON. (Stores the current value of the counter.)

Tab. 2-4: *Description of word devices*

TERMINOLOGY	Device	A location to store data such as ON/OFF, numeric values, and character strings in the programmable controller.
	Internal relay	Breaks/connects the sequential circuit by switching ON/OFF.
	Contact	An input used when creating a sequence program.

Instruction symbols

The following shows the basic instructions of sequence control.

Instruction symbol	Description
	Open contact: Conducts when an input signal is set to ON.
	Closed contact: Conducts when an input signal is set to OFF.
	Coil output: Outputs data to a specified device.

Tab. 2-5: *Basic instructions of sequence control*

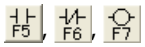
TERMINOLOGY Coil | An output used when creating a sequence program.

2.6.2 Creating a program

Create a sequence program for rehearsal.

The following shows how to create a sequence program with basic devices and instruction symbols for sequence control.

The following devices and instruction symbols are used.

- Input: "X" device
- Output: "Y" device
- Instruction symbols: 

Create a program that performs the following controls.

- When the X6 and X7 switches are turned on, the Y0 output lamp turns on.
- When the X8 switch is turned on, the Y6 and Y7 output lamps turn off.

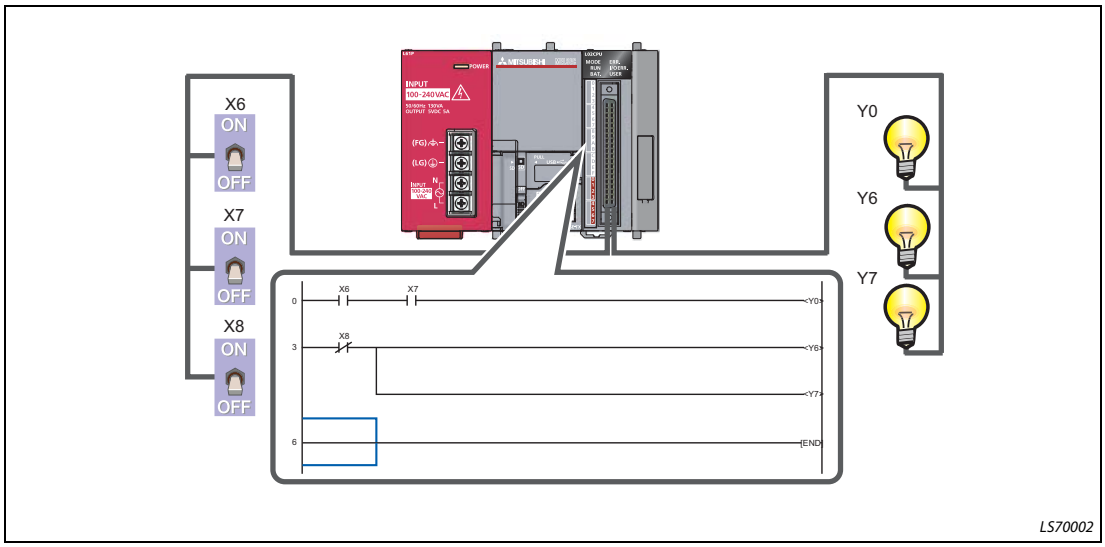


Fig. 2-10: *Sequence program*

The following explains the procedure to create this sequence program.

2.6.3 Starting GX Works2

Operating procedure

① Select ***Start*** → ***All Programs*** → ***MELSOFT Application*** → ***GX Works2*** → ***GX Works2***.

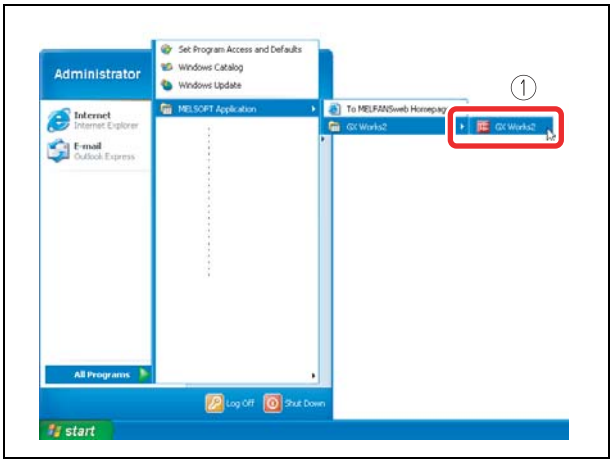


Fig. 2-11:
Selecting program GX Works2

000001a

② After starting, the "GX Works2" main screen is displayed.

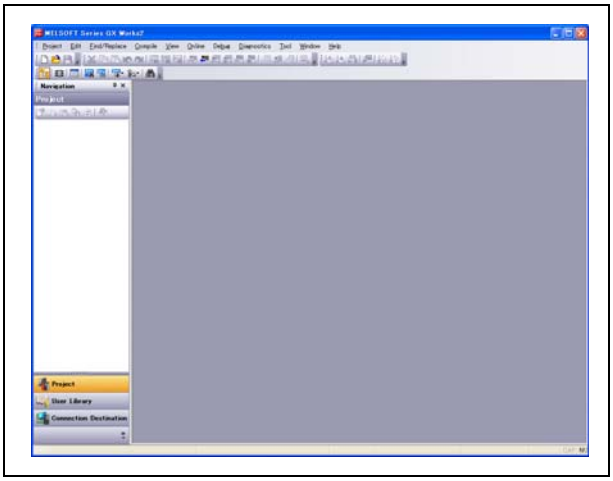


Fig. 2-12:
"GX Works2" main screen

000002a

2.6.4 Creating a new project

A project consists of programs, device comments, and parameters.

Operating procedure

① Select ***Project*** → ***New…***

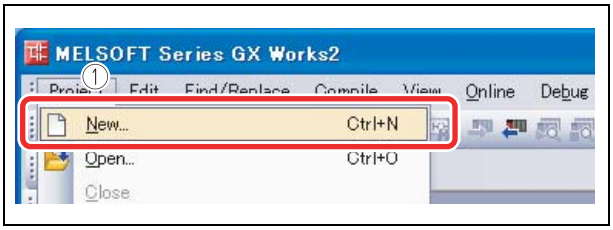


Fig. 2-13:
Select "New…" menu

000003a

② Select ***LCPU***.

③ Select the LCPU to be used (L02 in this guide).

④ Click the ***OK*** button.

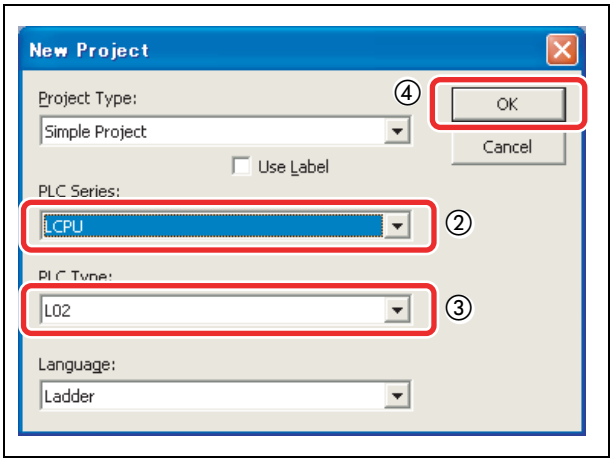


Fig. 2-14:
"New project" screen

000004a

⑤ A project tree and a ladder screen are displayed.

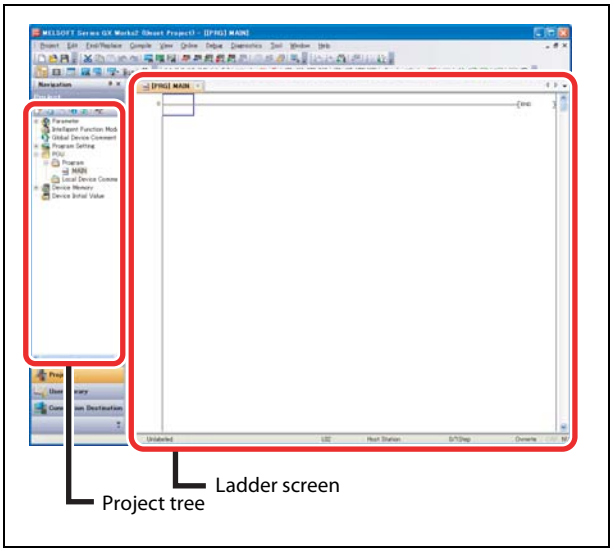


Fig. 2-15:
Project tree and ladder screen

000005a

2.6.5 Creating a sequence program

Operating procedure

- Enter input device **X6**.

  ① Click the area to enter, and then enter "X".

  ② Enter "6" on the ladder input screen, and then click the ***OK*** button.

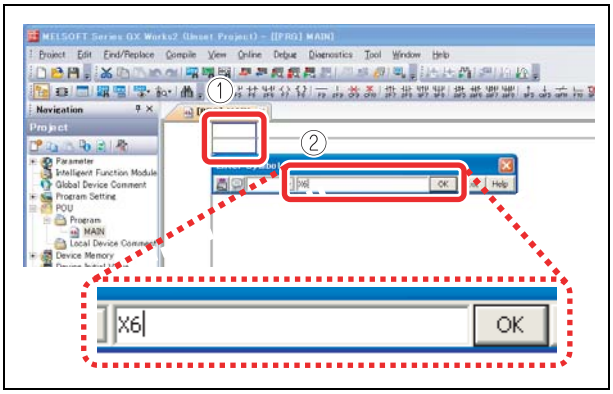


Fig. 2-16:
Enter input device X6

000006a

- Enter input device **X7**.

  ① Click the area to enter, and then enter "X".

  ② Enter "7" on the ladder input screen, and then click the ***OK*** button.

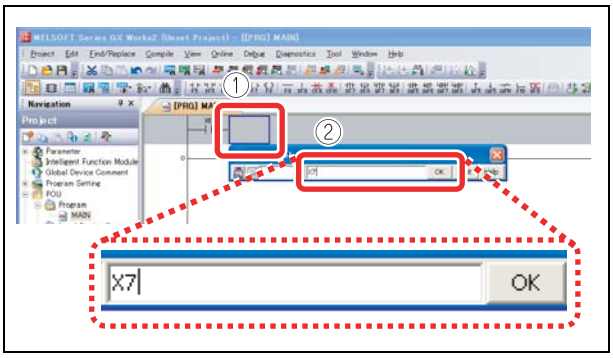


Fig. 2-17:
Enter input device X7

000007a

- Enter output device **Y0**.

  ① Enter "Y".

  ② Enter "0" on the ladder input screen, and then click the ***OK*** button.

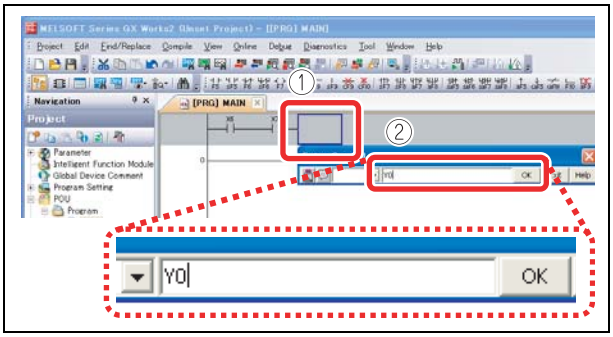


Fig. 2-18:
Enter output device Y0

000008a

Coil Y0 is displayed.

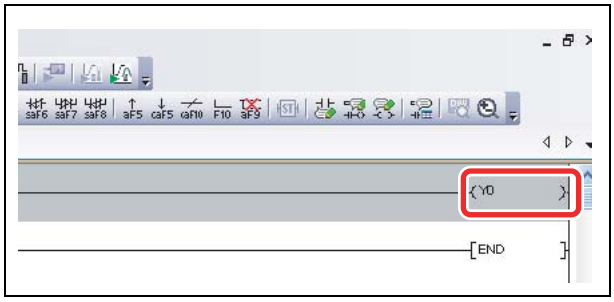


Fig. 2-19:
Coil Y0

000009a

- Enter input device **X8**.

  ① Click F6.

  ② Enter device "X8", and then click the ***OK*** button.

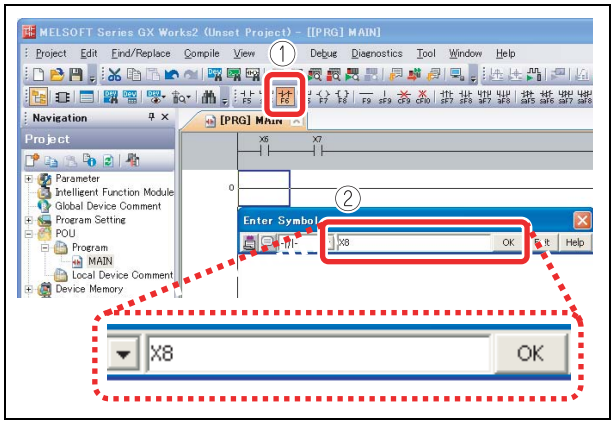


Fig. 2-20:
Enter input device X8

0000010a

- Enter output device **Y6**.

  ① Enter "Y".

  ② Enter "6" on the ladder input screen, and then click the ***OK*** button.

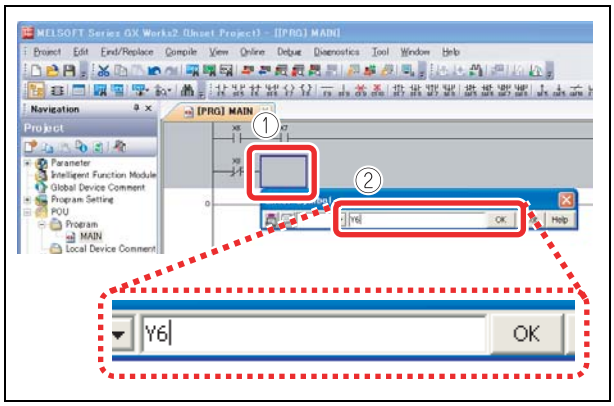


Fig. 2-21:
Enter output device Y6

0000011a

Coil Y6 is displayed.

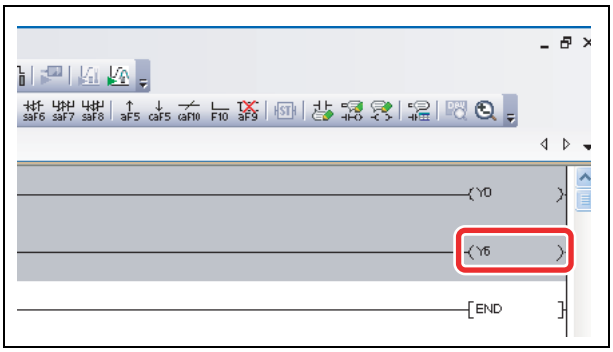


Fig. 2-22:
Coil Y6

0000012a

- Draw a line.

  ① Click the area to enter, and then enter [Ctrl] + [↓] and [Ctrl] + [→].

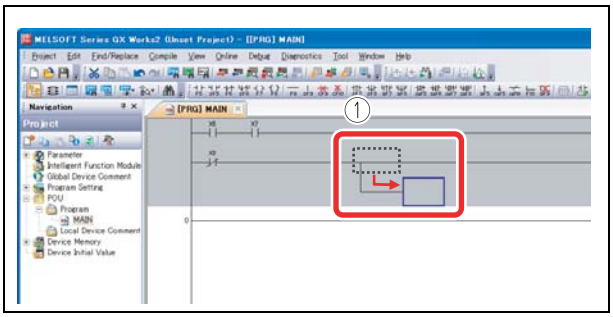


Fig. 2-23:
Drawing a line

0000013a

- Enter output device **Y7**.

  ① Enter "Y".

  ② Enter "7" on the ladder input screen, and then click the ***OK*** button.

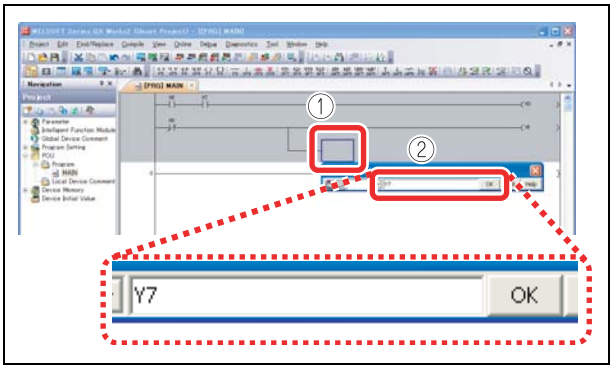


Fig. 2-24:
Enter output device Y7

0000014a

Coil Y7 is displayed.

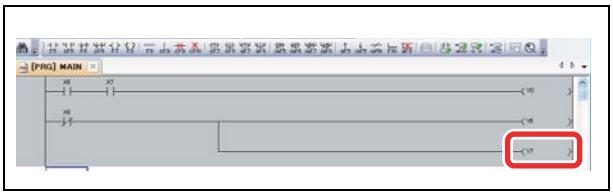


Fig. 2-25:
Coil Y7

0000015a

2.6.6 Converting a program

Define the contents of the entered ladder block.

Operating procedure

① Select ***Compile*** → ***Build***.

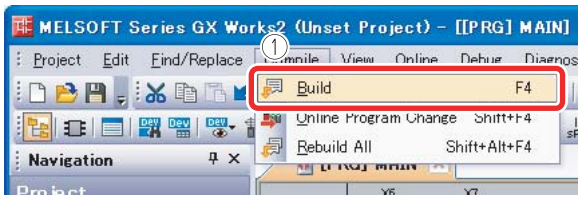


Fig. 2-26:
Select Compile, then Build

000016a

② Perform the conversion to align entered ladders. When completed, the gray display turns to white.

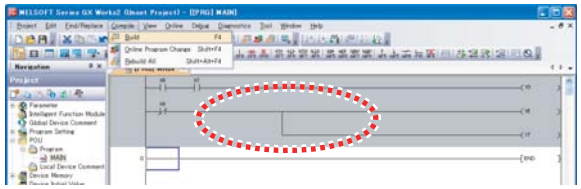


Fig. 2-27:
Before conversion: gray display

000017a

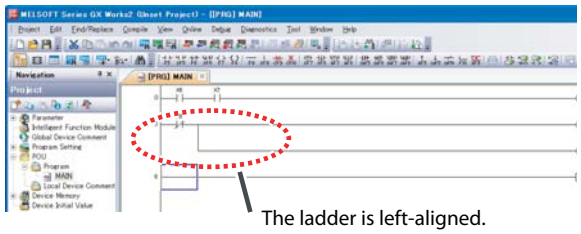


Fig. 2-28:
After conversion: white display

000018a

The programming is completed.

NOTE

Lines can also be edited using the following short-cut keys.

Editing	Toolbar	Short-cut key
Drawing lines	F10	[F10]
Inputting vertical lines	sF9	[Shift] + [F9] [Ctrl] + [↓]/[Ctrl] + [↑]
Inputting horizontal lines	F9	[F9] [Ctrl] + [←]/[Ctrl] + [→]
Inputting horizontal lines continually	—	[Ctrl] + [Shift] + [←]/ [Ctrl] + [Shift] + [→]

2.6.7 Saving a project

A program is saved in unit of project. Save the created project with a name.

Operating procedure

① Select ***Project*** → ***Save As...***

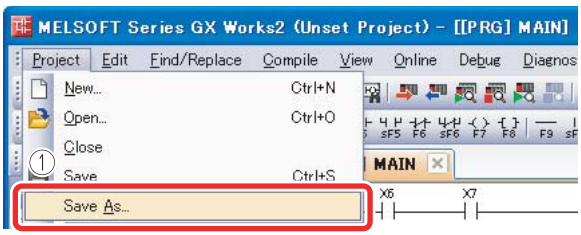


Fig. 2-29:
*Select **Project**, then **Save As...***

000019a

The "Save As" screen is displayed.

② Specify the save location.

③ Enter the work space name, project name, and title.

④ Click the ***Save*** button.

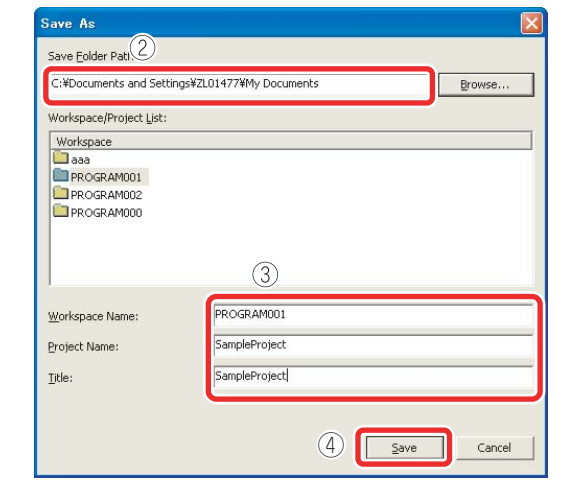


Fig. 2-30:
Steps to follow in the "Save As" screen

000020a

⑤ Click the ***Yes*** button.

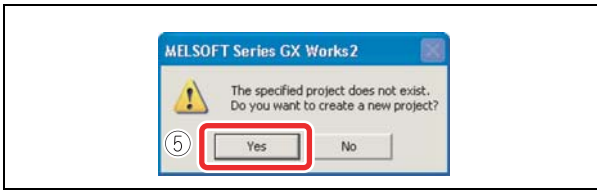


Fig. 2-31:
Confirm saving of the project

000021a

The project is saved.

2.7 Writing programs

This section explains hot to write the program to the CPU module.

2.7.1 Connecting the CPU module and the personal computer

Connect the CPU module and the USB port of the personal computer with a USB cable.

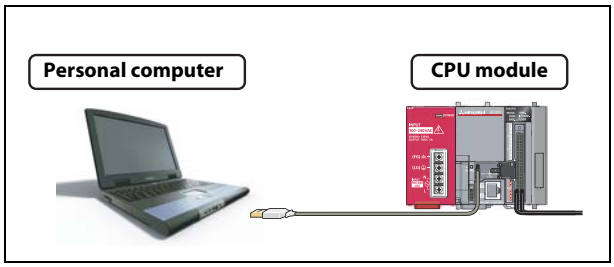


Fig. 2-32:
Connection with USB cable

I060001

2.7.2 Turning on the programmable controller

Turn on the power supply module. Then turn on the power of the external power supply.

2.7.3 Setting GX Works2 and the programmable controller connection

Operating procedure

① Click ***Connection Destination.***

② Double-click the data name to be transferred.

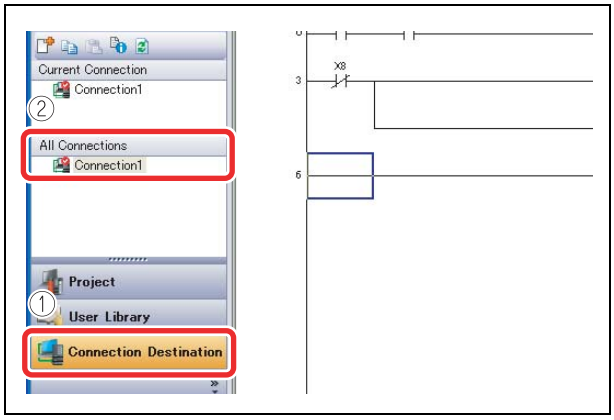
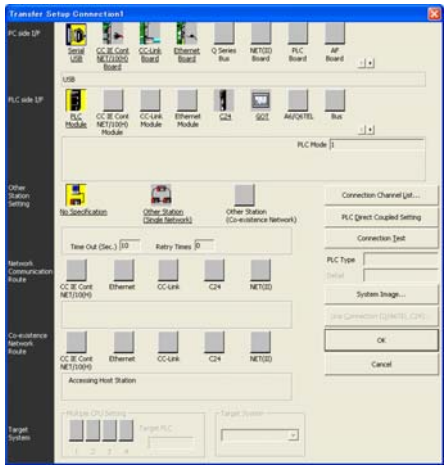


Fig. 2-33:
Select connection destination and data name to be transferred

000022a

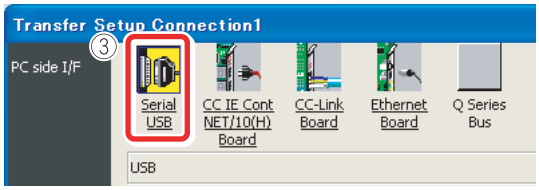
The "Transfer Setup Connection" screen is displayed.



C60001

Fig. 2-34:
"Transfer Setup Connection" screen

③ Double-click ***Serial USB***.



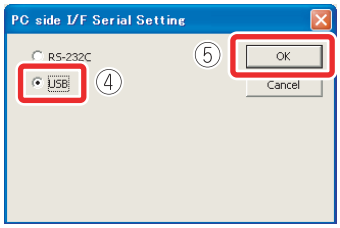
000023a

Fig. 2-35:
PC side I/F part of "Transfer Setup Connection" screen

The "PC side I/F Serial Setting" screen is displayed.

④ Select ***USB***.

⑤ Click the ***OK*** button.

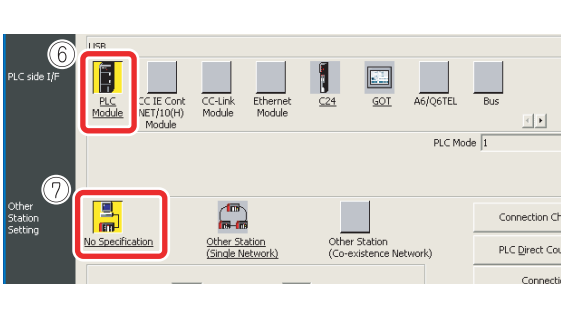


000024a

Fig. 2-36:
"PC side I/F Serial Setting" screen

⑥ Click ***PLC module***.

⑦ Click ***No Specification***.



000025a

Fig. 2-37:
Click appropriate options in the "Transfer Setup Connection" screen

⑧ Click the ***Connection Test*** button

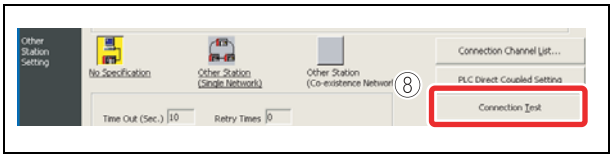


Fig. 2-38:
Starting the connection test

000026a

When properly connected, the connection completion message is displayed.

⑨ Click the ***OK*** button.

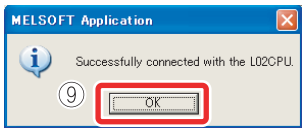


Fig. 2-39:
Connection completion message

000027a

⑩ Click the ***OK*** button.

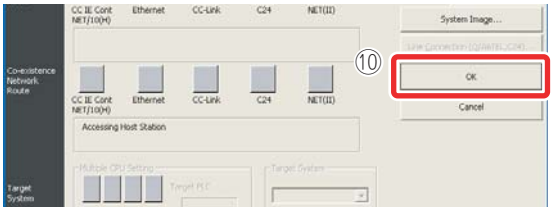


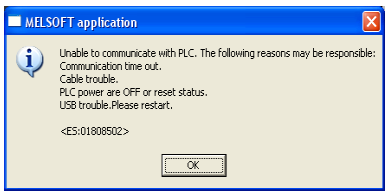
Fig. 2-40:
*Click the **OK** button to close the "Transfer Setup Connection" screen*

000029a

The connection setting is completed.

NOTE

If the screen shown below is displayed after step ⑧ is performed, check that the USB driver has been installed correctly and that an appropriate connection cable (USB cable) is being used.



For the installation of the USB driver, refer to the GX Works2 installation instructions.

2.7.4 Formatting the CPU module

Before writing the program, format the CPU module to set it to the initial status.

① Select ***Online*** → ***PLC Memory Operation*** → ***Format PLC Memory***.

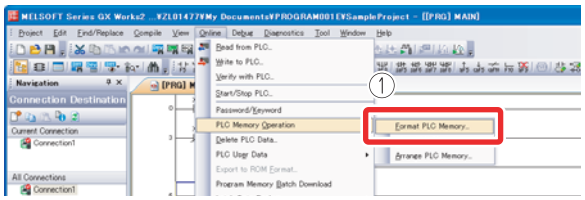


Fig. 2-41:
Select the "Format PLC Memory" menu

000030a

The "Format PLC Memory" screen is displayed.

② Select ***Program Memory/Device Memory*** from Target Memory.

③ Click the ***Execute*** button.

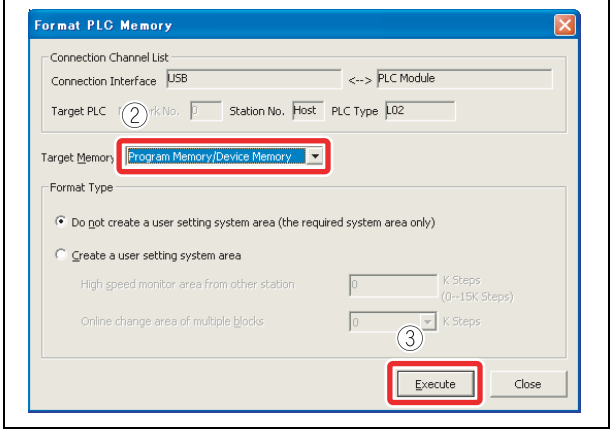


Fig. 2-42:
"Format PLC Memory" screen

000031a

NOTE

If data such as programs and parameters are already stored in the CPU module, they are deleted. Thus the necessary data should be read from the CPU module and saved as a project before executing the Format PLC "Format PLC Memory" function.

④ Click the ***YES*** button.

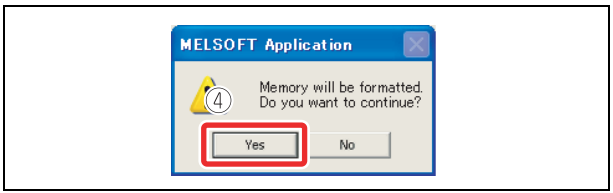


Fig. 2-43:
Confirm memory formatting

000032a

⑤ Click the ***OK*** button.

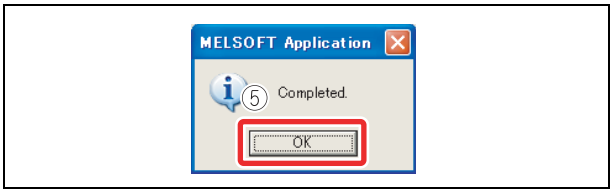


Fig. 2-44:
Formatting completion message

000033a

The CPU module formatting is completed.

Click the ***Close*** button to close the "Format PLC Memory" screen.

2.7.5 Writing programs to the CPU module

① Select ***Online*** → ***Write to PLC…***

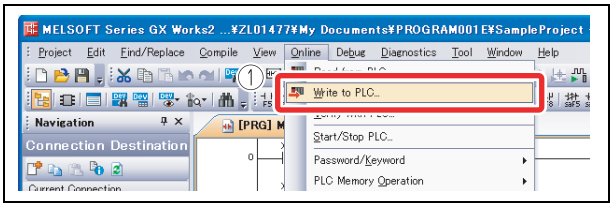


Fig. 2-45:
Select the "Write to PLC…" menu

000034a

The "Online Data Operation" screen is displayed.

② Click ***Parameter + Program***. "Program" and "Parameter" are checked.

③ Click the ***Execute*** button.

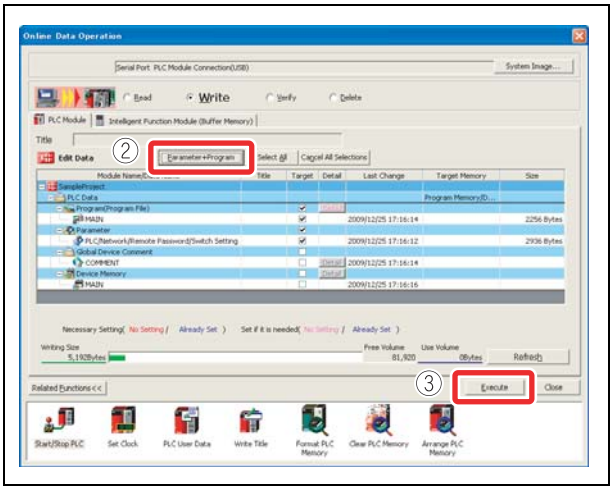


Fig. 2-46:
"Online Data Operation" screen

000035a

When the "Write to PLC" function is properly executed, the following message is displayed.

④ Click the ***Close*** button.

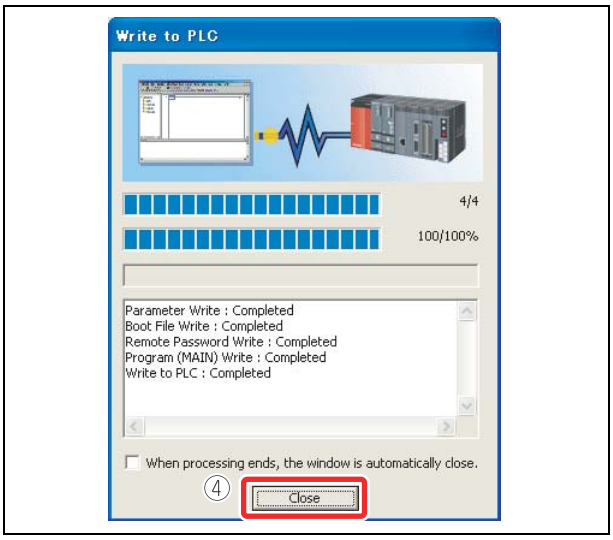


Fig. 2-47:
"Write to PLC" completion message

000036a

The program writing is completed.

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

2.8 Checking operation

Execute the program written to the CPU module to check the operation.

Check the program operation with the switches and lamps or the monitor function of GX Works2.

2.8.1 Executing the program written to the CPU module

Use the "RESET/STOP/RUN" switch on the front of the CPU module for the operation.

– RUN: Executes the sequence program operation.

– STOP: Stops the sequence program operation.

– RESET: Performs the hardware reset, operation error reset, and operation initialization.

Operating procedure

● Resetting the CPU module

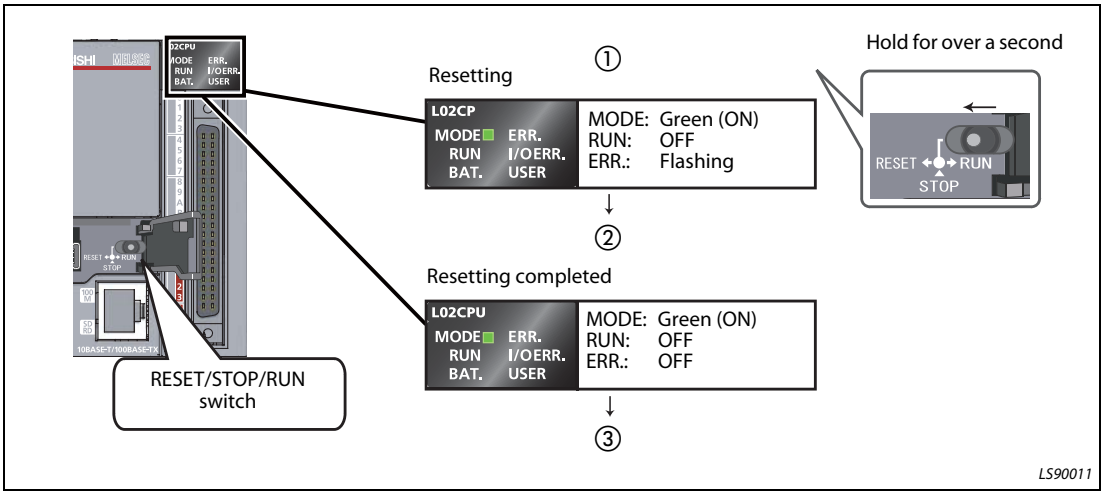


Fig. 2-48: *Resetting procedure*

① Tilt the "RESET/STOP/RUN" switch on the front of the CPU module towards "RESET" for over a second.

② After the "ERR." LED flashes and the "ERR." LED and "MODE" LED turn OFF, release the switch.

③ The switch returns to "STOP".
Resetting is completed.

- Executing the program

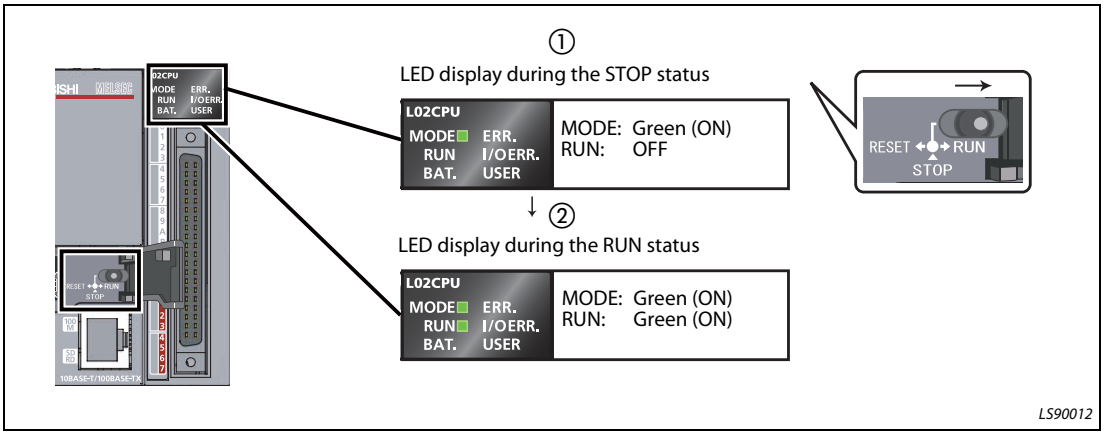


Fig. 2-49: *Executing the program*

① Tilt the "RESET/STOP/RUN" switch on the front of the CPU module towards "RUN".

② If the "RUN" LED turns on green, the program is running normally.

NOTE

Do not use pointed tools such as a screwdriver when operating the switch.
They may damage the switch.

2.8.2 Using switches and lamps to check the operation

Check the program operation by turning the switches and lamps ON/OFF.

If all of the switches (X6, X7, and X8) are off right after the execution of the program, the output lamp Y0 stays off and the output lamp Y6 and the output lamp Y7 stay on due to the instructions from the created program.

- Operation check step 1

  Turn on the switch X6.

  The output lamp Y0 stays off and the output lamps Y6 and Y7 stay on.

- Operation check step 2

  Turn on the switch X7.

  The output lamp Y0 turns on.

- Operation check step 3

  Turn on the switch X8.

  The output lamps Y6 and Y7 turn off.

NOTE

The described results of each step of the operation check are only valid, if the switch status of the step before is kept at the current step.

2.8.3 Checking the operation in GX Works2

Check the program operation by using the monitor mode on the GX Works2 screen, where switches and lamps can be operated and their statuses can be checked.

- Set the operating program display screen to the monitor mode.

  Select ***Online*** → ***Monitor*** → ***Start Monitoring***.

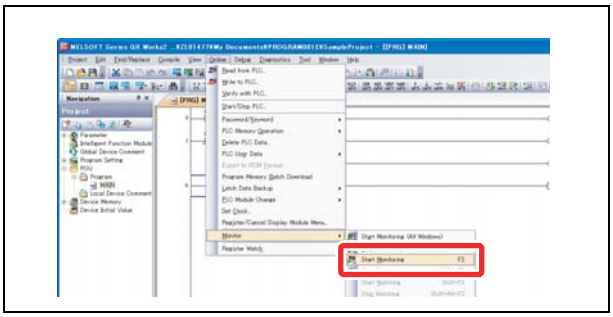


Fig. 2-50:
Select the "Start monitoring" menu

000037a

Execute the monitor to display the "Monitor status" screen.

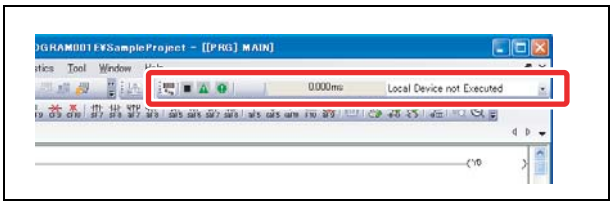


Fig. 2-51:
Monitor status screen

000038a

The ON/OFF status of bit devices can be checked on the ladder screen.

Contacts/outputs set to ON are displayed in blue.

Right after the program execution, bit devices X8, Y6, and Y7 are lit in blue due to the instructions from the program.

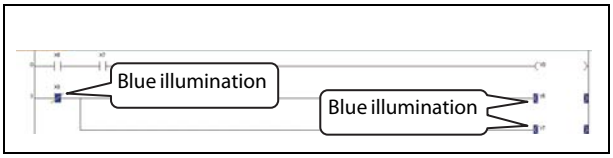


Fig. 2-52:
Contacts set to ON are displayed in blue

000039a

- Operation check 1

  ① Double-click ***X6*** while pressing the [Shift] key. X6 turns on.

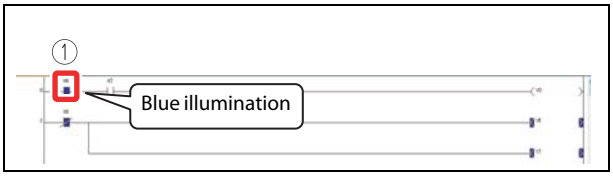


Fig. 2-53:
Operation check step 1

000040a

- Operation check 2

  ② Double-click ***X7*** while pressing the [Shift] key. X7 turns on and Y0 lights.

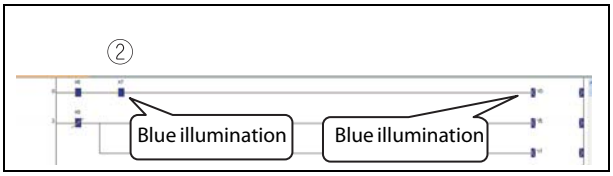


Fig. 2-54:
Operation check step 2

000041a

- Operation check 3

  ③ Double-click ***X8*** while pressing the [Shift] key. X8 turns off and Y6 and Y7 turn off.

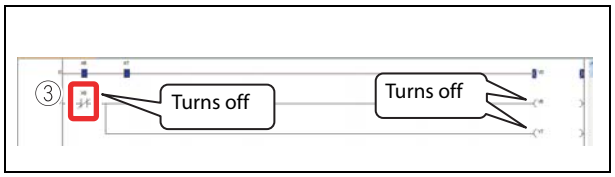


Fig. 2-55:
Operation check step 3

000042a

NOTE

While pressing the [Shift] key, double-click devices set to ON in Operation checks 1 and 2 to turn them off.

3 Frequently-used functions

This section explains functions frequently used in GX Works2.

3.1 Clarifying programs <Comment>

Use comments to clarify the contents of a program.

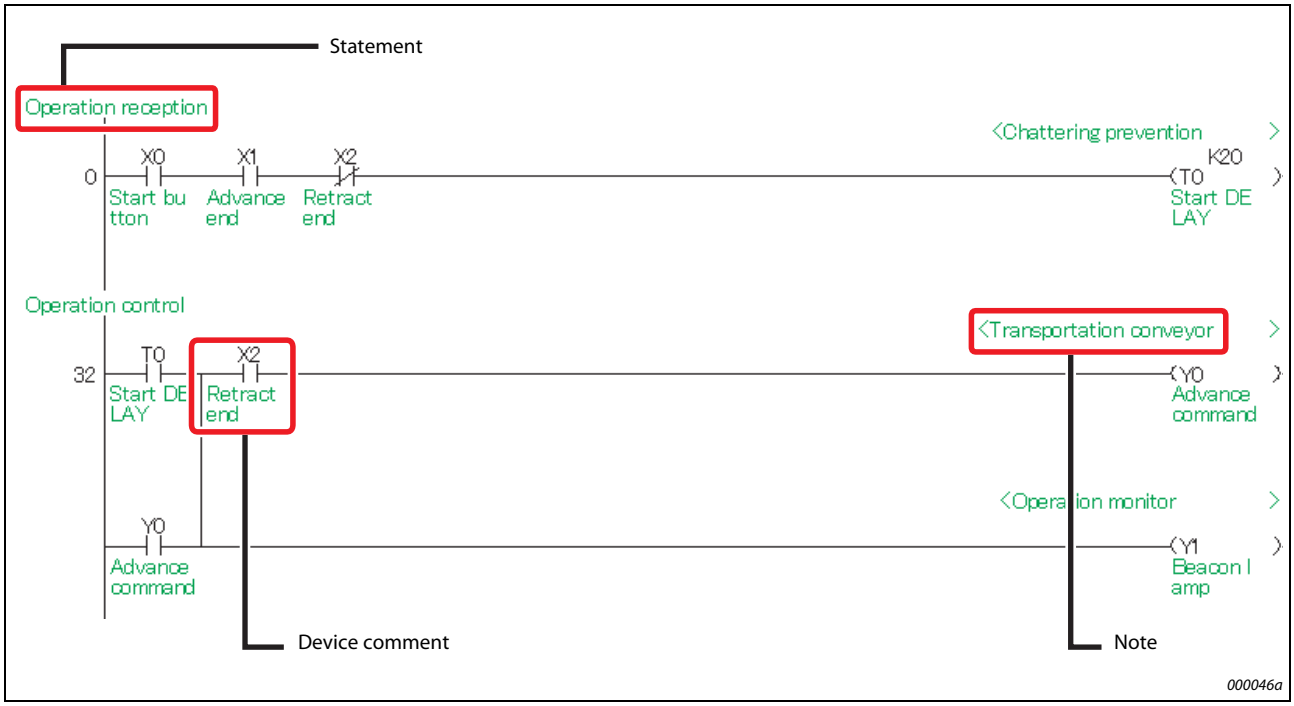


Fig. 3-1: *Use of comments*

The following are the three types of comment.

Type	Description	Number of characters
Device comment	Describes roles and usage of each device.	32
Statement	Describes roles and usage of ladder blocks.	64
Note	Describes roles and usage of output instructions.	32

Tab. 3-1: *Types of comment*

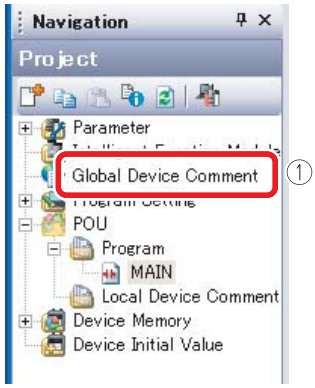
NOTE Select ***View*** → ***Comment*** ([Ctrl] key + [F5] key) to switch the comment display/hide setting.

3.1.1 Creating device comments

Device comments can be entered from the list or on the ladder diagram.

Input operation from the list

① Double-click ***Global Device Comment*** in the project list.

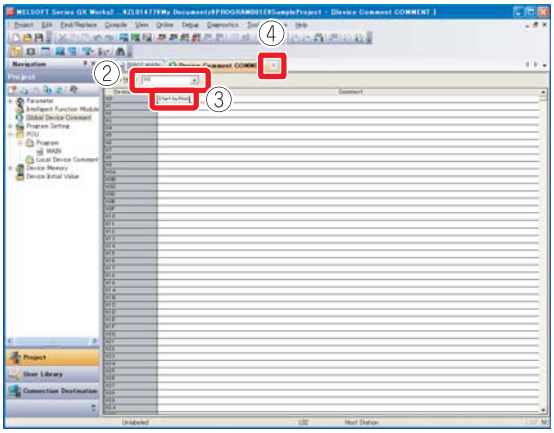


000047a

Fig. 3-2:
Select "Global Device Comment"

② Enter the start device number in "Device Name" and press the [Enter] key.

③ Enter a comment in the "Comment" column.
When entering comments for other devices, repeat Steps ② and ③.



000048a

Fig. 3-3:
"Device Comment" screen

④ Click the button to close the screen.

Input operation on the ladder diagram

① Select ***Edit*** → ***Documentation*** → ***Device Comment***.

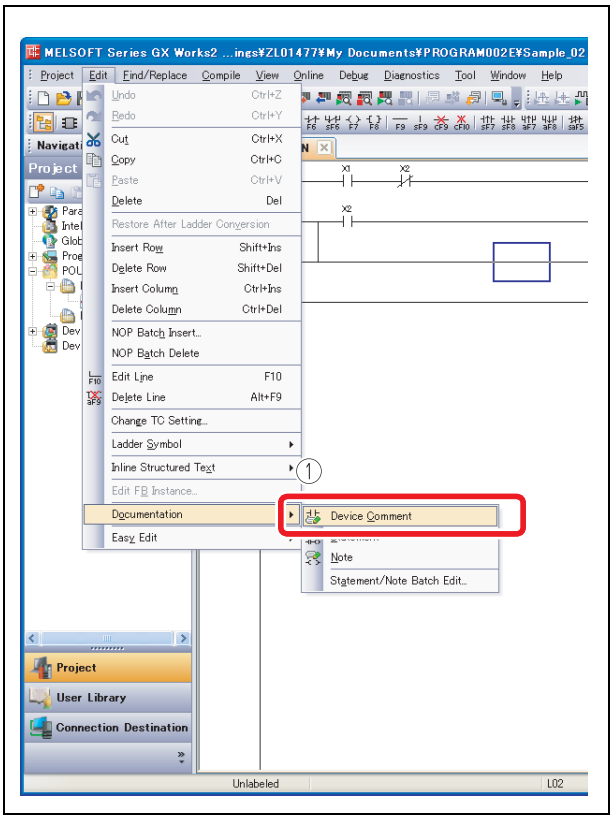


Fig. 3-4:
Select "Device Comment" menu

000049a

② Double-click the ladder symbol to enter a comment.

③ Enter a comment on the "Input Device Comment" screen.

④ Click the ***OK*** button.

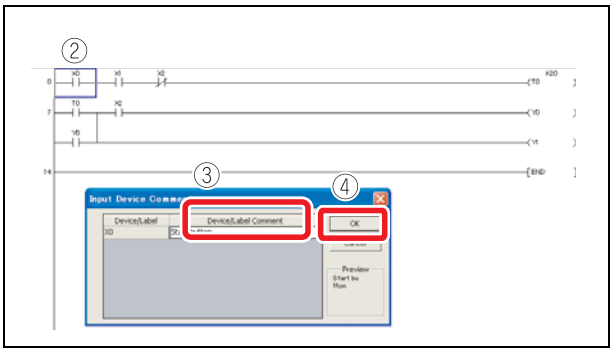


Fig. 3-5:
"Input Device Comment" screen

000050a

⑤ Select the ***Device Comment*** menu in Step ① again to finish the operation.

Entering comments when creating ladders

① Select ***Tool*** → ***Options...***

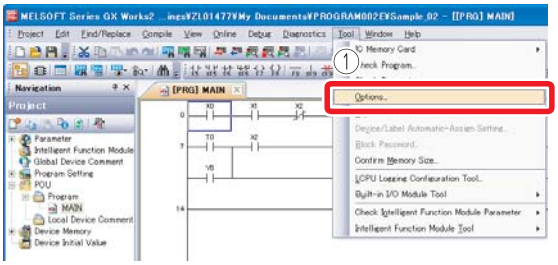


Fig. 3-6:
Select "Options" menu

000051a

② Select ***Program Editor*** → ***Ladder*** → ***Device***.

③ Activate "Enter label comment and device comment".

④ Click the ***OK*** button.

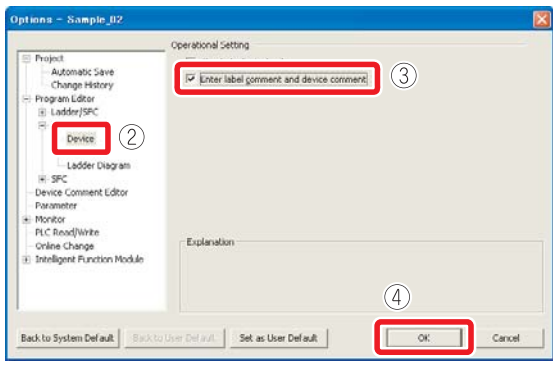


Fig. 3-7:
"Options" screen

000052a

After the ladder entry operation, the "Input Device Comment" screen is displayed and a comment can be entered.

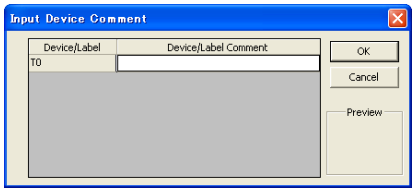


Fig. 3-8:
Enter a command on the "Input Device Comment" screen

000053a

3.1.2 Creating statements

Operating procedure

① Select ***Edit*** → ***Documentation*** → ***Statement***.

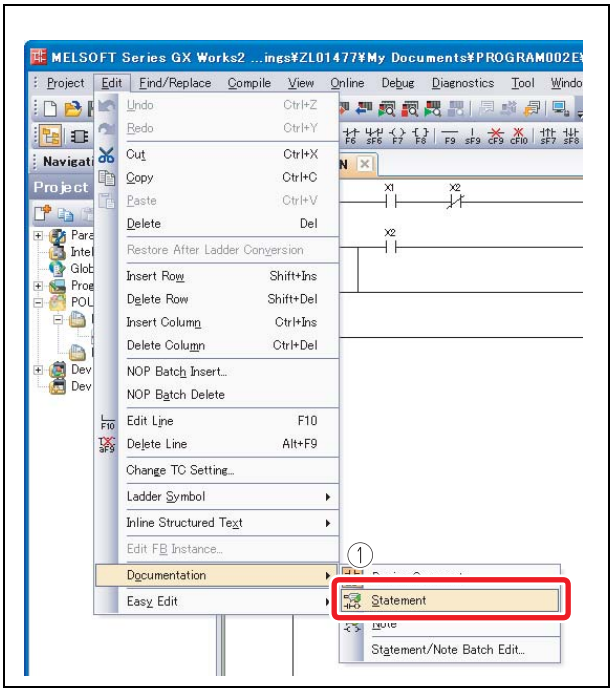


Fig. 3-9:
Select "Statement" menu

000054a

② Double-click the ladder symbol to enter a statement.

③ Select ***In PLC*** .

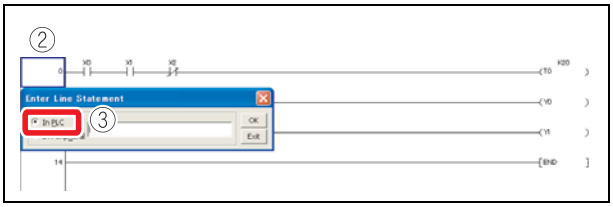


Fig. 3-10:
"Enter Line Statement" screen

000055a

④ Enter a statement.

⑤ Click the ***OK*** button.

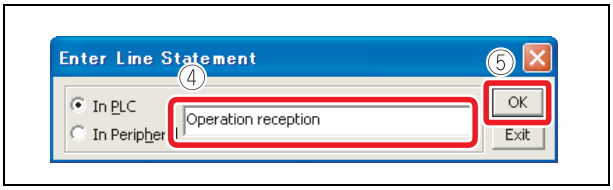


Fig. 3-11:
Close the "Enter Line Statement" screen after entering a statement

000056a

⑥ Select the "Statement" menu in Step ① again to finish the operation.
If a statement is entered, the program needs to be "converted" to reflect the input. For details on the conversion, refer to section 2.6.6 "Converting a program".

NOTE

The following are the two types of statement.

- PLC statement
  Integrated statements can be written to/read from the CPU module.
- Peripheral statement
  The program memory capacity can be saved since peripheral statements are not written to the CPU module. "*" is prefixed to the peripheral statement in the program.

3.1.3 Creating notes

Operating procedure

① Select ***Edit*** → ***Documentation*** → ***Note***.

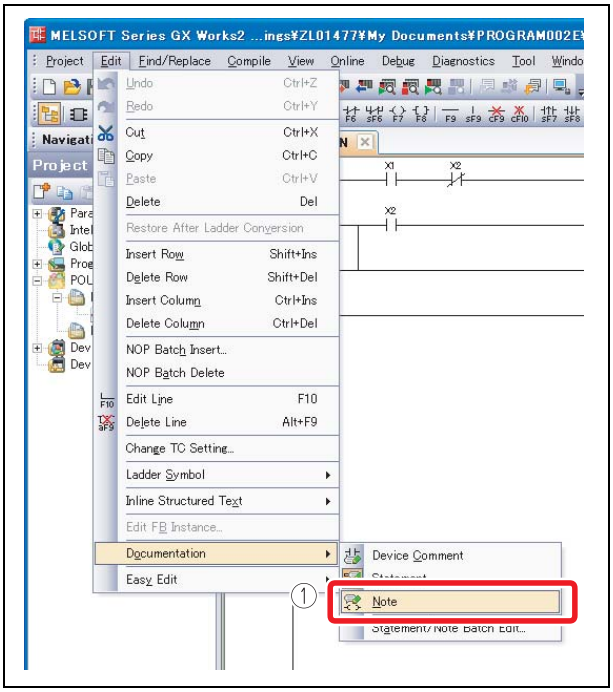


Fig. 3-12:
Select "Note" menu

000057a

② Double-click an output instruction to enter a note.

③ Select ***In PLC*** .

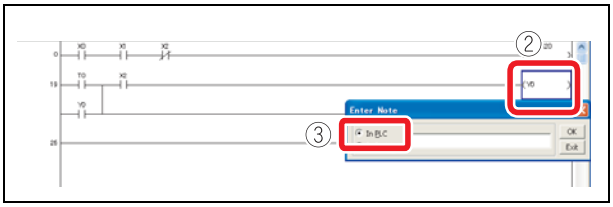


Fig. 3-13:
"Enter Note" screen

000058a

④ Enter a note.

⑤ Click the ***OK*** button.

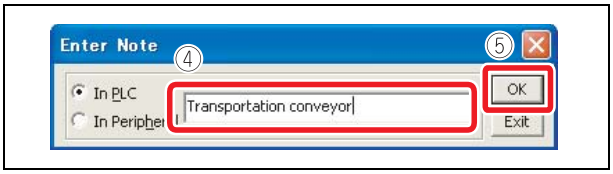


Fig. 3-14:
Close the "Enter Note" screen after entering a statement

000059a

⑥ Select the ***Note*** menu in Step ① again to finish the operation.
If a note is entered, the program needs to be "converted" to reflect the input. For details on the conversion, refer to section 2.6.6 "Converting a program".

NOTE

The following are the two types of note.

- PLC note
  Integrated notes can be written to/read from the CPU module.
- Peripheral note
  The program memory capacity can be saved since peripheral notes are not written to the CPU module. "*" is prefixed to the peripheral note in the program.

3.2 Monitoring device values and status <Device monitor>

The following are the two types of device monitor.

Type	Purpose
Device batch monitor	Used to monitor consecutive devices of one type.
Entry data monitor	Used to simultaneously monitor separately-located devices in the ladder or various devices on one screen.

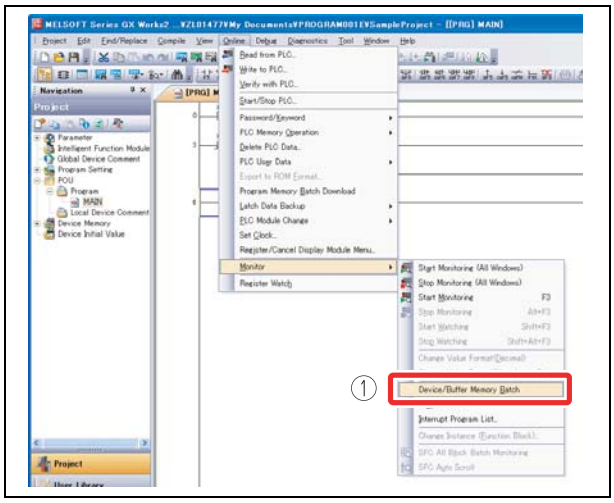
Tab. 3-2: *Types of device monitor*

3.2.1 Device batch monitor

Monitors consecutive devices by specifying the start device number.

Operating procedure

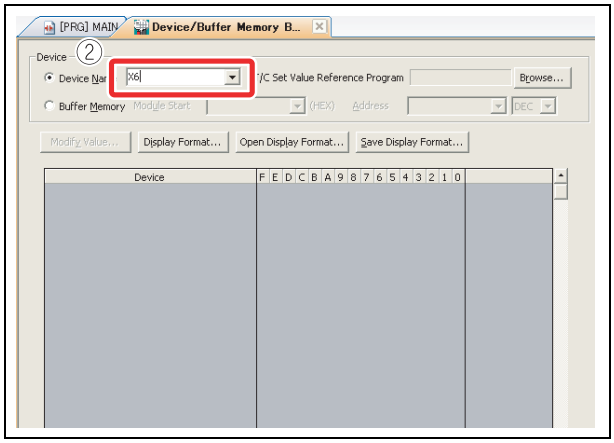
① Select ***Online*** → ***Monitor*** → ***Device/Buffer Memory Batch***.



000061a

Fig. 3-15:
Select "Device/Buffer Memory Batch" menu

② Enter the start device number to be monitored and press the [Enter] key.

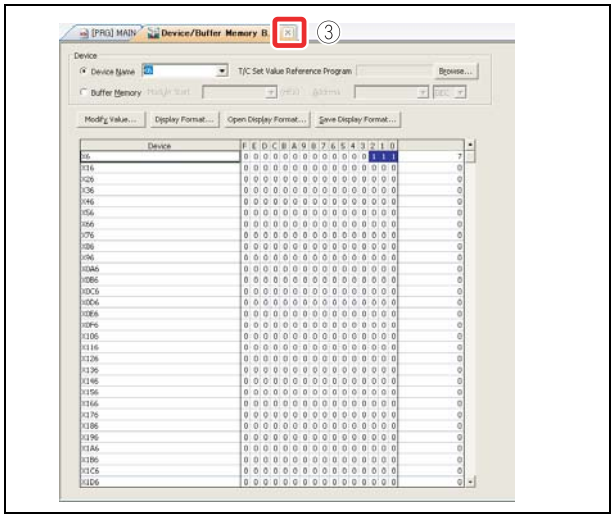


000062a

Fig. 3-16:
"Device/Buffer Memory Batch" screen

The values of devices and the ON/OFF status of contacts/coils are displayed.

③ Click the button to close the screen.



000063a

Fig. 3-17:
Close "Device/Buffer Memory Batch" screen

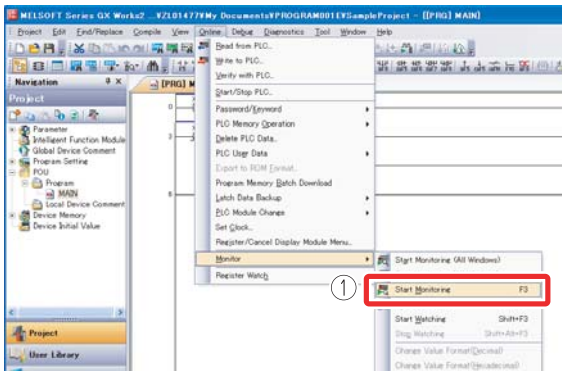
3.2.2 Entry data monitor

The device registration methods used to perform the Entry data monitoring are the specified device registration and the device registration with ladder monitor display. The device statuses can be displayed in watch windows 1 to 4.

Specified device registration

Register specified devices in Watch window 1.

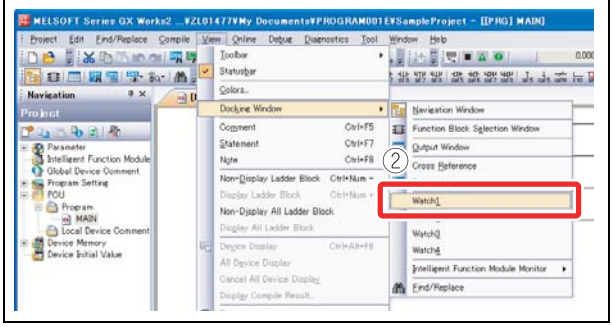
① Select ***Online*** → ***Monitor*** → ***Start Monitoring***.



000060a

Fig. 3-18:
Select "Start Monitoring" menu

② Select ***View*** → ***Docking Window*** → ***Watch1***.

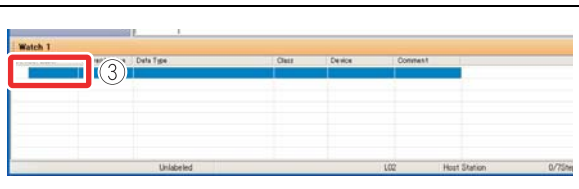


000064a

Fig. 3-19:
Select "Watch1" menu

Watch window 1 is displayed on the bottom right of the screen.

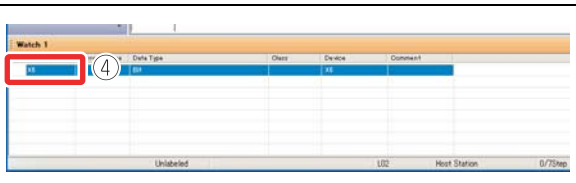
③ Double-click the "Device/Label" column.



000065a

Fig. 3-20:
Watch window 1

④ Enter the device/label to be registered and press the [Enter] key.



000066a

Fig. 3-21:
Enter device/label

⑤ Select ***Online*** → ***Monitor*** → ***Start Watching***.

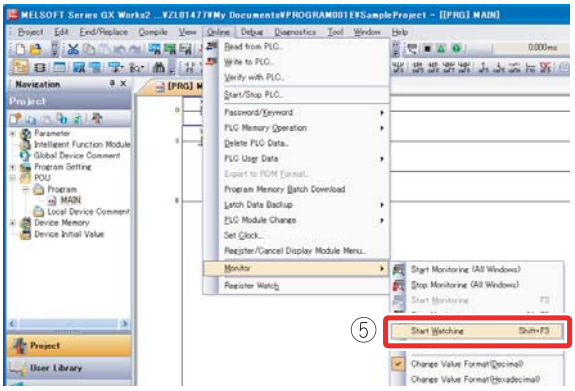


Fig. 3-22:
Select "Start Watching" menu

000067a

The values of devices and the ON/OFF status of contacts/coils are displayed.

Device registration with ladder monitor display

Specify the range of the ladder diagram on the ladder monitor screen and register the devices in a batch.

① Select ***Online*** → ***Monitor*** → ***Start Monitoring***.

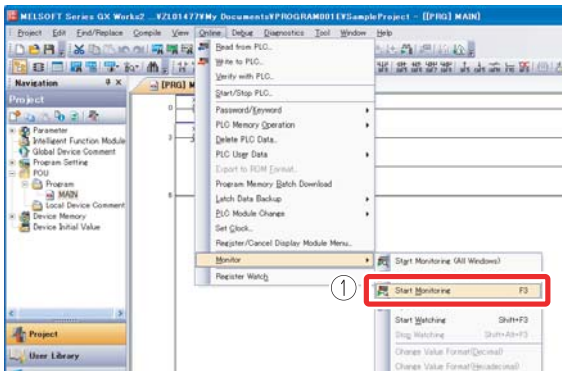


Fig. 3-23:
Select "Start Monitoring" menu

000060a

② Select ***View*** → ***Docking Window*** → ***Watch1***.

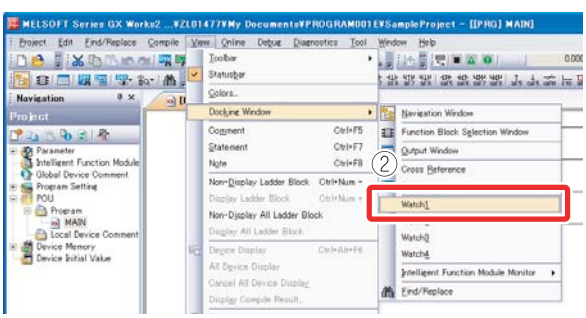


Fig. 3-24:
Select "Watch1" menu

000064a

③ Click the start point of the ladder.

④ Click the end point of the ladder while pressing the [Shift] key. The range is specified.

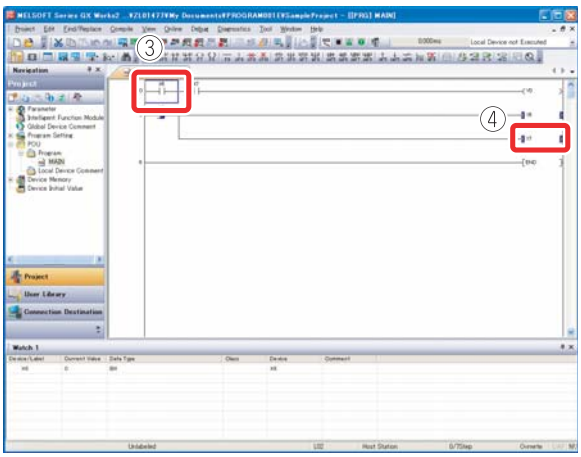
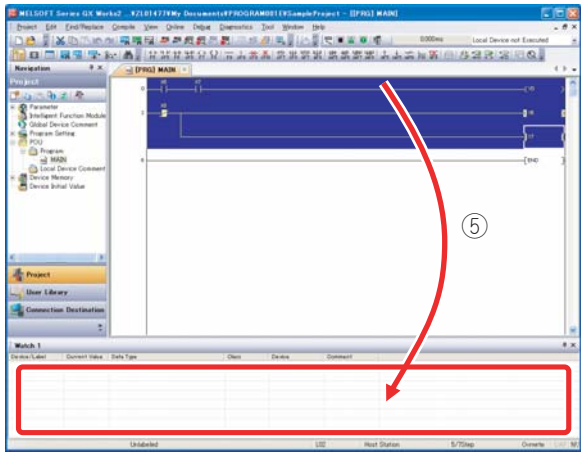


Fig. 3-25:
Specify the range on the ladder monitor screen

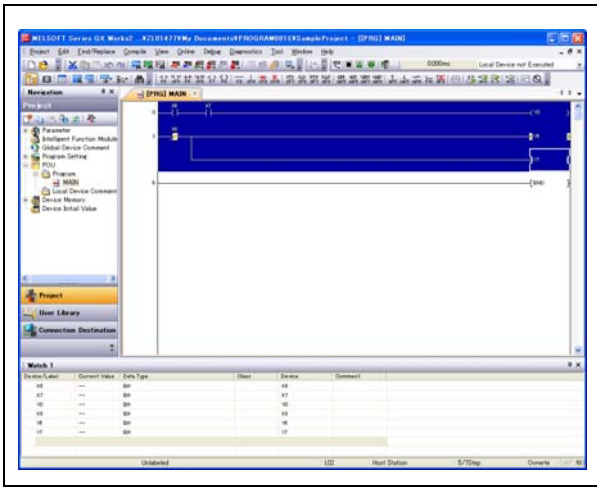
000068a

⑤ Drag and drop the selected range to the watch window 1.



000069a

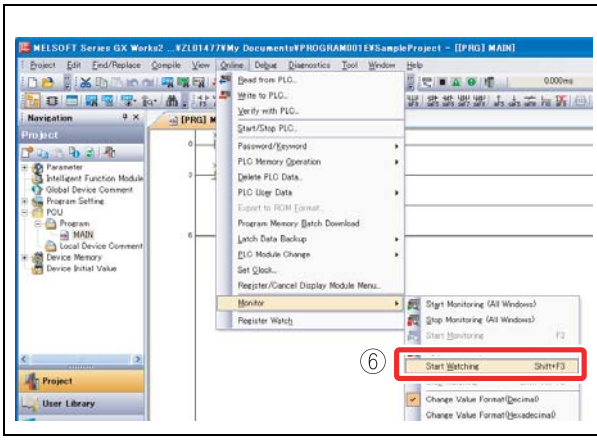
Fig. 3-26:
Register devices to the Watch window



000070a

Fig. 3-27:
The values of the selected devices are monitored.

⑥ Select ***Online*** → ***Monitor*** → ***Start Watching***.



000071a

Fig. 3-28:
Select "Start Watching" menu

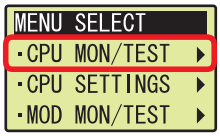
NOTE

Installing the display unit allows you to monitor specified device memory values without using GX Works2.

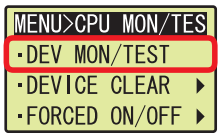
Operating procedure

The following is an example of monitoring the Y6 value.

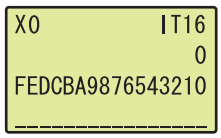
- Select function selection screen, then ***CPU MON/TEST***, and then click the ▶ button.



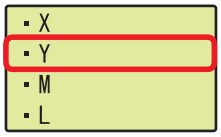
- Select ***DEV MON/TEST***, and then click the ***OK*** button.



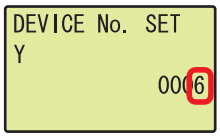
- Click the ◀ button on the screen shown below.



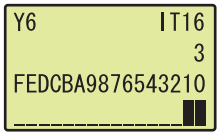
- Select a device using ▲ or ▼, and then click the ***OK*** button.



- Move the cursor position using ◀ or ▶, and increase/decrease the value for each digit one number at a time to specify the device number using ▲ or ▼, and then click the ***OK*** button.



The Y6 value is displayed.



3.3 Changing device values <Device test>

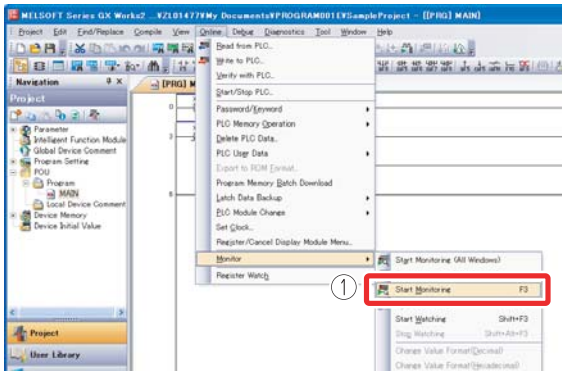
This function forcibly turns on/off the bit devices (X and Y) or changes the current value of the word device (such as T, C, and D).

3.3.1 Forced ON/OFF of bit device

Turn on/off forcibly the bit device (X and Y) of the CPU module.

Operating procedure

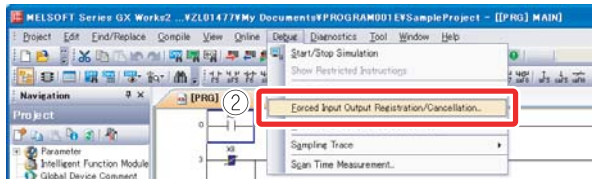
① Select ***Online*** → ***Monitor*** → ***Start Monitoring***.



000072a

Fig. 3-29:
Select "Start Monitoring" menu

② Select ***Debug*** → ***Forced Input Output Registration/Cancellation…***



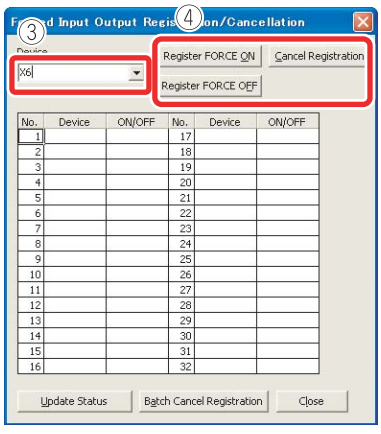
000073a

Fig. 3-30:
Select "Forced Input Output Registration/Cancellation…" menu

③ Enter a device to be turned on/off forcibly.

④ Turn on/off the device forcibly.

Register FORCE ON: Turns on the device.
Register FORCE OFF: Turns off the device.
Cancel Registration: Cancels the registration of the specified device.



000074a

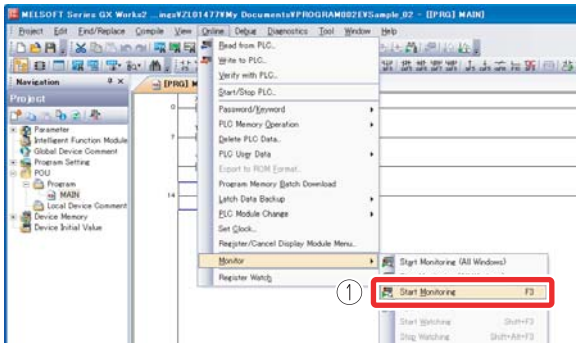
Fig. 3-31:
"Forced Input Output Registration/Cancellation" screen

3.3.2 Word device current value change

Changes the current value of the word device (such as T, C, and D) in the CPU module to the specified value.

Operating procedure

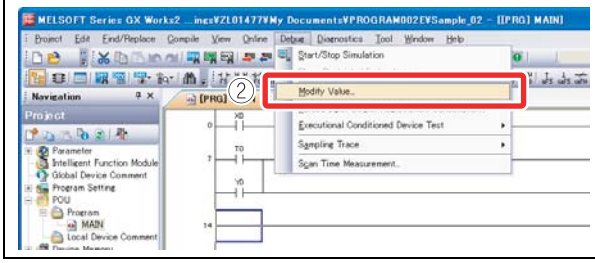
① Select ***Online*** → ***Monitor*** → ***Start Monitoring***.



000083a

Fig. 3-32:
Select "Start Monitoring" menu

② Select ***Debug*** → ***Modify Value***.



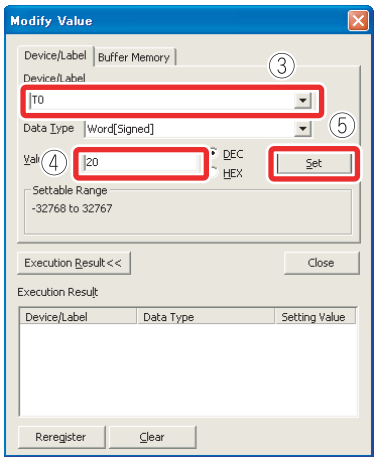
000084a

Fig. 3-33:
Select "Modify Value" menu

③ Enter the device number to be changed.

④ Enter the value to be changed.

⑤ Click the ***Set*** button.



000085a

Fig. 3-34:
"Modify Value" screen

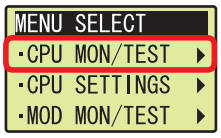
NOTE

Installing the display unit allows the forced ON/OFF of X/Y device with the operation of the display unit.

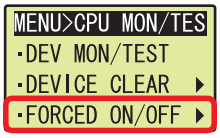
Operating procedure

The following is an example of operating the forced ON/OFF of X7.

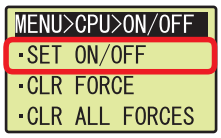
- Select function selection screen, then ***CPU MON/TEST***, and then click the ▶ button.



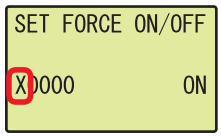
- Select ***FORCED ON/OFF***, and then click the ▶ button.



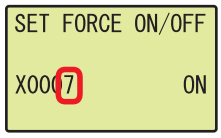
- Select ***SET ON/OFF***, and then click the ***OK*** button.



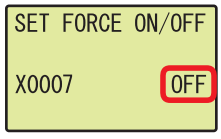
- Select X/Y using ▲ or ▼.



- Move the cursor position using ◀ or ▶, and increase/decrease the value for each digit one number at a time to specify the device number using ▲ or ▼.



- Move the cursor position using ◀ or ▶, and switch ON/OFF using ▲ or ▼, and then click the ***OK*** button.



3.4 Changing running programs <Online program change>

This function writes only the modified ladder block to the CPU module while the CPU module is in the "RUN" status. A program can be written in a short time since this function does not transfer the whole program.

The following is an example of adding a contact to the ladder.

Operating procedure

① Display the ladder.

Fig. 3-35:
Display ladder block to be changed

000075a

② Add contacts.

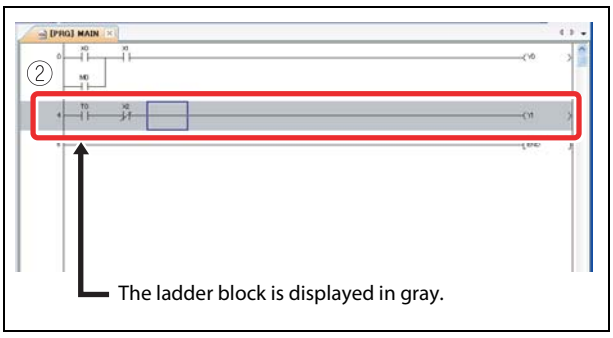


Fig. 3-36:
Add contacts

000076a

③ Select ***Compile*** → ***Online Program Change***.

④ Click the ***Yes*** button.

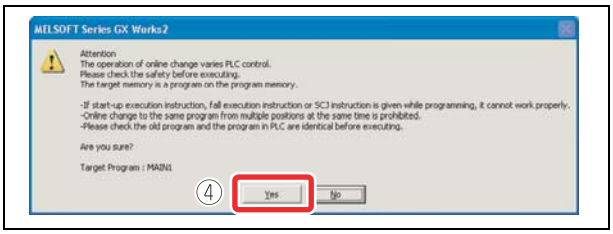


Fig. 3-37:
Confirm online program change message

000077a

When the online program change has been properly completed, the following message is displayed.

⑤ Click the ***OK*** button.

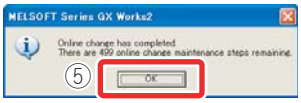


Fig. 3-38:
Online program change completion message

000078a

NOTE

The program in the CPU module and the program to be modified in GX Works2 must be the same to perform the online program change. If you are not sure, verify the programs in advance or modify the ladder after performing the "Read from PLC" function.

3.5 Checking errors <Error jump>

If an error occurs, it can be checked with PLC diagnostics. By using the Error jump, you can jump to the step number of the sequence program corresponding to the error.

3.5.1 PLC diagnostics

The details of errors occurring can be checked from the PLC diagnostics.

Operating procedure

① Select ***Diagnostics*** → ***PLC Diagnostics***.

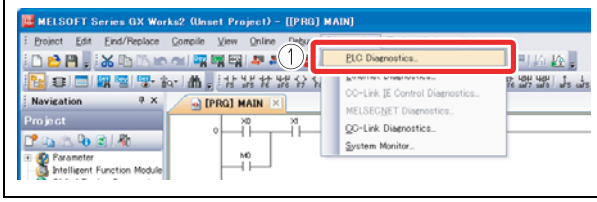


Fig. 3-39:
Select "PLC Diagnostics" menu

000079a

② Click the ***Error Help*** button of the current error or the error history.

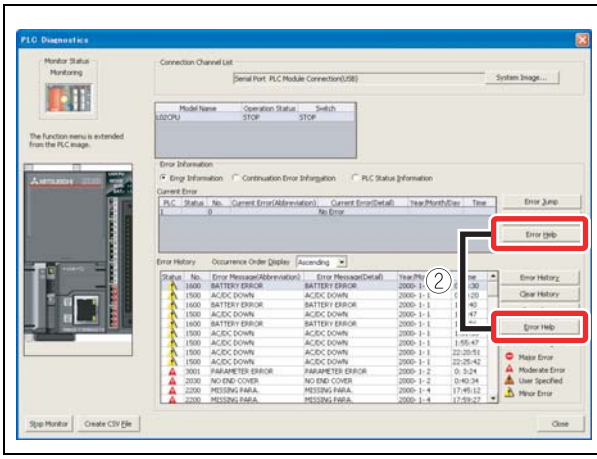


Fig. 3-40:
"PLC diagnostics" screen (example)

000044a

The details of the error and its countermeasures are displayed.

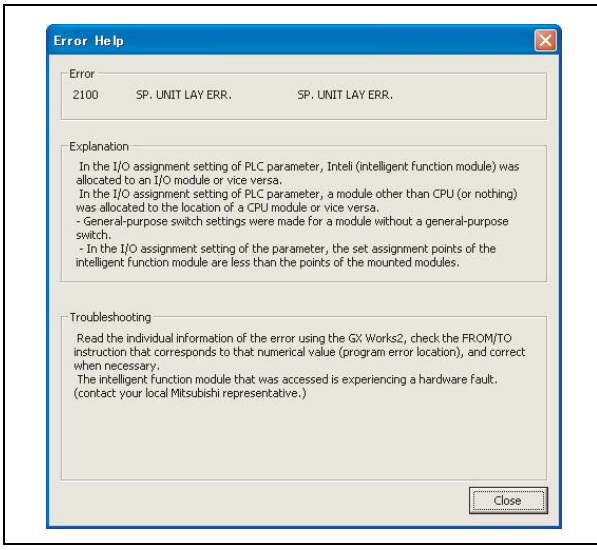


Fig. 3-41:
"Help" screen (example)

000045a

3.5.2 Error jump

Errors can be checked easily with the error jump function of PLC diagnostics.

Operating procedure

① Select ***Diagnostics*** → ***PLC Diagnostics***.

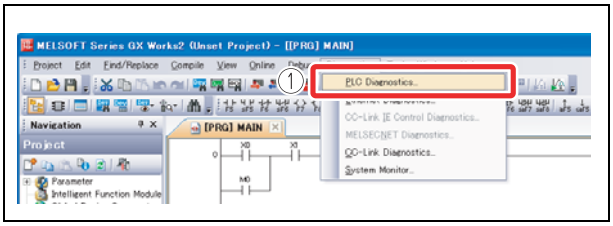


Fig. 3-42:
Select "PLC Diagnostics" menu

000079a

② Click the ***Error Jump*** button.

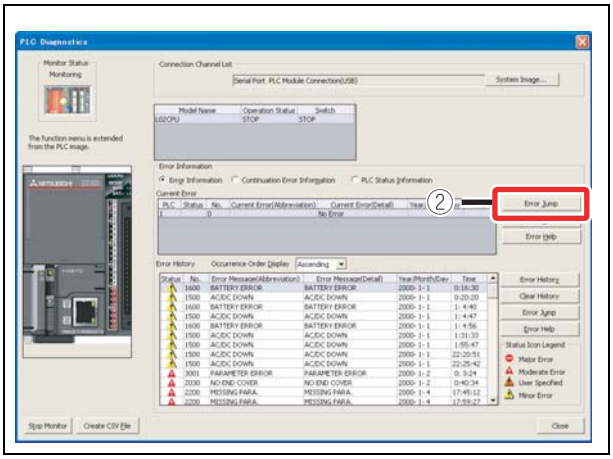


Fig. 3-43:
"PLC diagnostics" screen (example)

000080a

The cursor jumps to the step number of the sequence program corresponding to the selected error.

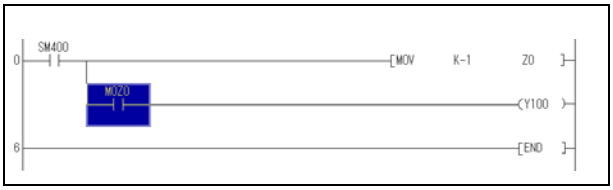


Fig. 3-44:
Step number of selected error

CE2002

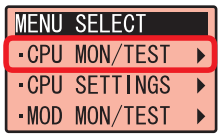
NOTES

Installing the display unit allows you to confirm the errors occurring and errors which have occurred in the past with the display unit.

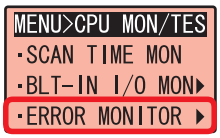
Operating procedure

The following is an example of the operating procedure to check the latest errors occurring in the CPU module.

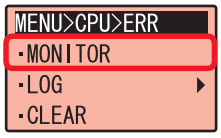
- Select function selection screen, then ***CPU MON/TEST***, and then click the ▶ button.



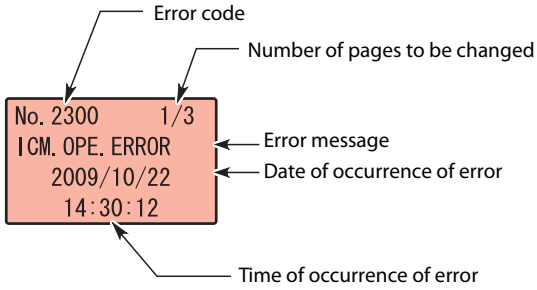
- Select ***ERROR MONITOR***, and then click the ▶ button.



- Select ***MONITOR***, and then click the **OK** button.



Error information is displayed.



Use ◀ or ▶ to display individual error information and common error information.

To return to the previous screen, click the ***ESC*** button.

The error history can be displayed and "Clearing the errors", etc. can also be performed using the display unit.

3.6 Monitoring system status <System monitor>

This function monitors the system status of the CPU module and other modules.

Operating procedure

① Select ***Diagnostics*** → ***System Monitor***.

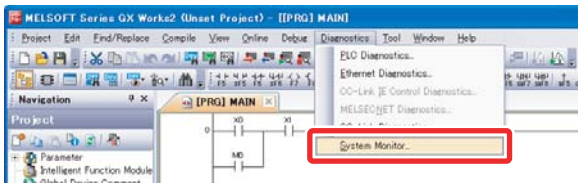


Fig. 3-45: *Select "System monitor" screen*

000081a

② The "System monitor" screen is displayed.

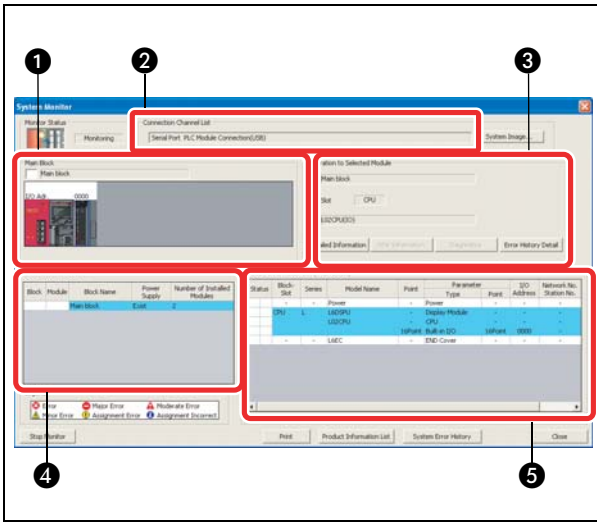


Fig. 3-46: *"System monitor" screen Explanations see table below.*

000082a

No.	Area	Description
❶	Main block	Displays the module operation statuses and I/O addresses.
❷	Connection channel list	Displays the details of the connection target being set.
❸	Operation to selected module	Displays the I/O and model of the module being selected.
❹	Block information list	Displays the block information.
❺	Module information list	Displays the model, type, and start I/O of the module being selected.

Tab. 3-3: *Areas of "System monitor" screen*

NOTE

The details of each module can be checked from the "System Monitor" screen.

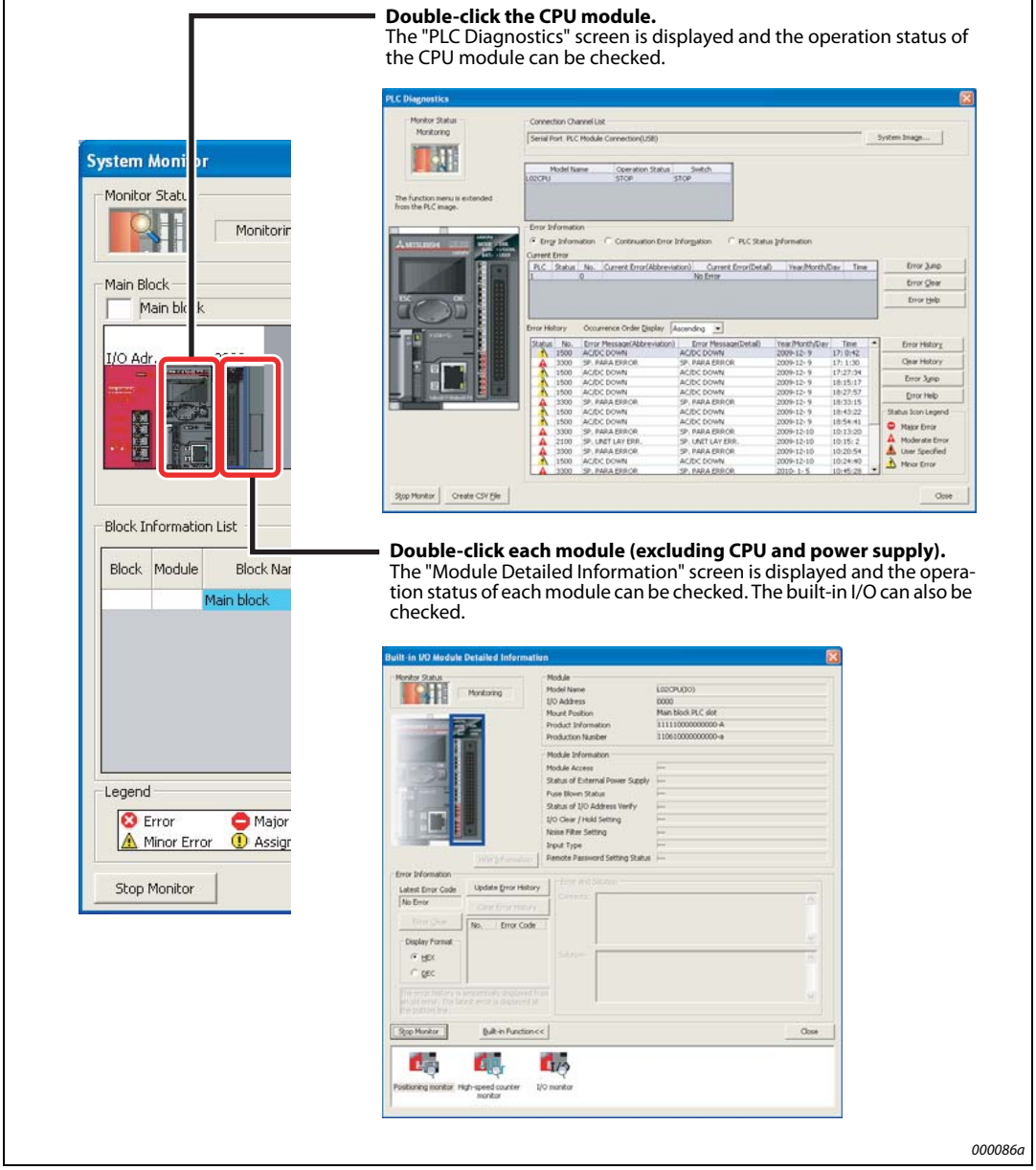


Fig. 3-47: *Check details of each module*

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