

MELSOFT

Programmable Logic Controllers

Operating Manual

GX Simulator Version 6 SW6D5C-LLT-E

• SAFETY PRECAUTIONS •

(Always read these instructions before using this equipment.)

Before using this product, please read this manual and the relevant manuals introduced in this manual carefully and pay full attention to safety to handle the product correctly.

The instructions given in this manual are concerned with this product. For the safety instructions of the programmable controller system, please read the CPU module User's Manual.


In this manual, the safety instructions are ranked as "DANGER" and "CAUTION".



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



Indicates that incorrect handling may cause hazardous conditions, resulting in medium or slight personal injury or physical damage.

Note that the  CAUTION level may lead to a serious consequence according to the circumstances. Always follow the instructions of both levels because they are important to personal safety.

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

[Cautions Regarding Test Operation]

DANGER

- GX Simulator simulates an actual PLC CPU to debug the created programs; however, it does not guarantee the operation of the debugged sequence program.
Be sure to connect the PC with PLC CPU to debug the program as usual prior to actual operation, after debugging with GX Simulator.
Failure to observe this may result in accidents due to misoutput or misoperation.
- The simulated result may differ from actual operation because GX Simulator cannot access I/O modules or special function modules, and do not support some instructions or device memory.
Be sure to connect the PC with PLC CPU to debug the program as usual prior to actual operation, after debugging with GX Simulator.
Failure to observe this may result in accidents due to misoutput or misoperation.
- GX Simulator includes serial communication function to respond to the demands from external devices; however, it does not guarantee the actual operation of the external devices using the response data.
Do not use the response data from the running GX Simulator for other than the checking by performing the serial communication function for the external device such as PC.
Failure to observe this may result in accidents due to misoutput or misoperation.

REVISIONS

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

| Print Date | * Manual Number | Revision |
|------------|------------------|---|
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| Jan., 2002 | SH (NA)-080169-C | Partial additions About the Generic Terms and Abbreviations, Section 1.2, Section 3.4.1, Section 3.4.2, Section 3.4.5 Partial corrections Section 2.2, Section 5.5.3, Section 5.5.6, Section 7.4.4, Section 7.5.8, Section 8.2 |
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| Feb., 2003 | SH (NA)-080169-F | Partial corrections CONTENTS, About Manuals, About the Generic Terms and Abbreviations, Section 2.2, Section 3.4.1, Section 3.4.3, Section 3.4.6, INDEX |
| | | |

Japanese Manual Version SH-080163-G

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— SOFTWARE USER REGISTRATION —

After agreeing to the terms of the Software License Agreement included in the package, please access the MELFANSweb Home Page (<http://www.nagoya.melco.co.jp/>) and make a software user registration. (User registration is free of charge.)

You can also make a registration by faxing or mailing the "Software Registration Card" packed with the product.

1. Software Registration

You can make a software registration by accessing the MELFANSweb Home Page or faxing or mailing the "Software Registration Card" packed with the product.

After you have made a software registration, we will register the user and send the "Software registration confirmation" together with the user ID.

We will also provide the latest information, such as the new product release, version upgrade information and event information, by direct mail.

2. Notes on Contact

Please ask questions concretely and clearly using terms listed in the manual.

When requesting us to solve a problem, provide us with detailed information for reproducing the problem.

In addition, contact the respective manufacturers when asking questions about the operating system (OS) or the other vender's software products

User registration is valid only in Japan.

INTRODUCTION

Thank you for choosing the Mitsubishi MELSOFT Series Integrated FA software.
Read this manual and make sure you understand the functions and performance of MELSOFT series thoroughly in advance to ensure correct use.

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About Manuals

The following manuals are related to this product.
Refer to the following table and request the necessary manuals.

Related Manuals

| Manual Name | Manual Number (Model Code) |
|--|-------------------------------|
| GX Developer Version 8 Operating Manual Describes the online functions of GX Developer including the programming procedure, printing out procedure, monitoring procedure, and debugging procedure. (Sold separately.) | SH-080373E (13JU41) |

REMARK

The GX Simulator Version 6 Operating Manual is contained in a single CD-ROM as a set of the software package and manual.
For the user who wants the GX Simulator Version 6 Operating Manual as a single item, it is available in a printed form as an option.

About the Generic Terms and Abbreviations

Unless otherwise specified, the following generic terms and abbreviations are used in this manual.

| Generic Term/Abbreviation | Description |
|----------------------------|---|
| GX Simulator | Generic product name of the products SWnD5C-LLT-E, SWnD5C-LLT-EA, SWnD5C-LLT-EV and SWnD5C-LLT-EVA. (n indicates any of versions 2 to 6.) -A indicates a multiple-license product, and -V an updated product. |
| GX Developer | Generic product name of the products SWnD5C-GPPW-E, SWnD5C-GPPW-EA, SWnD5C-GPPW-EV and SWnD5C-GPPW-EVA. (n indicates any of versions 2 to 8.) -A indicates a multiple-license product, and -V an updated product. |
| Debug | Locating and correcting errors in a sequence program to create a correct program. |
| Device memory | Areas to store device data in the GX Simulator, including inputs (X), outputs (Y), relays (M), timers (T), data registers (D), etc. |
| Monitor | Monitoring to determine the ON/OFF status of bit devices or the PV of word devices. |
| Simulations | Test execution of a program on a personal computer with the GX Simulator installed, instead of execution in an actual PLC. |
| Timing chart | Functions to visually confirm ON/OFF status of a bit device or the change in value of a word device. |
| WDT error | An error issued when a sequence program is written in such a way that it runs an infinite loop. |
| Pseudo-sequence program | Indicates a sequence program created by the GX Simulator to realize the settings of I/O System Settings. |
| A series CPU function | Function that simulates a project when the PLC series is the ACPU or QCPU (A mode). |
| QnA series CPU function | Function that simulates a project when the PLC series is the QnACPU. |
| FX series CPU function | Function that simulates a project when the PLC series is the FXCPU. |
| Motion controller function | Function that simulates a project when the PLC series is the motion controller (SCPU). |
| Q series CPU function | Function that simulates a project when the PLC series is the QCPU (Q mode). |
| A series CPU | Generic term of the A0J2HCPU, A1FXCPU, A1SCPU, A1SJCPU, A1SHCPU, A1SJHCPU, A1NCP, A2CCPU, A2CJCPU, A2NCP, A2NCP-S1, A2SCPU, A2SHCPU, A3NCP, A2ACPU, A2ACPU-S1, A3ACPU, A2UCPU, A2UCPU-S1, A2USCPU, A2USCPU-S1, A2ASCPU, A2ASCPU-S1, A2ASCPU-S30, A2ASCPU-S60, A2USHCPU-S1, A3UCPU, A4UCPU and CPU board (A80BD-A2USH-S1). |
| QnA series CPU | Generic term of the Q2ACPU, Q2ASCPU, Q2ASCPU-S1, Q2ASHCPU, Q2ASHCPU-S1, Q3ACPU, Q4ACPU and Q4ARCPU. |
| FX series CPU | Generic term of the FX0CPU, FX0sCPU, FX0NCP, FX1CPU, FX2CPU, FX2cCPU, FX1sCPU, FX1NCP, FX1NcCPU, FX2NCP and FX2NcCPU. |
| Motion controller | Generic term of the A171SHCPU, A172SHCPU, A173UHCPU, A173UHCPU-S1, A273UHCPU and A273UHCPU-S3. |
| Q series CPU (A mode) | Generic term of the Q02CPU-A, Q02HCPU-A and Q06HCPU-A. |
| Q series CPU (Q mode) | Generic term of the Q00JCPU, Q00CPU, Q01CPU, Q02CPU, Q02HCPU, Q06HCPU, Q12HCPU, Q12PHCPU Q25HCPU and Q25PHCPU |

Product Makeup

GX Simulator are made up of the following products.

| Type | Product Name | Quantity |
|------------------|--|----------|
| SW6D5C-LLT-E(V) | GX Simulator (1 license product) (CD-ROM) | 1 |
| | End-user software license agreement | 1 |
| | Software registration Card | 1 |
| | License agreement | 1 |
| SW6D5C-LLT-E(V)A | GX Simulator (Multiple license product) (CD-ROM) | 1 |
| | End-user software license agreement | 1 |
| | Software registration Card | n*1 |
| | License agreement | 1 |

*1 : The same number of software registration cards as that of licenses are packed with the product.

| NOTICES |
|---|
| <ul style="list-style-type: none"> • We don't guarantee the commercially-available Microsoft® Windows® Operating System-based software products that have been introduced in this manual. • We hold the copyrights of this software package. • No part of this manual may be transcribed or duplicated in any form without prior permission by Mitsubishi Electric Corporation. • We have attempted to cover all the revisions of software and hardware, but this manual may not contain the latest revisions. • The software of this product requires one license to be purchased per computer. • We permit the user to use this software package (including this manual) based on the Software License Agreement. • We are not liable for consequences or influences due to this software package (including this manual). • The specifications of this software package and the descriptions in this manual may be altered in future without prior notice. |

1. OUTLINE OF GX Simulator

1

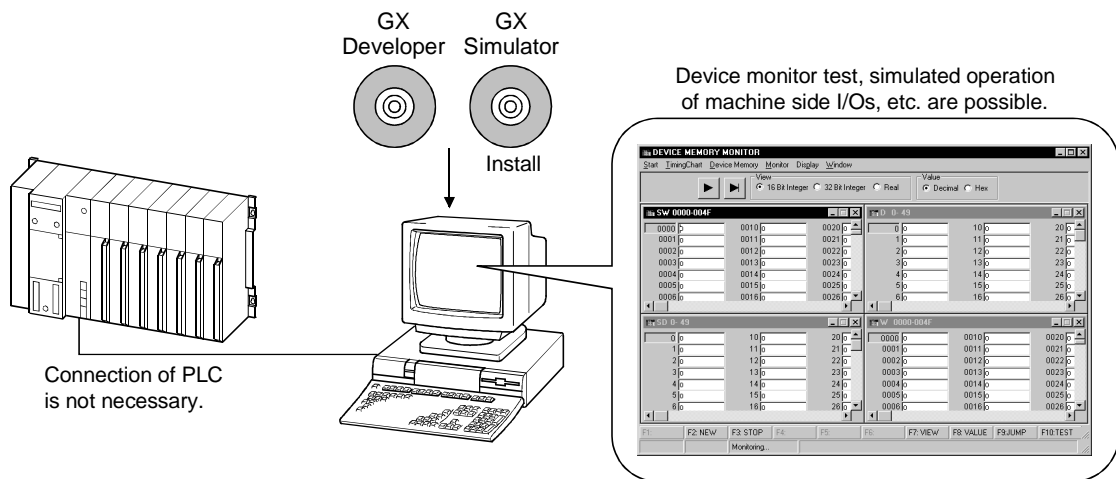
This operating manual describes the functions and operation of the GX Simulator Version 6.

The GX Simulator is a software package which runs under Microsoft® Windows® Operating System.

Offline debugging is possible by adding the GX Simulator to a computer in which the GX Developer is installed. The offline debugging functions include the device monitor test and simulated operation of external device I/Os.

As the GX Simulator allow sequence programs to be developed and debugged on a single computer, checking a modified program is quick and easy.

GX Developer must be installed before these functions can be used.



A sequence program created with GX Developer can be debugged by writing it to the GX Simulator.

The sequence program is automatically written to the GX Simulator when the GX Simulator are started up.

See GX Developer Operating Manual for information on operations not covered in this manual:

1.1 Features of the GX Simulator

The main features of the GX Simulator are described below.

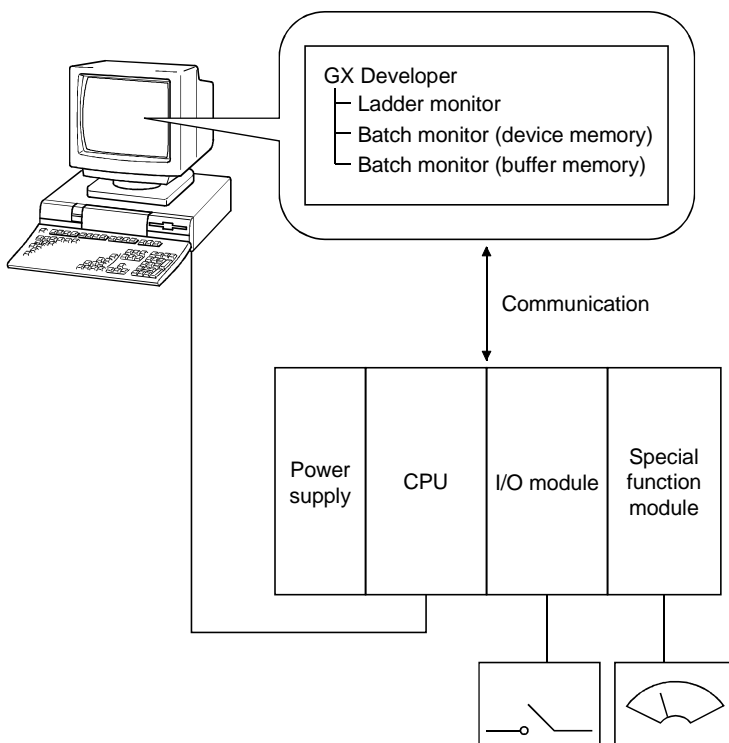
(1) Can be utilized as a single program debugging tool

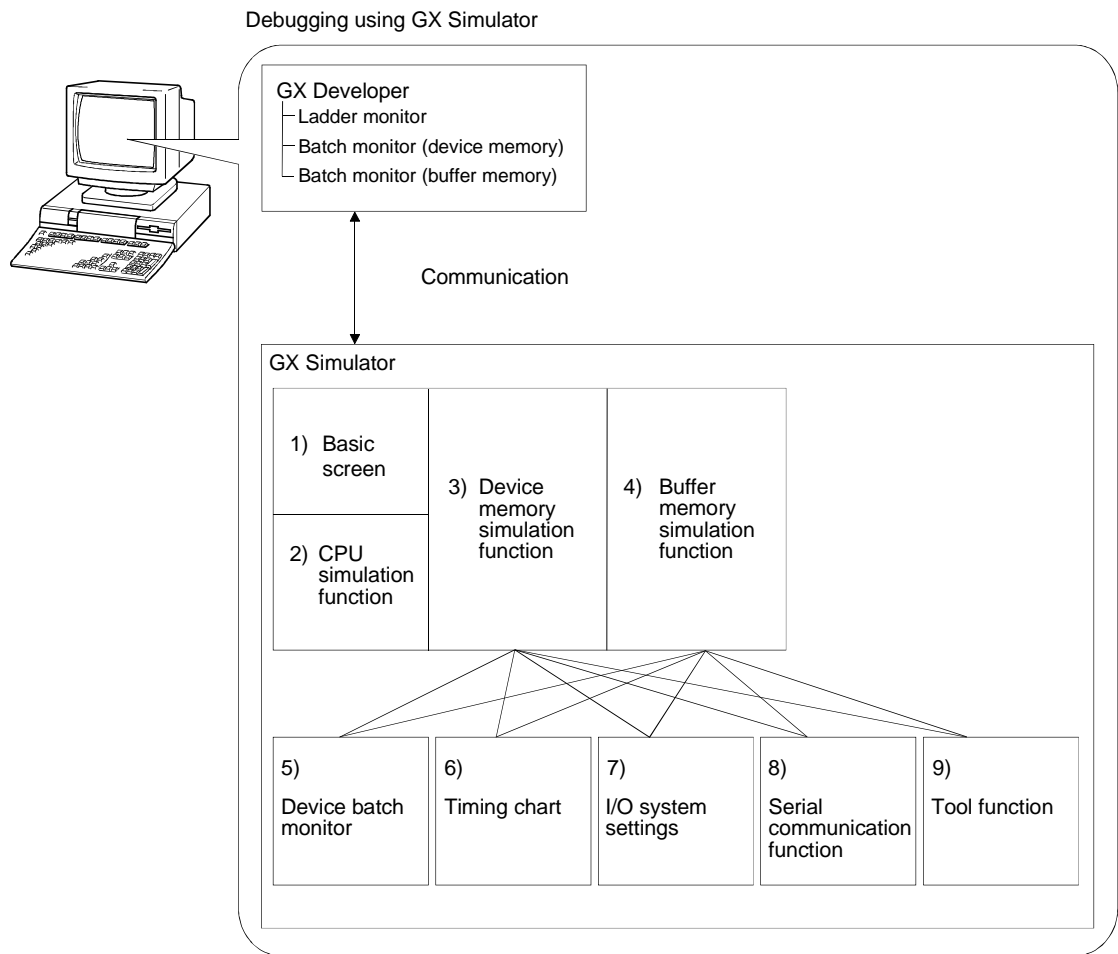
Using the PLC for debugging in the conventional method required not only the PLC but also I/O and special function modules, external device, etc. to be prepared as needed.

When using the GX Simulator, you can perform debugging on a single personal computer because I/O System Settings for external device simulation and the simulation function for special function module buffer memory are available in addition to the simulation function for PLC.

Also, because of no connection to actual equipment, you can proceed with debugging safely if an abnormal output should occur due to a program bug.

Conventional debugging

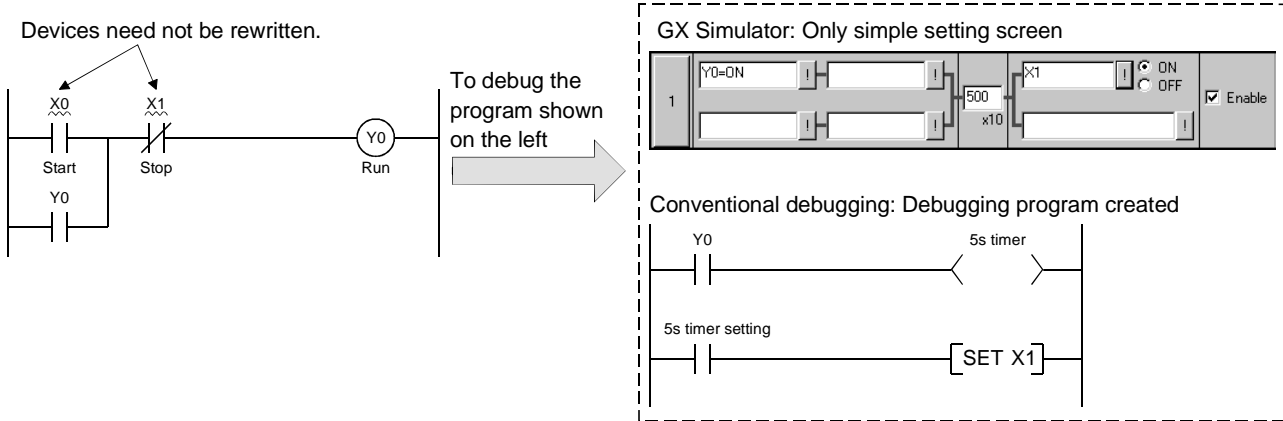




- 1) ... Key switch, indicator display function
- 2) ... Function to simulate CPU operation
- 3) ... Function to simulate CPU device memory
- 4) ... Function to simulate the buffer memory area of a special function module
- 5) ... Function to batch-monitor device memory values
- 6) ... Function to display device memory changes in a chart form
- 7) ... Function to simulate I/O operation of external device
- 8) ... Function to simulate communication with an external device
- 9) ... Function to save/read device memory or buffer memory data to/from a file

(2) Simulation of external device operation (I/O system setting function)

By setting the combination of bit device ON/OFF condition and word device value interactively in the I/O system settings of GX Simulator, an external input generated in response to a PLC output can be provided simulatively.



(3) Checking of message format of frame sent by external device (Serial communication function)

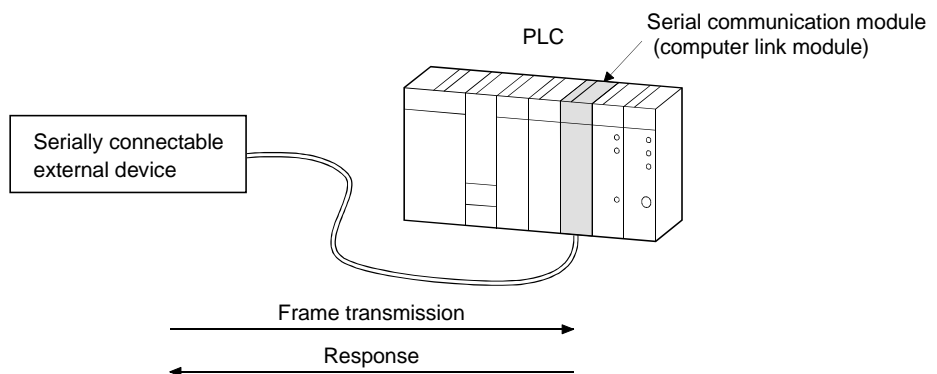
This function allows you to easily check whether the frame (A-compatible 1C frame, QnA-compatible 3C/4C frame) used for access from an external device to the PLC CPU via a serial communication module (computer link module) is in a correct message format or not.

Since this function also enables devices to be accessed, you can check/change device contents easily on an external device.

Conventionally, the serial communication module (computer link module) was actually connected with the external device to check operation. Using this function, however, you can easily check the message format and device contents between GX Simulator and external device.

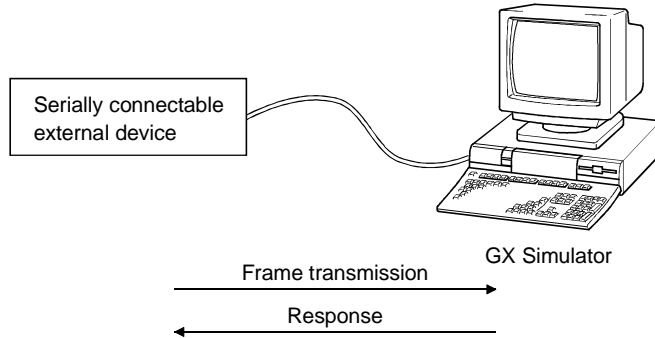
<Conventional debugging>

Debugging was performed with the external device connected with the serial communication module (computer link module) actually.



<Debugging using GX Simulator>

Since GX Simulator responds to the frame sent from the external device, the external device need not be connected to the serial communication module (computer link module) actually.

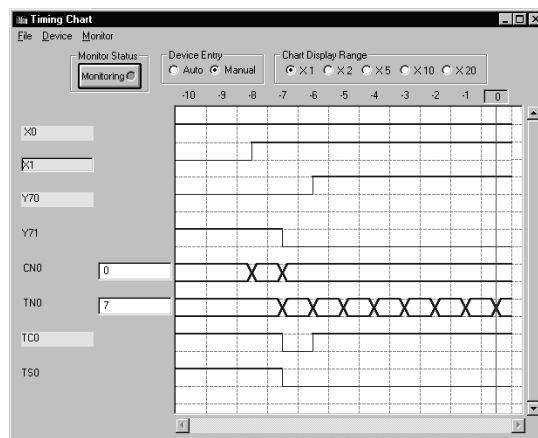


(4) Monitoring of device memory (monitor test function)

You can monitor the states of the virtual CPU device memory and the buffer memory.

Like the device batch monitor and buffer memory batch monitor functions of GX Developer, you can not only monitor the ON/OFF states and values of devices but also perform forced ON/OFF and change current values.

This function also allows you to display the ON/OFF states and values in a timing chart format to grasp time series operation.



(5) Saving/reading of device/buffer memory data (tool function)

You can save the data of the device memory in the virtual CPU or the buffer memory of the special function module temporarily, and when resuming debugging, you can read and use the saved data.

(6) Comparison between PLC and GX Simulator

There are the following differences between connection with a PLC and use of the GX Simulator.

| | An | AnA | AnU Q (A mode) | FX | QnACPU | Q (Q mode) | Refer To |
|----------------------------|-----|-----|-------------------|-----|--------|------------|-----------------|
| Device range | ○*1 | ○*1 | ○*1 | ○ | ○*8 | ○*8 | Appendix1 |
| Instruction (common) | ○*2 | ○*2 | ○*2 | ○*6 | ○*9 | ○*9 | Appendix2 |
| Instruction (dedicated) | — | ○*3 | ○*3 | — | — | — | Appendix 2.1 |
| Parameter | ○*4 | ○*4 | ○*4 | ○*7 | ○*10 | ○*10 | Section3.4 |
| Network parameter | × | × | × | × | × | × | Section3.4 |
| Special function module | ○*5 | ○*5 | ○*5 | ○*5 | ○*5 | ○*5 | — |

○: Supported ×: Unsupported —: Irrelevant

*1: Device I is not supported.

*2: Output instructions, program branch instructions, data processing instructions, display instructions and other instructions include unsupported instructions.

*3: Structured program instructions, I/O operation instructions, character string processing instructions, clock instructions, data link instructions and special function module instructions include unsupported instructions.

*4: Memory capacity setting, PLC RAS setting, PLC system setting and device setting include unsupported items.

*5: Only the buffer memory area is supported. The size of the buffer memory area is fixed to 16K points. The QCPU (Q mode) is fixed to 64K points.

*6: Program flow instructions, high-speed processing instructions, convenient instructions, external device instructions, positioning instructions and clock instructions include unsupported instructions.

*7: Memory capacity setting, device setting, PLC name setting, PLC system setting (1) and PLC system setting (2) include unsupported items.

*8: Devices S, Jn\X, Jn\Y, Jn\B, Jn\SB, Jn\W, Jn\SW, I, BL and TR are unsupported.

*9: Output instructions, program execution instructions, I/O refresh instructions, other convenient instructions, data processing instructions, structured instructions, display instructions, debugging, diagnostic instructions, character string processing instructions, special function instructions, data control instructions, clock instructions, peripheral device instructions and other instructions include unsupported instructions.

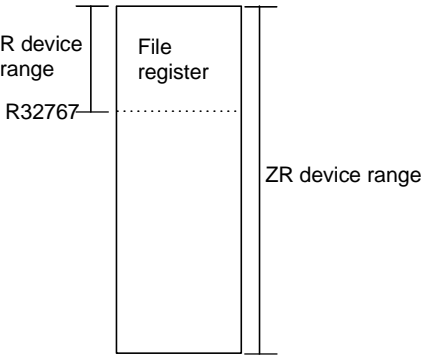
*10: PLC name setting, PLC system setting, PLC file setting, PLC RAS setting, device setting, boot file setting and SFC setting include unsupported items.

1.2 Differences To Debugging with an Actual PLC Connected

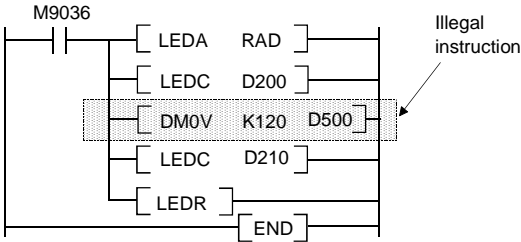
The specifications for debugging using the GX Simulator differ from those for debugging with an actual PLC connected.

The main differences between debugging using the GX Simulator and debugging with an actual PLC connected are shown below.

See Section 2.4 for details.

| Item Name | Debugging with an Actual PLC Connected | Debugging with GX Simulator | Applicable CPU |
|---|--|--|--|
| Step execution, skip execution, partial execution | Not supported. (When the ACPU or QCPU (A mode) is used, only step execution is not supported.) | Debugging using step execution, skip execution, and partial execution makes debugging operation more efficient. | <ul style="list-style-type: none"> • ACPU • FXCPU • QCPU(Q mode) • QCPU(A mode) |
| Device range check | Operation continues even if the indirect designation by the index register exceeds the device range. | <p>"OPERATION ERROR" occurs when the device range determined by CPU type or parameters is exceeded.*1</p> | <ul style="list-style-type: none"> • ACPU • QnACPU • FXCPU • Motion controller • QCPU(Q mode) • QCPU(A mode) |
| | | <p>The device (@**) to be indirectly designated is also checked within the device range of the device address. However, file register is checked within ZR device range instead of R device range. (For the device range for a specific CPU type, refer to Appendix 1.)</p> <p>@DO checks the error in the ZR device range setting when the following program is executed .</p> <pre> ┌───┴───┐ │ADRSET R32767 D0│ └───┴───┘ ┌───┴───┐ │FMOV K1 @D0 K20│ └───┴───┘ </pre>  <p>The diagram shows three overlapping ranges on a horizontal axis. From left to right: 'R device range' starting at 'R32767', 'File register' (a narrower range), and 'ZR device range' (the widest range, encompassing the others).</p> | <ul style="list-style-type: none"> • QnACPU • QCPU(Q mode) |

*1: Indirectly designating file register checks the device range within the range of capacity set on "PLC File" screen switched from "PLC Parameter" dialog box by tab.

| Item Name | Debugging with an Actual PLC Connected | Debugging with GX Simulator | Applicable CPU |
|--|--|--|--|
| Real number range check | Dedicated instructions to handle real numbers allow operation to continue when an illegal value occurs which cannot be evaluated as a real number. | Real number range checks are conducted rigorously. "OPERATION ERROR" is displayed if a value cannot be evaluated as a real number. | <ul style="list-style-type: none"> • ACPU • QnACPU • Motion controller • QCPU(Q mode) • QCPU(A mode) |
| Number range check | Value 0 is given as a result of "0 divided by 0" by DIV instruction, floating point division, of the A series PLC. No error occurs. | The rigorous number range check can detect an illegal 0 denominator and "OPERATION ERROR" is generated if 0 ÷ 0 is executed. | <ul style="list-style-type: none"> • ACPU • Motion controller • QCPU(A mode) |
| Illegal instruction in a dedicated instruction | The illegal instruction is ignored and operation continues. | <p>The illegal instruction is checked and "INSTRCT CODE ERR." is displayed. Dedicated instructions must be described as blocks.</p> <p>(Example of illegal ladder)</p>  | <ul style="list-style-type: none"> • ACPU • Motion controller • QCPU(A mode) |
| Time concept | Actual time | As per constant scan setting. | <ul style="list-style-type: none"> • ACPU • QnACPU • FXCPU • Motion controller • QCPU(Q mode) • QCPU(A mode) |
| Supported instructions | All instructions can be used. | <p>Since data refresh instructions, PID control instructions (QnA series, FX series CPUs), etc. cannot be used, they are processed as NOPs.</p> <p>(Refer to Appendix-2 for supported instructions.)</p> | <ul style="list-style-type: none"> • ACPU • QnACPU • FXCPU • Motion controller • QCPU(Q mode) • QCPU(A mode) |
| Operating CPU type | According to CPU type used. | <ul style="list-style-type: none"> • Operates as A4UCPU when A series CPU, motion controller or Q series CPU (A mode) is selected. • Operates as Q4ACPU when QnA series CPU is selected. • Operates as FXCPU when FX series CPU is selected. • Operates as Q25HCPU when Q series CPU (Q mode) is selected. | <ul style="list-style-type: none"> • ACPU • QnACPU • FXCPU • Motion controller • QCPU(Q mode) • QCPU(A mode) |
| Special function module (special function block) | Supported | <p>Not supported.</p> <p>Only the buffer memory area of a special function module (special function block) is supported.</p> | <ul style="list-style-type: none"> • ACPU • QnACPU • FXCPU • Motion controller • QCPU(Q mode) • QCPU(A mode) |

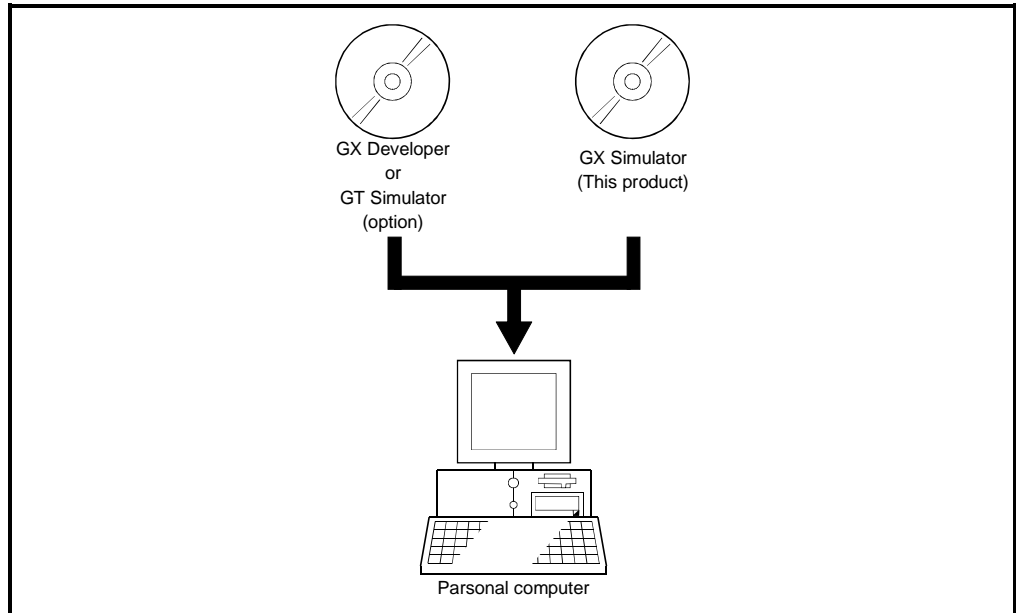
| Item Name | Debugging with an Actual PLC Connected | Debugging with GX Simulator | Applicable CPU |
|---|---|---|--|
| I/O module | Supported | Not supported | <ul style="list-style-type: none"> • ACPU • QnACPU • FXCPU • Motion controller • QCPU(Q mode) • QCPU(A mode) |
| Network | Supported | Not supported | <ul style="list-style-type: none"> • ACPU • QnACPU • FXCPU • Motion controller • QCPU(Q mode) • QCPU(A mode) |
| Memory cassette capacity | An error occurs in GX Developer if data exceeding the memory cassette capacity is written to the PLC. | No error occurs and normal operation continues if data exceeding the memory cassette capacity is written to the PLC. | <ul style="list-style-type: none"> • ACPU • QnACPU • Motion controller • QCPU(Q mode) • QCPU(A mode) |
| Intelligent function module (intelligent parameters) | Supported | Only the initial setting, auto refresh setting and buffer memory area are supported. | <ul style="list-style-type: none"> • QCPU(Q mode) |
| In case "Use the file register" and "Use the following file" are set, but "Capacity" is not set | Operates according to capacity of the file register if the file register specified on "Use the following file" exists in the specified drive. | Operates with the capacity of the file register set as an 0K point, whether the file used on "Use the following file" exist or not. Thus, "OPERATION ERROR" occurs if the file register is used in the program. | QnACPU QCPU (Qmode) |
| When "Use the same file name as the program" is selected for a file register. | (1) If the same name file register as the program is in the PLC CPU drive, the PLC CPU debugs the file register by the set capacity. | (1) If the same name file register as the program is in the PC drive, GX Simulator debugs the file register by the set capacity. | QnACPU QCPU(Q mode) |
| | (2) If the same name file register as the program is not in the PLC CPU drive, the PLC CPU will not debug. | (2) If the same name file register as the program is not in the PC drive, GX Simulator newly creates a file register of 1018k steps and debugs it. | |
| When the capacity of a file register is changed during program execution. | (1) When "Use the same file name as the program" is selected for a file register, the PLC CPU monitors the file register within the changed capacity. | (1) When "Use the same file name as the program" is selected for a file register, GX Simulator monitors a file register of 1018k steps (maximum). | QnACPU QCPU(Q mode) |
| | (2) When "Use the following file" is selected, the PLC CPU monitors the file register within the changed capacity. | (2) When "Use the following file" is selected, GX Simulator monitors a file register by the capacity set using parameter. | |

| Item Name | Debugging with an Actual PLC Connected | Debugging with GX Simulator | Applicable CPU |
|-------------------------------------|---|--|--|
| When step execution is performed | (1) When performed, execution stops at each of the first instruction, P/I pointer, statement and note. | (1) When performed, execution stops at the first instruction and P/I pointer but does not stop at the first statement and note. | <ul style="list-style-type: none"> • QnACPU • QCPU(Q mode) |
| | (2) When the start position is a statement or note, execution stops at the first statement or note. | (2) When the start position is a statement or note, execution stops at the first instruction or P/I pointer immediately after that statement or note. | |
| | (3) When the repetition count of the option setup is set, each of the instruction, P/I pointer, statement and note is counted once. | (3) When the repetition count of the option setup is set, each of the instruction and P/I pointer is counted once. The statement and note are not counted. | |
| | (4) When a statement or note step is set to the break point of the option setup, execution stops at the statement or note step. | (4) When a statement or note step is set to the break point of the option setup, execution does not stop at this break point. | |
| When partial execution is performed | (1) When performed, execution stops at each of the first instruction, P/I pointer, statement and note. | (1) When performed, execution stops at the first instruction and P/I pointer but does not stop at the first statement and note. | <ul style="list-style-type: none"> • QnACPU • QCPU(Q mode) |
| | (2) When the start position is a statement or note, execution stops at the first statement or note. | (2) When the start position is a statement or note, execution stops at the first instruction or P/I pointer immediately after that statement or note. | |
| | (3) When a statement or note step is set to the break point of the break condition, execution stops at the statement or note step. | (3) When a statement or note step is set to the break point of the break condition, execution does not stop at this break point. | |

2. SYSTEM CONFIGURATION

2.1 System Configuration

The following shows the system configuration.



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2.2 Operating Environment

The operating environment of GX Simulator is indicated below.

| Item | Description |
|----------------------|--|
| Computer main unit | Personal computer on which Windows® operates. |
| CPU | Refer to the following table "Used operating system and performance required for personal computer". |
| Required memory | |
| Hard disk free space | 70MB or more *1 |
| Disk drive | CD-ROM disk drive |
| Display | 800 × 600 dot or more resolution *2 |
| Operating system | Microsoft® Windows® 95 Operating System (English version) Microsoft® Windows® 98 Operating System (English version) Microsoft® Windows® Millennium Edition Operating System (English version) Microsoft® Windows NT® Workstation Operating System Version 4.0 (English version) Microsoft® Windows® 2000 Professional Operating System (English version) Microsoft® Windows® XP Professional Operating System (English version) Microsoft® Windows® XP Home Edition Operating System (English version) |

*1: 1MB is required to use a file register.

Make sure that the required space is secured within the driven in which this product has been installed, before using file register.

*2: When Windows® XP Professional or Windows® XP Home Edition is used, Large Fonts are not supported.

Used operating system and performance required for personal computer

| Operating system | | Performance Required for Personal Computer | |
|--|--|--|-----------------|
| | | CPU | Required memory |
| Windows® 95 | | Pentium® 133MHz or more | 64MB or more |
| Windows® 98 | | Pentium® 133MHz or more | 64MB or more |
| Windows® Me | | Pentium® 150MHz or more | 64MB or more |
| Windows NT® Workstation 4.0 (Service Pack 3 or more) | | Pentium® 133MHz or more | 64MB or more |
| Windows® 2000 Professional | | Pentium® 133MHz or more | 64MB or more |
| Windows® XP Professional | "XP compatibility mode" and "Fast User Switching" are not supported. | Pentium® 300MHz or more | 128MB or more |
| Windows® XP Home Edition | | Pentium® 300MHz or more | 128MB or more |

2

3. SPECIFICATIONS

3.1 Table of Functions

The functions supported by the GX Simulator are shown below.

The functions supported by the GX Simulator include functions executed from the GX Simulator menu and functions executed from the GX Developer menu.

The GX Simulator simulates the function of the CPU selected at the time of execution of the GX Simulator from the GX Developer menu: it supports CPU's of type A, QnA, and FX. Also, when the motion controller is selected, the corresponding function of the A series CPU operates. (Refer to Section 3.4.5(1) for the A series CPU corresponding to the motion controller.)

Also, when the Q series (Q mode) is selected, the Q series CPU functions operate, but when the Q series (A mode) is selected, the A series CPU functions operate as equivalent to those of the A4UCPU.

The functions supported by the GX Simulator are as indicated in Table 3.1.

See the GX Developer Operating Manual for details about the operation of functions executed from the GX Developer menu.

Table 3.1 Functions Supported by GX Simulator

| Function | | Description | Reference |
|---|----------------------------------|---|-------------------------------|
| Functions executed from the GX Developer menu | Ladder monitor Device monitor | <ul style="list-style-type: none"> Monitors the processing status of the GX Simulator | GX Developer Operating Manual |
| | Device test | <ul style="list-style-type: none"> Forcibly write device values to the GX Simulator during monitoring. | |
| | Write to PLC | <ul style="list-style-type: none"> Writes parameter file and program file to GX Simulator. | |
| | PLC diagnostics | <ul style="list-style-type: none"> Checks the GX Simulator status and errors. | |
| | Skip execution | <ul style="list-style-type: none"> Skips program execution in the range between two designated steps. | |
| | Partial execution | <ul style="list-style-type: none"> Executes the part of the program in a designated step or pointer range. | |
| | Step execution | <ul style="list-style-type: none"> Executes the sequence program one step at a time. | |
| | Remote operation | <ul style="list-style-type: none"> Operates the GX Simulator execution status. | |
| | Program monitor list | <ul style="list-style-type: none"> Monitors the program execution status and number of executions as a table, starts and stops the program execution in the table. | |

| Function | | Description | Reference |
|---|---|---|------------|
| Functions executed from the GX Simulator menu | I/O system settings | <ul style="list-style-type: none"> • Simulates the operation of external devices by simple settings. | Chapter 5. |
| | Serial communication function | <ul style="list-style-type: none"> • Checks the operation of the frame that is sent from the external device to the serial communication module (computer link module). | Chapter 6. |
| | Monitor test | <ul style="list-style-type: none"> • Conducts testing by monitoring the device memory status. • Displaying the ON/OFF chart of the devices. • Forcing the devices ON/OFF, and changing present values. | Chapter 7. |
| | Tools | <ul style="list-style-type: none"> • Reads the saved device memory/buffer memory data and makes option setting. | Chapter 8. |
| | Function equivalent to WDT | <ul style="list-style-type: none"> • Issues a WDT error if a sequence program is written in such a way that it runs an infinite loop. | — |
| | Error detail display function | <ul style="list-style-type: none"> • Displays detailed error information at occurrence of an error. | Chapter 4. |
| | Unsupported instruction list display function | <ul style="list-style-type: none"> • Lists the instructions which are not supported by the GX Simulator if they are included in a sequence program. | |

3.2 Function List

This section provides the function list of each screen.

(1) Basic screen function list

| | Reference |
|--|-------------|
| Start | |
| — Device Memory Monitor.....Shows the Device Memory Monitor screen. | Chapter 7 |
| — I/O System Settings.....Shows the I/O System Settings screen. | Chapter 5 |
| — Serial Communication Function.....Displays the serial communication function screen. | Chapter 6 |
| Tools | |
| — Backup Device Memory.....Writes device memory data to a file. | Section 8.1 |
| — Backup Buffer Memory.....Writes buffer memory data to a file. | Section 8.1 |
| — Restore Device Memory.....Reads the saved device memory data. | Section 8.2 |
| — Restore Buffer Memory.....Reads the saved buffer memory data. | Section 8.2 |
| — Option.....Selects how to display the initial window at the start of GX Simulator. | Section 8.3 |
| Help | |
| — About LLT.....Shows the product information. | |

(2) Device Memory Monitor screen function list

| | Reference |
|---|---------------|
| Start | |
| Exit..... | Section 7.3 |
| Closes the Device Memory Monitor screen. | |
| Timing Chart | |
| Run..... | Section 7.5.2 |
| Starts the Timing Chart screen. | |
| Device Memory | |
| Bit Device | |
| Bit device corresponding to CPU..... | Section 7.4.1 |
| Shows the window of the selected bit device. | |
| Word Device | |
| Word device corresponding to CPU..... | Section 7.4.1 |
| Shows the window of the selected word device. | |
| Monitor | |
| Start/Stop..... | Section 7.4.2 |
| Starts/stops monitor. | |
| Test..... | Section 7.4.6 |
| Sets ON/OFF of the device and changes the present value. | |
| Monitoring Interval..... | Section 7.4.3 |
| Changes the monitoring interval. | |
| Display | |
| Starting Page..... | Section 7.4.1 |
| Shows the first page in the active window. | |
| Previous Page..... | Section 7.4.1 |
| Shows the preceding page in the active window. | |
| Next Page..... | Section 7.4.1 |
| Shows the next page in the active window. | |
| End Page..... | Section 7.4.1 |
| Shows the last page in the active window. | |
| Jump..... | Section 7.4.1 |
| Shows the specified device and onward in the active window. | |
| Value | |
| Decimal..... | Section 7.4.4 |
| Shows decimal values in the active window. | |
| Hexadecimal..... | Section 7.4.4 |
| Shows hexadecimal values in the active window. | |
| View | |
| Sixteen Bit Integer..... | Section 7.4.4 |
| Shows 16-bit integers in the active window. | |
| Thirty Two Bit Integer..... | Section 7.4.4 |
| Shows 32-bit integers in the active window. | |
| Real..... | Section 7.4.4 |
| Shows real numbers in the active window. | |

Reference

| | | |
|-----------------|---|---------------|
| Window | | |
| — New..... | Opens a new window with the specified device. | Section 7.4.5 |
| — Cascade..... | Cascades currently open windows. | |
| — Tile..... | Tiles currently open windows. | |
| — Arrange | Arranges windows reduced to icons. | |

(3) Timing Chart function list

| | | |
|-------------------------|---|---------------|
| File | | |
| — Open File..... | Reads the saved monitor device data. | Section 7.5.6 |
| — Save File As..... | Writes the device data currently monitored. | Section 7.5.6 |
| — Save Timing Data..... | Saves as the timing chart data file. | Section 7.5.6 |
| — Exit..... | Exits from Timing Chart. | Section 7.5.2 |

| | | |
|----------------------|---|---------------|
| Device | | |
| — Enter Device..... | Registers the devices to be monitored. | Section 7.5.4 |
| — Delete Device..... | Deletes the selected devices. | Section 7.5.4 |
| — List Device..... | Lists the devices being monitored. | Section 7.5.8 |
| — Property..... | Change the display format of the selected device. | Section 7.5.8 |

| | | |
|------------------------|---|---------------|
| Monitor | | |
| — Start/Stop..... | Starts/stops monitor. | Section 7.5.5 |
| — Sampling period..... | To change the Data accumulation interval. | Section 7.5.7 |

(4) I/O system setting screen function list

| | Reference |
|--|---|
| File | |
| New..... | Creates the new I/O system setting file. Section 5.8.1 |
| Open..... | Opens current I/O system setting file. Section 5.8.1 |
| Save..... | Overwrites and saves file being opened. Section 5.8.1 |
| Save As..... | Gives the name to the file being opened and saves it. Section 5.8.1 |
| Execute I/O System Settings..... | Executes the I/O system setting. Section 5.7 |
| Cancel I/O system setting..... | Cancels the I/O system setting. Section 5.7 |
| Import Earlier Version of I/O System File..... | Reads I/O system setting files from SW2 to SW5. Section 5.8.5 |
| Exit I/O System Settings..... | Exits the I/O system setting. Section 5.2 |
| Edit | |
| Cut..... | Cuts the selected setting No.. Section 5.8.2 |
| Copy..... | Copies the selected setting No.. Section 5.8.2 |
| Paste..... | Pastes the setting No. cut or copied. Section 5.8.2 |
| Enable / Disable Settings | |
| Enable All..... | Enables all settings. Section 5.8.3 |
| Disable All..... | Disables all settings. Section 5.8.3 |
| Online | |
| Monitor Mode..... | Starts monitor. Section 5.8.4 |
| Edit Mode..... | Stops monitor. Section 5.8.4 |

Reference

- View**
 - Tool Bar.....Set whether tool bar is displayed or not.
 - Status Bar.....Set whether status bar is displayed or not.

- Window**
 - Cascade.....Cascades currently open windows.
 - Tile.....Tiles currently open windows.
 - Arrange Icons.....Arranges widows reduced to icons.

(5) Timing chart format input screen function list

- File**
 - Open File.....Opens the timing chart data file. Section 5.5.6
 - Exit.....Exits from timing format input. Section 5.5.2

- Device**
 - Enter Device.....Registers the devices to be setting. Section 5.5.3
 - Delete Device.....Deletes the registered devices. Section 5.5.3
 - List Device.....Lists the registered devices. Section 5.5.6
 - Property.....Changes the display format of the selected device. Section 5.5.6

- Edit**
 - Undo.....Returns to previous status one step before execution. Section 5.5.6
 - Bit Device.....Sets status of bit device. Section 5.5.4
 - Word Device.....Sets status of word device. Section 5.5.4
 - Wizard.....Activates setting of wizard screen. Section 5.5.4
 - Insert.....Inserts timing to selected section. Section 5.5.4
 - Delete.....Deletes timing of selected section. Section 5.5.4

- Scan**
 - Scan Setting.....Specifies scan number. Section 5.5.5

3.3 Devices and Instructions Supported by the GX Simulator

GX Simulator operates in the following device ranges and with the following instructions.

| CPU Type | Device | Instruction |
|-----------------------|---|---|
| A series CPU *1 | Operates in the device range of the selected CPU type. (See Appendix 1.1.) | Operates with the instructions supported by the ACPU. (See Appendix 2.1.) |
| QnA series CPU | Operates in the device range of the selected CPU type. (See Appendix 1.2.) | Operates with the instructions supported by the QnACPU. (See Appendix 2.2.) |
| FX series CPU | Operates in the device range of the selected CPU type. (See Appendix 1.3.) | Operates with the instructions supported by the FXCPU. (See Appendix 2.3.) |
| Motion controller | Operates in the device range of the corresponding ACPU. (See Appendix 1.1.) | Operates with the instructions supported by the ACPU. (See Appendix 2.1.) However, motion dedicated instructions (SVST, CHGA, CHGV, CHGT, SFCS, ITP) are not supported. They are not processed. |
| Q series CPU (A mode) | Operates in the device range of the A4UCPU. | Operates with the instructions supported by the A4UCPU. |
| Q series CPU (Q mode) | Operates in the device range of the selected CPU type. | Operates with the instructions supported by the QCPU (Q mode). |

*1: Select CPU type of A2USH-S1 when CPU card A80BD-A2USH-S1 is used.

However, some devices and instructions are restricted or are not supported. Unsupported devices and instructions are not processed (NOP). These NOP instructions are shown on the initial window of the GX Simulator as unsupported information. (See Section 4.3.)

See "Appendix 1 List of Supported Devices" and "Appendix 2 List of Supported Instruction" for details about the devices and instructions supported by the GX Simulator.

POINT

In this manual, the PLC portion of the motion controller is described as a function of the motion controller.

In addition, the A171SH, A172SH, A173UH(S1), and A273UH(S3) are included in the device/instruction support range of the A2SH, A2SH(S1), A3U, and A3U respectively.

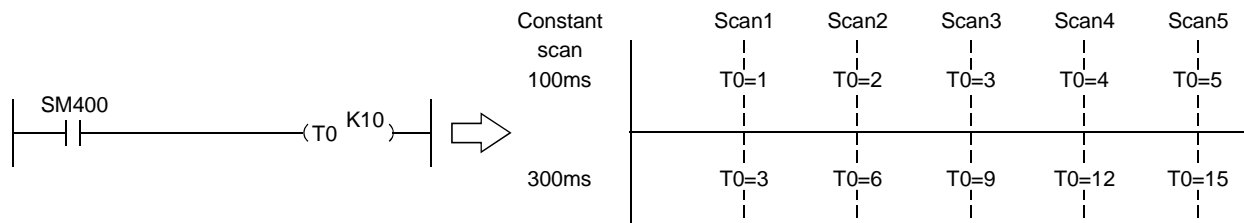
3.4 GX Simulator Restrictions and Cautions

The restrictions and cautions when debugging with the GX Simulator are described below.

3.4.1 Restrictions and cautions common to each type of CPU

(1) GX Simulator Processing Time

The time set as constant scan is used to update the present value of the timer.



(To change the time, you can use D9020 for the ACPU/QCPU (A mode)/motion controller functions, parameter setting for the QnACPU/QCPU (Q mode) functions, or D8039 for the FXCPU functions.)

In the GX Simulator, the count made by the timer instruction during one scan changes with the constant scan setting. At the constant scan setting of 100ms, the 100ms timer counts +1 during one scan. At the constant scan setting of 300ms, the 100ms timer counts +3 during one scan.

(2) Restarting the GX Simulator

When restarting the GX Simulator immediately after ending it, it may take longer than the usual restarting time.

(3) Device Range Checks using I/O System Settings

Appendix 3 shows a table of devices supported by I/O system settings. The usable device ranges depend on the selected CPU model and parameter setting range. (For details, refer to Appendix-1.)

(4) Interrupt Programs

Interrupt programs are not supported. Any sequence program created is not executed.

(5) Floating Decimal Point

Rounding errors can occur in the results of instructions using the floating decimal point. Therefore, the results may differ from calculations when a CPU is connected.

- (6) **Read from PLC, Compare with PLC**
Not supported by the GX Simulator.
- (7) **Comments**
Not supported by the GX Simulator.
- (8) **LED Reset Button**
The LED display is cleared when the LED reset button on the initial window is clicked. However, the display immediately reappears if the cause of the error has not been removed, so it appears that the LED display is not reset when the button is clicked.
- (9) **Automatic Writing of the GX Simulator**
Parameters and sequence programs are written when the GX Simulator is started up.
As the file register and device initial values are not automatically written, write them to the GX Simulator using write to PLC.
(If you do not perform Write to PLC on GX Developer of SW0D5□-GPPW-E, the file register/device initial values used are the values which were automatically retained when the GX Simulator was ended last time.)
- (10) **About Restrictions on GX Simulator Installation**
It is not possible to install an English version of the GX Simulator when a Japanese version GX Developer is already installed.

(11) Using the I/O system setting file

To use the I/O system settings of SW5 or earlier, you need to choose [File] - [Import Earlier Version of I/O System File] in the I/O system settings to read the I/O system setting file.

Refer to Section 5.8.5 for operation details.

(12) Task Bar Settings

If Auto Hide is set in the Microsoft® Windows® Operating System task bar settings, the task bar is hidden and not displayed at the bottom of the screen if the GX Developer window is displayed at its maximum size and the GX Simulator initial window is active.

The task bar is displayed when the GX Developer window is reduced or the GX Developer window is set active.

(13) About device range check

If the device range is exceeded in indirect designation using the index register, "OPERATION ERROR" occurs in the GX Simulator.

If "Continue" is selected for [PLC parameter] → <PLC RAS> tab → [Operating mode when there is an error] on GX Developer, GX Simulator stops when this error occurs.

(14) About real number range check

The GX Simulator checks the real number range strictly. If any value cannot be evaluated as a real number, "OPERATION ERROR" occurs.

If "Continue" is selected for [PLC parameter] → <PLC RAS> tab → [Operating mode when there is an error] on GX Developer, GX Simulator stops when this error occurs.

(15) About supported instructions

In the GX Simulator, some instructions are unusable and processed as NOPs. (Refer to Appendix-2 for the supported instructions.)

(16) About operating CPU types

When selected, the A series CPU/Q series CPU (A mode) operates as the A4UCPU, the QnA series CPU as the Q4ACPU, the FX series CPU as the FXCPU, the motion controller as the A4UCPU, and the Q series CPU (Q mode) as the Q25HCPU.

(17) About I/O modules

The GX Simulator does not support I/O modules.

(18) About networks

The GX Simulator does not support networks.

(19) I/O System setting

I/O System setting does not support the local devices. Set the device point that can be executed (valid setting) at a time to 25000 point or less, for device value input on I/O system setting dialog box.

Refer to Section 5.6. for details.

3.4.2 Restrictions and cautions for the A series CPU functions

(1) Special function module Compatibility

The GX Simulator does not support the special function modules.

The special function module buffer memory area capacity is 16 k points × 64 units. It is possible to save to and read from this area but any other access results in an error.

(2) Saving To and Reading From Buffer Memory

Make I/O assignments with GX Developer before saving or reading the special function module buffer memory. (See the GX Developer Operating Manual.)

It is not possible to save to and read from the buffer area unless I/O assignments are made.

(3) Enabling and Disabling the Parameter Setting Items

Some GX Developer parameter settings are disabled by the GX Simulator even if data is set for them.

The settings disabled by the GX Simulator are shown below.

| Parameter | | Setting |
|-------------------|-----------------|--|
| PLC parameter | Memory capacity | Disabled other than Sequence and "File register" of "program capacity". |
| | PLC system | "Output modes except for STOP→RUN" are disabled. |
| | PLC RAS | <ul style="list-style-type: none"> • "Annunciator display mode" is disabled. • Only "Operation error" and "Special function module access error" in the "operating mode when there is an error" are enabled. |
| | I/O assignment | All valid. |
| | Device | "Latch Start" is disabled. |
| Network Parameter | | All disabled. |

(4) Microcomputer Programs

Not supported by the GX Simulator.

(5) PLC Memory Clear

Execute to clear all user data written to the GX Simulator and initialize.

Also execute this function when unstable GX Simulator operation occurs.

(6) A1FXCPU Built-in Functions

If the A1FXCPU type CPU is selected, the A1FXCPU I/O signals become general I/O signals during debugging with the GX Simulator.

Consequently, the A1FX functions are identical to the I/O module functions.

(7) About numeric value range check

Checking the numeric value range strictly, the GX Simulator detects any illegal operation whose divisor is 0.

Execution of $0 \div 0$ will result in "OPERATION ERROR".

(8) About illegal instructions in dedicated instructions

The GX Simulator checks the dedicated instructions for illegal instructions and displays "INSTRUCT CODE ERR.", if any.

(9) About special function module (special function block)

The GX Simulator supports only the buffer memory area of a special function module (special function block).

(10) About memory cassette capacity

The GX Simulator has no memory cassette capacity. A lot of data which would result in an excess of capacity on the actual device will not result in an error and will be written properly.

(11) SFC Programs

Not supported by the GX Simulator.

3.4.3 Restrictions and cautions for the QnA series CPU functions

(1) Special Function Module Compatibility

The GX Simulator does not support the special function modules.

The special function module buffer memory area capacity is 16 k points × 64 modules. It is possible to save to and read from this area but any other access results in an error.

(2) Saving To and Reading From Buffer Memory

Make I/O assignments with GX Developer before saving or reading the special function module buffer memory. (See the GX Developer Operating Manual.)

It is not possible to save to and read from the buffer area unless I/O assignments are made.

(3) Enabling and Disabling the Parameter Setting Items

Some GX Developer parameter settings are disabled by the GX Simulator even if data is set for them.

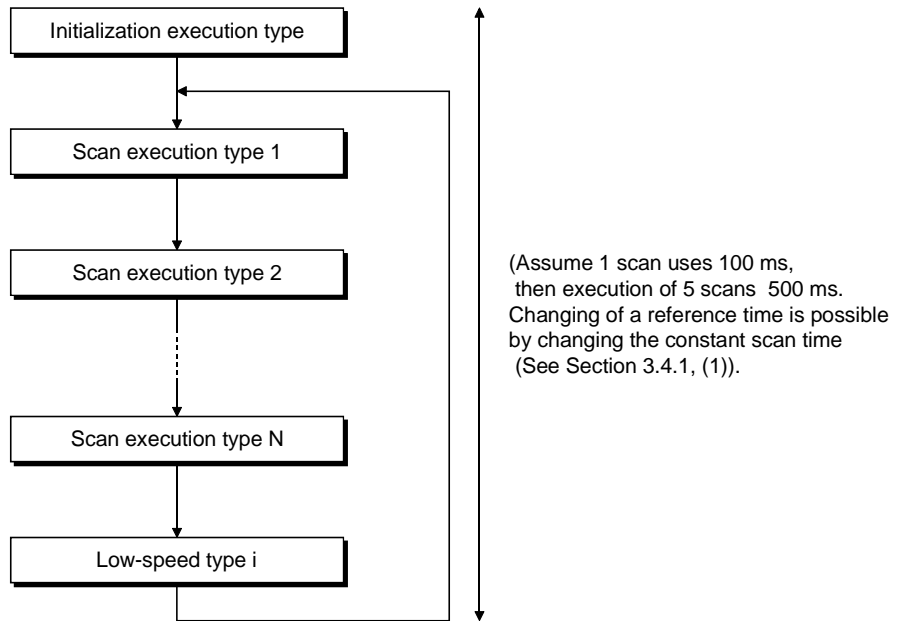
The settings disabled by the GX Simulator are shown below.

| Parameter | | Setting |
|-------------------|----------------|--|
| PLC parameter | PLC name | All disabled. |
| | PLC system | Disabled, except for "Output mode at STOP to RUN" and "Common pointer No." |
| | PLC file | <ul style="list-style-type: none"> • The corresponding memory for the "file register" is disabled. • The "comment file used in a command" is disabled. • The "corresponding memory" for the "device initial value" is disabled. • The "corresponding memory" for the "file for local device" is disabled. |
| | PLC RAS | <ul style="list-style-type: none"> • "Error Check" is disabled. • Only "Operation error" and "Special function module access error" in the "operating mode when there is an error" are enabled. • "Annunciator display mode" is disabled. • "Break down history" and "Lowspeed program execution time" are disabled. |
| | I/O assignment | "Standard settings" (base, Power supply unit, Increase cable) are all disabled. |
| | Device | "Latch Start" is disabled. |
| | Program | All valid. |
| | Boot file | All disabled. |
| | SFC | All disabled. |
| Network Parameter | | All disabled. |

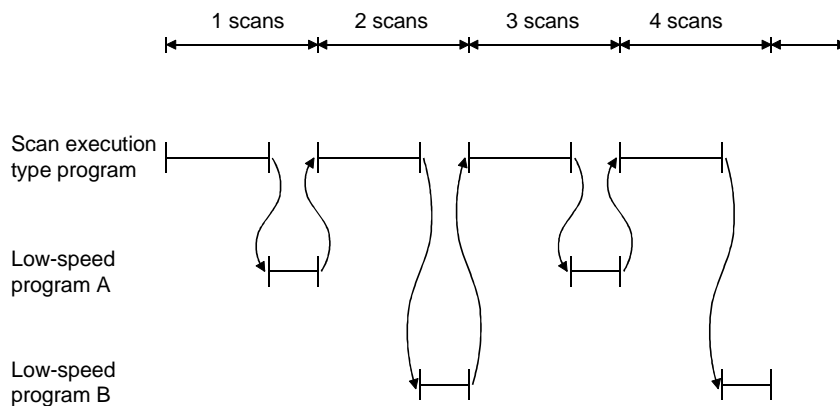
(4) Execution of Low-speed Programs

Regardless of the constant scan setting or setting of the low-speed program execution time, the GX Simulator always executes the low-speed programs after the scan execution programs.

The program execution sequence is show below. (This sequence is identical during step operation.)



During each scan, all scan programs are executed before one low-speed type program is executed. Consequently, if N low-speed programs are set, N scans are required to execute them all.



POINT

Since a low-speed program is always completed within one scan, the monitor value of SM510 is always OFF.

- (5) **Device Memory Monitor Device Range Check**
T31744 to T32767, SB800 to SB7FFF, and SW800 to SW7FFF are used by the system and are unavailable for monitoring or testing.
- (6) **Function register (FD) monitor**
Monitor of function register (FD) cannot be executed from menu of GX Simulator:
Execute only from menu of GX Developer.
- (7) **TTMR Instruction Restrictions**
A present value cannot be changed during TTMR instruction execution.
- (8) **I/O System Setting Device Range Check**
SB800 to SB7FFF and SW800 to SW7FFF are used by the system and cannot be assigned.
- (9) **SFC Programs**
Not supported by the GX Simulator.
- (10) **PLC Memory Format**
Execute to clear all user data written to the GX Simulator and initialize.
Also execute this function when unstable GX Simulator operation occurs.
- (11) **"MISSING END INS" Errors**
If a buffer register (Un\G) with no I/O assignment is used for a program or status setting, "MISSING END INS" is displayed on the LED display.
After correctly setting the I/O assignments, write the parameters to the GX Simulator.



- (12) **About special function module (special function block)**
The GX Simulator supports only the buffer memory area of a special function module (special function block).
- (13) **About built-in RAM/memory cassette capacity**
The GX Simulator has no built-in RAM/memory cassette capacity.
A lot of data which would result in an excess of capacity on the actual device will not result in an error and will be written properly.
- (14) **About Write to PLC of file register data**
When performing Write to PLC of file register data to GX Simulator, always set the execution status to STOP before starting execution.
- (15) **About forced input output registration/cancellation function**
Not supported by the GX Simulator.

3.4.4 Restrictions and cautions for the FX series CPU functions

(1) CPU Type Selection and FXCPU Operation

The GX Simulator for the FX series CPU functions operate according to the CPU functions and device range of the selected CPU.

Application instructions not supported by the selected CPU operate with the GX Simulator.

In cases where the sequence program may contain instructions not supported by the actual PLC due to conversion of a program for a higher model to a program for a lower model or due to input in the list mode, a program error occurs when the sequence program is written to the actual PLC, even if the program runs with the GX Simulator.

For example, the FX₀, FX_{0S} and FX_{0N} PLCs do not support pulse-execution application instructions, but these instructions run with the GX Simulator.

Even so, a program error occurs when this program is written to the actual PLC because it contains non-supported instructions.

(2) STOP → RUN Program Check

A program error is detected by the STOP → RUN program check only if MC/MCR exists in the STL instruction or if no RET instruction is input for a STL instruction.

No other items are detected by the STOP → RUN program check. Therefore, use the GX Developer program check functions in advance to check for these other errors.

(3) Program Memory Capacity

The maximum step capacity for each model is set.

(4) Watchdog Timer

The watchdog timer (D8000) operates every 200 ms for all CPUs. It can be rewritten but the written value has no effect on its operation.

(5) Debugging

The skip execution, partial execution, and step execution functions are only valid when using the GX Simulator.

They cannot be used when an actual PLC is connected.

(6) Buffer Memory Monitor

The special extension device buffer memory in the GX Simulator operates as general registers which allow reading and writing using FROM/TO instructions. This memory does not possess any special functions from the special extension devices.

- (7) **Analog Volume**
The data registers (D8013, D8030, and D8031) storing the analog volume values for the FX₀, FX_{0S}, FX_{0N}, FX_{1S}, FX_{1N} and FX_{1NC} PLCs operate as normal data registers. Use the GX Developer device test functions to write values between 0 and 255 to these registers for testing.
- (8) **SORT Instruction**
The SORT instruction is executed in the actual PLC over multiple scans. However, it is executed completely in a single scan in the GX Simulator and M8029 (complete flag) operates immediately.
- (9) **SFC Programs**
Testing of SFC program for FXCPU described as STL instructions is possible with GX Simulator of SW2D5□-LLT-E or later version.
SFC programs for FXCPU corresponding to GX Developer later than SW5D5C-GPPW-E can also be tested with GX Simulator of SW2D5□-LLT-E or later version.
However, when debugging is to be executed with step execution from SFC display screen of GX Developer, GX Simulator of SW5D5C-LLT-E or later version must be used.
- (10) **Handling Keep Devices**
Contents are maintained at a GX Simulator STOP.
Contents are cleared when the GX Simulator is quit.
- (11) **Handling Non-Keep Devices**
Contents are cleared at a GX Simulator STOP or when the GX Simulator are quit.
- (12) **Memory Clear**
Execute to clear all user data written to the GX Simulator and initialize.
Also execute this function when unstable GX Simulator operation occurs.
- (13) **Quick startup of the GX Simulator with the FX series CPU**
When the GX Simulator is used combining SW5D5C-LLT-E or later and SW5D5C-GPPW-E or later, the GX Developer executes quick startup of the GX Simulator. When other combinations are used, it starts up the GX Simulator at normal speed.
- (14) **About step execution, skip run and partial run**
Compatible with step execution, skip run and partial run, the GX Simulator ensures more efficient debugging.
Refer to (9) for the step execution of SFC programs.
- (15) **About special function module (special function block)**
The GX Simulator supports only the buffer memory area of a special function module (special function block).

3.4.5 Restrictions and cautions for the Motion controller functions

(1) Motion controller Type Selection and Applicable CPU Type

The range of devices or instructions of a motion controller are those of the applicable CPU.

The table below shows the types of CPU applicable to the motion controller.

| Motion Controller | Applicable CPU |
|-------------------|----------------|
| A171SH | A2SH |
| A172SH | A2SH (S1) |
| A173UH (S1) | A3U |
| A273UH (S3) | A3U |

(2) Motion dedicated instructions

The GX Simulator does not support motion dedicated instructions. Thus, when an attempt is made to use motion dedicated instructions on the GX Simulator, nothing will be processed. (NOP)

Motion dedicated instructions are only the following six;
SVST, CHGA, CHGV, CHGT, SFCS, and ITP.

(3) SFC Programs

Not supported by the GX Simulator.

REMARK

Any restrictions and cautions other than the ones described above are the same as those for the A series CPU functions. For the restrictions and cautions for the A series CPU functions, refer to Section 3.4.2.

For details of the motion controller, refer to the Motion Controller User's Manual.

3.4.6 Restrictions and precautions for the Q series CPU functions

1) A mode

For the Q series CPU (A mode) functions, the A series CPU functions perform as equivalent to those of the A4U, and therefore, refer to the restrictions on the A series CPU.

2) Q mode

(1) Compatibility with the special function module

The GX Simulator does not support the special function module.

However, it has the area of 64k points×64 modules for the buffer memory of the special function module. This area can be accessed, but access beyond that will result in an error.

(2) About saving/reading the buffer memory data

When saving/reading the buffer memory data of the special function module, always make I/O assignment on GX Developer. (Refer to the GX Developer Operating Manual.)

Without I/O assignment, buffer memory data cannot be saved/read.

(3) About validity of parameter setting items

Among the parameter setting items of GX Developer, there are setting items which will be invalid for the GX Simulator if their data have been set.

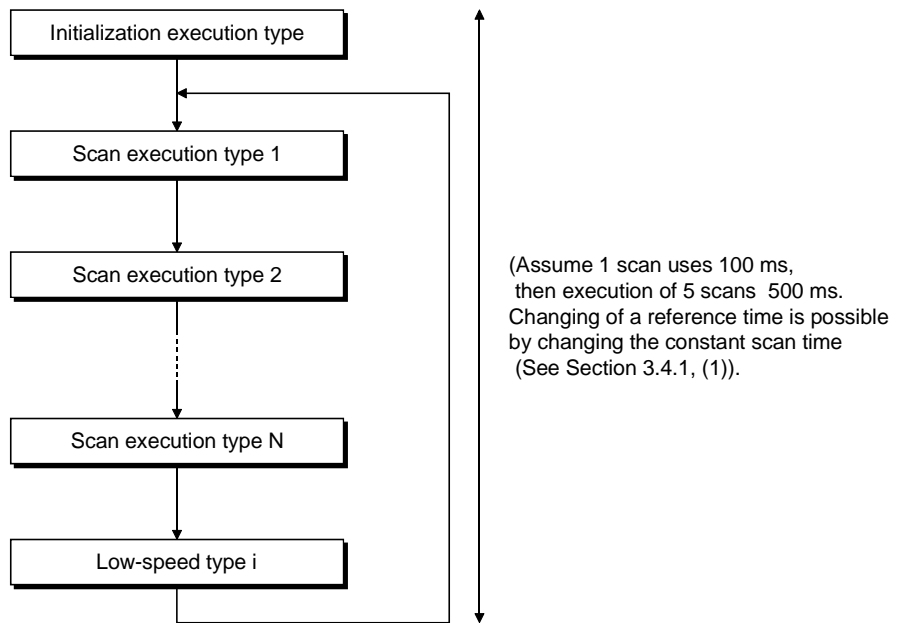
The following setting items are invalid for the GX Simulator.

| Parameters | | Setting Item |
|----------------------|--------------------|--|
| PLC parameter | PLC name setting | All invalid. |
| | PLC system setting | Items except "timer time limit setting", "STOP-RUN/output mode" and "common pointer No." are invalid. |
| | PLC file setting | <ul style="list-style-type: none"> • "Target memory" of "file register" is invalid. • "Comment file used for instructions" is invalid. • "Target memory" of "device initial value" is invalid. • "Target memory" of "file for local devices" is invalid. |
| | PLC RAS setting | <ul style="list-style-type: none"> • "Error check" is invalid. • Items other than "operation error" and "special function module access error" in "error-time operation mode" are invalid. • "Fault history" and "low-speed program running time" are invalid. |
| | I/O assignment | <ul style="list-style-type: none"> • "Model", "switch setting" and "detail setting" of "I/O assignment" are invalid. • "Basic setting" (base, power supply module, extension cable) is invalid. |
| | Device setting | "Latch range" is invalid. |
| | Program setting | <ul style="list-style-type: none"> • "Comment" of "file using method setting" is invalid. • "I/O refresh setting" is invalid. |
| | Boot file setting | All invalid. |
| | SFC setting | All invalid. |
| Network parameters | | All invalid. |
| Multiple PLC setting | | Invalid except "No. of PLC" |

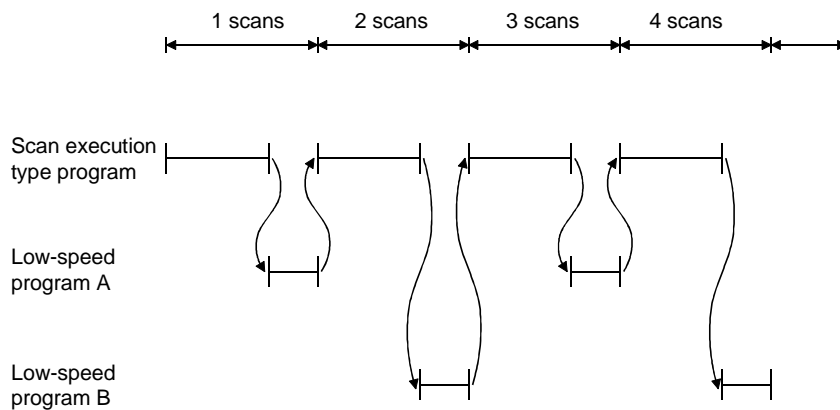
(4) Execution of Low-speed Programs

Regardless of the constant scan setting or setting of the low-speed program execution time, the GX Simulator always executes the low-speed programs after the scan execution programs.

The program execution sequence is show below. (This sequence is identical during step operation.)



During each scan, all scan programs are executed before one low-speed type program is executed. Consequently, if N low-speed programs are set, N scans are required to execute them all.

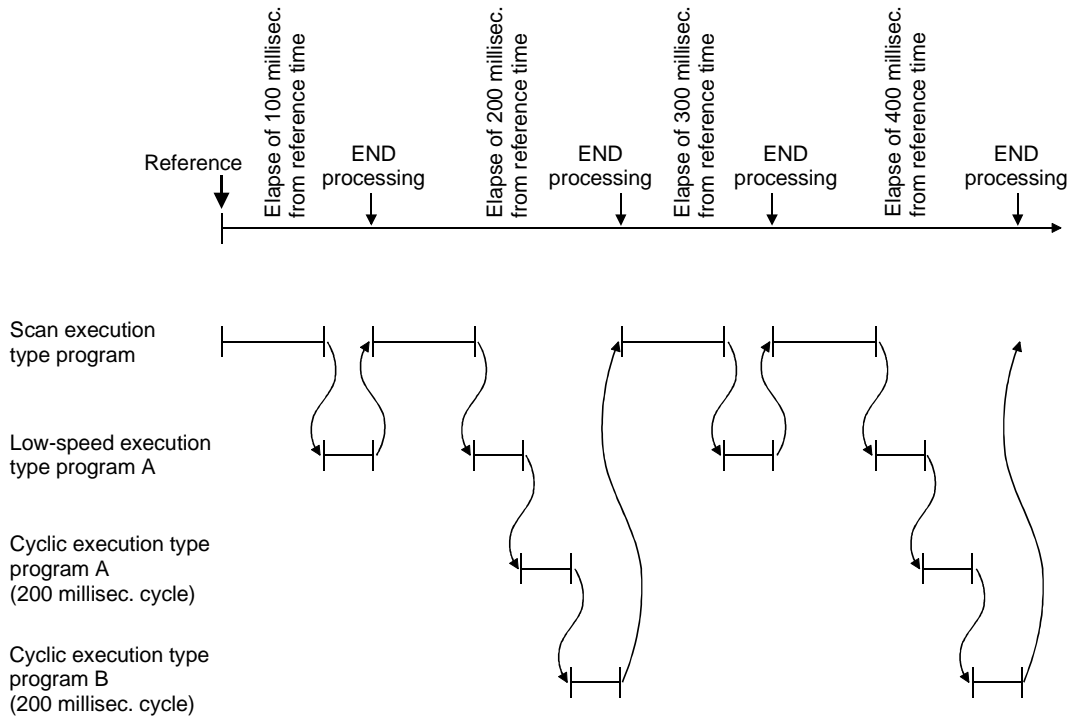


POINT

Since a low-speed program is always completed within one scan, the monitor value of SM510 is always OFF.

(5) About operation of cyclic execution program

A cyclic program judges whether it can run or not by measuring time after the end of a scan execution type and a low-speed execution type. The following timing chart shows the GX Simulator processing timing at the scan time setting of 100 milliseconds and the cyclic program setting of every 200 milliseconds.



(6) About monitoring the function register (FD)

The function register (FD) cannot be monitored from the GX Simulator menu. Monitor it from the GX Developer menu.

(7) About restrictions on TTMR instruction

During execution of the TTMR instruction, the current value cannot be changed.

(8) About SFC program

Not supported by the GX Simulator.

(9) About PLC memory format

Execute to clear all user data written to the GX Simulator and initialize. Also execute this function when unstable GX Simulator operation occurs.

(10) "MISSING END INS" Errors

If a buffer register (Un\G) with no I/O assignment is used for a program or status setting, "MISSING END INS" is displayed on the LED display.

After correctly setting the I/O assignments, write the parameters to the GX Simulator.



(11) About built-in RAM/memory cassette capacity

The GX Simulator has no built-in RAM/memory cassette capacity.

A lot of data which would result in an excess of capacity on the actual device will not result in an error and will be written properly.

(12) About intelligent function module

The GX Simulator supports only the initial value setting, auto refresh setting and buffer memory area of the intelligent function module.

(13) About Write to PLC of file register data

When performing Write to PLC of file register data to GX Simulator, always set the execution status to STOP before starting execution.

(14) About forced input output registration/cancellation function

Not supported by the GX Simulator.

3) Q mode (multiple PLC system)

(1) About the GX Simulator Compatibility with multiple PLC system

The GX Simulator can't be compatible with multiple PLC action itself.

There are reasons that the GX Simulator doesn't support multiple starts and isn't conscious of the number of own machine which is necessary for multiple CPU action. (Consciousness of what number the own machine is in some CPUs.)

It is only the part of the minimum requirements (it run as a single CPU sequence program) to run sequence program (project) for applicable multiple CPU which was written by the GX Developer.

(2) I/O assignment

I/O assignment parameter of the GX Developer appoints control CPU to each I/O and intelligent function units.

Although it is able to read the control information to the GX Simulator, the function isn't compatible without consciousness of own machine. (If it is multiple PLC applicable parameter, it isn't the error for I/O assignment of the GX Simulator original.)

- (3) Difference between the GX Simulator and the practical machine under the access instruction to the shared memory of multiple PLC
Although we use description of own machine/the other machine for expression of difference between the GX Simulator and the practical machine, the GX Simulator have no discrimination between own machine/the other machine.
The GX Simulator allows read from own machine with the FROM command.

3.5 GX Simulator Safety and Handling Precautions

The safety and handling precautions for the GX Simulator are described below.

- (1) The GX Simulator simulates the actual PLC to debug sequence programs.
However, the correct operation of a debugged sequence program cannot be guaranteed.
After debugging with the GX Simulator, before running the program in an actual application, connect a actual PLC and conduct a normal debugging operation.
- (2) The calculated results may differ from actual operation because the GX Simulator does not access the I/O modules or special function modules and do not support some instructions and devices.
After debugging with the GX Simulator, before running the program in an actual application, connect an actual PLC and conduct a normal debugging operation.

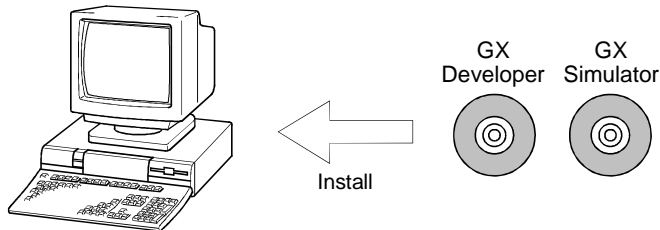
4. COMMON OPERATIONS FOR THE GX Simulator

4.1 Procedure from Installation to Debugging

This section describes the procedures from installing the GX Simulator to debugging a sequence program.

Procedure 1

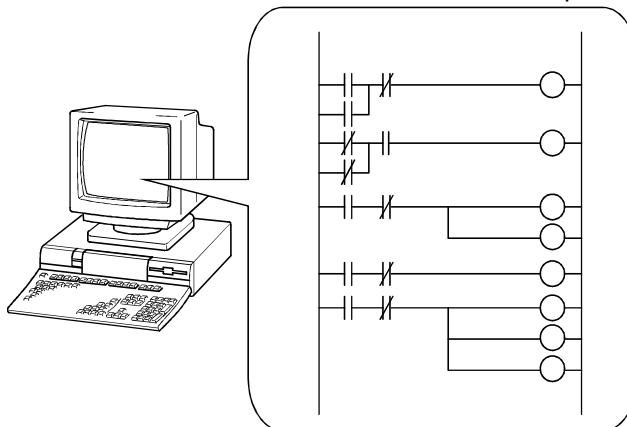
Install GX Developer and the GX Simulator in the personal computer.



Procedure 2

Use GX Developer to create a sequence program.

See the GX Developer Operating Manual.



Procedure 3

In GX Developer, set the parameters to assign the I/Os (for A/QnA/Q series CPU functions) and make the program settings (for QnA series/ Q series (Q mode) CPU functions).

See the GX Developer Operating Manual.

POINTS

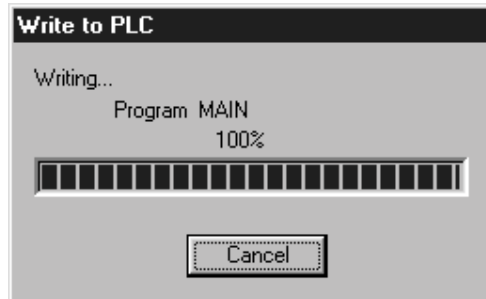
- (1) Always do the program settings for the QnA series/Q series CPU function. If you do not make the program settings and the GX Developer is of version later than SW2D5□-GPPW-E the following will occur.
 - 1) The ladder sequence (list) of the active window of GX Developer will be written.
 - 2) The sequence program will not be written, if the active window is not a ladder (list) window or if there are no active windows.
- (2) Please set the I/O assignments (for A/QnA/Q series CPU function) before reading/writing the buffer memory of special function module. See Section 4.2 (4).

(To next page)

(From previous page)

Procedure 4

Select the [Tools] → [Start ladder logic test] GX Developer menu items to start the GX Simulator. The sequence program and parameters created with GX Developer are automatically written to the GX Simulator (equivalent to write to PLC).

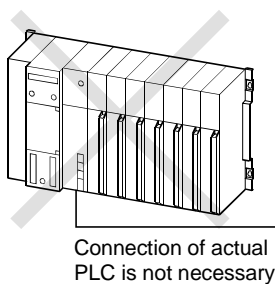


Procedure 5

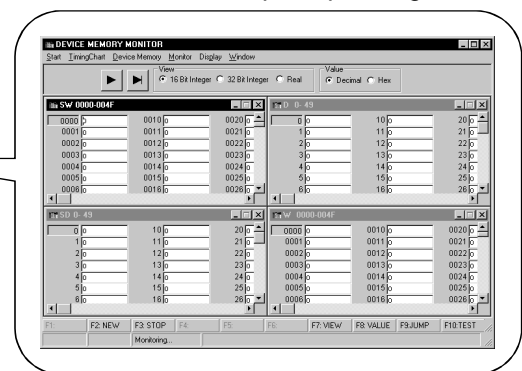
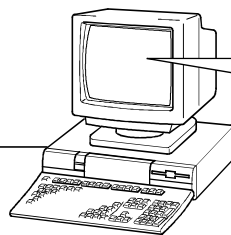
Debug the sequence program using the GX Simulator and GX Developer functions. Debugging is possible by using the device monitor, changing arbitrary device values, or simulation of machine operation.

See "Chapter 5 I/O SYSTEM SETTING FUNCTIONS" and "Chapter 7 MONITOR TEST FUNCTION".

See the GX Developer Operating Manual.



Connection of actual PLC is not necessary



When checking the operation of the frame sent from the external device, you can use the serial communication function for debugging.

See "Chapter 6 SERIAL COMMUNICATION FUNCTION".

Procedure 6

After debugging, modify the sequence program.

See the GX Developer Operating Manual.

Procedure 7

Set the execution status in the initial window to STOP.

If necessary, save the contents of the device memory and special function module buffer memory.

See "Chapter 8 TOOL FUNCTIONS".

Procedure 8

Select the [Online] → [Write to PLC] GX Developer menu items to write the modified program to the GX Simulator.

See the GX Developer Operating Manual.

To debug the program again, repeat Procedures 5 to 8.

4.2 GX Developer Operations before Debugging

This section describes the GX Developer operations required before debugging with the GX Simulator.

Conduct the operations described below before debugging a program with the GX Simulator.

- (1) Make the Project to Create the Sequence Program.

To create a new project, select [Project] → [New project] from the GX Developer menus and make the required settings.

To read an existing project, select [Project] → [Open project] from the GX Developer menus and select the project.



- (2) Create the Sequence Program.

- (3) On the GX Developer side, make parameter settings for I/O assignment (for A/QnA/Q series CPU functions), program setting (for QnA series/Q series (Q mode) CPU functions), etc.

POINT

Always do the program settings for the QnA series CPU function.

If you do not make the program settings and the GX Developer is of version later than SW2D5□-GPPW-E the following will occur.

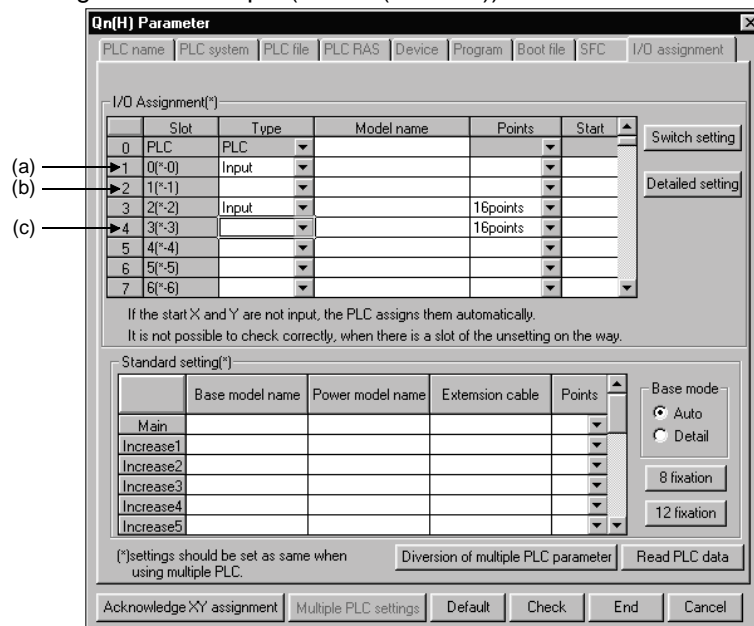
- (1) The ladder sequence (list) of the active window of GX Developer will be written.
- (2) The sequence program will not be written, if the active window is not a ladder (list) window or if there are no active windows.

- (4) When making I/O assignment on the <I/O assignment> tab screen in the [PLC Parameters] dialog box of GX Developer, set the types and the numbers of points of all modules.

"SP. UNIT LAY ERR." occurs if any of the following settings has been made.

- 1) Any of settings (a) to (c) on the following screen has been made.
 - (a) The type has been set but the number of points has not been set.
 - (b) With the settings made to slot 2 and later, the type and the number of points of slot 1 have not been set.
 - (c) The number of points has been set but the type has not been set.
- 2) X/Y settings are overlapped.

Setting screen example (QCPU (Q mode))

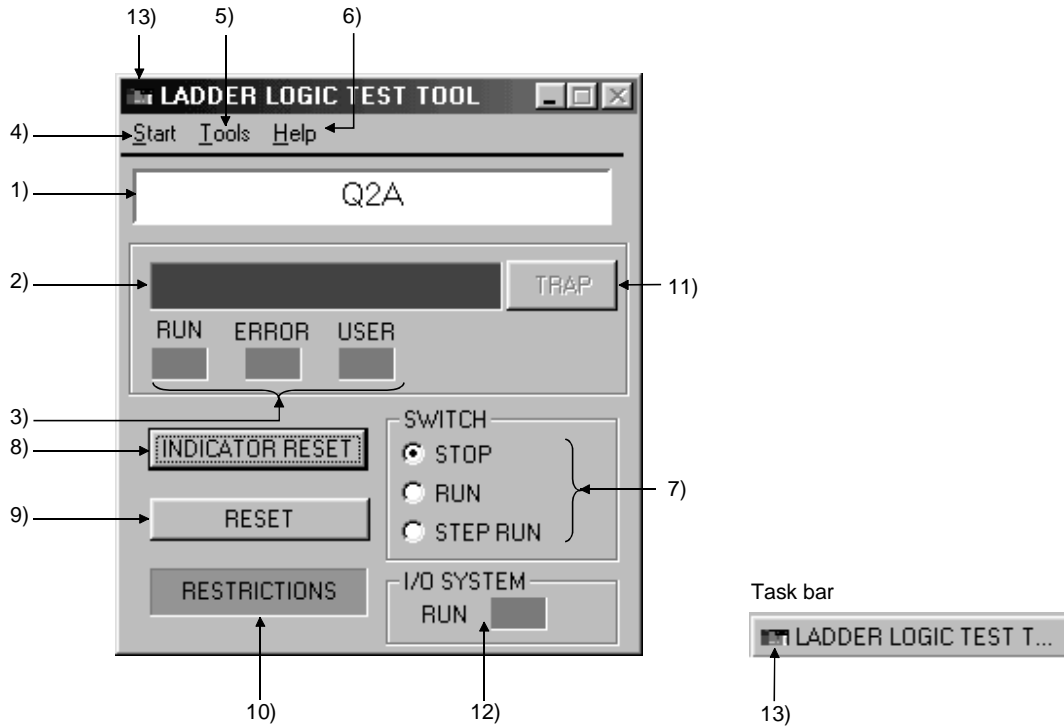


- (5) Select the [Tools] → [Start ladder logic test] GX Developer menu items to start the GX Simulator. An initial window as shown below is displayed. The sequence program and parameters are automatically written to the GX Simulator when the GX Simulator are started by GX Developer. Offline debugging of the sequence program using the GX Simulator is now possible.



4.3 Description of the Initial Window Display

A GX Simulator initial window as shown below is displayed when the GX Simulator is started. This section describes the items displayed in the GX Simulator initial window.



| Number | Name | Description | | | | | | |
|--------|--|---|------|----------------|--|--------|--|------------------|
| 1) | CPU type | Displays the currently selected CPU type. | | | | | | |
| 2) | LED Indicators | <ul style="list-style-type: none"> • Can display up to 16 characters. • The indicator display is equivalent to the display of CPU operation errors. | | | | | | |
| 3) | Operation Status LEDs | <ul style="list-style-type: none"> • RUN/ERROR: Valid for all of the QnA, A, FX, Q series CPU and motion controller functions. • USER : Appears only for the QnA series/Q series (Q mode) CPU functions. | | | | | | |
| 4) | Start | Enables the selection of [Device Memory Monitor], [I/O System Settings] and [Chapter 8 TOOL FUNCTIONS]. | | | | | | |
| 5) | Tools | Use the Tools menu to execute the tool functions. Refer to Chapter 8 Tool Functions. | | | | | | |
| 6) | Help | Displays the GX Simulator licensee name and software version. | | | | | | |
| 7) | Switch Display and Settings | Displays the execution status of the GX Simulator. Click on the radio buttons to change the execution status. | | | | | | |
| 8) | INDICATOR RESET button | Click to clear the LED display. | | | | | | |
| 9) | RESET button | <ul style="list-style-type: none"> • Click to reset the GX Simulator • Displayed only for the A, QnA, Q, and Motion controller series functions. | | | | | | |
| 10) | Unsupported information indicator lamp | <ul style="list-style-type: none"> • Displayed only when unsupported instructions or devices for the GX Simulator is found. • Double clicking this indicator will display the unsupported instructions that have been changed to NOP instructions and their steps. | | | | | | |
| 11) | Error advance display button | Clicking this button will display the descriptions of issued errors, error steps, and the name of files in which the error is issued. (The names of error files are displayed only when using the QnA series/ Q series (Q mode) CPU function.) | | | | | | |
| 12) | I/O system setting LED | <ul style="list-style-type: none"> • LED lights up during execution of I/O system setting. • Double clicking this will show the contents of current I/O system settings. | | | | | | |
| 13) | Icon | Displays the current status (normal or error occurrence). (At error occurrence, the icon is enclosed by yellow.) <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Icon</th> <th>Current Status</th> </tr> </thead> <tbody> <tr> <td></td> <td>Normal</td> </tr> <tr> <td></td> <td>Error occurrence</td> </tr> </tbody> </table> | Icon | Current Status | | Normal | | Error occurrence |
| Icon | Current Status | | | | | | | |
| | Normal | | | | | | | |
| | Error occurrence | | | | | | | |


4.4 Ending the GX Simulator

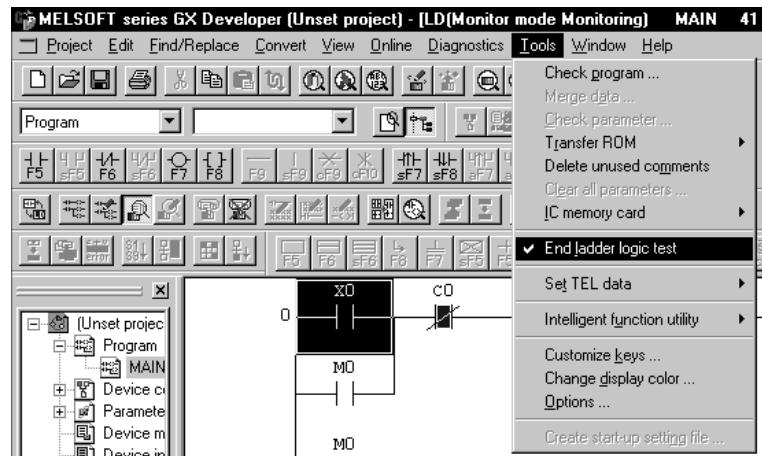
[Purpose]

To end the GX Simulator.

[Operation procedure]

(1) Select [Tool] - [End ladder logic test] of GX Developer menu.

You can also click  of GX Developer for above.



(2) When the dialog box appears, click the  button.



Click!

5. SIMULATION OF EXTERNAL DEVICE OPERATION - I/O SYSTEM SETTING FUNCTIONS

The I/O system setting functions allow simulation of the operation of external devices. In conventional debugging, a debugging sequence program was created to simulate the operation of the external devices.

Using the I/O system setting functions, the operation of the external devices can be automatically simulated without the requirement to create a special debugging sequence program.

(1) Differences between Conventional Debugging and Debugging with the I/O System Setting Functions

A comparison between conventional debugging with an actual PLC connected and debugging using the I/O system setting functions is shown below.

(a) Conventional Debugging

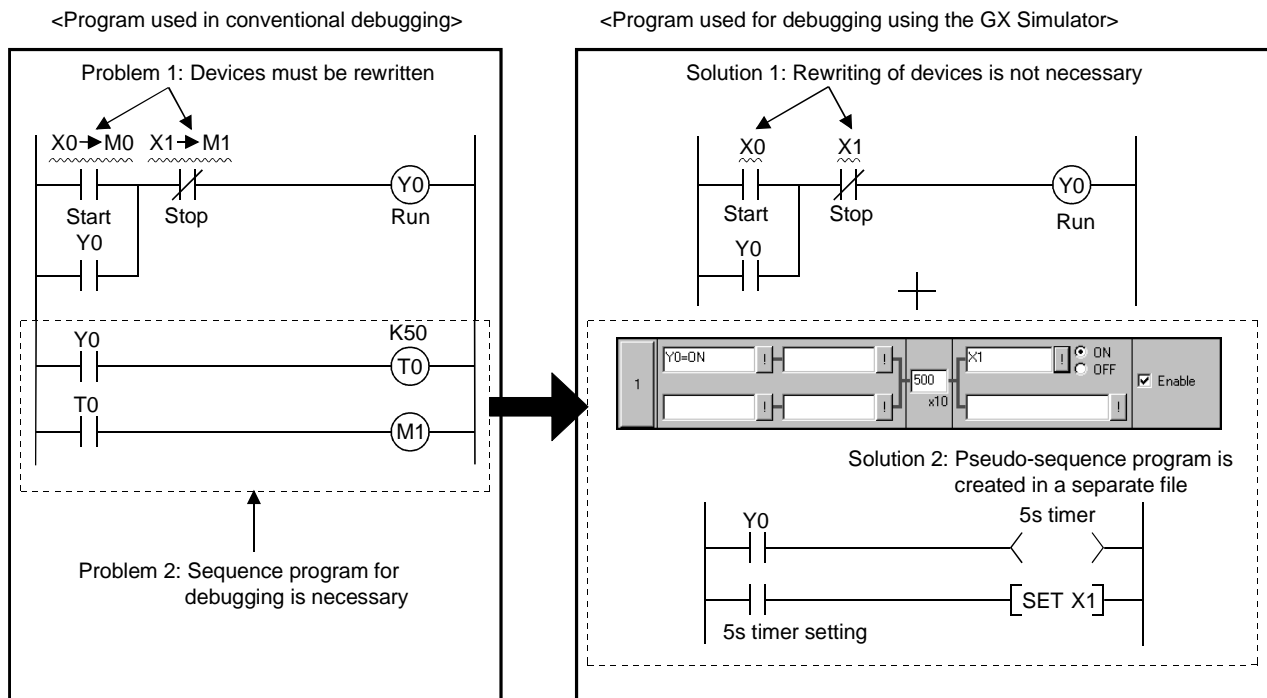
The program must be modified as follows for debugging:

- Add a debugging sequence program to simulate operation of the external devices.
- As an input (X) can be turned ON/OFF only with an external device connected to the I/O unit, modify the program by changing X0 → M0, X1 → M1, etc. to conduct debugging with no external device connected.

(b) Debugging using the I/O System Settings

The I/O system setting function allows sequence program settings and changes to be made for debugging from the setting window.

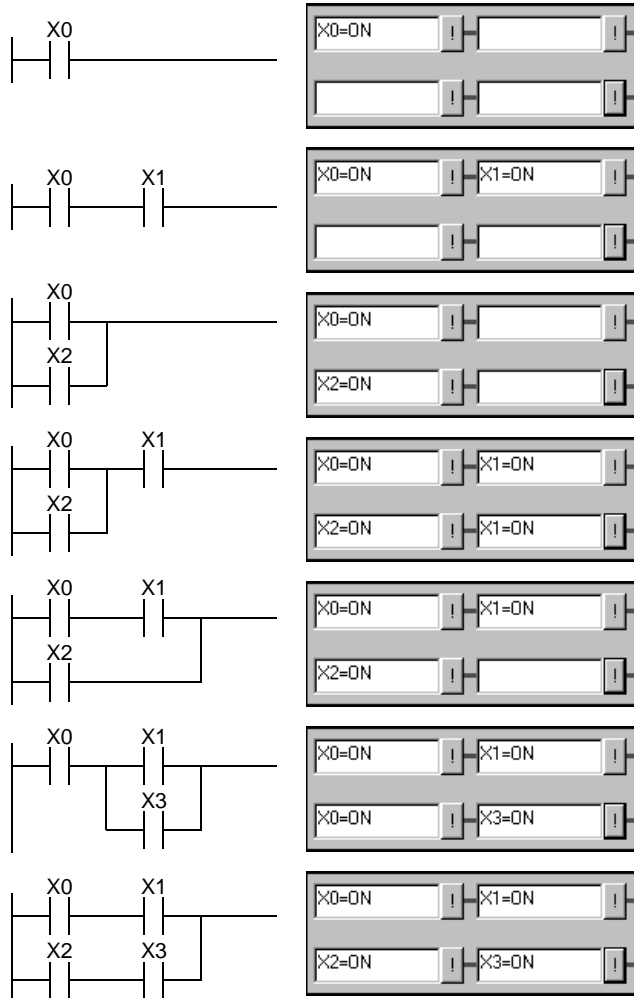
It is unnecessary to add a sequence program. It is not necessary to rewrite the devices (X0 → M0) as the inputs (X) can be directly turned ON/OFF from GX Developer.



(2) Conditions for simulation

With I/O system setting, optional operation will be performed after the condition is fulfilled.

By combining conditions, conditions equivalent to the following circuits can be set.



(3) Timing chart input and device value input

With I/O system setting, there are two inputs: one is timing chart input to execute timing chart prepared by user after condition is fulfilled; the other is device value input to set optional device value after specified time has elapsed.

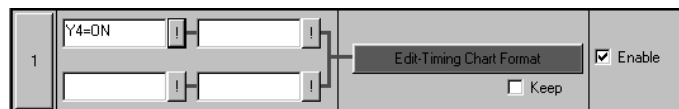
Differences between the above two inputs are described below.

(a) Timing chart input

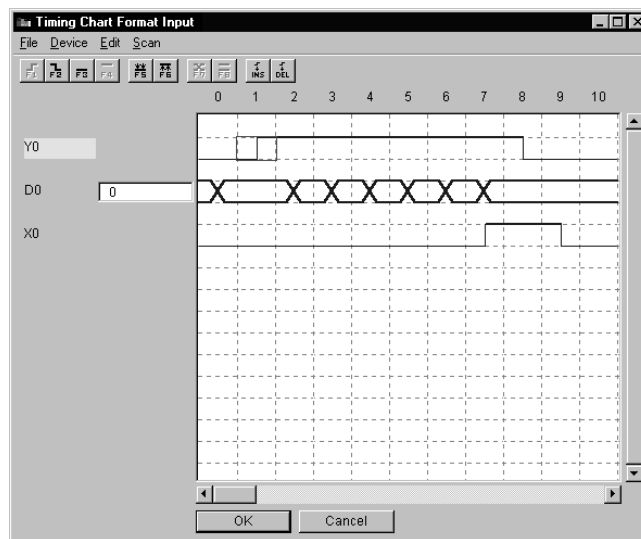
When condition set by user has been fulfilled, timing chart set by the user can be operated.

With this input, complicated operations, such as "When Y0 is turned ON, D0 is counted up, Y0 is turned OFF when X0 is turned ON", can be set.

However, the timer cannot be set: If timer is to be used, select device value input.



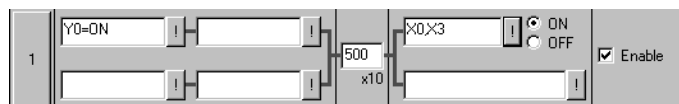
<Timing chart format input screen>



(b) Device value input

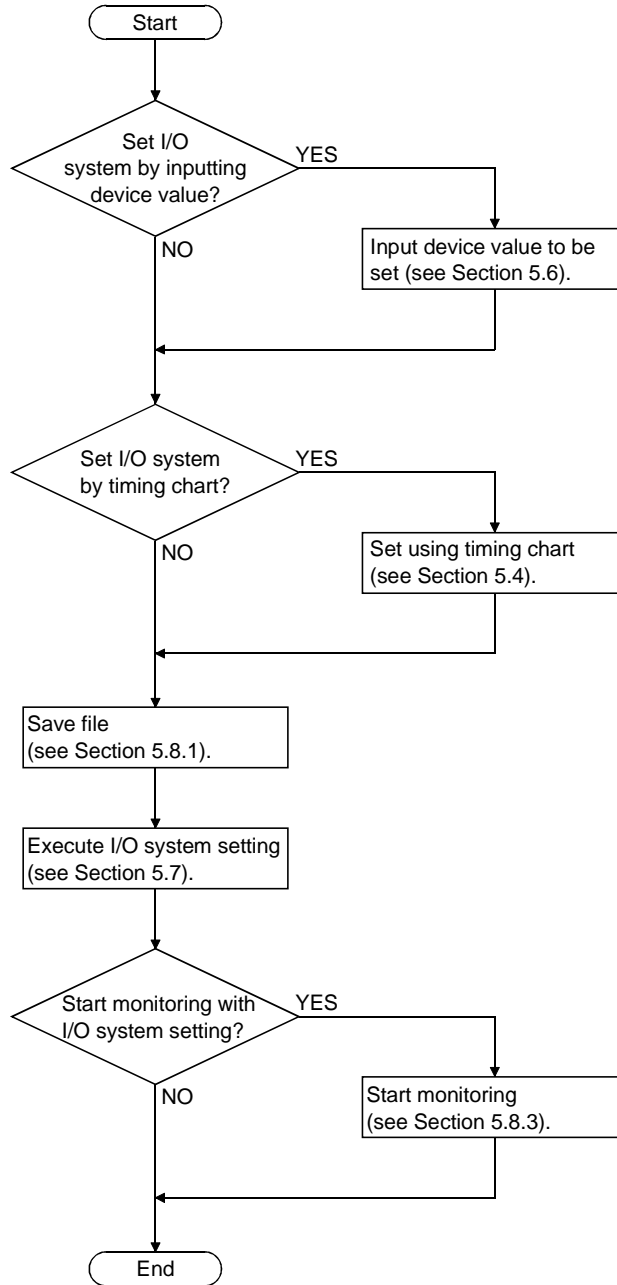
When condition set by user has been fulfilled, specified device value can be changed after an optional time has elapsed.

With this input, an operation such as "When Y0 is turned ON, 5 seconds later X0 and X3 are turned ON" can be set.



5.1 I/O System Setting Operation Procedure

Operation procedure for I/O system setting is shown below.



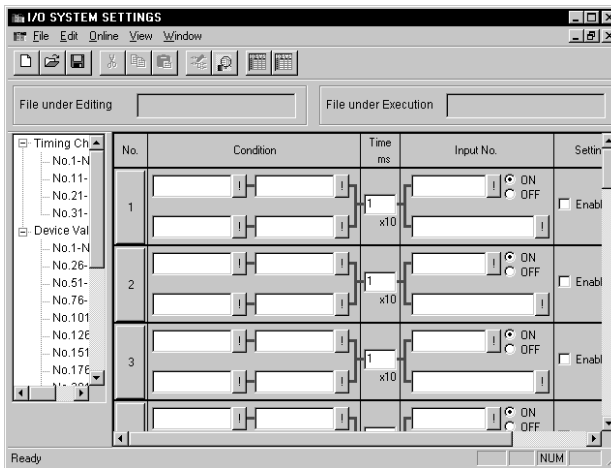
5.2 Start and End of I/O System Setting

(1) Starting I/O system setting
[Purpose]

To start I/O system setting.

[Operation procedure]

Select [start] - [I/O system settings] from the initial window.

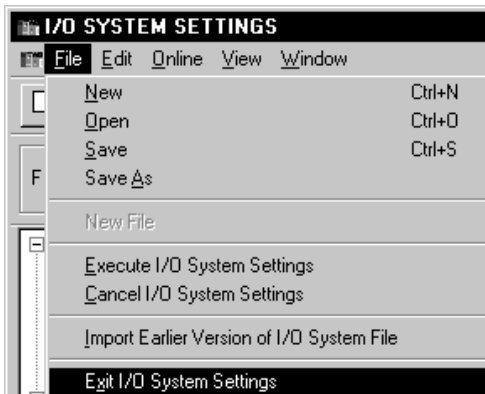


(2) Ending I/O system setting
[Purpose]

To end I/O system settings.

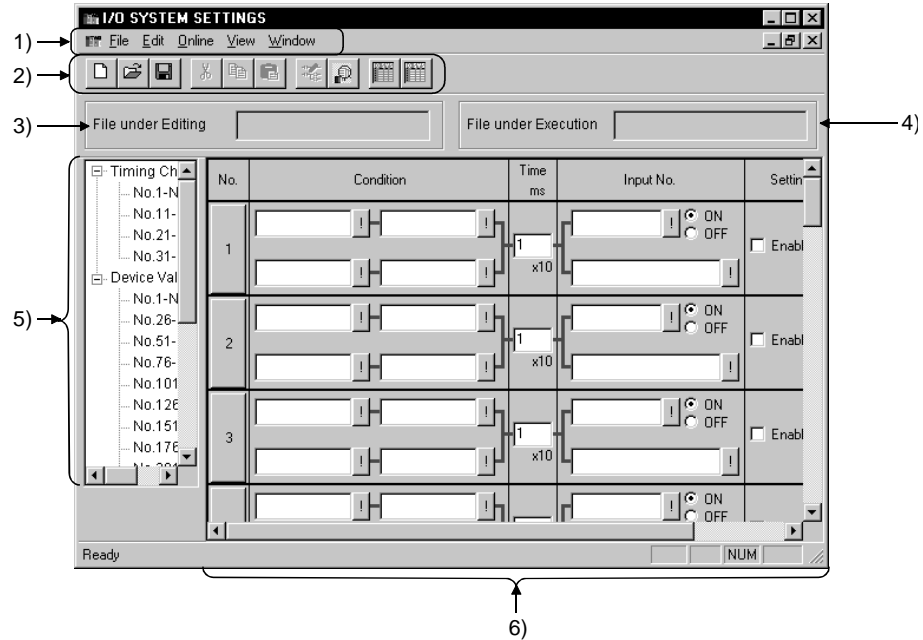
[Operation procedure]

Select [File] - [Exit I/O System Settings] from I/O system settings screen.



5.3 Configuration of I/O System Settings Screen

I/O system settings screen is opened by clicking [Start] - [I/O System Settings] of initial window. Configuration of I/O system settings screen is shown below.



1) Menu bar

Name of menu that can be used in I/O system settings is displayed. When menu has been selected, drop-down menu will be displayed and various functions from this menu can be used.

2) Tool bar

From functions assigned by menu bar, those most frequently used are displayed with buttons.

3) File during editing

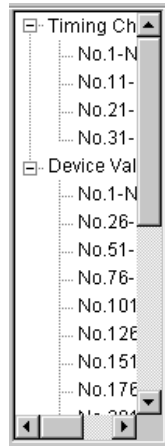
Displays name of file being edited.

4) File being executed.

Displays name of file registered as I/O system execution file.

5) I/O system settings tree

Selects setting method of I/O system settings.



- Timing chart input

Double-click column of number to be set: I/O system setting with timing chart format can now be performed.

Ups to 40 settings (from No. 1 to No. 40) are possible.

- Device value input

Double-click column of number to be set: I/O system setting with device value set can now be performed.

<When using the A/QnA/Q series CPU or motion controller>

You can make 500 settings, No. 1 to No. 500.

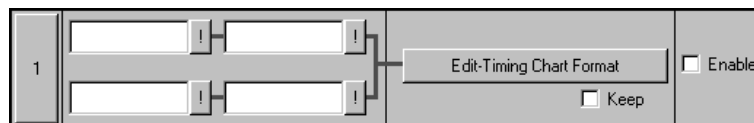
<When using the FX series CPU>

You can make 100 settings, No. 1 to No. 100.

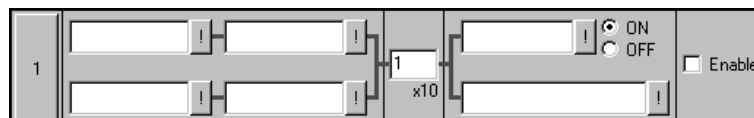
6) Edit/monitor screen

Editing and monitoring of I/O system settings are performed using this screen.

- In timing chart input mode (see Section 5.4)



- In device value input mode (see Section 5.6)

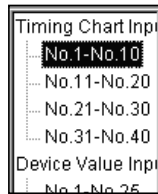


5.4 Setting by Using Timing Chart

This section describes how to perform I/O system settings using timing chart.

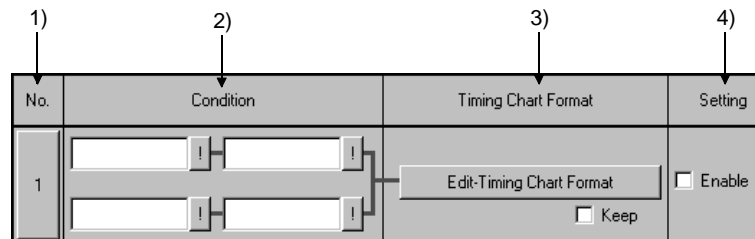
[Operation procedure]

- (1) Select [Start] - [I/O System Settings] from initial window.
- (2) Double-click column of number to set timing chart as shown below.



[Setting window]

Make the setting below in I/O system setting dialog box.



1) No.

The number of settings in the I/O system setting dialog box.
Up to 40 settings can be chosen.

When clicked, set No. is made object of Cut, Copy or Paste.

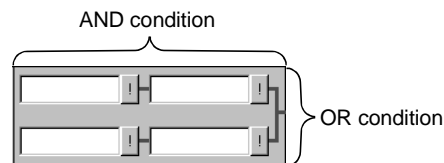
2) Condition

Designates the input condition from GX Simulator.

The input conditions can be designated as either a bit device or a word device.

For a bit device, designation condition is ON/OFF; for a word device, designation condition is a comparison (=,<,>,<=,>=) with a constant or another word device.

In addition, relational conditions can be set by specifying AND/OR operation.



AND ... The condition will be fulfilled if both designated conditions on the left and right are achieved. Otherwise, the condition will not be fulfilled.

OR..... The condition will be fulfilled if either or both of designated conditions in upper and lower columns are achieved.

- Input method (direct input)


Entering condition expression directly can perform setting.

<Example>

For a bit device: X0=OFF, M10=ON

For a word device: D5<20, D15<>5, D20=2, D25>=10, D0=D50

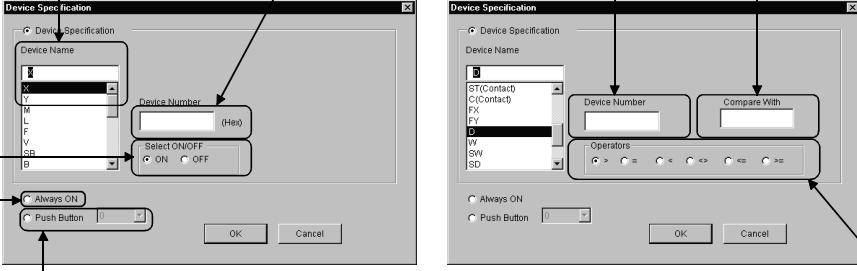
- Input method (entering by using dialog box)

Click  button and enter device name, device No., designated condition, etc.

Object of comparison is handled as a 16 bits hexadecimal integer.

When designated as K○○, setting is done using decimal number, and designated as H○○, a hexadecimal number. If neither K nor H is designated, decimal number setting will be selected.

Refer to Appendix 3.1 for devices that can be entered in the Condition area.



When a bit device is selected:

- Selects device name.
- Enters device No.
- Selects ON or OFF condition.
- Selects when "Normally ON" is set.
- When a bit device is selected:
- Selects to use as Push button in monitor mode. With Push button, you can make 500 settings, 0 to 499 (100 settings, 0 to 99, when using the FXCPU). User can fulfill conditions with optional timing by using the push button.

When a word device is selected:

- Enters device No.
- Enter object device name and value.
- Selects comparison designation.

POINT

Index representation (eg. D0Z0), representation of a word device in bits form (eg. D0,0), and sets of bits device representation (eg. K4X0) are not allowed in the Condition area.

3) Timing chart format

- **Edit-Timing Chart Format** button

Click this button: The timing chart format input screen will appear.

Refer to Section 5.5 for operation of screen/

- Continuing

When timing set by timing chart input is to be executed continuously, apply check mark to check box.

4) Setting

Designates enable or disable for each setting.

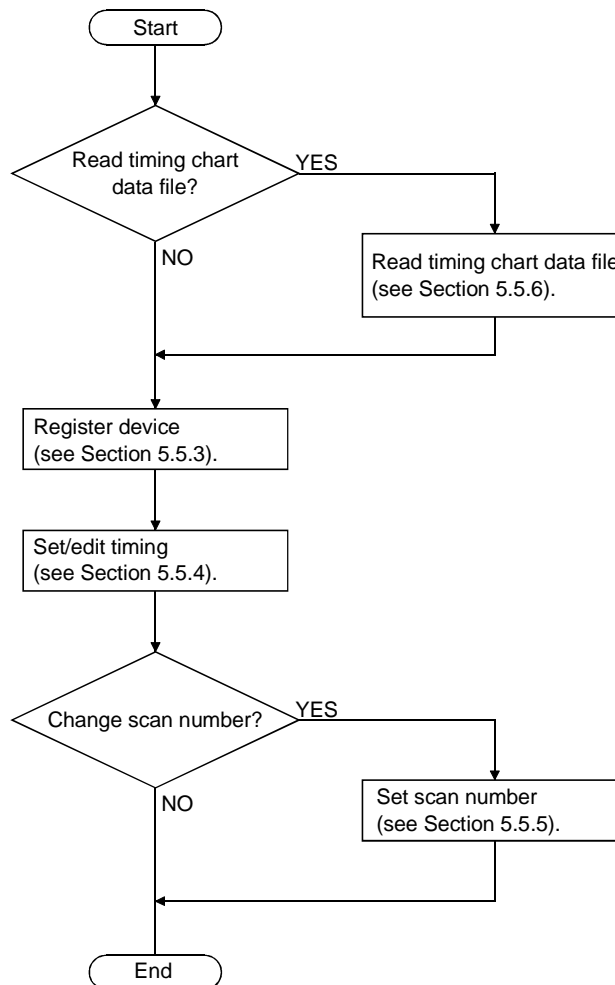
Apply a check mark to enable the setting.

5.5 Operation of Timing Chart Format Input Screen

This section describes operation of timing chart format input screen.

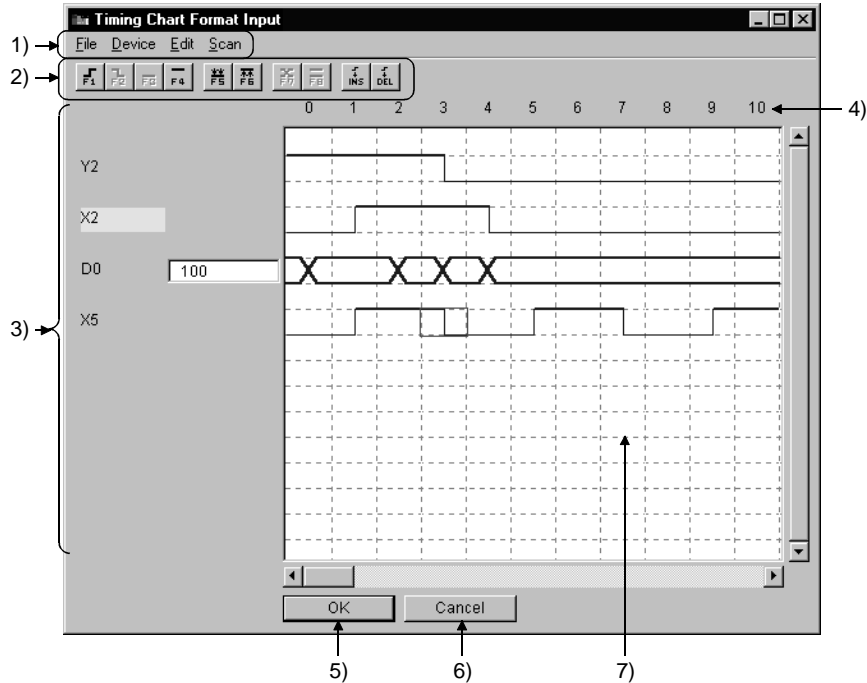
5.5.1 Operation procedure of timing chart format input screen

The operation procedure of timing chart format input screen is indicated below.



5.5.2 Configuration of timing chart format input screen

Configuration of timing chart format input screen is described below.



1) Menu bar

Name of menu, which can be used in timing chart format input screen, is displayed.

When menu has been selected, drop-down menu will be displayed and various functions from this menu can be used.

2) Tool bar

From functions assigned by menu bar, those most frequently used will be displayed with buttons.

3) Device name/device value

Bit device: When timing at cursor position is ON, device name lights (Yellow).

Word device: Device value, with the timing at cursor position, will be displayed in the text box on the right of device name.

POINT

(1) There are three types, Contact, coil and current value, for each expression of timer (T), Counter (C) and retentive timer (ST) in the timing chart: They are displayed with following the expressions in the timing chart.

| | Expressions used in timing chart | | |
|---------------|----------------------------------|---------|-----------------|
| | Timer | Counter | Retentive timer |
| Contact | TS | CS | STS |
| Coil | TC | CC | STC |
| Present value | TN | CN | STN |

| POINT | |
|---|--|
| (2) Buffer memory and extension file register are displayed as shown below. | |
| <p><Buffer memory></p> <p>The first I/O number of a special function module</p> <p>U ▼ \ G ▲</p> <p>Address</p> | <p><Extension file register></p> <p>Block No.</p> <p>ER ▼ \ R ▲</p> <p>Address</p> |
| When first I/O No. is 4, and address is K30, "U4\G30" will be displayed. | When block No. is 2, and address is K30, "ER2\R30" will be displayed. |
| (3) When a word device is designated as a 32-bit integer, (D) is added to the device name. Example: D0(D), W6(D) | |

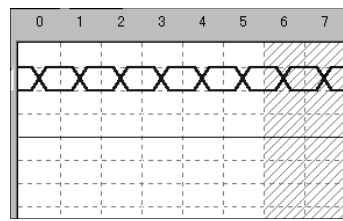
4) Scan number

Shows scan number of timing.

When scan number is set by selecting [Scan] - [Scan setting], disabled scans will be displayed with shading.

When applying check mark to "Keep" on the right of **Edit-Timing Chart Format** button, the enabled scans can be repeated while the condition is being fulfilled.

Example: For continuation with 6 scans designated:



Only 6 scans from 0 to 5 are enabled.

Scans 0 to 5 will be executed repeatedly while the condition is being fulfilled.

5) **OK** button

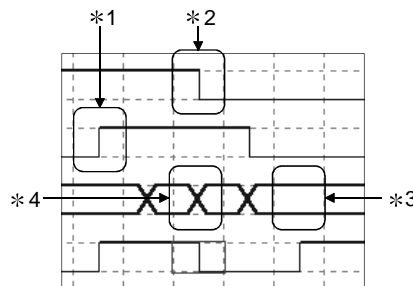
Defines settings and exits from this screen.

6) **Cancel** button

Cancel settings and exits from this screen.

7) Status

Displays state of timing chart being set.



*1: Shows that object device was turned ON from OFF.

*2: Shows that object device was turned OFF from ON.

*3: Shows that object device remains unchanged.

*4: Shows that object device has changed.

5.5.3 Entering/deleting device

(1) Entering device to be simulated
[Purpose]

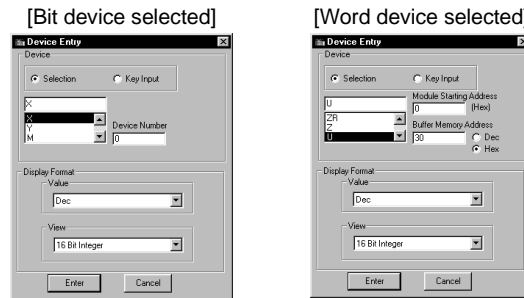
To enter device for setting timing.

[Operation procedure]

(a) Select [Device] - [Enter Device].



(b) Dialog shown below will appear. After setting each item, click **Enter** button.
A maximum of 16 devices can be entered.



| Item | Contents |
|----------------------|--|
| Device name | Selects name of device to be entered. |
| Device No. | Enters device No. |
| Unit initial address | Displayed when "U" is selected with device name. Enter the higher two digits when initial I/O No. is expressed in three digits. Example: In case of X/YIF0, enter "IF". |
| Initial value | Sets initial value. For a bit device, select ON/OFF. For a word device, enter value. |
| Displayed format | Sets display format of word device to be displayed. Both decimal and hexadecimal numbers can be set. Display can be selected from 16 Bit integers, 32 Bit integers and real numbers. |
| Enter button | Enters device. |
| Close button | Closes this screen. |

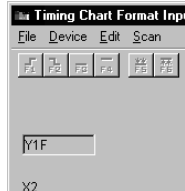
(2) Deleting entered device
[Purpose]

To delete entered device.

[Operation procedure]

(a) Select device to be deleted.

Deleting X1F is described here, as example.



(b) Select [Device] - [Delete Device].

Device has been deleted.




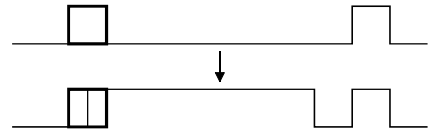

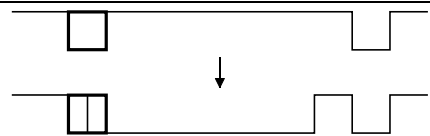

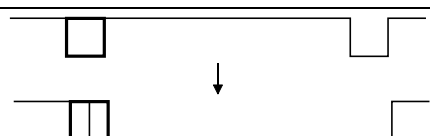

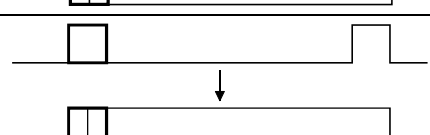

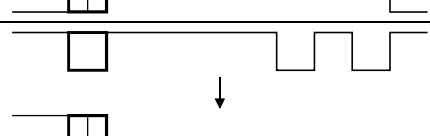

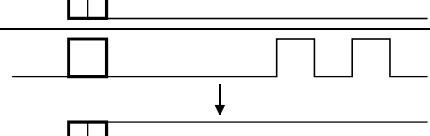

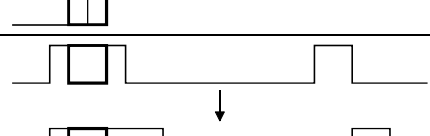

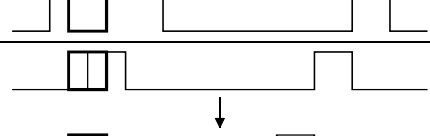
5.5.4 Setting/editing timing


This section describes setting and editing method of timing.

(1) Setting the timing of bit device

Timing of bit device can be set following the procedure shown below.

Move cursor to the timing to be set and operate using any tool button, menu or short-cut key.

| Operation | Tool button | Menu | Short-cut key | Timing |
|---|---|---|---------------|--|
| To turn ON designated timing |  | <ul style="list-style-type: none"> • [Edit] - [Bit Device] - [Device ON] • Right-click, then [Device ON] (Also can be done by double-clicking cursor position.) | F1 |  |
| To turn OFF designated timing |  | <ul style="list-style-type: none"> • [Edit] - [Bit Device] - [Device OFF] • Right-click, then [Device OFF] (Also possible to double-click cursor position.) | F2 |  |
| To turn OFF until next ON timing |  | <ul style="list-style-type: none"> • [Edit] - [Bit Device] - [Progressive OFF]. • Right-click, then [Progressive OFF]. | F3 |  |
| To turn ON until next OFF timing |  | <ul style="list-style-type: none"> • [Edit] - [Bit Device] - [Progressive ON]. • Right-click, then [Progressive ON]. | F4 |  |
| To turn OFF designated timing and all later |  | <ul style="list-style-type: none"> • [Edit] - [Bit Device] - [All OFF]. • Right-click, then [All OFF]. | F5 |  |
| To turn ON designated timing and all later |  | <ul style="list-style-type: none"> • [Edit] - [Bit Device] - [All ON]. • Right-click, then [All ON]. | F6 |  |
| To insert timing |  | <ul style="list-style-type: none"> • [Edit] - [Insert] • Right-click, then [Insert]. | Insert |  |
| To delete timing |  | <ul style="list-style-type: none"> • [Edit] - [Delete] • Right-click, then [Delete]. | Delete |  |

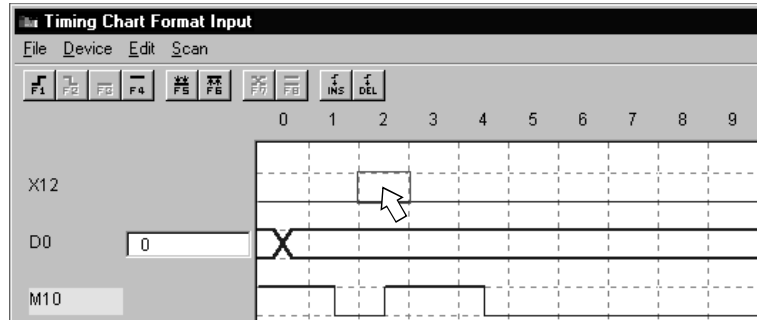
 shows cursor position.

(a) Setting ON/OFF period
[Purpose]

To set ON/OFF continuously, with optional period after designated timing.

[Operation procedure]

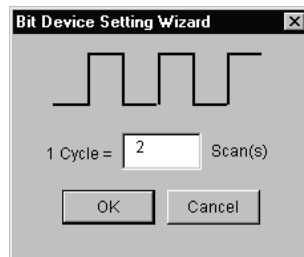
1) Select initial bit device timing.



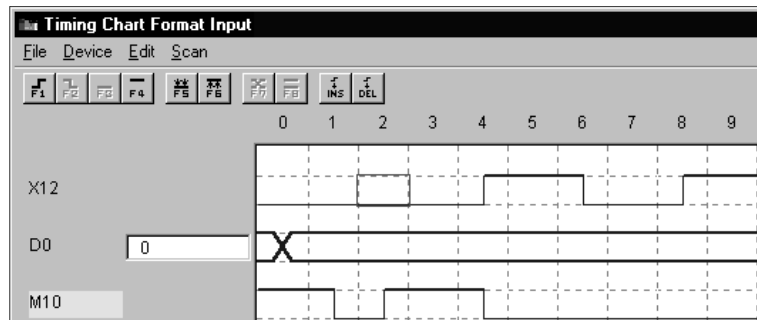
2) Operate either of operations shown below.

- Select [Edit] - [Wizard] menu.
- Right-click, select [Wizard] menu.

3) Bit device setting wizard screen will appear. Enter scan number and click button.



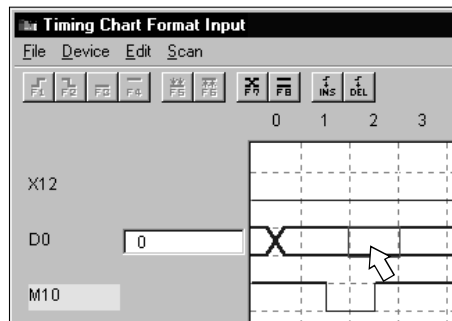
4) Bit device ON/OFF has been set periodically.





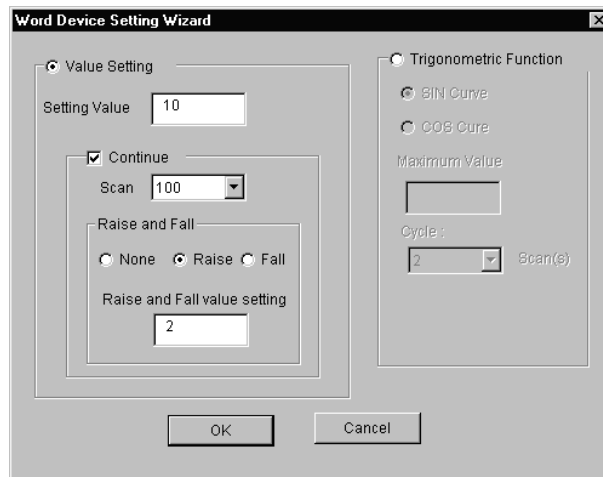
- (2) Setting the timing of word device
 (a) Changing the designated timing value
 [Purpose]
 To change the timing value of designated word device.

[Operation procedure]

- 1) Select timing of word device to be changed.

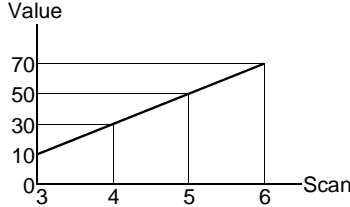
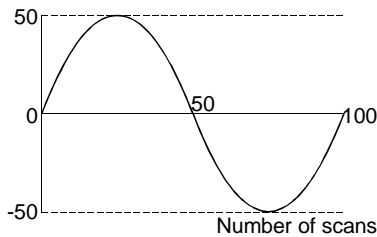
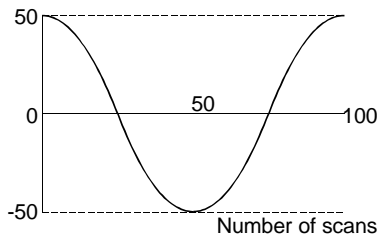


- 2) Operate any one of the following operations:
- Select [Edit] - [Word Device] - [Change] menu.
 - Right-click, then select [Change] menu.
 - Click .
 - Enter "F7" key.
 - Double-click designated timing.
- 3) Word device setting wizard screen will appear: Set each item and click  button.

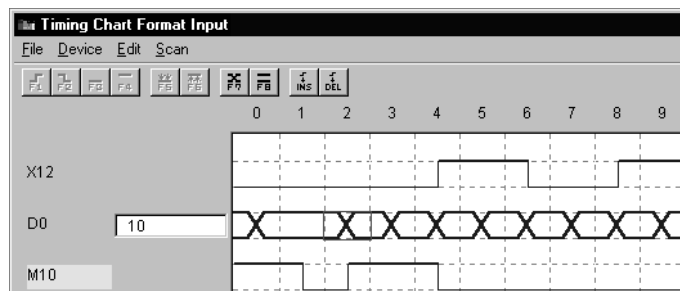


5 SIMULATION OF EXTERNAL DEVICE OPERATION - I/O SYSTEM SETTING FUNCTIONS

MELSOFT

| Item | Contents |
|--------------------------------|--|
| Value setting | |
| Set value | Enter set value of word device. |
| Continuation | Apply check mark when setting is to be performed continuously. (Example) Cursor position is scan No. 3, set value is 10, scan number is 4, changed value is 20 increased.  |
| Scan | Select number of scans to be continued. |
| Increase & decrease | Set to change set value when setting is to be performed continuously. <ul style="list-style-type: none"> • Increase: Select when value is to be increased. • Decrease: Select when value is to be decreased. |
| Changed value | Set increased/decreased value. |
| Trigonometric functions | |
| SIN curve, COS curve | Set when device value is changed as shown below. (Example) Maximum value is 50, periodical scans are 100. <ul style="list-style-type: none"> • SIN curve  <ul style="list-style-type: none"> • COS curve  |
| Maximum value | Enter maximum value. When maximum value is set, minimum value will be set as "-maximum value". |
| Periodic scan | Select number of scans corresponding to 1 period of SIN/COS curve. |

4) Word device value has been set.

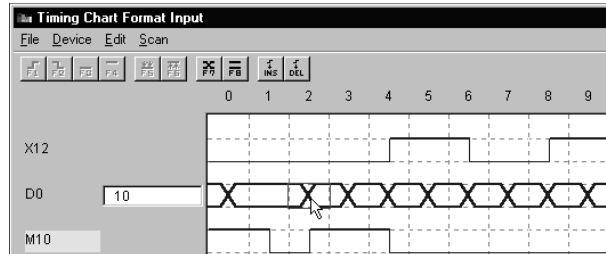


(b) Fixing unchanged designated timing value
[Purpose]


To make certain word device value of designated timing is not changed.

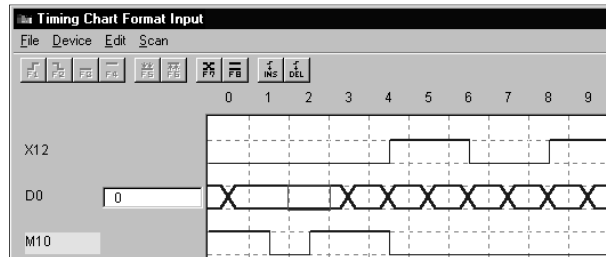
[Operation procedure]

1) Select word device timing that is not to be changed.



2) Operate any one of following operations:

- Select [Edit] - [Word Device] - [No change] menu.
- Right-click, then select [No change] menu.
- Click .
- Enter "F8" key.



Mark of scan No.2 has been changed.

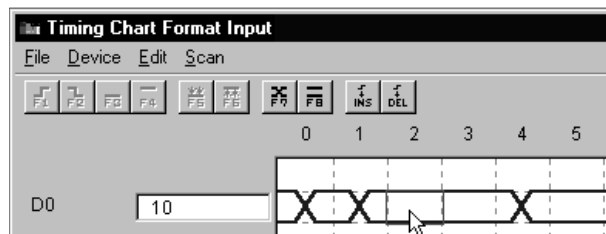
(C) Inserting timing
[Purpose]


Insert the timing before designated timing.

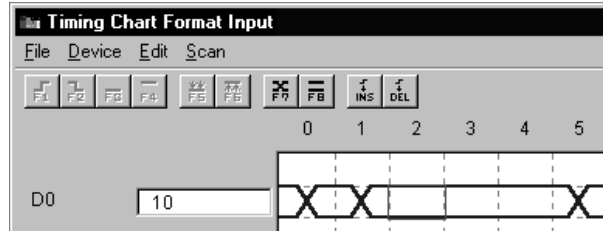
Timing is inserted to the left side of cursor position.

[Operation procedure]

1) Select the timing at the right side of the position where timing is to be inserted.



- 2) Operate any one of the following operations.
 - Select [Edit] - [Insert] menu.
 - Right-click, then select [Insert] menu.
 - Click .
 - Enter "Insert" key.

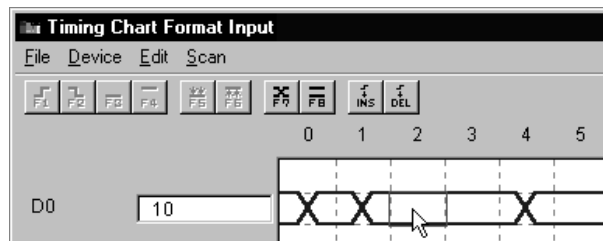



After timing has been inserted, timing will shift to the right.

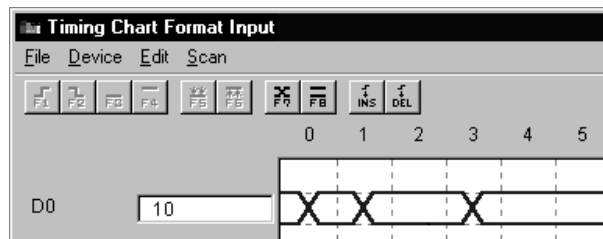
- (d) Deleting the timing
[Purpose]
To delete designated timing.

[Operation procedure]

- 1) Select timing of the position to be deleted.



- 2) Operate any one of the following operations:
 - Select [Edit] - [Delete] menu.
 - Right-click, then select [Delete] menu.
 - Click .
 - Enter "Delete" key.



After timing is deleted, timing will shift to the left.

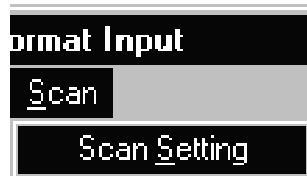
5.5.5 Setting scan number of timing chart

[Purpose]

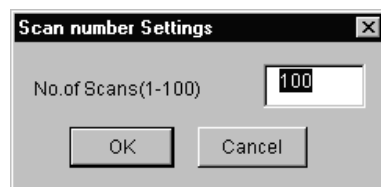
To set scan number of timing input from external device.

[Operation procedure]

(1) Select [Scan] - [Scan Setting].

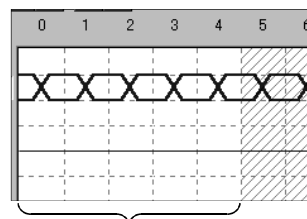


(2) Scan number setting screen will appear: Enter scan number.



(Example)

When Scan number is set to 5, and timing chart is set to "Keep", scanning from 0 to 4 will be repeated as long as the condition is fulfilled.



Only 5 scans from 0 to 4 are effective.

Scanning from 0 to 4 will be repeated as long as the condition is fulfilled.

5.5.6 Other operations

(1) Reading data saved using timing chart of device memory monitor

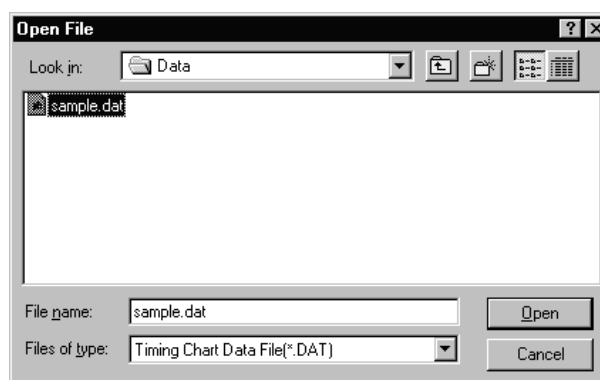
[Purpose]

To read and use timing chart data file (*.DAT) saved with timing chart.
When the file is read, device and timing will be automatically registered. It is not necessary to re-enter them.

[Operation procedure]

Select [File] - [Open File].

[Setting window]



Designate optional file with "Look in", click file to be opened and click **Open** button.

POINT

Devices for only 16 points from upper side of timings (maximum 64 points) set by timing chart screen can be read.
It is necessary to move required timings to upper side before creating timing data file.

(2) Returning to original state before operation

[Purpose]

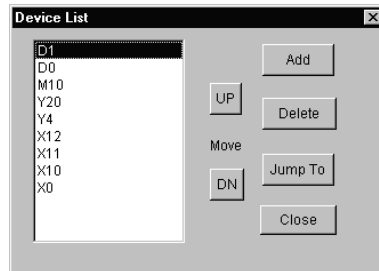
To return to previous state before last operation performed.
Only the operation immediately before can be regained.

[Operation procedure]

Select [Edit] - [Undo].

(3) Displaying registered device list

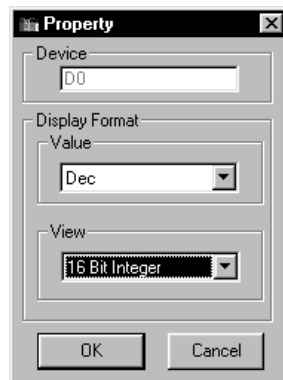
Select [Device] - [List Device]. Registered device list will be displayed.



- Click **Add** button. Device registration dialog will be displayed. Refer to Section 5.5.3 (1) for details.
- By clicking **Delete** button, the device is deleted from object of monitoring. Two or more devices can be deleted by using "**Shift** key + Select" or "**Ctrl** key + Select".
- By clicking **Jump To** button, display of timing chart format input screen jumps to device being selected.
- By clicking **UP**/**DN** button, device being selected moves up or down.
- Selecting Two or more devices
(Two or more devices cannot be selected and moved simultaneously.)

(4) Changing display format of word device

Select [Word Device]. Then select [Device] - [Property]. Dialog shown below will appear: Display format can be changed.

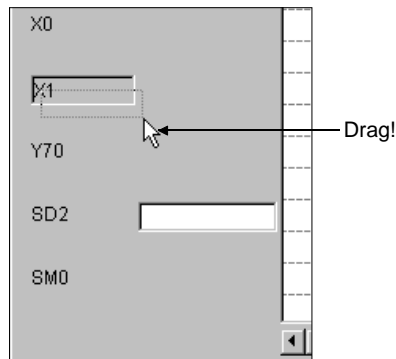


- Value
Selects decimal or hexadecimal number display.
- View
Selects 16 Bit, 32 Bit or real number.

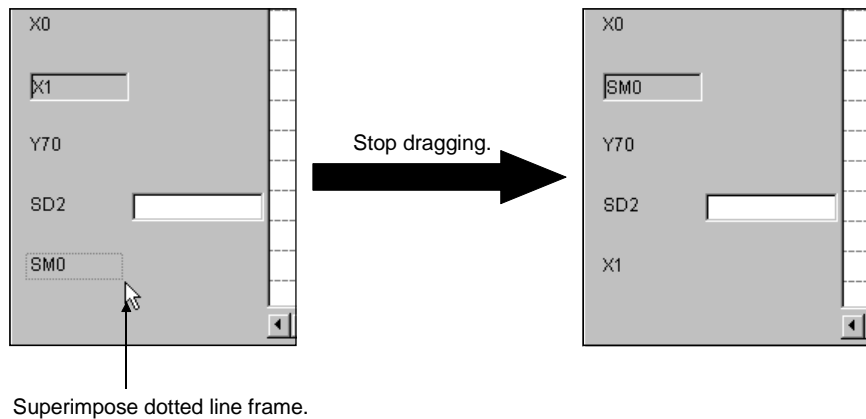
(5) Exchanging device display position

Display position of device can be exchanged by drag & Drop.

(a) Drag the device name in the timing chart format input screen. Dotted line frame will appear during dragging.



(b) Superimpose dotted line frame on the device name to be exchanged. Device name can now be exchanged.

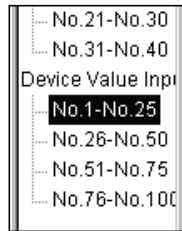


5.6 Setting by Entering Device Value

This section describes I/O system setting by entering device value.

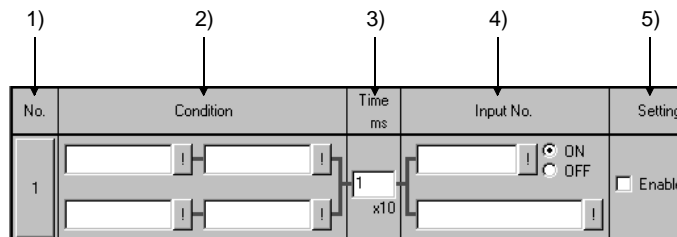
[Operation procedure]

- (1) Select [Start] - [I/O System Settings] from initial window.
- (2) Double-click column of number to which device value is to be set.



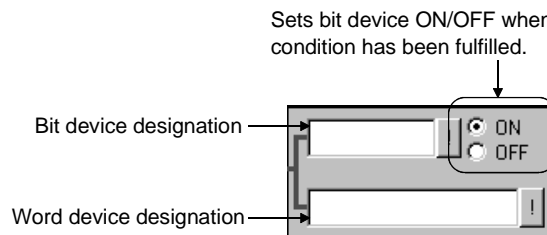
[Setting window]


Perform setting in I/O system setting dialog box as shown below.

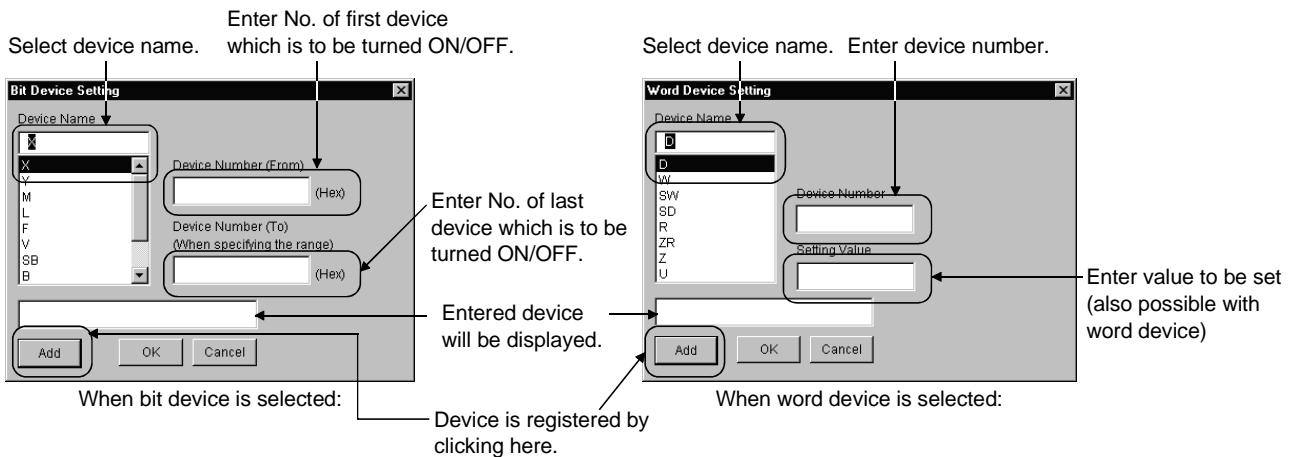


[Description of items]

- 1) No.
Number of settings in I/O system setting dialog box.
Maximum 100 settings can be chosen.
Once the set No. has been clicked, it can be cut, copied or pasted.
- 2) Condition
Since the conditions are the same as those when timing chart is used, refer to Section 5.4 2).
- 3) Timer
Sets the time from the point when designated condition is fulfilled until the input is issued. Enter the time in 10 ms units. The setting range is 1 to 1000 (× 10 ms).
- 4) Input No.
Designates the bit device which is turned ON/OFF once designated condition has been fulfilled. Also designates word device whose value is to be changed.



- Input method (Direct input)
 - Independent device designation.... Designates non-consecutive devices, separated by commas (,).
(Example: D0=10,D2=20,D3=50)
 - Consecutive device designation Designates the first and last of a series of consecutive devices, separated by a hyphen (-).
(Example: X0-100)
 - Mixed device designation..... Designates a mixture of independent and consecutive devices.
(Example: X0, X2, M10-20)
- Input method (using dialog box)
 - Click  button and enter device name and device No., etc.
 - Refer to Appendix 3.2 for devices that can be entered in the input No. area.

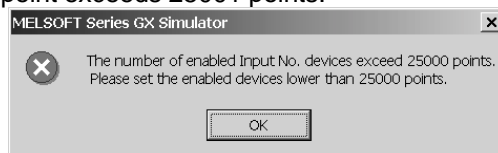


5) Setting

Designates whether each setting is to be enabled or disabled. Apply check mark to check box for the setting to be enabled.

POINT

Set the device point that can be executed(valid setting)at a time to 25000 point or less,for device value input on I/O system setting diaaalog box. The following error message displays if “Execute I/O System Settings” is executed when the device point exceeds 25001 points.



The cursor moves to 25001st point device setting area where “Enable” is set on “Edit/monitor” screen.

5.7 Starting/Stopping the Simulation

Refer to "Section 9.3 Using I/O System Settings for Debugging" for example of simulation.

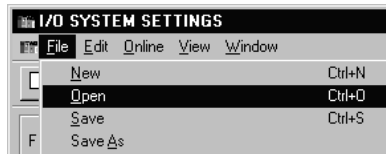
(1) Starting the simulation [Purpose]

To start simulation with contents in I/O system settings.

[Operation procedure]

(a) Select [File] - [Open] to open I/O system setting file (*.IOS).

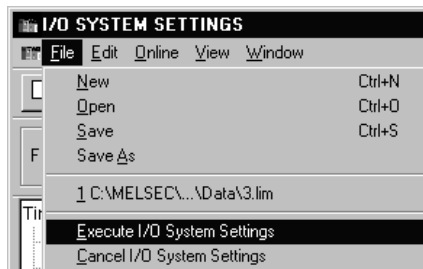
Refer to Section 5.8.1 for details of operation.



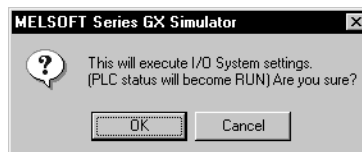
(b) Select [File] - [Execute I/O System Settings].



(Yellow) can also be clicked instead of above.



(c) Dialog box for confirmation will appear: Click **OK** button.



POINT

After changing I/O system setting of a file being opened, the file can automatically be saved by executing the I/O system settings.

If I/O system setting file is not to be saved, save the file under a different file name and execute I/O system settings.

(d) When A/QnA/QCCPU is used, execution state will automatically change from STOP to RUN mode, and simulation will start.

When FXCPU is used, simulation is started by switching the setting in the initial window from STOP to RUN.

- When GX Developer is SW2D5□-GPPW-E or later
After the GX Simulator is started, the set I/O system settings will remain enabled until they are deleted or the GX Simulator is quit.
To use the same I/O system settings when the GX Simulator is restarted, read the I/O system setting data from the saved file, and then execute the I/O system setting again.

| | |
|--------------|--|
| POINT | For FXCPU: If settings are made in RUN status, the status must be switched to STOP once before returning to RUN, to enable the new settings. |
|--------------|--|


(2) Stopping the simulation

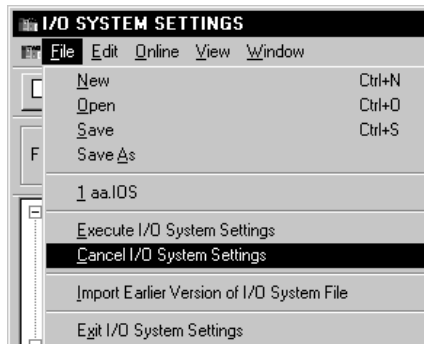
[Purpose]

To stop the I/O system setting operation currently being executed.

[Operation procedure]

(a) Select [File] - [Cancel I/O System Settings].

Also  (White) can be clicked instead of above.



| | |
|--------------|--|
| POINT | When I/O System Settings are not being executed, the I/O system setting LED on the initial window will turn off. |
|--------------|--|

5.8 Other Operations

5.8.1 Operating the file


(1) Creating a new file

[Purpose]

To create a new file (*.IOS) to be used for I/O system settings.

[Operation procedure]

Select [File] - [New].

Also  can be clicked instead of above.




(2) Opening saved file

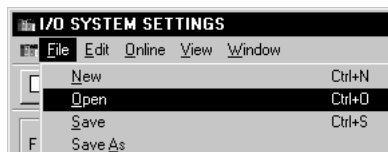
[Purpose]

To open an I/O system setting file (*.IOS) which has been saved.

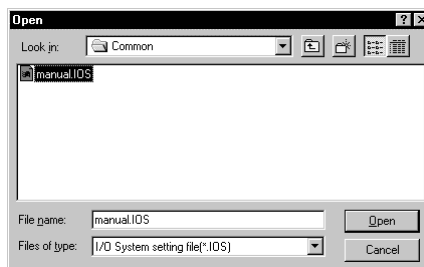
[Operation procedure]

Select [File] - [Open].

Also  can be clicked instead of above.



[Setting window]



Designate optional holder with "Look in", click the file to be opened, then click **Open** button.

(3) Saving the file

[Purpose]

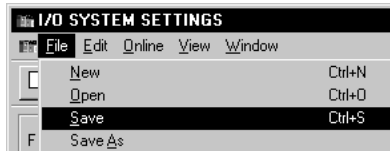
To over-write and save the I/O system setting file (*.IOS) being opened.

[Operation procedure]

Select [File] - [Save].



can also be clicked instead of above.



If file being opened has not been saved, "Save As" dialog will be displayed: Save with optional name entered. Refer to (4) for details.

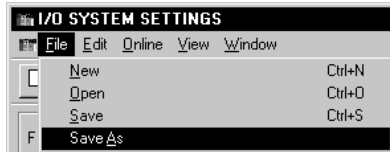
(4) Saving with new name

[Purpose]

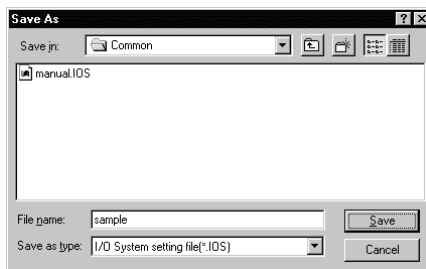
To save I/O system setting file (*.IOS) that is being opened with new name entered.

[Operation procedure]

Select [File] - [Save As].



[Setting window]



Designate optional folder with "Save in", and enter file name to be saved in "File name".

If setting is to be over-written on existing file, select the file to be saved by clicking: Then click **Save** button.

5.8.2 Cutting, copying and pasting all settings in the set No.

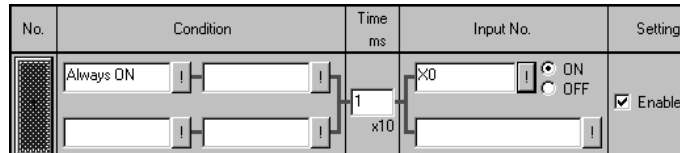
(1) Cutting and copying the selected set No.

[Purpose]

To cut and copy selected set No. and save on clipboard.

[Operation procedure]

(a) Select the set No. to be cut/copied by clicking.



(b) For cutting, select [Edit] - [Cut].



can also be clicked instead of above.

For copying, select [Edit] - [Copy].



can also be clicked instead of above.

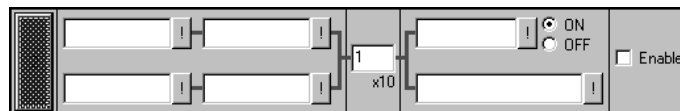
(2) Pasting the cut/copied set No.

[Purpose]

To paste cut/copied set No. to optional position

[Operation procedure]

(a) Select the set No. to be pasted by clicking.

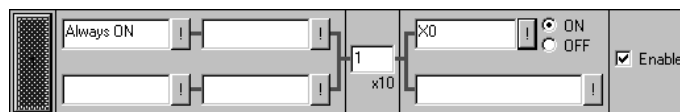


(b) Select [Edit] - [Paste].



can also be clicked instead of above.

(c) Cut/copied set No. has been pasted.



POINT

The set No. copied or cut by device value input cannot be pasted by timing chart input.

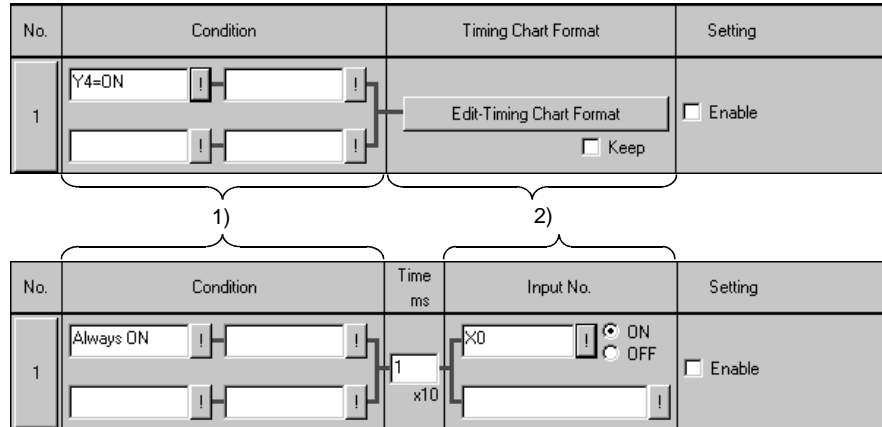
In addition, the set No. copied or cut by timing chart input cannot be pasted by device value input, either.

5.8.3 Batch-enabling/disabling settings

(1) Batch-enabling settings

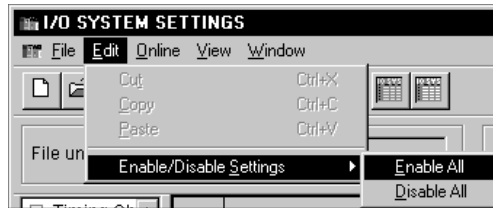
[Purpose]

To enable all set Nos. whose conditions and timing chart formats (or input Nos.) have both been set.



[Operation procedure]

Choose [Edit] - [Enable/Disable Settings] - [Enable All].



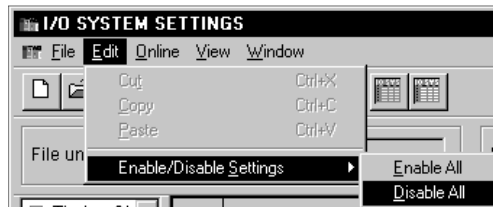
(2) Batch-disabling settings

[Purpose]

To disable all settings.

[Operation procedure]

Choose [Edit] - [Enable/Disable Settings] - [Disable All].



5.8.4 Executing monitoring

(1) Starting monitoring

[Purpose]

To start monitoring a device on the I/O system settings screen.

[Operation procedure]

(a) Select [Online] - [Monitor mode].

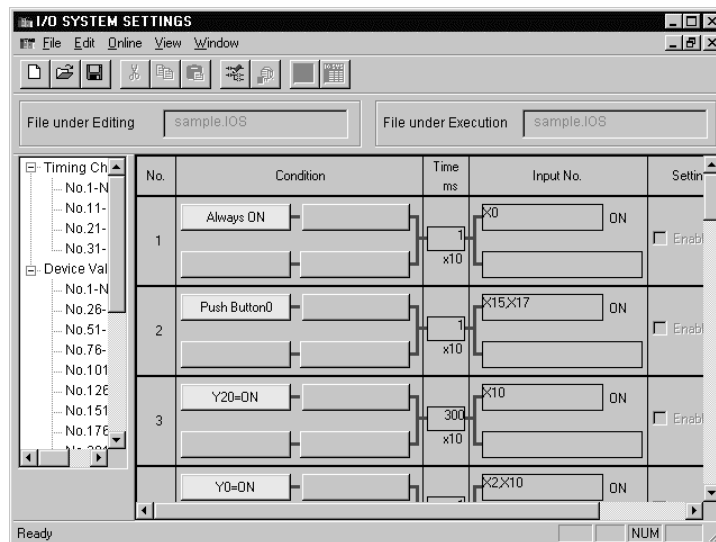


can also be clicked instead of above.



(b) Monitoring will start.

Refer to (3) for details of operation on the screen during monitoring.



(2) Stopping monitoring

[Purpose]

To stop monitoring with I/O system setting screen.

[Operation procedure]

Select [Online] - [Edit mode].



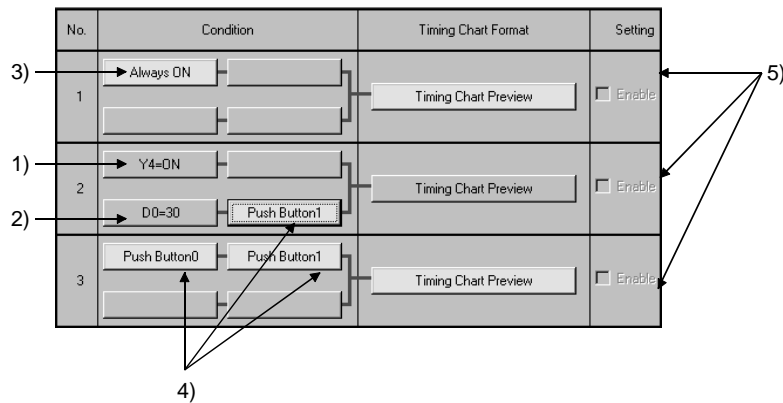
can also be clicked instead of above.



(3) Screen during monitoring

When monitoring is started, I/O system settings screen will appear as shown below:

Area displayed in yellow is effective.



1) Bit device

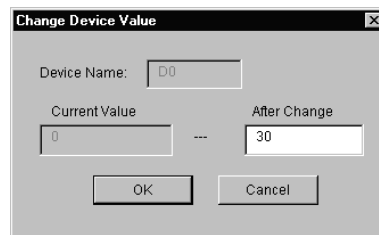
The status of displayed bit device can be inverted by clicking.

As shown on the screen, when "Y4=ON" is indicated, yellow display will show ON status.

If "Y4=OFF" is indicated, yellow display will show OFF status.

2) Word device

Following dialog box is displayed by clicking: Displayed value can be changed.



3) Normally ON

Since ON is normally set, nothing changes even if clicked.

4) Push button

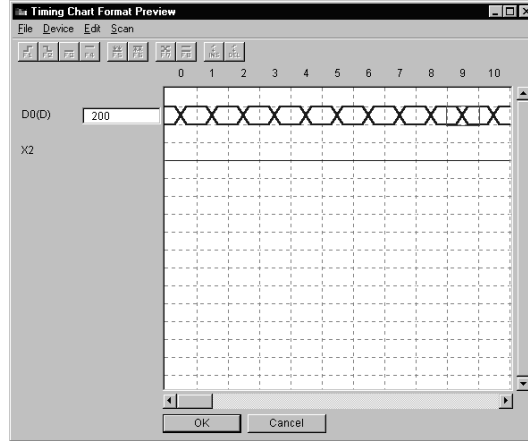
Push button state is inverted by clicking.

If there are push buttons with the same number, all buttons are linked for operation.

(5) **Timing chart preview** button

Timing chart format input screen is displayed by clicking and the set contents can be confirmed.

However, the contents of this displayed screen cannot be edited.



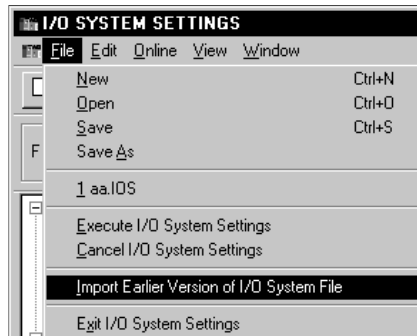
5.8.5 Reading I/O system setting file for SW5 or earlier versions

[Purpose]

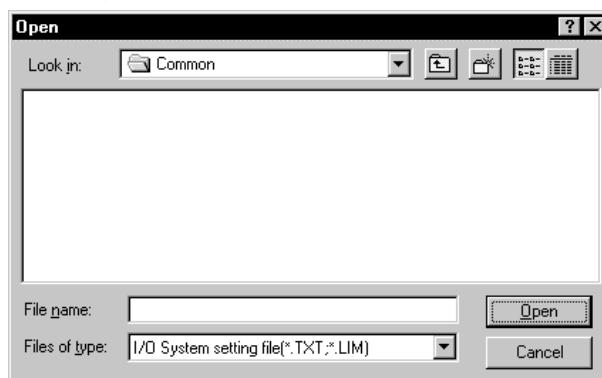
To read I/O system setting file for SW2D5□-LLT-E to SW5D5C-LLT-E.

[Operation procedure]

Select [File] - [Import Earlier Version of I/O System File].



[Setting window]



Specify any folder in "Look in", click the file to be opened (*.TXT, *.LIM), and then click the **Open** button.

POINT

When reading a SW5D5 format file, specify a LIM file (*.LIM).

6. COMMUNICATION WITH EXTERNAL DEVICE - SERIAL COMMUNICATION FUNCTION

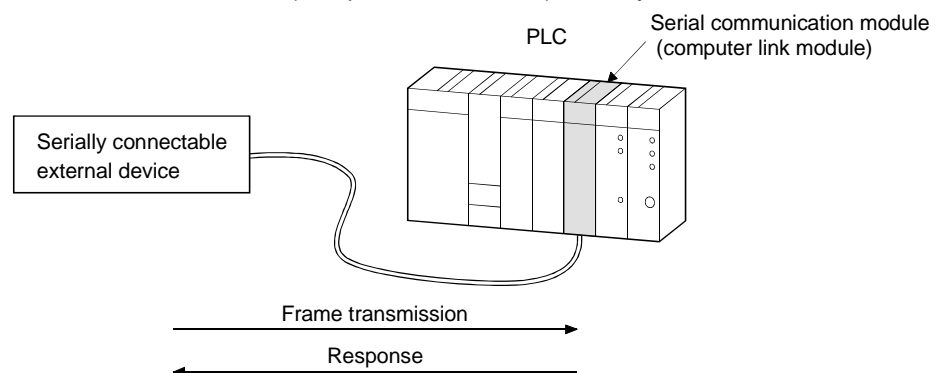
The serial communication function allows you to easily check whether the frame (A-compatible 1C frame, QnA-compatible 3C/4C frame) used for access from an external device to the PLC CPU via a serial communication module (computer link module) is in a correct message format or not.

Since this function also enables devices to be accessed, you can check/change device contents easily on an external device.

Conventionally, the serial communication module (computer link module) was actually connected with the external device to check operation. Using this function, however, you can easily check the message format and device contents between GX Simulator and external device.

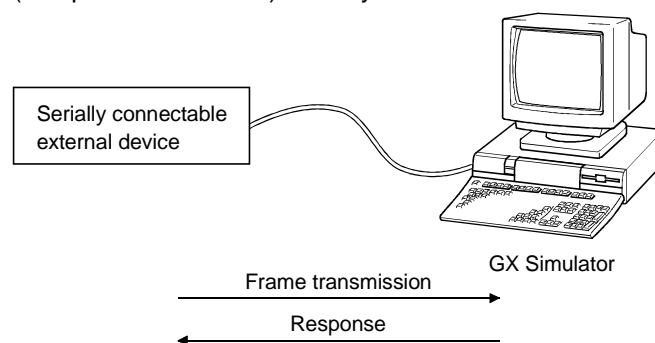
<Conventional debugging>

Debugging was performed with the external device connected with the serial communication module (computer link module) actually.



<Debugging using GX Simulator>

Since GX Simulator responds to the frame sent from the external device, the external device need not be connected to the serial communication module (computer link module) actually.

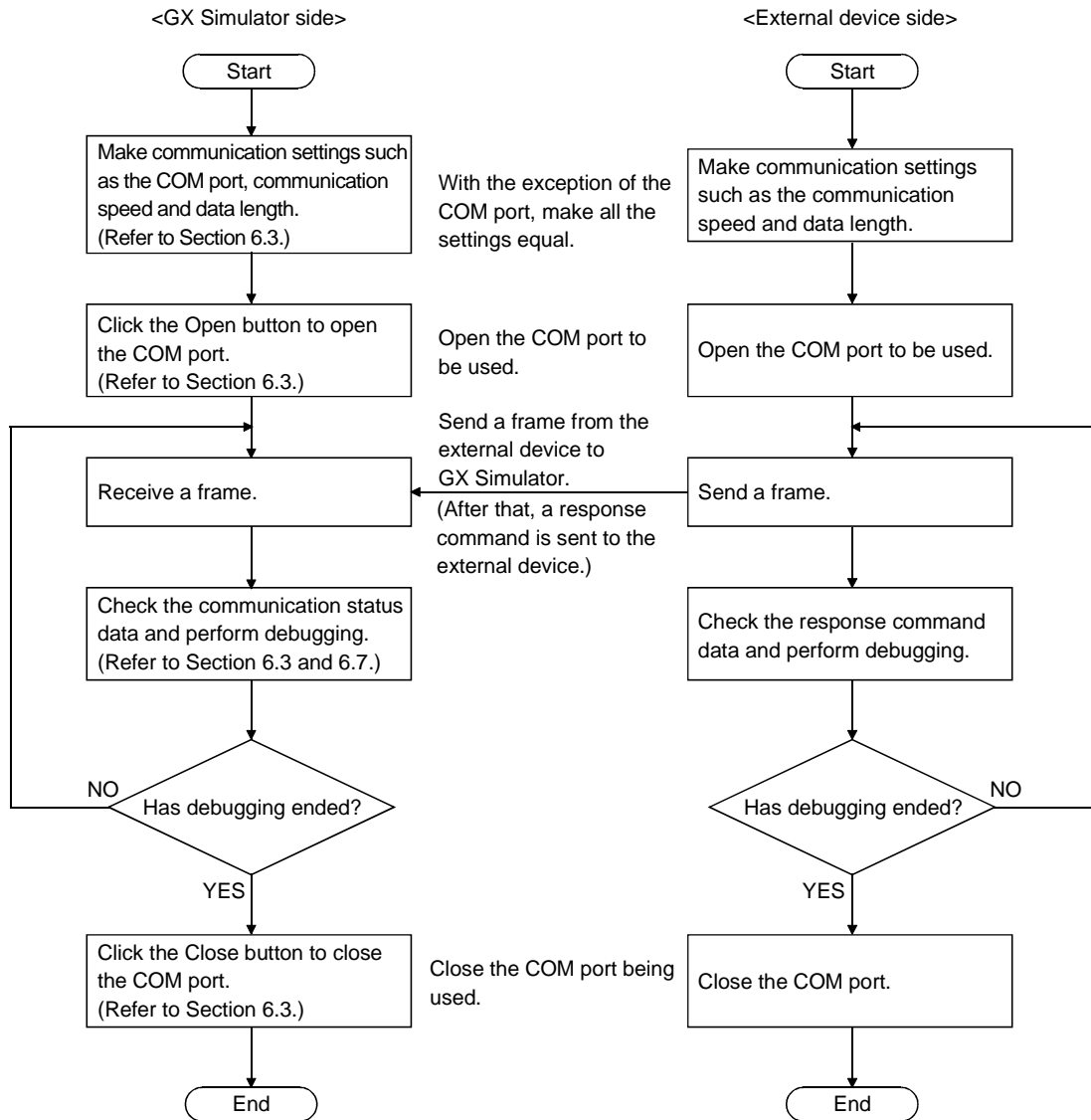


POINT

The serial communication function does not support the serial communication module's no-procedure protocol created by sequence programming.

6.1 Operation Procedures for Serial Communication Function

The following are the operation procedures for the serial communication function.



6.2 Starting and Terminating the Serial Communication Function

(1) Starting the serial communication function

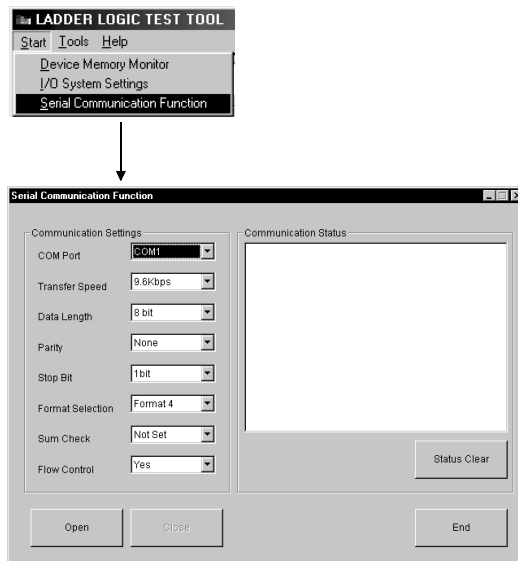
[Purpose]

To start the serial communication function.

[Operation procedure]

Choose [Start] - [Serial Communication Function] on the initial window.

Note that you cannot select the serial communication function if the PLC series is the FXCPU.



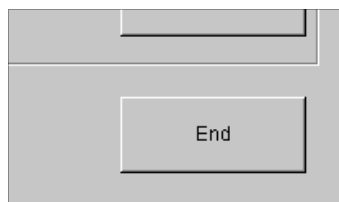
(2) Terminating the serial communication function

[Purpose]

To terminate the serial communication function.

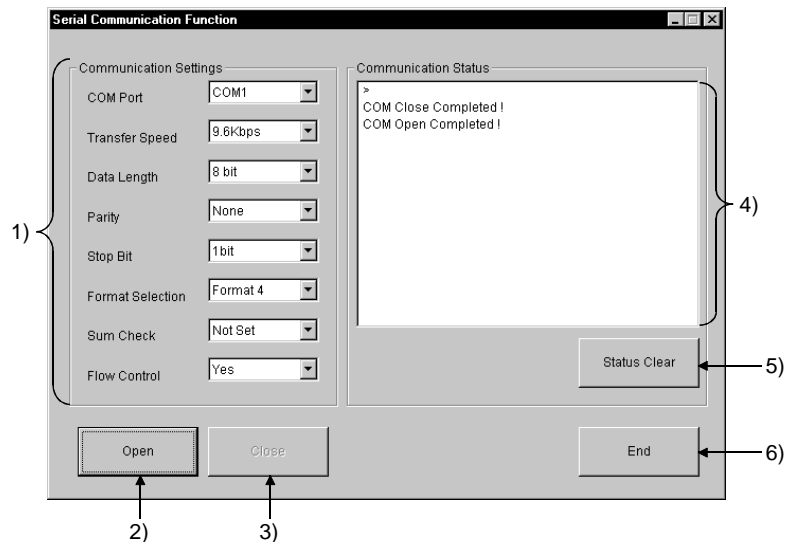
[Operation procedure]

Click the [End] button on the Serial Communication Function screen.



6.3 Layout of the Serial Communication Function Screen

This section describes the layout of the Serial Communication Function screen that opens when you click [Start] - [Serial Communication Function].



- 1) Set the GX Simulator side environment for communication with the external device.
With the exception of the COM port, make all settings equal to those of the external device side.

| Item | Description |
|------------------|--|
| COM Port | Choose the COM port to be used. |
| Transfer Speed | Choose the transfer speed. |
| Data Length | Choose the data length. |
| Parity | Choose the parity. |
| Stop Bit | Choose the stop bit. |
| Format Selection | Choose the frame format. GX Simulator supports only the following formats. <ul style="list-style-type: none"> • A-compatible 1C frame format 3, format 4 • QnA-compatible 3C frame format 3, format 4 • QnA-compatible 4C frame format 3, format 4 |
| Sum Check | Choose whether to make sum check or not. |
| Flow Control | Choose whether to exercise flow control or not. The flow control exercised is RS/CS control. |

- 2) **Open** button
Used to open the COM port as set in the communication settings.
Open the COM port first before starting communication with the external device.
- 3) **Close** button
Used to close the opened COM port.

- 4) Communication Status
Displays the communication result. Refer to Section 6.7 for details.
- 5) button
Used to clear the communication status.
- 6) button
Used to clear the communication status.

6.4 Transmission Specifications

The following are the transmission specifications of the serial communication function.

(1) Transmission specifications

| Specifications | | PLC Series | |
|------------------------|----------------------------|--|--|
| | | ACPU/QCPU (A mode)/ motion controller | QnACPU/QCPU (Q mode) |
| Item | | | |
| Communication system | | Half duplex communication | |
| Synchronization system | | Asynchronous system | |
| Transmission speed | | 9.6kbps | |
| Compatible frames | | A-compatible 1C frame format 3 A-compatible 1C frame format 4 | QnA-compatible 3C frame format 3 QnA-compatible 3C frame format 4 QnA-compatible 4C frame format 3 QnA-compatible 4C frame format 4 |
| Usable commands | | Refer to Section 6.6. | |
| Transmission control | DTR/DSR (ER/DR) control | Compatible | |
| | RS/CS (RTS/CTS) control | Selectable | |
| | CD signal control | Disabled | |
| | DC1/DC3 (Xon/Xoff) control | Disabled | |
| | DC2/DC4 control | Disabled | |
| Connection target | | All handled as host | |

POINT

When the PLC series is the FXCPU, the serial communication function is unavailable.

(2) Cable wiring

Connect the external device and GX Simulator with the cable wired as shown below.

| GX Simulator Side | Wiring | External Device Side |
|-------------------|--------|----------------------|
| FG | ↔ | FG |
| TXD | ↔ | TXD |
| RXD | ↔ | RXD |
| RS(RTS) | ↔ | RS(RTS)*1 |
| CS(CTS) | ↔ | CS(CTS)*1 |
| DSR(DR) | ↔ | DSR(DR) |
| DTR(ER) | ↔ | DTR(ER) |

*1 Needed for flow control only

6.5 Usable Frames

This section describes the frames usable with the serial communication function.

(1) Usable frames

The following frames are usable.

The message format sent from the external device is analyzed to judge the frame automatically.

(Example: When the PLC series is the ACPU, the A-compatible 1C frame format 3 and A-compatible 1C frame format 4 are judged automatically. However, the QnA-compatible 3C/4C frame is unusable.)

| Frame \ PLC Series | ACPU/QCPU (A Mode) / Motion Controller | QnA/QCPU (Q Mode) | FXCPU |
|----------------------------------|--|-------------------|-------|
| A-compatible 1C frame format 3 | ○ | × | × |
| A-compatible 1C frame format 4 | ○ | × | × |
| QnA-compatible 3C frame format 3 | × | ○ | × |
| QnA-compatible 3C frame format 4 | × | ○ | × |
| QnA-compatible 4C frame format 3 | × | ○ | × |
| QnA-compatible 4C frame format 4 | × | ○ | × |

○ : Usable, × : Unusable

Refer to the following manuals for details of the frames.

- Computer Link Module (Com.link func./Print.func.) User's Manual ..SH-3511
- Serial Communication Module User's Manual.....IB-66612
- Q Corresponding MELSEC Communication Protocol Reference Manual.....SH-080008

(2) Devices usable with the frames

The following frames are usable.

| | Device Type | | Remarks |
|-------------------------|---|-------------------------------|--|
| | Bit devices | Word devices | |
| A-compatible 1C frame | X, Y, M, L, S, B, F, M, TS, TC, C, S, CC, Special M | TN, CN, D, W, R, D, Special D | For extended registers, access can always be made to a maximum of 64 blocks regardless of the CPU. Note that the capacity depends on the parameter setting. |
| QnA-compatible 3C frame | X, Y, M, L, F, V, B, TS, TC, SS, | D, W, TN, SN, CN, SW, Z, R, | DX/DY is similar to X/Y. |
| QnA-compatible 4C frame | SC, CS, CC, SB, DX, DY | ZR | |

6.6 Command Lists

This section explains the commands of the frames supported by GX Simulator.
Refer to the following manuals for details of the commands.

Refer to the following manuals for details of the frames.

- Computer Link Module (Com.link func./Print.func.) User's Manual ..SH-3511
- Serial Communication Module User's Manual..... IB-66612
- Q Corresponding MELSEC Communication Protocol
Reference Manual.....SH-080008

6.6.1 Usable A-compatible 1C frame commands

The following are the A-compatible 1C frame commands usable with GX Simulator.

| Function | | Command | | Max. Number of Points | | |
|-----------------------------|---------------------------|--------------|-------------|-----------------------|----------------------|----------|
| | | Symbol | ASCII code | | | |
| Device memory | Batch read | Bit unit | BR JR *2 | 42H, 52H 4AH, 52H | 256 bits | |
| | | Word unit | WR QR *2 | 57H, 52H 51H, 52H | 32 words 64 words | |
| | Batch write | Bit unit | BW JW *2 | 42H, 57H 4AH, 57H | 160 bits | |
| | | Word unit | WW QW *2 | 57H, 57H 51H, 57H | 10 words 64 words | |
| | Test (Random write) | Bit unit | BT JT *2 | 42H, 54H 4AH, 54H | 20 bits | |
| | | Word unit | WT QT *2 | 57H, 54H 51H, 54H | 10 words 10 words | |
| | Monitor data registration | Bit unit *1 | BM JM *2 | 42H, 4DH 4AH, 4DH | 40 bits | |
| | | Word unit *1 | WM QM *2 | 57H, 4DH 51H, 4DH | 20 words 20 words | |
| | Monitor | Bit unit | MB MJ *2 | 4DH, 42H 4DH, 4AH | ——— | |
| | | Word unit | MN MQ *2 | 4DH, 4EH 4DH, 51H | | |
| | Extended file register | Batch read | | ER | 45H, 52H | 64 words |
| | | Batch write | | EW | 45H, 57H | 64 words |
| Test (Random write) | | ET | 45H, 54H | 10 words | | |
| Monitor data registration | | EM | 45H, 4DH | 20 words | | |
| Monitor | | Word unit | ME | 4DH, 45H | ——— | |
| Intelligent function module | Batch read | | TR | 54H, 52H | 128 bytes | |
| | Batch write | | TW | 54H, 57H | 128 bytes | |
| Loopback test | | | TT | 54H, 54H | ——— | |
| Remote operation | Remote RUN | | RR | 52H, 52H | ——— | |
| | Remote STOP | | RS | 52H, 53H | ——— | |

*1 : When the AnNCPU is used, the number of used points is calculated as twice larger if device X is used in bit unit monitor data registration (BM) or word unit monitor data registration (WM).
For device X, therefore, the number of usable points is halved.

*2 : Not supported when the AnNCPU is used.

6.6.2 Usable QnA-compatible 3C/4C frame commands

The following are the QnA-compatible 3C/4C frame commands usable with GX Simulator.

| Function | | Command (Sub command) | Max. Number of Points | | |
|--------------------------------|------------------------------|--------------------------|-----------------------|--------------|------------|
| | | | QnACPU | QCPU(Q mode) | |
| Device memory | Batch read | Bit unit | 0401(00□1) | 3952 bits | 7904 bits |
| | | Word unit | 0401(00□0) | 480 words | 960 words |
| | Batch write | Bit unit | 1401(00□1) | 3952 bits | 7904 bits |
| | | Word unit | 1401(00□0) | 480 words | 960 words |
| | Random read | Word unit | 0403(00□0) | 96 words | 192 words |
| | | | | 96 words | 192 words |
| | Test (Random write) | Bit unit | 1402(00□1) | 94 bits | 188 bits |
| | | Word unit | 1402(00□0) | 96 words | 192 words |
| | Monitor data registration | Word unit | 0801(00□0) | 96 words | 192 words |
| | | | | 96 words | 192 words |
| | Monitor | Word unit | 0802(0000) | — | — |
| | Multiple block batch read | Word unit | 0406(00□0) | 480 words | 960 words |
| Multiple block batch write | Word unit | 1406(00□0) | | | |
| Intelligent function module | Batch read | | 0601(0000) | 960 words | 1920 words |
| | Batch write | | 1601(0000) | 960 words | 1920 words |
| PLC CPU | Remote RUN | | 1001(0000) | — | — |
| | Remote STOP | | 1002(0000) | — | — |
| | CPU type read *1 | | 0101(0000) | — | — |
| Loopback test | | | 0619(0000) | — | — |

*1 : Unusable when the PLC series is the QnACPU

6.7 Communication Status

The following are the statuses displayed in Communication Status on the Serial Communication Function screen.

Communication Status shows the latest status at top and can display up to 100 communication logs.

| Displayed Status | Definition |
|--|--|
| Can not connect (ES * * * *) | A COM opening error occurred. The status is displayed with the error code that indicates the definition of the error that occurred. |
| COM Open Completed! | COM opened as set in the communication settings. |
| COM Close completed! | COM closed normally. |
| Command Packet (command character) *1 | A command was received from the connection target. |
| Acknowledge Packet (command character) *1 | A command was sent from the serial communication function to the connection target. |
| NAK Send | NAK was returned in a response message. The status is displayed with the error No. |
| Sum check error | In communication with sum check made, the sum check code was wrong. No response is given since GX Simulator side cannot recognize the frame format. |
| Unsupported command received | The command not supported was issued. GX Simulator side returns NAK in a response message. |
| Can not distinguish frame | The frame identification number cannot be recognized. No response is given. Check whether the PLC series and used frame are correct. |
| Buffer full error | response is given. Reduce the total number of data sent from the external device to less than 10000 bytes. |

*1 : The communication command symbol is displayed.

6.8 Error Code Lists

This section explains the codes, definitions and corrective actions of errors that may occur during communication.

6.8.1 When the A-compatible 1C frame is used

The following table indicates the error codes that may occur when the A-compatible 1C frame is used.

| Error Code (Hexadecimal) | Error Item | Error Definition | Corrective Action |
|-----------------------------|--|--|---|
| 02H | Sum check error | <ul style="list-style-type: none"> The calculated sum check does not match the sent sum check. | <ul style="list-style-type: none"> Reexamine the sum check on the other end device. |
| 03H | Protocol error | <ul style="list-style-type: none"> The frame format is incorrect. (When the data length is shorter than the header length) Data does not exist in the character part. | <ul style="list-style-type: none"> Restart communication after checking and correcting the message sent by the other end device. |
| 06H | Character part error | <ul style="list-style-type: none"> A non-existing command was specified. The requested number of points exceeded the range permitted for the command. A non-existing device was specified. The command of the AnACPU/AnUCPU was sent to the AnNCPUs. The device unusable in the instruction was specified. Monitor read was executed without monitor registration. | <ul style="list-style-type: none"> Restart communication after checking and correcting the message sent by the other end device. |
| 07H | Character error | <ul style="list-style-type: none"> Unusable data was received. <ol style="list-style-type: none"> The data outside the range usable with the instruction was received. The bit device is not headed by a multiple of 16. | |
| 12H | Special function module specifying error | <ul style="list-style-type: none"> The specified position is not I/O-assigned correctly. | <ul style="list-style-type: none"> Make I/O assignment of the specified position. |

6.8.2 When the QnA-compatible 3C/4C is used

The following table indicates the error codes that may occur when the QnA-compatible 3C/4C frame is used.

| Error Code (Hexadecimal) | Error Item | Error Definition | Corrective Action |
|-----------------------------|---|--|---|
| 7140H | Request data error | <ul style="list-style-type: none"> The requested number of points exceeded the range permitted for the command. A word device was specified for the bit unit command. The last device number exceeded the range. Last number of corresponding device \geq specified starting device number + specified number of points The command size is illegal. The device name is NULL. The number of device points exceeded the maximum. The bit device is not headed by a multiple of 16 in the word unit random read command or multiple block batch read command. | <ul style="list-style-type: none"> Restart communication after checking and correcting the message sent by the other end device. |
| | | <ul style="list-style-type: none"> Buffer memory read/write was executed with a non-existing module number specified (without I/O assignment). | <ul style="list-style-type: none"> Make I/O assignment and access the existing module number. |
| 7142H | Device name error | <ul style="list-style-type: none"> The device that could not be specified was specified in the corresponding command. | <ul style="list-style-type: none"> Restart communication after checking and correcting the message sent by the other end device. |
| 7144H | Monitor registration error | <ul style="list-style-type: none"> A monitor request was made before monitor registration. | <ul style="list-style-type: none"> Make a monitor request after registering the device to be monitored. |
| 7147H | Monitor registration point count excess error | <ul style="list-style-type: none"> The number of points for monitor registration exceeded the range. | <ul style="list-style-type: none"> Restart communication after checking and correcting the message sent by the other end device. |
| 7E40H | Command error | <ul style="list-style-type: none"> A non-existing command or sub command was specified. F8 (QnA-compatible 4C frame) was specified as the frame identification number of the QnA-compatible 3C frame, or F9 (QnA-compatible 3C frame) was specified as the frame identification number of the QnA-compatible 4C frame. | <ul style="list-style-type: none"> Restart communication after checking and correcting the message sent by the other end device. |
| 7E43H | Device error | <ul style="list-style-type: none"> A non-existing device was specified. | <ul style="list-style-type: none"> Restart communication after checking and correcting the message sent by the other end device. |
| 7E4FH | Device point count error | <ul style="list-style-type: none"> The limit of the device point count was exceeded. | <ul style="list-style-type: none"> Restart communication after checking and correcting the message sent by the other end device. |
| 7F20H | ASCII-binary conversion error | <ul style="list-style-type: none"> A character unconvertible into binary was used in the command. The sub command is illegal. | <ul style="list-style-type: none"> For communication in ASCII-binary conversion, always send data in an even byte unit. |
| 7F23H | MC protocol message error | <ul style="list-style-type: none"> After the character part, data (e.g. ETX, CR-LF) does not exist or incorrect data was specified. | <ul style="list-style-type: none"> Restart communication after checking and correcting the message sent by the other end device. |
| 7F24H | Sum check error | <ul style="list-style-type: none"> The calculated sum check does not match the received sum check. | <ul style="list-style-type: none"> Reexamine the sum check on the other end device. |

7. MONITORING DEVICE MEMORY - MONITOR TEST FUNCTION

The monitor test functions monitor the status of the device memory saved in the GX Simulator, force bit devices ON/OFF, and test changes to word device present values.

7.1 GX Developer and GX Simulator Monitor Test Functions

A combination of the GX Simulator and GX Developer monitor test functions allows the extensive GX Developer monitor test functions to be used offline.

All monitor test functions available with the GX Developer and GX Simulator are described below.

If the GX Simulator does not support a function, execute a function from a GX Developer menu.

| Function | | Function Executed from a GX Developer Menu | Function Executed from a GX Simulator Menu |
|------------------------|-----------------------------|--|--|
| Monitor test functions | Ladder monitor | ○ | — |
| | Device batch monitor | ○ | ○ |
| | Device registration monitor | ○ | — |
| | Buffer memory batch monitor | ○ | ○ |
| | Device test | ○ | ○ |
| | Skip execution | ○ | — |
| | Partial execution | ○ | — |
| | Step execution*1 | ○ | — |

○..... Available

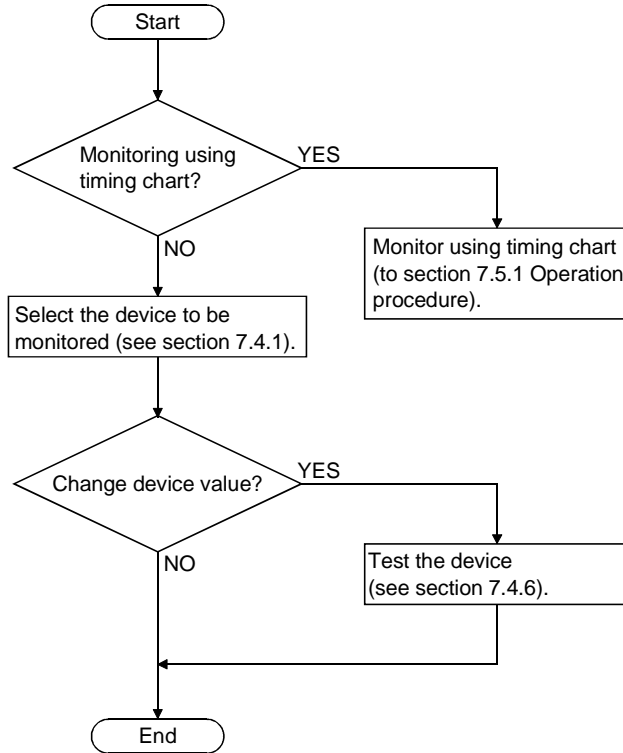
—..... Not supported

*1: For the Q series CPU (Q mode), GX Developer cannot be used. Only GX Simulator may be used.

See the GX Developer Operating Manual for details of the functions which can be executed from the GX Developer menu.

7.2 Operation Procedure of Monitoring Device Memory

Operation procedure of monitoring device memory is shown below:



7.3 Starting/Ending Monitoring Device Memory

(1) Starting monitoring device memory

[Purpose]

To start monitoring device memory.

[Operation procedure]

Select [Start] - [Device Memory Monitor] from initial window.



(2) Ending monitoring device memory

[Purpose]

To end monitoring device memory.

[Operation procedure]

Select [Start] - [Exit] from device memory monitor screen.



7.4 Monitoring/Testing the Device Memory

This section describes how to monitor/test the device memory.

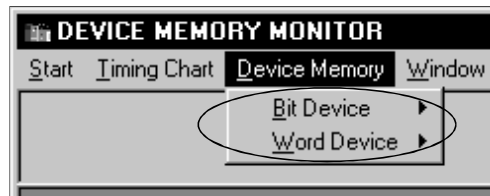
This section provides only the functions which are performed from the GX Simulator menu. See the GX Developer Operating Manual for details of the functions performed from the GX Developer menu.

7.4.1 Selecting the devices for monitoring

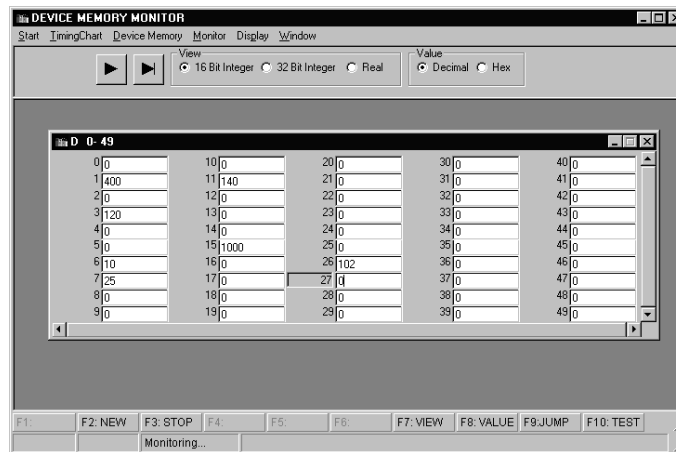
This section describes how to select the devices for monitoring.

[Operation Procedure]

- 1) Select [Start] → [Device Memory Monitor] from the initial window.
- 2) Select [Device Memory] then [Bit Device] or [Word Device] in the device memory monitor window and select the devices to be monitored in the monitor test.



- 3) The selected device window is displayed.
The selected device monitor is started automatically.



POINT

Be sure to set the required items on "I/O assignment" setting screen of GX Developer when monitoring the special function buffer memory according to the setting of A series, QnA series, Q series CPU function or motion controller function.

4) Click on the button or select [Display] → [Jump] (**F9**) to change the displayed device range.

..... Click this button to display the first page of currently displayed devices.

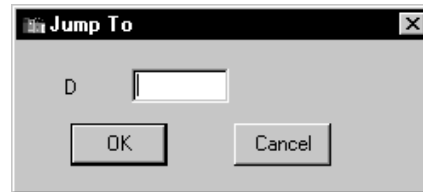
..... Click this button to display the previous page of currently displayed devices.

..... Click this button to display the next page of currently displayed devices.

..... Click this button to display the last page of currently displayed devices.

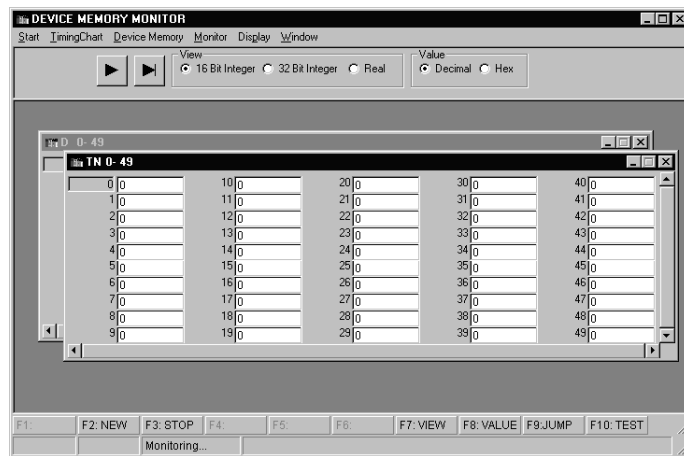
[Display] → [Jump] (**F9**)... Select these items to open the following setting window.

Designate the first device number to be displayed.



5) To open multiple windows, select [Window] → [New] (**F2**) and designate the device names and device numbers.

The designated device windows are displayed overlapping each other.



POINTS

- (1) Although the device window opens in either procedure of [Device Memory] → [Bit Device] / [Word Device] or [Window] → [New] (**F2**), the device window called by the procedure beginning with the selection of [Device Memory] display the devices starting from device number 0.
Select [Window] menu (**F2**) to specify an arbitrary start device number for display.
- (2) Pressing the **ESC** key closes the device window which is currently active.

7.4.2 Stopping and restarting the device memory monitor

[Purpose]

To stop the device data changes and view the monitor window.

[Operation Procedure]

- 1) Select [Monitor] → [Start/Stop] (**F3**) in the Device memory monitor window while monitoring the device memory.

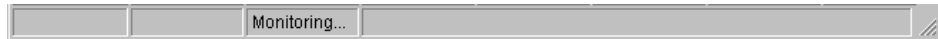


- 2) The device memory monitoring stops.
- 3) To restart the device memory monitoring, select [Monitor] → [Start/Stop] (**F3**) again.

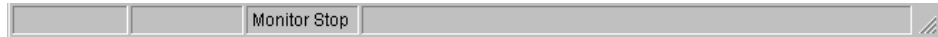
POINT

The present monitor status is displayed in the guidance column below the device memory monitor window.

- During monitoring



- During monitor stopped



7.4.3 Changing the monitor communications interval

[Purpose]

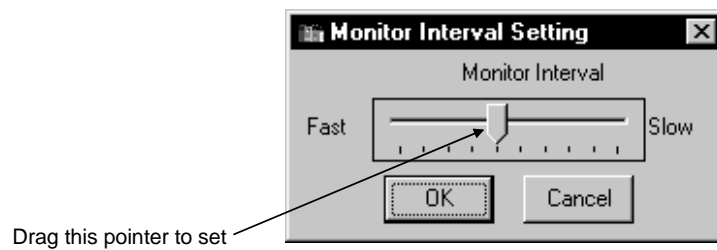
To set the interval at which the GX Simulator device memory status is monitored.

[Operation Procedure]

- 1) Select [Monitor] → [Monitor Interval] in the Device memory monitor window.



- 2) The monitoring interval dialog box is displayed.
Drag the pointer in the dialog box to set the monitoring interval.
Click on the **OK** button when the setting is complete.

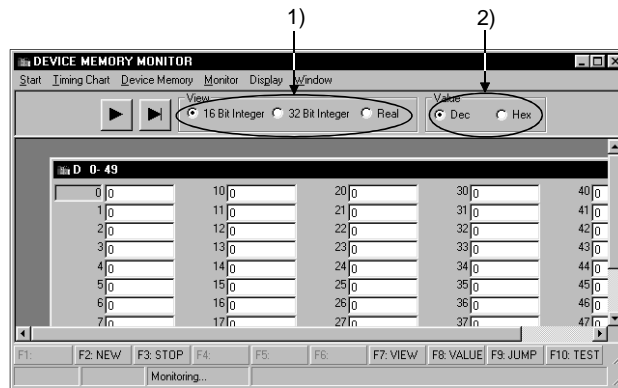


7.4.4 Changing the device memory monitor format

[Purpose]

To switch the display format of the device monitor column to match the data contents.

[Setting Window]



[Description of the Settings]

1) View

Selects whether to display the values in the device monitor column in 16-bit units, 32-bit units, or as a floating decimal-point display when monitoring a word device.

The same operation is possible from the keyboard by pressing the **[F7]** key.

16 Bit IntegerDisplays the values in 16-bit units.

32 Bit IntegerDisplays the values in 32-bit units.

RealDisplays the value as a floating decimal point value (single-precision value).

2) Value

Selects whether to display the values in the device monitor column as a decimal or hexadecimal value when monitoring a word device.

The same operation is possible from the keyboard by pressing the **[F8]** key.

Decimal.....Displays a decimal value.

Hexadecimal.....Displays a hexadecimal value.

POINT

The device monitor format can also be changed by selecting the desired format from the drop-down menu of [Display] in the Device memory monitor window.

7.4.5 Opening the new window

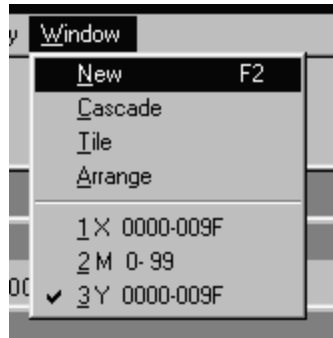
[Purpose]

To open a new window, designate the device.

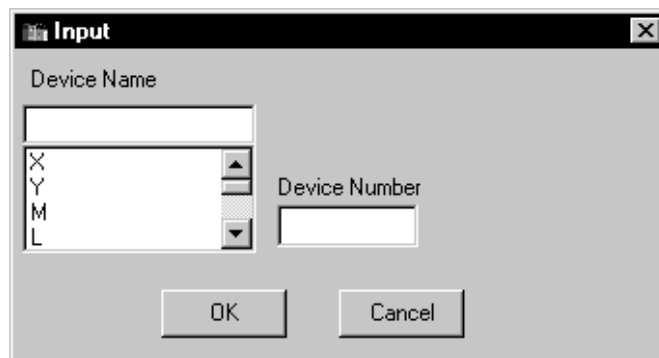
[Operation Procedure]

1) Opening a new window

Choose [Window] → [New] in the Device Memory window.



Entering the device name and device number and clicking the [OK] button opens a new window.



POINT

You can open up to 8 windows concurrently.

7.4.6 Running the device test

[Purpose]

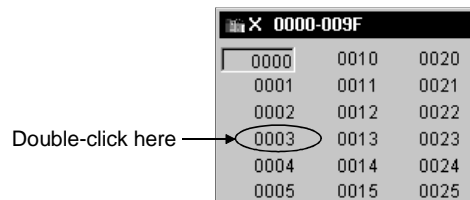
To force bit devices ON/OFF or force changes to the present values of word devices while monitoring the devices.

[Operation Procedure]

Select [Device Memory] then [Bit Device] or [Word Device] in the Device memory monitor window and select the devices to be monitored in the monitor test.

(1) Forcing Bit Devices ON/OFF

- (a) Double-click on the device number to be turned ON/OFF forcibly in the bit device monitor window.



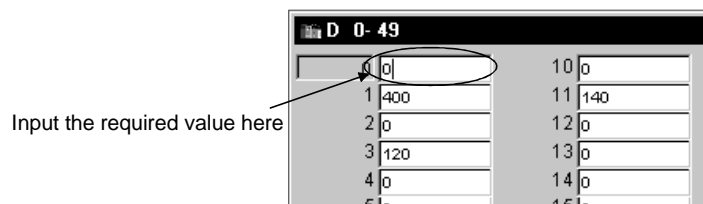
- (b) Click on the device number to select it and press the **F10** key. The ON/OFF status of the selected bit device is highlighted.

- (c) Click on the device number to select it and select [Monitor] – [Test].



(2) Changing Word Device's Present Values

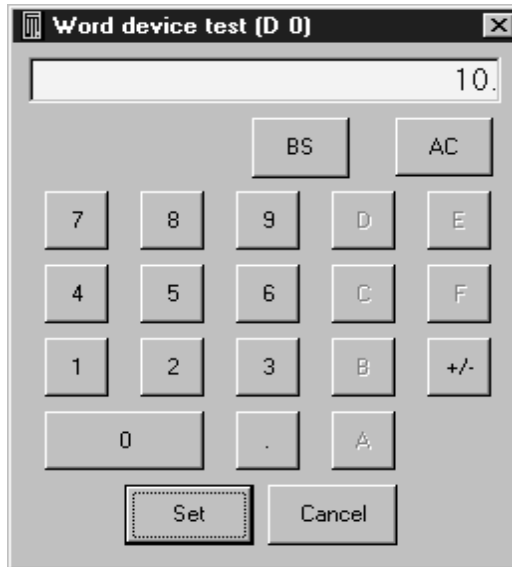
- (a) Move the cursor to the present value text box for the word device and directly input the required value.



Press the **Enter** key to change the original present value to the designated value.

(b) Double-click on the device number.

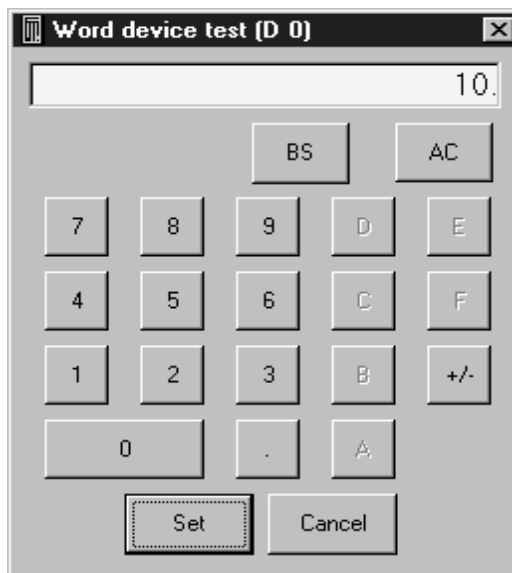
Calculator screen will appear: Designate present value after change and click **Set** button.



(c) Click device number and select [Monitor] - [Test].



Calculator screen will appear: Designate present value after change and click **Set** button.



POINT

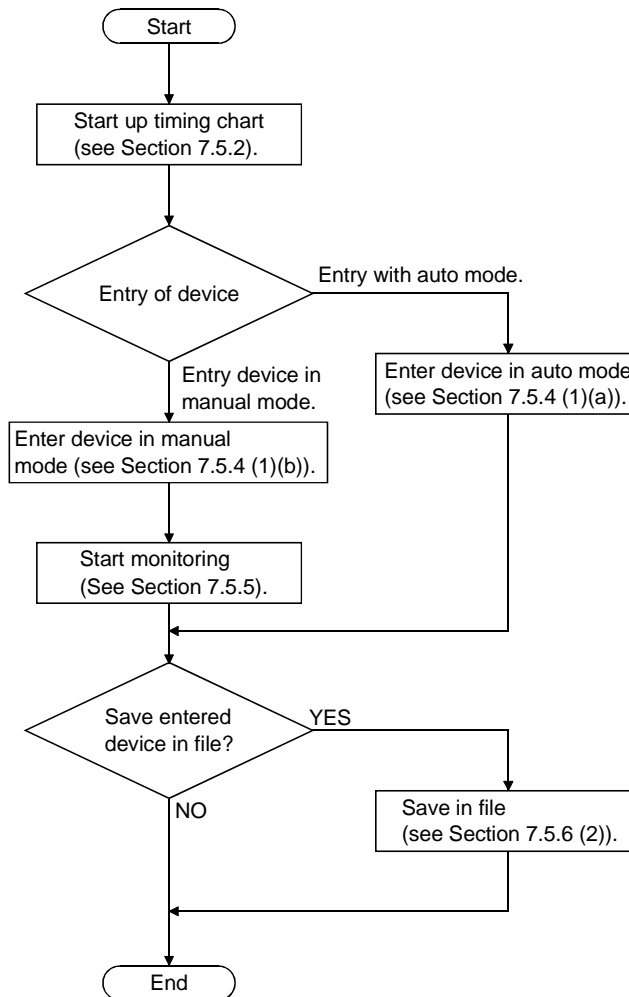
Always select the hexadecimal display for numeric values when inputting a hexadecimal using the numeric keypad. Note that character-string cannot be input.

7.5 Using Timing Chart

By using timing chart, timing of ON/OFF for bit device and change in word device value can be confirmed easily.

7.5.1 Operation procedure of timing chart

Operation procedure of timing chart is shown below:



REMARK

When sampling period is to be set, refer to Section 7.5.7.
Refer to Section 7.5.6 (3) if saved as timing chart data file.

7.5.2 Starting/exiting timing chart

(1) Starting timing chart

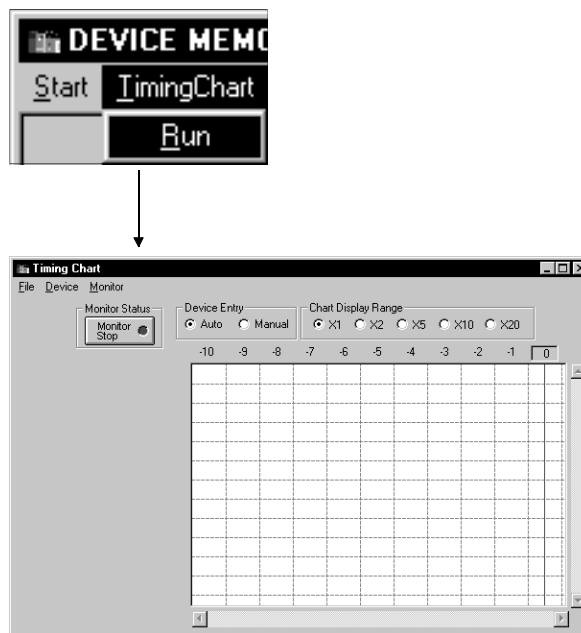
[Purpose]

To start timing chart.

[Operation procedure]

Select [Timing Chart] - [Run] from device memory monitor screen.

Maximum 4 timing charts can be started.



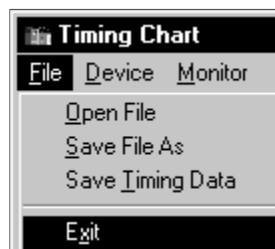
(2) Exit timing chart

[Purpose]

To exit timing chart.

[Operation procedure]

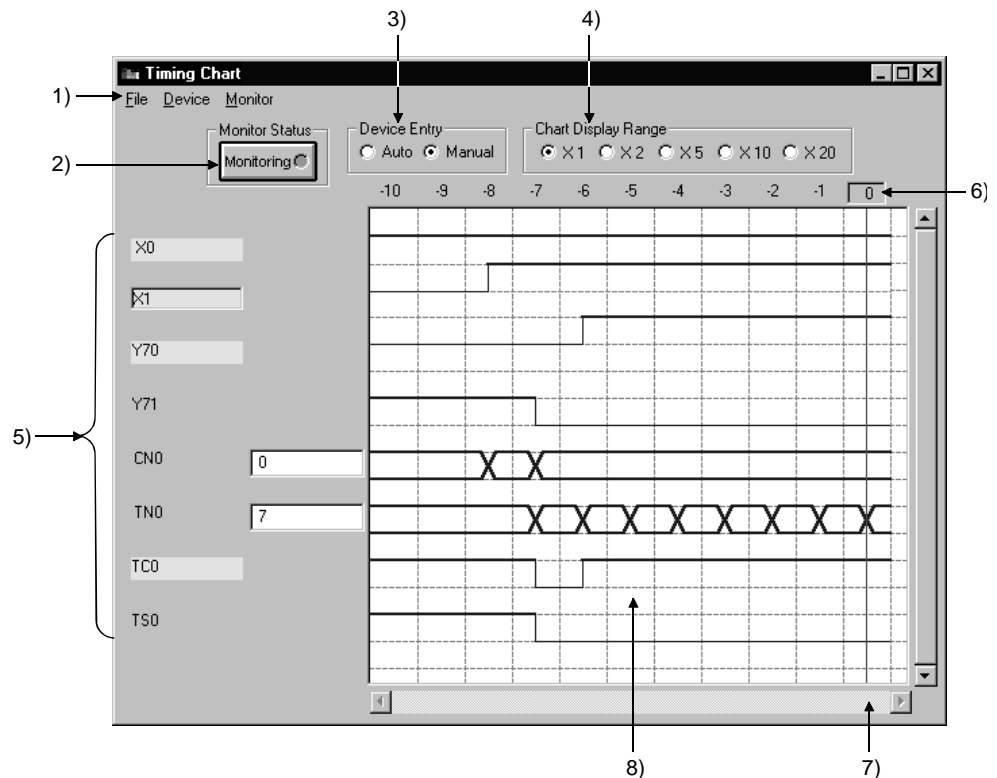
Select [File] - [Exit] from timing chart screen.



7.5.3 Using timing chart

(1) Screen display/operation

When you run Timing Chart, the following Timing Chart screen appears. The following gives the explanations of the display data of the Timing Chart screen.



1) Menu bar

Names of menu that can be used in timing chart are displayed. When menu is selected, drop-down menu will be displayed and you can use various functions from this menu.

2) "Status" button

By clicking the "Status" button, you can start/stop monitoring. For the details, refer to Section 7.5.5.

3) Device Entry

Selects auto or manual entry of device to be monitored. For the details, refer to Section 7.5.4.

4) Range of Chart Display

When the sampling interval is set to per scan, the chart display range is enlarged by 1, 2, 5, 10, and 20 times.

5) Device name/Device value

Bit device When a device is in ON status, the device name lights up (Yellow). Clicking on the device name will highlight either ON and OFF of the device.

Word device Displays the device value in an edit box at the right side of the device name. Double clicking on the device value will edit the device value.

| POINTS | Expressions used in the timing chart | | |
|---------------|--------------------------------------|---------|-----------------|
| | Timer | Counter | Retentive timer |
| Contact | TS | CS | STS |
| Coil | TC | CC | STC |
| Present value | TN | CN | STN |

(1) The expressions in the timing chart are timer (T), counter (C), and retentive timer (ST), and each of them has three types; contact, coil, and present value. In the timing chart, they are expressed as follows.

(2) Buffer memory and extension file register are displayed as follows.

<Buffer memory>
The first I/O number of a special function module

U ▼ \ G ▲
Address

When the first I/O number is 4 and the address is K30, they are displayed as "U4\G30".

<Extension file register>

Block No.

ER ▼ \ R ▲
Address

When the block No. is 2 and the address is K30, they are displayed as "ER2\R30".

(3) When word device is designated as 32 bit integer, (D) is added to the end of device name.
Example: D0(D), W6(D)

6) Reference line/scale

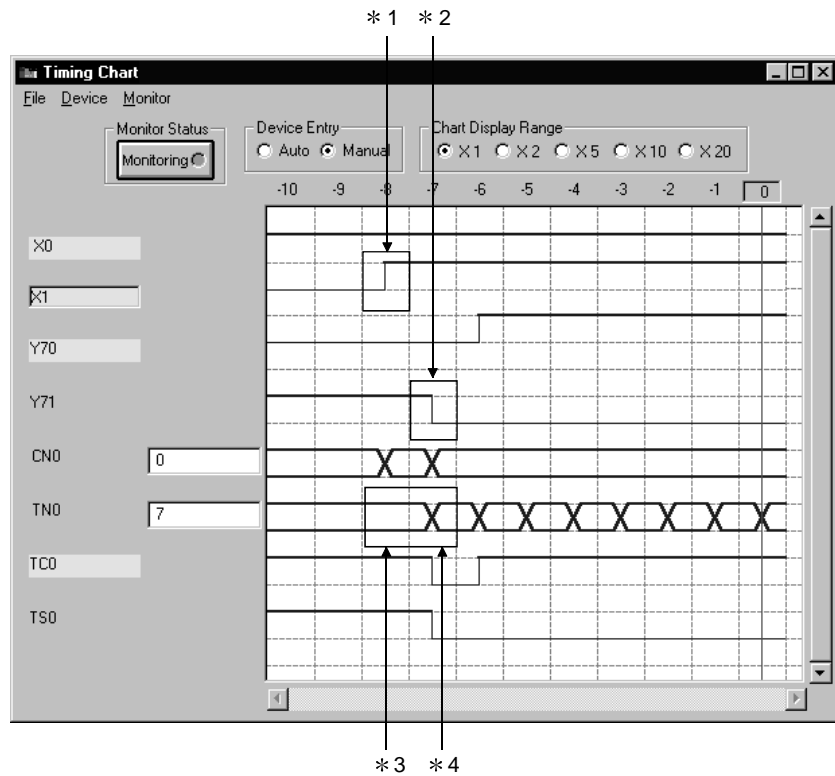
The scale displayed indicates the past scan count. Clicking the scale moves the reference line (vertical line) and shows the device values at that scan in 5).

7) Scroll bar

Up to 1000 sampled past states of devices area saved. By operating the scroll bar, you can confirm the past states of devices.

8) Status display

Shows the states of the monitor devices.



- *1 denotes that the corresponding device turned from OFF to ON.
- *2 denotes that the corresponding device turned from ON to OFF.
- *3 denotes that the value of the corresponding device remains unchanged.
- *4 denotes that the value of the corresponding device has changed.

7.5.4 Entering/deleting device to be monitored

(1) Entering device to be monitored

(a) Automatic setting

[Purpose]

Automatically enters device used with sequence program.

[Operation procedure]

1) Make sure that device entry is set to "Auto":

If set to "Manual", switch to "Auto".



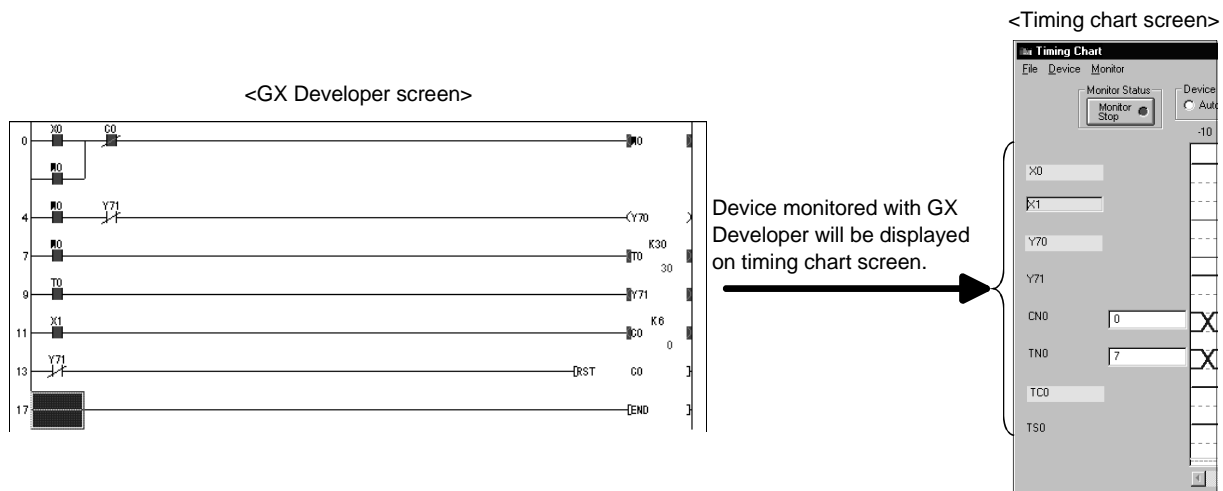
2) Select [Monitor] - [Start/Stop] to set to monitor mode.

You can also click [Monitor Stop] button instead of above.



3) Device displayed on GX Developer screen will automatically be registered as device, and monitoring will start. (Maximum 64 devices can be entered.)

If displayed device is changed by scrolling the screen, device entry will automatically change.



| POINTS |
|--|
| (1) If devices registered using GX Developer do not appear in the timing chart screen, switch the device entry setting from Auto to Manual , and execute device entry. |
| (2) For any instruction whose argument occupies double-word positions, two word devices will be displayed on the timing chart screen. (For DINC D0, D0 and D1 are entered.) |
| (3) When batch monitor of GX Developer is used to monitor a bit device, this bit device will not be entered. |
| (4) When the A/FX/Q (A mode) CPU/motion controller is selected, the bit digit-specified/index-qualified device will not be entered. |
| (5) When QnA/QCPU (Q mode) is selected, directly designated buffer memory will not be entered. |
| (6) When FX series CPU is selected, the following instructions displayed on GX Developer circuit monitor screen will not be entered. (RST T, RST C) (PLS Y, PLS M) (PLF Y, PLF M) |

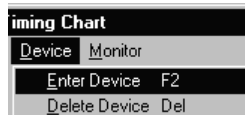
(b) Manual entry

[Purpose]

Manually enters device to be monitored in timing chart.

[Operation procedure]

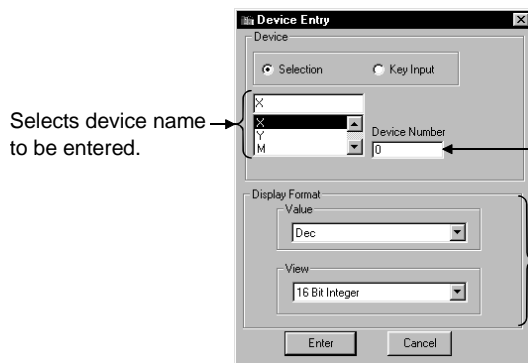
- 1) Select [Device] - [Enter Device].



- 2) The dialog shown below will appear: After setting each item, click **Enter** button.

Maximum 64 devices can be entered.

<"Selection" selected>

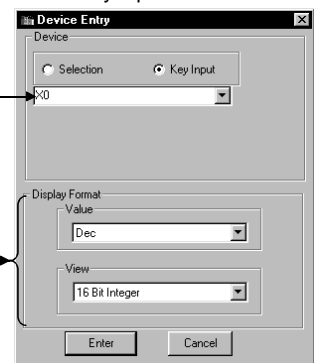


Selects device name to be entered.

Designates device No.

Selects display format of device to be displayed.

<"Key input" selected>



Directly enters device name.

(2) Deleting registered device

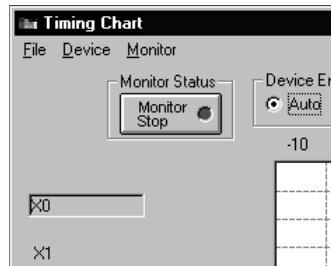
[Purpose]

To delete registered devices.

[Operation procedure]

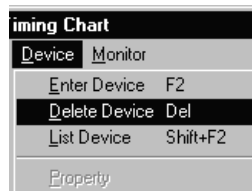
(a) Select the device to be deleted:

For example, X0 is deleted here.



(b) Select [Device] - [Delete Device].

Device has been deleted.



7.5.5 Starting/stopping monitoring

(1) Starting monitoring

[Purpose]

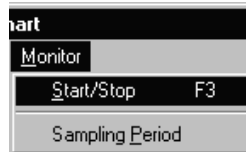
To start monitoring the timing chart.

[Operation procedure]

After registering device, select [Monitor] - [Start/Stop] while monitor is stopped.

You can also click **Monitor Stop** button instead of above.

However, if device is registered in auto mode, monitoring will start when device is registered.



(2) Stopping monitoring

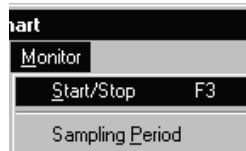
[Purpose]

To stop monitoring timing chart.

[Operation procedure]

Select [Monitor] - [Start/Stop] during monitoring.

You can also click **Monitoring** button instead of above.



7.5.6 Operating file

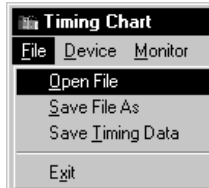
(1) Opening saved file

[Purpose]

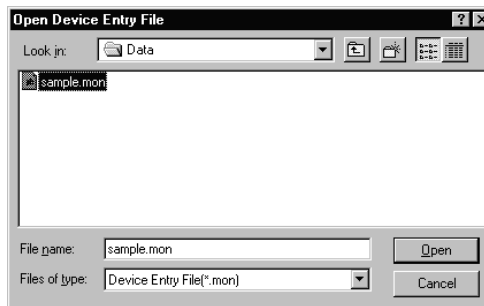
To open device registration file (*.mon) that have been saved.

[Operation procedure]

Select [File] - [Open file].



[Setting window]



Designate optional folder with "Look in", click file to be opened, then click **Open** button.

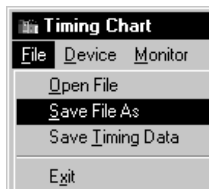
(2) Saving in file

[Purpose]

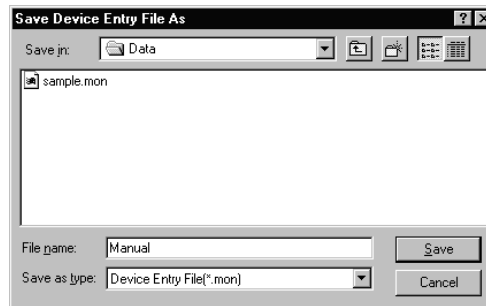
To save entered device as a device registration file (*.mon).

[Operation procedure]

Select [File] - [Save File As].



[Setting window]



Designate optional folder with "Save in", and enter new file name in "File name".
If data is to be overwritten on existing file, select the file by clicking.
After setting, click **Save** button.

(3) Saving as timing chart data file

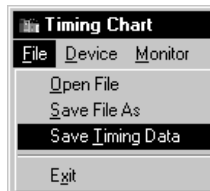
[Purpose]

To save as a timing chart data file.

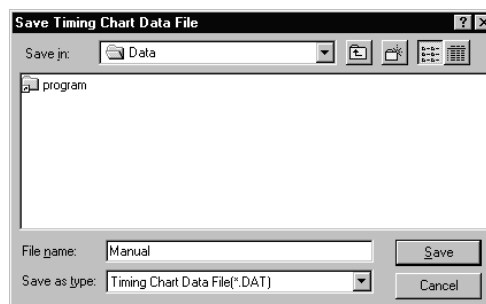
Timing chart data file can be read using timing chart format input of I/O system settings.

[Operation procedure]

Select [File] - [Save Timing data].



[Setting window]



Designate optional folder with "Save in", and enter new file name in "File name".
If data is to be overwritten on existing file, select the file by clicking.
After setting, click **Save** button.

7.5.7 Setting sampling period

[Purpose]

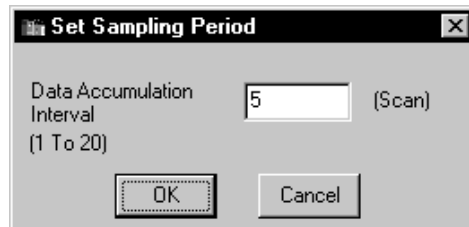
To set collection interval of device value in the range between 1 and 20 scans.

[Operation procedure]

(1) Select [Monitor] - [Sampling Period].



(2) Sampling period setting screen will appear: Input data collection interval.



<Example>

When Data Accumulation Interval is set to 5 scans, the device value will be collected every 5 scans and displayed in the timing chart display screen.

(The default value is 1 scan.)

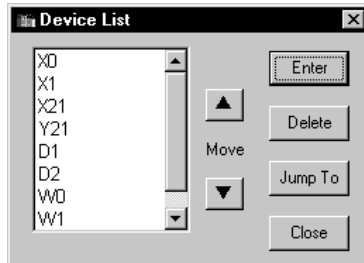
REMARK

Every time you change the sampling period, the data displayed in the timing chart will be cleared.

7.5.8 Other operations

(1) Displaying the list of registered devices

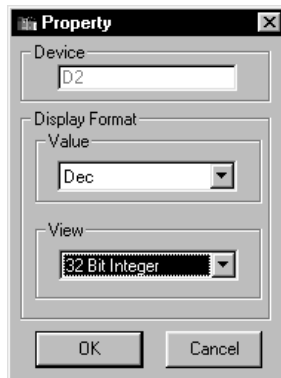
Select [Device] - [List Device]: The list of registered devices will be displayed.



- Click **Enter** button: Device entry dialog will appear.
Refer to Section 7.5.4 for details.
- Click **Delete** button: The device will be deleted from target of monitoring.
By using "**Shift** key + Select" or "**Ctrl** key + Select", two or more devices can be deleted simultaneously.
- Click **Jump To** button: Timing chart being displayed will jump to selected device.
- Click **▲** / **▼** button: Device being selected will move up/down.
- Selecting two or more devices
(You cannot select two or more devices for moving.)

(2) Changing word device display format

Select "Word Device" and select [Device] - [Property]. The dialog shown below will appear: Display format can now be changed.



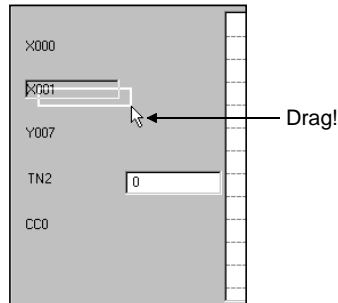
- Value
Changes between decimal and hexadecimal.
- View
Changes between 32 bit integer and Real number.
(Effective only when selected device is a double word)

(3) Exchanging display position of device

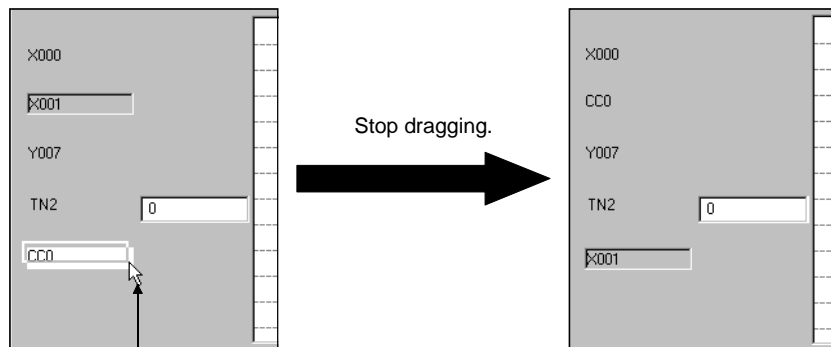
Dragging and dropping device name can exchange the device displayed position.

(a) Drag device name of the timing chart screen.

During dragging, a white square frame will appear.



(b) By superimposing white square frame on the device name to be exchanged, device name can be exchanged.



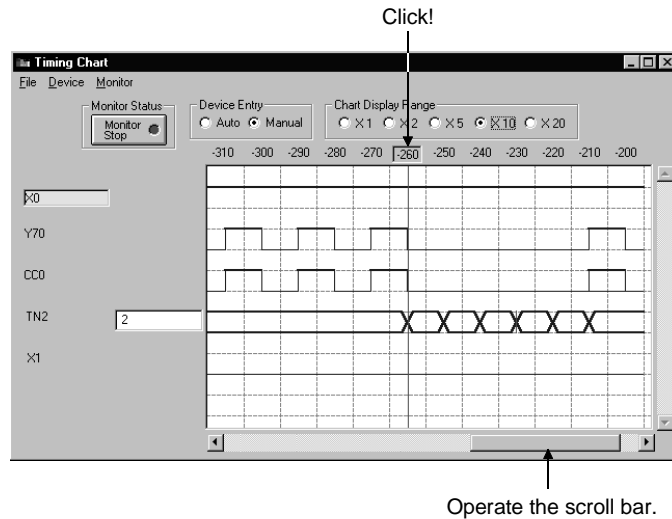
Superimpose white square frame.

(4) Viewing the status changes of the devices monitored

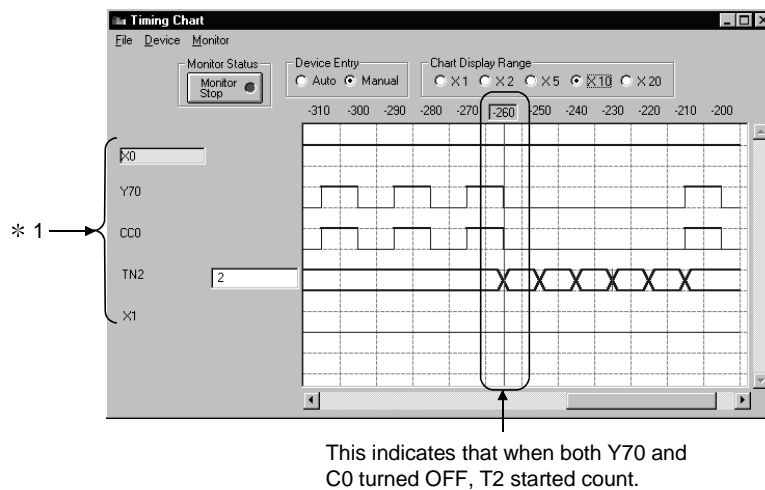
The GX Simulator can save up to 1000 samples of past states of devices. The following example shows how to confirm the device status of 260 scans before.

(a) Set the monitoring state of timing chart to stop.

(b) Operate the scroll bar until -260 appears on the timing chart screen. Click "-260" on the screen.



(c) By clicking "-260", the device status of 260 scans before will appear in *1. In *1, the bit device ON/OFF status and word device value are displayed.



This indicates that when both Y70 and C0 turned OFF, T2 started count.

7.5.9 Usable devices in the timing chart

The device names that can be used (displayed) in the timing chart are shown below.

| A series CPU Functions, Motion Controller Function Q series CPU (A Mode) Functions | | |
|---|------------------|-------------------------|
| Symbols Displayed on Window | | Device Name |
| Bit device | X | Input |
| | Y | Output |
| | M | Internal relay |
| | F | Annunciator |
| | B | Link relay |
| | TS | Timer (contact) |
| | TC | Timer (coil) |
| | CS | Counter (contact) |
| | CC | Counter (coil) |
| | Sp.M | Special relay |
| Word device | TN | Timer (Current value) |
| | CN | Counter (Current value) |
| | D | Data register |
| | W | Link register |
| | Buffer Memory | Buffer memory |
| | R | File register |
| | ER | Extension file register |
| | Z | Index register |
| | V | |
| | A | Accumulator |
| Sp.D | Special register | |

| FX series CPU Functions | | |
|--------------------------------|---------------|-------------------------|
| Symbols Displayed on Window | | Device Name |
| Bit device | X | Input |
| | Y | Output |
| | M | Internal relay |
| | S | State |
| | TS | Timer (contact) |
| | TC | Timer (coil) |
| | CS | Counter (contact) |
| | CC | Counter (coil) |
| | Sp.M | Special relay |
| Word device | TN | Timer (Current value) |
| | CN | Counter (Current value) |
| | D | Data register |
| | Buffer Memory | Buffer memory |
| | Z | Index register |
| | V | |
| | Sp.D | Special register |

| QnA series CPU Functions Q series CPU (Q Mode) Functions | | |
|---|---------------|------------------------------------|
| Symbols Displayed on Window | | Device Name |
| Bit device | X | Input |
| | Y | Output |
| | M | Internal relay |
| | L | Latch relay |
| | F | Annunciator |
| | V | Edge relay |
| | SB | Special link relay |
| | B | Link relay |
| | SM | Special relay |
| | TS | Timer (contact) |
| | TC | Timer (coil) |
| | STS | Retentive timer (contact) |
| | STC | Retentive timer (coil) |
| | CS | Counter (contact) |
| | CC | Counter (coil) |
| | FX | Function input |
| | FY | Function output |
| Word device | TN | Timer (Current value) |
| | STN | Retentive timer (Current value) |
| | CN | Counter (Current value) |
| | D | Data register |
| | W | Link register |
| | SW | Special link register |
| | SD | Special register |
| | R | File register |
| | ZR | Serial file register |
| | Z | Index register |
| U | Buffer memory | |

8. SAVING AND READING THE DEVICE AND BUFFER MEMORIES, OPTION SETTING - TOOL FUNCTIONS

The following three functions are available as the tool functions.

- **Function to save device memory/buffer memory data**
Function that saves the contents of the device memory or special function module buffer memory temporarily at any timing.
- **Function to read the saved device memory/buffer memory data**
Function that reads the saved data onto GX Simulator.

With these functions, the contents of the GX Simulator device memory or special function module buffer memory can be saved midway through debugging and the saved data can be read onto GX Simulator when debugging is restarted, allowing debugging to be continued from the status when the data was saved.

- **Option setting function**
Function to select how to display the initial window at the start of GX Simulator

With this function, whether the initial window displayed at the start of GX Simulator is minimized or not can be selected.

8.1 Saving the Device and Buffer Memories

[Purpose]

To temporarily save the contents of the device memory and buffer memory to allow debugging to continue after the personal computer is re-booted.

[Operation Procedure]

- 1) Set the execution status in the initial window to STOP when the device memory or buffer memory contents are to be saved.
- 2) Select [Tools] → [Backup device memory] or [Backup buffer memory].

[Setting Window]



Click on the Yes button, to save the entire device memory or the buffer memory for the slots allocated to special function modules in the I/O assignment settings.

The buffer memory data is saved to the following directories:

- A series CPU Functions
(Directory where the GX Simulator are installed) \Acpu\Devmem
- QnA series CPU Functions
(Directory where the GX Simulator are installed) \QnAcpu\Devmem
- FX series CPU Functions
(Directory where the GX Simulator are installed) \FXcpu\Devmem
- Motion controller Functions
(Directories where the GX Simulator are installed)\Acpu\Devmem
- Q series CPU Functions
(Directory where the GX Simulator are installed) \Qcpu\Devmem

[Example]

If C:\MELSEC is designated as the directory where the GX Simulator are installed, then the buffer memory data is saved to the following directories:

A series CPU Functions..... C:\Melsec\LLT\Acpu\Devmem
 QnA series CPU Functions..... C:\Melsec\LLT\QnAcpu\Devmem
 FX series CPU Functions..... C:\Melsec\LLT\FXcpu\Devmem
 Motion controller Functions..... C:\Melsec\LLT\Acpu\Devmem
 Q series CPU Functions C:\Melsec\LLT\Qcpu\Devmem

POINTS

- (1) If the execution status is RUN, device memory/buffer memory cannot be saved.
To save the device memory/buffer memory, change the status to STOP.
- (2) The GX Simulator can save only one file.
If data already exists in the GX Simulator, the new file overwrites the existing data (file).

8.2 Reading Saved Device Memory or Buffer Memory Data

[Purpose]

To read the stored data of device memory and buffer memory.

[Operation Procedure]

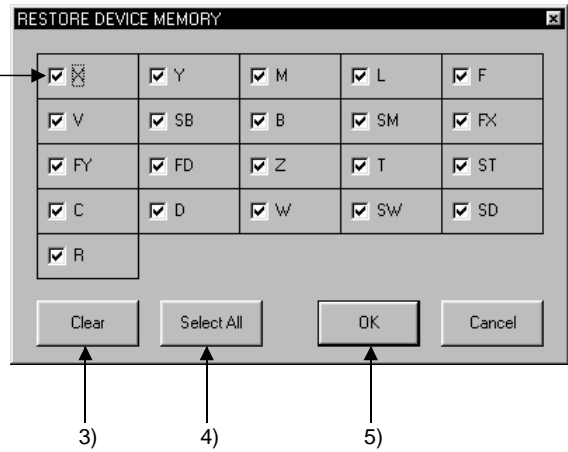
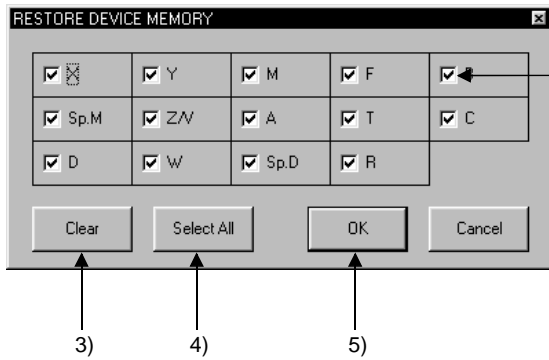
Set the execution status in the initial window to STOP. Select [Tools] → [Restore device memory] or [Restore buffer memory].

[Setting Window]

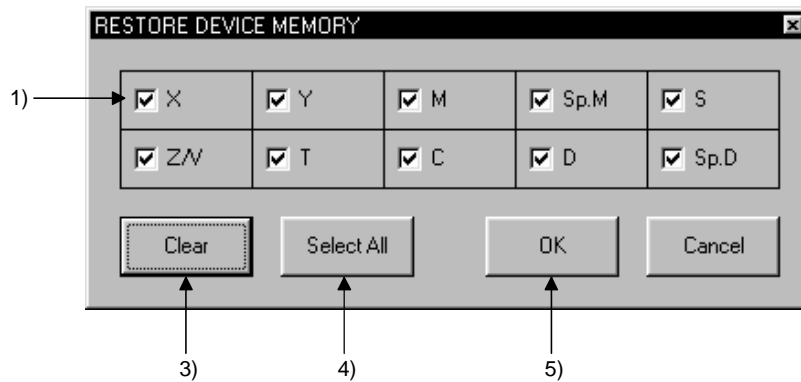
Reading device memory

<A series CPU, Motion controller and Q series CPU (A Mode)>

<QnA series CPU and Q series CPU (Q Mode)>

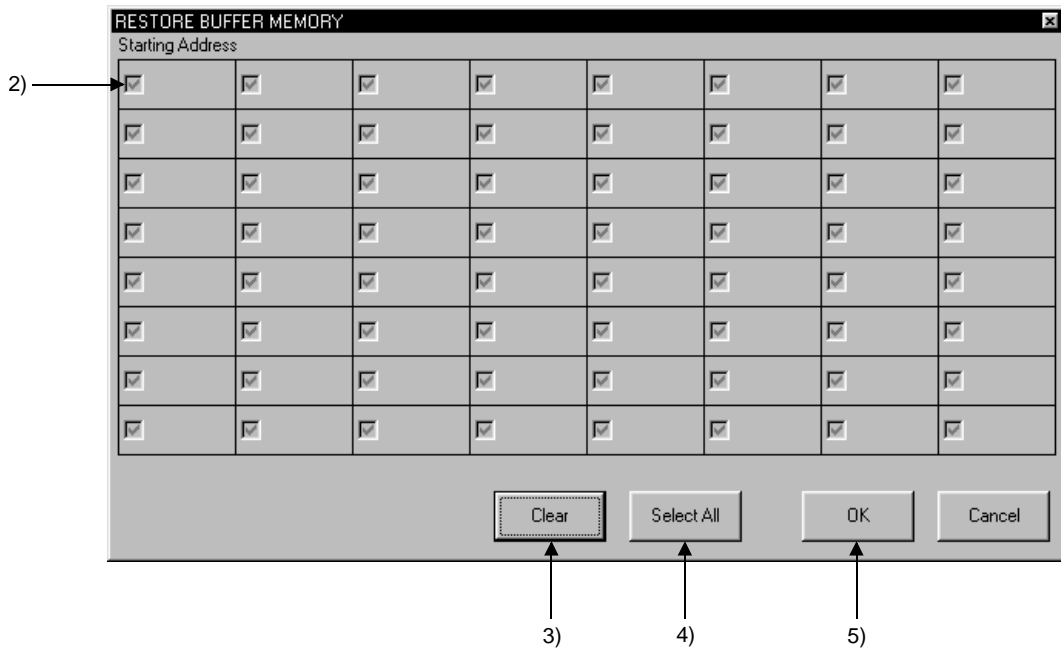


<FX series CPU>

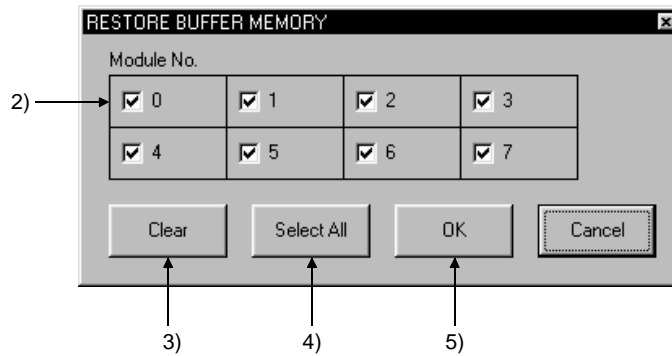


Reading buffer memory

<A series CPU, QnA series CPU, Motion controller and Q series CPU >



<FX series CPU>



[Description]

1) Read Device Check Boxes

Click in the check boxes to select the devices read to GX Simulator.
Click on a check box again to cancel a selection.
All devices are selected by default.

2) Read Special Function Module Check Boxes

For A series, QnA series, Q series CPU function or motion controller function, the first I/O number to the special function module is displayed on the screen.

The special function module block number or module block number is displayed at the top of the FX series window.

Click the check box to select the special function module to be read to the GX Simulator.

Click on a check box again to cancel a selection.

All special function modules are selected by default.

Only the special function module buffer memory can be read.

3) [CLEAR] button

Click to clear all device or special function module selections.

4) [SELECT ALL] button

Click to select all devices or special function modules.

5) [OK] button

Click this button after completing all settings.

| POINTS |
|--|
| (1) Device memory/buffer memory read is not allowed while the execution status is RUN. Change the execution status to STOP before reading device memory/buffer memory. |
| (2) With the A series CPU function, QnA series CPU function, Q series CPU function or Motion controller function, selection of a slot that is not assigned to a special function module using the GX Developer I/O assignment setting is not possible. Before reading buffer memory, set the GX Developer I/O assignment. |

8.3 Option Setting

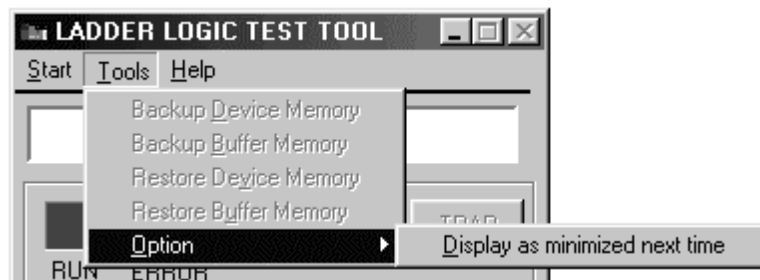
[Purpose]

Selects how to display the initial window at the start of GX Simulator.

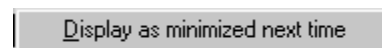
[Operation Procedure]

Choose [Tools] - [Option] - [Display as minimized next time].

Every time it is chosen, the check box on the left of the menu alternates between ON and OFF.



When check box is ON



When check box is OFF

When you exit from GX Simulator with the check box ON, starting GX Simulator next time displays the initial window on the task bar in the minimized status.



POINT

- (1) The initial setting is a "check box OFF" status.
- (2) Making selection merely turns the check box ON/OFF in the menu. At this time, the initial window is not minimized.

9. EXAMPLES OF GX Simulator APPLICATIONS

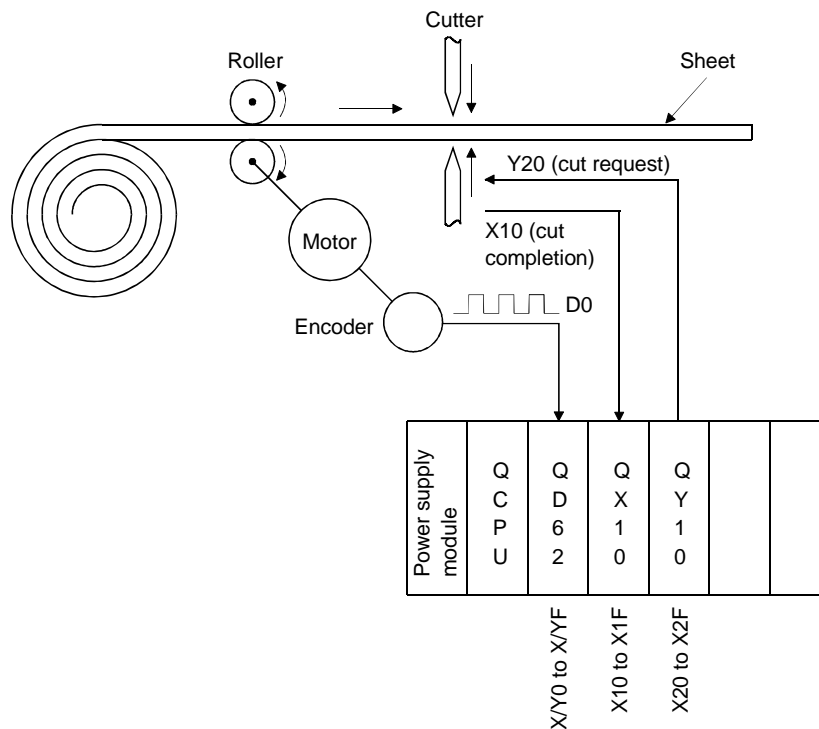
This chapter provides examples of debugging an actual program using the GX Simulator.

In this manual, explanations are given using the system configuration shown below and program shown on page 9-2.

[Simulation Example]

The following shows the system where sheet is fed using roller and cut by cutter. Rotation amount of roller is taken into high-speed counter unit (Channel 1 is used), roller stops when the value reaches "1000" and sheet is cut by Y20 (cut request). Roller turns again by X10 (cut completion) from cutter to feed sheet.

[System Configuration]



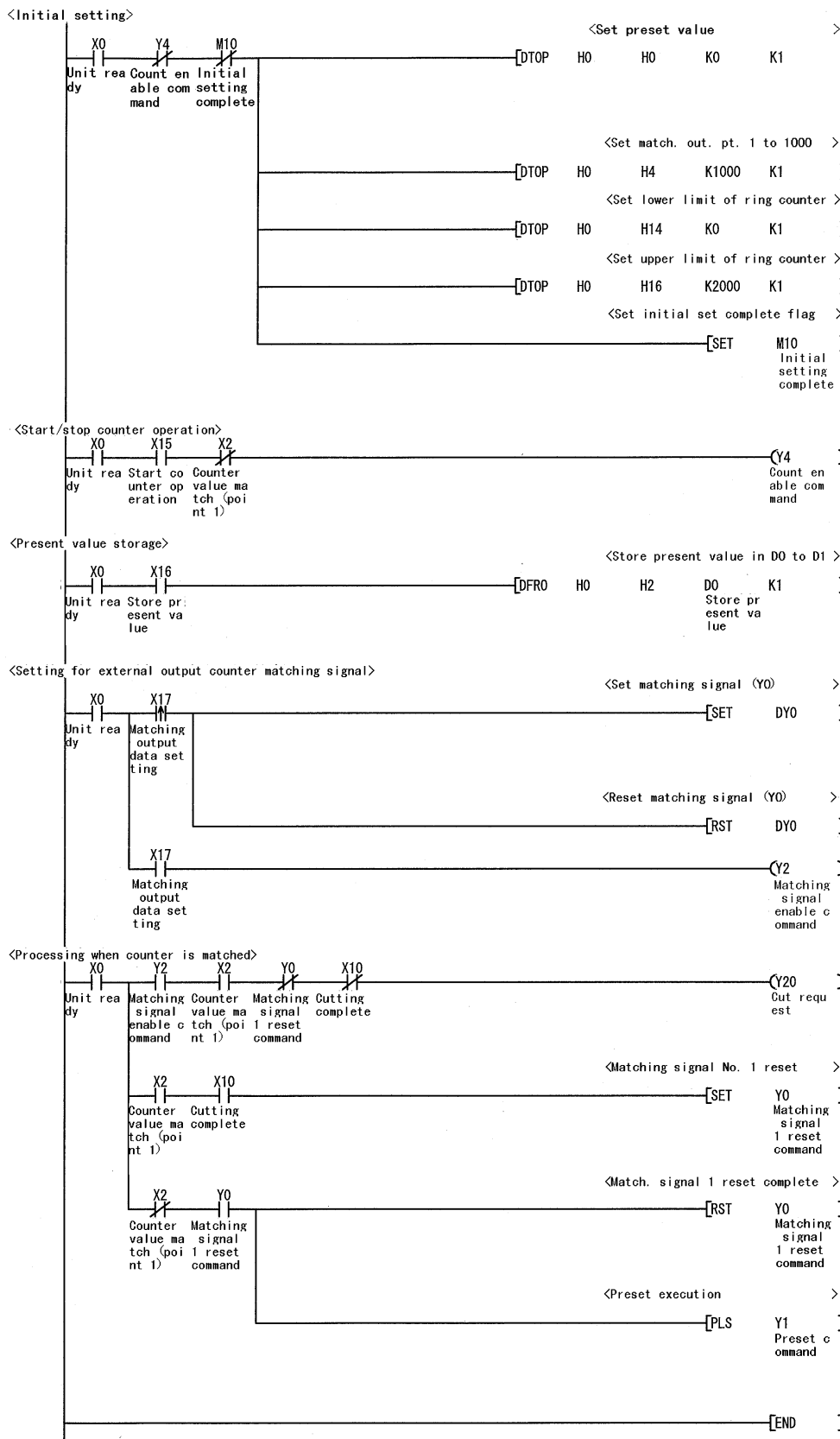
POINT

Program, device registration file (*.mon), and I/O system setting file (*.IOS) are stored in "Manual" folder of CD-ROM for the product.

When using them, copy them once onto the hard disk.

Since the sample files copied are read-only, cancel the read-only settings of all files.

[Sequence program]



[Devices used]

| | Device No. | Signal name | Contents |
|----------------------------------|------------|-------------------------------------|--|
| High-speed counter unit signals | X0 | Unit ready | Turns ON when high-speed counter unit is ready for start. |
| | X2 | Counter value matching (point No.1) | Turns ON when present value matches the preset value of matching output point. Turns ON when value reaches "1000" in this example. |
| | Y0 | Matching signal No. 1 reset command | Turns ON to turn X2 OFF. |
| | Y1 | Preset command | Turns ON when executing preset functions. In this example, present value is set to "0" when preset is executed. |
| | Y2 | Matching signal enable command | Turns ON when matching signal is output to external terminal. In this example, it can be ignored. |
| | Y4 | Count enable command | Starts high-speed counter unit. Count can be executed only when this signal is turned ON. |
| Cutter operation control signals | X10 | cutting complete | Turns ON when cutting of sheet is completed. Turns OFF when Y20 is turned OFF. |
| | Y20 | Cut request | Turns ON when sheet cutting is to be executed. |
| Signals for ON/OFF by user | X15 | Count operation start | Turns ON when executing count with high-speed counter unit. |
| | X16 | Present value reading | Turns ON when reading present value of high-speed counter unit. |
| | X17 | Matching output data setting | Turns ON when matching signal is externally output. Normally turns ON when matching signal is used. |
| Other devices | M10 | Initial setting complete | Signal to inhibit initial setting at scan 2 or after. |
| | D0 to D1 | Present value storage | Device to store present value. |

9.1 Debugging Using GX Developer Step Execution Function

Using GX Developer independently, it is not possible to turn arbitrary devices ON/OFF or to change device values during step execution. However, using the GX Simulator allows the device values to be easily changed during step execution.

In this section, example of debugging with step execution jointly used with following program is described.

Running the program on page 9-2 and turning on X0 causes "SP. UNIT ERROR" to occur.

Carry out step execution to find out the step at which the error has taken place.

(1) Pre-debugging operation

- 1) Start GX Developer and create the program on page 9-2.
- 2) Choose [Tools] → [Start ladder logic test] on GX Developer to start the GX Simulator. (At a start, the parameters and program are automatically written and SWITCH changes to RUN.)

(2) Step execution

- 1) Set SWITCH of the GX Simulator to STEP RUN.



- 2) Turn on X0.

- 3) Move the cursor to the position where step execution will be started (step 0).

- 4) Select [Online] → [Debug] → [Debug] on GX Developer.
In addition, select [Online] → [Debug] → [Step execution] on GX Developer.
The Step Execution dialog box then appears.
- 5) Every time you click the **Step excute** button in the Step Execution dialog box, one instruction is executed.
- 6) As you click the **Step excute** button to run the program on an instruction-by-instruction basis, you will know that "SP. UNIT ERROR" occurs when [DTOP H0 H0 K0 K1] is executed.

POINT

"SP. UNIT ERROR" occurred because you attempted to write a value to the buffer memory using the TO instruction, without making I/O assignment.
Section 9.2 gives a debugging example in which I/O assignment is made and the buffer memory is used.

- 7) Double-click "Parameter" - "Set PLC parameter" from project data list on GX Developer and click "I/O assignment" tab so that I/O assignment is as shown below.

| | Slot | Type | Model | Points |
|---|---------|---------|-------|-----------|
| 0 | 0 (*-0) | Special | QD62 | 16 points |
| 1 | 0 (*-1) | Input | QX10 | 16 points |
| 2 | 0 (*-2) | Output | QY10 | 16 points |

- 8) By updating parameter with PLC writing and setting to RUN after resetting, error will not occur even if X0 is turned ON.

9.2 Using Timing Chart Display for Debugging

This section explains how to check device value changing timings with the timing chart which displays the device chart using the GX Simulator.

(1) Pre-debugging operation

- 1) Start GX Developer and create the program on page 9-2.
- 2) Double-click "Parameter" - "PLC parameter" of project data list on GX Developer, click the "I/O assignment" tab, and make I/O assignment as indicated below.

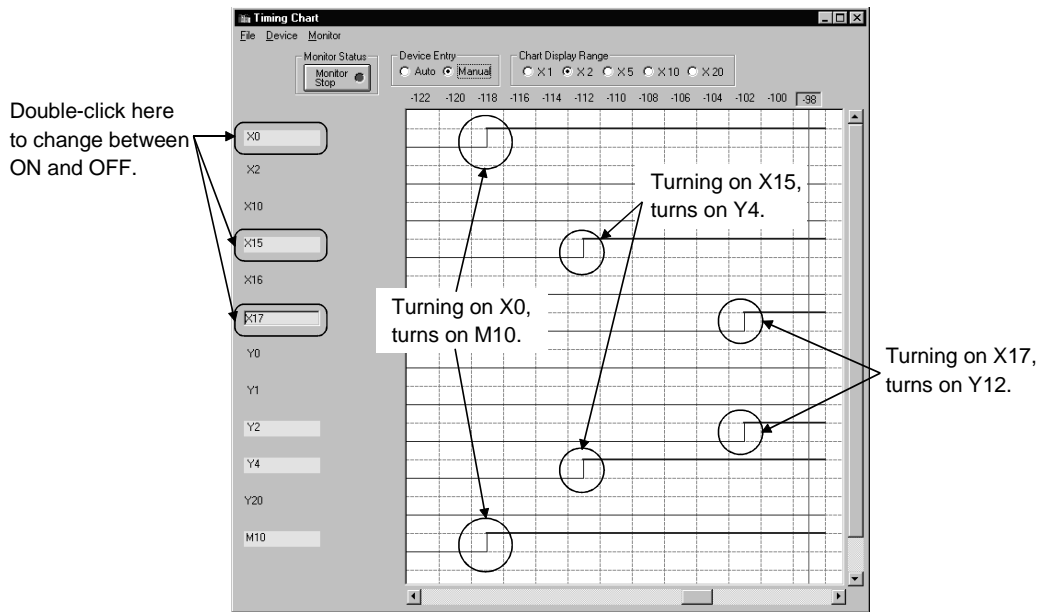
| | Slot | Type | Model | Points |
|---|---------|---------|-------|-----------|
| 0 | 0 (*-0) | Special | QD62 | 16 points |
| 1 | 0 (*-1) | Input | QX10 | 16 points |
| 2 | 0 (*-2) | Output | QY10 | 16 points |

- 3) Choose [Tools] → [Start ladder logic test] on GX Developer to start the GX Simulator. (At a start, the parameters and program are automatically written and SWITCH changes to RUN.)
- 4) Select [Start] - [Device Memory Monitor] from initial window of GX Simulator, and start device memory monitor.

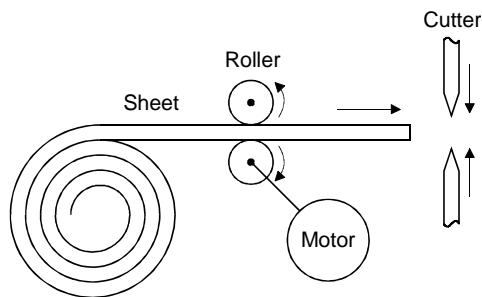
(2) Displaying the timing chart

- 1) Running the timing chart
Choose [Timing Chart] → [Run] of Device Memory Monitor to run the timing chart.
- 2) Register device and start monitoring.
Register the following devices and click "Monitor Stop" button to start monitoring.
 - X0, X2, X10, X15, X16, X17, Y0, Y1, Y2, Y4, Y20, M10, D0 (Double word)
- 3) Turning X0, X15 and X17 ON (initial setting)
X0, X15 and X17 are turned ON in sequence.
When X0 is turned ON, M10 is turned ON, in like manner X15: Y4, and X17: Y2.

| |
|--|
| POINT |
| The timing chart retains data of up to 1000 scans. |

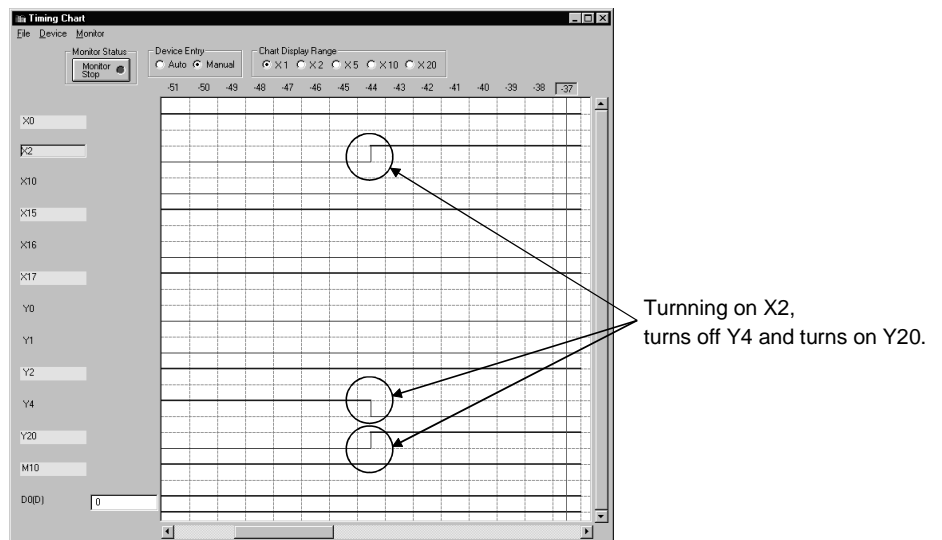


<Actual machine state>

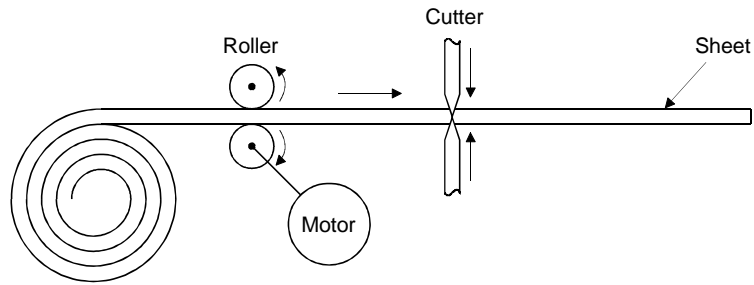


4) Turning X2 ON (Sheet feeding complete → start cutting)

Assuming that present value of high-speed counter unit matches the matching output point No. 1 (reaches 1000), turn X2 ON. When X2 is turned ON, Y4 is turned OFF to stop roller operation, and cutter executes cutting by turning Y20 ON.

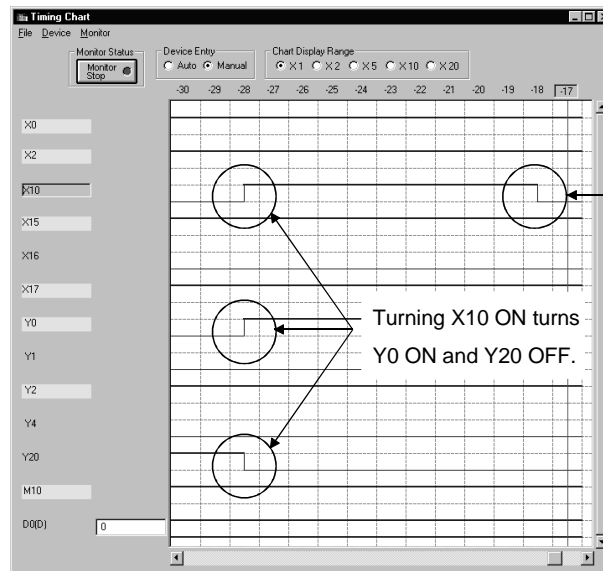


<Actual machine state>



5) Turn X10 ON (cutting complete)

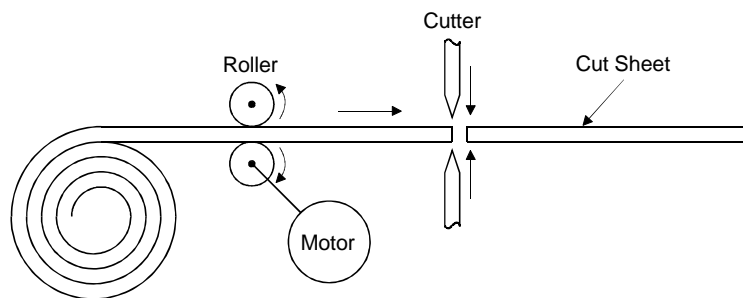
Assuming that cutting is complete, signal X10 sent from cutter turns ON. When X10 is turned on, Y20 is turned OFF and Y0 is turned ON. When Y20 is turned ON, cutter turns OFF X10. Turn X10 OFF manually.



Turn X10 OFF manually.

Turning X10 ON turns Y0 ON and Y20 OFF.

<Actual machine state>

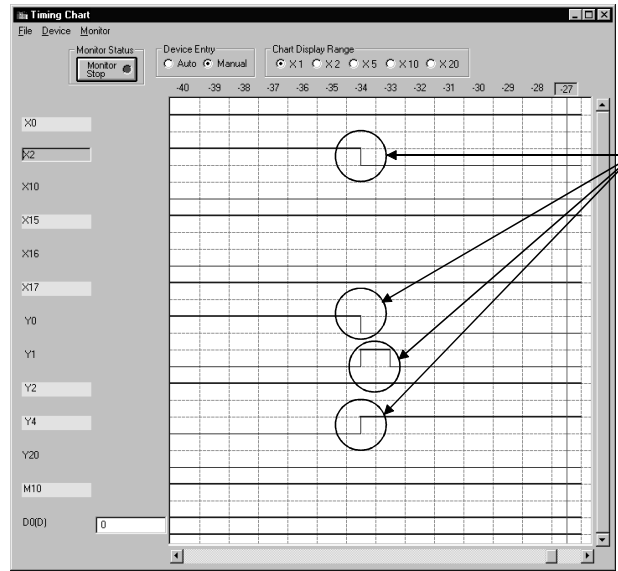


6) Turn X2 OFF (Re-starting operation)

When Y0 is turned ON, high-speed counter unit turns X2 OFF. Turn X2 OFF manually.

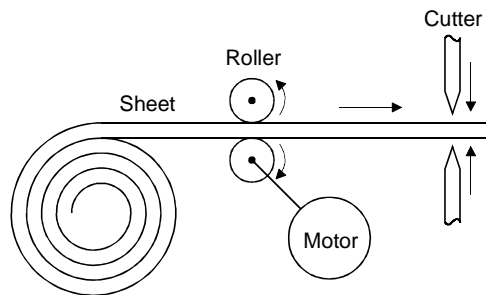
When X2 is turned OFF, Y0 is turned OFF, Y1 ON and then OFF and Y4 ON. By turning Y4 ON, roller re-starts operation.

General operation of program is now complete.



When X2 is turned OFF, Y0 is turned OFF, Y1 is turned ON for one scan and Y4 is turned ON.

<Actual machine state>



9.3 Using I/O System Settings for Debugging

This section describes the operation to perform simulation of external equipment using the I/O system setting.

(1) Pre-debugging operation

- 1) Start GX Developer and create the program on page 9-2.
- 2) Double-click [Parameter] - [PLC parameter] of project data list on GX Developer and click "I/O assignment" tab so that I/O assignment is as shown below.

| | Slot | Type | Model | Points |
|---|---------|---------|-------|-----------|
| 0 | 0 (*-0) | Special | QD62 | 16 points |
| 1 | 0 (*-1) | Input | QX10 | 16 points |
| 2 | 0 (*-2) | Output | QY10 | 16 points |

- 3) Select [Tool] - [Start ladder logic test] on GX Developer to start GX Simulator. (Once started, parameter and program will be automatically written and execution state is set to RUN.)
- 4) Select [Start] - [I/O System Settings] on initial window of GX Simulator to start I/O system setting.

(2) Operation of I/O system settings

- 1) Make the following settings.

- Timing chart input

The following setting is performed: D0 is counted up by turning Y4 ON, and X2 turns ON when count reaches 1000 (matching output).

| No. | Condition | Timing Chart Format | Setting |
|-----|-----------|---------------------|--|
| 1 | | | <input checked="" type="checkbox"/> Enable |

<Timing chart format input screen>

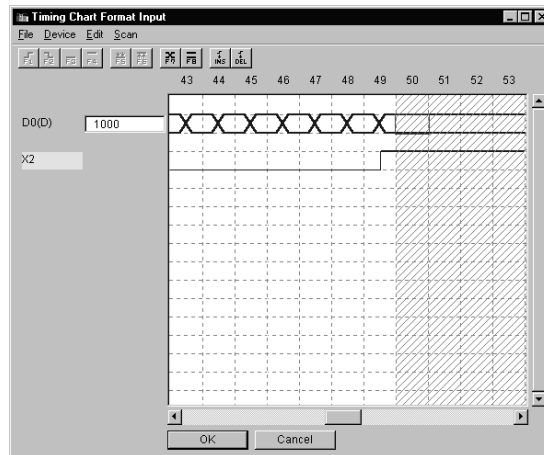
Count up D0 (32 bit integer) assuming present value.

Turn ON X2 at the moment D0 reaches 1000.

D0: Counted up in 20 count units from 0 to 49th scan.

20 (0 scan), 40, 60, 80 to 1000 (49th scan)

X2: Turned OFF 0 to 48th scan, turned ON only for 49th scan.



• Device value input

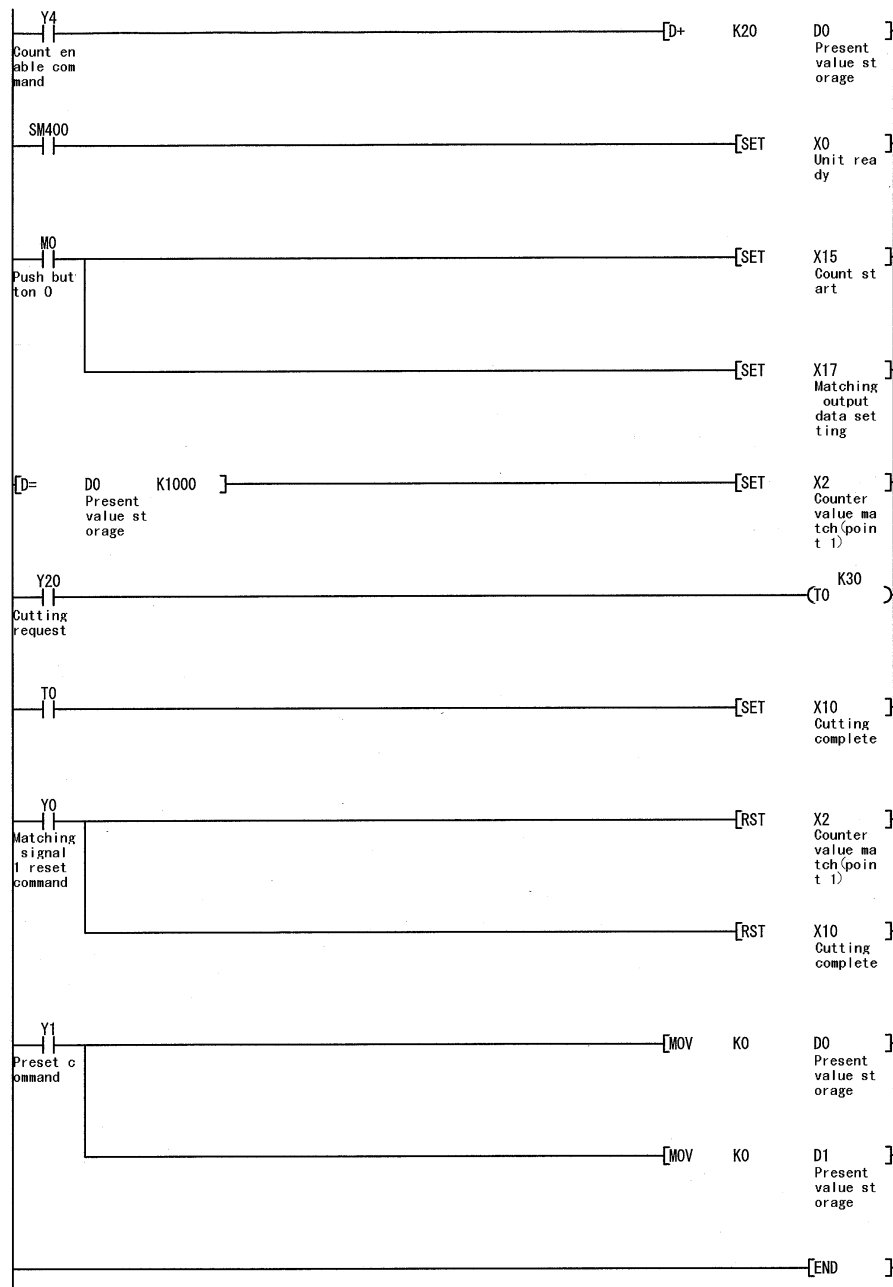
| No. | Condition | Time ms | Input No. | Setting |
|-----|--------------|------------|------------|--|
| 1 | Always ON | 1 x10 | X0 | ON OFF <input checked="" type="checkbox"/> Enable |
| 2 | Push Button0 | 1 x10 | X15 X17 | ON OFF <input checked="" type="checkbox"/> Enable |
| 3 | Y20=ON | 300 x10 | X10 | ON OFF <input checked="" type="checkbox"/> Enable |
| 4 | Y0=ON | 1 x10 | X2 X10 | ON OFF <input checked="" type="checkbox"/> Enable |
| 5 | Y1=ON | 1 x10 | D0=0, D1=0 | ON OFF <input checked="" type="checkbox"/> Enable |

| Set No. | Contents |
|---------|--|
| 1 | X0 (unit ready) is normally turned ON. |
| 2 | By clicking push button 0, X15 (count operation start) and X17 (matching data setting) which must be turned ON by user, can be turned ON. Operation will start by clicking push button 0. |
| 3 | When Y20 (cut request) is turned ON, X10 (cut complete) turns ON 3 seconds later. This assumes the operation through cutting has been completed, after requesting cut. |
| 4 | When Y0 (matching signal No. 1 reset command) is turned ON, X2 (counter value matching (point No. 1)) and X10 (cutting complete) are turned OFF. Operation in which turning Y0 ON turns X2 OFF assumes the operation of high-speed counter unit. Turning X10 OFF assumes the operation to return cutter signal to initial value. |
| 5 | When Y1 (preset command) is turned ON, D0 and D1 are set to "0". This assumes the preset operation of high-speed counter unit. |

- 2) Save I/O system settings.
- 3) Select [File] - [Execute I/O System Settings] to execute I/O system setting.
Execution state of GX Simulator is set to RUN.
- 4) Select [Online] - [Monitor Mode] to set I/O system setting to monitor mode.

When I/O system setting has been performed, the following pseudo program is created.

When running program, the pseudo program will be executed after the created program is executed.



(3) Displaying timing chart

To confirm the device value, monitor using timing chart.

1) Starting the timing chart

Select [Timing Chart] - [Run] from device memory monitor to start timing chart.

2) Registering device and starting monitoring

Register the devices shown below and click "Monitor Stop" button to start monitoring.

- X0, X2, X10, X15, X16, X17, Y0, Y1, Y2, Y4, Y20, M10, D0 (Double word)

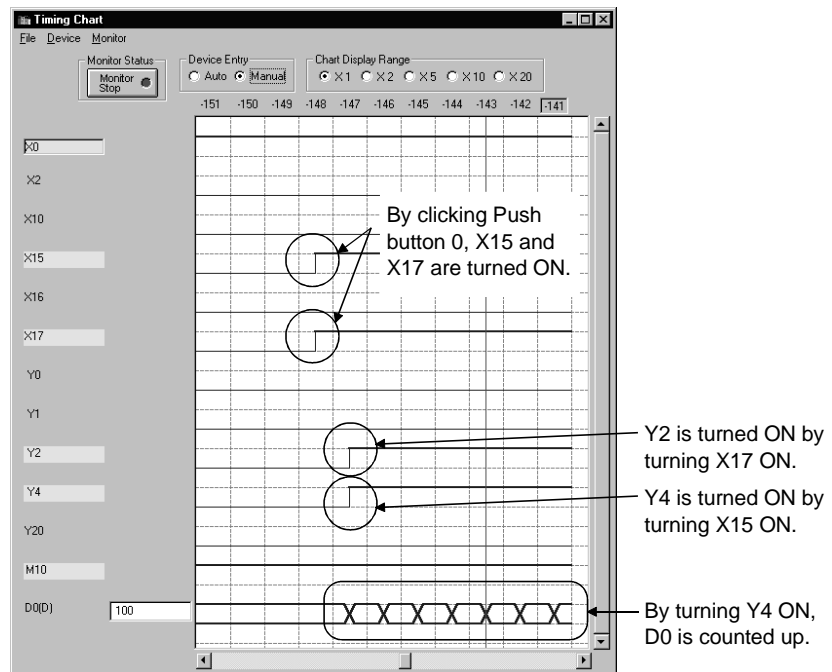
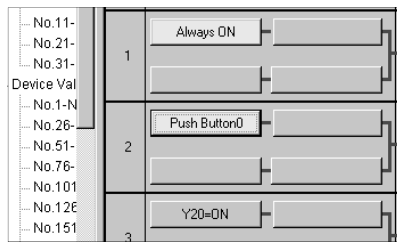
(4) Confirming the program operation

1) Click Push button 1. (Initial setting)

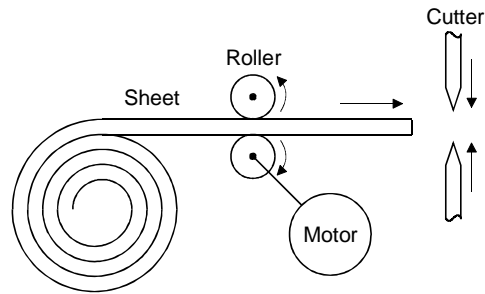
When Push button 0 of I/O system settings is clicked, operation will start.

By clicking Push button 0, X15 and X17 are turned ON.

Turning X15 ON turns Y4 ON, and turning X17 ON turns Y2 ON. In addition, DO will be counted up in 20-count units by turning ON Y4.



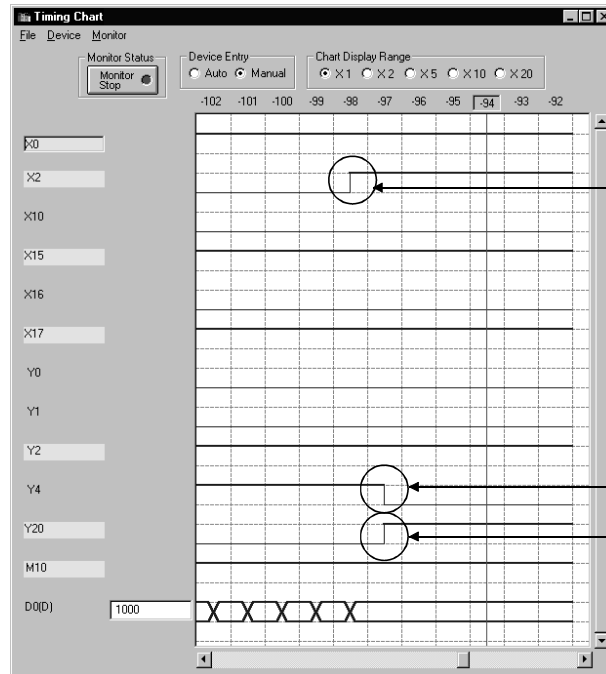
<Actual machine status>



2) Turning X2 ON (Sheet feeding complete → Start cutting)

X2 is turned ON the moment D0 reaches 1000.

Y4 is turned OFF by turning X2 ON to stop roller operation, and cutting is executed by cutter when Y20 is turned ON.

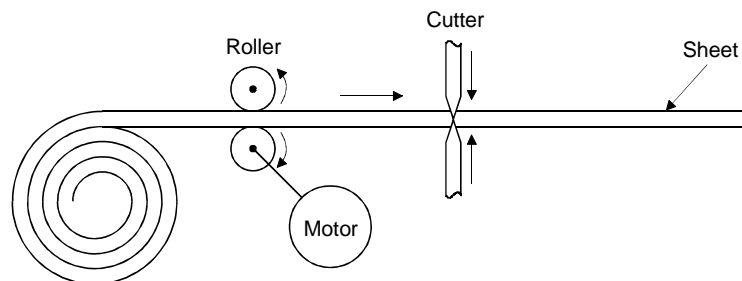


X2 is turned ON just the moment D0 reaches 1000.

Y4 is turned OFF by turning X2 ON.

Y20 is turned ON by turning X2 ON.

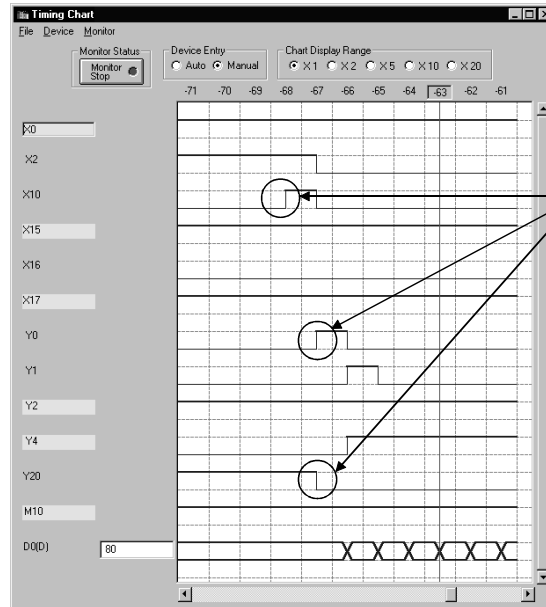
<Actual machine status>



3) Turning X10 ON 3 seconds after Y20 is turned ON (Cutting completed)

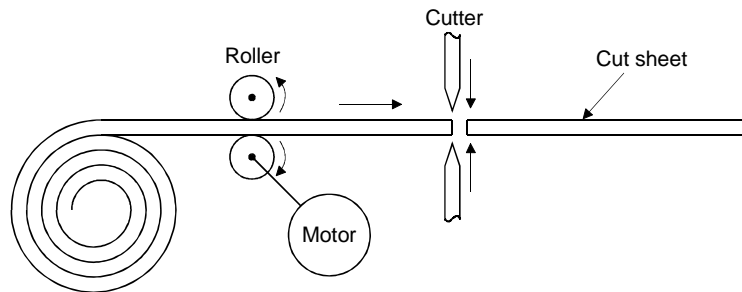
Assuming that 3 seconds is needed until cutting operation is complete, X10 should be turned ON 3 seconds after Y20 is turned ON.

When X10 is turned ON, Y20 is turned OFF and Y0 is turned ON.



Turning on X10, turns on Y0 and turns off Y20.

<Actual machine status>



10. TROUBLESHOOTING

10.1 Error Messages Displayed on the LED Indicators

This section describes error messages and error codes occurring in the GX Simulator, gives a description and cause of the error, and suggests remedies.

(1) GX Simulator for A series CPU Functions

Error Message Table

| Error Message | Error Code (D9008) * 1 | Details Error Code (D9091) * 1 | Error Description and Cause | Remedy |
|---|------------------------|--------------------------------|---|---|
| "INSTRCT CODE ERR." <small>(Checked at RUN → STOP or at the execution of an instruction)</small> | 10 | 101 | The program contains an instruction code which could not be decoded by the GX Simulator. | Read the error step using GX Developer and modify the program step. |
| | | 102 | Index qualification used for a 32-bit constant. | |
| | | 103 | The device specified in the dedicated instruction is incorrect. | |
| | | 104 | The program structure of the dedicated instruction is incorrect. | |
| | | 105 | The command name of the dedicated instruction is incorrect. | |
| | | 107 | (1) The index qualification used for the device number and SV in timer or counter OUT instructions. (2) The index qualification used for the label number of the pointer (P) added at the start of an instruction jump destination or for the label number of the interrupt pointer (I) added at the start of an interrupt program for the following instructions. <code>CJ</code> <code>SCJ</code> <code>CALL</code> <code>JMP</code> <code>LEDA/B</code> <code>FCALL</code> <code>LEDA/B</code> <code>BREAK</code> | |
| "MISSING END INS." <small>(Checked at RUN → STOP)</small> | 12 | 121 | There is no END (FEND) instruction in the main program. | Write END in the end of main program. |
| | | 122 | A sub program has been allocated in the parameters and there is no END (FEND) instruction. | Write END in the end of the sub-program. |
| "CANT EXECUTE(P)" <small>(Checked at the execution of the instruction)</small> | 13 | 131 | The device number of the pointer (P) or the interrupt pointer (I) used as a label added to the destination head is duplicating. | Remove the duplicated number of pointer (P) with the destination head and correct so that the number is not duplicated. |
| | | 132 | The label of the pointer (P) specified by <code>CJ</code> <code>SCJ</code> <code>CALL</code> <code>CALLP</code> <code>JMP</code> <code>LEDA/B</code> <code>FCALL</code> and <code>LEDA/B</code> <code>BREAK</code> instructions is not specified prior to the END instruction. | Read the error step using GX Developer, check the step and insert the destination pointer (P). |

Error Message Table (cont.)

| Error Message | Error Code (D9008) * 1 | Details Error Code (D9091) * 1 | Error Description and Cause | Remedy |
|--|------------------------|--------------------------------|--|--|
| "CANT EXECUTE(P)" (Checked at the execution of the instruction) | 13 | 133 | (1) There is no [CALL] instruction for the [RET] instruction in the program. (2) There is no [FOR] instruction for the [NEXT], [LEDAB], [BREAK] instructions in the program. (3) The nesting level of [CALL], [CALLP], or [FOR] exceeds the nesting limit six (6) and is executing the sixth level. (4) There is no [RET] or [NEXT] instructions for the [CALL] or [FOR] instruction. | (1) Read the error step using GX Developer. Check and modify the program step. (2) Nesting level for the [CALL], [CALLP] and [FOR] instructions must be five (5) or less. |
| | | 134 | There is no parameter settings for the sub program. Can not execute the [CHG] instruction. | Read the error step using GX Developer. Delete the line containing the [CHG] instruction. |
| | | 136 | There is no parameter settings for sub program 1. Can not execute the [ZCHG1] instruction. | Read the error step using GX Developer. Delete the line containing the [ZCHG1] instruction. |
| | | 137 | There is no parameter settings for sub program 2. Can not execute the [ZCHG2] instruction. | Read the error step using GX Developer. Delete the line containing the [ZCHG2] instruction. |
| | | 138 | There is no parameter settings for sub program 3. Can not execute the [ZCHG3] instruction. | Read the error step using GX Developer. Delete the line containing the [ZCHG3] instruction. |
| "WDT ERROR" (Checked at the execution of the sequence program.) | 22 | 220 | A program instruction is executed infinitely in a single scan. | Read the error step and confirm there is no occurrence of an infinite loop. |
| "END NOT EXECUTE" (Checked at the execution of the instruction.) | 24 | 241 | The entire program has been executed without executing the END instruction. (1) There is no END instruction. (2) The END instruction is replaced with some other instruction. | Please write the program to PLC again. |
| "SP.UNIT ERROR" (Checked at the execution of the FROM/TO instruction or special function module dedicated instruction.) | 46 | 461 | There is no special function module in the area specified by the FROM/TO instruction. | (1) Read the error step using GX Developer. Check and modify the FROM/TO instruction in the program step. (2) Correct the I/O unit allocation parameter settings. |

Error Message Table (cont.)

| Error Message | Error Code (D9008) * 1 | Details Error Code (D9091) * 1 | Error Description and Cause | Remedy |
|--|------------------------|--------------------------------|--|---|
| "OPERATION ERROR" (Checked at the execution of the instruction) | 50 | 501 | (1) Operations using the file register (R), are executed with the device number or block number exceeding the range specified for the file register (R). (2) The file register is used in the program without setting necessary parameters for the file register (R). | (1) Read the error step using GX Developer. Check and modify the program step. (2) Set the parameters for the file register (R). |
| | | 502 | The combination of devices specified by instruction is incorrect. | Read the error step using GX Developer. Check and modify the program step. |
| | | 503 | The storage data or constants are not within the usable range. | |
| | | 504 | The number of data handling settings exceeds the usable range. | |

* 1 Characters in parentheses () indicate the special register number where the information is saved.

(2) GX Simulator for QnA series CPU

Error Message Table

| Error Message | Error Code (SD0) ※1 | Error Description and Cause | Remedy |
|------------------|---------------------|---|---|
| SP.UNIT LAY ERR. | 2107 | (1) The starting X/Y setting in the I/O allocation setting of parameter overlaps with the X/Y setting of some other module. (2) There is some data missing in the Type or Points in the I/O allocation setting of parameter. | (1) Reset the I/O allocation setting of parameter according to the actual status. (2) Set the missing data in the Type or Points in the I/O allocation setting of parameter. |
| SP.UNIT ERROR | 2110 | There is no special function module in the area specified by the FROM/TO instruction. | (1) Read the error step and correct the contents of the FROM/TO instruction. (2) Correct the I/O unit parameter settings. |
| MISSING PARA. | 2200 | Parameter file is missing. | Please write the parameter again. |
| FILE SET ERROR | 2400 | The file specified in the parameter settings is not available. | (1) Please delete the file name from the parameter settings. (2) Make a file as specified in the parameter settings. |
| FILE OPE.ERROR | 2410 | The file specified in the sequence program is not available. | (1) Check and modify the specified file name. (2) Create the specified file. |
| CAN'T EXE.PRG. | 2501 | Multiple program files exist. But, the program settings parameter is set to "None". | Change the parameter settings to "Present" or delete unnecessary programs. |
| | 2503 | No program files exist. | Please check the program configuration. |
| PARAMETER ERROR | 3001 | Parameter data is corrupted. | Please write the parameter again. |
| MISSING END INS. | 4010 | The program contains no "END (FEND)" instruction. | Please check and correct the program. |
| CAN'T SET(P) | 4020 | The total number of pointers used in the program files exceeds the maximum allowable number defined in the parameter settings. | Check the error step and correct the program. |
| | 4021 | Overlapping of common pointers exist. | |
| OPERATION ERROR | 4100 | An instruction contains data that cannot be processed. | Check the error step and correct the program. |
| | 4101 | The instruction data exceeds the allowable number of data handled. Or the storage data constants specified in the instruction exceeds the usable range. | |
| FOR NEXT ERROR | 4200 | A FOR instruction is executed without NEXT instruction. Or the number of NEXT instructions is lower than the number of FOR instruction. | Check the error step and correct the program. |
| | 4201 | A NEXT instruction is executed without a FOR instruction. Or the number of NEXT instructions is greater than the number of FOR instructions. | |
| | 4202 | The nesting exceeds 16 loops. | Reduce nesting count to 16 or less loops. |
| | 4203 | A BREAK instruction is executed when there is no FOR instruction. | Check the error step and correct the program. |

Error Message Table (cont.)

| Error Message | Error Code (SD0) *1 | Error Description and Cause | Remedy |
|--------------------|---------------------|--|---|
| CAN'T EXECUTE (P) | 4210 | A CALL instruction is executed without a destination pointer. | Check the error step and correct the program. |
| | 4211 | The executed subroutine program contains no RET instruction. | |
| | 4212 | A RET instruction is existing before the FEND instruction. | |
| | 4213 | The nesting exceeds 16 loops. | Reduce nesting count to 16 or less loops. |
| INST. FORMAT ERROR | 4231 | Mismatch in the number of IX and IXEND instructions. | Check the error step and correct the program. |
| WDT ERROR | 5000 | An instruction in a program of initial execution type is infinitely executed in a single scan. | Read the error step and confirm there is no occurrence of an infinite loop. |
| | 5001 | An instruction in the program is infinitely executed in a single scan. | Read the error step and confirm there is no occurrence of an infinite loop. |
| F * * * * | 9000 | The program turns ON annunciator. | Check the user condition that turns On the annunciator and make corrective action for that condition. |

*1 Characters in parentheses () indicate the special register number where the information is saved.

(3) GX Simulator for FX series CPU Functions

Error Message Table

| Error Message | Error Code (D8065, D8066) * 1 | Error Description and Cause | Remedy |
|----------------------|-------------------------------------|---|---|
| WDT ERROR | 6105 | Occurrence of an infinite loop. | Check the program or contents of the operands in the application instruction. |
| FILE NOT FOUND | 6409 | Illegal parameter settings. | Correct the parameter settings and write parameters again. |
| INVALID CODE ERROR | 6503 | Data instruction code is corrupted. | Transfer the program from GX Developer again. |
| EXIST SAME LABEL No. | 6504 | Overlapping label numbers. | Check the program and correct the overlapping label numbers. |
| STL-MC INST.ERROR | 6505 | (1) There is no [RET] instruction. (2) MC and MCR instructions are designated within an STL state. | Check the program and correct the mutual instructions. |
| FOR NEXT ERROR | 6607 | Illegal occurrence of FOR to NEXT instructions. FOR to NEXT nesting exceeds the maximum nesting level of 6. | Check the program or contents of the operands in the application instruction. |
| OPERATION ERROR | 6701 | No jump destination is specified for CJ or CALL instruction. | Check the program or contents of the operands in the application instruction. |
| CAN'T EXECUTE (P) | 6702 | The nestings of CALL instructions exceed the maximum nesting level of 6. | Check the program or contents of the operands in the application instruction. |
| FOR NEXT ERROR | 6704 | FOR - NEXT nestings exceed the maximum nesting level of 6. | Check the program or contents of the operands in the application instruction. |
| OPERATION ERROR | 6705 | An incompatible device is specified as an operand of an application instruction. | Check the program or contents of the operands in the application instruction. |
| | 6706 | A device is specified outside the allowable range of an application instruction operand. | |
| | 6707 | A file register which is not defined in the parameter settings is accessed. | |
| SP. UNIT ERROR | 6708 | FROM - TO instruction error. | Check the program or contents of the operands in the application instruction. |
| OPERATION ERROR | 6709 | (1) Illegal nesting of FOR - NEXT instructions. (2) Illegal nesting of CALL - SRET instructions. | Check the program or contents of the operands in the application instruction. |

* 1 Characters in parentheses () indicate the special register number where the information is saved.

Errors not displayed on the LED indicators are stored as operation error codes in the special data register D8067.

Devices related to error displays (see Appendix 1)

M8067 : Operation error generated

M8068 : Operation error latch

D8067 : Operation error code number

D8068 : Latch for step number where operation error was generated

D8069 : Step where M8067 error was generated

(4) GX Simulator for Q series CPU (A Mode) Functions

The error codes of the Q series CPU (A mode) are the same as those of the A series CPU. Refer to the error message list of the GX Simulator for A series CPU functions in Section 10.1(1).

(5) GX Simulator for Q series CPU (Q Mode) Functions

Refer to the QnA for the error message list.

Note that the following error message is specific to the Q mode.

| | | | |
|----------------|------|---|--|
| SP PARA. ERROR | 3301 | There is an error in the intelligent function utility settings. | (1) Check and correct the intelligent function unit settings. (2) Check and correct the parameter settings (I/O allocation, Device settings). |
|----------------|------|---|--|

APPENDICES

Appendix 1 List of Supported Devices

The GX Simulator supports the devices for an A series CPU, QnA series CPU, Q series CPU, and FX series CPU.

(Non-supported devices are reserved as devices for reading and writing only.)

For the motion controller, refer to the compatible devices of the A series CPU. For the compatible CPU, refer to Section 3.3.

The devices supported by the GX Simulator are listed in Appendix Table 1.1 to Appendix Table 1.15.

Appendix 1.1 The A series CPU function GX Simulator

(1) Device list

Appendix Table 1.1 List of Devices Supported by the GX Simulator

| Device | | Device range (points) | | | | | | | | |
|--------------------------|-----------------------------|--|---------------------------|-----------------------------|------------------------------|--|--------------------------------------|------------------------------|---|--|
| | | A0J2H A1FX | A1N A1SJ | A2C A2CJ A1S(S1) | A2N(S1) * 3 A2S(S1) | A3N A1SH A1SJH A2SH(S1) | A2A(S1) | A3A | A2U(S1) A2US(S1) A2USH-S1 A2AS(S1) A2AS-S30 A2AS-S60 A3U A4U | |
| Bit device | Input (X) * 1 | X0 to X1FF (512 points) | X0 to XFF (256 points) | X00 to X1FF (512 points) | X00 to X3FF (1024 points) | X0 to X7FF (2048 points) | X00 to X3FF (1024 points) | X00 to X7FF (2048 points) | X00 to X1FFF (8192 points) | |
| | Output (Y) * 1 | Y0 to Y1FF (512 points) | Y0 to YFF (256 points) | Y00 to Y1FF (512 points) | Y00 to Y3FF (1024 points) | Y0 to Y7FF (2048 points) | Y00 to Y3FF (1024 points) | Y00 to Y7FF (2048 points) | Y00 to Y1FFF (8192 points) | |
| | Internal relay (L/M/S) | M0 to M2047 (2048 points) (Usable as L/M/S by making setting) | | | | M0 to M8191 (8192 points) (Usable as L/M/S by making setting) | | | | |
| | Special relay (M) | M9000 to M9255 (256 points) | | | | | | | | |
| | Link relay (B) | B0 to B3FF (1024 points) | | | | | B0 to BFFF (4096 points) | | B0 to B1FFF (8192 points) | |
| | Annunciator (F) | F0 to F255 (256 points) | | | | | F0 to F2047 (2048 points) | | | |
| Word device | Timer (T) | T0 to T255 (256 points) | | | | | T0 to T2047 (2048 points) | | | |
| | Counter (C) | C0 to C255 (256 points) | | | | | C0 to C1023 (1024 points) | | | |
| | Data register (D) | D0 to D1023 (1024 points) | | | | | D0 to D6143 (6144 points) | | D0 to D8191 (8192 points) | |
| | Special register (D) | D9000 to D9255 (256 points) | | | | | | | | |
| | Link register (W) | W0 to W3FFF (1024 points) | | | | | W0 to WFFF (8192 points) | | W0 to W1FFF (8192 points) | |
| | File register (R) | R0 to R8191 (8192 points) | | | | | | | | |
| | Extension file register | Block 1 to 64 (8k points) * 2 | | | | | | | | |
| | Accumulator (A) | A0, A1 (2 points) | | | | | | | | |
| | Index register (Z, V) | Z, V (2 points) | | | | | Z, Z1 to Z6, V, V1 to V6 (14 points) | | | |
| | Nesting (N) | N0 to N7 (8 points) | | | | | | | | |
| Pointer (P) | P0 to P255 (256 points) | | | | | | | | | |
| Decimal constant (K) | K-2147483648 to K2147483647 | | | | | | | | | |
| Hexadecimal constant (H) | H0 to HFFFFFFF | | | | | | | | | |

* 1 : Remote I/O is included.

* 2 : In the SW2D5□-GPPW-E, the data of file register can be written in the block No. 1 through 48 only.

* 3 : The device range of the A2NCPU is that of the A2NCPU-S1.

(2) Special Relay List

Appendix Table 1.2 lists the special relays supported by the GX Simulator for the A series CPU functions. See the A series actual PLC User's Manual for details about the special relays.

Appendix Table 1.2 List of Special Relays Supported by the GX Simulator

| Number | Name | Description |
|-------------|-------------------------|--|
| M9008 | Self-diagnostic error | OFF :No error ON :Error |
| M9009 | Annunciator detected | OFF :Not detected ON :Detected |
| M9010 | Operation error flag | OFF :No error ON :Error |
| M9011 | Operation error flag | OFF :No error ON :Error |
| M9012 | Carry flag | OFF :Carry OFF ON :Carry ON |
| M9020 | User timing clock No. 0 | |
| M9021 | User timing clock No. 1 | |
| M9022 | User timing clock No. 2 | |
| M9023 | User timing clock No. 3 | |
| M9024 | User timing clock No. 4 | |
| M9028 | Clock data read request | OFF :No processing ON :Read request |
| M9030 *1 | 0.1-second clock | |
| M9031 *1 | 0.2-second clock | |

| Number | Name | Description |
|-------------|--|---|
| M9032 *1 | 1-second clock | |
| M9033 *1 | 2-second clock | |
| M9034 *1 | 1-minute clock | |
| M9036 | Normally ON | ON _____ OFF _____ |
| M9037 | Normally OFF | ON _____ OFF _____ |
| M9038 | ON one scan only after RUN | ON |
| M9039 | RUN flag (OFF one scan only after RUN) | ON |
| M9042 | Stop status contact | OFF :Not stop status ON :Stop status |
| M9051 | CHG instruction execution disabled | OFF :Enabled ON :Disabled |
| M9054 | STEP RUN flag | OFF :Not STEP RUN ON :STEP RUN |
| M9091 | Instruction error flag | OFF :No error ON :Error |

*1 : The values obtained are based on the set values of a constant scan.

(3) Special Register List

Appendix Table 1.3 lists the special registers supported by the GX Simulator for the A series CPU functions. See the A series actual PLC User's Manual for details about the special registers.

Appendix Table 1.3 List of Special Registers Supported by the GX Simulator

| Number | Name | Description |
|-------------|-----------------------|--|
| D9008 | Self-diagnostic error | Self-diagnostic error number |
| D9009 | Annunciator detected | F number from external breakdown |
| D9010 | Error step | Step number where operation error occurred |
| D9011 | Error step | Step number where operation error occurred |
| D9015 | CPU operation status | CPU operation status |
| D9016 | Program number | Saves the BIN value of the executing sequence program. |
| D9017 *2 | Scan time | Minimum scan time (10 ms units) |
| D9018 *2 | Scan time | Scan time (10ms units) |
| D9019 *2 | Maximum scan time | Maximum scan time (10ms units) |
| D9020 *3 | Constant scan | Constant scan time (user settable in 10 ms units) |
| D9021 *2 | Scan time | Scan time (1 ms units) |
| D9022 *1 | 1-second counter | Number of counts in 1-second intervals |
| D9025 | Clock data | Clock data (year, month) |

| Number | Name | Description |
|--------|--|--|
| D9026 | Clock data | Clock data (day, hour) |
| D9027 | Clock data | Clock data (minute, second) |
| D9028 | Clock data | Clock data (, day of week) |
| D9035 | Extension file register | Block No. used |
| D9036 | Designates device number of extension file register. | Device number for direct access of each extension file registers device. |
| D9037 | | |
| D9091 | Detailed error number | Self-diagnosis detailed error number |
| D9124 | Quantity of annunciators detected | Quantity of annunciators detected |
| D9125 | Number of detected annunciators | Number of detected annunciators |
| D9126 | | |
| D9127 | | |
| D9128 | | |
| D9129 | | |
| D9130 | | |
| D9131 | | |
| D9132 | | |

*1 : Value derived from the constant scan set value.

*2 : Value equal to all constant scan set values. Default value is 100 ms.

*3 : The set constant time becomes the time for one scan.

Appendix 1.2 The QnA series CPU function GX Simulator

(1) Device list

Appendix Table 1.4 List of Devices Supported by the GX Simulator

| Device Name | Device Range (Points) | Remarks | |
|---------------------------|------------------------------|--|---|
| Bit device | Input (X) | X0 to X1FFF (8192 points) | Actual inputs are disabled. |
| | Output (Y) | Y0 to Y1FFF (8192 points) | Actual outputs are disabled. |
| | Internal relay (M) | M0 to M8191 (8191 points) | — |
| | Latch relay (L) | L0 to L8191 (8191 points) | — |
| | Annunciator (F) | F0 to F2047 (2048 points) | — |
| | Edge relay (V) | V0 to V2047 (2048 points) | — |
| | Link special relay (SB) | SB0 to SB7FF (2048 points) | — |
| | Link relay (B) | B0 to B1FFF (8192 points) | |
| | Special relay (SM) | SM0 to SM2047 (2048 points) | See (b) Special Relay List for details about the special relays supported. |
| | Function input (FX) | FX0 to FX4 (5 points) | — |
| | Function output (FY) | FY0 to FY4 (5 points) | — |
| Word device | Data register (D) | D0 to D12287 (12288 points) | — |
| | Special register (SD) | SD0 to SD2047 (2048 points) | See (c) Special Register List for details about the special registered supported. |
| | Link register (W) | W0 to W1FFF (8192 points) | — |
| | Link special register (SW) | SW0 to SW7FF (2048 points) | — |
| | Timer (T) | T0 to T2047 (2048 points) | — |
| | Retentive timer (ST) | (ST0 to ST2047) (0 points) | — |
| | Counter (C) | C0 to C1023 (1024 points) | — |
| | Function register (FD) *1 | FD0 to FD4 (5 points) | — |
| | File register (R) | R0 to R1042431 (1042432 points) | — |
| | Buffer register (Un\G) *2 | Un\G0 to Un\G16383 (16384 points) | I/O assignments must be set for the parameters. |
| Index register (Z) | Z0 to Z15 (16 points) | — | |
| Nesting (N) | N0 to N14 (15 points) | — | |
| Pointer (P) | P0 to P4095 (4096 points) | — | |
| Decimal constant (K) | K-2147483648 to K2147483647 | — | |
| Hexadecimal constant (H) | H0 to HFFFFFFFF | — | |
| Real number constant | E±1.17549-38 to E±3.40282+38 | — | |
| Character string constant | "ABC", "123" | Maximum 16 characters per instruction. | |

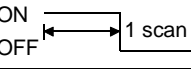
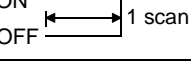
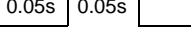
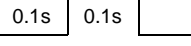
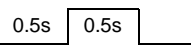
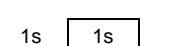
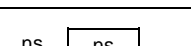
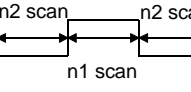
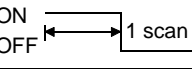
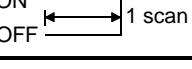
*1 : Cannot be monitored by the device memory monitor of GX Simulator. Perform the monitor/test function from GX Developer.

*2 : If index qualification is added to the module number, e.g. "U0Z0\G0" in the ladder, index qualification is ignored and the module number is processed as U0\G0.

(2) Special Relay List

Appendix Table 1.5 lists the special relays supported by the GX Simulator for the QnA series CPU functions. See the QnA series actual PLC User's Manual for details about the special relays.

Appendix Table 1.5 List of Special Relays Supported by the GX Simulator

| Number | Name | Description | Number | Name | Description |
|--------|------------------------------|---|----------|----------------------------------|---|
| SM0 | Diagnostic error | OFF :No error ON :Error | SM404 | ON one scan only after RUN | ON  OFF |
| SM1 | Self-diagnostic error | OFF :No self-diagnostic error ON :Self-diagnostic error | SM405 | OFF one scan only after RUN | ON  OFF |
| SM5 | Error common information | OFF :No error common information ON :Error common information | SM410 *1 | 0.1-second clock |  |
| SM16 | Error individual information | OFF :No error individual information ON :Error individual information | SM411 *1 | 0.2-second clock |  |
| SM50 | Error reset | OFF → ON :Error reset | SM412 *1 | 1-second clock |  |
| SM56 | Operation error | OFF :Normal ON :Operation error | SM413 *1 | 2-second clock |  |
| SM62 | Annunciator detected | OFF :Not detected ON :Detected | SM414 *1 | 2n-second clock |  |
| SM203 | STOP contacts | STOP status | SM420 | User timing clock No.0 |  |
| SM205 | STEP-RUN contacts | STEP-RUN status | SM421 | User timing clock No.1 | |
| SM213 | Clock data read request | OFF :No processing ON :Read request | SM422 | User timing clock No.2 | |
| SM250 | Max. loaded I/O read | OFF :No processing ON :Read | SM423 | User timing clock No.3 | |
| SM400 | Normally ON | ON _____ OFF _____ | SM424 | User timing clock No.4 | |
| SM401 | Normally OFF | ON _____ OFF _____ | SM430 | User timing clock No.5 | |
| SM402 | ON one scan only after RUN | ON  OFF | SM431 | User timing clock No.6 | |
| SM403 | OFF one scan only after RUN | ON  OFF | SM432 | User timing clock No.7 | |
| | | | SM433 | User timing clock No.8 | |
| | | | SM434 | User timing clock No.9 | |
| | | | SM510 | Low-speed program execution flag | OFF :Complete or no execution ON :Executing |

Appendix Table 1.5 List of Special Relays Supported by the GX Simulator (cont.)

| Number | Name | Description |
|--------|-------------------------------|---|
| SM620 | Memory card B usability flag | OFF :Unusable ON :Usable |
| SM621 | Memory card B protection flag | OFF :Without protection ON :With protection |
| SM622 | Drive 3 flag | OFF :Without drive 3 ON :With drive 3 |
| SM623 | Drive 4 flag | OFF :Without drive 4 ON :With drive 4 |
| SM640 | Use file register | OFF :File registers not used ON :File registers used |
| SM700 | Carry flag | OFF :Carry OFF ON :Carry ON |
| SM703 | Sort order | OFF :Ascending ON :Descending |
| SM704 | Block comparison | OFF :Some do not match ON :All match |
| SM715 | EI flag | OFF :DI ON :EI |
| SM1008 | Self-diagnostic error | OFF :No error ON :Error |
| SM1009 | Annunciator detected | OFF :Not detected ON :Detected |
| SM1010 | Operation error | OFF :Normal ON :Operation error |
| SM1020 | User timing clock No.0 | |
| SM1021 | User timing clock No.1 | |
| SM1022 | User timing clock No.2 | |
| SM1023 | User timing clock No.3 | |
| SM1024 | User timing clock No.4 | |

| Number | Name | Description |
|--------|-----------------------------|---|
| SM1030 | 0.1-second clock | |
| SM1031 | 0.2-second clock | |
| SM1032 | 1-second clock | |
| SM1033 | 2-second clock | |
| SM1034 | 2n-second clock | |
| SM1036 | Normally ON | ON _____ OFF _____ |
| SM1037 | Normally OFF | ON _____ OFF _____ |
| SM1038 | ON one scan only after RUN | ON OFF |
| SM1039 | OFF one scan only after RUN | ON OFF |
| SM1042 | Stop status contact | OFF :Not stop status ON :Stop status |
| SM1054 | STEP RUN flag | ON :STEP RUN OFF :Not STEP RUN |

(3) Special Register List

Appendix Table 1.6 lists the special registers supported by the GX Simulator for the QnA series CPU functions. See the QnA series actual PLC User's Manual for details about the special registers.

Appendix table 1.6 List of Special Registers Supported by the GX Simulator

| Number | Name | Description | Number | Name | Description | | |
|--------|------------------------------------|------------------------------------|--------------------------|-----------------------------------|-----------------------------|----------------------|-----------------------------|
| SD0 | Diagnostic error | Diagnostic error number | SD70 | Annunciator detected number table | Annunciator detected number | | |
| SD1 | Time the diagnostic error occurred | Time the diagnostic error occurred | SD71 | | | | |
| SD2 | | | SD72 | | | | |
| SD3 | | | SD73 | | | | |
| SD4 | | | SD74 | | | | |
| SD5 | Error information class | Error information class code | SD75 | | | | |
| SD6 | | | SD76 | | | | |
| SD7 | | | SD77 | | | | |
| SD8 | | | SD78 | | | | |
| SD9 | | | SD79 | | | | |
| SD10 | | | Error common information | Error common information | SD200 | Switch status | CPU switch status |
| SD11 | | | | | SD203 | CPU operating status | CPU operating status *3 |
| SD12 | | | | | SD210 | Clock data | Clock data (year, month) |
| SD13 | | | | | SD211 | Clock data | Clock data (day, hour) |
| SD14 | | | | | SD212 | Clock data | Clock data (minute, second) |
| SD15 | SD213 | Clock data | | | Clock data (, day of week) | | |
| SD16 | Error independent information | Error independent information | | | SD290 | Device assignment | No. of X points assigned |
| SD17 | | | SD291 | No. of Y points assigned | | | |
| SD18 | | | SD292 | No. of M points assigned | | | |
| SD19 | | | SD293 | No. of L points assigned | | | |
| SD20 | | | SD294 | No. of B points assigned | | | |
| SD21 | | | SD295 | No. of F points assigned | | | |
| SD22 | | | SD296 | No. of SB points assigned | | | |
| SD23 | | | SD297 | No. of V points assigned | | | |
| SD24 | | | SD298 | No. of S points assigned | | | |
| SD25 | | | SD299 | No. of T points assigned | | | |
| SD26 | | | | | | | |
| SD50 | Error reset | Reset error number | | | | | |
| SD62 | Annunciator No. | Annunciator No. | | | | | |
| SD63 | Annunciator quantity | Annunciator quantity | | | | | |
| SD64 | Annunciator detected number table | Annunciator detected number | | | | | |
| SD65 | | | | | | | |
| SD66 | | | | | | | |
| SD67 | | | | | | | |
| SD68 | | | | | | | |
| SD69 | | | | | | | |

Appendix Table 1.6 List of Special Registers Supported by the GX Simulator (cont.)

| Number | Name | Description |
|-------------|-----------------------------|--|
| SD300 | Device assignment | No. of ST points assigned |
| SD301 | | No. of C points assigned |
| SD302 | | No. of D points assigned |
| SD303 | | No. of W points assigned |
| SD304 | | No. of SW points assigned |
| SD412 *1 | 1-second counter | Number of counts in 1-second intervals |
| SD414 *1 | 2n-second clock setting | 2n-second clock units |
| SD420 | Scan counter | Number of scans counted |
| SD430 | Low-speed scan counter | Number of scans counted |
| SD500 | Executed program number | Program execution type. |
| SD510 | Low-speed program number | Current low-speed execution file name |
| SD520 *2 | Present scan time | Present scan time (1 ms units) |
| SD521 *2 | | Present scan time (1 μs units) |
| SD522 *2 | Initial scan time | Initial scan time (1 ms units) |
| SD523 *2 | | Initial scan time (1 μs units) |
| SD524 *2 | Minimum scan time | Minimum scan time (1 ms units) |
| SD525 *2 | | Minimum scan time (1 μs units) |
| SD526 *2 | Maximum scan time | Maximum scan time (1 ms units) |
| SD527 *2 | | Maximum scan time (1 μs units) |
| SD528 *2 | Current low-speed scan time | Current scan time (1 ms units) |
| SD529 *2 | | Current scan time (1 μs units) |

| Number | Name | Description |
|--------------|---------------------------------|--|
| SD532 *2 | Minimum low-speed scan time | Minimum low-speed scan time (1 ms units) |
| SD533 *2 | | Minimum scan time (1 μs units) |
| SD534 *2 | Maximum low-speed scan time | Maximum scan time (1 ms units) |
| SD535 *2 | | Maximum scan time (1 μs units) |
| SD647 | File register capacity | File register capacity |
| SD648 | File register block number | File register block number |
| SD1008 | Self-diagnostic error | Self-diagnostic error number |
| SD1009 | Annunciator No. | Annunciator No. |
| SD1015 | CPU operation status | CPU operation status |
| SD1017 *2 | Scan time | Minimum scan time (10 ms units) |
| SD1018 *2 | Scan time | Scan time (10 ms units) |
| SD1019 *2 | Scan time | Maximum scan time (10 ms units) |
| SD1021 *2 | Scan time | Scan time (1 ms units) |
| SD1022 *2 | 1-second counter | Number of counts of 1-second units |
| SD1035 | Extension file register | Used block number |
| SD1124 | Number of annunciators detected | Number of annunciators detected |
| SD1125 | Number of annunciators detected | Number of annunciators detected |
| SD1126 | | |
| SD1127 | | |
| SD1128 | | |
| SD1129 | | |
| SD1130 | | |
| SD1131 | | |
| SD1132 | | |

*1 : Value derived from the constant scan setting value and number of scans.

*2 : Values equal to all constant scan setting values.

*3 : SD203 supports the CPU operation status only. STOP/PAUSE cause is fixed at 0.

POINT

Special relays/registers that have contents different from those of Q4ACPU will operate by the contents of special relays/registers of Q4ACPU.

Appendix 1.3 FX series CPU function GX Simulator

(1) Device list

Appendix Table 1.7 List of Devices Supported by the GX Simulator (CPU type: FX0/FX0S)

| Device Name | | Device Range (Points) | Remarks | |
|--------------------------|---|---------------------------|--|---------------------------------|
| Bit device | Input (X) | X000 to X017 (16 points) | Octal number. Actual inputs are disabled. | |
| | Output (Y) | Y000 to Y015 (14 points) | Octal number. Actual outputs are disabled. | |
| | Auxiliary relay (M) | General purpose | M0 to M495 (496 points) | — |
| | | Hold*1 | M496 to M511 (16 points) | |
| | | Special | M8000 to M8255 (57 points) | |
| | State (S) | Initial state | S0 to S9 (10 points) | — |
| General purpose | | S10 to S63 (54 points) | | |
| Word device | Timer (T) | 100 ms | T0 to T31 (32 points) | T32-T55 switched by M8028 drive |
| | | 100 ms / 10 ms | T32 to T55 (24 points) | |
| | Counter (C) | 16-bit up | C0 to C13 (14 points) | — |
| | | 16-bit up*1 | C14 to C15 (2 points) | |
| | Data register (D) (32-bit for pair use) | 16-bit general purpose | D0 to D29 (30 points) | — |
| | | 16-bit hold*1 | D30 to D31 (2 points) | |
| | | 16-bit special | D8000 to D8255 (27 points) | |
| | | 16-bit index | V, Z (2 points) | |
| Nesting (N) | For master control | N0 to N7 (8 points) | — | |
| Pointer (P) | For JMP, CALL branching | P0 to P63 (64 points) | — | |
| Decimal constant (K) | 16 bits | -32768 to 32767 | — | |
| | 32 bits | -2147483648 to 2147483647 | — | |
| Hexadecimal constant (H) | 16 bits | H0 to HFFFF | — | |
| | 32 bits | H0 to HFFFFFFFF | — | |

*1 Area fixed to back up for interruption: This cannot be changed.

Appendix Table 1.8 List of Devices Supported by the GX Simulator (CPU type: FX0N)

| Device Name | | Device Range (Points) | Remarks | |
|--------------------------|---|--|--|---------------------------------|
| Bit device | Input (X) | Total number of points with expansion X000 to X177 (128 points) | Octal number. Actual inputs are disabled. | |
| | output (Y) | Total number of points with expansion Y000 to Y177 (128 points) | Octal number. Actual outputs are disabled. | |
| | Auxiliary relay (M) | general purpose | M0 to M383 (384 points) | — |
| | | Hold*1 | M384 to M511 (128 points) | |
| | | Special | M8000 to M8255 (67 points) | |
| | State (S) | Initial state*1 | S0 to S9 (10 points) | — |
| Hold*1 | | S10 to S127 (118 points) | | |
| Word device | Timer (T) | 100 ms | T0 to T31 (32 points) | T32-T62 switched by M8028 drive |
| | | 100 ms / 10 ms | T32 to T62 (31 points) | |
| | | 1 ms | T63 (1 point) | |
| | Counter (C) | 16 bit up | C0 to C15 (16 points) | — |
| | | 16bit up*1 | C16 to C31 (16 points) | — |
| | Data register (D) (32-bit for pair use) | 16-bit general purpose | D0 to D127 (128 points) | — |
| | | 16-bit hold*1 | D128 to D255 (128 points) | |
| | | 16-bit special | D8000 to D8255 (106 points) | |
| | | File*1 | D1000 to D2499 (1500 points) | |
| | | 16-bit index | V, Z (2 points) | |
| Nesting (N) | For master control | N0 to N7 (8 points) | — | |
| Pointer (P) | For JMP, CALL branching | P0 to P63 (64 points) | — | |
| Decimal constant (K) | 16 bits | -32768 to 32767 | — | |
| | 32 bits | -2147483648 to 2147483647 | — | |
| Hexadecimal constant (H) | 16 bits | H0 to HFFFF | — | |
| | 32 bits | H0 to HFFFFFFFF | — | |

*1 Area fixed to back up for interruption: This cannot be changed.

Appendix Table 1.9 List of Devices Supported by the GX Simulator (CPU type: FX1)

| Device Name | | Device Range (Points) | Remarks | |
|--|-------------------------|--|--|-------------------------|
| Bit device | Input (X) | Total number of points with expansion X000 to X177 (128 points) | Octal number. Actual inputs are disabled. | |
| | Output (Y) | Total number of points with expansion Y000 to Y177 (128 points) | Octal number. Actual outputs are disabled. | |
| | Auxiliary relay (M) | General purpose | M0 to M499 (500 points) | — |
| | | Hold *1 | M500 to M1023 (524 points) | |
| | | Special | M8000 to M8255 (156 points) | |
| | State (S) | Initial state *1 | S0 to S9 (10 points) | — |
| | | General purpose *1 | S10 to S499 (490 points) | |
| | | Hold *2 | S500 to S899 (400 points) | |
| | | Annunciator *3 | S900 to S999 (100 points) | |
| | Word device | Timer (T) | 100 ms | T0 to T199 (200 points) |
| 10 ms | | | T200 to T245 (46 points) | |
| Counter (C) | | 16 bits up *1 | C0 to C99 (100 points) | — |
| | | 16 bits up *2 | C100 to C125 (36 points) | |
| Data register (D) (32-bit for pair use) | | 16-bit general purpose *1 | D0 to D99 (100 points) | — |
| | | 16-bit hold *2 | D100 to D127 (28 points) | |
| | | 16-bit special | D8000 to D8255 (106 points) | |
| | | 16-bit index | V, Z (2 points) | |
| Nesting (N) | For master control | N0 to N7 (8 points) | — | |
| Pointer (P) | For JMP, CALL branching | P0 to P63 (64 points) | — | |
| Decimal constant (K) | 16 bits | -32768 to 32767 | — | |
| | 32 bits | -2147483648 to 2147483647 | — | |
| Hexadecimal constant (H) | 16 bits | H0 to HFFFF | — | |
| | 32 bits | H0 to HFFFFFFF | — | |

*1 : Area not backed up for interruption. However, this area can be changed to area backed up for interruption by using parameter settings.

*2 : Area backed up for interruption. This area can be changed to area not backed up for interruption by using parameter settings.

*3 : Area fixed to back up for interruption: This area cannot be changed.

Appendix Table 1.10 List of Devices Supported by the GX Simulator (CPU type: FX2/FX2C)

| Device Name | | Device Range (Points) | Remarks | |
|--------------------------|--|--|--|---|
| Bit device | Input (X) | Total number of points with expansion X000 to X377 (256 points) | Octal number. Actual inputs are disabled. | |
| | Output (Y) | Total number of points with expansion Y000 to Y377 (256 points) | Octal number. Actual outputs are disabled. | |
| | Auxiliary relay (M) | General purpose *1 | M0 to M499 (500 points) | — |
| | | Hold *2 | M500 to M1023 (524 points) | |
| | | Hold *3 | M1024 to M1535 (512 points) | |
| | | Special | M8000 to M8255 (156 points) | |
| | State (S) | Initial state *1 | S0 to S9 (10 points) | — |
| | | General purpose *1 | S10 to S499 (490 points) | |
| | | Hold *2 | S500 to S899 (400 points) | |
| | | Annunciator *3 | S900 to S999 (100 points) | |
| Word device | Timer (T) | 100 ms | T0 to T199 (200 points) | — |
| | | 10 ms | T200 to T245 (46 points) | |
| | | 1 ms retentive *3 | T246 to T249 (4 points) | |
| | | 100 ms retentive *3 | T250 to T255 (6 points) | |
| | Counter (C) | 16-bit up *1 | C0 to C99 (100 points) | — |
| | | 16-bit up *2 | C100 to C199 (100 points) | |
| | | 32-bit bi-directional *1 | C200 to C219 (20 points) | |
| | | 32-bit bi-directional *2 | C220 to C234 (15 points) | |
| | Data register (D) (32-bit for pair use) | 16-bit general purpose *1 | D0 to D199 (200 points) | — |
| | | 16-bit hold *2 | D200 to D511 (312 points) | |
| | | 16-bit hold *3 | D512 to D999 (488 points) | |
| | | 16-bit special | D8000 to D8255 (106 points) | |
| | | File *3 | D1000 to D2999 (2000 points) | |
| RAM file | | D6000 to D7999 (2000 points) | | |
| Nesting (N) | For master control | N0 to N7 (8 points) | — | |
| Pointer (P) | For JMP, CALL branching | P0 to P127 (128 points) | — | |
| Decimal constant (K) | 16 bits | -32768 to 32767 | — | |
| | 32 bits | -2147483648 to 2147483647 | — | |
| Hexadecimal constant (H) | 16 bits | H0 to HFFFF | — | |
| | 32 bit | H0 to HFFFFFFF | — | |

*1 : Area not backed up for interruption. However, this area can be changed to area backed up for interruption by using parameter settings.

*2 : Area backed up for interruption. This area can be changed to area not backed up for interruption by using parameter settings.

*3 : Area fixed to back up for interruption: This area cannot be changed.

Appendix Table 1.11 List of Devices Supported by the GX Simulator (CPU type: FX1S)

| Device Name | | Device Range (Points) | Remarks | |
|--------------------------|---|---|--|---------------------------------|
| Bit device | Input (X) | Total number of points with expansion X000 to X017 (16 points) | Octal number. Actual inputs are disabled. | |
| | output (Y) | Total number of points with expansion Y000 to Y015 (14 points) | Octal number. Actual outputs are disabled. | |
| | Auxiliary relay (M) | general purpose | M0 to M383 (384 points) | — |
| | | Hold*1 | M384 to M511 (128 points) | |
| | | Special | M8000 to M8255 (256 points) | |
| | State (S) | Initial state*1 | S0 to S9 (10 points) | — |
| Hold*1 | | S0 to S127 (128 points) | | |
| Word device | Timer (T) | 100 ms | T0 to T31 (32 points) | T32-T62 switched by M8028 drive |
| | | 100 ms / 10 ms | T32 to T62 (31 points) | |
| | | 1 ms | T63 (1 point) | |
| | Counter (C) | 16 bit up | C0 to C15 (16 points) | — |
| | | 16bit up*1 | C16 to C31 (16 points) | |
| | Data register (D) (32-bit for pair use) | 16-bit general purpose | D0 to D127 (128 points) | — |
| | | 16-bit hold*1 | D128 to D255 (128 points) | |
| | | 16-bit special | D8000 to D8255 (256 points) | |
| | | File*1 | D1000 to D2499 (1500 points) | |
| | | 16-bit index | V0 to V7, Z0 to Z7 (16 points) | |
| Nesting (N) | For master control | N0 to N7 (8 points) | — | |
| Pointer (P) | For JMP, CALL branching | P0 to P63 (64 points) | — | |
| Decimal constant (K) | 16 bits | -32768 to 32767 | — | |
| | 32 bits | -2147483648 to 2147483647 | — | |
| Hexadecimal constant (H) | 16 bits | H0 to HFFFF | — | |
| | 32 bits | H0 to HFFFFFFFF | — | |

*1 Area fixed to back up for interruption: This cannot be changed.

Appendix Table 1.12 List of Devices Supported by the GX Simulator (CPU type: FX1N / FX1NC)

| Device Name | | Device Range (Points) | Remarks | |
|---|-------------------------|--|--|---|
| Bit device | Input (X) | Total number of points with expansion X000 to X177 (128 points) | Octal number. Actual inputs are disabled. | |
| | output (Y) | Total number of points with expansion Y000 to Y177 (128 points) | Octal number. Actual outputs are disabled. | |
| | Auxiliary relay (M) | general purpose | M0 to M383 (384 points) | — |
| | | Hold*1 | M384 to M511 (128 points) | |
| | | Hold*1 | M512 to M1535 (1024 points) | |
| | | Special | M8000 to M8255 (256 points) | |
| | State (S) | Initial state hold*1 | S0 to S9 (10 points) | — |
| | | Hold*1 | S10 to S127 (118 points) | |
| | | Hold*1 | S128 to S999 (872 points) | |
| | Word device | Timer (T) | 100 ms | T0 to T199 (200 points) |
| 10 ms | | | T200 to T245 (46 points) | |
| 1 ms retentive hold *1 | | | T246 to T249 (4 points) | |
| 100 ms retentive hold *1 | | | T250 to T255 (6 points) | |
| Counter (C) | | 16 bit up | C0 to C15 (16 points) | — |
| | | 16bit up*1 | C16 to C31 (16 points) | |
| | | 16bit up*1 | C32 to C199 (168 points) | |
| | | 32-bit bi-directional | C200 to C219 (20 points) | |
| | | 32-bit bi-directional *1 | C220 to C234 (15 points) | |
| Data register (D) (32-bit for pair use) | | 16-bit general purpose | D0 to D127 (128 points) | D1000 and later can be specified as file registers. |
| | 16-bit hold*1 | D128 to D255 (128 points) | | |
| | 16-bit hold*1 | D256 to D7999 (7744 points) | | |
| | 16-bit special | D8000 to D8255 (256 points) | | |
| | 16-bit index | V0 to V7, Z0 to Z7 (16 points) | | |
| Nesting (N) | For master control | N0 to N7 (8 points) | — | |
| Pointer (P) | For JMP, CALL branching | P0 to P127 (128 points) | — | |
| Decimal constant (K) | 16 bits | -32768 to 32767 | — | |
| | 32 bits | -2147483648 to 2147483647 | — | |
| Hexadecimal constant (H) | 16 bits | H0 to HFFFF | — | |
| | 32 bits | H0 to HFFFFFFFF | — | |

*1 Area fixed to back up for interruption: This cannot be changed.

Appendix Table 1.13 List of Devices Supported by the GX Simulator
(CPU type: FX_{2N}/FX_{2NC})

| Device Name | | Device Range (Points) | Remarks | | |
|--|-------------------------|--|--|--------------------------|---|
| Bit device | Input (X) | Total number of points with expansion X000 to X377 (256 points) | Octal number. Actual inputs are disabled. | | |
| | Output (Y) | Total number of points with expansion Y000 to Y377 (256 points) | Octal number. Actual outputs are disabled. | | |
| | Auxiliary relay (M) | General purpose *1 | M0 to M499 (500 points) | — | |
| | | Hold *2 | M500 to M1023 (524 points) | | |
| | | Hold *3 | M1024 to M3071 (2048 points) | | |
| | | Special | M8000 to M8255 (156 points) | | |
| | State (S) | Initial state *1 | S0 to S9 (10 points) | — | |
| | | General purpose *1 | S10 to S499 (490 points) | | |
| | | Hold *2 | S500 to S899 (400 points) | | |
| | | Annunciator *3 | S900 to S999 (100 points) | | |
| | Word device | Timer (T) | 100 ms | T0 to T199 (200 points) | — |
| | | | 10 ms | T200 to T245 (46 points) | |
| 1 ms retentive *3 | | | T246 to T249 (4 points) | | |
| 100 ms retentive *3 | | | T250 to T255 (6 points) | | |
| Counter (C) | | 16-bit up *1 | C0 to C99 (100 points) | — | |
| | | 16-bit up *2 | C100 to C199 (100 points) | | |
| | | 32-bit bi-directional *1 | C200 to C219 (20 points) | | |
| | | 32-bit bi-directional *2 | C220 to C234 (15 points) | | |
| Data register (D) (32-bit for pair use) | | 16-bit general purpose *1 | D0 to D199 (200 points) | — | |
| | | 16-bit hold *2 | D200 to D511 (312 points) | | |
| | | 16-bit hold *3 | D512 to D7999 (7488 points) | | |
| | | 16-bit special | D8000 to D8255 (106 points) | | |
| | 16-bit index | V0 to V7, Z0 to Z7 (16 points) | | | |
| Nesting (N) | For master control | N0 to N7 (8 points) | — | | |
| Pointer (P) | For JMP, CALL branching | P0 to P127 (128 points) | — | | |
| Decimal constant (K) | 16 bits | -32768 to 32767 | — | | |
| | 32 bits | -2147483648 to 2147483647 | — | | |
| Hexadecimal constant (H) | 16 bits | H0 to HFFFF | — | | |
| | 32 bit | H0 to HFFFFFFF | — | | |

*1 : Area not backed up for interruption. However, this area can be changed to area backed up for interruption by using parameter settings.

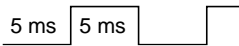
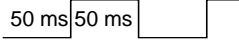
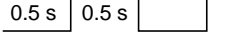
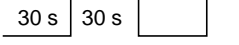
*2 : Area backed up for interruption. This area can be changed to area not backed up for interruption by using parameter settings.

*3 : Area fixed to back up for interruption: This area cannot be changed.

(2) Special Relay List

Appendix Table 1.14 lists the special relays supported by the GX Simulator for the FX series CPU functions. See the FX series actual PLC Programming Manual for details about the special relays.

Appendix Table 1.14 List of Special Relays Supported by the GX Simulator

| No. | Name | Description | FX ₀ , FX _{0S} | FX _{0N} | FX ₁ | FX ₂ , FX _{2C} | FX _{1S} | FX _{1N} , FX _{1NC} | FX _{2N} , FX _{2NC} |
|-------|--|---|---------------------------------------|------------------|-----------------|---------------------------------------|------------------|---|---|
| M8000 | RUN monitor N/O contact | OFF :STOP ON :RUN | | | | ○ | | | |
| M8001 | RUN monitor N/C contact | OFF :RUN ON :STOP | | | | ○ | | | |
| M8002 | Initial pulse N/O contact | ON one scan after RUN | | | | ○ | | | |
| M8003 | Initial pulse N/C contact | OFF one scan after RUN | | | | ○ | | | |
| M8004 | Error occurred | ON if any of M8060 to M8067 operates. | | | | ○ | | | |
| M8011 | 10 ms clock |  | | | | ○ | | | |
| M8012 | 100 ms clock |  | | | | ○ | | | |
| M8013 | 1 s clock |  | | | | ○ | | | |
| M8014 | 1 min clock |  | | | | ○ | | | |
| M8018 | Internal real-time clock detected | Normally ON | — | — | — | △ | ○ | ○ | △ |
| M8020 | Zero | ON if counting result is 0 | | | | ○ | | | |
| M8021 | Borrow | ON if counting result is less than maximum minus value. | | | | ○ | | | |
| M8022 | Carry | ON if counting result increases a digit. | | | | ○ | | | |
| M8023 | Decimal-point operation instruction | ON when floating decimal- point instruction is executed. | — | — | — | ○ | — | — | — |
| M8024 | Designate BMOV direction | ON :Write OFF :Read | — | — | — | — | — | — | ○ |
| M8026 | RAMP mode designation | ON :Hold output value OFF :Reset output value | — | — | — | ○ | — | — | ○ |
| M8028 | Switch timer instruction | OFF :100 ms base ON :10 ms base | ○ | ○ | — | — | ○ | — | — |
| M8029 | Instruction execution complete | OFF :Executing ON :Execution complete | | | | ○ | | | |
| M8031 | Non-hold memory all clear instruction | OFF :Hold ON :Clear | | | | ○ | | | |

Appendix Table 1.14 List of Special Relays Supported by the GX Simulator (cont.)

| No. | Name | Description | FX ₀ , FX _{0S} | FX _{0N} | FX ₁ | FX ₂ , FX _{2C} | FX _{1S} | FX _{1N} , FX _{1NC} | FX _{2N} , FX _{2NC} |
|-------|--|---|---------------------------------------|------------------|-----------------|---------------------------------------|------------------|---|---|
| M8032 | Hold memory all clear instruction | OFF :Hold ON :Clear | | | | ○ | | | |
| M8033 | Memory hold stop instruction | OFF :Clear ON :Hold | | | | ○ | | | |
| M8034 | Disable all outputs instruction | OFF :Output enabled ON :Output OFF | | | | ○ | | | |
| M8038 | RAM file clear instruction | OFF :Hold ON :Clear | — | — | — | ○ | — | — | — |
| M8039 | Constant scan mode designation | OFF :Normal scan ON :Constant scan mode | | | | ○ | | | |
| M8040 | Disable transition instruction | OFF :Transition enabled ON :Transition disabled | | | | ○ | | | |
| M8041 | Transition start instruction (for IST command) | OFF :Stop ON :Transition start | | | | ○ | | | |
| M8042 | Start pulse instruction (for IST command) | ON :IST command start instruction | | | | ○ | | | |
| M8043 | Home position return complete instruction (for IST command) | ON :IST command home position return instruction | | | | ○ | | | |
| M8044 | Home position condition (for IST command) | ON :Home position OFF :Home position return not complete | | | | ○ | | | |
| M8045 | All output reset disabled (for IST command) | ON :Reset disabled OFF :Reset enabled | | | | ○ | | | |
| M8046 | STL state operation | ON if any of S0 to S899 operates. | | | | ○ | | | |
| M8047 | STL monitor enable | ON :D8040 to D8047 enabled | | | | ○ | | | |
| M8048 | Annunciator operation | ON if any of S900 to S999 operates. | — | — | ○ | ○ | — | — | ○ |
| M8049 | Annunciator enable instruction | ON :D8049 enabled OFF : D8049 enabled | — | — | ○ | ○ | — | — | ○ |
| M8067 | Operation error occurred | ON :Operation error OFF :No operation error | | | | ○ | | | |
| M8068 | Operation error latch | Holds M8067 status | | | | ○ | | | |
| M8074 | RAM file register setting | ON :Use OFF :Do not use | — | — | — | ○ | — | — | — |

Appendix Table 1.14 List of Special Relays Supported by the GX Simulator (cont.)

| No. | Name | Description | FX ₀ , FX _{0S} | FX _{0N} | FX ₁ | FX ₂ , FX _{2C} | FX _{1S} | FX _{1N} , FX _{1NC} | FX _{2N} , FX _{2NC} |
|-------|--|--|---------------------------------------|------------------|-----------------|---------------------------------------|------------------|---|---|
| M8160 | XCH SWAP function setting | ON :8-bit conversion OFF :Normal mode | — | — | — | ○ | — | — | ○ |
| M8161 | 8-bit processing mode | ASC, ASCI, HEX processing method | — | ○ | — | ○ | ○ | ○ | ○ |
| M8164 | Change number of FROM/TO instruction transfer points | Transfer points switch instruction | — | — | — | — | — | — | ○ |
| M8168 | SMOV HEX data handling functions | Digit shift in 4-bit unit | — | — | — | ○ | — | — | ○ |
| M8200 | Counting direction of counter | ON :C200 down OFF :C200 up | — | — | — | ○ | — | ○ | ○ |
| M8201 | Counting direction of counter | ON :C201 down OFF :C201 up | — | — | — | ○ | — | ○ | ○ |
| M8202 | Counting direction of counter | ON :C202 down OFF :C202 up | — | — | — | ○ | — | ○ | ○ |
| M8203 | Counting direction of counter | ON :C203 down OFF :C203 up | — | — | — | ○ | — | ○ | ○ |
| M8204 | Counting direction of counter | ON :C204 down OFF :C204 up | — | — | — | ○ | — | ○ | ○ |
| M8205 | Counting direction of counter | ON :C205 down OFF :C205 up | — | — | — | ○ | — | ○ | ○ |
| M8206 | Counting direction of counter | ON :C206 down OFF :C206 up | — | — | — | ○ | — | ○ | ○ |
| M8207 | Counting direction of counter | ON :C207 down OFF :C207 up | — | — | — | ○ | — | ○ | ○ |
| M8208 | Counting direction of counter | ON :C208 down OFF :C208 up | — | — | — | ○ | — | ○ | ○ |
| M8209 | Counting direction of counter | ON :C209 down OFF :C209 up | — | — | — | ○ | — | ○ | ○ |
| M8210 | Counting direction of counter | ON :C210 down OFF :C210 up | — | — | — | ○ | — | ○ | ○ |
| M8211 | Counting direction of counter | ON :C211 down OFF :C211 up | — | — | — | ○ | — | ○ | ○ |
| M8212 | Counting direction of counter | ON :C212 down OFF :C212 up | — | — | — | ○ | — | ○ | ○ |
| M8213 | Counting direction of counter | ON :C213 down OFF :C213 up | — | — | — | ○ | — | ○ | ○ |
| M8214 | Counting direction of counter | ON :C214 down OFF :C214 up | — | — | — | ○ | — | ○ | ○ |
| M8215 | Counting direction of counter | ON :C215 down OFF :C215 up | — | — | — | ○ | — | ○ | ○ |

Appendix Table 1.14 List of Special Relays Supported by the GX Simulator (cont.)

| No. | Name | Description | FX ₀ , FX _{0S} | FX _{0N} | FX ₁ | FX ₂ , FX _{2C} | FX _{1S} | FX _{1N} , FX _{1NC} | FX _{2N} , FX _{2NC} |
|-------|-------------------------------|-------------------------------|---------------------------------------|------------------|-----------------|---------------------------------------|------------------|---|---|
| M8216 | Counting direction of counter | ON :C216 down OFF :C216 up | — | — | — | ○ | — | ○ | ○ |
| M8217 | Counting direction of counter | ON :C217 down OFF :C217 up | — | — | — | ○ | — | ○ | ○ |
| M8218 | Counting direction of counter | ON :C218 down OFF :C218 up | — | — | — | ○ | — | ○ | ○ |
| M8219 | Counting direction of counter | ON :C219 down OFF :C219 up | — | — | — | ○ | — | ○ | ○ |
| M8220 | Counting direction of counter | ON :C220 down OFF :C220 up | — | — | — | ○ | — | ○ | ○ |
| M8221 | Counting direction of counter | ON :C221 down OFF :C221 up | — | — | — | ○ | — | ○ | ○ |
| M8222 | Counting direction of counter | ON :C222 down OFF :C222 up | — | — | — | ○ | — | ○ | ○ |
| M8223 | Counting direction of counter | ON :C223 down OFF :C223 up | — | — | — | ○ | — | ○ | ○ |
| M8224 | Counting direction of counter | ON :C224 down OFF :C224 up | — | — | — | ○ | — | ○ | ○ |
| M8225 | Counting direction of counter | ON :C225 down OFF :C225 up | — | — | — | ○ | — | ○ | ○ |
| M8226 | Counting direction of counter | ON :C226 down OFF :C226 up | — | — | — | ○ | — | ○ | ○ |
| M8227 | Counting direction of counter | ON :C227 down OFF :C227 up | — | — | — | ○ | — | ○ | ○ |
| M8228 | Counting direction of counter | ON :C228 down OFF :C228 up | — | — | — | ○ | — | ○ | ○ |
| M8229 | Counting direction of counter | ON :C229 down OFF :C229 up | — | — | — | ○ | — | ○ | ○ |
| M8230 | Counting direction of counter | ON :C230 down OFF :C230 up | — | — | — | ○ | — | ○ | ○ |
| M8231 | Counting direction of counter | ON :C231 down OFF :C231 up | — | — | — | ○ | — | ○ | ○ |
| M8232 | Counting direction of counter | ON :C232 down OFF :C232 up | — | — | — | ○ | — | ○ | ○ |
| M8233 | Counting direction of counter | ON :C233 down OFF :C233 up | — | — | — | ○ | — | ○ | ○ |
| M8234 | Counting direction of counter | ON :C234 down OFF :C234 up | — | — | — | ○ | — | ○ | ○ |

○ :This device or function is supported by the actual PLC.

— :This device or function is not supported by the actual PLC.

△ :This device is supported by actual PLCs with a clock function.

For the GX Simulator, always ON regardless whether the actual PLC has a clock function.

(3) Special Register List

Appendix Table 1.15 lists the special registers supported by the GX Simulator for the FX series CPU functions. See the FX series actual PLC Programming Manual for details about the special registers.

Appendix Table 1.15 List of Special Registers Supported by the GX Simulator

| No. | Name | Description | FX ₀ , FX _{0S} | FX _{0N} | FX ₁ | FX ₂ , FX _{2C} | FX _{1S} | FX _{1N} , FX _{1NC} | FX _{2N} , FX _{2NC} |
|-------|--|--|---------------------------------------|------------------|-----------------|---------------------------------------|------------------|---|---|
| D8000 | Watchdog timer | 200 ms *1 | | | | ○ | | | |
| D8001 | PLC type and system version | *2 | | | | ○ | | | |
| D8002 | Memory capacity | Maximum value for model | | | | ○ | | | |
| D8004 | Error M number | M8060 to M8068 | | | | ○ | | | |
| D8006 | Low battery voltage detection level | 30 (0.1 V units) | — | — | ○ | ○ | — | — | ○ |
| D8010 | Scan present value | 0.1 ms units *3 | | | | ○ | | | |
| D8011 | Minimum scan time | 0.1 ms units *3 | | | | ○ | | | |
| D8012 | Maximum scan time | 0.1 ms units *3 | | | | ○ | | | |
| D8013 | Seconds | Operates as 1-second clock | — | — | — | △ | ○ | ○ | △ |
| D8014 | Minutes | Time data | — | — | — | △ | ○ | ○ | △ |
| D8015 | Hours | Time data | — | — | — | △ | ○ | ○ | △ |
| D8016 | Day | Time data | — | — | — | △ | ○ | ○ | △ |
| D8017 | Month | Time data | — | — | — | △ | ○ | ○ | △ |
| D8018 | Year | Time data | — | — | — | △ | ○ | ○ | △ |
| D8019 | Day of week | Time data | — | — | — | △ | ○ | ○ | △ |
| D8028 | Z register contents | Z register contents | | | | ○ | | | |
| D8029 | V register contents | V register contents | | | | ○ | | | |
| D8030 | Analog volume 1 | *4 | — | ○ | — | — | ○ | ○ | — |
| D8031 | Analog volume 2 | *4 | — | ○ | — | — | ○ | ○ | — |
| D8039 | Constant scan time | Initial value: 100 ms (1 ms units) *5 | | | | ○ | | | |
| D8040 | ON state number 1 | STL monitor contents | | | | ○ | | | |
| D8041 | ON state number 2 | STL monitor contents | | | | ○ | | | |
| D8042 | ON state number 3 | STL monitor contents | | | | ○ | | | |
| D8043 | ON state number 4 | STL monitor contents | | | | ○ | | | |
| D8044 | ON state number 5 | STL monitor contents | | | | ○ | | | |
| D8045 | ON state number 6 | STL monitor contents | | | | ○ | | | |
| D8046 | ON state number 7 | STL monitor contents | | | | ○ | | | |
| D8047 | ON state number 8 | STL monitor contents | | | | ○ | | | |
| D8049 | ON state minimum number | STL monitor contents | | | | ○ | | | |
| D8067 | Operation error code number | Error code number | | | | ○ | | | |
| D8068 | Operation error occurred step number latch | Saves step number where error occurred | | | | ○ | | | |

Appendix Table 1.15 List of Special Registers Supported by the GX Simulator (cont.)

| No. | Name | Description | FX ₀ , FX _{0S} | FX _{0N} | FX ₁ | FX ₂ , FX _{2C} | FX _{1S} | FX _{1N} , FX _{1NC} | FX _{2N} , FX _{2NC} | |
|-------|---|----------------------------------|---------------------------------------|------------------|-----------------|---------------------------------------|------------------|---|---|--|
| D8069 | M8067 error occurred step number | Step number where error occurred | ○ | | | | | | | |
| D8102 | Memory capacity | Maximum value for model | — | — | — | — | ○ | ○ | ○ | |
| D8164 | Designate number of FROM/TO instruction transfer points | Write transfer points | — | — | — | — | — | — | ○ | |
| D8182 | Z1 register contents | Z1 register contents | — | — | — | — | ○ | ○ | ○ | |
| D8183 | V1 register contents | V1 register contents | — | — | — | — | ○ | ○ | ○ | |
| D8184 | Z2 register contents | Z2 register contents | — | — | — | — | ○ | ○ | ○ | |
| D8185 | V2 register contents | V2 register contents | — | — | — | — | ○ | ○ | ○ | |
| D8186 | Z3 register contents | Z3 register contents | — | — | — | — | ○ | ○ | ○ | |
| D8187 | V3 register contents | V3 register contents | — | — | — | — | ○ | ○ | ○ | |
| D8188 | Z4 register contents | Z4 register contents | — | — | — | — | ○ | ○ | ○ | |
| D8189 | V4 register contents | V4 register contents | — | — | — | — | ○ | ○ | ○ | |
| D8190 | Z5 register contents | Z5 register contents | — | — | — | — | ○ | ○ | ○ | |
| D8191 | V5 register contents | V5 register contents | — | — | — | — | ○ | ○ | ○ | |
| D8192 | Z6 register contents | Z6 register contents | — | — | — | — | ○ | ○ | ○ | |
| D8193 | V6 register contents | V6 register contents | — | — | — | — | ○ | ○ | ○ | |
| D8194 | Z7 register contents | Z7 register contents | — | — | — | — | ○ | ○ | ○ | |
| D8195 | V7 register contents | V7 register contents | — | — | — | — | ○ | ○ | ○ | |

○ : This device or function is supported by the actual PLC.

— : This device or function is not supported by the actual PLC.

△ : This device is supported by actual PLCs with a clock function.

For the GX Simulator, always ON regardless whether the actual PLC has a clock function.

*1 : Initial value: 200 ms for all models. Can be changed but no watchdog timer check is conducted.

*2 : FX₀, FX_{0S} 20000

FX_{0N} 20000

FX₁ 21000

FX₂, FX_{2C} 20000

FX_{1S} 22000

FX_{1N}, FX_{1NC} ... 26000

FX_{2N}, FX_{2NC} ... 24000

*3 : Values equal to all constant scan setting values. Default value is 100 ms.

*4 : Operates as a general data register. Test by writing values from 0 to 255 using the GX Developer device test functions.

*5 : The set constant time becomes the time for one scan.

Appendix 1.4 GX Simulator for Q series CPU (A mode) functions

(1) Device list

Since the devices of the Q series CPU (A mode) are the same as those of the A4UCPU, refer to A4U in "Appendix Table 1.1 List of Devices Supported by the GX Simulator".

(2) Special relay list

Since the special relays of the Q series CPU (A mode) are the same as those of the A series CPU, refer to "Appendix Table 1.2 List of Special Relays Supported by the GX Simulator".

(3) Special register list

Since the special registers of the Q series CPU (A mode) are the same as those of the A series CPU, refer to "Appendix Table 1.3 List of Special Registers Supported by the GX Simulator".

Appendix 1.5 GX Simulator for Q series CPU (Q mode) functions

(1) Device list

Appendix Table 1.16 List of Devices Supported by the GX Simulator

| Device | Device Range (Points) | Setting Range | Remarks | |
|-------------|----------------------------|---------------------------------|---------------------------------------|---|
| Bit device | Input (X) | X0 to X1FFF (8192 Points) | Fixed Actual inputs are disabled. | |
| | Output (Y) | Y0 to Y1FFF (8192 Points) | Fixed Actual outputs are disabled. | |
| | Internal relay (M) | M0 to M8191 (8192 Points) | Changeable | — |
| | Latch relay (V) | L0 to L8191 (8192 Points) | Changeable | — |
| | Annunciator (F) | F0 to F2047 (2048 Points) | Changeable | — |
| | Edge relay (V) | V0 to V2047 (2048 Points) | Changeable | — |
| | Link special relay (SB) | SB0 to SB7FF (2048 Points) | Changeable | — |
| | Link relay (B) | B0 to B1FFF (8192 Points) | Changeable | — |
| | Special relay (SM) | SM0 to SM2047 (2048 points) | Fixed | Compatible with some functions. |
| | Function input (FX) | FX0 to FXF (16 points) | Fixed | — |
| | Function output (FY) | FY0 to FYF (16 points) | Fixed | — |
| | CPU shared memory (Un\G) | Un\GO to Un\GOFFF (4096 points) | Fixed | Valid only multiple PLC setting |
| Word device | Data register (D) | D0 to D12287 (12288 Points) | Changeable | — |
| | Special register | SD0 to SD2047 (2048 points) | Fixed | Compatible with some functions. |
| | Link register (W) | W0 to W1FFF (8192 Points) | Changeable | — |
| | Link special register (SW) | SW0 to SW7FF (2048 Points) | Changeable | — |
| | Timer (T) | T0 to T2047 (2048 Points) | Changeable | No operation in real time. High-speed timer can be set in 0.1ms increments (in parameter). 1ms increments in conventional GX Simulator. |

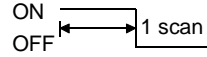
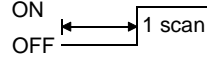
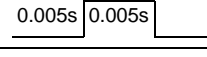
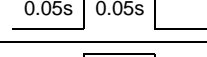
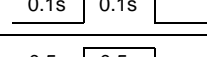
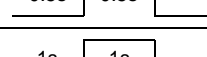
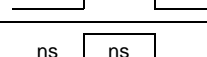
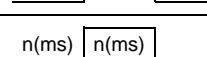
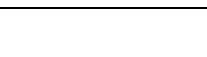
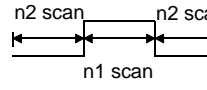
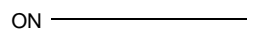
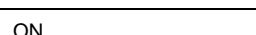
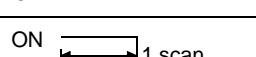
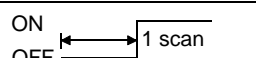
Appendix Table 1.16 List of Devices Supported by the GX Simulator (cont.)

| Name | Device Range (Points) | Setting Range | Remarks |
|---------------------------|---------------------------------|--|---|
| Word device | Retentive timer (ST) | None (ST0 to-) | Changeable No operation in real time. High-speed retentive timer can be set in 0.1ms increments (in parameter). 1ms increments in conventional GX Simulator. |
| | Counter (C) | C0 to C1023 (1024 Points) | Changeable — |
| | Function register (FD) *1 | FD0 to FD4 (5 points) | Fixed — |
| | File register (R/ZR) | R0 to R18383 (18384 points) ZR0 to ZR1042432 (1042433 points) | Fixed — |
| | Buffer register (Un\G0) *2 | Un\G0 to Un\G65535 (65536 points) | Fixed 16384 points in conventional GX Simulator. |
| | Index register (Z) | Z0 to Z15 (16 points) | Fixed — |
| Nesting | N0 to N14 (15 points) | Fixed — | |
| Pointer | P0 to P4095 (4096 points) | Fixed — | |
| Decimal constant (K) | K-2147483648 to K2147483647 | Fixed — | |
| Hexadecimal constant (H) | H0 to HFFFFFFFF | Fixed — | |
| Real number constant | E±1.17549-38 to E±3.40282+38 | Fixed — | |
| Character string constant | "ABC", "123"etc. | Fixed Up to 16 characters per instruction | |
| CPU shared memory (Un\G) | Un\G0 to Un\GOFFF (4096 points) | Fixed Valid only multiple PLC setting | |

(2) Special Relay List

Appendix Table 1.17 lists the special relays supported by GX Simulator for the Q series CPU (Q mode) functions. For details of the special relays, refer to the Q Series CPU (Q Mode) PLC CPU User's Manual.

Appendix Table 1.17 List of Special Relays Supported by the GX Simulator

| Number | Name | Description | Number | Name | Description |
|--------|----------------------------------|---|----------|-----------------------------|---|
| SM0 | Diagnostic error | OFF :No error ON :Error | SM404 | ON one scan only after RUN | ON  OFF |
| SM1 | Self-diagnostic error | OFF :No self-diagnostic error ON :Self-diagnostic error | SM405 | OFF one scan only after RUN | ON  OFF |
| SM5 | Error common information | OFF :No error common information ON :Error common information | SM409 | 0.01-second clock |  |
| SM16 | Error individual information | OFF :No error individual information ON :Error individual information | SM410 *1 | 0.1-second clock |  |
| SM50 | Error reset | OFF → ON :Error reset | SM411 *1 | 0.2-second clock |  |
| SM56 | Operation error | OFF :Normal ON :Operation error | SM412 *1 | 1-second clock |  |
| SM62 | Annunciator detected | OFF :Not detected ON :Detected | SM413 *1 | 2-second clock |  |
| SM203 | STOP contacts | STOP status | SM414 *1 | 2n-second clock |  |
| SM205 | STEP-RUN contacts | STEP-RUN status | SM415 *1 | 2n(ms)-clock |  |
| SM213 | Clock data read request | OFF :No processing ON :Read request | SM420 | User timing clock No.0 |  |
| SM250 | Max. loaded I/O read | OFF :No processing ON :Read | SM421 | User timing clock No.1 | |
| SM254 | All station refresh command | OFF :Reached station refresh ON :All station refresh | SM422 | User timing clock No.2 | |
| SM400 | Normally ON | ON  OFF | SM423 | User timing clock No.3 | |
| SM401 | Normally OFF | ON  OFF | SM424 | User timing clock No.4 | |
| SM402 | ON one scan only after RUN | ON  OFF | SM430 | User timing clock No.5 | |
| SM403 | OFF one scan only after RUN | ON  OFF | SM431 | User timing clock No.6 | |
| | | | SM432 | User timing clock No.7 | |
| | | | SM433 | User timing clock No.8 | |
| | | | SM434 | User timing clock No.9 | |
| SM510 | Low-speed program execution flag | OFF :Complete or no execution ON :Executing | | | |

Appendix Table 1.17 List of Special Relays Supported by the GX Simulator (cont.)

| Number | Name | Description |
|--------|-------------------------------------|---|
| SM620 | Memory card B usability flag | OFF :Unusable ON :Usable |
| SM621 | Memory card B protection flag | OFF :Without protection ON :With protection |
| SM622 | Drive 3 flag | OFF :Without drive 3 ON :With drive 3 |
| SM623 | Drive 4 flag | OFF :Without drive 4 ON :With drive 4 |
| SM640 | Use file register | OFF :File registers not used ON :File registers used |
| SM700 | Carry flag | OFF :Carry OFF ON :Carry ON |
| SM703 | Sort order | OFF :Ascending ON :Descending |
| SM704 | Block comparison | OFF :Some do not match ON :All match |
| SM715 | EI flag | OFF :DI ON :EI |
| SM722 | BIN/DBIN error processing switching | OFF :Error OK ON :Error NG |
| SM1008 | Self-diagnostic error | OFF :No error ON :Error |
| SM1009 | Annunciator detected | OFF :Not detected ON :Detected |
| SM1010 | Operation error | OFF :Normal ON :Operation error |
| SM1020 | User timing clock No.0 | |
| SM1021 | User timing clock No.1 | |
| SM1022 | User timing clock No.2 | |
| SM1023 | User timing clock No.3 | |
| SM1024 | User timing clock No.4 | |

| Number | Name | Description |
|--------|-----------------------------|---|
| SM1030 | 0.1-second clock | |
| SM1031 | 0.2-second clock | |
| SM1032 | 1-second clock | |
| SM1033 | 2-second clock | |
| SM1034 | 2n-second clock | |
| SM1036 | Normally ON | ON _____ OFF _____ |
| SM1037 | Normally OFF | ON _____ OFF _____ |
| SM1038 | ON one scan only after RUN | ON |
| SM1039 | OFF one scan only after RUN | OFF |
| SM1042 | Stop status contact | OFF :Not stop status ON :Stop status |
| SM1054 | STEP RUN flag | ON :STEP RUN OFF :Not STEP RUN |

(3) Special Device List

Appendix Table 1.18 lists the special devices supported by GX Simulator for the Q series CPU (Q mode) functions. For details of the special devices, refer to the Q Series CPU (Q Mode) PLC CPU User's Manual.

Appendix table 1.18 List of Special Registers Supported by the GX Simulator

| Number | Name | Description |
|--------|------------------------------------|------------------------------------|
| SD0 | Diagnostic error | Diagnostic error number |
| SD1 | Time the diagnostic error occurred | Time the diagnostic error occurred |
| SD2 | | |
| SD3 | | |
| SD4 | Error information class | Error information class code |
| SD5 | Error common information | Error common information |
| SD6 | | |
| SD7 | | |
| SD8 | | |
| SD9 | | |
| SD10 | | |
| SD11 | | |
| SD12 | | |
| SD13 | | |
| SD14 | | |
| SD15 | Error independent information | Error independent information |
| SD16 | | |
| SD17 | | |
| SD18 | | |
| SD19 | | |
| SD20 | | |
| SD21 | | |
| SD22 | | |
| SD23 | | |
| SD24 | | |
| SD25 | | |
| SD26 | | |
| SD50 | Error reset | Reset error number |
| SD62 | Annunciator No. | Annunciator No. |
| SD63 | Annunciator quantity | Annunciator quantity |
| SD64 | Annunciator detected number table | Annunciator detected number |
| SD65 | | |
| SD66 | | |
| SD67 | | |
| SD68 | | |
| SD69 | | |

| Number | Name | Description |
|--------|-----------------------------------|-----------------------------|
| SD70 | Annunciator detected number table | Annunciator detected number |
| SD71 | | |
| SD72 | | |
| SD73 | | |
| SD74 | | |
| SD75 | | |
| SD76 | | |
| SD77 | | |
| SD78 | | |
| SD79 | | |
| SD200 | Switch status | CPU switch status |
| SD201 | LED status | CPU LED status |
| SD203 | CPU operating status | CPU operating status *3 |
| SD220 | Display device data | Display device data |
| SD221 | | |
| SD222 | | |
| SD223 | | |
| SD224 | | |
| SD225 | | |
| SD226 | | |
| SD227 | | |
| SD290 | Device assignment | No. of X points assigned |
| SD291 | | No. of Y points assigned |
| SD292 | | No. of M points assigned |
| SD293 | | No. of L points assigned |
| SD294 | | No. of B points assigned |
| SD295 | | No. of F points assigned |
| SD296 | | No. of SB points assigned |
| SD297 | | No. of V points assigned |
| SD298 | | No. of S points assigned |
| SD299 | | No. of T points assigned |

Appendix Table 1.18 List of Special Registers Supported by the GX Simulator (cont.)

| Number | Name | Description | Number | Name | Description |
|-------------|--------------------------|--|--------------|---------------------------------|--|
| SD300 | Device assignment | No. of ST points assigned | SD532 *2 | Minimum low-speed scan time | Minimum low-speed scan time (1 ms units) |
| SD301 | | No. of C points assigned | SD533 *2 | | Minimum scan time (1 μs units) |
| SD302 | | No. of D points assigned | SD534 *2 | Maximum low-speed scan time | Maximum scan time (1 ms units) |
| SD303 | | No. of W points assigned | SD535 *2 | | Maximum scan time (1 μs units) |
| SD304 | | No. of SW points assigned | SD647 | File register capacity | File register capacity |
| SD412 *1 | 1-second counter | Number of counts in 1-second intervals | SD648 | File register block number | File register block number |
| SD414 *1 | 2n-second clock setting | 2n-second clock units | SD1008 | Self-diagnostic error | Self-diagnostic error number |
| SD415 *1 | 2n(ms) clock | 2n(ms) clock units | SD1009 | Annunciator No. | Annunciator No. |
| SD420 | Scan counter | Number of scans counted | SD1015 | CPU operation status | CPU operation status |
| SD430 | Low-speed scan counter | Number of scans counted | SD1017 *2 | Scan time | Minimum scan time (10 ms units) |
| SD500 | Executed program number | Program execution type. | SD1018 *2 | Scan time | Scan time (10 ms units) |
| SD510 | Low-speed program number | Current low-speed execution file name | SD1019 *2 | Scan time | Maximum scan time (10 ms units) |
| SD520 *2 | Present scan time | Present scan time (1 ms units) | SD1021 *2 | Scan time | Scan time (1 ms units) |
| SD521 *2 | | Present scan time (1 μs units) | SD1022 *2 | 1-second counter | Number of counts of 1-second units |
| SD522 *2 | Initial scan time | Initial scan time (1 ms units) | SD1035 | Extension file register | Used block number |
| SD523 *2 | | Initial scan time (1 μs units) | SD1124 | Number of annunciators detected | Number of annunciators detected |
| SD524 *2 | Minimum scan time | Minimum scan time (1 ms units) | SD1125 | Number of annunciators detected | Number of annunciators detected |
| SD525 *2 | | Minimum scan time (1 μs units) | SD1126 | | |
| SD526 *2 | Maximum scan time | Maximum scan time (1 ms units) | SD1127 | | |
| SD527 *2 | | Maximum scan time (1 μs units) | SD1128 | | |
| SD528 *2 | | Current scan time (1 ms units) | SD1129 | | |
| SD529 *2 | | Current scan time (1 μs units) | SD1130 | | |
| | | | SD1131 | | |
| | | | SD1132 | | |

*1 : Value derived from the constant scan setting value and number of scans.
*2 : Values equal to all constant scan setting values.
*3 : SD203 supports the CPU operation status only. STOP/PAUSE cause is fixed at 0.

Appendix 2 List of Supported Instruction

The GX Simulator supports the A series CPU/QnA series CPU/Q series CPU instructions.

However, some instructions are subject to restrictions and some are not supported.

Unsupported instructions are not processed (NOP).

See Appendices Table 2.1 to 2.4 for the instructions supported by the GX Simulator.

| POINT |
|--|
| Unsupported instructions are not processed (NOP), and the "Unsupported information indicator lamp" lights up on the initial window of the GX Simulator functions. (Refer to the display contents in "Section 4.3 Description of the Initial Window Display". |

Appendix 2.1 A series CPU function GX Simulator

Appendix Table 2.1 List of Supported Instructions (A Series CPU Function)

(1) Sequence Instructions

| Class | Instruction Symbol | Restriction |
|-----------------------------|---------------------------------------|-------------|
| Contact instructions | LD, LDI, AND, ANI, OR, ORI | — |
| Coupling instructions | ANB, ORB, MPS, MRD, MPP | — |
| Output instructions | OUT, OUT T, OUT C, SET, RST, PLS, PLF | — |
| Shift instruction | SFT(P) | — |
| Master control instructions | MC, MCR | — |
| End instructions | FEND, END | — |
| Other instructions | STOP, NOP | — |

(2) Basic Instructions

| Class | Instruction Symbol | Restriction |
|------------------------------------|--|-------------|
| Comparative operation instructions | =, <>, >, <=, <, >=, D=, D<>, D>, D<=, D<, D>= | — |
| Arithmetic operation instructions | +(P), -(P), D+(P), D-(P), *(P), /(P), D*(P), D/(P), B+(P), B-(P), DB+(P), DB-(P), B*(P), B/(P), DB*(P), DB/(P), INC(P), DEC(P), DINC(P), DDEC(P) | — |
| BCD ↔ BIN conversion instructions | BCD(P), DBCD(P), BIN(P), DBIN(P) | — |
| Data transfer instruction | MOV(P), DMOV(P), CML(P), DCML(P), BMOV(P), FMOV(P), XCH(P), DXCH(P) | — |
| Program branching instructions | CJ, SCJ, JMP, CALL(P), RET | — |
| Program switching instructions | CHG | — |

Appendix Table 2.1 List of Supported Instructions (A Series CPU Function) (cont.)

(3) Applied Instructions

| Class | Instruction Symbol | Restriction |
|-----------------------------------|---|--|
| Logical arithmetic instructions | WAND(P), DAND(P), WOR(P), DOR(P), WXOR(P), DXOR(P), WXNR(P), DXNR(P), NEG(P) | — |
| Rotation instructions | ROR(P), RCR(P), ROL(P), RCL(P), DROR(P), DRCR(P), DROL(P), DRCL(P) | — |
| Shift instruction | SFR(P), SFL(P), BSFR(P), BSFL(P), DSFR(P), DSFL(P), | — |
| Data processing instructions | SER(P), SUM(P), DSUM(P), DECO(P), ENCO(P), SEG, BSET(P), BRST(P), DIS(P), UNI(P), ASC | SEG conducts 7-segment decoding regardless of M9052 ON/OFF status. |
| FIFO instruction | FIFW(P), FIFR(P) | — |
| Buffer memory access instructions | FROM(P), DFRO(P), TO(P), DTO(P) | — |
| FOR to NEXT instructions | FOR, NEXT | — |
| Display instructions | LED, LEDA, LEDB, LEDR | — |
| Other instructions | STC, CLC, DUTY | STC converted to SET M9012 CLC converted to RST M9012 |

(4) Dedicated Instructions

| Class | Instruction Symbol | Restriction |
|--|---|-------------|
| Direct output instruction | DOUT, DSET(P), DRST(P) | — |
| Structural program instructions | BREAK(P), FCALL(P) | — |
| Data operation instructions | DSER(P), SWAP(P), DIS(P), UNI(P), TEST(P), DTEST(P) | — |
| I/O operation instruction | FF | — |
| Real number processing instructions | BSQR(P), BDSQR(P), BSIN(P), BCOS(P), BTAN(P), BASIN(P), BACOS(P), BATAN(P), INT(P), DINT(P), FLOAT(P), DFLOAT(P), ADD(P), SUB(P), MUL(P), DIV(P), RAD(P), DEG(P), SIN(P), COS(P), TAN(P), ASIN(P), ACOS(P), ATAN(P), SQR(P), EXP(P), LOG(P) | — |
| Character string processing instructions | BINDA(P), DBINDA(P), BINHA(P), DBINHA(P), BCDDA(P), DBCDDA(P), DABIN(P), DDABIN(P), HABIN(P), DHABIN(P), DABCD(P), DDABCD(P), LEN(P), STR(P), DSTR(P), VAL(P), DVAL(P), ASC(P), HEX(P), SMOV(P), SADD(P), SCMP(P), WTOB(P), BTOW(P) | — |
| Data control instructions | LIMIT(P), DLIMIT(P), BAND(P), DBAND(P), ZONE(P), DZONE(P) | — |
| Clock instructions | DATERD(P) | — |
| Extension file register instructions | RSET(P), BMOVR(P), BXCHR(P), ZRRD(P), ZRWR(P), ZRRDB(P), ZRWRB(P) | — |
| Program switching instructions | ZCHG | — |

Appendix 2.2 QnA series function GX Simulator

Appendix Table 2.2 List of Supported Instructions (QnA series CPU functions)

(1) Sequence Instructions

| Class | Instruction Symbol | Restriction |
|-----------------------------|--|-------------|
| Contact instructions | LD, LDI, AND, ANI, OR, ORI, LDP, LDF, ANDP, ANDF, ORP, ORF | — |
| Coupling instructions | ANB, ORB, MPS, MRD, MPP, INV, MEP, MEF, EGP, EGF | — |
| Output instructions | OUT, OUT T, OUT C, OUTH T, SET, RST, PLS, PLF, FF | — |
| Shift instructions | SFT(P) | — |
| Master control instructions | MC, MCR | — |
| End instructions | FEND, END | — |
| Other instructions | STOP, NOP, NOPLF, PAGE | — |

(2) Basic Instructions

| Class | Instruction Symbol | Restriction |
|------------------------------------|--|-------------|
| Comparative operation instructions | =, <>, >, <=, <, >=, D=, D<>, D>, D<=, D<, D>=, E=, E<>, E>, E<=, E<, E>=, \$=, \$<>, \$>, \$<=, \$<, \$>=, BKCMP□(P) | — |
| Arithmetic operation instructions | +(P), -(P), D+(P), D-(P), *(P), /(P), D*(P), D/(P), B+(P), B-(P), DB+(P), DB-(P), B*(P), B/(P), DB*(P), DB/(P), E+(P), E-(P), E*(P), E/(P), BK+(P), BK-(P), \$+(P), INC(P), DEC(P), DINC(P), DDEC(P) | — |
| Data conversion instructions | BCD(P), DBCD(P), BIN(P), DBIN(P), INT(P), DINT(P), FLT(P), DFLT(P), DBL(P), WORD(P), GRY(P), DGRY(P), GBIN(P), DGBIN(P), NEG(P), DNEG(P), ENEG(P), BKBCD(P), BKBIN(P) | — |
| Data transfer instructions | MOV(P), DMOV(P), EMOV(P), \$MOV(P), CML(P), DCML(P), BMOV(P), FMOV(P), XCH(P), DXCH(P), BXCH(P), SWAP(P) | — |
| Program branching instructions | CJ, SCJ, JMP, GOEND | — |
| Other convenient instructions | TTMR, STMR, RAMP, MTR | — |

Appendix Table 2.2 List of supported instructions (QnA series CPU functions) (cont.)

(3) Applied Instructions

| Class | Instruction Symbol | Restriction |
|--|---|--|
| Logical arithmetic instructions | WAND(P), DAND(P), BKAND(P), WOR(P), DOR(P), BKOR(P), WXOR(P), DXOR(P), BKXOR(P), WXNR(P), DXNR(P), BKNXR(P) | — |
| Rotation instructions | ROR(P), RCR(P), ROL(P), RCL(P), DROR(P), DRCR(P), DROL(P), DRCL(P) | — |
| Shift instructions | SFR(P), SFL(P), BSFR(P), BSFL(P), DSFR(P), DSFL(P), | — |
| Bit processing instructions | BSET(P), BRST(P), TEST(P), DTEST(P), BKRST(P) | — |
| Data processing instructions | SER(P), DSER(P), SUM(P), DSUM(P), DECO(P), ENCO(P), SEG(P), DIS(P), UNI(P), NDIS(P), NUNI(P), WTOP(P) BTOW(P), MAX(P), MIN(P), DMAX(P), DMIN(P), SORT(P), DSORT(P), WSUM(P), DWSUM(P) | SORT(P), DSORT(P) are executed one scan. |
| Structural instructions | FOR, NEXT, BREAK(P), CALL(P), RET, FCALL(P), ECALL(P), EFCALL(P) | — |
| Data table operation instruction | FIFW(P), FIFR(P), FPOP(P), FINS(P), FDEL(P) | — |
| Buffer memory access instructions | FROM(P), DFRO(P), TO(P), DTO(P) | — |
| Character string processing instructions | BINDA(P), DBINDA(P), BINHA(P), DBINHA(P), BCDDA(P), DBCDDA(P), DABIN(P), DDABIN(P), HABIN(P), DHABIN(P), DABCD(P), DDABCD(P) LEN(P), STR(P), DSTR(P), VAL(P), DVAL(P), ESTR(P), EVAL(P), ASC(P), HEX(P), RIGHT(P), LEFT(P), MIDR(P), MIDW(P), INSTR(P), EMOD(P), EREXP(P) | — |
| Special function instructions | SIN(P), COS(P), TAN(P), ASIN(P), ACOS(P), ATAN(P), RAD(P), DEG(P), SQR(P), EXP(P), LOG(P), BSQR(P), BDSQR(P), BSIN(P), BCOS(P), BTAN(P), BASIN(P), BACOS(P), BATAN(P) | — |
| Data control instructions | LIMIT(P), DLIMIT(P), BAND(P), DBAND(P), ZONE(P), DZONE(P), RSET(P), QDRSET(P) | — |
| Clock instructions | DATERD(P), DATE+(P), DATE-(P), SECOND(P), HOUR(P) | DATERD(P) reads the computer clock data. |
| Program control instructions | PSTOP(P), POFF(P), PSCAN(P), PLOW(P) | — |
| Display instructions | LED, LEDR | — |
| Other instructions | DUTY, ZRRDB(P), ZRWRB(P), ADRSET(P) | — |

Appendix 2.3 FX series function GX Simulator

Appendix Table 2.3 List of Supported Instructions (FX series CPU functions)

(1) Sequence Instructions

| Class | Instruction Symbol | Restriction |
|-----------------------------|--|-------------|
| Contact instructions | LD, LDI, LDP, LDF, AND, ANI, ANDP, ANDF, OR, ORI, ORP, ORF | *1 |
| Coupling instructions | ANB, ORB, MPS, MRD, MPP, INV | *1 |
| Output instructions | OUT, SET, RST, PLS, PLF | — |
| Master control instructions | MC, MCR | — |
| Step ladder instructions | STL, RET | — |
| Other instructions | END, NOP | — |

*1: The LDP, LDF, ANDP, ANDF, ORP, ORF, and INV instructions are only compatible with FX1S, FX1N, FX1NC, FX2N and FX2NC PLC.

(2) Applied Instructions

| Class | FNC No. | Instruction Symbol | 32-bit Instruction | Pulses Execution Instruction | Applicable PLCs | | | | | | | Compatibility with GX Simulator |
|-----------------------|---------|--------------------|--------------------|------------------------------|-----------------|------|-----|-----------|------|-------------|-------------|---------------------------------|
| | | | | | FX0, FX0s | FX0N | FX1 | FX2, FX2C | FX1S | FX1N, FX1NC | FX2N, FX2NC | |
| Program flowchart | 00 | CJ | — | △ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ● |
| | 01 | CALL | — | YES | — | — | ○ | ○ | ○ | ○ | ○ | ● |
| | 02 | SRET | — | — | — | — | ○ | ○ | ○ | ○ | ○ | ● |
| | 03 | IRET | — | — | ○ | ○ | ○ | ○ | ○ | ○ | ○ | × |
| | 04 | EI | — | — | ○ | ○ | ○ | ○ | ○ | ○ | ○ | × |
| | 05 | DI | — | — | ○ | ○ | ○ | ○ | ○ | ○ | ○ | × |
| | 06 | FEND | — | — | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ● |
| | 07 | WDT | — | △ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | × |
| | 08 | FOR | — | — | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ● |
| 09 | NEXT | — | — | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ● | |
| Transition/Comparison | 10 | CMP | YES | △ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ● |
| | 11 | ZCP | YES | △ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ● |
| | 12 | MOV | YES | △ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ● |
| | 13 | SMOV | — | YES | — | — | — | ○ | — | — | ○ | ● |
| | 14 | CML | YES | YES | — | — | — | ○ | — | — | ○ | ● |
| | 15 | BMOV | — | △ | — | ○ | — | ○ | ○ | ○ | ○ | ● |
| | 16 | FMOV | YES | YES | — | — | — | ○ | — | — | ○ | ● |
| | 17 | XCH | YES | YES | — | — | — | ○ | — | — | ○ | ● |
| | 18 | BCD | YES | △ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ● |
| | 19 | BIN | YES | △ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ● |

Appendix Table 2.3 List of Supported Instructions (FX series CPU functions) (cont.)

| Class | FNC No. | Instruction symbol | 32-bit Instruction | Pulses Execution Instruction | Applicable PLCs | | | | | | | Compatibility with GX Simulator |
|-------------------------------|---------|--------------------|--------------------|------------------------------|------------------------------------|------------------|-----------------|------------------------------------|------------------|--------------------------------------|--------------------------------------|---------------------------------|
| | | | | | FX ₀ , FX _{0S} | FX _{0N} | FX ₁ | FX ₂ , FX _{2C} | FX _{1S} | FX _{1N} , FX _{1NC} | FX _{2N} , FX _{2NC} | |
| Arithmetic/logical operations | 20 | ADD | YES | △ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ● |
| | 21 | SUB | YES | △ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ● |
| | 22 | MUL | YES | △ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ● |
| | 23 | DIV | YES | △ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ● |
| | 24 | INC | YES | △ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ● |
| | 25 | DEC | YES | △ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ● |
| | 26 | WAND | YES | △ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ● |
| | 27 | WOR | YES | △ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ● |
| | 28 | WXOR | YES | △ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ● |
| | 29 | NEG | YES | YES | — | — | — | ○ | — | — | ○ | ● |
| Rotation shift | 30 | ROR | YES | YES | — | — | — | ○ | — | — | ○ | ● |
| | 31 | ROL | YES | YES | — | — | — | ○ | — | — | ○ | ● |
| | 32 | RCR | YES | YES | — | — | — | ○ | — | — | ○ | ● |
| | 33 | RCL | YES | YES | — | — | — | ○ | — | — | ○ | ● |
| | 34 | SFTR | — | △ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ● |
| | 35 | SFTL | — | △ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ● |
| | 36 | WSFR | — | YES | — | — | — | ○ | — | — | ○ | ● |
| | 37 | WSFL | — | YES | — | — | — | ○ | — | — | ○ | ● |
| | 38 | SFWR | — | YES | — | — | — | ○ | ○ | ○ | ○ | ● |
| | 39 | SFRD | — | YES | — | — | — | ○ | ○ | ○ | ○ | ● |
| Data processing | 40 | ZRST | — | △ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ● |
| | 41 | DECO | — | △ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ● |
| | 42 | ENCO | — | △ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ● |
| | 43 | SUM | YES | YES | — | — | — | ○ | — | — | ○ | ● |
| | 44 | BON | YES | YES | — | — | — | ○ | — | — | ○ | ● |
| | 45 | MEAN | YES | YES | — | — | — | ○ | — | — | ○ | ● |
| | 46 | ANS | — | — | — | — | — | ○ | — | — | ○ | ● |
| | 47 | ANR | — | YES | — | — | — | ○ | — | — | ○ | ● |
| | 48 | SOR | YES | YES | — | — | — | ○ | — | — | ○ | ● |
| | 49 | FLT | YES | YES | — | — | — | ○ | — | — | ○ | ● |
| High-speed processing | 50 | REF | — | △ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | × |
| | 51 | REFF | — | YES | — | — | ○ | ○ | — | — | ○ | × |
| | 52 | MTR | — | — | — | — | — | ○ | ○ | ○ | ○ | × |
| | 53 | HSCS | YES | — | ○ | ○ | ○ | ○ | ○ | ○ | ○ | × |
| | 54 | HSCR | YES | — | ○ | ○ | ○ | ○ | ○ | ○ | ○ | × |
| | 55 | HSZ | YES | — | — | — | — | ○ | — | — | ○ | × |
| | 56 | SPD | — | — | — | — | — | ○ | ○ | ○ | ○ | × |
| | 57 | PLSY | YES | — | ○ | ○ | — | ○ | ○ | ○ | ○ | × |
| | 58 | PWM | — | — | ○ | ○ | — | ○ | ○ | ○ | ○ | × |
| | 59 | PLSR | YES | — | — | — | — | ○ | ○ | ○ | ○ | × |

Appendix Table 2.3 List of Supported Instructions (FX series CPU functions) (cont.)

| Class | FNC No. | Instruction symbol | 32-bit Instruction | Pulses Execution Instruction | Applicable PLCs | | | | | | | Compatibility with GX Simulator |
|-------------------------|---------|--------------------|--------------------|------------------------------|------------------------------------|------------------|-----------------|------------------------------------|------------------|--------------------------------------|--------------------------------------|---------------------------------|
| | | | | | FX ₀ , FX _{0S} | FX _{0N} | FX ₁ | FX ₂ , FX _{2C} | FX _{1S} | FX _{1N} , FX _{1NC} | FX _{2N} , FX _{2NC} | |
| Convenient instructions | 60 | IST | — | — | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ● |
| | 61 | SER | YES | YES | — | — | — | ○ | — | — | ○ | ● |
| | 62 | ABSD | YES | — | — | — | — | ○ | ○ | ○ | ○ | ● |
| | 63 | INCD | — | — | — | — | — | ○ | ○ | ○ | ○ | ● |
| | 64 | TTMR | — | — | — | — | — | ○ | — | — | ○ | ● |
| | 65 | STMR | — | — | — | — | — | ○ | — | — | ○ | ● |
| | 66 | ALT | — | — | ○ | ○ | — | ○ | ○ | ○ | ○ | ● |
| | 67 | RAMP | — | — | ○ | ○ | — | ○ | ○ | ○ | ○ | ● |
| | 68 | ROTC | — | — | — | — | — | ○ | — | — | ○ | × |
| 69 | SORT | — | — | — | — | — | ○ | — | — | ○ | ● | |
| External devices, I/O | 70 | TKY | YES | — | — | — | — | ○ | — | — | ○ | × |
| | 71 | HKY | YES | — | — | — | — | ○ | — | — | ○ | × |
| | 72 | DSW | — | — | — | — | — | ○ | ○ | ○ | ○ | × |
| | 73 | SEGD | — | YES | — | — | — | ○ | — | — | ○ | × |
| | 74 | SEGL | — | — | — | — | — | ○ | ○ | ○ | ○ | × |
| | 75 | ARWS | — | — | — | — | — | ○ | — | — | ○ | × |
| | 76 | ASC | — | — | — | — | — | ○ | — | — | ○ | ● |
| | 77 | PR | — | — | — | — | — | ○ | — | — | ○ | × |
| | 78 | FROM | YES | YES | — | ○ | — | ○ | — | ○ | ○ | ● |
| 79 | TO | YES | YES | — | ○ | — | ○ | — | ○ | ○ | ● | |
| External devices, SER | 80 | RS | — | — | — | ○ | — | ○ | ○ | ○ | ○ | × |
| | 81 | PRUN | YES | YES | — | — | — | ○ | ○ | ○ | ○ | × |
| | 82 | ASCI | — | YES | — | ○ | — | ○ | ○ | ○ | ○ | ● |
| | 83 | HEX | — | YES | — | ○ | — | ○ | ○ | ○ | ○ | ● |
| | 84 | CCD | — | YES | — | ○ | — | ○ | ○ | ○ | ○ | × |
| | 85 | VRRD | — | YES | — | — | ○ | ○ | ○ | ○ | ○ | × |
| | 86 | VRSC | — | YES | — | — | — | ○ | ○ | ○ | ○ | × |
| | 87 | — | — | — | — | — | — | — | — | — | — | — |
| | 88 | PID | — | — | — | — | — | ○ | ○ | ○ | ○ | × |
| 89 | — | — | — | — | — | — | — | — | — | — | — | |
| External devices, F2 | 90 | MNET | — | YES | — | — | — | — | — | — | — | × |
| | 91 | ANRD | — | YES | — | — | — | — | — | — | — | × |
| | 92 | ANWR | — | YES | — | — | — | — | — | — | — | × |
| | 93 | RMST | — | — | — | — | — | ○ | — | — | — | × |
| | 94 | RMWR | YES | YES | — | — | — | ○ | — | — | — | × |
| | 95 | RMRD | YES | YES | — | — | — | ○ | — | — | — | × |
| | 96 | RMMN | — | YES | — | — | — | ○ | — | — | — | × |
| | 97 | BLK | — | YES | — | — | — | — | — | — | — | × |
| | 98 | MCDE | — | YES | — | — | — | — | — | — | — | × |
| 99 | — | — | — | — | — | — | — | — | — | — | — | |

Appendix Table 2.3 List of Supported Instructions (FX series CPU functions) (cont.)

| Class | FNC No. | Instruction symbol | 32-bit Instruction | Pulses Execution Instruction | Applicable PLCs | | | | | | | Compatibility with GX Simulator |
|------------------------|---------|--------------------|--------------------|------------------------------|------------------------------------|------------------|-----------------|------------------------------------|------------------|--------------------------------------|--------------------------------------|---------------------------------|
| | | | | | FX ₀ , FX _{0S} | FX _{0N} | FX ₁ | FX ₂ , FX _{2C} | FX _{1S} | FX _{1N} , FX _{1NC} | FX _{2N} , FX _{2NC} | |
| Floating decimal-point | 110 | ECMP | YES | YES | — | — | — | — | — | — | ○ | ● |
| | 111 | EZCP | YES | YES | — | — | — | — | — | — | ○ | ● |
| | 118 | EBCD | YES | YES | — | — | — | — | — | — | ○ | ● |
| | 119 | EBIN | YES | YES | — | — | — | — | — | — | ○ | ● |
| | 120 | EADD | YES | YES | — | — | — | — | — | — | ○ | ● |
| | 121 | ESUB | YES | YES | — | — | — | — | — | — | ○ | ● |
| | 122 | EMUL | YES | YES | — | — | — | — | — | — | ○ | ● |
| | 123 | EDIV | YES | YES | — | — | — | — | — | — | ○ | ● |
| | 127 | ESQR | YES | YES | — | — | — | — | — | — | ○ | ● |
| | 129 | INT | YES | YES | — | — | — | — | — | — | ○ | ● |
| | 130 | SIN | YES | YES | — | — | — | — | — | — | ○ | ● |
| | 131 | COS | YES | YES | — | — | — | — | — | — | ○ | ● |
| | 132 | TAN | YES | YES | — | — | — | — | — | — | ○ | ● |
| | 147 | SWAP | YES | YES | — | — | — | — | — | — | ○ | ● |
| Positioning | 155 | ABS | YES | — | — | — | — | — | ○ | ○ | ○ | × |
| | 156 | ZRN | YES | — | — | — | — | — | ○ | ○ | — | × |
| | 157 | PLSV | YES | — | — | — | — | — | ○ | ○ | — | × |
| | 158 | DRVI | YES | — | — | — | — | — | ○ | ○ | — | × |
| | 159 | DRVA | YES | — | — | — | — | — | ○ | ○ | — | × |
| Clock operations | 160 | TCMP | — | YES | — | — | — | — | ○ | ○ | ○ | ● |
| | 161 | TZCP | — | YES | — | — | — | — | ○ | ○ | ○ | ● |
| | 162 | TADD | — | YES | — | — | — | — | ○ | ○ | ○ | ● |
| | 163 | TSUB | — | YES | — | — | — | — | ○ | ○ | ○ | ● |
| | 166 | TRD | — | YES | — | — | — | — | ○ | ○ | ○ | ● |
| | 167 | TWR | — | YES | — | — | — | — | ○ | ○ | ○ | × |
| Other | 169 | HOUR | YES | — | — | — | — | — | ○ | ○ | ○ | ● |
| | 170 | GRY | YES | YES | — | — | — | — | — | — | ○ | ● |
| | 171 | GBIN | YES | YES | — | — | — | — | — | — | ○ | ● |
| | 176 | RD3A | — | YES | — | — | — | — | — | ○ | ○ | × |
| | 177 | WR3A | — | YES | — | — | — | — | — | ○ | ○ | × |
| Extended instruction | 180 | EXTR | YES | YES | — | — | — | — | — | — | ○ | × |

Appendix Table 2.3 List of Supported Instructions (FX series CPU functions) (cont.)

| Class | FNC No. | Instruction symbol | 32-bit Instruction | Pulses Execution Instruction | Applicable PLCs | | | | | | | Compatibility with GX Simulator |
|--------------------|---------|--------------------|--------------------|------------------------------|------------------------------------|------------------|-----------------|------------------------------------|------------------|--------------------------------------|--------------------------------------|---------------------------------|
| | | | | | FX ₀ , FX _{0S} | FX _{0N} | FX ₁ | FX ₂ , FX _{2C} | FX _{1S} | FX _{1N} , FX _{1NC} | FX _{2N} , FX _{2NC} | |
| Contact comparison | 224 | LD= | YES | — | — | — | — | — | ○ | ○ | ○ | ● |
| | 225 | LD> | YES | — | — | — | — | — | ○ | ○ | ○ | ● |
| | 226 | LD< | YES | — | — | — | — | — | ○ | ○ | ○ | ● |
| | 228 | LD<> | YES | — | — | — | — | — | ○ | ○ | ○ | ● |
| | 229 | LD≤ | YES | — | — | — | — | — | ○ | ○ | ○ | ● |
| | 230 | LD≥ | YES | — | — | — | — | — | ○ | ○ | ○ | ● |
| | 232 | AND= | YES | — | — | — | — | — | ○ | ○ | ○ | ● |
| | 233 | AND> | YES | — | — | — | — | — | ○ | ○ | ○ | ● |
| Contact comparison | 234 | AND< | YES | — | — | — | — | — | ○ | ○ | ○ | ● |
| | 236 | AND<> | YES | — | — | — | — | — | ○ | ○ | ○ | ● |
| | 237 | AND≤ | YES | — | — | — | — | — | ○ | ○ | ○ | ● |
| | 238 | AND≥ | YES | — | — | — | — | — | ○ | ○ | ○ | ● |
| | 240 | OR= | YES | — | — | — | — | — | ○ | ○ | ○ | ● |
| | 241 | OR> | YES | — | — | — | — | — | ○ | ○ | ○ | ● |
| | 242 | OR< | YES | — | — | — | — | — | ○ | ○ | ○ | ● |
| | 244 | OR<> | YES | — | — | — | — | — | ○ | ○ | ○ | ● |
| | 245 | OR≤ | YES | — | — | — | — | — | ○ | ○ | ○ | ● |
| 246 | OR≥ | YES | — | — | — | — | — | ○ | ○ | ○ | ● | |

- : Supported by GX Simulator.
- × : Not supported by GX Simulator.
- : Instruction supported by the actual PLC.
- △ : FX₀, FX_{0S}, and FX_{0N} actual PLCs do not support pulse-executed instructions.
- : Instruction not supported by the actual PLC.

Appendix 2.4 GX Simulator for Q series CPU (A mode) functions

Since the supported instructions of the Q series CPU (A mode) are the same as those of the A series CPU, refer to "Appendix Table 2.1 List of Supported Instructions (A series CPU Function)".

Appendix 2.5 GX Simulator for Q series CPU (Q mode) functions

Appendix Table 2.4 List of Supported Instructions (Q Series CPU (Q Mode) Function)

(1) Sequence Instructions

| Class | Instruction Symbol | Restriction |
|-----------------------------|--|-------------|
| Contact instructions | LD, LDI, AND, ANI, OP, ORI, LDP, LDF, ANDP, ANDF, ORP, ORF | — |
| Coupling instructions | ANB, ORB, MPS, MRD, MPP, INV, MEP, MEF, EGP, EGF | — |
| Output instructions | OUT, OUT T, OUT C, OUTH T, SET, RST, PLS, PLF, FF | — |
| Shift instruction | SFT(P) | — |
| Master control instructions | MC, MCR | — |
| End instructions | FEND, END | — |
| Other instructions | STOP, NOP | — |

(2) Basic Instructions

| Class | Instruction Symbol | Restriction |
|------------------------------------|--|-------------------------------------|
| Comparative operation instructions | =, <>, >, <=, <, >=, D=, D<>, D>, D<=, D<, D>=, E=, E<>, E>, E<=, E<, E>=, BKCMP□(P) | — |
| | =\$, \$<>, \$>, \$<=, \$<, \$>= | *1 |
| Arithmetic operation instructions | +(P), -(P), D+(P), D-(P), *(P), /(P), D*(P), D/(P), B+(P), B-(P), DB+(P), DB-(P), B*(P), B/(P), DB*(P), DB/(P), E+(P), E-(P), E*(P), E/(P), BK+(P), BK-(P), INC(P), DEC(P), DINC(P), DDEC(P) | — |
| | \$(P) | *1 |
| Data conversion instructions | BCD(P), DBCD(P), BIN(P), DBIN(P) INT(P), DINT(P), FLT(P), DFLT(P), DBL(P), WORD(P), GRY(P), DGRY(P), GBIN(P), DGBIN(P), NEG(P), DNEG(P), ENEG(P), BKBCD(P), BKBIN(P) | — |
| Data transfer instructions | MOV(P), DMOV(P), EMOV(P), \$MOV(P), CML(P), DCML(P), BMOV(P), FMOV(P), XCH(P), DXCH(P), BXCH(P), SWAP(P), RBMOV | RBMOV operates as BMOV instruction. |
| Program branch instructions | CJ, SCJ, JMP, GOEND | — |
| Other convenient instructions | TTMR, STMR, RAMP, MTR | *1 |

*1 : Unusable when the Q00JCPU, Q00CPU or Q01CPU is used.

Appendix Table 2.4 List of Supported Instructions (Q Series CPU (Q Mode) Function) (cont.)

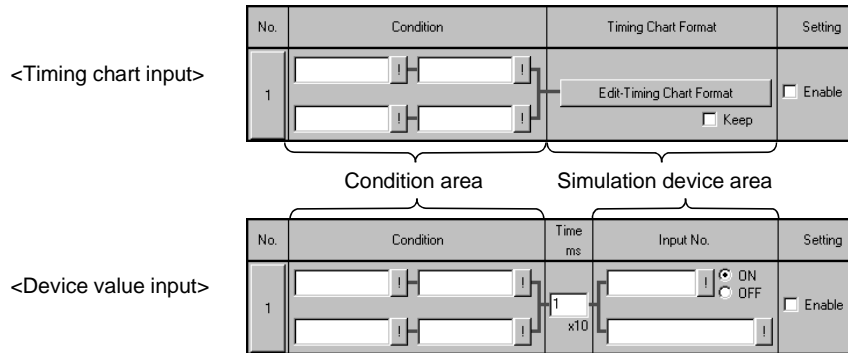
(1) Applied Instructions

| Class | Instruction Symbol | Restriction |
|--|--|--|
| Logical arithmetic instructions | WAND(P), DAND(P), BKAND(P), WOR(P), DOR(P), BKOR(P), WXOR(P), DXOR(P), BKXOR(P), WXNR(P), DXNR(P), BKNXR(P) | — |
| Rotation instructions | ROR(P), RCR(P), ROL(P), RCL(P), DROR(P), DRCR(P), DROL(P), DRCL(P) | — |
| Shift instructions | SFR(P), SFL(P), BSFR(P), BSFL(P), DSFR(P), DSFL(P) | — |
| Bit processing instructions | BSET(P), BRST(P), TEST(P), DTEST(P), BKRST(P), | — |
| Data processing instructions | SER(P), DSER(P), SUM(P), DSUM(P), DECO(P), ENCO(P), SEG(P), DIS(P), UNI(P), NDIS(P), NUNI(P), WTOB(P), BTOW(P), MAX(P), MIN(P), DMAX(P), DMIN(P), SORT(P), DSORT(P), WSUM(P), DWSUM(P) | SORT(P) and DSORT(P) are executed in 1 scan. |
| Structured instructions | FOR, NEXT, BREAK(P), CALL(P), RET, FCALL(P) | — |
| | ECALL(P), EFCALL(P) | *1 |
| Data table operation instructions | FIFW(P), FIFR(P), FPOP(P), FINS(P), FDEL(P) | — |
| Buffer memory access instructions | FROM(P), DFRO(P), TO(P), DTO(P) | — |
| Character string processing instructions | STR(P), DSTR(P), VAL(P), DVAL(P), ESTR(P), EVAL(P) | — |
| | BINDA(P), DBINDA(P), BINHA(P), DBINHA(P), BCDDA(P), DBCDDA(P), DABIN(P), DDABIN(P), HABIN(P), DHABIN(P), DABCD(P), DDABCD(P), LEN(P), ASC(P), HEX(P), RIGHT(P), LEFT(P), MIDR(P), MIDW(P), INSTR(P), EMOD(P), EREXP(P) | *1 |
| Special function instructions | SIN(P), COS(P), TAN(P), RAD(P), DEG(P), SQR(P), EXP(P), LOG(P), RND(P), SRND(P) | — |
| | ASIN(P), ACOS(P), ATAN(P), BSQR(P), BDSQR(P), BSIN(P), BCOS(P), BTAN(P), BASIN(P), BACOS(P), BATAN(P) | *1 |
| Data control instructions | LIMIT(P), DLIMIT(P), BAND(P), DBAND(P), ZONE(P), DZONE(P), RSET(P) | — |
| Switching instruction | RSET(P), QDRSET(P) | *1 |
| Clock instructions | DATERD(P), DATA+(P), DATA-(P), SECOND(P), HOUR(P) | DATERD(P) reads clock data of personal computer. |
| Program control instructions | PSTOP(P), POFF(P), PSCAN(P), PLOW(P) | *1 |
| Display instructions | LED, LEDR | — |
| Other instructions | DUTY, ZRRDB(P), ZRWRB(P), ADRSET(P), ZPUCH(P), ZPOP(P) | — |

*1 : Unusable when the Q00JCPU, Q00CPU or Q01CPU is used.

Appendix 3 List of Devices Usable with the I/O System Settings

Some devices designated in the condition setting area and simulation device area by the I/O system settings are subject to restrictions.
A list of the devices which can be used with the I/O system settings is shown below.



Appendix 3.1 Condition area

Devices which can be designated in condition area are the same for both timing chart input and device value input.

| Device Name | | Function | | | | | |
|-------------|--------------------------|----------|--------|--------------|--------------|-------|------|
| | | ACPU | QnACPU | QCPU(A mode) | QCPU(Q mode) | FXCPU | |
| Bit device | Input (X) | ○ | ○ | ○ | ○ | ○ | |
| | Output (Y) | ○ | ○ | ○ | ○ | ○ | |
| | Internal relay (M) | ○ | ○ | ○ | ○ | ○ | |
| | Latch relay (L) | × | ○ | × | ○ | — | |
| | Step relay (S) | × | — | × | — | — | |
| | Step relay (S) (for SFC) | — | × | — | × | — | |
| | State (S) | — | — | — | — | ○ | |
| | Annunciator (F) | ○ | ○ | ○ | ○ | — | |
| | Edge relay (V) | — | ○ | — | ○ | — | |
| | Link special relay (SB) | — | ○ | — | ○ | — | |
| | Link relay (B) | ○ | ○ | ○ | ○ | — | |
| | Special relay | (M) | ○ | — | ○ | — | ○ |
| | | (SM) | — | ○ | — | ○ | — |
| | Timer (T) | Contacts | ○ *1 | ○ *1 | ○ *1 | ○ *1 | ○ *1 |
| Coil | | × | × | × | × | × | |

| Device Name | | Function | | | | | | |
|--------------------------------------|----------------------------|-------------------|--------|--------------|--------------|-------|--------|---|
| | | ACPU | QnACPU | QCPU(A mode) | QCPU(Q mode) | FXCPU | | |
| Bit device | Retentive timer (ST) | Contacts | — | ○ *1 | — | ○ *1 | ○ *1*2 | |
| | | Coil | — | × | — | × | × | |
| | Counter (C) | Contacts | ○ *1 | ○ *1 | ○ *1 | ○ *1 | ○ *1 | |
| | | Coil | × | × | × | × | × | |
| | Function input (FX) | | — | ○ | — | ○ | — | |
| | Function output (FY) | | — | ○ | — | ○ | — | |
| | Link input (Jn\X) | | — | × | — | × | — | |
| | Link output (Jn\Y) | | — | × | — | × | — | |
| | Link relay (Jn\B) | | — | × | — | × | — | |
| | Link special relay (Jn\SB) | | — | × | — | × | — | |
| | SFC block (BL) | | — | × | — | × | — | |
| | SFC transition device(TR) | | — | × | — | × | — | |
| | Word device | Data register (D) | | ○ | ○ | ○ | ○ | ○ |
| | | Special register | (D) | ○ | — | ○ | — | ○ |
| (SD) | | | — | ○ | — | ○ | — | |
| Link register (W) | | ○ | ○ | ○ | ○ | — | | |
| Link special register (SW) | | — | ○ | — | ○ | — | | |
| Timer (present value) (T) | | × | × | × | × | × | | |
| Retentive timer (present value) (ST) | | — | × | — | × | — | | |
| Counter (present value) (C) | | × | × | × | × | × | | |
| Function register (FD) | | — | × | — | × | — | | |
| File register (R or D) | | ○ | ○ | ○ | ○ | ○ | | |
| Extension file register | | (ER) | × | — | × | — | — | |
| | | (ZR) | — | ○ | — | ○ | — | |
| Buffer register (Un\G) | | — | ○ | — | ○ | — | | |
| Link register (Jn\W) | | — | × | — | × | — | | |
| Link direct device (Jn\SW) | | — | × | — | × | — | | |
| Index register | | (Z) | ○ | ○ | ○ | ○ | ○ | |
| | | (V) | ○ | — | ○ | — | ○ | |
| Accumulator (A) | | ○ | — | ○ | — | — | | |

○.....Can be used

×.....Cannot be used

—.....Not supported

*1 : Only T, ST, and C contacts can be designated.

*2 : In the FX series, the device name becomes "T".

Appendix 3.2 Simulation device area

(1) Timing chart input

| Device Name | | Function | | | | | |
|-------------|----------------------------|----------|--------|--------------|--------------|-------|---|
| | | ACPU | QnACPU | QCPU(A mode) | QCPU(Q mode) | FXCPU | |
| Bit device | Input (X) | ○ | ○ | ○ | ○ | ○ | |
| | Output (Y) | ○ | ○ | ○ | ○ | ○ | |
| | Internal relay (M) | ○ | ○ | ○ | ○ | ○ | |
| | Latch relay (L) | × | ○ | × | ○ | — | |
| | Step relay (S) | × | — | × | — | — | |
| | Step relay (S) (for SFC) | — | × | — | × | — | |
| | State (S) | — | — | — | — | ○ | |
| | Annunciator (F) | ○ | ○ | ○ | ○ | — | |
| | Edge relay (V) | — | ○ | — | ○ | — | |
| | Link special relay (SB) | — | ○ | — | ○ | — | |
| | Link relay (B) | ○ | ○ | ○ | ○ | — | |
| | Special relay | (M) | ○ | — | ○ | — | ○ |
| | | (SM) | — | ○ | — | ○ | — |
| | Timer (T) | Contacts | ○ | ○ | ○ | ○ | × |
| | | Coil | × | × | × | × | × |
| | Retentive timer (ST) | Contacts | — | ○ | — | ○ | × |
| | | Coil | — | × | — | × | × |
| | Counter (C) | Contacts | ○ | ○ | ○ | ○ | × |
| | | Coil | × | × | × | × | × |
| | Function input (FX) | | — | ○ | — | ○ | — |
| | Function output (FY) | | — | ○ | — | ○ | — |
| | Link input (Jn\X) | | — | × | — | × | — |
| | Link output (Jn\Y) | | — | × | — | × | — |
| | Link relay (Jn\B) | | — | × | — | × | — |
| | Link special relay (Jn\SB) | | — | × | — | × | — |
| | SFC block (BL) | | — | × | — | × | — |
| | SFC transition device(TR) | | — | × | — | × | — |

○.....Can be used
 ×.....Cannot be used
 —.....Not supported

| Device Name | | Function | | | | | |
|-------------|--------------------------------------|----------|--------|--------------|--------------|-------|---|
| | | ACPU | QnACPU | QCPU(A mode) | QCPU(Q mode) | FXCPU | |
| Word device | Data register (D) | ○ | ○ | ○ | ○ | ○ | |
| | Special register | (D) | ○ | — | ○ | — | ○ |
| | | (SD) | — | ○ | — | ○ | — |
| | Link register (W) | ○ | ○ | ○ | ○ | — | |
| | Link special register (SW) | — | ○ | — | ○ | — | |
| | Timer (present value) (T) | × | × | × | × | × | |
| | Retentive timer (present value) (ST) | — | × | — | × | — | |
| | Counter (present value) (C) | × | × | × | × | × | |
| | Function register (FD) | — | × | — | × | — | |
| | File register (R or D) | ○ | ○ | ○ | ○ | ○ | |
| | Extension file register | (ER) | ○ | — | ○ | — | — |
| | | (ZR) | — | ○ | — | ○ | — |
| | Buffer register (Un\G) | — | ○ | — | ○ | — | |
| | Link register (Jn\W) | — | × | — | × | — | |
| | Link direct device (Jn\SW) | — | × | — | × | — | |
| | Index register | (Z) | ○ | ○ | ○ | ○ | ○ |
| | | (V) | ○ | — | ○ | — | ○ |
| | Accumulator (A) | ○ | — | ○ | — | — | |

○.....Can be used
 ×.....Cannot be used
 —.....Not supported

(2) Device value input

| Device Name | | Function | | | | | |
|-------------|----------------------------|----------|--------|--------------|--------------|-------|---|
| | | ACPU | QnACPU | QCPU(A mode) | QCPU(Q mode) | FXCPU | |
| Bit device | Input (X) | ○ | ○ | ○ | ○ | ○ | |
| | Output (Y) | ○ | ○ | ○ | ○ | ○ | |
| | Internal relay (M) | ○ | ○ | ○ | ○ | ○ | |
| | Latch relay (L) | × | ○ | × | ○ | — | |
| | Step relay (S) | × | — | × | — | — | |
| | Step relay (S) (for SFC) | — | × | — | × | — | |
| | State (S) | — | — | — | — | ○ | |
| | Annunciator (F) | ○ | ○ | ○ | ○ | — | |
| | Edge relay (V) | — | ○ | — | ○ | — | |
| | Link special relay (SB) | — | ○ | — | ○ | — | |
| | Link relay (B) | ○ | ○ | ○ | ○ | — | |
| | Special relay | (M) | ○ | — | ○ | — | ○ |
| | | (SM) | — | ○ | — | ○ | — |
| | Timer (T) | Contacts | × | × | × | × | × |
| | | Coil | × | × | × | × | × |
| | Retentive timer (ST) | Contacts | — | × | — | × | × |
| | | Coil | — | × | — | × | × |
| | Counter (C) | Contacts | × | × | × | × | × |
| | | Coil | × | × | × | × | × |
| | Function input (FX) | — | ○ | — | ○ | — | |
| | Function output (FY) | — | ○ | — | ○ | — | |
| | Link input (Jn\X) | — | × | — | × | — | |
| | Link output (Jn\Y) | — | × | — | × | — | |
| | Link relay (Jn\B) | — | × | — | × | — | |
| | Link special relay (Jn\SB) | — | × | — | × | — | |
| | SFC block (BL) | — | × | — | × | — | |
| | SFC transition device (TR) | — | × | — | × | — | |

○.....Can be used
 ×.....Cannot be used
 —.....Not supported

| Device Name | | Function | | | | | |
|-------------|--------------------------------------|----------|--------|--------------|--------------|-------|---|
| | | ACPU | QnACPU | QCPU(A mode) | QCPU(Q mode) | FXCPU | |
| Word device | Data register (D) | ○ | ○ | ○ | ○ | ○ | |
| | Special register | (D) | ○ | — | ○ | — | ○ |
| | | (SD) | — | ○ | — | ○ | — |
| | Link register (W) | ○ | ○ | ○ | ○ | — | |
| | Link special register (SW) | — | ○ | — | ○ | — | |
| | Timer (present value) (T) | × | × | × | × | × | |
| | Retentive timer (present value) (ST) | — | × | — | × | — | |
| | Counter (present value) (C) | × | × | × | × | × | |
| | Function register (FD) | — | × | — | × | — | |
| | File register (R or D) | ○ | ○ | ○ | ○ | × | |
| | Extension file register | (ER) | × | — | × | — | — |
| | | (ZR) | — | ○ | — | ○ | — |
| | Buffer register (Un\G) | ○ | ○ | — | ○ | — | |
| | Link register (Jn\W) | — | × | — | × | — | |
| | Link direct device (Jn\SW) | — | × | — | × | — | |
| | Index register | (Z) | ○ | ○ | ○ | ○ | ○ |
| | | (V) | ○ | — | ○ | — | ○ |
| | Accumulator (A) | ○ | — | ○ | — | — | |

○.....Can be used
 ×.....Cannot be used
 —.....Not supported

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