

# MELSEC System Q

Programmable Logic Controllers

User's Manual  
(Function Explanation,  
Program Fundamentals)

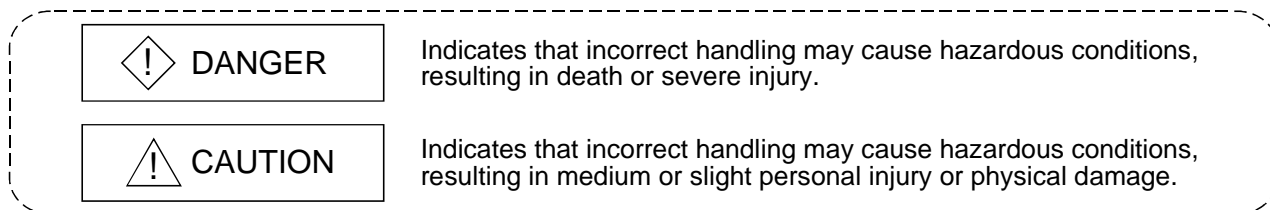
## QnPH CPUs


## • SAFETY INSTRUCTIONS •

(Always read these instructions before using this equipment.)

When using Mitsubishi equipment, thoroughly read this manual and the associated manuals introduced in this manual. Also pay careful attention to safety and handle the module properly.

These SAFETY PRECAUTIONS classify the safety precautions into two categories: "DANGER" and "CAUTION".



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.

### [Design Precautions]

#### **DANGER**

- Install a safety circuit external to the PLC that keeps the entire system safe even when there are problems with the external power supply or the PLC module. Otherwise, trouble could result from erroneous output or erroneous operation.
  - (1) Outside the PLC, construct mechanical damage preventing interlock circuits such as emergency stop, protective circuits, positioning upper and lower limits switches and interlocking forward/reverse operations.
  - (2) When the PLC detects the following problems, it will stop calculation and turn off all output in the case of (a). In the case of (b), it will stop calculation and hold or turn off all output according to the parameter setting.
    - (a) The power supply module has over current protection equipment and over voltage protection equipment.
    - (b) The PLC CPUs self-diagnosis functions, such as the watch dog timer error, detect problems.In addition, all output will be turned on when there are problems that the PLC CPU cannot detect, such as in the I/O controller. Build a fail safe circuit exterior to the PLC that will make sure the equipment operates safely at such times. Refer to "LOADING AND INSTALLATION" in Process CPU User's Manual (Hardware Design, Maintenance and Inspection) for example fail safe circuits.
  - (3) Output could be left on or off when there is trouble in the output module relay or transistor. So build an external monitoring circuit that will monitor any single outputs that could cause serious trouble.

## [Design Precautions]

### DANGER

- When overcurrent which exceeds the rating or caused by short-circuited load flows in the output module for a long time, it may cause smoke or fire. To prevent this, configure an external safety circuit, such as fuse.
- Build a circuit that turns on the external power supply when the PLC main module power is turned on. If the external power supply is turned on first, it could result in erroneous output or erroneous operation.
- When there are communication problems with the data link, refer to the corresponding data link manual for the operating status of each station.  
Not doing so could result in erroneous output or erroneous operation.
- When connecting a peripheral device to the CPU module or connecting a personal computer or the like to the intelligent function module to exercise control (data change) on the running PLC, configure up an interlock circuit in the sequence program to ensure that the whole system will always operate safely.  
Also before exercising other control (program change, operating status change (status control)) on the running PLC, read the manual carefully and fully confirm safety.  
Especially for the above control on the remote PLC from an external device, an immediate action may not be taken for PLC trouble due to a data communication fault.  
In addition to configuring up the interlock circuit in the sequence program, corrective and other actions to be taken as a system for the occurrence of a data communication fault should be predetermined between the external device and PLC CPU.

### CAUTION

- Do not bunch the control wires or communication cables with the main circuit or power wires, or install them close to each other. They should be installed 100 mm (3.94 inch) or more from each other.  
Not doing so could result in noise that would cause erroneous operation.
- When controlling items like lamp load, heater or solenoid valve using an output module, large current (approximately ten times greater than that present in normal circumstances) may flow when the output is turned OFF to ON.  
Take measures such as replacing the module with one having sufficient rated current.

## [Installation Precautions]

### CAUTION

- Use the PLC in an environment that meets the general specifications contained in Process CPU User's Manual (Hardware Design, Maintenance and Inspection). Using this PLC in an environment outside the range of the general specifications could result in electric shock, fire, erroneous operation, and damage to or deterioration of the product.
- Hold down the module loading lever at the module bottom, and securely insert the module fixing latch into the fixing hole in the base unit. Incorrect loading of the module can cause a malfunction, failure or drop.  
When using the PLC in the environment of much vibration, tighten the module with a screw. Tighten the screw in the specified torque range.  
Undertightening can cause a drop, short circuit or malfunction.  
Overtightening can cause a drop, short circuit or malfunction due to damage to the screw or module.
- When installing more cables, be sure that the base unit and the module connectors are installed correctly. After installation, check them for looseness.  
Poor connections could cause an input or output failure.
- Securely load the memory card into the memory card loading connector.  
After installation, check for lifting.  
Poor connections could cause an operation fault.
- Completely turn off the external power supply before loading or unloading the module.  
Not doing so could result in electric shock or damage to the product.  
Note that online module change can be made when the QnPHCPU is used.  
Note that there are restrictions on the modules that can be changed online and each module has a predetermined changing procedure.  
For details, refer to the section of online module change in the Process CPU User's Manual (Hardware Design, Maintenance and Inspection).
- Do not directly touch the module's conductive parts or electronic components.  
Touching the conductive parts could cause an operation failure or give damage to the module.

## [Wiring Precautions]

### DANGER

- Completely turn off the external power supply when installing or placing wiring.  
Not completely turning off all power could result in electric shock or damage to the product.
- When turning on the power supply or operating the module after installation or wiring work, be sure that the module's terminal covers are correctly attached.  
Not attaching the terminal cover could result in electric shock.

## [Wiring Precautions]

### CAUTION

- Be sure to ground the FG terminals and LG terminals to the protective ground conductor. Not doing so could result in electric shock or erroneous operation.
- When wiring in the PLC, be sure that it is done correctly by checking the product's rated voltage and the terminal layout.  
Connecting a power supply that is different from the rating or incorrectly wiring the product could result in fire or damage.
- External connections shall be crimped or pressure welded with the specified tools, or correctly soldered.  
Imperfect connections could result in short circuit, fires, or erroneous operation.
- Tighten the terminal screws with the specified torque.  
If the terminal screws are loose, it could result in short circuits, fire, or erroneous operation.  
Tightening the terminal screws too far may cause damages to the screws and/or the module, resulting in fallout, short circuits, or malfunction.
- Be sure there are no foreign substances such as sawdust or wiring debris inside the module.  
Such debris could cause fires, damage, or erroneous operation.
- The module has an ingress prevention label on its top to prevent foreign matter, such as wire offcuts, from entering the module during wiring.  
Do not peel this label during wiring.  
Before starting system operation, be sure to peel this label because of heat dissipation.

## [Startup and Maintenance precautions]

### DANGER

- Do not touch the terminals while power is on.  
Doing so could cause shock or erroneous operation.
- Correctly connect the battery. Also, do not charge, disassemble, heat, place in fire, short circuit, or solder the battery.  
Mishandling of battery can cause overheating or cracks which could result in injury and fires.
- Switch all phases of the external power supply off when cleaning the module or retightening the terminal or module mounting screws. Not doing so could result in electric shock.  
Undertightening of terminal screws can cause a short circuit or malfunction.  
Overtightening of screws can cause damages to the screws and/or the module, resulting in fallout, short circuits, or malfunction.

## [Startup and Maintenance precautions]

### CAUTION

- The online operations conducted for the CPU module being operated, connecting the peripheral device (especially, when changing data or operation status), shall be conducted after the manual has been carefully read and a sufficient check of safety has been conducted. Operation mistakes could cause damage or problems with of the module.
- Do not disassemble or modify the modules.  
Doing so could cause trouble, erroneous operation, injury, or fire.
- Use a cellular phone or PHS more than 25cm (9.85 inch) away from the PLC.  
Not doing so can cause a malfunction.
- Switch all phases of the external power supply off before mounting or removing the module.  
If you do not switch off the external power supply, it will cause failure or malfunction of the module.  
Note that online module change can be made when the QnPHCPU is used.  
Note that there are restrictions on the modules that can be changed online and each module has a predetermined changing procedure.  
For details, refer to the section of online module change in the Process CPU User's Manual (Hardware Design, Maintenance and Inspection).

## [Disposal Precautions]

### CAUTION

- When disposing of this product, treat it as industrial waste.

REVISIONS

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## INTRODUCTION

Thank you for choosing the Mitsubishi MELSEC-Q Series of General Purpose Programmable Controllers. Please read this manual carefully so that equipment is used to its optimum.

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#### 11.2.15 Flowchart when it is unable to perform boot operation from memory card

#### 11.2.16 Flowchart when UNIT VERIFY ERR. occurs

#### 11.2.17 Flowchart when CONTROL BUS ERR. occurs

### 11.3 Error Code List

#### 11.3.1 Procedure for reading error codes

#### 11.3.2 Error code list

### 11.4 Canceling of Errors

### 11.5 I/O Module Troubleshooting

#### 11.5.1 Input circuit troubleshooting

### 11.6 Special Relay List

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## APPENDICES

### APPENDIX 1 Error Code Return to Origin During General Data Processing

#### APPENDIX 1.1 Error code overall explanation

#### APPENDIX 1.2 Description of the errors of the error codes (4000H to 4FFFH)

### APPENDIX 2 External Dimensions Diagram

#### APPENDIX 2.1 CPU module

#### APPENDIX 2.2 Power supply module

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### APPENDIX 3 Comparison between Process CPU and High Performance model QCPU

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## Manuals

The following manuals are also related to this product.

In necessary, order them by quoting the details in the tables below.

### **Related Manuals**

Manual Name	Manual Number (Model Code)
Process CPU User's Manual (Hardware Design, Maintenance and Inspection) This manual provides the specifications of the CPU modules, power supply modules, base units, extension cables, memory cards and others. (Sold separately)	SH-080314E (13JR55)
QCPU (Q Mode)/QnA CPU Programming Manual (Common Instructions) This manual describes how to use the sequence instructions, basic instructions and application instructions. (Sold separately)	SH-080039 (13JF58)
QCPU (Q Mode)/QnA CPU Programming Manual (SFC) This manual explains the system configuration, performance specifications, functions, programming, debugging, error codes and others of MELSAP3. (Sold separately)	SH-080041 (13JF60)
QCPU (Q Mode)/QnA CPU Programming Manual (MELSAP-L) This manual describes the programming methods, specifications, functions, and so on that are necessary to create the MELSAP-L type SFC programs. (Sold separately)	SH-080076 (13JF61)
QnPHCPU Programming Manual (Process Control Instructions) This manual describes the programming procedures, device names, and other items necessary to implement PID control using process control instructions. (Sold separately)	SH-080316E (13JF67)

## How to Use This Manual

This manual is prepared for users to understand memory map, functions, programs and devices of the CPU module when you use MELSEC-Q Series PLCs.

The manual is classified roughly into three sections as shown below.

- |                       |   |
|-----------------------|---|
| (1) Chapters 1 and 2  | Describe the outline of the CPU module and the system configuration. The feature of CPU module and the basics of the system configuration of CPU module are described.                                    |
| (2) Chapters 3 to 6   | Describe the performance specifications, executable program, I/O No. and memory of the CPU module.  |
| (3) Chapter 7         | Describes the functions of the CPU modules.   |
| (4) Chapter 8         | Describes communication with intelligent function modules.  |
| (5) Chapters 9 and 10 | Describe parameters and devices used in the CPU modules.  |
| (6) Chapter 11        | Describes the CPU module processing time.   |
| (7) Chapter 12        | Describes the procedure for writing parameters and programs created at the GX Developer to the CPU module.  |
| (8) Chapters 13 to 19 | Describes an overview of the multiple PLC system, the system configuration, the I/O numbers, communications between CPU modules, and communications between I/O modules and intelligent function modules. |

### **REMARK**

This manual does not explain the functions of power supply modules, base units, extension cables, memory cards and batteries of CPU module.

For these functions, refer to the manual shown below.

- Process CPU User's Manual (Hardware Design, Maintenance and Inspection)

## Generic Terms and Abbreviations

The following abbreviations and general names for Q12PHCPU, and Q25PHCPU are used in the manual.

Generic Term/Abbreviation	Description
High Performance model QCPU	General name for Q02CPU, Q02HCPU, Q06HCPU Q12HCPU and Q25HCPU modules.
Process CPU	General name for Q12PHCPU, and Q25PHCPU
QnCPU	General name for Q02CPU.
QnHCPU	General name for Q02HCPU, Q06HCPU Q12HCPU, and Q25HCPU
QnPHCPU	General name for Q12PHCPU, and Q25PHCPU
Q Series	Abbreviation for Mitsubishi MELSEC-Q Series Programmable Logic Controller.
AnS Series	Abbreviation for small types of Mitsubishi MELSEC-A Series Programmable Logic Controller.
GX Developer	General product name for SWnD5C-GPPW-E, SWnD5C-GPPW-A-E, SWnD5C-GPPW-V-E, SWnD5C-GPPW-VA-E. For QnPHCPU, version 7.10L or later can be used.
Main base unit	General name for Q33B, Q35B, Q38B, Q312B type main base unit with Q Series power supply module, I/O module, intelligent function module attachable.
Q6□B	General name for Q63B, Q65B, Q68B and Q612B type extension base unit with Q Series power supply module, I/O module, intelligent function module attachable.
Extension base unit	General name for Q5□B and Q6□B.
Base unit	General name for main base unit and extension base unit.
SRAM card	General name for Q2MEM-1MBS and Q2MEM-2MBS types SRAM card.
Flash card	General name for Q2MEM-2MBF and Q2MEM-4MBF types Flash card.
ATA card	General name for Q2MEM-8MBA, Q2MEM-16MBA and Q2MEM-32MBA types ATA card.
Memory card	General name for SRAM card, Flash card and ATA card.
Power supply module	General name for Q61P-A1, Q61P-A2, Q62P, Q63P and Q64P type power supply module.
Battery	General name for battery for Q6BAT type CPU module and Q2MEM-BAT type SRAM card.
Extension cable	General name for QC05B, QC06B, QC12B, QC30B, QC50B, QC100B type extension cable.
Q5□B	General name for Q52B and Q55B that accept the Q Series I/O and intelligent function modules.
Control PLC	Process CPU/High Performance model QCPU/motion CPU that controls any of the I/O and intelligent function modules mounted on the main or extension base unit. For example, when the module mounted on slot 3 is controlled by the PLC No. 2, the PLC No. 2 is the control PLC of the module on slot 3.
Non-controlled module (Non-group module)	I/O or intelligent function module other than the controlled module. For example, when the module mounted on slot 3 is controlled by the PLC No. 2, the module on slot 3 is the non-controlled module of the PLC Nos. 1, 3 and 4.
Controlled module	I/O or intelligent function module controlled by the control PLC. For example, when the module mounted on slot 3 is controlled by the PLC No. 2, the module on slot 3 is the controlled module of the PLC No. 2.
CPU numbers	Numbers assigned to differentiate between the Process CPU, High Performance model QCPU and motion CPU mounted in a multi PLC system. The CPU on the CPU slot is the PLC No. 1, the one on slot 0 is the PLC No. 2, the one on slot 1 is the PLC No. 3, and the one on slot 2 is the PLC No. 4.
Single PLC system	System mounted with the Process CPU on the CPU slot to exercise control.
PC CPU module	MELSEC-Q Series corresponding PC CPU module
Non-control PLCs	Process CPU, High Performance model QCPU and/or Motion CPUs other than the control PLC. For example, when the module mounted on slot 3 is controlled by the PLC No. 2, the CPU Nos. 1, 3 and 4 are the non-control PLCs of the module on slot 3.
Multiple PLC system	System mounted with up to four Process CPU, High Performance model QCPU, Motion CPU and PC CPU module on the main base unit to exercise control.

## 1. OVERVIEW

1

This User's Manual describes the hardware specifications and handling methods of the Process CPU.

The Manual also describes those items related to the specifications of the power supply module, main base unit, extension base unit, extension cable, memory card and battery.

The Process CPU is a process control-compatible CPU module.

Based on the High Performance model QCPU, the Process CPU has the following additional instructions and functions.

- Process control instructions: 52 instructions
- Auto tuning function
- Online module change
- MELSECNET/H multiplex remote I/O system compatibility

POINT
(1) For details of the added instructions and auto tuning function, refer to the QnPHCPU Programming Manual (Process Control Instructions).
(2) For details of online module change, refer to Section 4.6 of this manual.

## 1.1 Features

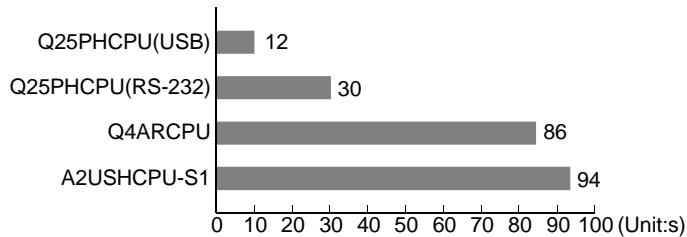
Process CPU has the following new features:

- (1) **52 instructions added as process control instructions**  
52 additional instructions are capable of high-level process control.
- (2) **2-degree-of-freedom PID control system**  
The 2-degree-of-freedom PID control system adopted enables optimum response to both set value variation and disturbance variation.
- (3) **Addition of auto tuning function (PID constant initial value setting)**  
The auto tuning function automates control parameter adjustment, shortens adjustment, saves the labor of operators and control engineers, and resolves differences in adjustment results between individuals.
- (4) **Module can be changed online (online module change)**  
When a module fails, you can change it without stopping the system.  
Online module change applies to the Q series I/O modules and to the A/D converter, D/A converter, thermocouple input and temperature control modules of function version C and later.
- (5) **Multiplex remote I/O system of MELSECNET/H can be configured**  
By mounting the remote master station of the MELSECNET/H, you can configure the multiplex remote I/O system of the MELSECNET/H.

POINT
(1) For details of the added instructions and auto tuning function, refer to the QnPHCPU Programming Manual (Process Control Instructions).
(2) For details of online module change, refer to Section 4.6 of this manual.
(3) Use the Process CPU of GX Developer Version 7.10L or later.

- (6) **Controllable multiple I/O points**  
 All Process CPUs support 4096 points (X/Y0 to FFF) as the number of actual I/O points capable of getting access to the I/O module installed on the base unit. They also support 8192 points max. (X/Y0 to 1FFF) as the number of I/O devices which can be used in the remote I/O stations such as MELSECNET/H remote I/O NET and CC-Link data link.
  
- (7) **Lineup according to program capacity**  
 The optimum CPU module for the program capacity to be used can be selected.  
 Q12PHCPU : 124k step  
 Q25PHCPU : 252k step
  
- (8) **Realised high speed processing**  
 Depending on the type of the sequencer, high speed processing has been realized.(Example: when LD instruction is used)  
 Q12PHCPU, Q25PHCPU : 0.034  $\mu$ s  
  
 In addition, an access to the intelligent function module or an increase in speed of the link refresh of the network have been realized by the connection system (System bus connection) of the newly developed base unit.  
 Access to the intelligent function module : 20  $\mu$ s /word (approx. 7 times)\*1  
 MELSECNET/H link refresh processing : 4.6ms/8k word (approx. 4.3 times)\*1  
 \*1: Where Q25PHCPU is compared with Q4ARCPU.
  
- (9) **Increase in debugging efficiency through high speed communication with GX Developer**  
 In the Process CPU, a time required for writing/reading of a program or monitoring has been reduced through the high speed communication at a speed of 115.2kbps max. by the RS-232, and a communication time efficiency at the time of debugging has been increased.  
 In the Process CPU, a high speed communication at a speed of 12Mbps is allowed through the USB.

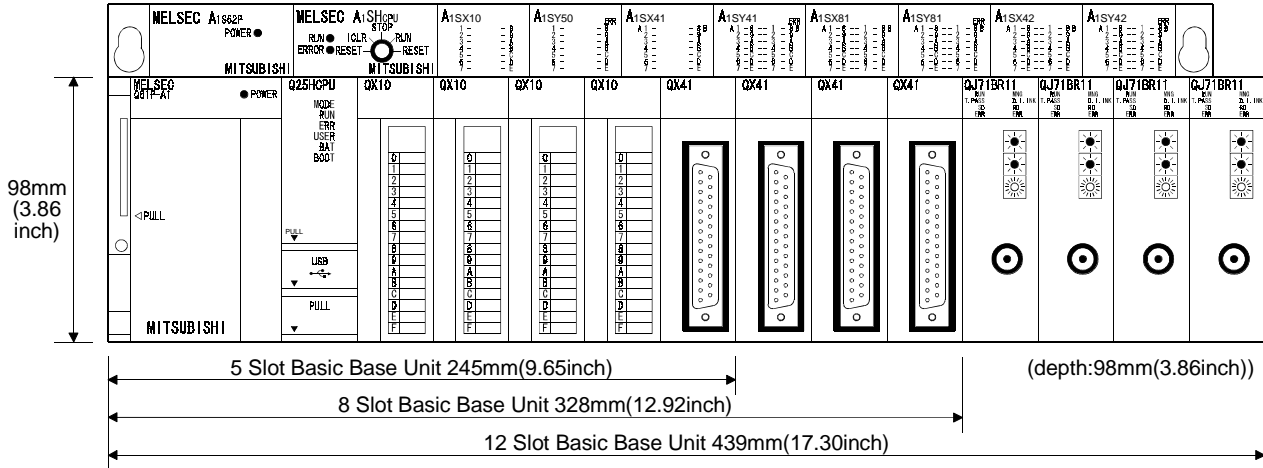
26k step program transfer time



(10) Saved space by a reduction in size

The installation space for Q series has been reduced by approx. 60 % of the space for AnS series.

Comparison of installation space



(11) Connection of up to seven extension base units.

- (a) The Process CPU can connect to seven extension base units (eight base units including the main) and accept up to 64 modules.
- (b) The overall distance of the extension cables is up to 13.2m to ensure high degree of extension base unit arrangement.

(12) Memory extension by memory card

The Process CPU is provided with a memory card installation connector to which a memory card of 32 Mbyte max. can be connected (32 Mbyte is available when a ATA card is used).

When a memory card of large capacity is installed, a large capacity of file can be controlled, comments to all data devices can be set up, and the programs in the past can be stored in the memory as they are in the form of the corrected histories.

If a memory card is not installed, a program can be stored onto the standard ROM built in the CPU module, and 128k points of the file registers can be handled by the standard RAM.



**(13) Data can be written automatically to standard ROM**

You need not use GX Developer to write parameters/programs on a memory card to the standard ROM of the Process CPU.

When the standard ROM is used to perform ROM operation, you can load a memory card into the Process CPU and write parameters/programs on the memory card to the standard ROM. Hence, you need not carry GX Developer (personal computer) to rewrite the parameters/programs.

**(14) External I/O can be turned ON/OFF forcibly**

If the Process CPU is in the RUN mode, you can operate GX Developer to turn external inputs/outputs ON/OFF forcibly, independently of the program execution status.

You need not put the Process CPU in the STOP mode to perform wiring/operation tests by forced ON/OFF of outputs.

**(15) Remote password can be set**

When access to an Ethernet module or serial communication module is made externally, whether access to the Process CPU can be made or not can be selected with a remote password.

**(16) Remote I/O network of MELSECNET/H can be configured**

You can load the remote master station of the MELSECNET/H to configure an MELSECNET/H remote I/O system.

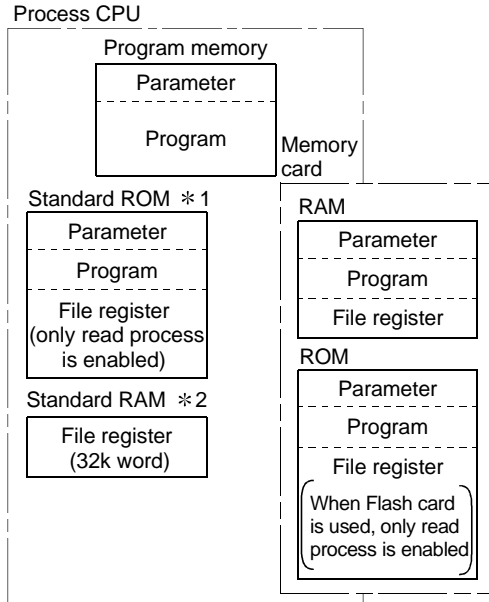
**REMARK**

- In addition to the remote password, there are the following protection facilities for the Process CPU.
  - Protection of the whole CPU module by making system settings of the Process CPU
  - Protection of the memory card by setting the write protect switch of the memory card
  - File-by-file protection using password

1.2 Programs

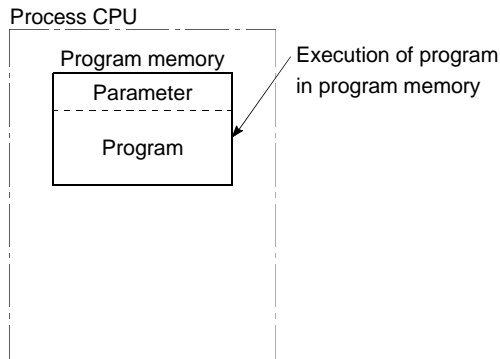
(1) Program management by memory card

- (a) Programs created with GX Developer can be stored in the Process CPU's program memory, standard ROM or memory card.

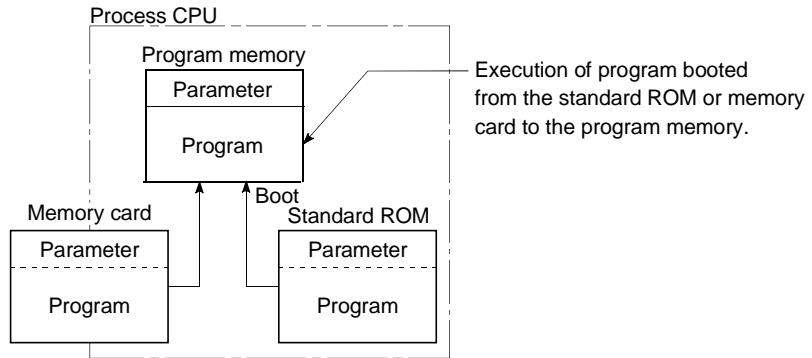


- \*1: The standard ROM is used when parameters and programs are written to ROM.
- \*2: The standard RAM is used when access to the file register need to speed up.

- (b) The Process CPU processes programs stored in the program memory.



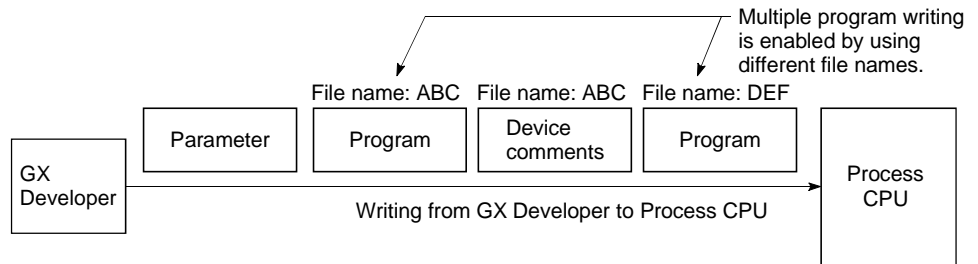
Programs stored in the standard ROM/memory card are executed after they are booted to (read to) the Process CPU program memory. (Programs to be booted to the Process CPU are designated on the "(PLC) Parameter" dialog box, and the parameter drive is designated by a DIP switch setting at the Process CPU.)



(2) Program construction

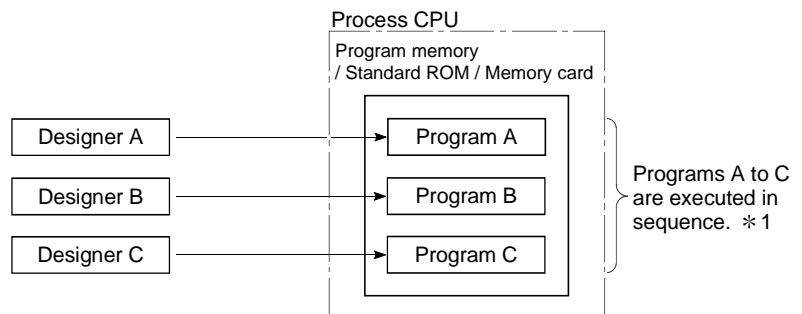
Programs are stored in a file format in the program memory, standard ROM or memory card.

Multiple programs can therefore be stored in the program memory, standard ROM or memory card by using different file names.



Therefore, the program creation can be split among several designers so that they control and manage the programs by process or function. Only the relevant programs should be modified or debugged when the specifications are changed.

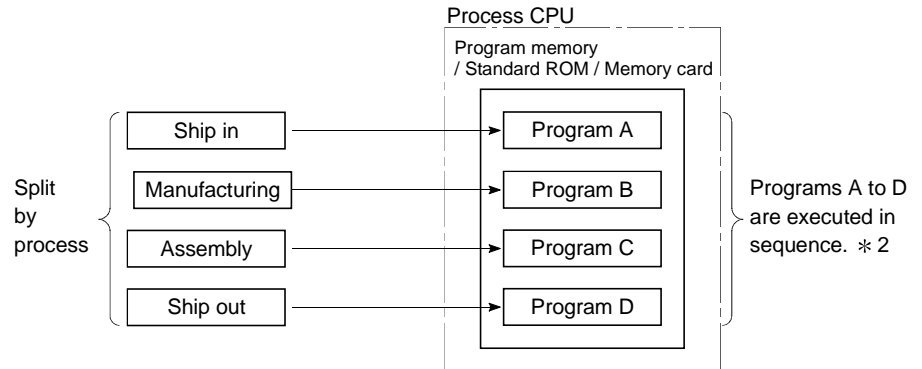
(a) Example of program creation split among several designers:



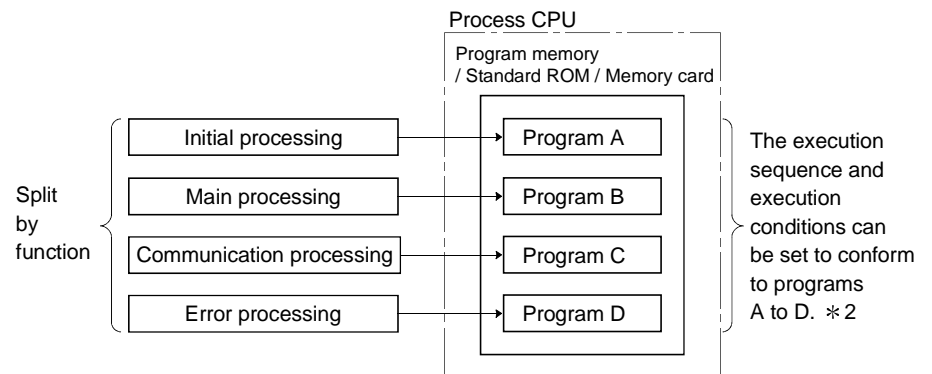
**REMARK**

\*1: See Section 4.2 for details on the execution sequence.

(b) Example of programs split by process: \*1



(c) Example of programs split by function:



**REMARK**

\*1: Programs split by process can be further split by function.

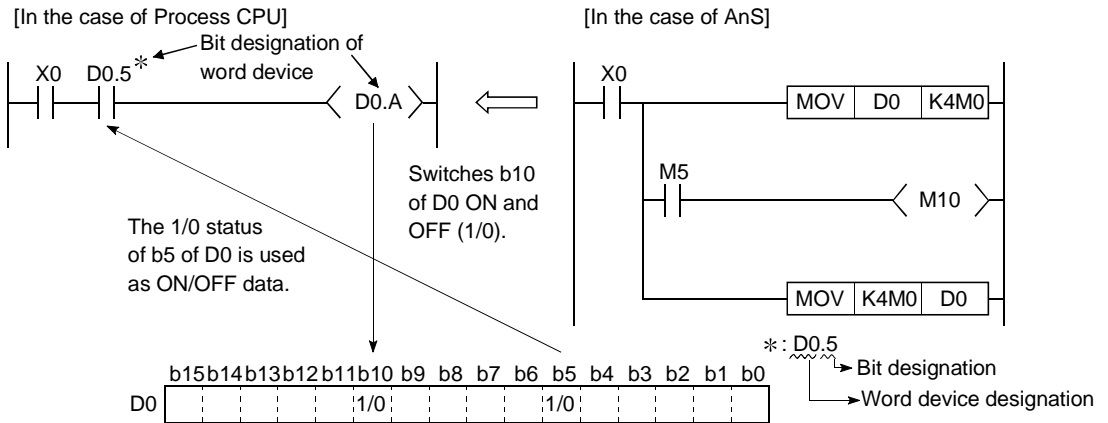
\*2: See Section 4.2 for details on the execution sequence and execution conditions.

### 1.3 Convenient Programming Devices and Instructions

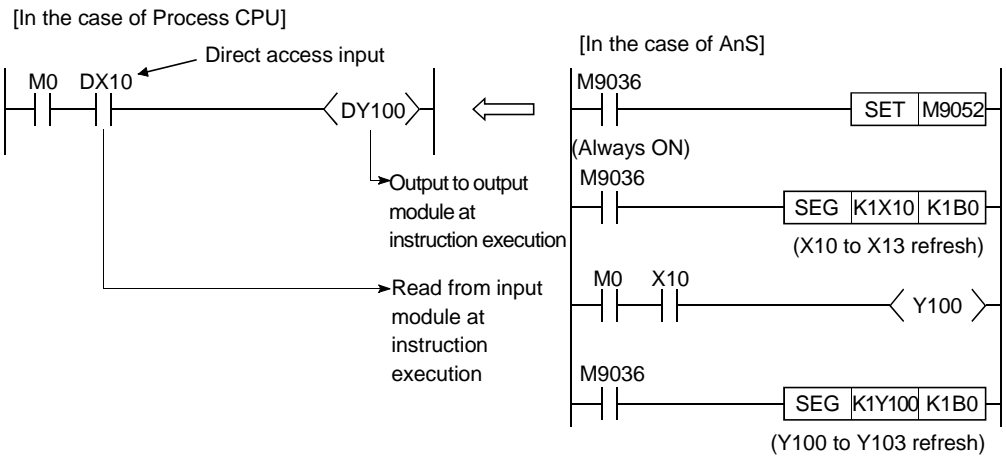
The Process CPU features devices and instructions which facilitate program creation. Some of them are described below.

#### (1) Flexible device designation

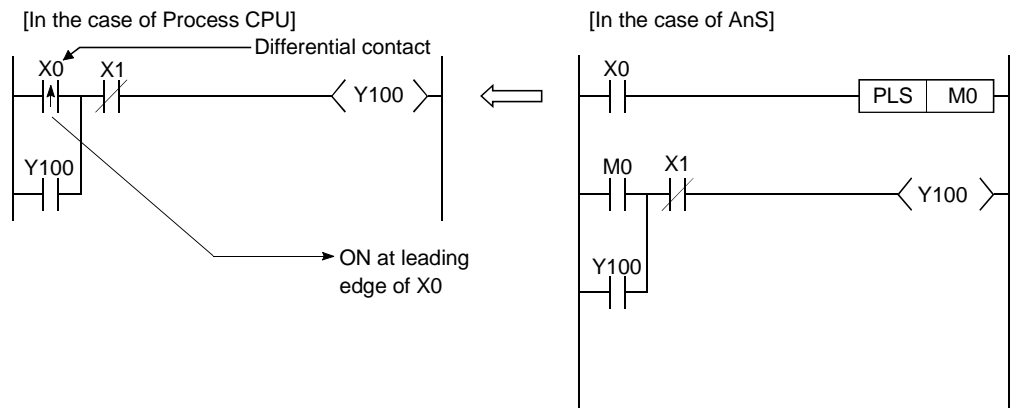
(a) Word device bits can be designated to serve as contacts or coils.



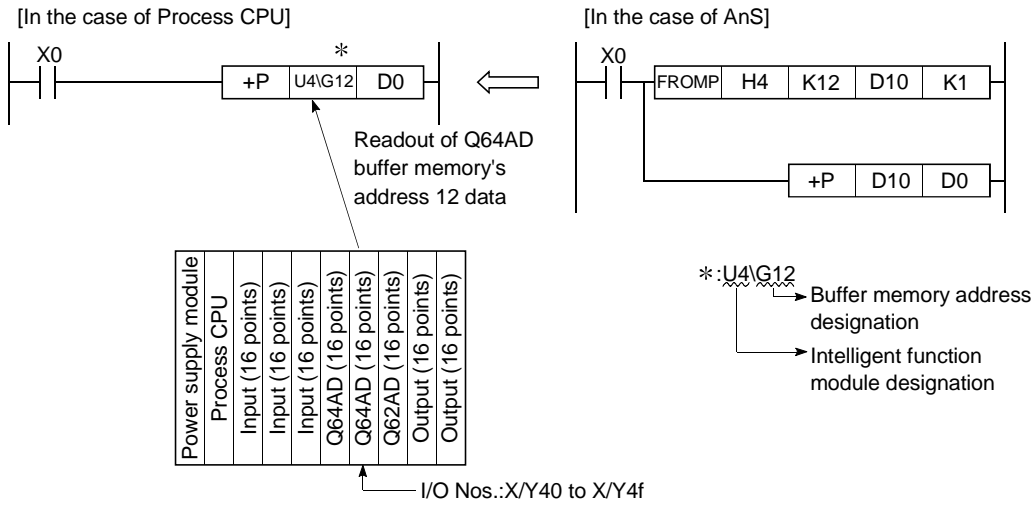
(b) Direct processing in 1-point units is permitted within a program simply by using direct access inputs (DX[]) and direct access outputs (DY[]).



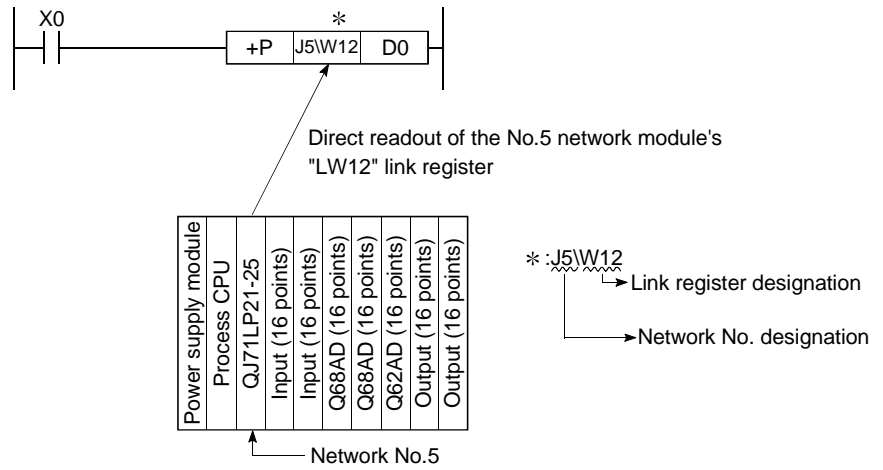
(c) Differential contacts (—|/|—) eliminate the need of converting inputs to pulses.



(d) The buffer memory of intelligent function module (e.g. Q64AD, Q62DA) can be used in the same way as devices when programming.



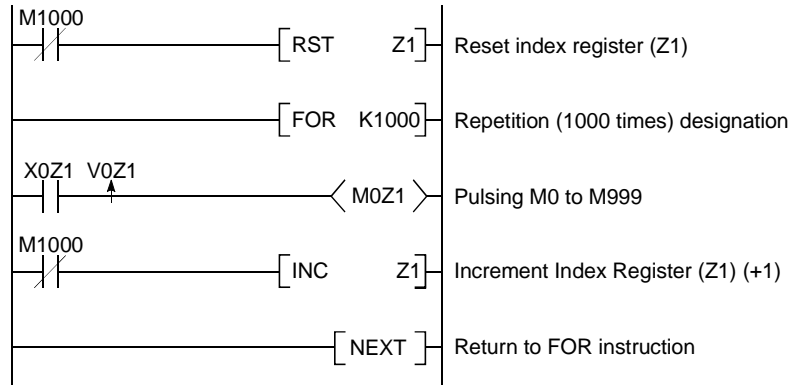
(e) Direct access to link devices (LX, LY, LB, LW, SB, SW) of MELSECNET/H network modules (e.g. QJ71LP21-25) is allowed without refresh settings.



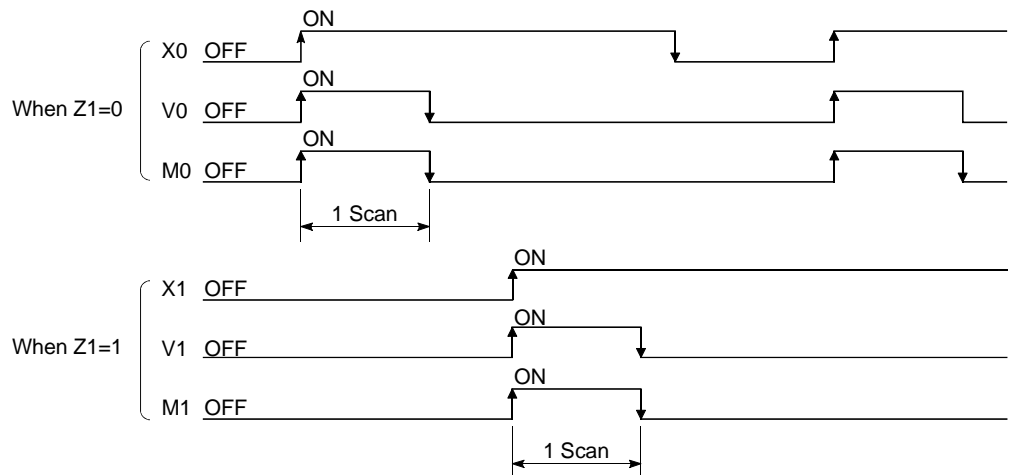
(2) Edge relays simplify pulse conversion processing

- (a) The use of a relay (V) that comes ON at the leading edge of the input condition simplifies pulse processing when a contact index qualification has been made.

[Circuit example]

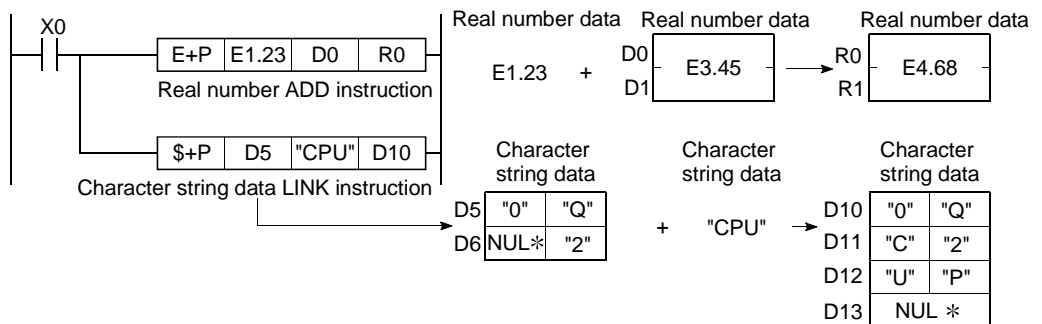


[Timing chart]



(3) Simple data processing

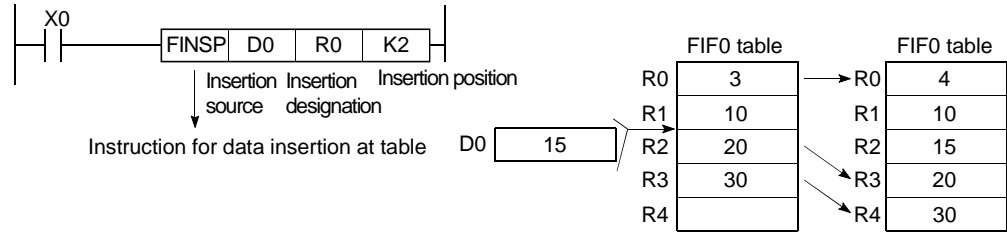
- (a) Real numbers (floating decimal point data) and character string constants can be used in the programming as they are.



**REMARK**

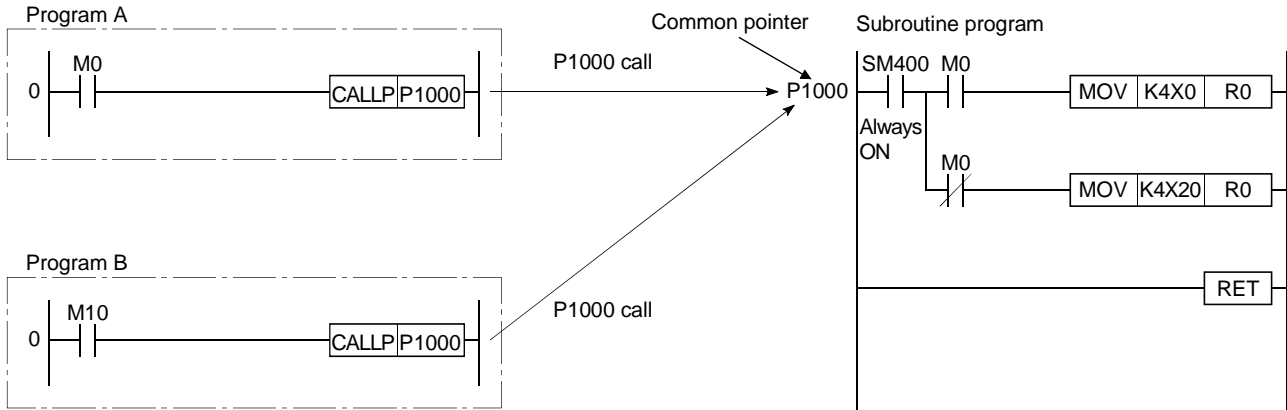
\*: NUL indicates "00H (character string END)".

- (b) Data processing instructions such as table processing instructions, etc., enable high speed processing of large amounts of data.

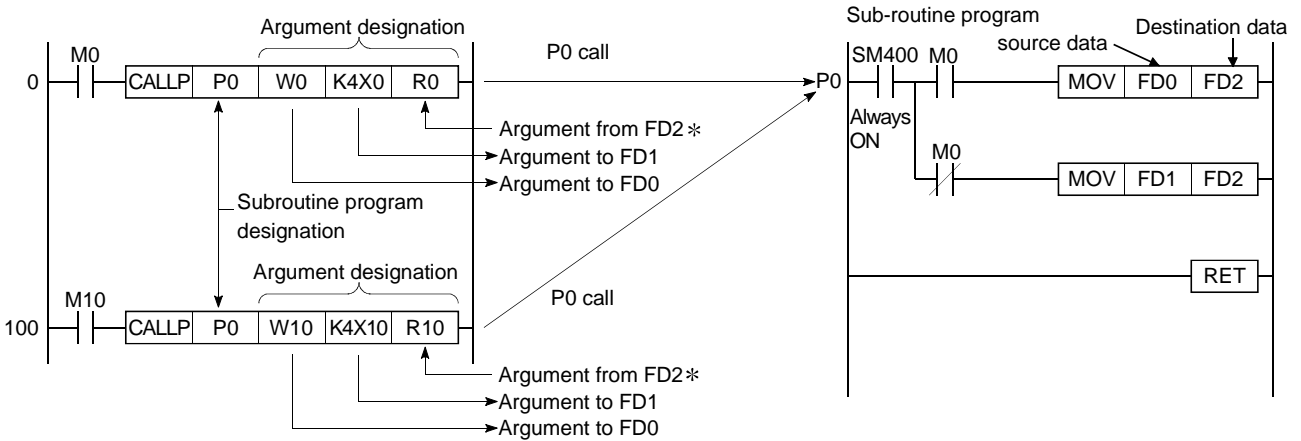


(4) Easy shared use of sub-routine programs

- (a) A common pointer can be used to call the same sub-routine program from all sequence programs being executed.



- (b) The use of sub-routine call instructions with arguments simplifies the creation of sub-routine programs which are called several times.



**REMARK**

\*: For details on the argument I/O condition, see Section 10.3.1.





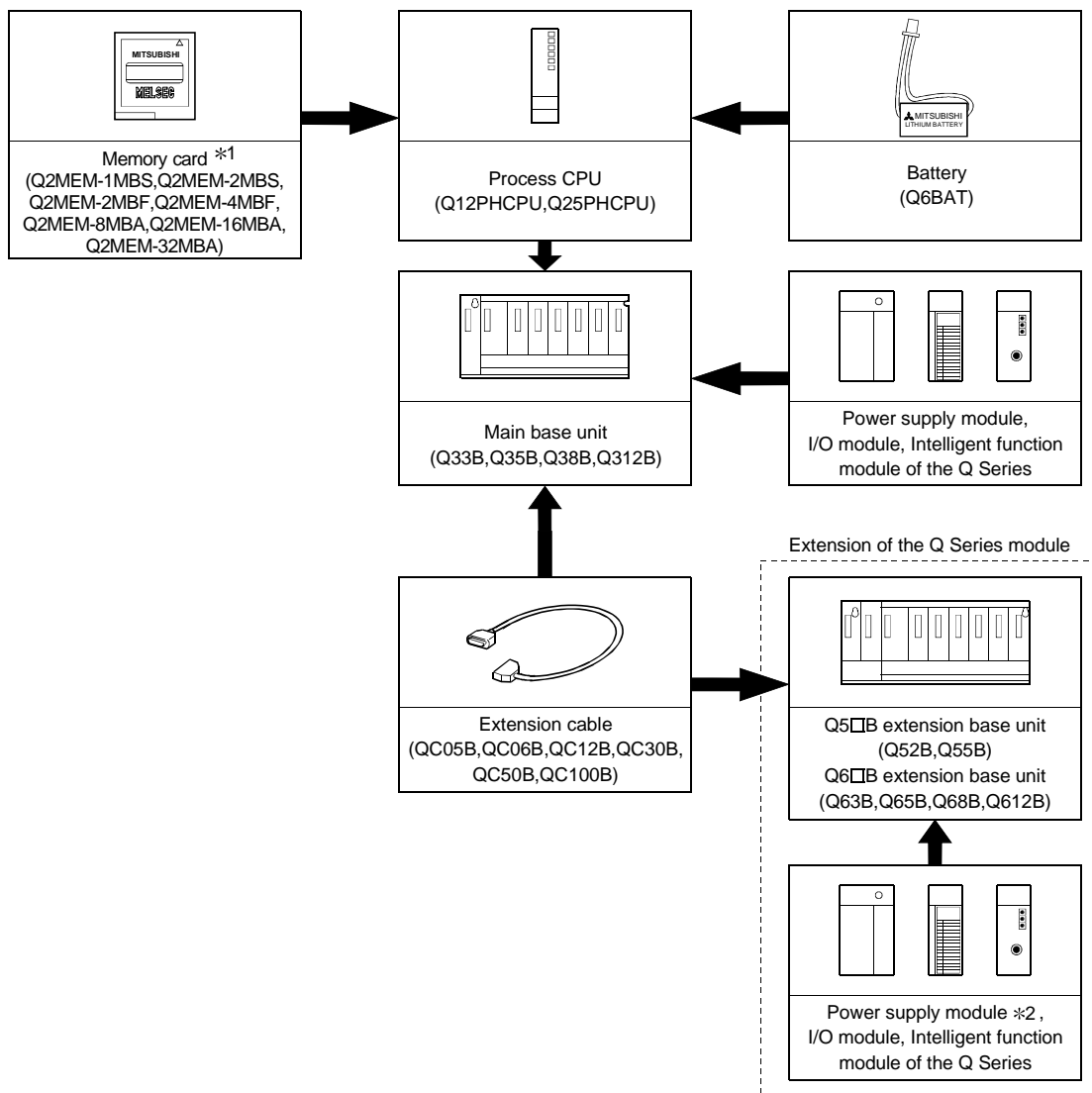
## 2. SYSTEM CONFIGURATION FOR SINGLE CPU SYSTEM

This section describes the system configuration of the Process CPU, cautions on use of the system, and configured equipment.

### 2.1 System Configuration

The outline of the equipment configuration, configuration with peripheral devices, and system configuration in the Process CPU system is described below.

#### (1) Equipment configuration



#### POINTS

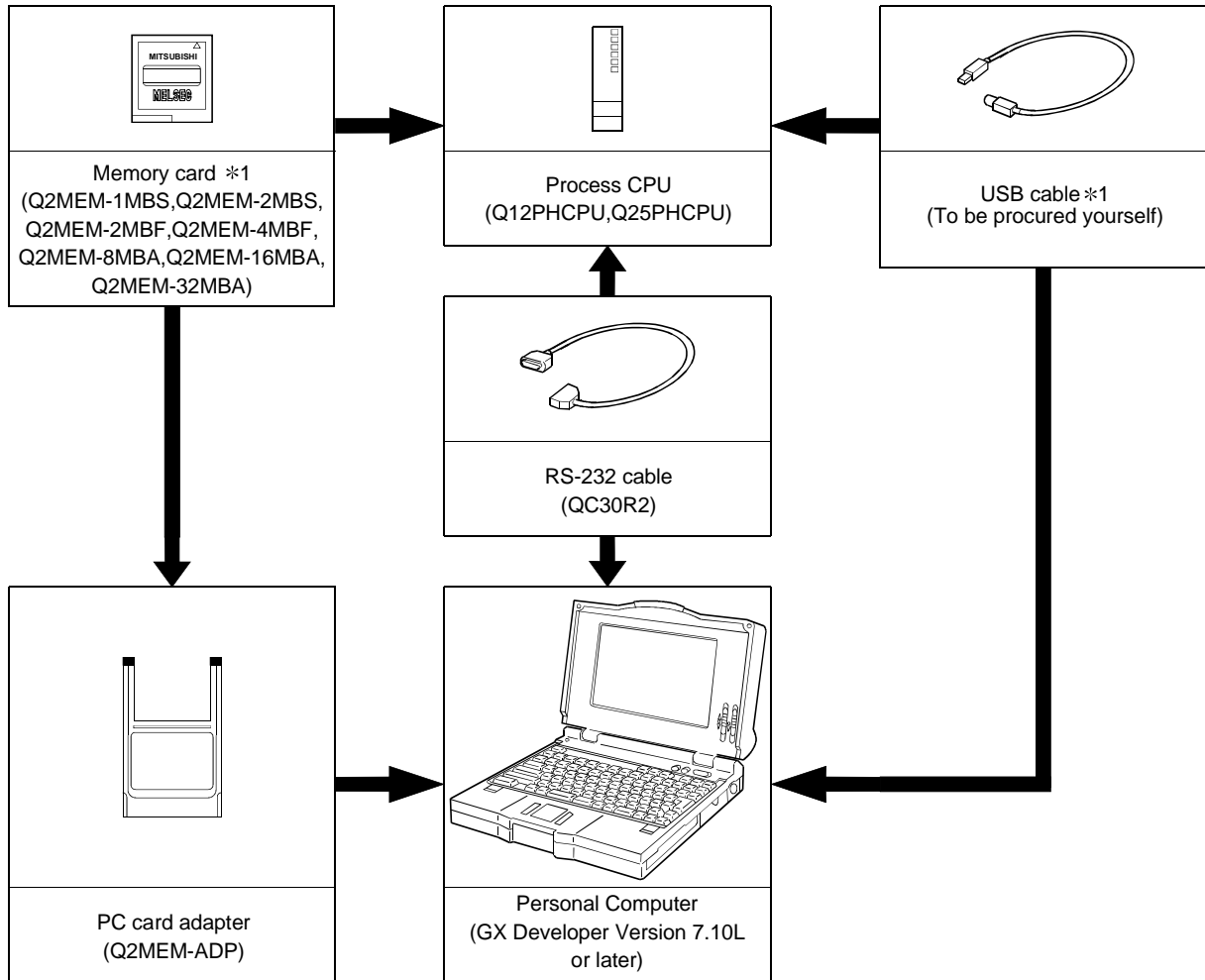
\*1: The number of memory cards to be installed is one sheet.

The memory card must be selected from SRAM, Flash, and ATA according to the application and capacity.

With commercial memory cards, the Operation is not assured.

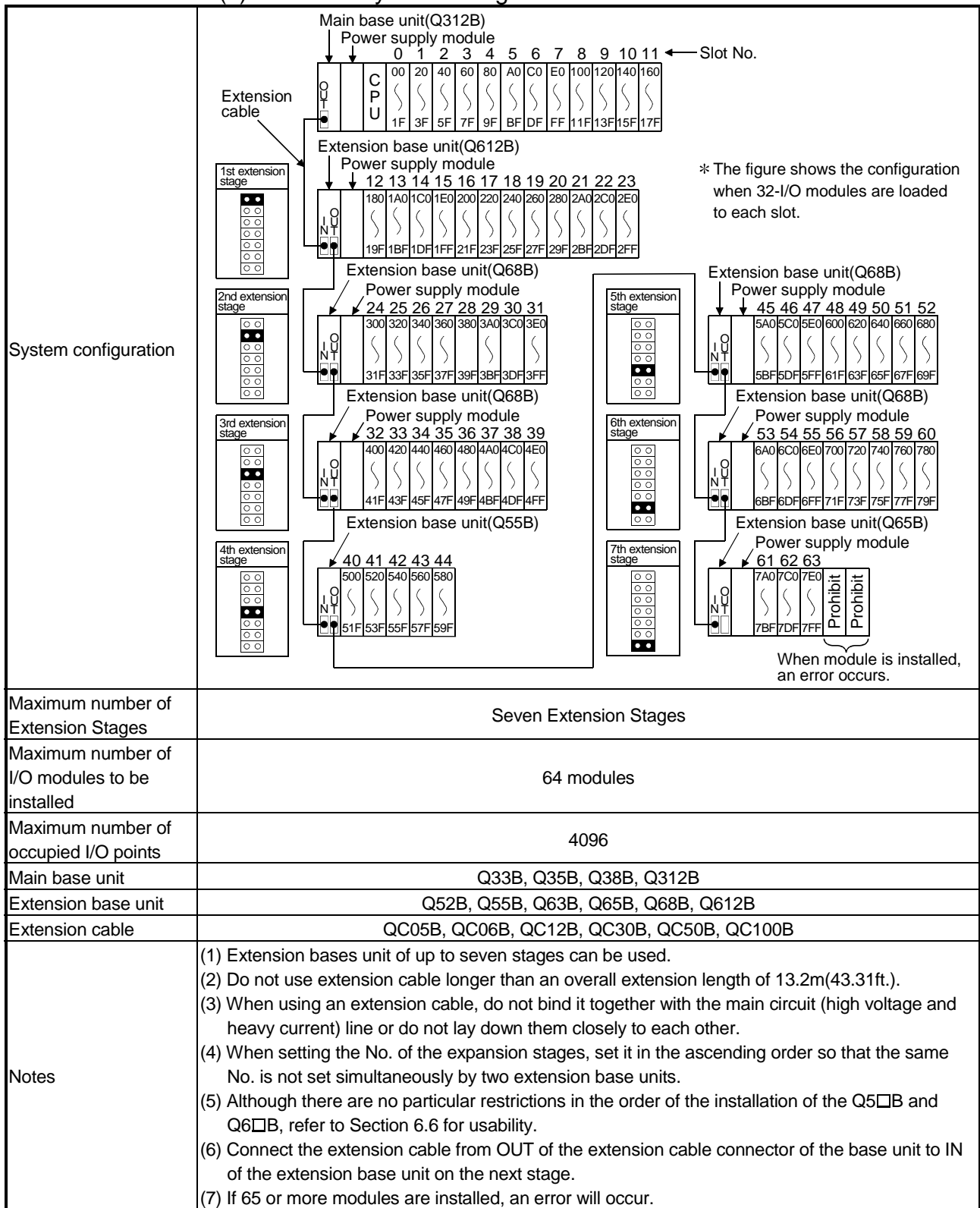
\*2: The Q series power supply module is not required for the Q5□B type extension base unit.

(2) Configuration of peripheral devices



\*1: For writing into memory card on GX Developer, and USB cable, refer to the operating manual of the GX Developer.

(3) Outline of system configuration



## 2.2 Precaution on System Configuration

This section describes hardware and software packages compatible with Process CPU.

### (1) Hardware

(a) The Process CPU can be used with the MELSEC-Q series I/O and intelligent function modules.

It cannot be used with the MELSEC-AnS/Q2AS series I/O and special function modules.

(b) The number of modules to be installed and functions are limited depending on the type of the modules.

Applicable Module	Type	Limit of number of modules to be installed
Q Series MELSECNET/10H network module	<ul style="list-style-type: none"> <li>• QJ71LP21</li> <li>• QJ71BR11</li> <li>• QJ71LP21-25</li> <li>• QJ71LP21G</li> <li>• QJ71LP21GE</li> </ul>	Up to 4 units
Q series Ethernet interface module	<ul style="list-style-type: none"> <li>• QJ71E71</li> <li>• QJ71E71-B2</li> <li>• QJ71E71-100</li> </ul>	Up to 4 units
Q series CC-Link system master local module	<ul style="list-style-type: none"> <li>• QJ61BT11</li> </ul>	No limit*
Interrupt module	<ul style="list-style-type: none"> <li>• QI60</li> </ul>	One unit only

\*: A maximum of 4 modules if the network parameters for CC-Link are set and controlled by the GX Developer. There is no restriction in the number of modules when the parameters are set by the special-purpose instructions for the CC-Link. For details on the CC-Link System Master Local Unit that can set parameters with the special-purpose instructions, refer to the manual for the CC-Link Master Local module.

(c) A graphic operation terminal can be used only for the GOT900 series (Basic OS matching Q mode and communication driver must be installed).

The GOT800 series, A77GOT, and A64GOT cannot be used.

### (2) Software package

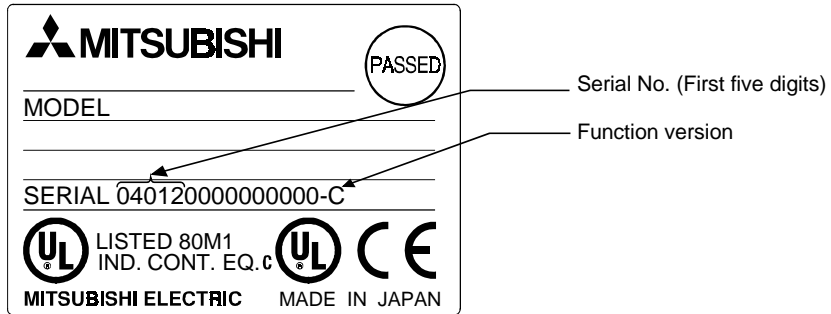
You can use GX Developer Version 7.10L or later to create the programs of the Process CPU.

Do not use GX Developer Version 7.09K or earlier.

2.3 Confirming the Serial Number and Function Version

The CPU module serial No. can be confirmed on the rated plate and GX Developer's system monitor.

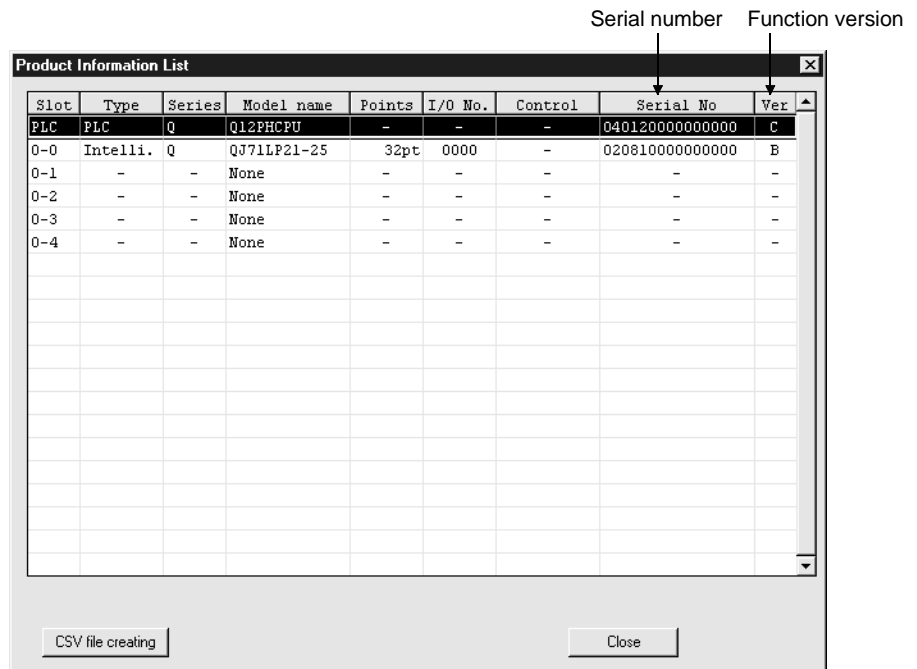
(1) Confirming the serial No. on the rated plate



(2) Confirming the serial No. on the system monitor (list of product information)

The CPU module serial No. and function version can be confirmed with the list of product information on the GX Developer system monitor.

Serial Nos. and function versions of the intelligent function module and CPU module can also be confirmed.



## 3 PERFORMANCE SPECIFICATION

The table below shows the performance specifications of the CPU module.

Performance Specifications

Item	Model		Remark	
	Q12PHCPU	Q25PHCPU		
Control method	Repetitive operation of stored program			
I/O control method	Refresh mode		Direct I/O is possible by direct I/O specification (DX□, DY□)	
Programming language (Sequence control dedicated language)	Relay symbol language, logic symbolic language, MELSAP3 (SFC), MELSAP-L, Function block			
Processing speed (Sequence instruction)	LD X0	0.034 $\mu$ s		
	MOV D0 D1	0.102 $\mu$ s		
Total number of instructions	415 (excluding intelligent function module dedicated instructions)			
Constant scan (ms) (Function for setting the scan timer to fixed settings)	0.5 to 2000 (configurable in increments of 0.5 ms)		Set parameter values to specify	
Program *2 capacity	Program memory (Drive 0)	124k step	252k step	
Memory capacity	Memory card (RAM) (Drive 1)	Capacity of loading memory cards(2Mbyte max.)		
	Memory card (ROM) (Drive 2)	Installed memory card capacity (Flash card: 4 Mbyte max., ATA card: 32 Mbyte max.)		
	Standard RAM (Drive 3)	256kbyte		
	Standard ROM (Drive 4)	496 kbyte	1008 kbyte	
	CPU shared memory *3	8 kbyte		
Maximum number of stored files	Program memory	124	252 *1	
	Memory card (RAM)	256		
	Memory card (ROM)	Flash card	288	
		ATA card	512	
	Standard RAM	2		Only one file register and one local device
Standard ROM	124	252		
Standard ROM number of writings	Max. 100000 times			

\*1:124 is the maximum number of programs that can be executed on Process CPU.

\*2:The maximum number of sequence steps (for one program) for which the parameters are stored in another drive and executed with the Process CPU can be calculated with the following expression.

(Program size) - (File header size (default: 34 steps))

Refer to the Process CPU User's Manual (Function Explanation, Program Fundamentals) for details on the program size and file.

\*3:The CPU shared memory is not latched. The CPU shared memory is cleared when the power is turned on to the PLC or when the CPU module is reset.

Performance Specifications (continued)

Item	Model		Remark
	Q12PHCPU	Q25PHCPU	
Number of I/O devices points	8192 points (X/Y0 to 1FFF)		Number of devices usable on program
Number of occupied I/O points	4096 points (X/Y0 to FFF)		Number of points accessible to actual I/O modules
Number of device points	Internal relay [M]	Default 8192 points (M0 to 8191)	Number of use points is set with parameters.
	Latch relay [L]	Default 8192 points (L0 to 8191)	
	Link relay [B]	Default 8192points (B0 to 1FFF)	
	Timer [T]	Default 2048 points (T0 to 2047) (for low / high speed timer) Select between low / high speed timer by instructions. The measurement unit of the low / high speed timer is set with parameters. (Low speed timer : 1 to 1000ms, 1ms/unit, default 100ms) (High speed timer : 0.1 to 100ms, 0.1ms/unit, default 10ms)	
	Retentive timer [ST]	Default 0 point(for low / high speed retentive timer) Switchover between the low / high speed retentive timer is set by instructions. The measurement unit of the low / high speed retentive timer is set with parameters. (Low speed retentive timer : 1 to 1000ms, 1ms/unit, default 100ms) (High speed retentive timer : 0.1 to 100ms, 0.1ms/unit, default 10ms)	
	Counter [C]	• Normal counter default 1024 points (C0 to 1023) • Interrupt counter maximum 256 points (default 0 point, set with parameters)	
	Data register [D]	Default 12288 points (D0 to 12287)	
	Link register [W]	Default 8192 points (W0 to 1FFF)	
	Annunciator [F]	Default 2048 points (F0 to 2047)	
	Edge relay [V]	Default 2048 points (V0 to 2047)	
File register	[R]	<ul style="list-style-type: none"> <li>When a standard RAM is used: The number of points of up to 131072 points can be used by block conversion in increments of 32768 points (R0 to 32767).</li> <li>When a SRAM card (1Mbyte) is used: The number of points of up to 517120 points can be used by block conversion in increments of 32768 points (R0 to 32767).</li> <li>When a SRAM card (2Mbyte) is used: The number of points of up to 1041408 points can be used by block conversion in increments of 32768 points (R0 to 32767).</li> <li>When a Flash card (2Mbyte) is used: The number of points of up to 1041408 points can be used by block conversion in increments of 32768 points (R0 to 32767).</li> <li>When a Flash card (4Mbyte) is used: The number of points of up to 1042432 points can be used by block conversion in increments of 32768 points (R0 to 32767).</li> </ul>	When a Flash card is used, read only is possible. The ATA card cannot be used.
	[ZR]	<ul style="list-style-type: none"> <li>When a standard RAM is used: 131072 points (ZR0 to 131071), No block conversion necessary.</li> <li>When a SRAM card (1Mbyte) is used: 517120 points (ZR0 to 517119), No block conversion necessary.</li> <li>When a SRAM card (2Mbyte) is used: 1041408 points (ZR0 to 1041407), No block conversion necessary.</li> <li>When a Flash card (2Mbyte) is used: 1041408 points (ZR0 to 1041407), No block conversion necessary.</li> <li>When a Flash card (4Mbyte) is used: 1042432 points (ZR0 to 1042431), No block conversion necessary.</li> </ul>	

3



Performance Specifications (continued)

Item		Model		Remark
		Q12PHCPU	Q25PHCPU	
Number of device points	Special link relay [SB]	2048 points (SB0 to 7FF)		The number of device points is fixed.
	Special link register [SW]	2048 points (SW0 to 7FF)		
	Step relay [S]	8192 points (S0 to 8191)		
	Index register [Z]	16 points (Z0 to 15)		
	Pointer [P]	4096 points (P0 to 4095), set parameter values to select usable range of in-file pointer / shared pointers.		
	Interrupt pointer [ I ]	256 points (I0 to 255) The specified intervals of the system interrupt pointers I28 to I31 can be set with parameters.(0.5 to 1000ms, 0.5 ms/unit) Default I28 : 100ms I29 : 40ms I30 : 20ms I31 : 10ms		
	Special relay [SM]	2048 points (SM0 to 2047)		
	Special register [SD]	2048 points (SD0 to 2047)		
	Function input [FX]	16 points (FX0 to F)		
	Function output [FY]	16 points (FY0 to F)		
	Function register[FD]	5 points (FD0 to 4)		
Link direct device	Device having a direct access to link device. MELSECNET/10(H) use only. Specified form : J□□\X□□, J□□\Y□□, J□□\W□□, J□□\B□□, J□□\SW□□, J□□\SB□□			
Intelligent function module device	Device having a direct access to the buffer memory of the intelligent function module. Specified form : U□□\G□□			
Latch (power interrupt hold-on) range	L0 to 8191 (default) (Latch range can be set for B, F, V, T, ST, C, D, and W.)		Set parameter values to specify	
Remote RUN/PAUSE contact	RUN and PAUSE contacts can be set from among X0 to 1FFF, respectively.			
Clock function	Year, month, day, hour, minute, second, day of the week (leap year automatic distinction) Accuracy -3.18 to +5.25s (TYP. +2.12s) /d at 0°C Accuracy -3.93 to +5.25s(TYP. +1.90s)/d at 25°C Accuracy -14.69 to +3.53s(TYP. -3.67s)/d at 55°C			
Allowable momentary power failure period	Varies according to the type of power supply module.			
5VDC internal current consumption	0.64A			
Weight	0.20kg			
External dimensions	H	98mm (3.86inch)		
	W	27.4mm (1.08inch)		
	D	89.3mm (3.52inch)		

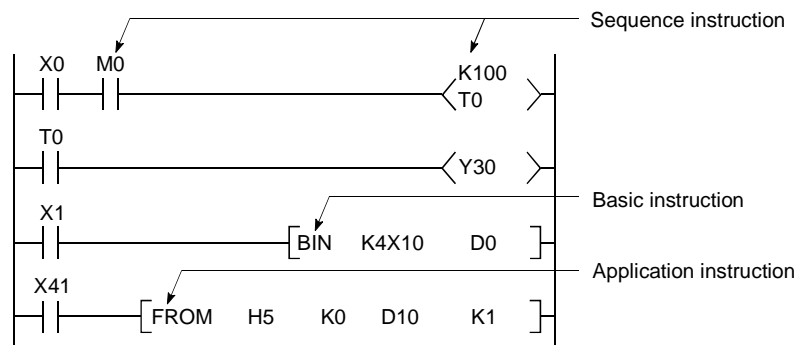
## 4 SEQUENCE PROGRAM CONFIGURATION AND EXECUTION CONDITIONS

Sequence programs and SFC programs can be executed at the Process CPU. This chapter describes the sequence program configuration and execution conditions. SFC programs are not described in this manual. For details on SFC programs, refer to the QCPU (Q mode)/QnACPU Programming Manual (SFC).

### 4.1 Sequence Program

#### (1) Definition of sequence program

- (a) A sequence program consists of sequence instructions, basic instructions, and application instructions, etc.

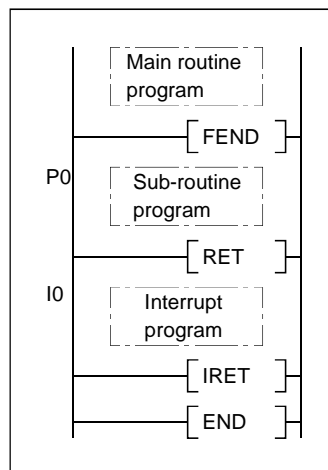


- (b) There are 3 types of sequence program: main routine programs, sub-routine programs, and interrupt programs.

For details on these programs, see the following sections of this manual:

- Main routine programs : Section 4.1.1
- Sub-routine programs : Section 4.1.2
- Interrupt programs : Section 4.1.3

File A



#### REMARK

For details on the sequence instructions, basic instructions, and application instructions, refer to the " QCPU (Q Mode)/QnACPU Programming Manual (Common Instructions)".

(2) Sequence program writing format

Programming for sequence programs is enabled using either ladder mode or list mode.

(a) Ladder mode

- The ladder mode is based on the relay control sequence ladder. Programming expressions are similar to the relay control sequence ladder.
- Relay symbolic language programming occurs in ladder block units. A ladder block is the smallest unit of sequence program operation, with the ladder beginning from the left bus and ending at the right bus.

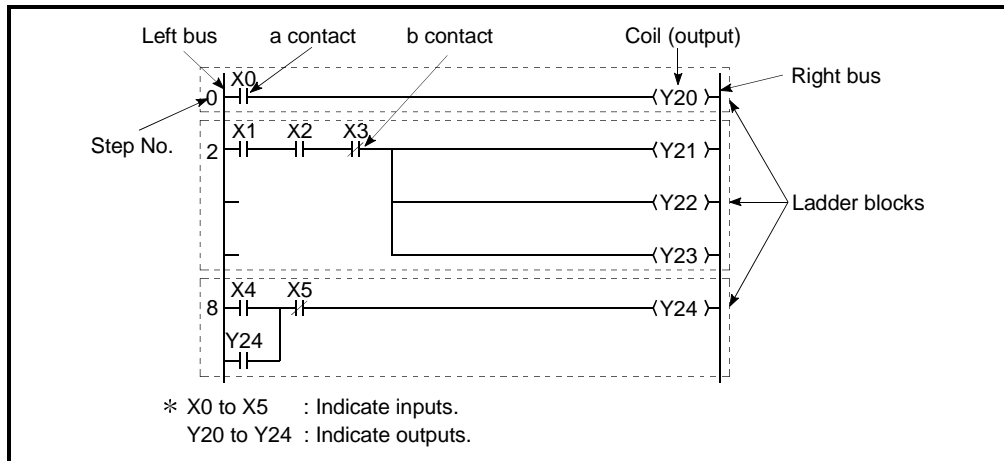


Fig.4.1 Ladder Block

(b) List mode

The list mode uses dedicated instructions instead of the contact symbols, coil symbols, etc., used in the ladder mode.

Contact a, contact b and coil instructions are as follows:

- a contact .....LD, AND, OR
- b contact .....LDI, ANI, ORI
- coil.....OUT

(3) Program operation

In sequence program, the instructions are executed in order beginning from step 0 and ending at the END/FEND.

With ladder mode, the instructions in a ladder block are executed in order beginning from left bus to the right bus. When one ladder block is completed, the next downward ladder block will be executed.

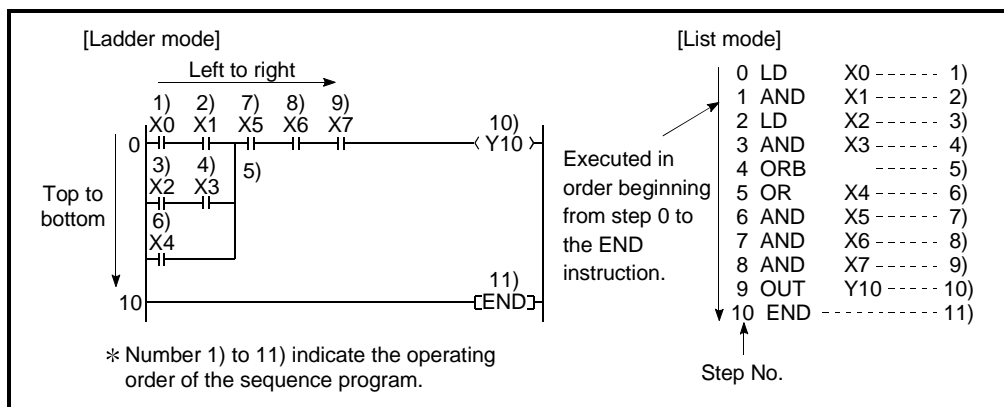
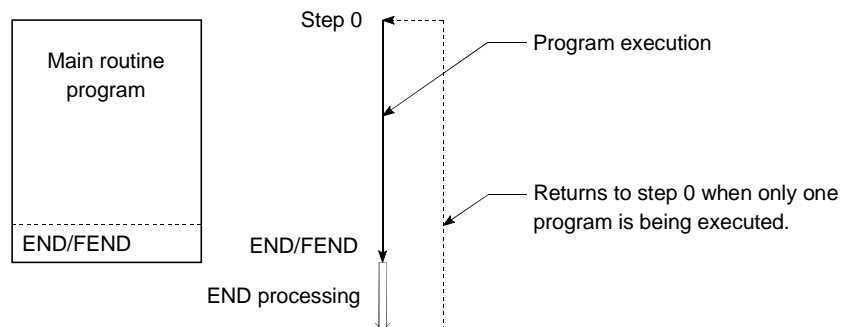


Fig.4.2 Sequence Program Operation

4.1.1 Main routine program

(1) Definition of main routine program

- (a) A main routine program begins from step 0 and ends at the END/FEND instruction. \*1
- (b) In the main routine program, the instructions are executed from step 0 to the END/FEND.
  - 1) If only one program is executed, the program is operated from step 0 again after the END/FEND instruction is executed and the END instruction is processed.



- 2) If multiple programs are being executed, each of them will be operated according to the designated execution conditions after the END/FEND instruction is processed.

(2) Execution conditions for main routine programs \*2

If multiple programs are being executed, the following five types of execution conditions can be designated by the program in the PLC parameters according to the application.

- Initial execution program : See Section 4.2.1.
- Scan execution type program : See Section 4.2.2.
- Low speed execution type program : See Section 4.2.3.
- Stand-by type program : See Section 4.2.4.
- Fixed scan execution type program : See Section 4.2.5.

**REMARK**

\*1: For details on the END/FEND instruction, refer to the "QCPU (Q mode)/QnACPU Programming Manual (Common Instructions)".

\*2: If only one program is executed, it is processed under the "scan execution type program" condition without designation by the program in the PLC parameters.

4.1.2 Sub-routine programs

(1) Definition of sub-routine program

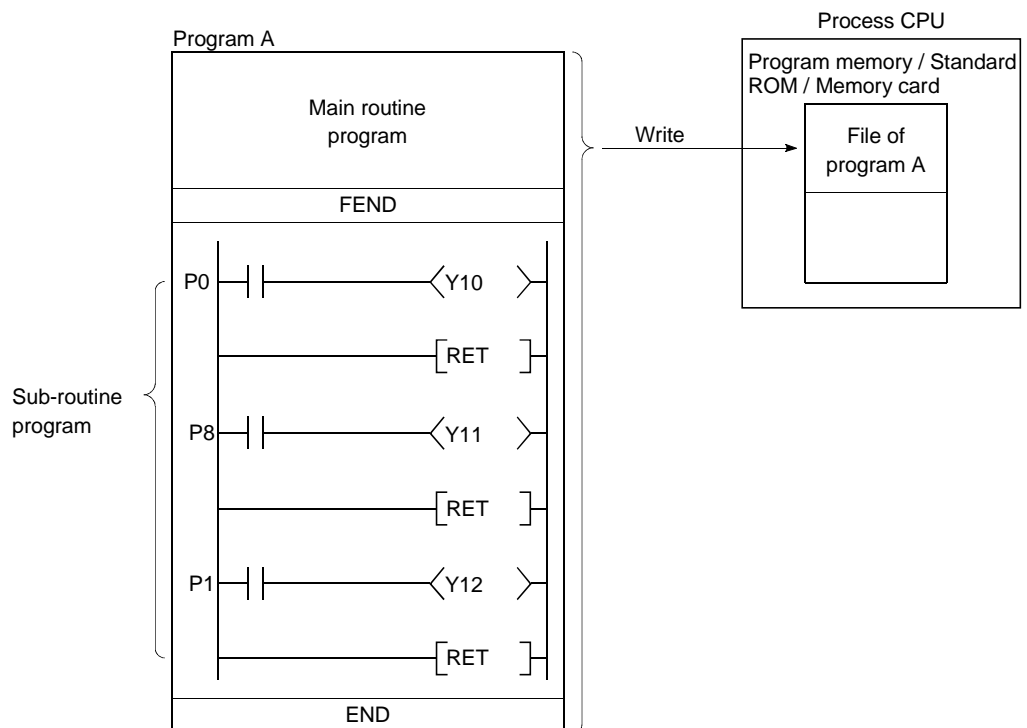
- (a) A sub-routine program begins from a pointer (P[ ]) and ends at a RET instruction.
- (b) A sub-routine program is executed only when called by a CALL instruction (e.g. CALL(P), FCALL(P)) from the main routine program.
- (c) Sub-routine program application
  - 1) The overall step count can be reduced by using a sub-routine program as a program which is executed several times in one scan.
  - 2) The step count of a constantly executed program can be reduced by using a sub-routine program as a program which is executed only when a given condition is satisfied.

(2) Sub-routine program management

Sub-routine programs are created after the main routine program (after FEND instruction), and the combination of main and sub-routine programs can be managed as one program.

(a) When created after the main routine program

- A sub-routine program is created between the main routine program's FEND and END instructions.
- Because there are no restrictions on the order in which sub-routine programs are created, it is not necessary to set the pointers in ascending order when creating multiple sub-routine programs.
- Either a local pointer or a common pointer can be used. \*



**REMARK**

\*: See Section 10.9 for details on local and common pointers.  
See Section 10.8 for details on sub-routine program nesting.

- (b) Using the sub-routine program as a separate program  
Sub-routine programs can also be managed as separate, separate programs (stand-by type programs). (See Section 4.2.4 for details on stand-by type programs).

4.1.3 Interrupt programs

(1) Definition of interrupt program

- (a) An interrupt program begins from the interrupt pointer (I□□), and ends at the IRET instruction. \*1
- (b) Interrupt programs are executed only when an interrupt factor occurs. \*1

**REMARK**

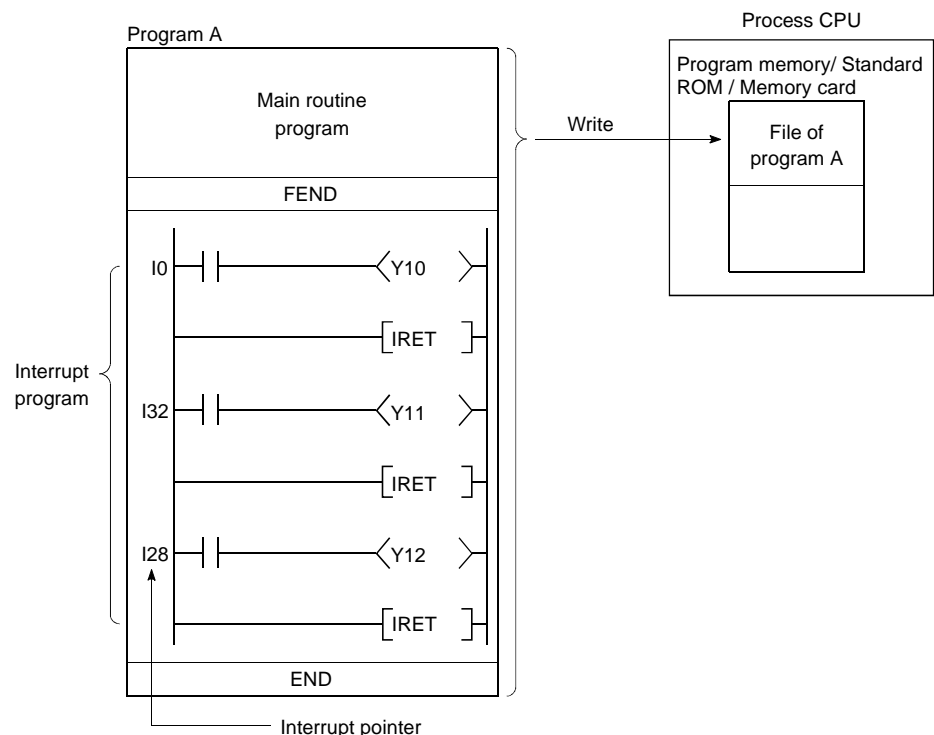
\*1: See Section 10.10 for details on interrupt factors and interrupt pointers.

(2) Interrupt program management

Interrupt programs are created after the main routine program (after the FEND instruction), and the combination of main and sub-routine programs can be managed as one program.

(a) When created after the main routine program

- An interrupt program is created between the main routine program's FEND and END instructions.
- Because there are no restrictions on the order in which interrupt programs are created, it is not necessary to set the interrupt pointers in ascending order when creating multiple interrupt programs.



- (b) Using the interrupt program as a separate program  
 Interrupt programs can also be managed as separate, discrete programs (stand-by type programs). (See Section 4.2.4 for details on stand-by type programs).  
 However, the same interrupt program pointer number cannot be used more than once in the program being executed by the CPU module.

(3) Executing interrupt programs

- (a) In order to execute an interrupt program with the interrupt pointer I32 to I47, IMASK and EI instructions are required to obtain permission for the interruption. \*1
  - 1) If an interrupt factor occurs prior to an interruption permitted status, the interrupt program corresponding to the factor will be executed when the "interruption permitted" status is established.
  - 2) If an interrupt factor occurs during a STOP/PAUSE, the interrupt program corresponding to the factor will be executed when the "interruption permitted" status is established following a return to the RUN status.

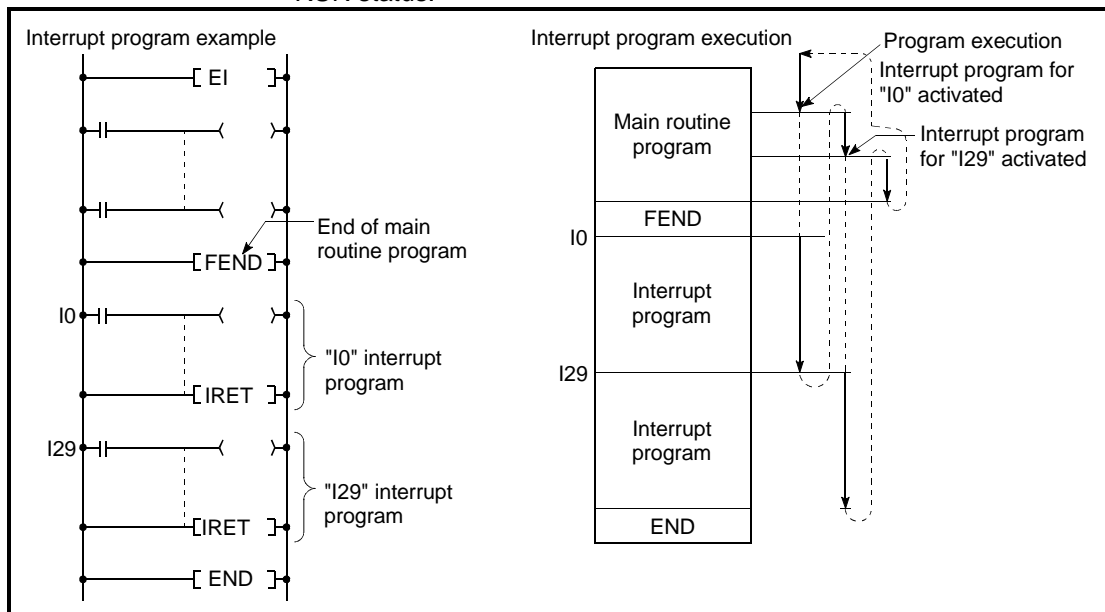


Fig.4.3 Interrupt Program Execution

- (b) When an interrupt factor occurs, the interrupt program with the interrupt pointer number corresponding to that factor is executed. However, interrupt program execution varies according to the condition at that time.
  - 1) If two or more interrupts occur at the same time:  
 The interrupt programs are executed, starting with the one corresponding to an interrupt pointer number (I □ ) of the highest priority. \*2  
 The remaining interrupt programs remain on stand-by until processing of the higher priority interrupt program is completed.  
 If the same interrupt factor as that being executed occurs before the interrupt program is processed, the interrupt factor is stored in the memory and, after the interrupt program has been processed, the same interrupt program is executed again.
  - 2) When an instruction is being executed:  
 Interruptions are prohibited during execution of instructions.  
 If an interrupt factor occurs during execution of an instruction, the interrupt program will be executed after processing of the instruction is completed.



- 3) Interruption during a network refresh:  
If an interrupt factor occurs during a network refresh operation, the network refresh operation is suspended, and the interrupt program is executed.  
This means that "assurance of blocks in cyclic data at each station" cannot be secured by using a device designated as a destination of link refresh operation on the MELSECNET/H Network System. \*3

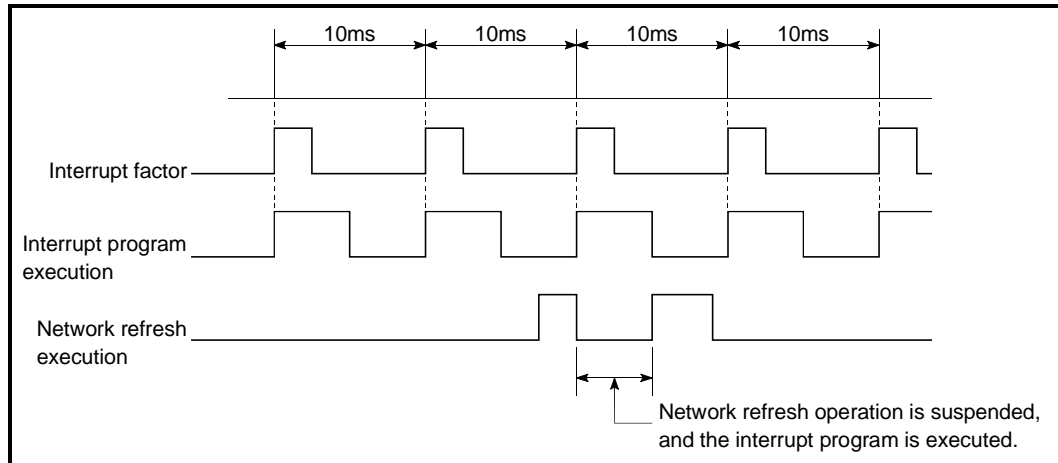


Fig.4.4 Interruption during Network Refresh Operation

- 4) Interruption during END processing:  
If an interrupt factor occurs during an END processing waiting period when constant scan is performed, the interrupt program corresponding to the factor will be executed.
- (c) See Section 10.6.2 for details on index register processing when switching to an interrupt program from a scan execution type program or low speed execution type program.
- (4) High speed execution of an interrupt program and overhead time  
By default, Process CPU performs the following process when executing an interrupt program:
- To hide and restore an index register. (See section 10.6.2)
  - To hide and restore the file name of a file register in use.
- The above-listed processes are not performed if "Execute at a High Speed" is selected at the "PLC System" tab screen in the "(PLC) Parameter" dialog box.  
This will make it possible to shorten the duration of overhead time required for execution of an interrupt program.

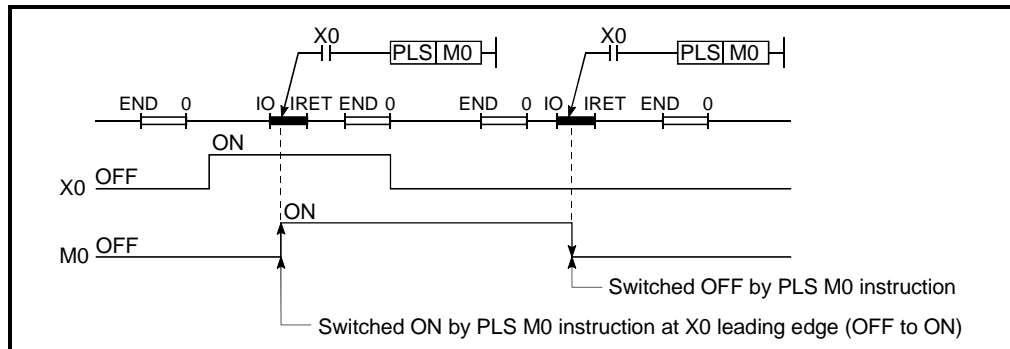
CPU TYPE	OVERHEAD TIME (μs)	
	High speed execution is not selected	High speed execution is selected
Q12PHCPU, Q25PHCPU	165	100

**REMARK**

- \*1: For details on the IMASK and EI instructions, refer to the "QCPU (Q mode)/QnACPU Programming Manual (Common Instructions).  
To execute interrupt programs I0 through I31 and I48 through I255, use an EI instruction to enter the interrupt programs into an interrupt enabled status.
- \*2: See Section 10.10 for details on the priority ranking of interrupt programs.
- \*3: For assurance of station unit blocks in cyclic data, see the "MELECNET/H Network System Reference Manual."

(5) Program creation restrictions

- (a) A device which is switched ON by a PLS instruction in an interrupt program will remain ON until that interrupt program is executed again.



- (b) A DI status (interruption prohibited) is established during execution of an interrupt program.  
Do not execute EI/DI instructions in the interrupt program.
- (c) Timers cannot be used in interrupt programs.  
As timers are used at OUT T [ ] instructions to update present values and switch contacts ON and OFF, the use of a timer in the interrupt program would make a normal time count impossible.
- (d) The following commands cannot be used in the interrupt program.
- COM
  - ZCOM
  - EI
  - DI
- (e) When the interrupt program/fixed scan execution type program is executed at a measuring time such as the scan time or execution time, the values of the interrupt program/fixed scan execution type program are added to the measured time.  
Thus, if the interrupt program/ fixed scan execution type program is executed, the values stored in the following special registers and GX Developer monitor values will be longer than when the interrupt program/ fixed scan execution type program is not executed.
- 1) Special registers
    - SD520, SD521: Current scan time
    - SD522, SD523: Initial scan time
    - SD524, SD525: Minimum scan time
    - SD526, SD527: Maximum scan time
    - SD528, SD529: Current scan time for low speed
    - SD532, SD533: Minimum scan time for low speed
    - SD534, SD535: Maximum scan time for low speed
    - SD540, SD541: END processing time
    - SD542, SD543: Constant scan wait time
    - SD544, SD545: Cumulative execution time for low speed execution type programs
    - SD546, SD547: Execution time for low speed execution type programs
    - SD548, SD549: Scan program execution time
    - SD551, SD552: Service interval time
  - 2) GX Developer monitor values
    - Execution time measurement
    - Scan time measurement
    - Constant scan

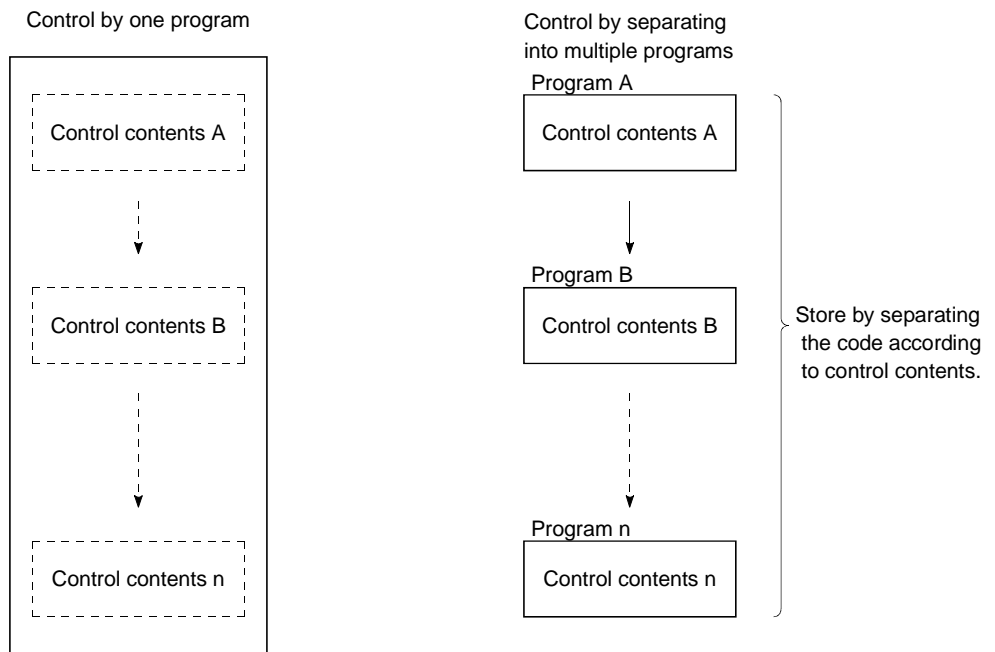
### 4.2 Program Execute Type

Programs executed by Process CPU can be stored in the Process CPU's program memory, standard ROM or memory card.

Programs can be stored in the standard ROM or memory card as a single program, but also as multiple programs by splitting them into separate programs for each control function.

This permits the programming procedure to be split up among several program designers, who can design separate programs for each operation and can store them in the standard ROM or memory card.

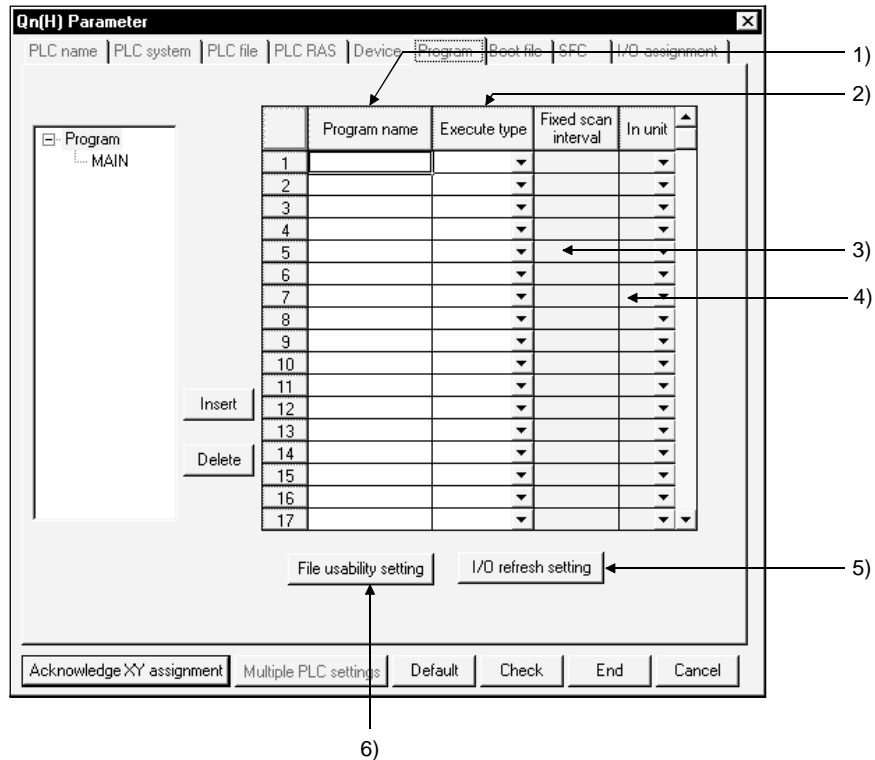
When multiple programs are executed by Process CPU, "program name (file name)" and "execute type" settings of the programs must be designated.



(1) Execute Type Setting

(a) To execute several programs, specify a "Program name" and "Execute type" of each program at the "Program" tab screen in the "(PLC) Parameter" dialog box.

Process CPU will execute the selected programs in the order of specified Execute Type setting.



- 1) Program name  
This column is used to specify a program name (file name) of the program to be executed by Process CPU.
- 2) Execute type  
This column is used to specify the execute type of the program defined in the "Program name" column. See Section (b).
- 3) Fixed scan  
This column is used to specify time intervals at which to an execution type program.  
The Fixed Scan setting range is determined by the units of time intervals as follows:
  - In the unit "ms": 0.5 to 999.5
  - In the unit "s": 1 to 60
- 4) In units  
This column is used to specify the units (ms/s) of fixed scan intervals.

5) File Use Setting

Sets whether to use the data (file register, initial device value, comment, local device) set at the "PLC file" tab screen in the "(PLC) Parameter" dialog box, per program. The data is set for each program. By default, the option "Use PLC file setting" is selected. If the option "Not used" is selected, the File Use setting is made as listed below in the table.

Setting item	Processing when the option "Not used" is selected
File register	File registers can not be used in the program.
Initial device value	The device initial value is not set when the program file name and the device initial value is the same.
Comment file used in a command	Comments can not be used in the program.
Local device	Local devices are not hidden or restored at the time of program conversion.

6) I/O Refresh Setting

Process CPU uses the I/O Refresh setting to update output and input from an I/O module and an intelligent function module. The I/O Refresh Setting button is used to update the range of selected programs. Make the I/O Refresh setting for a scan execution type program if you want to receive an input (X) or produce an output (Y) before executing the fixed scan execution type program.

(b) There are following 5 execute types:

1) Initial execution (Initial)

This program type is executed once only at power ON or when STOP-RUN switching occurs. (See Section 4.2.1)

2) Scan execution (Scan)

This program type is executed once per scan, beginning from the scan which follows execution of the initial execution program. (See Section 4.2.2)

3) Low speed execution (Low speed)

This program type is executed only when a constant scan setting is made or when a time is set for execution of low speed execution type programs.

- When a constant scan setting is made, the program is executed during the surplus time of a scan execution type program.
- When a time for execution of low speed execution type programs is set, the program is executed during this set time. (See Section 4.2.3.)

4) Stand-by (Wait)

This program is executed only when its execution is requested. (See Section 4.2.4.)

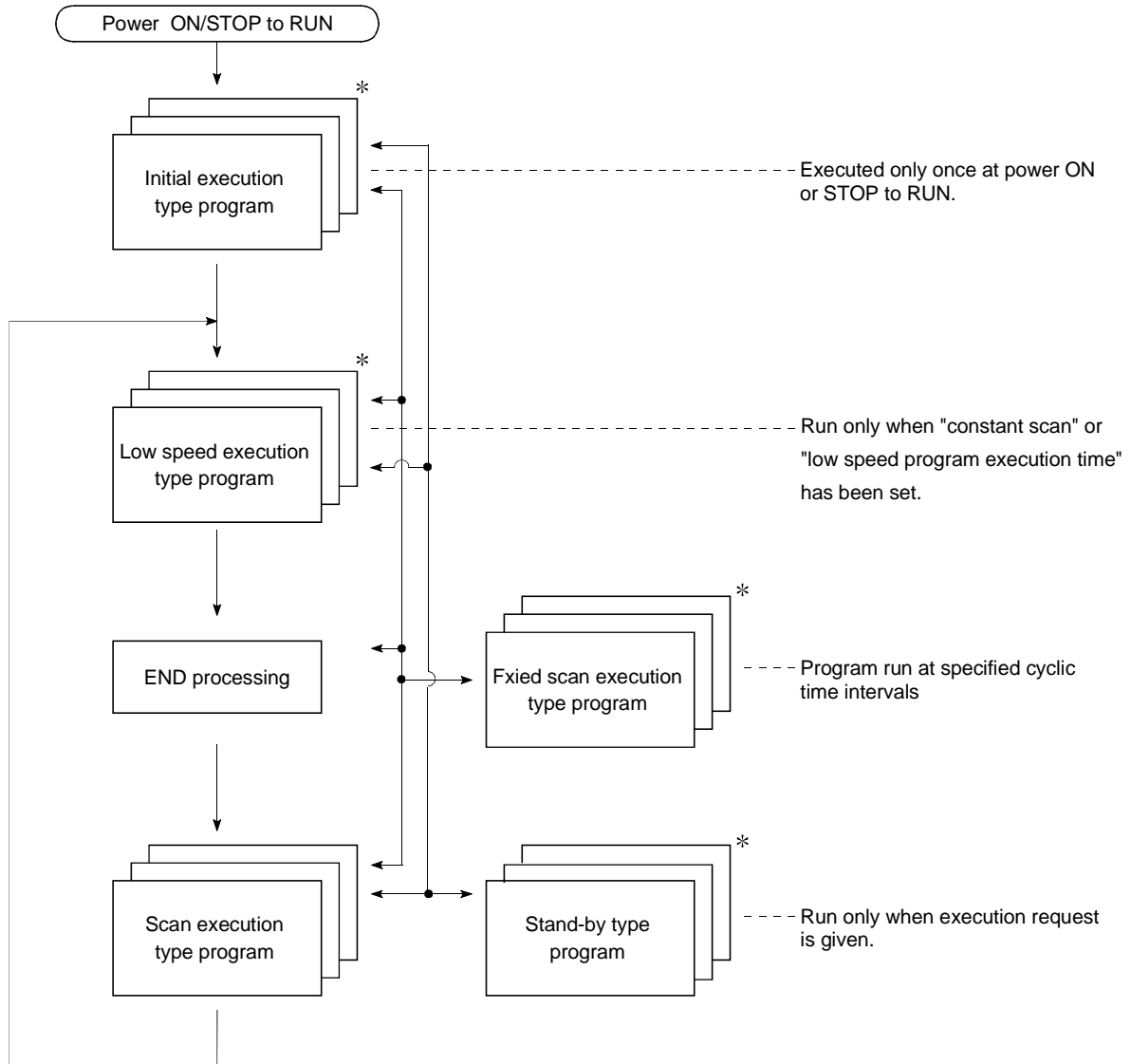
5) Fixed scan execution (Fixed scan)

Program that is executed at time intervals specified in the "Fixed scan" and "In units" columns of the Program Setting sheet of the PLC Parameter dialog box. (See Section 4.2.5.)

(c) Scantimes of programs being executed (except the fixed scan execution type program) can be checked on the monitor of the program list. (See Section 7.11.1.)

(2) Flow of each program of Process CPU

The flow of each program after power-ON or STOP of the PLC to RUN switching of the CPU module is shown below.

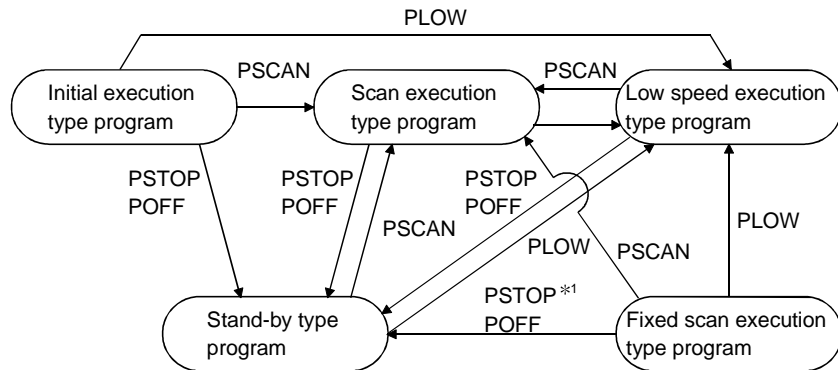


**POINT**

Not all execute types need to be set for the Process CPU.  
Use the items marked with "\*" as needed, such as the Initial execution, low speed execution, stand-by and fixed scan execution type programs.

(3) Changing the Execute Type

- (a) The Execute Type setting made at the "Program" tab screen in the "(PLC) Parameter" dialog box can be changed at any time while a sequence program is executed. To change the execute type of a program, use a PSCAN, PLOW, PSTOP or POFF instruction.



- (b) The following table shows the timing of changing the execute type of a program by using a PSCAN, PLOW, PSTOP or POFF instruction.

Executed instruction Execute type before change	PSCAN	PSTOP	POFF	PLOW
Scan execution type	No change - remains scan execution type.	Becomes stand-by type.	Output is turned OFF in the next scan.	Becomes low speed type.
Initial execution type	Becomes scan execution type.		Becomes stand-by type from the next scan after that.	
Stand-by type		No change - remains stand-by type.	No processing.	
Low speed execution type	Low speed execution type execution is stopped: becomes scan executions from the next scan. (Execution from step 0.)	Low speed execution type execution is stopped: becomes stand-by type from the next scan.	Low speed execution type execution is stopped, and output is turned OFF in the next scan. Becomes stand-by type from the next scan after that.	No change - remains low speed executions.
Fixed scan execution type	Becomes scan execution type.	Becomes stand-by type.	Output is turned OFF in the next scan. Becomes stand-by type from the next scan after that.	Becomes low speed type.

**POINT**

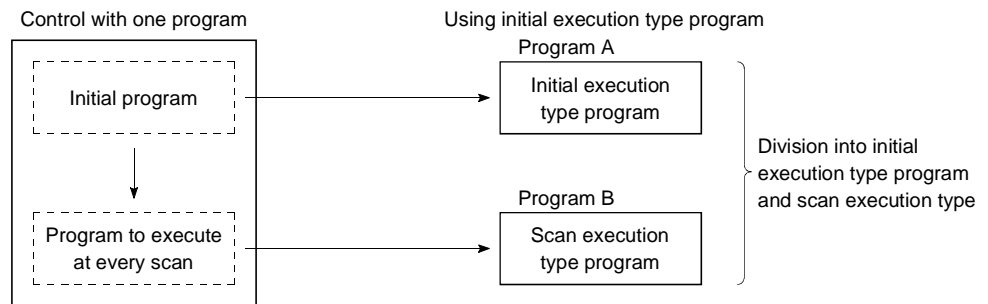
\*1: If the fixed scan execution type program is changed to another execution type, you cannot return to the fixed scan execution type.

4.2.1 Initial execution type program

(1) Definition of initial execution type program

- (a) An initial execution type program is executed once only at power ON, or when STOP to RUN switching occurs.
- (b) This program's execute type is designated as "initial" in the program of the PLC parameters.
- (c) In the same manner as the initial processing for the intelligent function module, the initial execution program is executed only once, and is not required in subsequent scans.

An instruction that contains a complete device cannot be used for an initial execution type program because the complete device needs several scans to complete the execution.

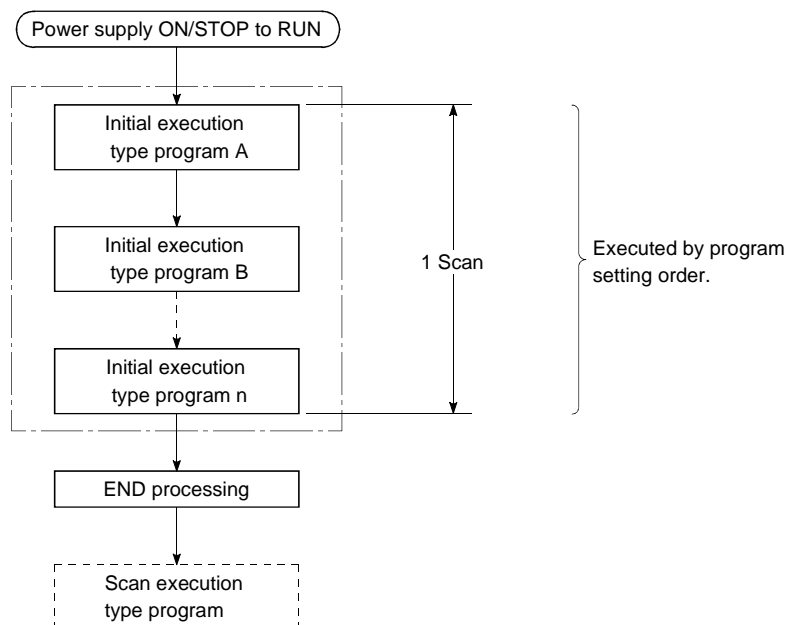


(2) Using multiple initial execution type programs

When multiple initial execution type programs are used, they are executed one by one in ascending order of the program in the PLC parameters.

(3) END processing

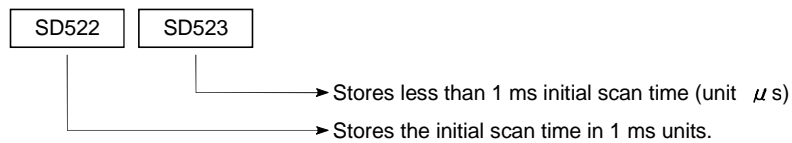
END processing is performed when all initial execution type programs are completed, and the "scan execution type program" is then executed from the next scan.





(4) Initial scan time

- (a) This is the execution time period for initial execution type programs.  
If multiple initial execution type programs are executed, it is the execution time period in which all those programs are executed.  
When an interrupt program/fixed scan execution type program is executed while an initial execution type program is running, the execution time of the interrupt program/fixed scan execution type program will be added to the initial execution type program.
- (b) The Process CPU measures the initial scan time and stores the result in special registers (SD522, SD523). \*1  
The initial scan time can be checked by monitoring the SD522 and SD523 special registers.



If the SD522 value is 3, and the SD523 value is 400, the initial scan time is 3.4 ms.

**POINT**

\*1: The accuracy of the initial scan time stored at the special registers is  $\pm 0.1$  ms. The initial scan time count will continue even if a watchdog time reset instruction (WDT) is executed at the sequence program.

(5) Initial execution monitor time

- (a) The execution period of the initial execution type program can be monitored by this timer. The default value is not set.  
When monitoring the execution time of the initial execution type program, designate the initial execution monitor time within the range of 10 to 2000 ms range at the "PLC RAS" tab screen in the "(PLC) Parameter" dialog box. (Setting unit: 10 ms)
- (b) The low speed execution type program is executed after the execution of the initial execution type program is completed.  
To use the low speed execution type program, specify the time that is longer than the sum of the initial scan time and the execution time of the low speed execution type program.
- (c) When the initial scan time exceeds the set initial execution monitor time, "WDT ERROR (error code: 5000)" occurs, and Process CPU operation is stopped.

**POINT**

When the initial execution monitor time is designated, there will be a 10 ms error in the count value.  
Therefore, a monitor time setting (t) of 10 ms will result in a "WDT ERROR" when the initial scan time is in the range  $10 \text{ ms} < t < 20 \text{ ms}$ .

4.2.2 Scan execution type program

(1) Definition of scan execution type program

- (a) Scan execution type programs are executed once per scan, beginning from the scan which follows execution of the initial execution type program.
- (b) Set the execute type to "scan" at the "Program" tab screen in the "(PLC) Parameter" dialog box.

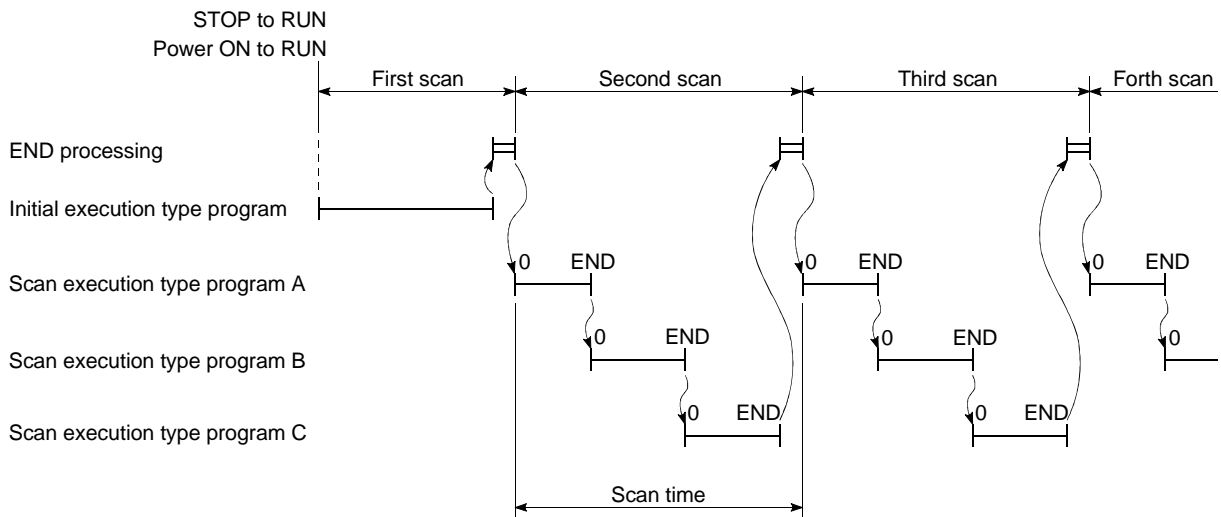
(2) Executing multiple scan execution type programs

When multiple scan execution type programs are used, they are executed one by one in ascending order set at the "Program" tab screen in the "(PLC) Parameter" dialog box.

(3) END processing

The first scan execution type program is executed again, when all scan execution type programs are executed and the END processing is completed.

The END processing (network refresh) can be performed for each program while several scan execution type programs are executed. To do this, include a COM instruction at the end of each scan execution type program.



(4) Constant scan setting \*1

When constant scanning is designated, the scan execution type program is executed at each designated constant scan time.

**REMARK**

- \*1: The "constant scan" function executes the scan type program repeatedly at regular intervals.  
For details on of the constant scan, see Section 7.2.

(5) Scan time

- (a) The "scan time" is a total of following the execution time of the scan execution type program and END processing.  
If multiple scan execution type programs are used, the "scan time" is the total time required to execute all the programs.  
When an interrupt program/fixed scan execution type program is executed, the value added to the interrupt program/fixed scan execution type program's execution time will become the scan time.
- (b) The scan time current value, minimum value, and maximum value are measured at the Process CPU, and the results are stored in special registers (SD520, SD521, and SD524 to SD527). \*1  
Therefore, the initial scan time can be checked by monitoring the SD520, SD521, and SD524 to SD527 special registers.



If the SD520 value is 3, and the SD521 value is 400, the initial scan time is 3.4 ms.

**POINT**

\*1: The accuracy of the scan time stored at the special registers is  $\pm 0.1$  ms. The scan time count will continue even if a watch dog timer reset instruction (WDT) is executed at the sequence program.

(6) WDT (Watch dog timer)

This is the timer which monitors the scan time, and its default setting is 200 ms. This WDT setting can be designated within the range of 10 to 2000 ms range at the "PLC RAS" tab screen in the "(PLC) Parameter" dialog box.

(Setting units: 10 ms)

When using the low speed execution type program, set the WDT greater than the scan time plus the execution time of the low speed execution type program.

If the scan time (execution time for scan execution type program + low speed execution type program) exceeds the WDT setting value, a "WDT ERROR (error code: 5000)" occurs, and Process CPU operation is stopped.

**POINT**

The WDT measurement error is 10 ms. Therefore, a WDT setting (t) of 10 ms will result in a "WDT ERROR" if the scan time is in the following range:  $10 \text{ ms} < t < 20 \text{ ms}$ .

**REMARK**

Use the GX Developer's Program Monitor List to check the execution time of a program being executed. See Section 7.11.1 for details on the GX Developer's Program Monitor List.

4.2.3 Low speed execution type program

(1) Definition of low speed execution type program

- (a) Low speed execution type programs are executed only during "constant scanning surplus time" or during the period designated for "low speed program execution time".
  - 1) For a constant scan time with enhanced control accuracy, designate a constant scan time setting at the "PLC RAS" tab screen in the "(PLC) Parameter".  
(Setting range: 0.5 to 2000 ms, setting unit: 0.5 ms)
  - 2) To secure execution time for low speed execution type programs at each scan, designate a low speed program execution time in the "PLC RAS" tab screen the (PLC) "Parameter".  
(Setting range: 1 to 2000 ms, setting unit: 1 ms)
  - 3) In order to execute a low speed execution type program, set either the constant scan time or low speed program execution time.
- (b) Set the execute type of the low speed program to "low speed" in the program of the PLC parameters.
- (c) The low speed execution type program is used for programs which do not require execution in each scan, for example programs for printer output.

(2) Executing multiple low speed execution type programs

When multiple low speed execution type programs are used, they are executed one by one in ascending number order of the program in the PLC parameters.

(3) Execution time of the Low speed execution type program to be executed per scan

- (a) If all the low speed execution type program operation is completed within one scan and there is surplus time, the processing executed after that depends on the ON/OFF status of special register SM330 and the execution condition for low speed execution type programs.
  - 1) Asynchronous method (SM330 = OFF)  
Method in which low speed execution type program operation is continued in the surplus time.
  - 2) Synchronous method (SM330 = ON)  
Method in which even if there is surplus time, low speed execution type program operation is not continued, and operation starts again from the next scan.

Operation method for low speed execution type programs	SM330 setting status	Execution condition for low speed execution type programs	
		When constant scan time is set	When low speed program execution time is set
Asynchronous method	OFF	The low speed execution type program is re-executed * <sup>1</sup> .	The low speed execution type program is re-executed * <sup>2</sup> .
Synchronous method	ON	Constant scan waiting time is generated * <sup>3</sup> .	Scan execution type program operation is started * <sup>4</sup> .

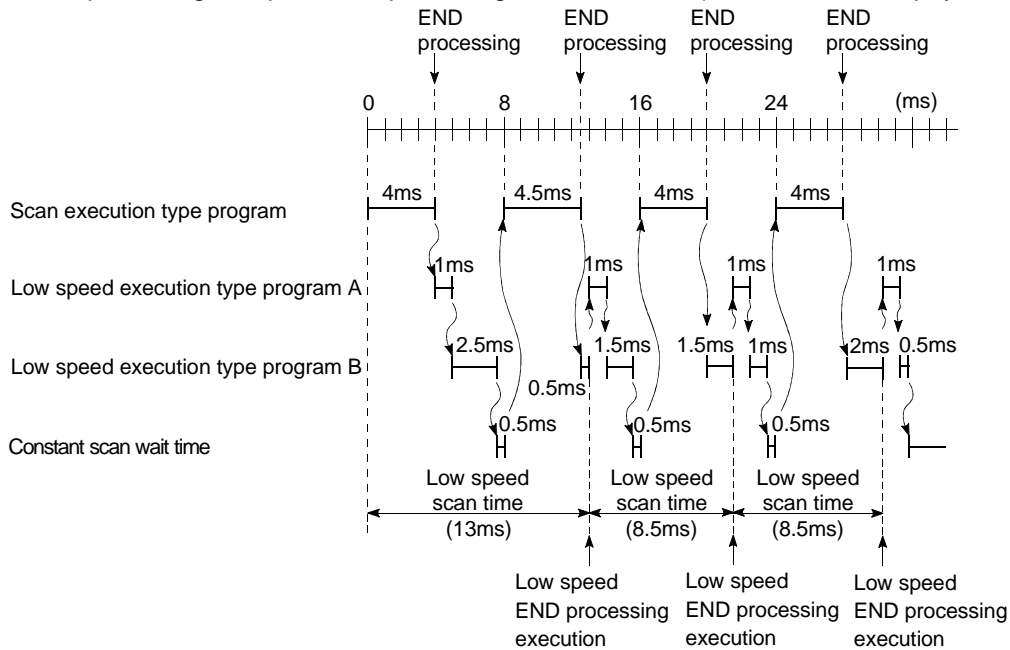
- \*1 If a constant scan time has been designated, the low speed execution type program will be executed repeatedly during the constant scan's surplus time.  
Therefore, the low speed execution type program's execution time varies from scan to scan.  
As the low speed execution type program will not be executed at all if the constant scan's surplus time is 0.5 ms or less, a constant scan time setting should be designated which provides a surplus time of more than 0.5 ms.
  - \*2 If a low speed program execution time has been designated, the low speed execution type program will be executed repeatedly in accordance with that time setting.  
Therefore, the scan time will vary from scan to scan.
  - \*3 If a constant scan time has been designated, the surplus time after completion of low speed END processing is waiting time, and execution of a scan execution type program starts when the constant scan time has elapsed.  
This means that the scan time is constant in each scan.  
However, if the surplus time after the constant scan is less than 0.5 ms, low speed execution type programs cannot be executed. If using a low speed execution type program, set the constant scan time so that the surplus time is 0.5 ms or longer.
  - \*4 If a "low speed program execution time" has been designated, scan execution type program operation is started ignoring the surplus time after completion of low speed END processing.  
This means that the scan time differs in each scan.
- (b) If a low speed execution type program cannot be processed within constant scan surplus time or within the low speed program execution time, program execution is temporarily stopped and the remainder of the program is executed in the next scan.

1 : Asynchronous method

(1) Constant scan time setting

The low speed execution type program is operated under the following conditions as shown below.

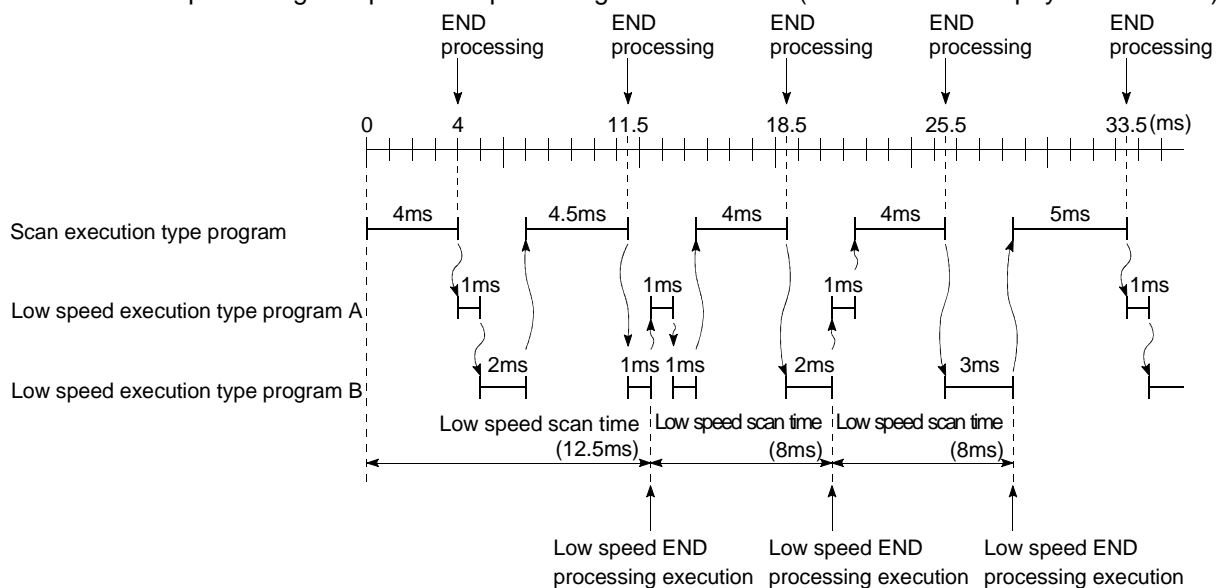
- Constant scan time : 8ms
- Total scan execution type program time : 4ms to 5ms
- Execution time of low speed execution type program A : 1ms
- Execution time of low speed execution type program B : 3ms
- END processing/low speed END processing : 0ms (0 ms is used to simplify the illustration)



(2) Low speed program execution time setting

The low speed execution type program is operated under the following conditions as shown below.

- Low speed program execution time : 3ms
- Total scan execution type program time : 4ms to 5ms
- Execution time of low speed execution type program A : 1ms
- Execution time of low speed execution type program B : 3ms
- END processing/low speed END processing : 0ms (0 ms is used to simplify the illustration)

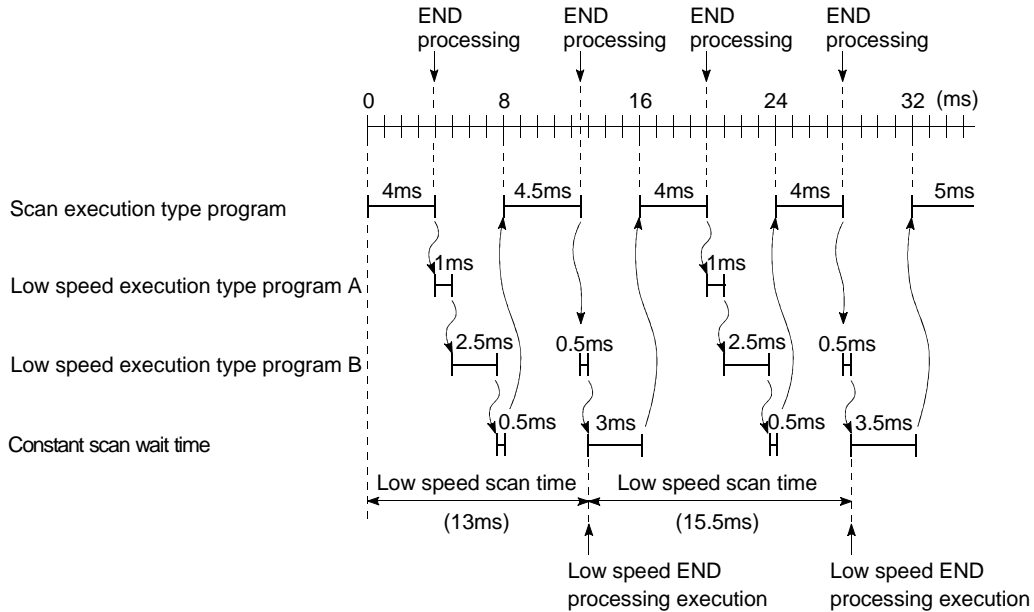


2 : Synchronous method

(1) Constant scan time setting

The low speed execution type program is operated under the following conditions as shown below.

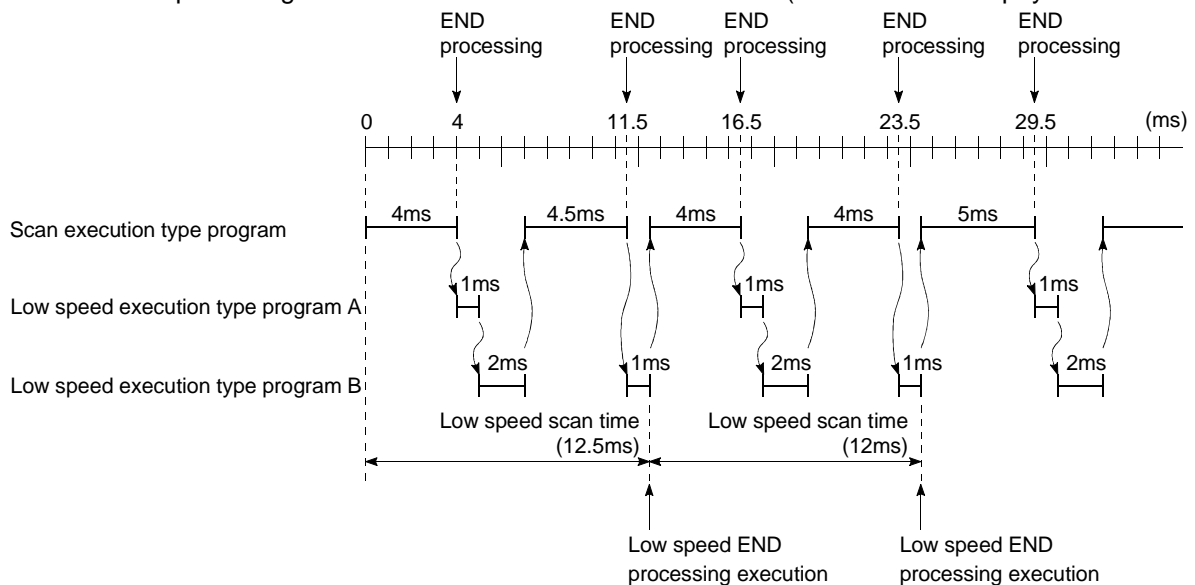
- Constant scan time : 8ms
- Total scan execution type program time : 4ms to 5ms
- Execution time of low speed execution type program A : 1ms
- Execution time of low speed execution type program B : 3ms
- END processing/low speed END processing : 0ms (0 ms is used to simplify the illustration)



(2) Low speed program execution time setting

The low speed execution type program is operated under the following conditions as shown below.

- Low speed program execution time : 3ms
- Total scan execution type program time : 4ms to 5ms
- Execution time of low speed execution type program A : 1ms
- Execution time of low speed execution type program B : 3ms
- END processing : 0ms (0 ms is used to simplify the illustration)



(4) Precautions for creating Low speed execution type programs

- (a) See Section 10.6.1 for details on index register processing when switching from a scan execution type program to a low speed execution type program.
- (b) See Section 10.6.2 for details on index register processing when an interrupt program/a fixed scan execution type program is executed during execution of low speed execution type program.
- (c) The low speed program execution time should be set so that sum of the [scan time] + [low speed program execution time] sum is less than the WDT setting value.
- (d) The COM instruction can not be used in low speed execution type programs.
- (e) Low speed execution type programs can also be executed with scans that execute the initial execution type programs.  
Establish an interlock with SM402 and SM403 for the circuit that validates the low speed execution type program's operation after the scan execution type program has been executed.
- (f) When the "constant scan time" and "low speed program execution time" have been set, "PRO. TIME OVER (error code: 5010)" will occur if (surplus time of constant scan) < (low speed program execution time).

(5) Low speed END processing

The low speed END processing is performed when all the low speed execution type programs are executed.

The following processing is performed for the low speed END processing.

- Low speed program special relay/special register setting
- Low speed execution type program write during RUN
- Low speed scan time measurement
- Low speed execution type program watch dog timer reset

When the low speed END processing is completed, the low speed execution type program is executed from the beginning again.

POINT
(1) During execution of low speed execution type programs, the constant scan time may deviate by the amount of "the maximum instruction processing time + low speed END processing time".



(6) Low speed scan time

- (a) The low speed scan time is the total time required for low speed execution type program execution and low speed END processing.

If multiple low speed execution type programs are executed, the low speed scan time is the total time required to execute all the programs, plus the low speed END processing time.

When an interrupt program/fixed scan execution type program is executed, the value added with the interrupt program/fixed scan execution type program's execution time will become the low speed scan time.



- (b) The low speed scan time is measured by the Process CPU, and the result is stored in special registers (SD528 to SD535). \*1  
The low speed scan time can therefore be checked by monitoring the SD528 to SD535 special registers.

Current value	SD528	SD529	
Initial value	SD530	SD531	
Minimum value	SD532	SD533	
Maximum value	SD534	SD535	

→ Stores less than 1 ms low-speed scan time (unit  $\mu$  s)  
 → Stores the low-speed scan time in 1 ms units.

If the SD528 value is 50, and the SD529 value is 400, the low speed scan time is 50.4 ms.

**POINT**

\*1: The accuracy of the scan time stored at the special registers is  $\pm 0.1$  ms.  
The scan time count will continue even if a watchdog time reset instruction (WDT) is executed in the sequence program.

**(7) Low speed execution monitor time**

The execution time of the low speed execution type program can be monitored by this timer. The default value is not set.

When monitoring the execution time of the low speed execution type program, designate the low speed execution monitor time in a 10 to 2000 ms range at the "PLC RAS" tab screen in the "(PLC) Parameter" dialog box. (Setting unit: 10 ms)  
If the execution time of the low speed execution type program exceeds this timer setting, a "PRG TIME OVER" error occurs.

**POINT**

The low speed execution time measurement occurs at low speed END processing. Therefore a "PRG TIME OVER" error will occur if the low speed execution monitor time (t) is designated as 100 ms, and the measured low speed scan time at low speed END processing exceeds 100 ms.

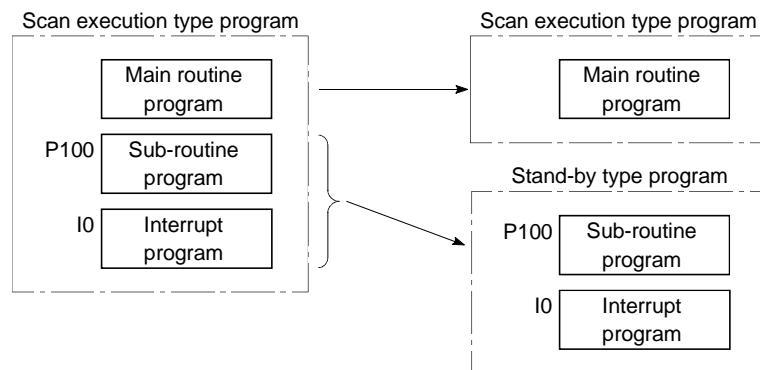
4.2.4 Stand-by type program

(1) Definition of stand-by type program

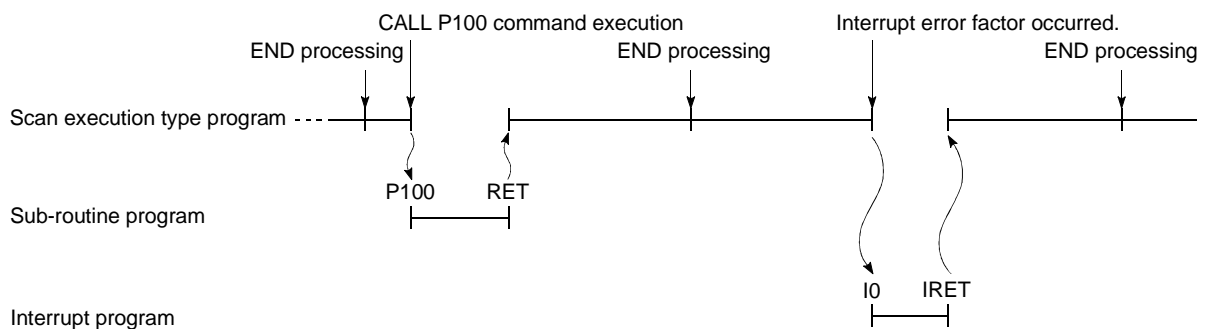
- (a) Stand-by type programs are executed only when requested.
- (b) Stand-by type programs are used for the following applications.
  - 1) Placing programs in the library  
Sub-routine and interrupt programs are converted to stand-by type programs which are managed separately from the main program.
  - 2) Changing the program setup  
Main routing programs registered as stand-by type programs can execute the programs required for control by converting them to scan execution type programs. They will be reconverted to stand-type programs after they completes the program execution.

(2) Stand-by type program applications

- (a) Placing programs in the library
  - 1) This application is used to manage sub-routine and interrupt programs separately from the main routine program. Multiple sub-routine and interrupt programs can be created for a single stand-by type program.



- 2) When stand-by type program execution is completed, the program, which was active before the stand-by type program was executed, is executed. A stand-by type program's sub-routine and interrupt programs are executed as shown below.



(b) Changing the program setup

- 1) Create a program compatible with all programs and use it only to execute necessary programs.

Programs designated as stand-by type programs in the "(PLC) Parameter" dialog box can be converted to scan execution type programs and executed in a sequence program.

Change the execution type in the Process CPU by using PSCAN, PLOW, PSTOP, and POFF instructions. (See Section 4.2 3.)

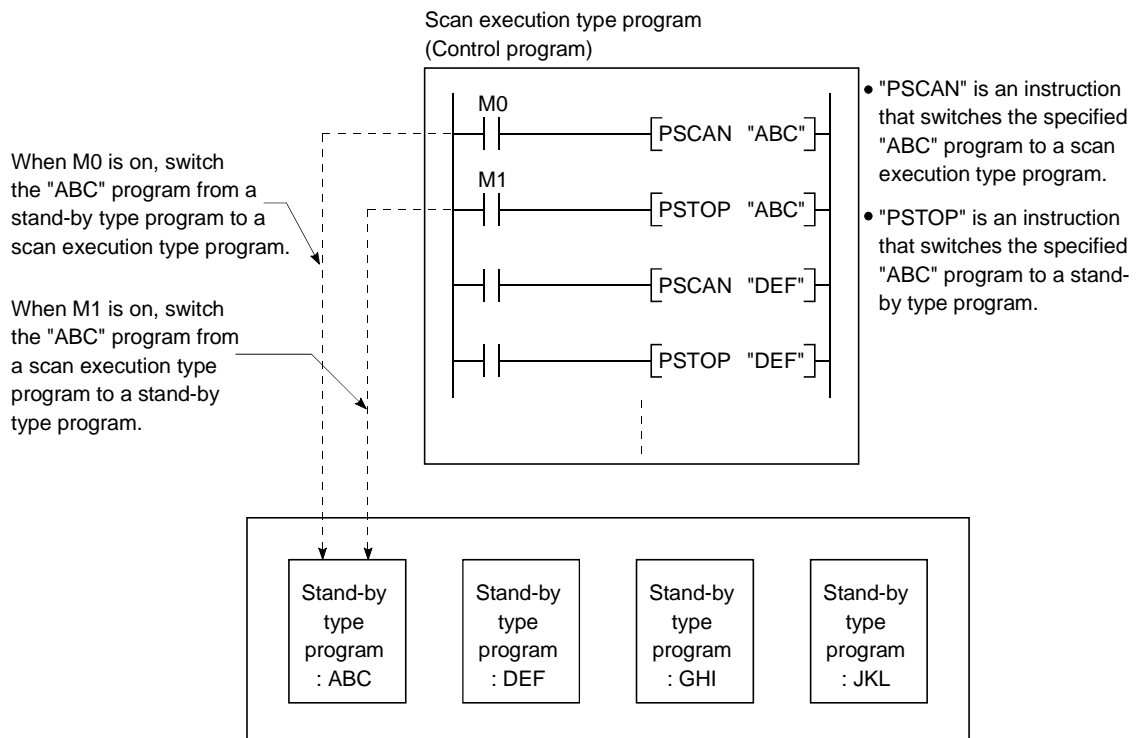
(c) The following methods can be used to convert a program which is to be executed.

- 1) Selecting the program to be executed from a single management program:

- Convert a stand-by type program that meets the designated conditions to a scan execution type program by using a constantly executed scan execution type program as the management program. Then execute the converted program.

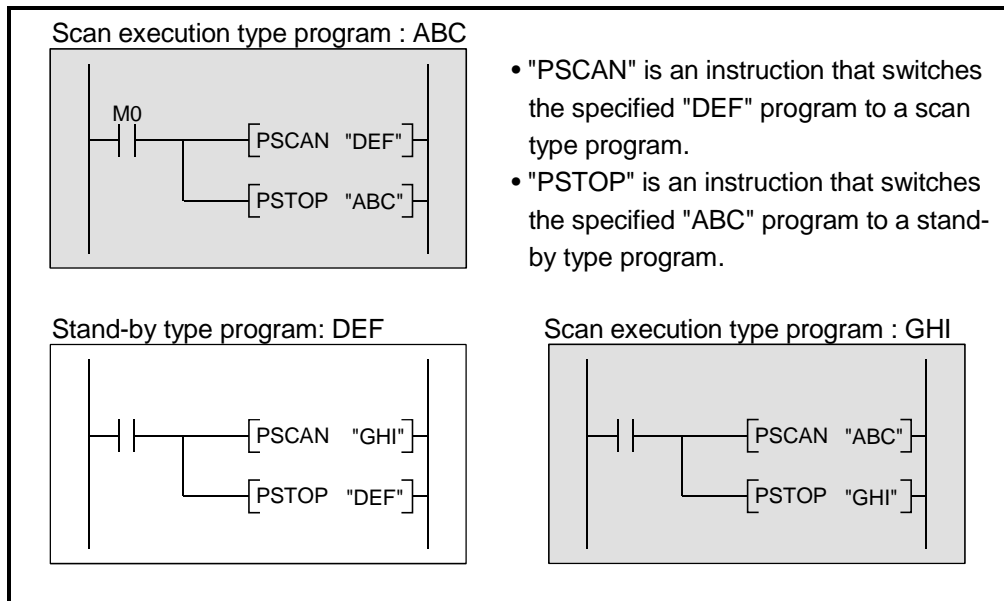
Scan execution type programs which are not required can be converted to stand-by type programs.

- Execute types of "ABC", "DEF", "GHI" and "JKL" stand-by type programs are converted as shown below.



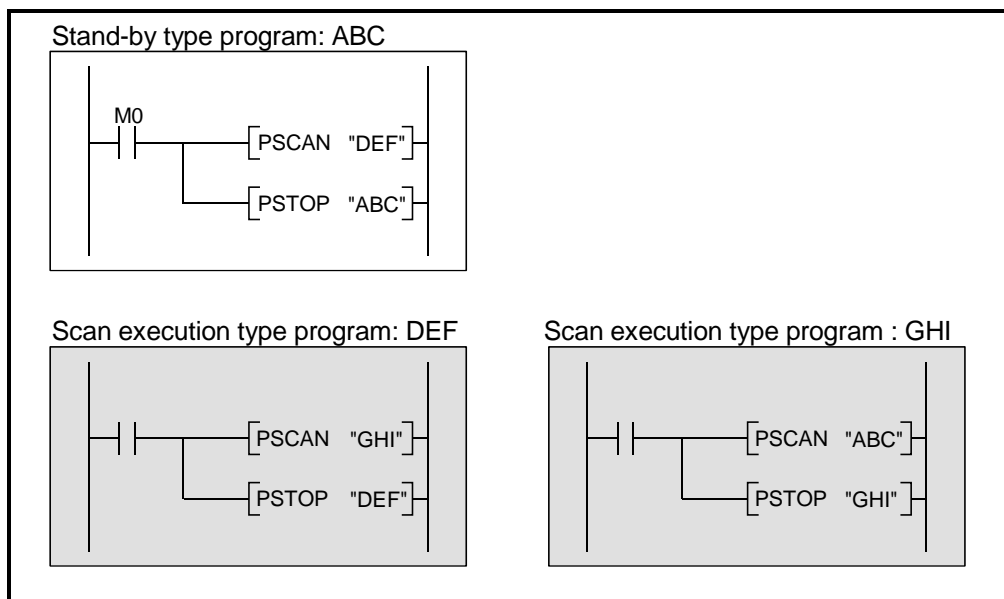
- 2) When changing the execute type of the scan execution type programs and stand-by type programs by the scan execution type programs having the condition for switching the execution type.
- The scan execution type program being executed changes the next program to be executed from a stand-by type program to a scan execution type program.
  - If the condition realizes when "ABC" and "GHI" programs have been set to scan execution type, and "DEF" program to stand-by type, the execute types of "ABC" and "DEF" programs are switched as shown below.

[Before execution of PSCAN and PSTOP instructions]

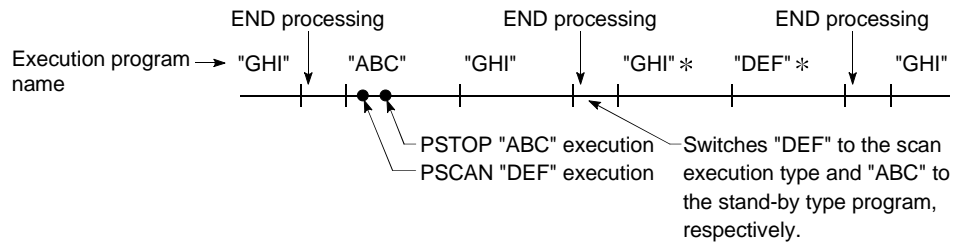


↓ When M0 is on

[After execution of PSCAN and PSTOP instructions]



- (d) The execute type of program is switched at END processing. The program execute type does not change while the program is being executed. If different execute type is specified for a same program in a same scan, the last-specified execute type becomes effective.



**REMARK**

- 1) \*: The "GHI" and "DEF" programs are executed in the order as set at the "Program" tab screen in the "(PLC) Parameter" dialog box.

(3) Precautions for creating stand-by type programs

(a) Because current value is updated and contact ON/OFF is switched when the OUT T[] instruction is executed, timers cannot be used in stand-by type programs.

(b) Gathering sub-routine programs in a single program

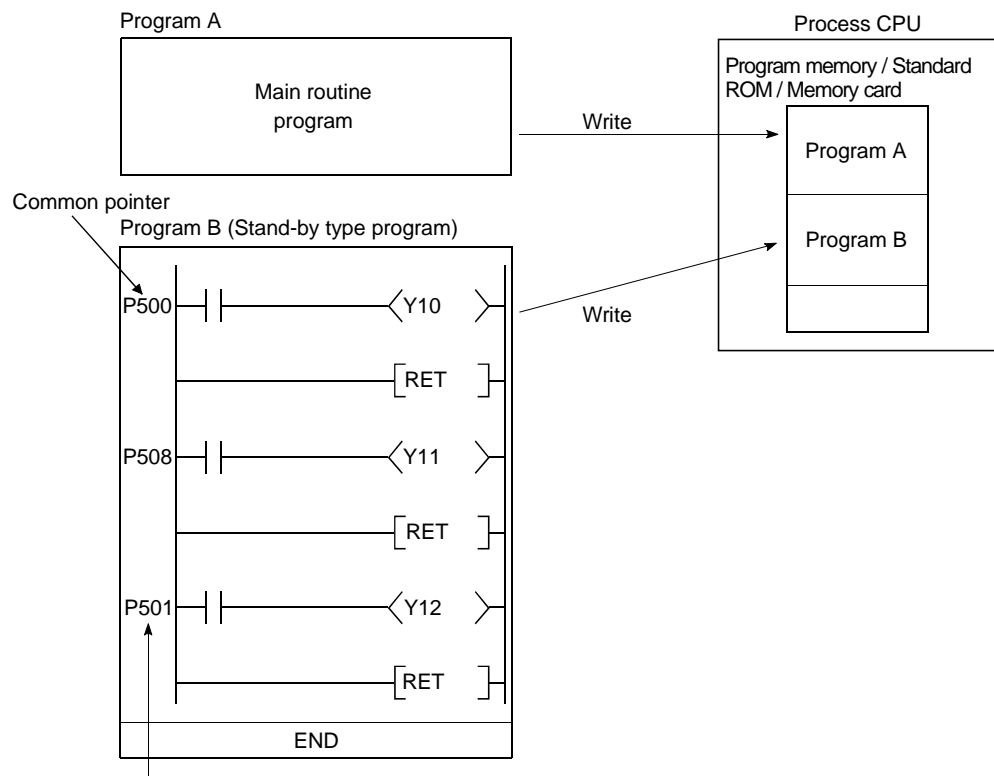
1) Create the sub-routine programs in order beginning from step 0 of the stand-by type program. An END instruction is required at the end of the sub-routine program.

2) Because there are no restrictions on the order of creating sub-routine programs, the pointer numbers need not be assigned in ascending order when creating multiple sub-routine programs.

3) Use common pointers. \*

Sub-routine programs with common pointers can be called from all programs executed by Process CPU.

(If local pointers are used, the stand-by type program's sub-routine programs will not be executed.)



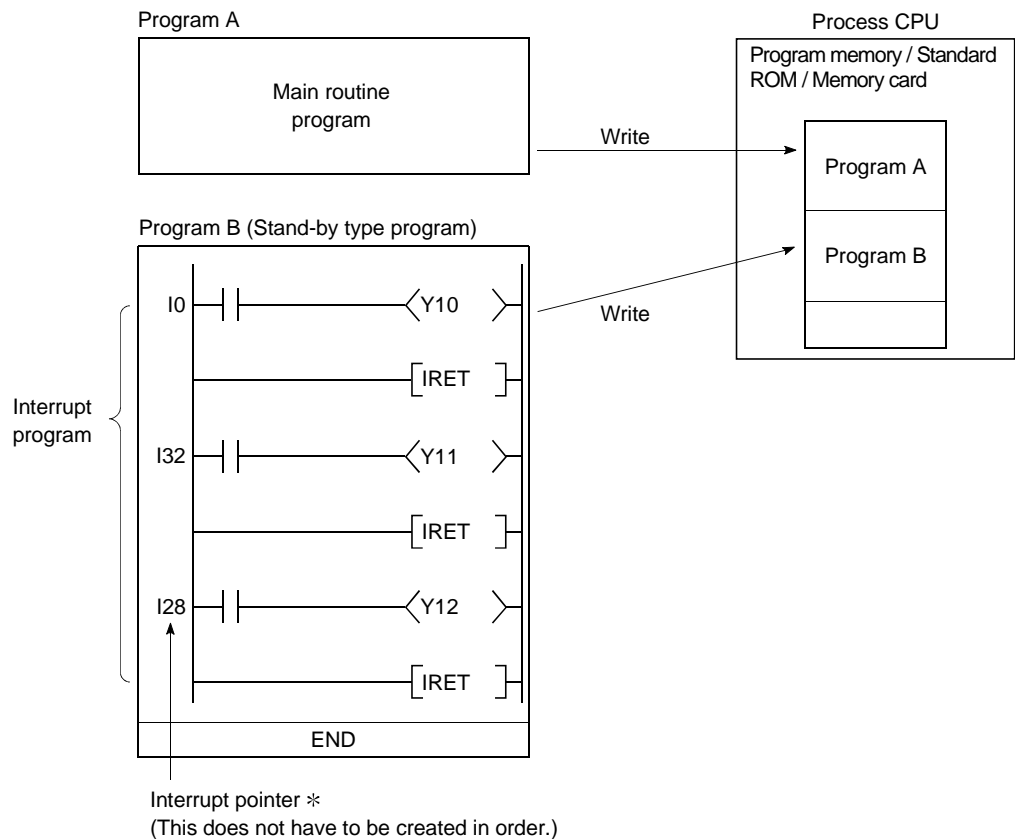
Use a common pointer. \*  
(This does not have to be created in order.)

4) See section 10.13.1 for execution of a sub-routine program that contains local devices.

**REMARK**

\*: See Section 10.9 for details on common pointers and local pointers.

- (c) Gathering interrupt programs in a single program
- 1) Create the interrupt programs in order beginning from step 0 of the stand-by type program.  
An END instruction is required at the end of the interrupt program.
  - 2) Because there are no restrictions on the order of creating interrupt programs, the pointer numbers need not be assigned in ascending order when creating multiple interrupt programs.



**REMARK**

\*: See Section 10.10 for details on interrupt pointers.

4.2.5 Fixed scan execution type program

(1) Definition of fixed scan execution type program

- (a) This program is executed at specified intervals.  
Without describing an interrupt point and IRET instruction, a fixed scan execution can be performed for each file.
- (b) The type of execution is set to "Fixed Scan" at the "Program" tab screen in the (PLC) parameter dialog box.

(2) Execution of fixed scan execution type program

- (a) Fixed scan execution type programs are executed at specified cyclic time intervals.  
When multiple fixed scan execution type programs have reached there simultaneously, they are executed in the ascending order set at the "Program" tab screen in the "(PLC) Parameter" dialog box.
- (b) Set the periodic interval at the "Program" setting tab screen in "(PLC) Parameter" dialog box. The setting range varies with the set unit.
  - When the unit is "ms": 0.5 to 999.5ms
  - When the unit is "s": 1 to 60s
- (c) When the specified times of fixed scan execution type programs and interrupt programs (I28 to I31) have come simultaneously, the priority of execution is given to the interrupt programs.
- (d) Execution during network refreshing  
When the execution conditions of fixed scan execution type programs are established during the network refreshing, the network refresh is suspended, and interrupt programs are executed.  
Therefore, even if the "block assurance of cyclic data for each station" is made in the MELSECNET/H network system, the above operation will not be assured when a device set to be refreshed is used in the interrupt programs. \*1

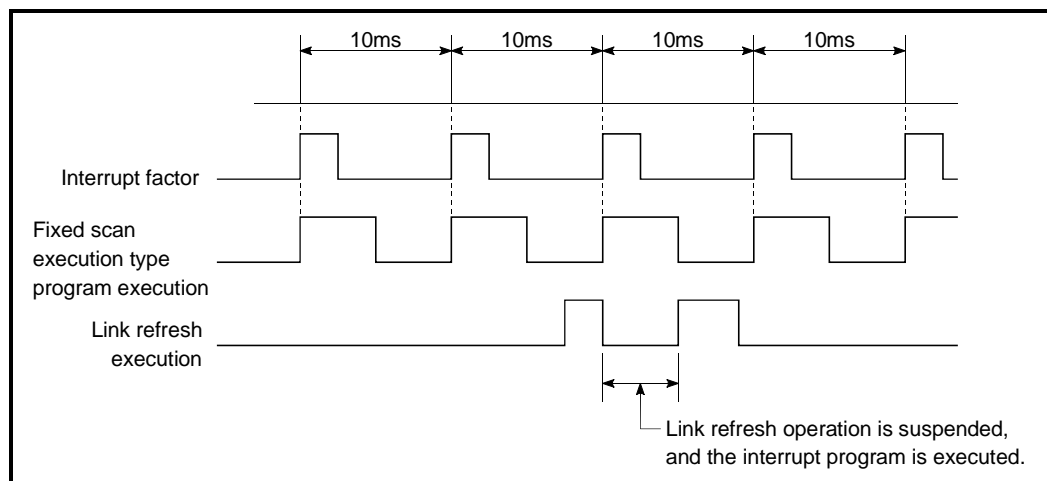


Fig. 4.5 Execution of Fixed Scan Execution Type Programs during Network Refreshing

**REMARK**

- \*1: Refer to the following manual on the block assurance of cyclic data for each station.
  - Q-Corresponding MELSECNET/H Network System Reference Manual



- (e) Execution during END processing:  
When the execution condition of fixed scan execution type programs are established during the wait time of END instruction while the constant scan is executed, the fixed scan execution type programs are executed.
- (f) Perform the processing of the index register when the program is switched from the scan execution type program to the fixed scan execution type program by seeing Section 10.6.2.

(3) Setting of fixed scan execution type program for high speed execution and overhead time

When fixed scan execution type programs are executed, the processing below is performed.

- Save and return of index register
- Save and return of file name of file register in use

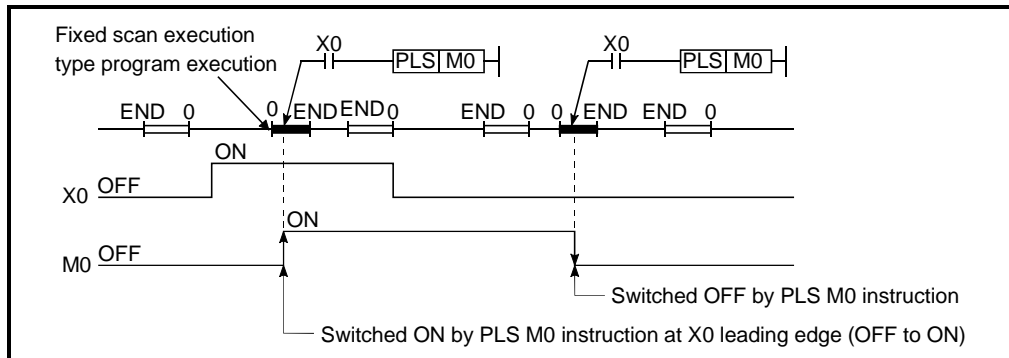
If "High Speed Execution" is selected from the interrupt program/fixed scan execution type program at the "PLC system" tab screen in the "(PLC) Parameter" dialog box, the processing above will not be performed.

As a result, the overhead time for the fixed scan execution type programs can be reduced.

CPU TYPE	OVERHEAD TIME ( μ s)	
	High speed execution is not selected	High speed execution is selected
Q12PHCPU, Q25PHCPU	165	100

(4) Cautions on programming

- (a) If a device is turned ON in a fixed scan execution type program by a PLS instruction, it is kept ON until the same type of the fixed scan execution type program is executed again.



- (b) During the execution of a fixed scan execution type program, interruption is prohibited (DI). Therefore, do not execute EI/DI instructions during the programming of the fixed scan execution type program.
- (c) During the programming of a fixed scan execution type program, a timer cannot be used.  
Because the timer updates the current values and turns ON/OFF at the time of execution of OUT T[ ] instruction, if the timer is used during the programming in the fixed scan execution type program, the current values will be updated only when the fixed scan execution type program is executed, and normal measurement will be disabled.
- (d) When a fixed scan execution type program is executed, an interruption must be allowed by an EI instruction in the initial execution type program/scan execution type program.

- (e) When the interrupt program/fixed scan execution type program is executed at a measuring time such as the scan time or execution time, the values of the interrupt program/fix scan execution type program are added to the measured time.

Thus, if the interrupt program/ fixed scan execution type program is executed, the values stored in the following special registers and GX Developer monitor values will become longer than when the interrupt program/ fixed scan execution type program is not executed.

1) Special registers

- SD520, SD521: Current scan time
- SD522, SD523: Initial scan time
- SD524, SD525: Minimum scan time
- SD526, SD527: Maximum scan time
- SD528, SD529: Current scan time for low speed
- SD532, SD533: Minimum scan time for low speed
- SD534, SD535: Maximum scan time for low speed
- SD540, SD541: END processing time
- SD542, SD543: Constant scan wait time
- SD544, SD545: Cumulative execution time for low speed execution type programs
- SD546, SD547: Low speed execution time
- SD548, SD549: Scan program execution time
- SD551, SD552: Service interval time

2) GX Developer monitor values

- Execution time measurement
- Scan time measurement
- Constant scan

### 4.3 Operation Processing

#### 4.3.1 Initial processing

This is a preprocessing for sequence operation execution, and is performed only once as shown in the table below.

When the initial processing is completed, the Process CPU goes in the RUN/STOP switch setting status. (See Section 4.4.)

Initial processing item	Process CPU status		
	When the power is turned on.	When reset is executed.	When STOP to RUN *1
The I/O module initialization	○	○	×
Boot from the standard ROM/memory card	○	○	○
Multiple PLC system parameter value equality check	○	○	○
Device initialization of the range not latched (bit device: OFF, word device: 0)	○	○	×
Execution of self-diagnosis in the QCPU	○	○	×
Automatic allocation of the I/O number of installed modules	○	○	○
Start of the MELSECNET/H network information setting and network communication	○	○	○
Switch setting of intelligent function module	○	○	×
CC-Link data setting	○	○	×
Ethernet data setting	○	○	×
Setting of device initialization values	×	×	○

○ : executed, × : not executed

#### REMARK

\*1: When parameters or programs are changed in the STOP status, reset by the RESET/L.CLR switch.

When the RUN/STOP switch is turned from STOP to RUN without the reset, RUN LED flickers.

When the RUN/STOP switch is turned from RUN to STOP to RUN again, the Process CPU goes in the RUN status, and the "When STOP to RUN" status becomes effective.

#### 4.3.2 I/O refresh (I/O module refresh processing)

In I/O refresh, an input (X) is received from the input module/intelligent function module, and output (Y) of the Process CPU is sent to the output module/intelligent function module.

The I/O refresh is executed before the sequence program operation starts.

During constant scan execution, the I/O refresh is executed after the constant scan delay time has elapsed.

(The I/O refresh is executed at each constant scan cycle.)

### 4.3.3 Automatic refresh of the intelligent function module

When automatic refresh of intelligent function modules is set, communication with the intelligent function modules of the designated data is performed.

Refer to the manual of the intelligent function modules, for details on the automatic refresh setting of intelligent function modules.

### 4.3.4 END processing

This is a post-processing to return the sequence program execution to step 0 after completing the whole sequence program operation processing once.

- (a) When a refresh request is made from the network module, refresh processing is performed.
- (b) When the trace point of the sampling trace is set at every scan (after END instruction execution), the set device status is stored in the sampling trace area.

POINT
(1) When the constant scan function (See Section 7.2) is set, END processing time result is stored until when END processing is completed or the next scan starts.
(2) When executing the low speed execution type program, the low speed END processing starts after the all low speed execution type programs are completed. See Section 4.2.3 for details on the low speed execution type program and low speed END processing.

4.4 RUN, STOP, PAUSE Operation Processing

The Process CPU has three types of operation status; RUN, STOP and PAUSE status.

The Process CPU operation processing is explained below:

- (1) **RUN Status Operation Processing**
  - (a) RUN status indicate that the sequence program operation is performed from step 0 to END (FEND) instruction to step 0 repeatedly.
  - (b) When entering the RUN status, the output status saved at STOP status is output by setting "Previous status" as "Output mode at STOP to RUN" at the "PLC system" tab screen in the "(PLC) Parameter" dialog box.
  - (c) It usually takes 1 to 3 seconds to prepare for starting the sequence program operation since STOP status is switched to RUN status, though it might be longer depending on the system.
- (2) **STOP Status Operation Processing**
  - (a) STOP status indicates that the sequence programs are stopped by RUN/STOP switch or remote STOP function. (See 7.6.1 for details on remote STOP function.)  
Process CPU might enter STOP status when a stopping error occurs.
  - (b) When entering the STOP status, save the output status and turn off all output.  
The device memory of other than the output (Y) is retained.
- (3) **PAUSE Status Operation Processing**
  - (a) The PAUSE status indicates that the sequence program operations are paused by remote PAUSE function while maintaining the output and device memory status. (See Section 7.6.2 for details on remote PAUSE function.)
- (4) **Process CPU Operation Processing with RUN/STOP status**

Operation processing RUN/STOP status	Sequence program operation processing	External output	Device memory (Y, M, L, S, T, C, D)
RUN to STOP	Executes up to the END instruction and stops.	OS saves the output status and all output are off.	Maintains the status immediately before the STOP status.
STOP to RUN	Starts at step 0.	Determined by the output mode of the PLC parameter at STOP to RUN.	Starts executing the operation from the status immediately before the STOP status. When a device initial value is designated, however, the value is set. Local devices are cleared.

<b>POINT</b>
<p>The Process CPU performs the following in any of RUN, STOP, and PAUSE status:</p> <ul style="list-style-type: none"> <li>• I/O module refresh processing</li> <li>• Data communication with GX Developer and serial communication module</li> <li>• Refresh process of MELSECNET/H and CC-Link</li> </ul> <p>For this reason, I/O monitor and test operation using GX Developer, reading/writing from the serial communication, communication with another station using MELSECNET/H, and communication with a remote station over the CC-Link can be made even in the STOP or PAUSE status.</p>

#### 4.5 Operation Processing during Momentary Power Failure

The Process CPU detects a momentary power failure when the input power voltage supplied to the power supply module is lower than the regulated ranges.

When the Process CPU detects a momentary power failure, the following operation processing is performed:

- (1) When momentary power failure occurs for a period shorter than the permitted power failure time
  - (a) The output is maintained when the momentary power failure occurs, and file name of the file accessed and error history are logged. Then the system interrupts the operation processing. (The timer clock continues.)
  - (b) When there is an SFC continue specification, a system saving processing is performed.
  - (c) When a momentary power failure ends, the operation processing is resumed.
  - (d) Even if the operation is interrupted due to momentary power failure, the watchdog timer (WDT) measurement continues. For example, if the GX Developer PLC parameter mode WDT setting is set at 200 ms, when a momentary failure of 15 ms occurs at scan time 190 ms, the watch dog timer error is set.

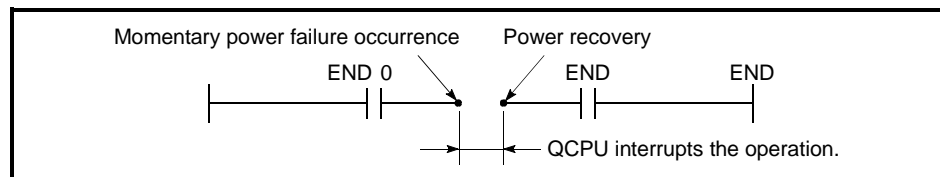


Fig.4.6 Operation Processing When Momentary Power Failure Occurs

- (2) When a power failure occurs for a period longer than the permitted power failure time

The Process CPU starts initially. (PLC power is turned on.)

The same operation processing as that after the following operation occurs.

- Power ON
- Resetting using RESET/L. CLR switch
- Remote setting using GX Developer

## 4.6 Data Clear Processing

### (1) Data clear

The Process CPU clears all data except for the following, when a reset operation is performed with RESET/L.CLR switch, or power ON to OFF to ON.

- (a) Program memory data (except for when "clear program memory" is set at boot specification.)
- (b) Data in the memory card
- (c) Device data with latch specification (latch clear valid)
- (d) Device data with latch specification (latch clear invalid)
- (e) File register data
- (f) Failure history data (when special register SD storage)

Data in (c) is cleared by operating "latch clear" with the RESET/L.CLR switch, or operating "remote latch clear" from GX Developer.

See Section 7.6.4 for details on the remote latch clear.

### (2) Device latch specification

- (a) Specify the device latch (latch range setting) for each device at the "Device" tab screen in the "(PLC) Parameter" dialog box.

There are two types of latch range settings:

- 1) Valid latch clear key

Sets the latch range that can be cleared by operating "latch clear" with the RESET/L.CLR switch and remote latch clear.

- 2) Invalid latch clear key

Sets the latch range that can not be cleared even by operating "latch clear" with the RESET/L.CLR switch or operating "remote latch clear" from GX Developer.

- (b) The devices in which RESET/L.CLR switch is set to invalid can only be cleared by an instruction or GX Developer.

- 1) Instruction to clear method

Reset with the RST instruction or send "0" with the MOV/FMOV instruction.

- 2) GX Developer clear method

Clear all device memory in the online PLC memory clear (including latch).

Refer to the GX Developer operating manual for details of the GX Developer operation methods.

<b>POINT</b>
--------------

To clear file registers or local devices, use the RST instruction to perform a reset operation, or use the MOV/FMOV instruction to transmit "0".
--

<b>REMARK</b>
---------------

Refer to following manual for the MOV/FMOV instruction.

- QCPU (Q mode)/QnACPU Programming Manual (Common instructions)

### 4.7 I/O Processing and Response Lag

In the direct mode, the batch communication with I/O modules is performed before sequence program operation starts.

By creating a sequence program with direct access I/O, I/O processing can be performed in a direct mode to communicate with I/O module at execution of each instruction in the sequence program.

For details on direct access I/O, see Section 10.2.1 and 10.2.2, respectively.

#### 4.7.1 Refresh mode

##### (1) Definition of refresh mode

With the refresh mode, batch communication with the I/O modules is performed before the sequence program operation starts.

- (a) Batch reading of the input module ON/OFF information is executed in the Process CPU's internal input device memory when sequence program operation starts. This ON/OFF data (in the input device memory) is then used for processing when a sequence program is executed.
- (b) The processing result of the output (Y) sequence program is output to the Process CPU's internal output device memory, and batch output of the ON/OFF data (in output device memory) to the output module is executed when sequence program operation starts.

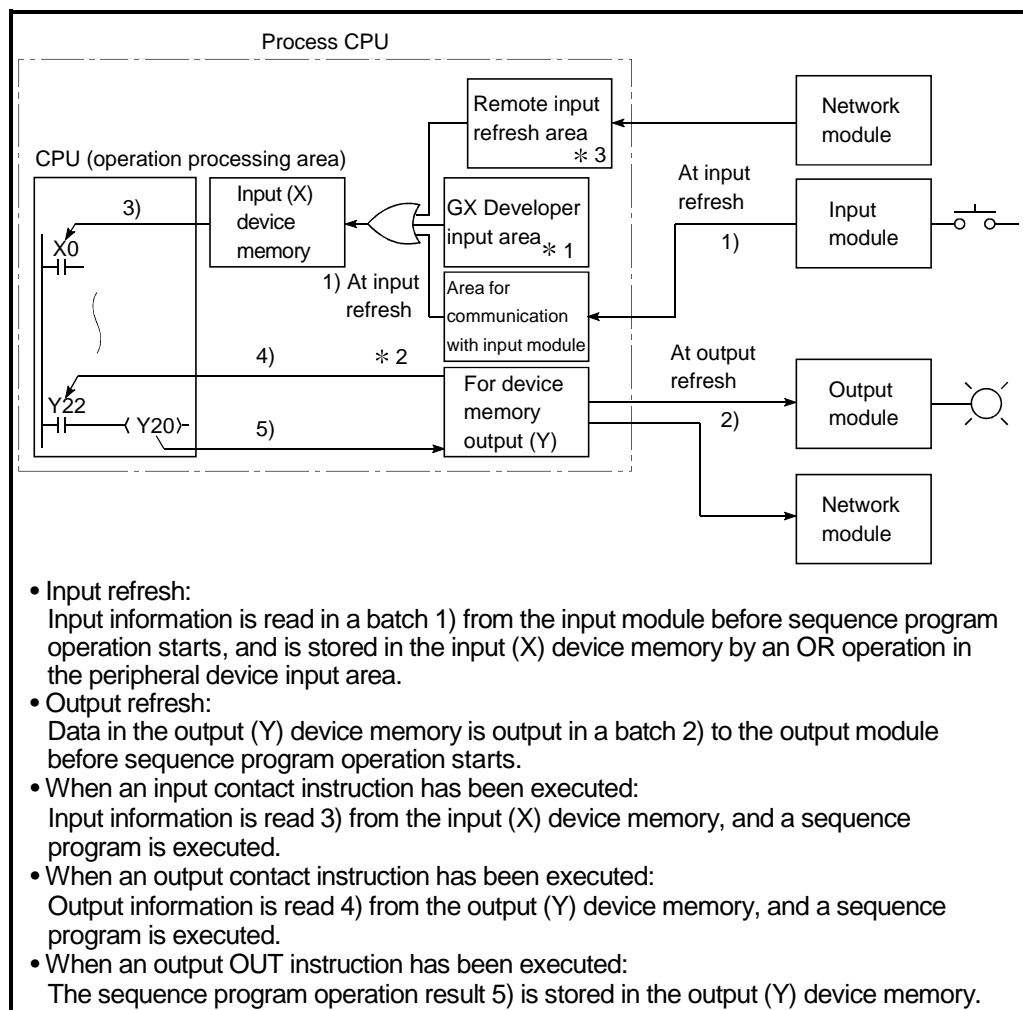


Fig.4.7 I/O Information Flow in Refresh Mode



**REMARK**

- \*1: The peripheral device input area can be switched ON and OFF by the following:
  - Test operation by the GX Developer
  - A network refresh by the MELSECNET/H network system
  - Writing from a serial communication module
  - CC-Link automatic refresh
- \*2: The output (Y) device memory can be switched ON and OFF by the following:
  - Test operation by GX Developer
  - A network refresh by the MELSECNET/H network system
  - Writing from a serial communication module
  - CC-Link automatic refresh
- \*3: The remote I/O refresh area indicates the area used when automatic refresh setting is made to the input (X) with MELSECNET/H and CC-Link. Automatic refresh of the remote input refresh area is executed during END processing.

(2) Response lag

An output module lags max.2 scans behind an input module. (See Fig.4.8)

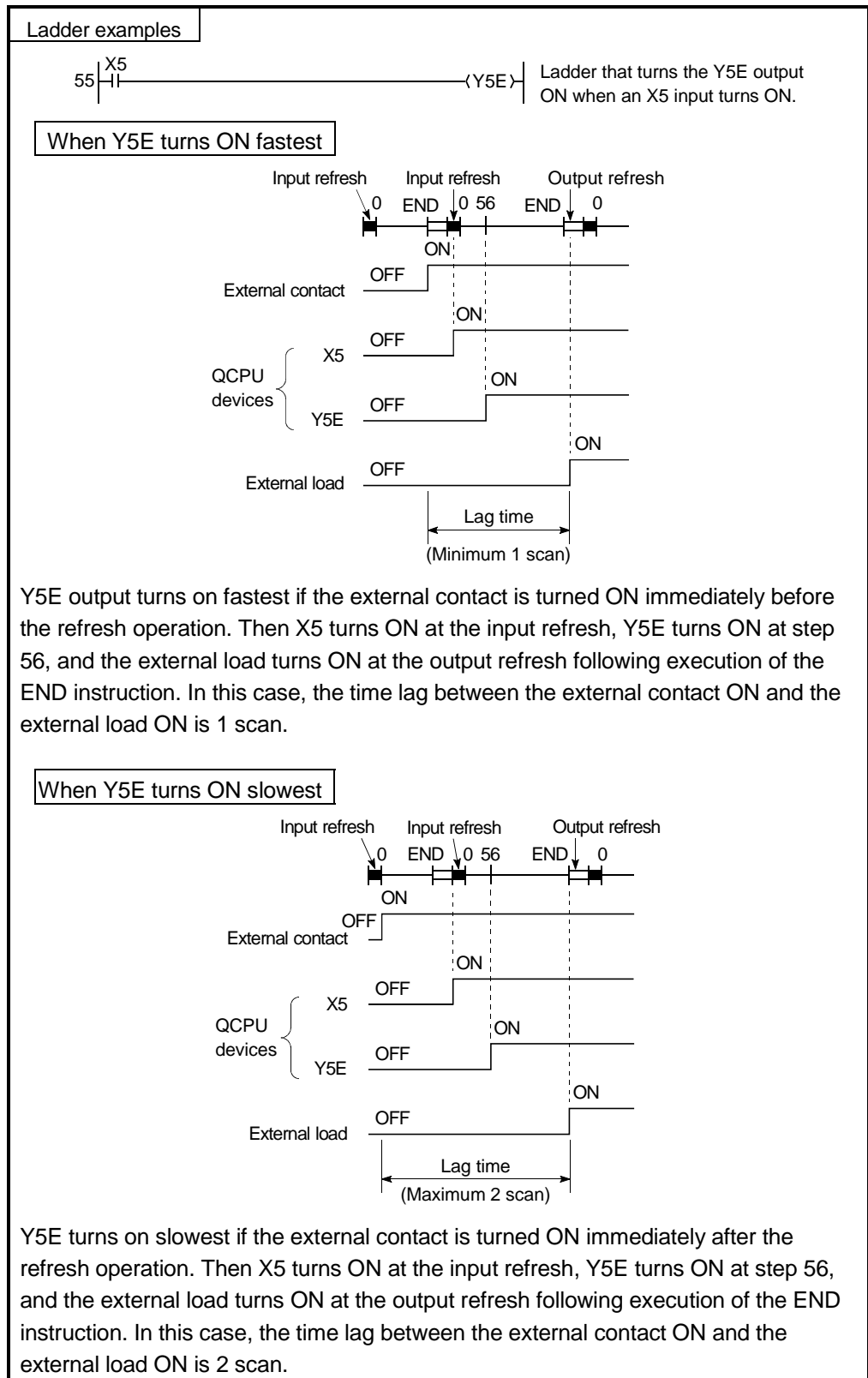


Fig.4.8 Timing chart showing response of Output "Y" when Input "X" turns ON

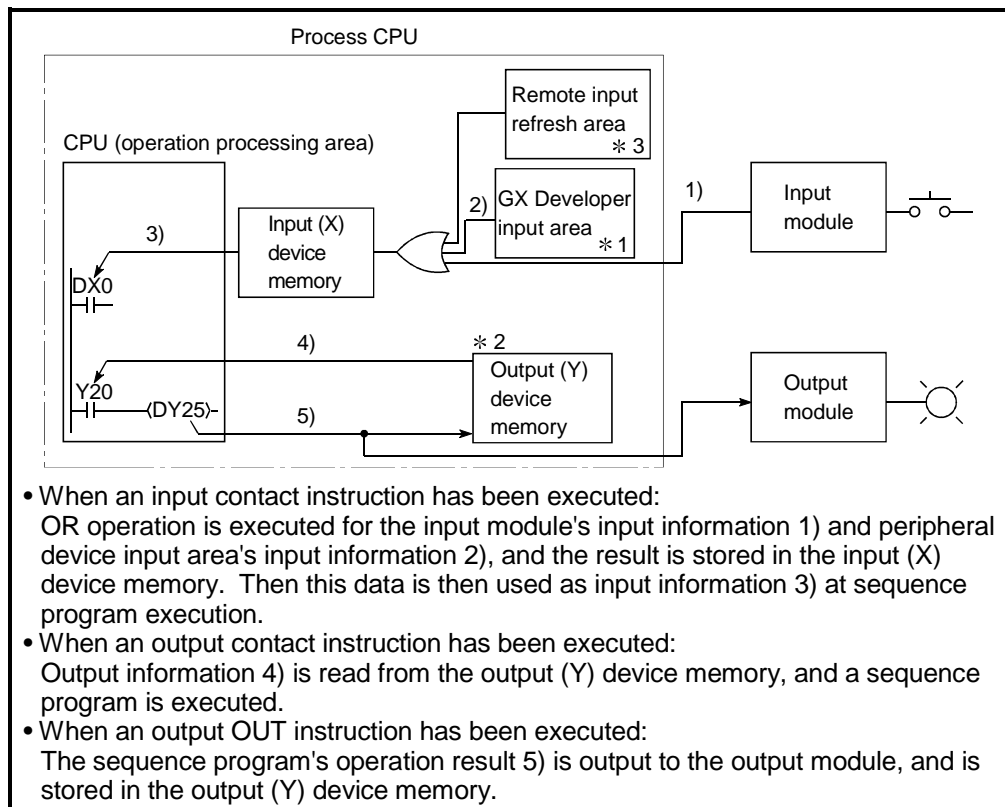
4.7.2 Direct mode

(1) Definition of direct mode

In the direct mode the communication with the I/O modules is performed when executing sequence program instructions.

With Process CPU, direct mode I/O processing can be performed by using direct access inputs (DX) and direct access outputs (DY).

For details on direct I/O, see Section 10.2.1 and 10.2.2, respectively.



- When an input contact instruction has been executed: OR operation is executed for the input module's input information 1) and peripheral device input area's input information 2), and the result is stored in the input (X) device memory. Then this data is then used as input information 3) at sequence program execution.
- When an output contact instruction has been executed: Output information 4) is read from the output (Y) device memory, and a sequence program is executed.
- When an output OUT instruction has been executed: The sequence program's operation result 5) is output to the output module, and is stored in the output (Y) device memory.

Fig.4.9 I/O Information Flow in Direct Mode

**REMARK**

- \*1: The GX Developer input area can be turned ON and OFF by the following:
  - Test operation by GX Developer
  - Writing from a serial communication module
- \*2: The output (Y) device memory can be turned ON and OFF by the following:
  - Test operation by the GX Developer
  - A network refresh by MELSECNET/H network system
  - Writing from a serial communication module
  - CC-Link automatic refresh
- \*3: The remote input refresh area indicates the area used when automatic refresh setting is made to the input (X) with MELSECNET/H and CC-Link. Automatic refresh of the remote input refresh area is performed during END processing.

(2) Response lag

An output module lags max.1 scan behind an input module. (See Fig.4.10)

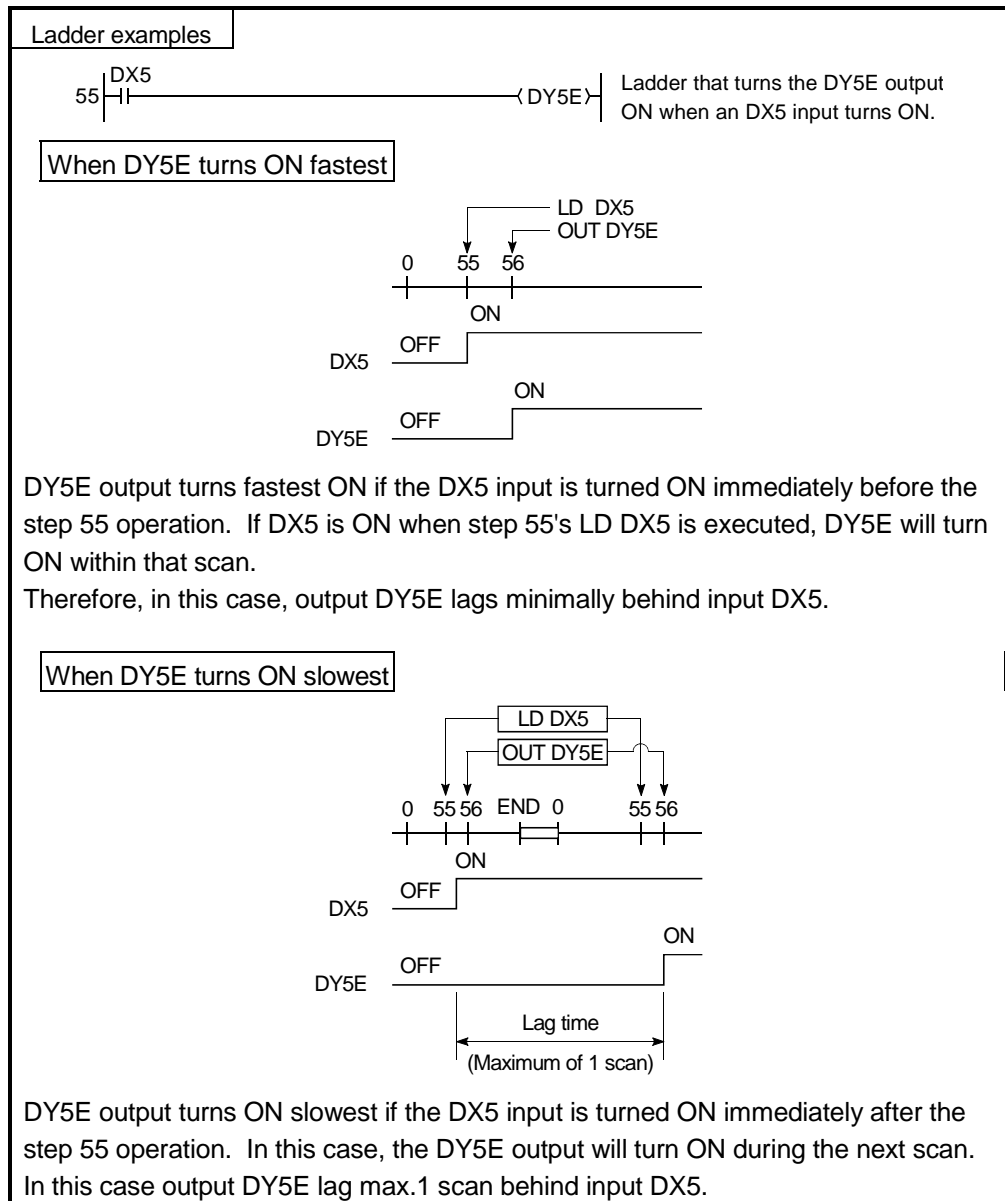


Fig.4.10 Timing chart showing response of Output "Y" when Input "X" turns ON

4.8 Numeric Values which Can Be Used in Sequence Programs

Numeric and alphabetic data are expressed by "0" (OFF) and "1" (ON) numerals in the Process CPU.

This expression form is called "binary code" (BIN).

The hexadecimal (HEX) expression form in which BIN data are expressed in 4-bit units, and the BCD (binary coded decimal) expression form are applicable to the Process CPU.

Real numbers may also be used. (See Section 4.8.4)

The numeric expressions by BIN, HEX, BCD, and Decimal (DEC) notations are shown in Table 4.1 below.

Table 4.1 BIN, HEX, BCD, and Decimal Numeric Expressions

DEC (Decimal)	HEX (Hexadecimal)	BIN (Binary)				BCD (Binary Coded Decimal)			
0	0					0			
1	1					1			
2	2					10			
3	3					11			
•	•					•			
•	•					•			
•	•					•			
9	9					1001			
10	A					1010			
11	B					1011			
12	C					1100			
13	D					1101			
14	E					1110			
15	F					1111			
16	10					1 0000			
17	11					1 0001			
•	•					•			
•	•					•			
•	•					•			
47	2F					10 1111			
•	•								
•	•								
•	•								
32766	7FFE	0111	1111	1111	1110				
32767	7FFF	0111	1111	1111	1111				
-32768	8000	1000	0000	0000	0000	1000	0000	0000	0000
-32767	8001	1000	0000	0000	0001	1000	0000	0000	0001
•	•								
•	•								
•	•								
-2	FFFE	1111	1111	1111	1110				
-1	FFFF	1111	1111	1111	1111				

(1) External numeric inputs to Process CPU

When inputting numeric values to the Process CPU from an external source (such as digital switch), use BCD (binary coded decimal) which allows the same setting as decimal form.

However, the Process CPU handles the values as BIN data since the operation is based on BIN form, if it uses values set in the BCD form as they are.

Therefore, the Process CPU operates with numeric values that are different from the set values.

A BIN instruction is provided to convert the BCD input data to the BIN data compatible with the Process CPU.

A program which converts numeric data to BIN data can be created at the sequence program to allow the settings of numeric values from an external source without being conscious of the corresponding BIN values.

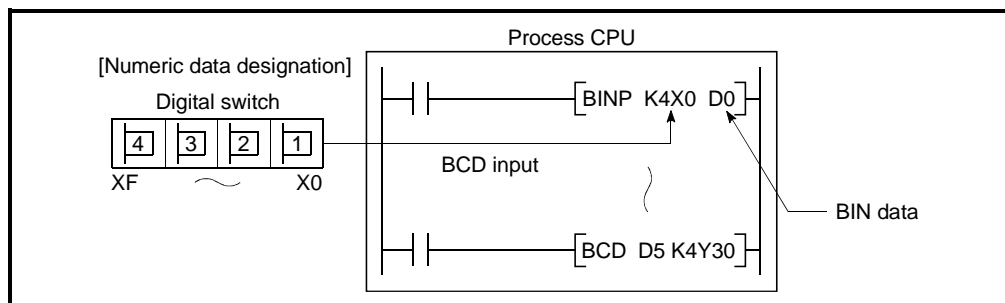


Fig.4.11 Digital Switch Data Input to Process CPU

(2) External numeric outputs from Process CPU

A digital display can be used to display numeric data which is output from the Process CPU.

However, BIN data cannot be displayed at the digital display as it is because the Process CPU use it for operation.

Therefore BCD instruction is provided for the Process CPU to convert the BIN data to BCD data. A program which converts BIN data to BCD data can be created in the sequence program in order to display the output data in the same manner as decimal data.

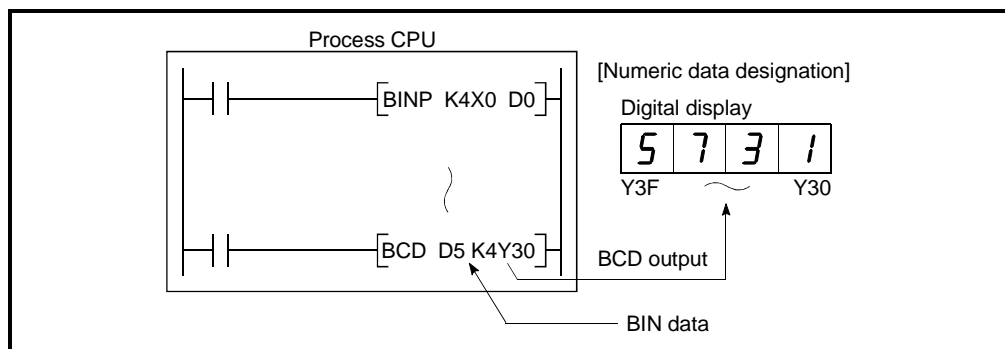


Fig.4.12 Digital Display of Data from Process CPU

4.8.1 BIN (Binary Code)

(1) Binary code

Binary data is represented by 0 (OFF) and 1 (ON).

Decimal notation uses the numerals 0 through 9. When counting beyond 9, a 1 is placed in the 10s column and a 0 is placed in the 1s column to make the number 10.

In binary notation, the numerals 0 and 1 are used. A carry occurs after 1 and the number becomes 10 (decimal 2).

Table 4.2 gives a comparison between binary and decimal notations.

Table 4.2 Comparison between Binary and Decimal Notations

DEC (Decimal)	BIN (Binary)
0	0000
1	0001
2	0010
3	0011
4	0100
5	0101
6	0110
7	0111
8	1000
9	1001
10	1010
11	1011

Carry indicators (left-pointing arrows) are shown to the right of the table, pointing to the rightmost bit of the binary representation for decimal values 2, 3, and 8.

(2) Binary numeric expression

(a) Process CPU registers (data registers, link registers, etc.) consist of 16 bits, and a "2<sup>n</sup>" value is allocated to each of the register bits.

The most significant bit (initial bit) is used to discriminate between "positive" and "negative".

1) When most significant bit is "0"...Positive

2) When most significant bit is "1"...Negative

The numeric expressions for the Process CPU registers are shown in Fig.4.13 below.

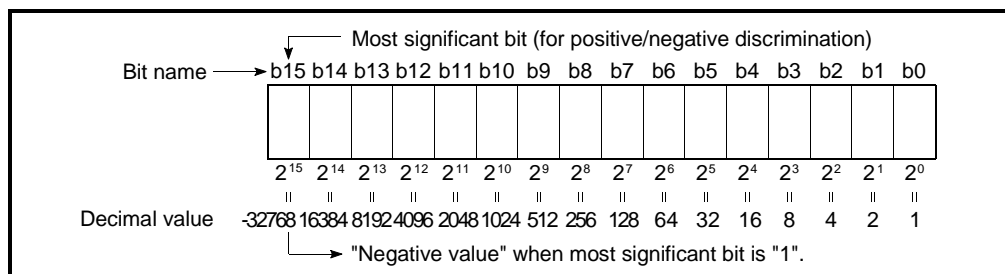


Fig.4.13 Numeric Expressions for Process CPU Registers

(b) Usable numeric data for Process CPU

As shown in Fig.4.13, the numeric expression range is -32768 to 32767.

Therefore, numeric data within this range can be stored in the Process CPU registers.

4.8.2 HEX (Hexadecimal)

(1) Hexadecimal notation

In hexadecimal notation, 4 binary bits are expressed in 1 digit.

If 4 binary bits are used in binary notation, 16 different values from 0 to 15 can be represented.

Since hexadecimal notation represents 0 to 15 in 1 digit, letters A to F are used to represent the numbers 10 to 15.

Then, a carry occurs after F.

Table 4.3 shows numeric expressions by binary, hexadecimal, and decimal notations.

Table 4.3 Comparison of BIN, HEX, and DEC Numeric Expressions

DEC (Decimal)	HEX (Hexadecimal)	BIN (Binary)
0	0	0
1	1	1
2	2	10
3	3	11
•	•	•
•	•	•
•	•	•
9	9	1001
10	A	1010
11	B	1011
12	C	1100
13	D	1101
14	E	1110
15	F	1111
16	10	1 0000
17	11	1 0001
•	•	•
•	•	•
•	•	•
47	2F	10 1111

  Carry ←

(2) Hexadecimal numeric expression

Process CPU registers (data registers, link registers, etc.) consist of 16 bits.

Therefore, the numeric values expressed in hexadecimal notation can be stored in each register within 0 to FFFF<sub>H</sub> range.



4.8.3 BCD (Binary Coded Decimal)

(1) BCD notation

BCD notation is binary expression with a carry similar to that of the decimal notation.

Though it uses 4-bit representation like hexadecimal notation, it dose not use letters A to F.

Table 4.4 gives numeric expressions by binary, BCD, and decimal notations.

Table 4.4 Comparison of BIN, BCD, and DEC Numeric Expressions

DEC (Decimal)	BIN (Binary)	BCD (Binary Coded Decimal)
0	0	0
1	1	1
2	10	10
3	11	11
4	100	100
5	101	101
6	110	110
7	111	111
8	1000	1000
9	1001	1001
10	1010	1 0000
11	1011	1 0001
12	1100	1 0010

   Carry ←

(2) BCD numeric expression

Process CPU registers (data registers, link registers, etc.) consist of 16 bits.

Therefore, the numeric values expressed in BCD notation can be stored in each register within 0 to 9999 range.

4.8.4 Real numbers (floating decimal point data)

(1) Real numbers

Real numbers are single precision floating decimal point data.

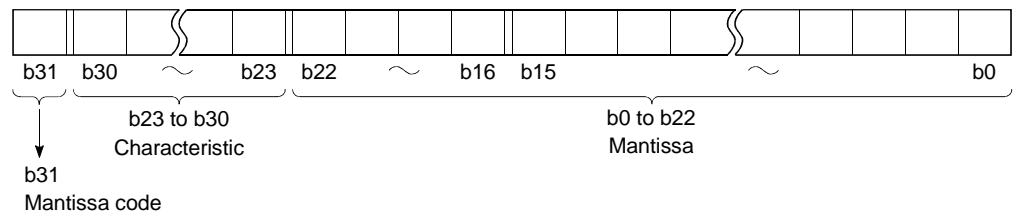
(2) Internal expression of floating decimal point data

The Process CPU's internal expression of received real number data is explained below.

Real number data is expressed as shown below, using 2 word devices.

1. [Mantissa] × 2<sup>(characteristic)</sup>

The bit configuration used for internal expression of floating decimal point data is shown and explained below.



- Mantissa code: The mantissa code is expressed at b31 as follows.  
0: Positive  
1: Negative

- Characteristic: The "n" of "2<sup>n</sup>" is expressed in various ways at b23 to b30, depending on the b23 to b30 BIN value.

b23 to b30	FFH	FEH	FDH		81H	80H	7FH	7EH		02H	01H	00H
n	Non-numeric	127	126		2	1	0	-1		-125	-126	Non-numeric

- Mantissa: For a binary value of 1.XXXXXX..., the "XXXXXX" portion of the value is expressed at b0 to b22 (23 bits).

(3) Calculation examples

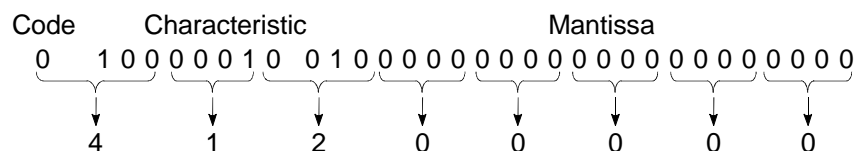
Calculation examples are shown below (the nnnnn "X" indicates an X-system data expression).

(a) Storing "10"

$$(10)_{10} \rightarrow (1010)_2 \rightarrow (1.\underbrace{01000\dots}_X \times \underbrace{2^3}_X)_2$$

Mantissa code      Positive to 0  
 Characteristic    3 to 82H to (10000010)<sub>2</sub>  
 Mantissa            (010 0000 0000 0000 0000)<sub>2</sub>

Therefore, the data expression will be 41200000H, as shown below.

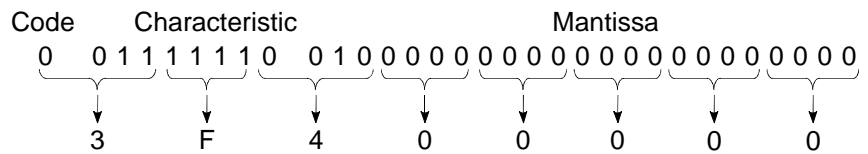


(b) Storing "0.75"

$$(0.75)_{10} \rightarrow (0.11)_2 \rightarrow (1.100\dots \times 2^{-1})_2$$

Mantissa code            Positive to 0  
Characteristic        -1 to 7EH to (01111110)<sub>2</sub>  
Mantissa                (100 0000 0000 0000 0000)<sub>2</sub>

Therefore, the data expression will be 3F40000H, as shown below.



**POINT**

- (1) The monitor function for GX Developer permits monitoring the real number data of the Process CPU.  
However, if an attempt is made to monitor the data that cannot be represented as a real number, e.g. "FFFFH", "\_\_\_\_\_" is displayed.
- (2) For a "0" value, "0" will be indicated at all the b0 to b31 bits.

**REMARK**

In binary notation, the portion of the value following the decimal point is calculated as follows:



This bit expresses  $2^{-1}$     This bit expresses  $2^{-2}$     This bit expresses  $2^{-3}$     This bit expresses  $2^{-4}$

$$(0.1101)_2 = 2^{-1} + 2^{-2} + 2^{-4} = 0.5 + 0.25 + 0.0625 = (0.8125)_{10}$$

4.9 Character String Data

(1) Character String Data

The Process CPU uses ASCII code data.

(2) ASCII code character strings

ASCII code character strings are shown in the Table below.

"00H" (NUL code) is used at the end of a character string.

					<table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td></tr> <tr><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td><td>1</td><td>1</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td></tr> <tr><td>0</td><td>0</td><td>1</td><td>1</td><td>0</td><td>0</td><td>1</td><td>1</td><td>0</td><td>0</td><td>1</td><td>1</td><td>0</td><td>0</td><td>1</td><td>1</td></tr> <tr><td>0</td><td>1</td><td>0</td><td>1</td><td>0</td><td>1</td><td>0</td><td>1</td><td>0</td><td>1</td><td>0</td><td>1</td><td>0</td><td>1</td><td>0</td><td>1</td></tr> </table>																0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0	0	0	0	1	1	1	1	0	0	0	0	1	1	1	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1
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## 5 ASSIGNMENT OF I/O NUMBERS

This section describes the necessary information on the I/O number assignment for the data exchange between Process CPU and I/O modules or intelligent function modules.

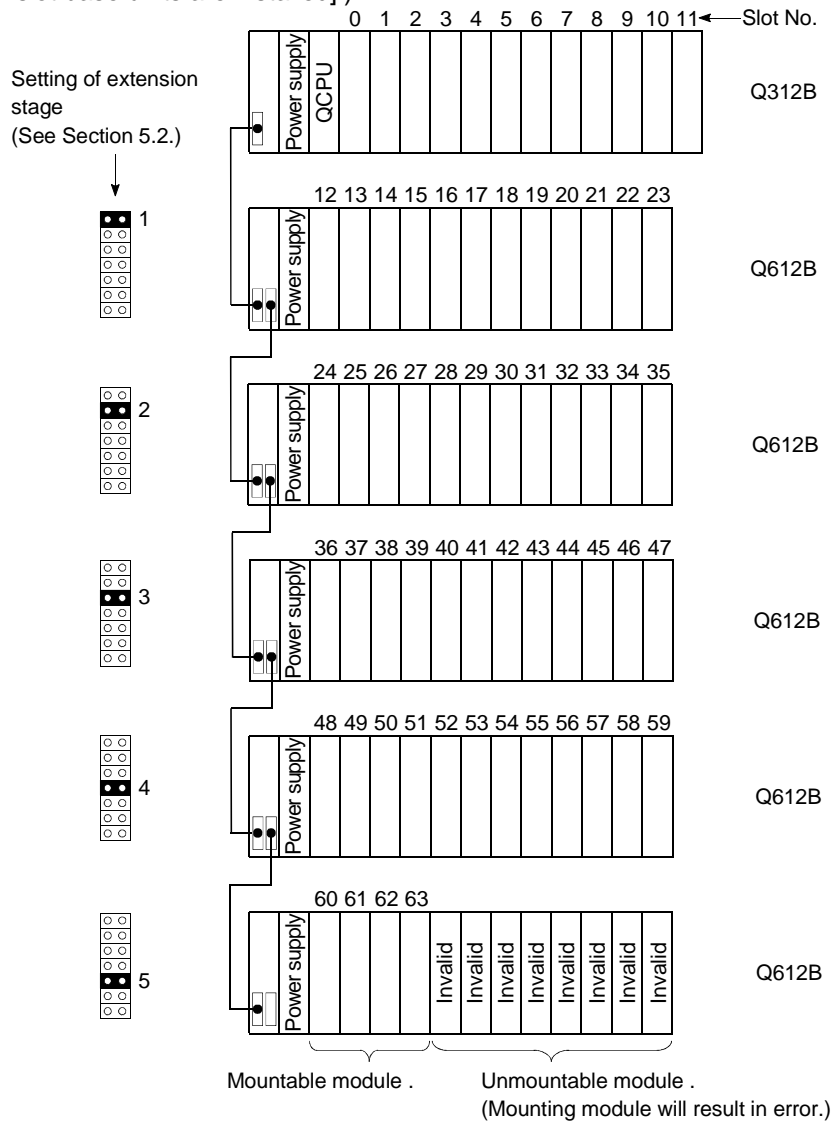
### 5.1 Relationship Between the Number of Stages and Slots of the Extension Base Unit

Process CPU allows the system configuration using eight base units: one main base unit and seven extension base units.

However, the number of available slots (modules) is limited to 64 slots including empty slots.

An error (SP. UNIT LAY ERR.) occurs when a module (input, output, or intelligent function module) is installed to the 65th or subsequent slots.

Be sure to install modules within the range of 64 slots. (An error does not occur as long as all modules are installed within the range of 64 slots, even if the total number of slots of the main and extension base units results in 65 slots or more [e.g. When 6 12-slot base units are installed].)



5.2 Installing Extension Base Units and Setting the Number of Stages

There are two types of extension base units: Q5□B/Q6□B for mounting of Q-Series modules.

(1) Setting order of the stage numbers for extension base units

Extension base units require the setting of the extension stage numbers (1 to 7) using the stage No. setting connector.

Assign the extension stage numbers starting from 1 to 7 to the extension base units in the connected order starting from the one connected to the main base unit.

(2) Cautions for assigning extension stage numbers to extension base units

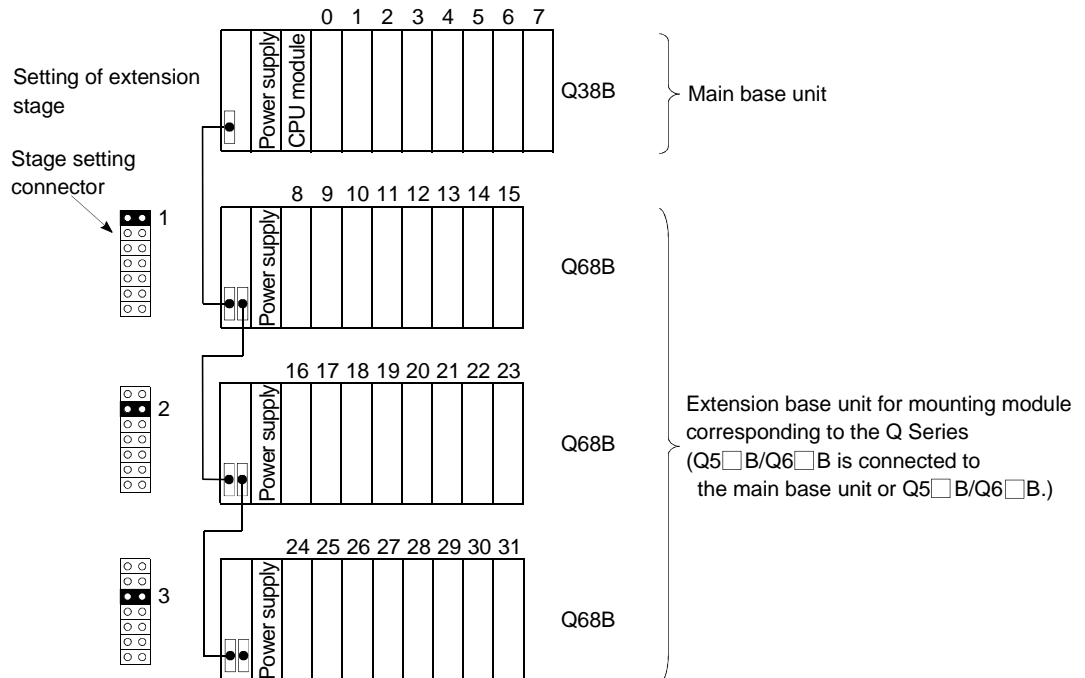
(a) Assign consecutive numbers to extension stages.

If you assign stage numbers to base units in "Auto" mode and assign some stage numbers to no modules, "0" is assigned to the skipped stage as the number of slots. Consequently, the number of empty slots does not increase. The skipped stage is also assigned with "0" of I/O point.

(b) It is impossible to set and use the same extension stage number with two or more extension base units.

(c) You cannot use the system if two or more connector pins are inserted to the stage setting connector.

On the contrary, you cannot use the system if no connector pin is inserted to the stage setting connector.



5.3 Base Unit Assignment (Base Mode)

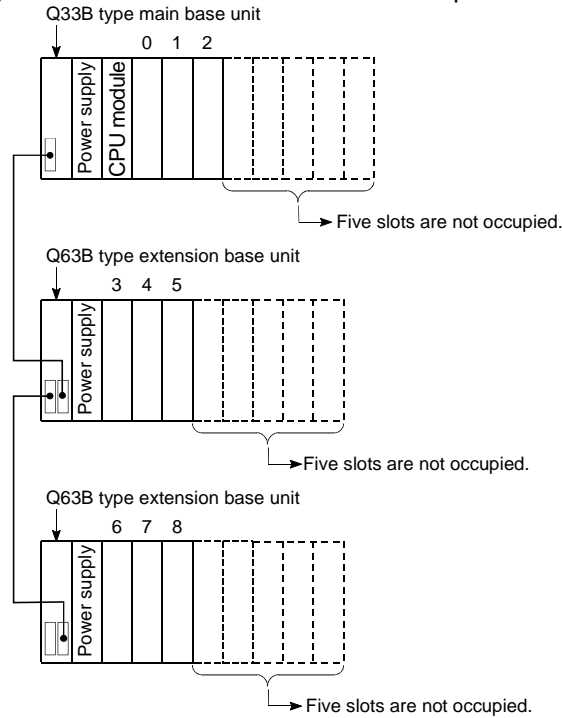
There are "Auto" and "Detail" modes to assign the number of modules can be mounted in the main and extension base units of Process CPU.

(1) Auto mode

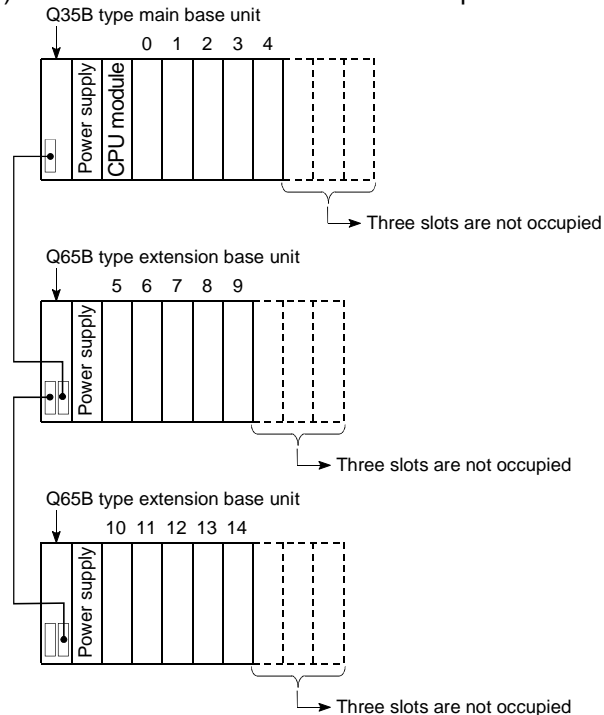
In Auto mode, the slot numbers are assigned to the main and extension base units according to the number of slots than can be occupied.

The I/O numbers are assigned according to the modules which can be mounted to the current base unit.

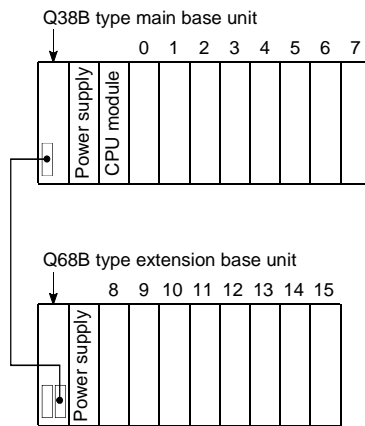
(a) For 3-slot base unit: 3 slots are occupied



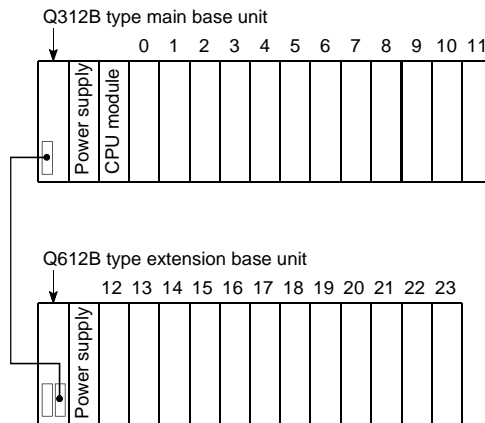
(b) For 5-slot base unit: 5 slots are occupied



(c) For 8-slot base unit: 8 slots are occupied



(d) For 12-slot base unit: 12 slots are occupied





(2) Detail mode

(a) In Detail mode, the number of mountable modules is assigned to the individual base units (main and extension base units) at the "I/O assignment" tab screen in the "(PLC) Parameter" dialog box.

Use this mode to match the number of slots to the one for the AnS Series base units (8 fixation).

(b) Cautions on setting the number of slots

The number of slots can be set regardless of the number of the module being used.

However, the number of slots must be set for all the base units in use.

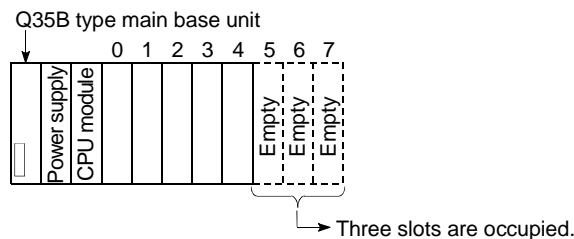
If the number of slot is not set for all the base units, I/O assignment may not work correctly.

The followings result if the preset number of slots differs from that of the installed base units.

1) When the designated number of slots is larger than that of the installed base unit:

Among the designated slots, those after the slots occupied by the installed base unit will be empty slots.

For example, when 8 slots are designated for a 5-slot base unit, 3 slots will be empty slots.



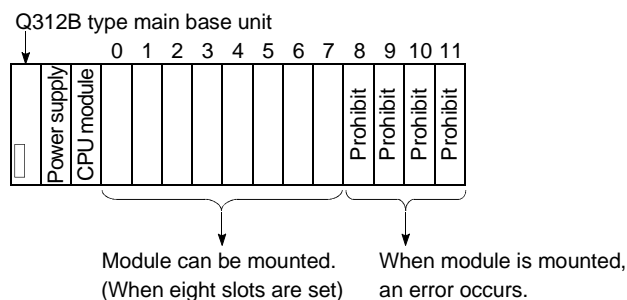
The number of points for the empty slots is the one designated at the "I/O assignment" tab screen in the "(PLC) Parameter" dialog box. (Default value is 16 points.)

2) When the designated number of slots is smaller than that of the base unit being used:

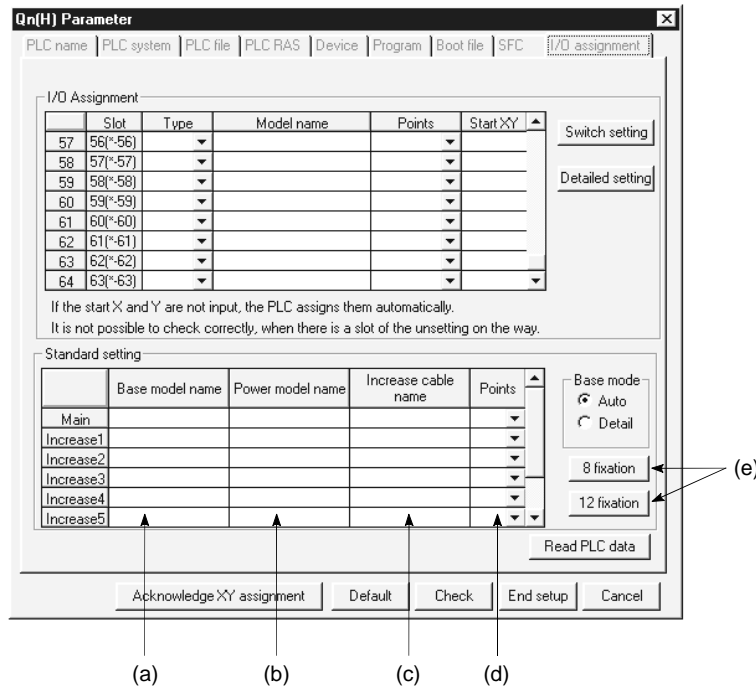
The slots other than those designated are disabled.

For example, when 8 slots are designated for a 12-slot base unit, the 4 slots on the right of the base unit are disabled.

(If a module is mounted to the prohibited slot, an error [SP. UNIT LAY ERR.] occurs.)



## (3) Setting screen and setting items for Base mode of GX Developer



- (a) **Base model name**  
Designate the model name of the installed base unit with 16 or less characters. Process CPU does not use the designated model name. (It is used as a user's memo or for parameter printing)
- (b) **Power model name**  
Designate the model name of the installed power supply module with 16 or less characters. Process CPU does not use the designated model name. (It is used as a user's memo or for parameter printing)
- (c) **Increase cable name**  
Designate the model name of the extension cable being used with 16 or less characters. Process CPU does not use the designated model name. (It is used as a user's memo or for parameter printing)
- (d) **Points (Used with Process CPU)**  
Select the number of points for the slot of the base unit being used from the followings:
- 2 (2 slots)
  - 3 (3 slots)
  - 5 (5 slots)
  - 8 (8 slots)
  - 10 (10 slots)
  - 12 (12 slots)
- (e) **8 fixation/12 fixation (Used with Process CPU)**  
Select either option to designate the number of slots for all base units to the same number.

5.4 What are I/O Numbers?

I/O numbers are used in sequence programs for importing ON/OFF data to Process CPU from outsides and outputting ON/OFF data from Process CPU to outsides.

Input (X) is used for the importing of ON/OFF data to Process CPU.

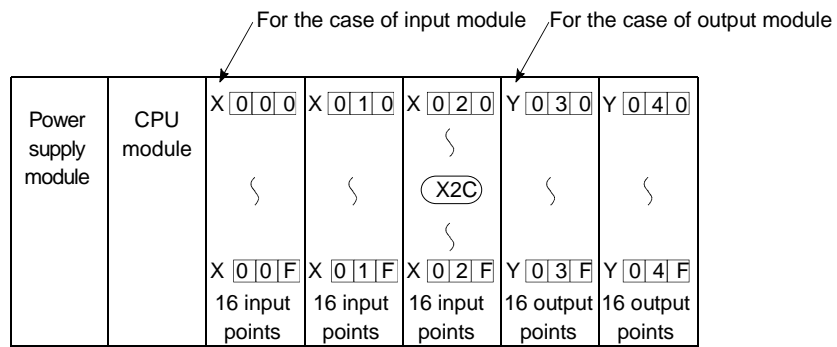
Output (Y) is used for outputting ON/OFF data from Process CPU.

I/O numbers are expressed as hexadecimal.

When using 16-point I/O modules, I/O numbers are consecutively assigned to the slots having □□0 to □□F, 16 points, as follows.

The module mounted in the base unit assigns the following:

- For the input module, "X" is assigned at the beginning of the I/O number.
- For the output module, "Y" is assigned at the beginning of the I/O number.



## 5.5 Concept of I/O Number Assignment

### 5.5.1 I/O numbers of main base unit and extension base unit

Process CPU assigns I/O numbers at power-on or reset according to the following items.

As a result, Process CPU can be controlled without performing I/O assignment using GX Developer.

To assign I/O numbers, follow the items below:

#### (1) Number of slots of base units

The numbers of slots of the main and extension base units are set according to the Base mode setting. (For Base mode, see Section 5.3.)

(a) In Auto mode, the number of slots is determined as the available number of modules mounted to each base unit.

For example, 5 slots are assigned to a 5-slot base unit, and 12 slots are assigned to a 12-slot base unit.

(b) In Detail mode, the number of slots is determined as the one designated at the "I/O assignment" tab screen in the "(PLC) Parameter" dialog box.

#### (2) Order of I/O number assignment

The I/O numbers are assigned to the modules from left to right consecutively, starting from 0H assigned to the module on the right of the Process CPU in the main base unit.

#### (3) Order of I/O number assignment for extension base units

The I/O numbers for extension base units continue from the last number of the I/O number of the main base unit.

The I/O numbers are assigned to the extension base units from left (I/O 0) to right consecutively, in the order in which the setting connectors of the extension base unit are set.

#### (4) I/O numbers of each slot

Each slot of base units occupies the points of I/O numbers of the mounted I/O modules or intelligent function modules.

When 32-point input module is mounted on the right of Process CPU, X0 to X1F are assigned as I/O numbers.

#### (5) I/O numbers of empty slots

If the base unit has empty slots mounted with no I/O modules or no intelligent function modules are mounted, the points designated at the "I/O assignment" tab screen in the "(PLC) Parameter" dialog box are assigned to the empty slots.

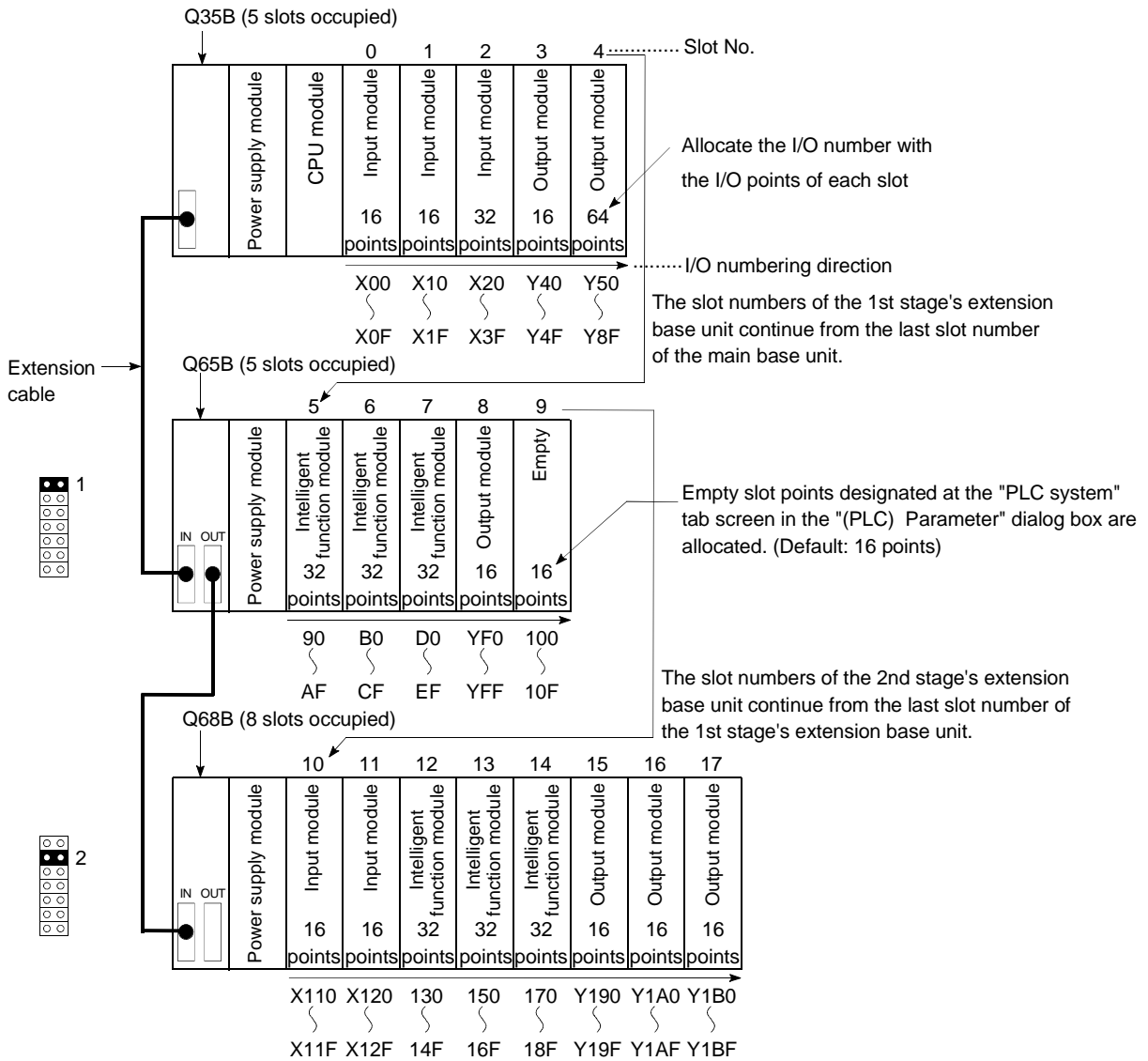
(Default value is 16 points.)

#### POINT

When the assignment of base units is conducted in Auto mode, the number of empty extension stages is not assured even if the extension stage is skipped at the stage number setting connector of the base unit. (Lower I/O numbers are assigned first.)

To reserve empty extension stages for future expansion, use the PLC parameter to set the base unit.

The following shows the example of the I/O number assignment when the base unit is set in Auto mode without I/O assignment:

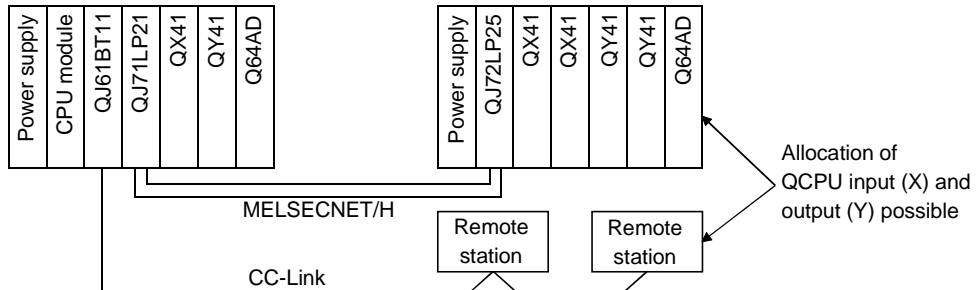


**POINT**

The above example shows the case where the intelligent function module has 32 I/O points. The number of I/O points may vary depending on the intelligent function module. Refer to the manual of the intelligent function module being used and check the number of the I/O points before assigning the I/O numbers.

5.5.2 Remote station I/O number

It is possible to allocate Process CPU device input (X) and output (Y) to remote station I/O modules and intelligent function modules and control the modules in the MELSECNET/H remote network, the CC-Link and other remote I/O systems.

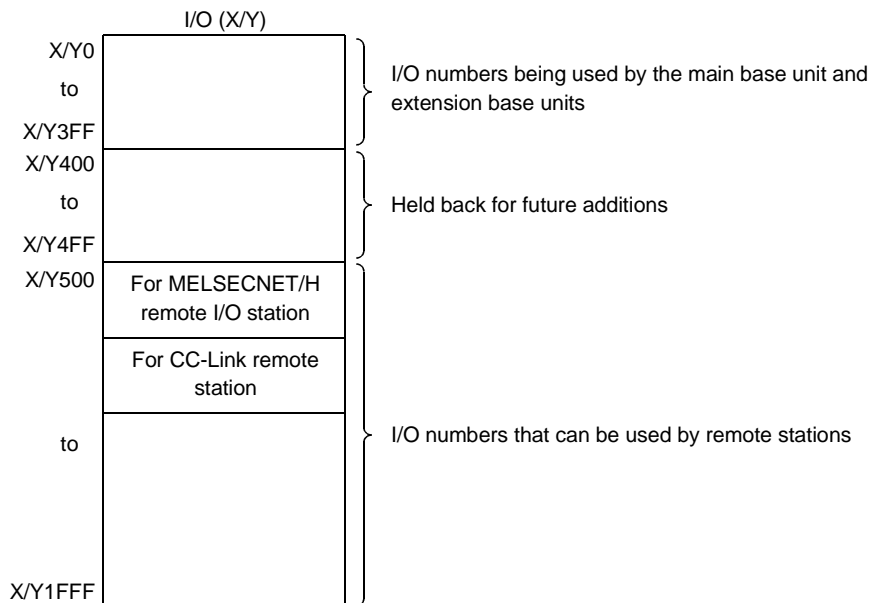


When using Process CPU device input (X) and output (Y) in remote stations, I/O numbers that succeed the numbers used by the main base unit and extension base units' I/O modules and intelligent function modules will be allocated.

For example, if X/Y0 to X/Y3FF are being used by the main base unit and extension base units' I/O modules and intelligent function modules, then numbers above X/Y400 can be used by the remote station.

However, the I/O numbers for remote stations should be set in consideration of additions to the main base unit and extension base units' I/O modules and intelligent function modules.

For example, if 1024 points from X/Y0 to X/Y3FF are being used by the main base unit and extension base units, and 256 points from X/Y400 to X/Y4FF are to be held back for use with future additions, then the situation shown in the diagram below is to be observed.



**POINT**

If network parameter setting is not made in the CC-Link system, 2048 points in the range from X/Y1000 to X/Y17FF are assigned to the master local module of the CC-Link having the lowest number.

**REMARK**

There is restriction on the order of allocating I/O numbers for MELSECNET/H remote I/O networks, CC-Link or other networks.

## 5.6 I/O Assignment by GX Developer

This section describes the I/O assignment using GX Developer.

### 5.6.1 Purpose of I/O assignment by GX Developer

I/O assignment by GX Developer is used under the following circumstances.

- (1) **Reserving points when converting to module other than 16-point modules**  
 You can reserve the number of points in advance so that you do not have to change the I/O numbers when the current module will be changed to one with a different number of occupied I/O points in the future.  
 For example, you can assign a 32-point I/O module to the slot where a 16-point I/O module is mounted at present.
- (2) **Preventing I/O numbers from changing when converting modules**  
 You can avoid the change in the I/O numbers when an I/O module other than 16-point module or intelligent function module is removed due to a malfunction.
- (3) **Changing the I/O numbers to those used in the program**  
 When the designed program's I/O numbers are different from the actual system I/O numbers, each module's I/O number of base units can be set to program-I/O number.
- (4) **Setting the input response time of input modules and interrupt modules (I/O response time)**  
 To match the input response time of the input modules and interrupt modules to the system, select "Type" at the "I/O assignment" tab screen in advance. (For details, see Section 7.7.)
- (5) **Setting the switch of intelligent function modules**  
 To set the switch of the intelligent function module, select "Type" at the "I/O assignment" tab screen in advance. (For details, see Section 7.8.)
- (6) **Setting outputs during Process CPU error**  
 To set the output status (retain/clear) of the output modules and intelligent function modules when the Process CPU stops the operation due to a stop error, select "Type" at the "I/O assignment" tab screen in advance.
- (7) **Setting Process CPU operation during a hardware error of intelligent function modules**  
 To set the Process CPU operation (continue/stop) during a hardware error of an intelligent function module, select "Type" at the "I/O assignment" tab screen in advance.

<b>POINT</b>
The I/O assignment is necessary for setting the response time of the input modules and the switch of intelligent function modules.

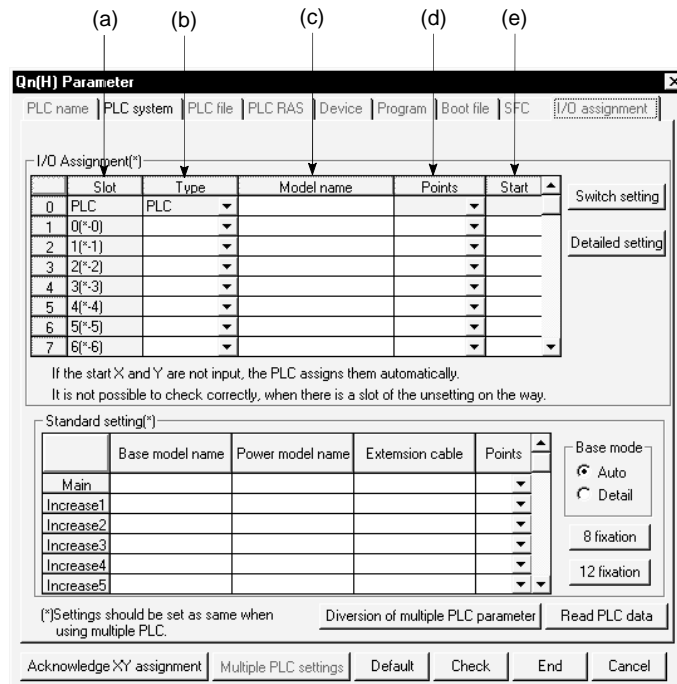
## 5.6.2 Concept of I/O assignment using GX Developer

## (1) I/O assignment for each slot

"Type" (module type), "Points" (number of I/O points), and "Start" (head I/O number) can be designated individually for each slot of the base unit.

For example, to change the number of I/O points of the designated slot, only the number of I/O points can be designated.

The items other than designated are set to the status where the base unit is installed. The I/O assignment is conducted at the "I/O assignment" tab screen in the "(PLC) Parameter" dialog box.



## (a) Slot

Displays the slot No. and the ordinal position of the slot in the base unit. If the base unit is not designated in Detail mode, the stage number of the base unit is shown as " \* ", and the ordinal number of a slot is counted from slot 0 of the main base unit.

## (b) Type (For Process CPU)

Select the type of module being mounted from the followings:

- Empty (Empty slot)
- Input (Input module)
- Hi Input (Q Series high speed module)
- Output (Output module)
- I/O Mix (I/O mixed module)
- Intelligent (Intelligent function module)
- Interrupt (Q Series interruption module)

If the type is not designated, the type of the actually mounted module is used.



## (c) Model name

Designate the model name of the mounted module with 16 or less characters. Process CPU does not use the designated model name. (It is used as a user's memo)

## (d) Points (Used with Process CPU)

To change the number of I/O points of each slot, select it from the followings:

- 0 (0 point)
- 16 (16 points)
- 32 (32 points)
- 48 (48 points)
- 64 (64 points)
- 128 (128 points)
- 256 (256 points)
- 512 (512 points)
- 1024 (1024 points)

If the number of I/O points is not designated for a slot, the one of the actually mounted module is used.

## (e) Start XY (Used with Process CPU)

1) When the I/O number of each slot is changed, you should designate the head I/O number according to the change.

If Start XY is not designated for a slot, the I/O number continuing from the last number of the currently designated slot is assigned.

2) Avoid the I/O number designation of each slot from overlapping the I/O numbers assigned by Process CPU.

An error (SP. UNIT LAY ERR.) occurs when the I/O numbers overlap.

## (2) Slot status after I/O assignment

When the I/O number is assigned to a slot, the assigned I/O number takes priority regardless of the actual installation of a module.

(a) If the designated number of I/O points is lower than that of the actually mounted I/O module, some I/O points of the mounted module are not used.

For example, if a slot where a 32-point input module is mounted is designated for a 16-point input module, the latter 16 points of the 32-point input module are disabled.

(b) If the designated number of I/O points is higher than that of the actually mounted I/O module, the points exceeding the points of the actually mounted module are set as dummies.

- (c) Be sure to set the same module type for the mounted module and the I/O assignment.

If the module type of the I/O assignment is different from that of the actually mounted module, the module may not work normally.

For the intelligent function module, make sure that the numbers of I/O points are the same.

Actually installed module	I/O assignment	Result
Input module	Output/Empty	Empty
Output module	Input/Empty	Empty
Input module/output module	Intelligent	Error (SP. UNIT LAY ERR.)
Intelligent function module	Empty	Empty
	Input/output	Error (SP. UNIT LAY ERR.)
Empty slot	Intelligent	No error occurs.

- (d) Be sure to assign the I/O numbers so that the last I/O number is within the range of FFF<sub>H</sub> or less. An error (SP. UNIT LAY ERR.) occurs when the last I/O number exceeds FFF<sub>H</sub>. (System monitor of GX Developer shows "\*\*\*" as an I/O address.)

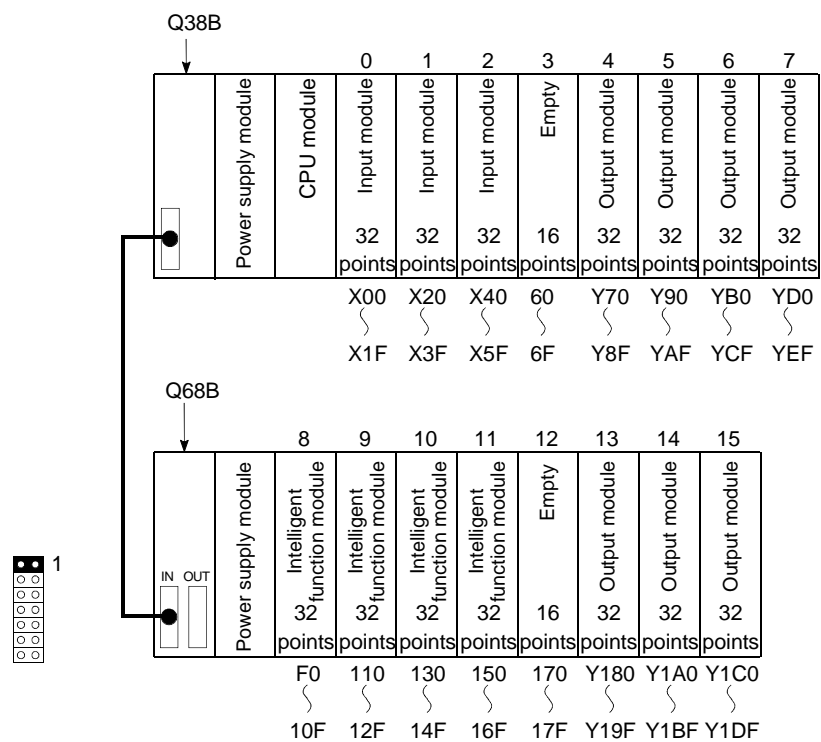
5.7 Examples of I/O Number Assignment

This section shows the examples of the I/O number assignment using GX Developer.

- (1) When changing the number of points of an empty slot from 16 to 32 points:

Reserve 32 points to the empty slot (slot No. 3) so that the I/O numbers do not change when a 32-point input module is mounted in the future. (The empty slot for slot No. 12 is not changed from 16 points.) \*1

- (a) System configuration and I/O number assignment before the I/O assignment with GX Developer



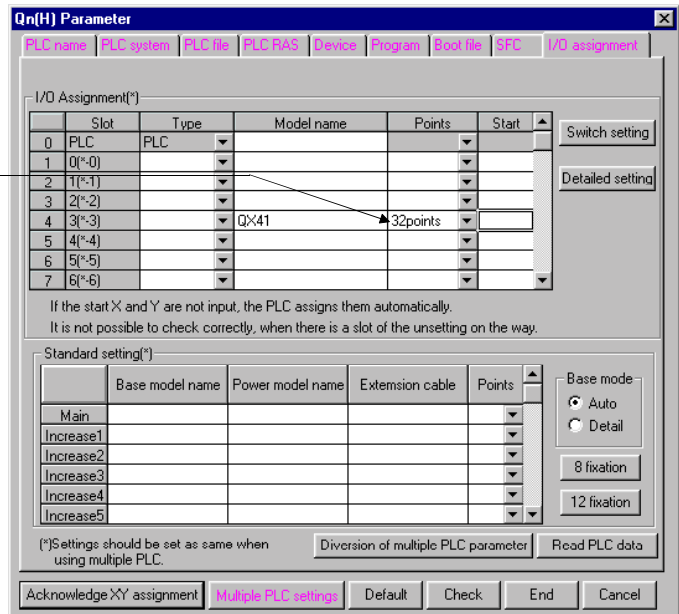
**REMARK**

\*1: This is the case where the number of points for an empty slot is set to 16 at the "PLC system" tab screen in the "(PLC) Parameter" dialog box.

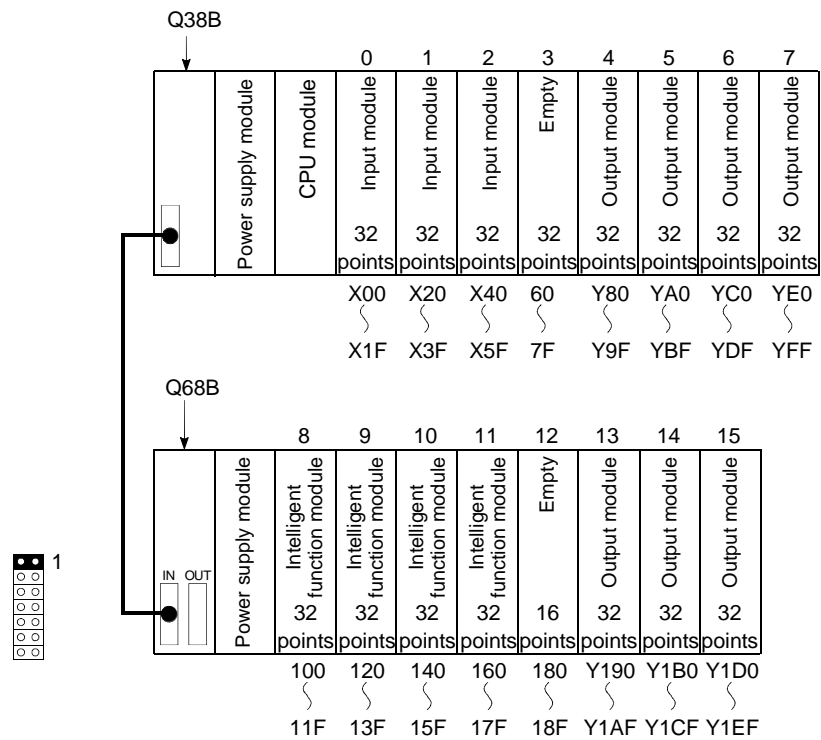
(b) I/O assignment with GX Developer

Designate slot No. 3 to "32 points" at the "I/O assignment" tab screen of GX Developer.

Select 32 points.  
(When the type is not selected, the type of the installed module will be selected.)



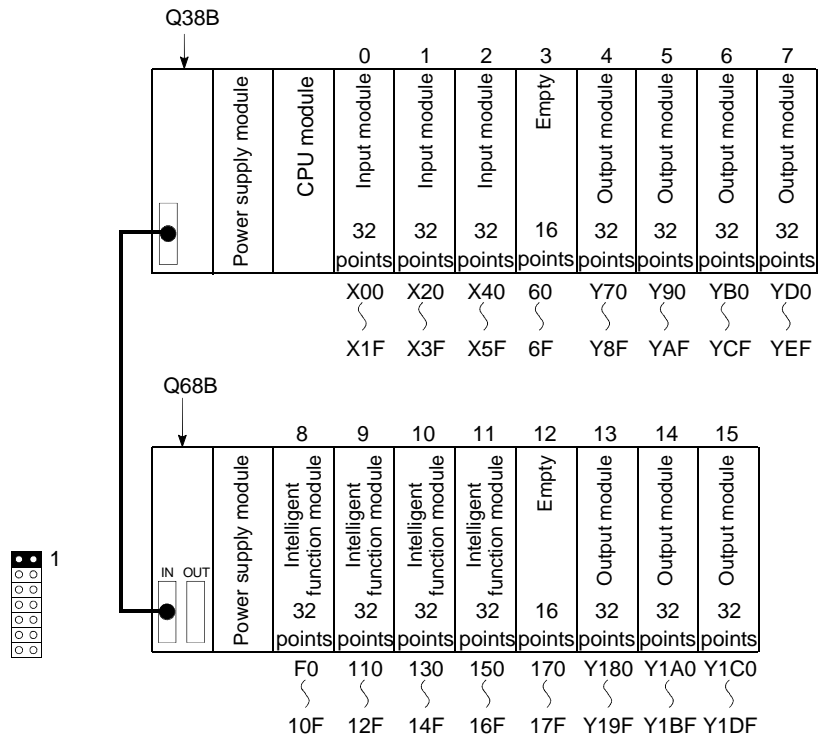
(c) I/O number assignment after the I/O assignment with GX Developer



(2) Changing the I/O number of slots

Change the I/O number of an empty slot (slot No. 3) to X200 through X21F so that the I/O numbers of slot No. 4 and later slots do not change when a 32-point input module is mounted to the empty slot (slot No. 3).

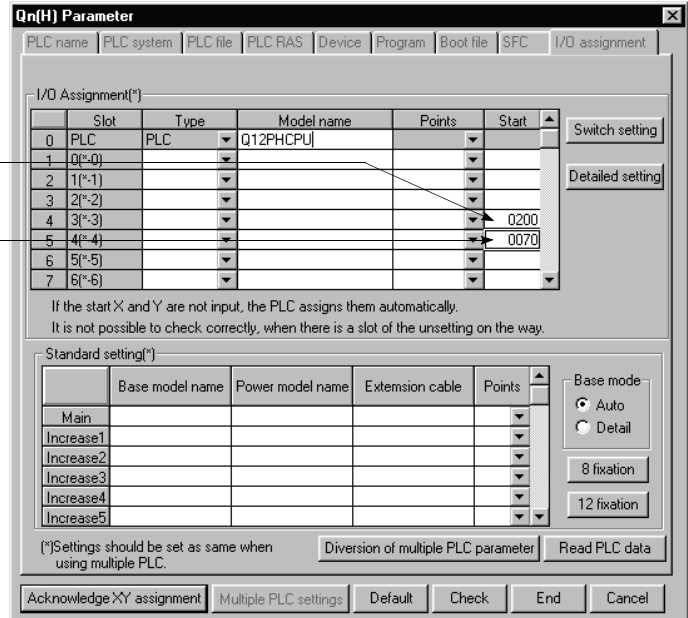
(a) System configuration and I/O number assignment before the I/O assignment with GX Developer



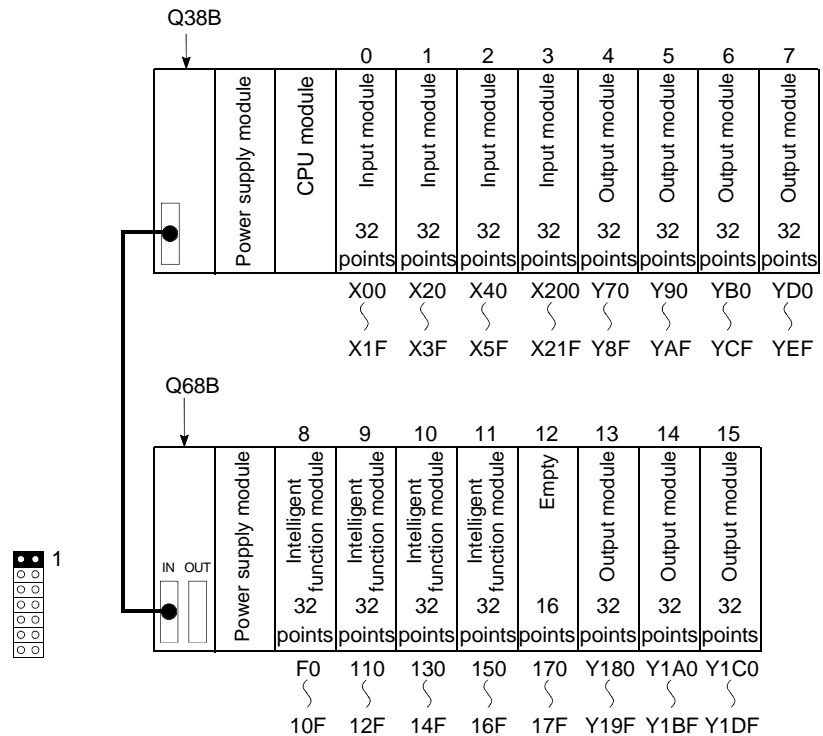
(b) I/O assignment with GX Developer

Designate the head I/O number of slot No. 3 to "200" and that of slot No. 4 to "70" at the "I/O assignment" tab screen of GX Developer.

"200" is designated as the head I/O number.  
 "70" is designated as the head I/O number.  
 (When the head I/O number is not designated, the I/O number following the 3rd slot will be assigned.)



(c) I/O number assignment after the I/O assignment with GX Developer



5.8 Checking the I/O Numbers

System monitor of GX Developer allows the check of the mounted modules of Process CPU and their I/O numbers. (For system monitor, refer to Section 7.18.)

## 6 PROCESS CPU FILES

### (1) Process CPU file type

(a) The Process CPU parameters, programs, comment data, etc. are assigned "file names" and "extension", and are then stored in the following memories:

- Program memory
- Standard ROM
- Memory card

When reading and writing this data from GX Developer to the Process CPU, files can be specified by type (parameter, program, comment, etc.) without regard to their extension. (GX Developer automatically assigns the appropriate extension for the file type which has been specified.)

(b) It is impossible to set and use the same extension stage number with two or more extension base units.

### (2) Process CPU file management

The use of different file and extension names permits multiple files to be stored in the Process CPU.

Because the Process CPU can also process a given program as one file, programs created can be managed individually according to their "designer", "process", or "function" by using different program file names.

Moreover, program execution is allowed for multiple programs stored in the Process CPU.

(See Chapter 4 for details on Process CPU program execution details.)

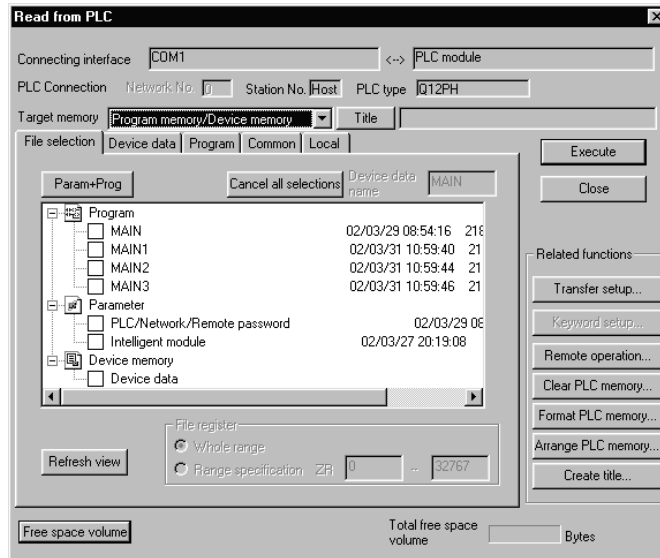
### (3) File written from GX Developer

The Process CPU stores files written from GX Developer in the memory (program memory/standard ROM/memory card).

## (4) File details

File name, file size and writing date, which are set when created with GX Developer, are added to every file written into Process CPU.

When monitoring the files by GX Developer, the files are displayed as shown below.



## (a) File name

- 1) The file name consists of the file name (max. 8 characters) and the extension (3 characters).

A file name of any file written from the GX Developer into the Process CPU will be displayed in uppercase characters on screen. When naming a file by using a sequence program, type a file name in uppercase characters.

An extension which corresponds to the file type designated when the file was written in the Process CPU by GX Developer is automatically appended to the file name.

- 2) The following Windows-reserved words cannot be used for a file name.
  - COM1 to COM9
  - LPT1 to LPT9
  - AUX
  - CON
  - PRN
  - NUL
  - CLOCK\$

## (b) Date &amp; time

The date & time when the file was written from GX Developer to the Process CPU is indicated.

The set date and time indicate the GX Developer-side date and time.

## (c) Size

The file size when written from GX Developer to the Process CPU is indicated in byte units. (To view the latest Process CPU data, click on the Update button.)

Files are stored in the Process CPU program file and standard ROM in 4-byte units (1 step), and in the memory card in 1-byte units.

When calculating a file's size, at least 64 bytes (136 bytes for programs) will be added to all user created files other than file registers.



## 6.1 About the Process CPU's Memory

### (1) User Memory

A user memory can be created within the memory of the Process CPU by using the GX Developer/sequence program.

The Process CPU has the following built-in memories:

- Program memory
- Standard RAM
- Standard ROM

A memory card can be mounted on the Process CPU to increase the size of a user memory.

- (a) Programs used for arithmetic operations of the Process CPU are stored in the program memory. Programs stored in the standard ROM or on a memory card are booted (read) into the program memory for arithmetic operation. A batch of parameters and programs stored in the program memory can be copied to the standard ROM/memory card (Flash card).
- (b) Parameters and programs are stored in the standard ROM. These data are used for ROM operation of the Process CPU.
- (c) File register and local device data is stored in the standard RAM. The use of file registers in the standard RAM will enable high speed access as is the case with data registers.

#### (d) Memory card

A memory card can be connected to a memory card interface of the Process CPU. This allows the read/write of data. The Process CPU supports three types of memory cards: SRAM card, Flash card, and ATA card.

- 1) The SRAM card allows the write/read of programs through a sequence program in the following cases where:
  - File registers are used in excess of the standard RAM capacity.
  - Sampling trace data is stored.
  - Failure history data is stored.The use of file registers allows the write/read of data at 1017 k points in a sequence program.
- 2) The Flash card allows only the read through a sequence program. The Flash card is useful when data written by the Process CPU is read through a sequence program but no change is made to the data. The use of file registers allows a sequence program to read a maximum of 1018 k points of data written by the Process CPU.
- 3) The ATA card is used for PLC user data (general-purpose data). Access to PLC user data stored on the ATA card can be made in CSV format/binary format by using a file access instruction (e.g. FWRITE) in a sequence program.

(2) Types of Data Stored in the Process CPU Memory or on the Memory Card

The table below shows the type of data stored in a standard RAM/standard ROM or on a memory card.

Data Name	Process CPU Built-In			Memory Card (RAM)	Memory Card (ROM)		Remarks
	Program Memory	Standard RAM	Standard ROM	SRAM Card	Flash Card	ATA Card	
Parameter	○	×	○	○	○	○	1 data/drive
Intelligent function module parameter	○	×	○	○	○	○	1 data/drive
Program	⊙	×	○ *1	○ *1	○ *1	○ *1	
Device comment	○ *2	×	○	○	○	○ *3	
Device initial value	○	×	○	○	○	○	
File register	×	○ *5	×	○	○ *4	×	
Local device	×	○	×	○	×	×	1 data/CPU module
Debug data	×	×	×	○	×	×	
Failure history data	×	×	×	○	×	×	
PLC user data	×	×	×	×	×	○ *6	

⊙ : Needed, ○ : Stored, × : Not stored

**REMARK**

- \*1: Boot the program memory to execute a program.
  - \*2: Data can be written by operating from the GX Developer. Device comments cannot be used in an instruction of a sequence program.
  - \*3: The read from a sequence program requires several scans.
  - \*4: A sequence program allows the read only. No data can be written through access from a sequence program.
  - \*5: A standard RAM hold a single file.
  - \*6: Data can be written or read with the following instructions:
    - S.FREAD (allows the batch read from a specified file on a memory card)
    - S.FWRITE (allows the batch write to a specified file on a memory card)
- The table below shows file names and extensions of data files stored in the Process CPU or on a memory card.

Data name	File name
Parameter	PARAM.QPA
Intelligent function module parameter	IPARAM.QPA
Program	***.QPG
Device comment	***.QCD
Device initial value	***.QDI
File register	***.QDR
Local device	***.QDL
Debug data	***.QTD
Failure history data	***.QFD
PLC user data	***.***

The \* portions can be named by the user.

**(3) Drive Number**

- (a) The Process CPU uses drive numbers to control standard RAMs, standard ROMs, and memory cards. GX Developer specifies a selected memory (standard RAM, standard ROM or memory card) to read/write parameters and program files from to the Process CPU. There is no need to specify the drive number when using the GX Developer.
- (b) The table below shows the drive numbers used to specify a selected memory (program memory, standard RAM, standard ROM or memory card) when using a sequence program. The drive number must be used to specify a selected memory when the read/write is made through access from a serial communication module.

Memory		Drive Number
Process CPU built-in	Program memory	0
	Standard RAM	3
	Standard ROM	4
Memory card (RAM)	SRAM card	1
Memory card (ROM)	Flash card	2
	ATA card	2

**(4) Memory Capacity and Formatting**

The following table shows the size of a memory of the Process CPU and whether to format a memory.

		Q12PHCPU	Q25PHCPU	Whether to Format
Standard RAM		256 kbyte		*1
Program memory		124 k steps (496 kbyte)	252 k steps (1008 kbyte)	*1
Standard ROM		496 kbyte	1008 kbyte	*2
Memory card	SRAM card	Q2MEM-1MBS: 1 Mbyte Q2MEM-2MBS: 2 Mbyte		Required. (Use the GX Developer or a personal computer)
	Flash card	Q2MEM-2MBF: 2 Mbyte Q2MEM-4MBF: 4 Mbyte		Not required.
	ATA card	Q2MEM-8MBA: 8 Mbyte Q2MEM-16MBA: 16 Mbyte Q2MEM-32MBA: 32 Mbyte		Required. (Use the GX Developer or a personal computer)

\*1: If the memory is in the initial status or it is unstable due to low voltage of the battery (Q6BAT), formatting automatically starts upon power-on or resetting of the PLC. However, format with GX Developer before starting operation.

\*2: The standard ROM is used in ROM formation of the program memory and therefore formatting is unnecessary for it.

## 6.2 Program Memory

### (1) What is the Program Memory?

- (a) The Process CPU's program memory is an internal RAM that stores programs executed by the Process CPU.
- (b) The data storage in the program memory is backed up by Process CPU's built-in batteries (Q6BAT).
- (c) Before using the Process CPU for the first time, the program memory must be formatted by GX Developer.

For details on the formatting procedure by GX Developer, refer to GX Developer manuals.

#### POINT

- (1) Before using the Process CPU for the first time, the program memory must be formatted by GX Developer.  
For details on the formatting procedure by GX Developer, refer to GX Developer manuals.
- (2) Programs are stored in the program memories in 1 k step units.

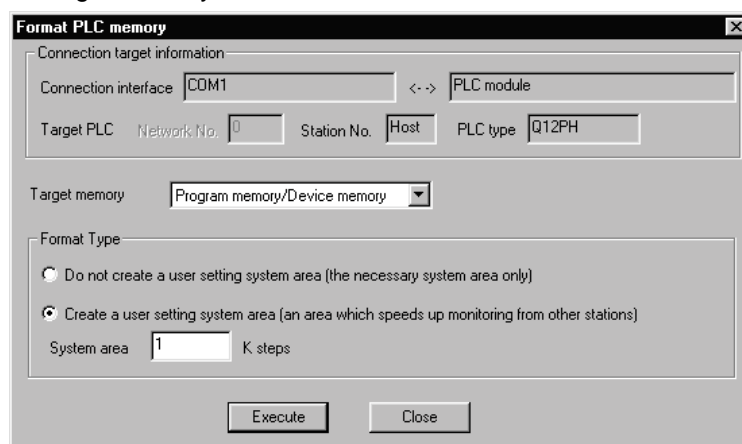
### (2) Data Storage

Data on parameters and programs can be stored in the program memory. For the types of data stored in the program memory, see Section 6.1.

### (3) Format

#### (a) Formatting

Choose "Online" → "Format PLC memory" to open the Format PLC memory dialog box. Select "Program memory/Device memory" from the Target Memory list box.



(b) Memory capacity after formatting

The memory capacity of the program memory after formatting is as follows.

Table 6.1 Memory capacity after formatting \*1

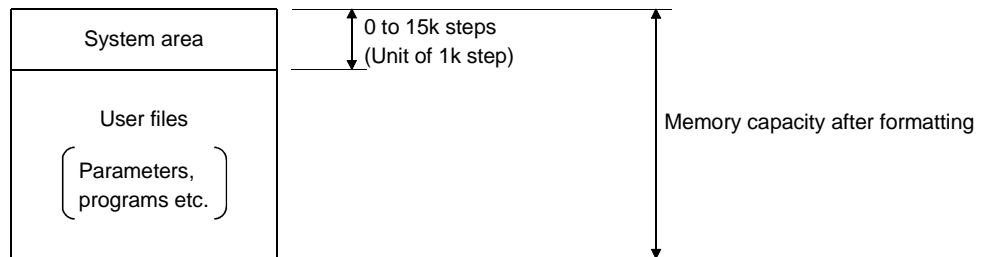
Model Name	Memory * <sup>2</sup>	Max. Number of Files Stored
Q12PHCPU	124 k steps (507904 bytes)	124 files
Q25PHCPU	252 k steps (1032192 bytes)	252 files * <sup>3</sup>

(c) Precautions for formatting

1) Formatting of program memory

The Process CPU program memory can only be used after being formatted by GX Developer.

When formatting the program memory, designate whether or not a system area is to be allocated for user settings. (Up to 16 k steps (in 1 k-step units) can be allocated for the user setting system area.)



2) System area setting

If RS-232 and USB interfaces are connected to GX Developer, the system area user setting data is used for registering monitor data from the GX Developer connected to serial communication module.

The allocation of space for system and user-defined areas will make it much easier to perform monitoring operation by operating from the GX Developer connected to the serial communications module.

Although the designation of a user setting area speeds up monitoring from the GX Developer connected to serial communication module, it also reduces the amount of space available for user files.

**REMARK**

- 1)\*1: This table shows an example in which 0 k step is allocated for a system area.
- 2)\*2: In computing the memory capacity, 1 step is equal to 4 bytes.
- 3)\*3: Maximum number of executable program is 124. More than 124 programs can not be executed.

### 6.3 About the Standard ROM

- (1) What is the standard ROM?
- (a) The standard ROM is used for the ROM operation of the Process CPU.
  - (b) Programs stored in the standard ROM can be used after being read (boosted) to the program memory in accordance with the setting made at the "Boot file" tab screen in the "(PLC) Parameter" dialog box.
  - (c) The standard ROM does not need formatting.
  - (d) Writing into standard ROMs is performed with the GX Developer's on-line "PLC Writing" (flash ROM) of "Create Program Memory ROM" (see Section 6.6.1.) It is also possible to write in a standard ROM from the memory card with "Automatic writing in the standard ROM" without using GX Developer.

#### POINTS

- (1) Before writing data to a standard ROM, all previous data stored in the standard ROM are erased. Therefore, all data stored in a standard ROM must be read out and copied into the program memory at first. Then, read through and modify it as necessary. Then, write the modified data back into a standard ROM at a time. Please note that an error may occur if data stored in the standard ROM is used in a sequence program, with data being written in the standard ROM.
- (2) For details on the formatting procedure by GX Developer, refer to GX Developer manuals.
- (3) Programs are stored in the standard ROM in 1 k step units.

#### (2) Data Storage

A standard ROM stores data such as parameters and programs.  
See Section 6.1 for the data to store in the standard ROM.

#### (3) Memory Capacity

Table 6.2 shows the memory capacity of standard ROMs.

Table 6.2 Memory Capacity

Model Name	Memory Capacity *2	Max. Number of Files Stored
Q12PHCPU	124 k steps (507904 bytes)	124 files
Q25PHCPU	252 k steps (1032192 bytes)	252 files

#### REMARK

In computing a memory capacity, 1 step is equal to 4 bytes.

## 6.4 About the Standard RAM

### (1) What is the standard RAM?

- (a) The standard RAM is used when using file registers or local devices without a memory card being mounted on the Process CPU.
- (b) The standard ROM must be formatted by using GX Developer when using the Process CPU for the first time. Refer to the GX Developer manual for details on the formatting method.
- (c) Data can be written into the standard RAM by using the online function: "Write to PLC."

### (2) Stored Data

A standard RAM holds two files: file register file and local device file. Any other files cannot be written into a standard RAM.

### (3) Format

- (a) Formatting  
To format a standard RAM, choose "Online" → "Format PLC memory" and then select "Standard RAM" in the "Target memory" list box. See Section 6.2 for the PLC Memory Format dialog box.
- (b) Memory capacity after formatted  
Table 6.3 shows the memory capacity of a "formatted" standard RAM.

Table 6.3 Memory Capacity

CPU Type	Number of Files Stored	Number of Files Stored	
		File Register	Local Device
Q12PHCPU	128 k words (256 kbytes)	1	1
Q25PHCPU	128 k words (256 kbytes)	1	1

### (4) Precautions

When setting file registers and local devices in the standard RAM, memory capacity is secured in 1024 byte units.

## 6.5 Memory Card

### (1) Memory card

- (a) A memory card is used to expand the size of an internal memory of the Process CPU.
- (b) There are three types of memory cards for use in the Process CPU: SRAM card, Flash card, and ATA card.

POINTS
(1) Before the memory card can be used for the first time, the memory card must be formatted by GX Developer. For details on the formatting procedure by GX Developer, refer to the GX Developer manuals.
(2) Before writing data into a Flash card, all previous data stored on the Flash card are erased. For this reason, to write data into the Flash card, you must first read and copy all previous data stored in the Flash card before writing necessary data. Please note that an error may occur if data stored in the Flash card is used in a sequence program, with data being written on the Flash card.
(3) Programs are stored in the memory card in 512 byte (128 steps) step units.

### (2) Stored Data

A memory card holds parameter and program data. See Section 6.1 for the types of data stored in a memory card.

### (3) Format

- (a) Formatting  
To format a memory card, choose "Online" → "Format PLC memory" and then select "Memory card (RAM)" or "Memory card (ROM) in the "Target memory" list box. See Section 6.2 for the PLC Memory Format dialog box.
- (b) Memory capacity after formatted  
Table 6.4 shows the memory capacity of a "formatted" memory card.

Table 6.4 Memory Capacity

Memory Card Type	Memory Capacity	Number of Files Stored
Q2MEM-1MBS	1011.5 kbyte	256 files
Q2MEM-2MBS	2034 kbyte	288 files
Q2MEM-2MBF	2035 kbyte	288 files
Q2MEM-4MBF	4079 kbyte	288 files
Q2MEM-8MBA	7940 kbyte	512 files
Q2MEM-16MBA	15932 kbyte	512 files
Q2MEM-32MBA	31854 kbyte	512 files

### (c) Precautions

For a formatted memory card, a "memory card information" area is automatically created on the memory card. This means that available space could be decreased by the size of the newly created "memory card information area."



## 6.6 Writing Data to the Standard ROM or the Flash Card

### 6.6.1 Writing Data to the standard ROM or to the Flash card using GX Developer

The "write to PLC" function in the GX Developer Online menu does not allow the user to write files into a standard ROM or on a Flash card. For writing files to a standard ROM or to a Flash card by operating from GX Developer, GX Developer Online menu provides two functions: "Write the program memory to ROM" and "Write to PLC (Flash ROM)."

#### (1) Write the program memory to ROM

- (a) The "Write the program memory to ROM" function allows a batch of files stored in a program memory to be written to a standard ROM or a Flash card. This function is used to debug the programs stored in the program memory.
- (b) When the "Write a memory to ROM" function is executed, all files stored in the standard ROM or Flash card are erased before a batch of files stored in a program memory are written. No files can be added to the standard ROM or Flash card.
- (c) The memory capacity of a standard ROM or Flash card is the same as that of a program memory. A memory of a larger size than the memory capacity of a program memory cannot be used.
- (d) To execute the "Write the program memory to ROM" function, set the length of GX developer's time-check to 60 seconds or longer. Shorter time-check may cause a time-out on the GX Developer side. To execute the "Write the program memory to ROM" function via the CC-Link network by operating from a GX Developer at a local station, set the length of CC-Link's CPU monitoring time (SW0A) to 60 seconds or longer. The default is 90 seconds. Use the default value when making the setting.

#### (2) Write to PLC (Flash ROM)

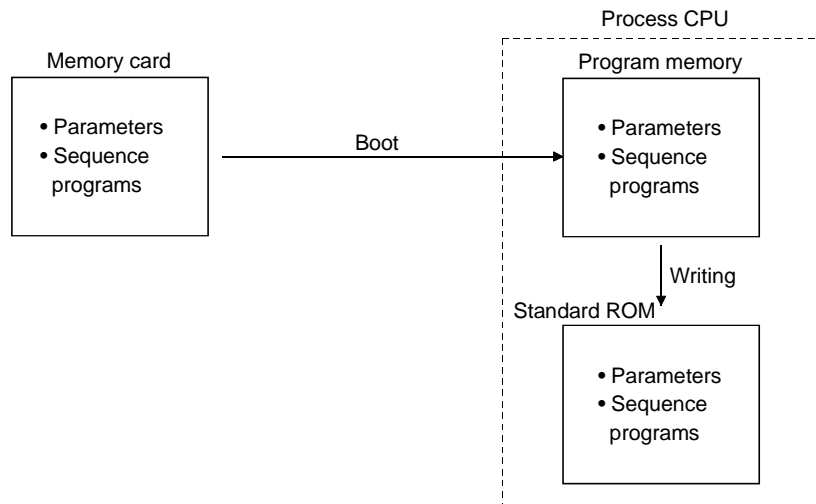
- (a) The "Write to PLC (Flash ROM)" function is used to write a batch of files specified by GX Developer to a standard ROM or Flash card.
- (b) The "Write to PLC (Flash ROM)" function can fill all available space in a standard ROM or Flash card. If a program that contains a small number of steps is written to a Flash card, it will take long to fill the Flash card with programs. When a RS-232 interface is mounted at Q2MEM-4MBF, a baud rate of 115.2k bps takes about 14 minutes. To write data to a Flash card, increase a baud rate or use a USB interface. If the "Write to PLC (Flash ROM)" function is executed from a local station, communication time will be longer.
- (c) To execute the "Write to PLC (Flash ROM)" function, set the length of GX Developer's time-check to 60 seconds or longer. Shorter time-check may cause a time-out on the GX Developer side. To execute the "Write to PLC (Flash ROM)" function via the CC-Link network by operating from GX Developer at a local station, set the length of CC-Link's CPU monitoring time (SW0A) to 60 seconds or longer. The default is 90 seconds. Use the default value when making the setting.

- (d) When the "Write to PLC (Flash ROM)" function is executed, all files stored in the standard ROM or on the Flash card are erased before a batch of files specified by GX Developer are written. No files can be added to the standard ROM or Flash card. To add new files to old files, read all the old files from Process CPU and write them again into the Process CPU.
- (e) The "Write to PLC (Flash ROM)" function can be executed when the Process CPU is in RUN status. However, for the following cases, execute the "Write to PLC (Flash ROM)" function after the Process CPU enters into STOP status.
  - 1) The file registers of the Flash card is used in a sequence program.
  - 2) The file registers are used in a sequence program by setting the file register to "set not to use" in the PLC parameter.If the "Write to PLC (Flash ROM)" function is executed when the Process CPU is in RUN status, an error may occur and the Process CPU may stop running.
- (f) While the "Write to PLC (Flash ROM)" function is executed, the read/write cannot be made from other modules. This may cause a time out on the side of other modules.

POINT
When the Process CPU is expanded to STOP status and Write to PLC (Flash ROM) is being performed, do not set it in RUN status. RUN cannot be performed normally during Write to PLC (Flash ROM). Perform RUN after Write to PLC (Flash ROM) is completed.

### 6.6.2 Automatic write to standard ROM (Auto Download all Data from Memory card to Standard ROM)

"Automatic write to standard ROM" function writes the parameters and sequence programs stored on the memory card into the Process CPU's standard ROM without using GX Developer. (The writing of parameters and sequence programs into the memory card is performed by GX Developer (Version 7.10L or later.) With this function, the parameters and sequence programs are booted from the memory card to the program memory, and the booted parameters and sequence programs are then written from the program memory into the standard ROM, as shown below.



"Automatic write to standard ROM" is used to change the Process CPU programs that perform ROM operations with the standard ROM. Overwriting in the standard ROM is performed by GX Developer, but using "Automatic write to standard ROM" moves the memory card in which the parameters and the changed programs are written to the Process CPU, so that they are written into the standard ROM from the memory card.

The followings are necessary for "Automatic write to standard ROM".

- Set "Automatic write to standard ROM settings" in the "(PLC) Parameters dialog box".
- Memory card on which the parameters and programs are stored.
- Memory card mounted onto the Process CPU and the Process CPU switch settings.

#### POINT

Perform "Automatic write to standard ROM" after the Process CPU control is suspended.

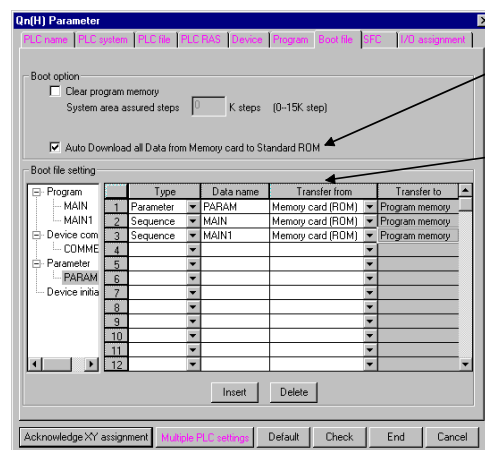
A suspension error (BOOT OK (Error Code: 9020)) occurs when automatic write to standard ROM is completed.

It is necessary to reset the Process CPU or restart, the power supply to the PLC after "Automatic write to standard ROM" is completed.

(1) Execution procedure for "Automatic write to standard ROM"  
Observe the following procedure for "Automatic write to standard ROM".

(a) Operations with the GX Developer (Settings for "Automatic write to Standard ROM")

- 1) Check "Auto Download all Data from Memory card to Standard ROM" at the "Boot file" tab screen in the "(PLC) Parameter" dialog box. Set the parameters and programs to be booted. (Set the "Transfer from" to "Standard ROM".)



Check "Auto Download all Data from Memory card to Standard ROM"

Set the "Transfer from" to the "Standard ROM"

- 2) Store the setup parameters and the programs to be booted in the memory card.

(b) Operations with Process CPU (Automatic write to standard ROM)

- 1) Switch off the power supply to the PLC.
- 2) Mount the memory card that contains the parameters and programs to be booted onto the Process CPU.
- 3) Set the parameter valid drive to the mounted memory card with the CPU's dip switches as follows:
  - When a SRAM card is mounted: SW2 : ON, SW3 : OFF
  - When a Flash/ATA card is mounted: SW2 : OFF, SW3 : ON
- 4) Switch on the power supply to the PLC.  
Boot the file specified with the parameter to the program memory from the memory card. Write the content of the program memory to the standard ROM when the boot is completed.
- 5) "BOOT" LED will flicker when automatic write to standard ROM is completed, and the Process CPU will assume a suspension error status.
- 6) Switch off the power supply to the PLC.
- 7) Remove the memory card, and then set the parameter valid drive to the standard ROM with the Process CPU's dip switches as follows:
  - Standard ROM: SW2 : ON, SW3 : ON

(c) The parameters and programs will be booted from the standard ROM to the program memory to enable actual operations when the PLC is switched on.

## (2) Precautions

This section indicates the precautions for performing "Automatic write to standard ROM"

- (a) If the file to be booted from the memory card shares the same name as a file in the program memory, the memory card data will be overwritten. Also, if the file to be booted from the memory card does not share the same name as a file in the program memory, it will be added to the program memory. The "FILE SET ERROR (Error code: 2401)" will occur at this time if the capacity of the program memory is exceeded.
- (b) It is possible to select whether to perform the boot after the program memory has been cleared, or perform the boot without clearing the program memory when booting from the memory card to the program memory. Performing the boot after the program memory has been cleared when "Automatic write to standard ROM" prevents the program memory from overflowing during the boot.
- (c) The "Auto Download all Data from Memory card to Standard ROM" setting at the "Boot file" tab screen is valid only when the Process CPU parameter valid drive is to "Memory Card".  
The "Auto Download all Data from Memory card to Standard ROM" setting at the "Boot file" tab screen is disabled if the parameter valid drive is set to "Program Memory" or "Standard ROM".

## 6.7 Executing Standard ROM/Memory Card Programs (Boot Run)

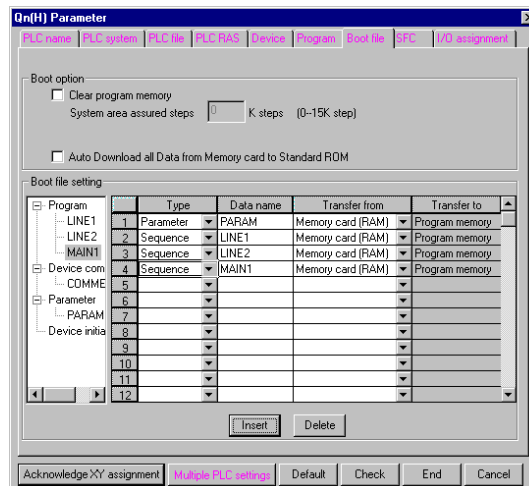
## (1) Executing Process CPU programs

- (a) The Process CPU executes programs stored in the program memory. The Process CPU does not perform operation of programs stored in the standard ROM or memory cards.
- (b) To execute programs stored in the standard ROM and memory card, designate file names to be booted (read) to program memory at the "Boot file" tab screen in the "(PLC) Parameter" dialog box. Programs with file names designated there are booted from the standard ROM/memory card to program memory and executed when the power is turned ON or the Process CPU is reset.

## (2) Preparation for Boot Run

Perform the following steps in preparation for boot run:

- (a) Create a program using GX Developer.  
Create a program used for the boot run.
- (b) Select a boot file using GX Developer.  
Select a boot file at the "Boot file" tab screen in the "(PLC) Parameter" dialog box.



- (c) Make the Process CPU hardware setting.  
Set Process CPU Dip switches to specify a parameter-driven drive.
- (d) Insert a memory card.  
Insert a memory card in a slot if you want to store parameters or programs on the memory card during the boot run.
- (e) Write parameters and programs using GX Developer.  
Write parameters on the parameter-driven drive. Write a program to the memory specified at the "Boot file" tab screen in the "(PLC) Parameter" dialog box.
- (f) Execute a program.  
Reset the Process CPU with the RESET/L.CLR switch. After the boot run is completed in the specified memory, the "BOOT" LED lights up.

### (3) Changing Program Files While the Process CPU is in the Run Status.

(a) While the Process CPU is in RUN status, addition/change/deletion of program files from the standard ROM or memory card to the program memory can be made by using any of the following instructions in a sequence program.

- PLOAD (Loading program from memory card)
- PUNLAOD (Unloading program from program memory)
- PSWAP (Load + Unload)

For details on the PLOAD, PUNLAOD and PSWAP instructions, refer to the QCPU (Q Mode)/QnACPU Programming Manual (Common Instructions).

(b) Even if a program file is changed while the Process CPU is in RUN status, the settings specified at the "Program" tab screen the "(PLC) Parameter" dialog box will remain unchanged. When the Process CPU is in STOP status, the settings made at the "Program" tab screen in the "(PLC) Parameter" dialog box must be adjusted to any changes (addition, change or deletion of program names) made when the Process CPU was in RUN status.

If no adjustment is made at the "Program" tab screen in the "(PLC) Parameter" dialog box, an error may occur when the Process CPU enters into RUN status from STOP status.

### (4) Precautions for Executing Programs in the Standard ROM/Memory Card

(a) For boot run, store parameters (PLC parameters) of the boot file setting in a standard RAM or memory card. If parameters are stored in a program memory and a parameter valid drive is set to "Program Memory", the boot file setting made in the "(PLC) Parameter" dialog box is ignored. As a result, a boot run is not performed when power is turned on or when the PLC is reset.

(b) If programs are written in the program memory during RUN status while a boot run is performed from a memory card (RAM), any change made will be reflected in the programs stored on the memory card (RAM). For details on the writing of programs during RUN status, see Section 7.10.

(c) If programs are written in the program memory during RUN status while a boot run is performed from a standard ROM/memory card (ROM), any change made will not be reflected in the programs stored in the standard ROM or the memory card (ROM).

(d) At the "Boot file" tab screen in the "(PLC) Parameter" dialog box, set the maximum number of boot files to the number of files stored in the program memory. The number of boot files will be decreased by one in the following cases where:

- A header is specified.
- A PLC parameter in which a boot file setting is made is booted.

(e) If boot operation is made under the following conditions, it may take maximum 200 ms for each 1k steps (4kbyte) during boot sequence.

- To boot from an ATA card.
- To boot from standard ROM with an ATA card mounted.

- (f) If the program memory is changed when a sequence program is written in the program memory and PLC is turned on or reset, boot operation mode may be selected.

If the "BOOT" LED is lit on the front panel of the Process CPU, the boot operation mode is selected.

Cancel the boot operation mode with the following procedure.

- 1) Write parameters, in which no boot file settings are made, into the program memory.
- 2) Using the DIP switch of the CPU module, set "program memory" for the valid drive setting. (DIP switch setting: SW2: OFF. SW3: OFF)
- 3) Turn off and on the PLC or reset the CPU module.  
(After the procedure, the settings given in steps 1) and 2) become valid.)

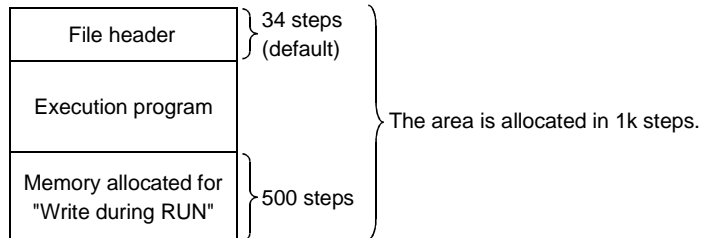


### 6.8 Program File Configuration

#### (1) Program File Configuration

- (a) Program files consist of a file header, an execution program, and allocate memory allocated for "Write during RUN".

Program file configuration



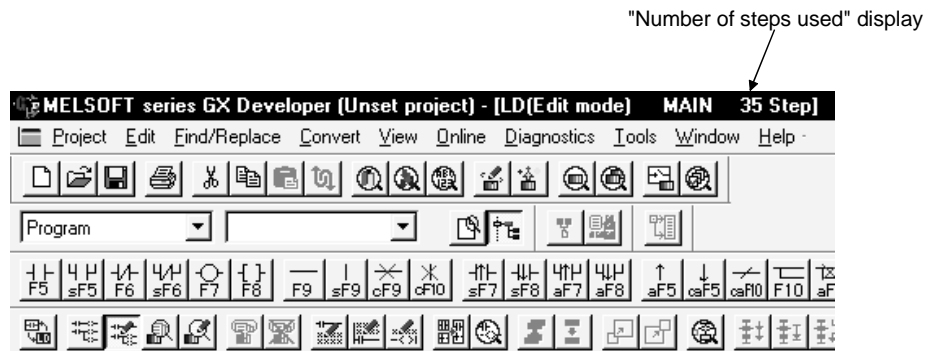
- (b) As shown below, the size of a program stored in the Process CPU includes all the above components.

- 1) File header: The file name, file size, and file creation data, etc., are stored in this area.  
The file header size is fixed to 34 to 35 steps (136 to 140 bytes).  
(Default: 34 steps)
- 2) Execution program: The created program is stored in this area.  
1 step is 4 bytes.
- 3) Memory allocated for "Write during RUN": This area is used when write during RUN that write during RUN increases the number of steps is executed from GX Developer.  
Default value is set to 500 steps (2000 bytes).  
The number of memory allocated for "Write during RUN" can be changed using the online write to PLC program.  
The number of memory allocated for "Write during RUN" can be redefined if the number of memory allocated is not sufficient for write during RUN. (See Section 7.10.1.)

#### (2) The size of the program displayed by GX Developer

During programming by GX Developer, the program size (the total of the file header size and the number of created program steps) is displayed as the number of steps as shown below.

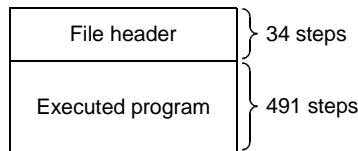
During programming, the size of the program created is displayed.



**PRECAUTIONS**

- 1) The program capacity displayed during programming with GX Developer is the sum of file header and executed program capacities and does not include the capacity of steps secured for write during RUN.
- 2) Since a file is stored on the program memory in 1k step units, the program capacity displayed during programming with GX Developer may differ from the capacity of the program file on the Process CPU.

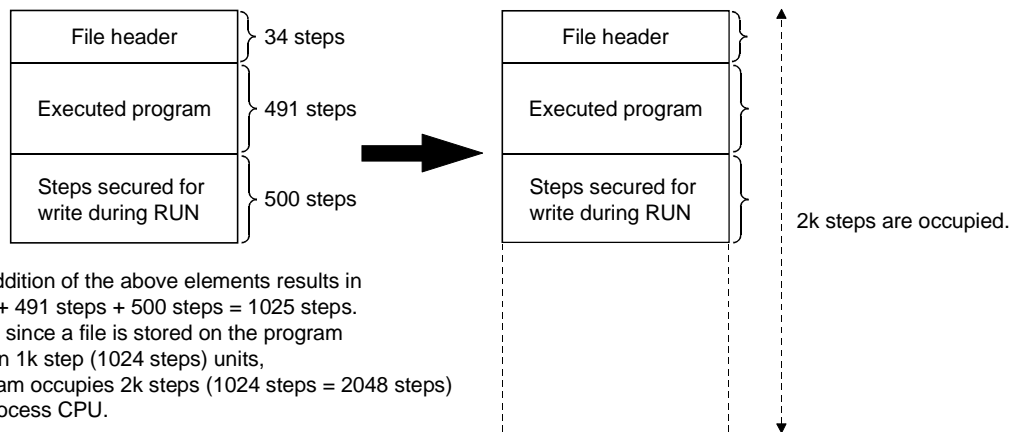
(Example) The capacity of a program whose executed program part has 491 steps is displayed on GX Developer as shown below. (File header is fixed at 34 steps)



Display on GX Developer:  
34 steps + 491 steps = 525 steps

Status of File on GX Developer

However, when the above program is written to the Process CPU, it occupies 2k steps on the Process CPU. The reason is as shown below.



Simple addition of the above elements results in 34 steps + 491 steps + 500 steps = 1025 steps. However, since a file is stored on the program memory in 1k step (1024 steps) units, the program occupies 2k steps (1024 steps = 2048 steps) on the Process CPU.

Status of File on Process CPU

## 6.9 GX Developer File Operation and File Handling Precautions

## 6.9.1 File operation

GX Developer online operation allows the files which are stored in the program memory, standard ROM and memory card, to perform the file operations in the table below.

However the available file operations vary according to the presence or absence of a password (registered by GX Developer), the Process CPU "write protect" switch setting status, and the Process CPU RUN/STOP status.

Table 6.5 File Operations from GX Developer

File Operation	Operation Enabled/Disabled				Operation Description
	A*	B*	C	D	
Read from PLC	○	△	○	○	Files are read from concerned memory.
Write to PLC	△	△	×	○	Files are written to the program memory or SRAM card.
Verify with PLC	△	△	○	○	Verify the target memory and the GX Developer's file.
Write the program memory to ROM	△	△	×	○	Write a batch of files from the program memory to the standard ROM or Flash card.
Write to PLC (Flash ROM)	△	△	×	○	Write a batch of files from GX Developer to the standard ROM or Flash card.
Delete PLC data	△	△	×	×	A file stored in memory is deleted.
Format PLC memory	○	○	×	×	Memory formatting is executed.
Arrange PLC memory	○	○	×	×	Memory files which are no longer contiguous are re-organized to make them contiguous.
Write during RUN in the ladder mode	△	△	×	○	Write changes made in the ladder mode into the program memory.

○ : Execution enabled, △ : Execution enabled with some restrictions, × : Execution disabled

**REMARK**

- 1) The codes (A, B, C, D) used at the "operation enabled/disabled" item in the above table are explained below.

Table 6.6 Operation enabled/disabled

Code	Description
A	When "write prohibit" password is registered in a file
B	When "read/write prohibit" password is registered in a file
C	When the Process CPU's "system protect" switch is ON
D	When Process CPU RUN status is in effect

- 2)\*: Execution is allowed only when the passwords match.

## 6.9.2 File handling precautions

## (1) Power OFF (or reset) during program operation

- (a) If power is switched OFF during a file operation which will not cause a file shift, the memory data will not be lost.
- (b) If files and data in the memory of the Process CPU is backed up using the battery (Q6BAT), the program memory data will not be lost when the power is switched OFF during the following file operations which cause a file shift.
- File size change
  - PLC memory arrangement
  - New file creation
  - Writing a program file during the RUN status
  - Writing a program in excess of memory allocated for 'Write during RUN'
  - Reading a file with the PLOAD instruction

Files stored in the memory card will not be lost unless the memory card is removed from the Process CPU while the power is OFF.

**POINT**

If the above operations are done, the half-processed data will be stored in the Process CPU internal memory, and will be restored when power is switched ON again. A battery backup is required in order to save internal memory data for this reason.

## (2) Simultaneous access of a single file from multiple GX Developers

The Process CPU permits access to a single file from a single GX Developer. When access to the same file is made from multiple GX Developers, the file is accessible only when the current processing is completed by the GX Developer prior to the next processing.

**REMARK**

For details on the PLOAD instruction, refer to the QCPU (Q Mode)/QnACPU Programming Manual (Common Instructions).

## 6.9.3 File size

The file size differs with the types of files used. When a program memory, standard RAM, standard ROM, and memory card are used, calculate the size of a file by referring to the table 6.7 shown below.

Space for file storage is available as shown below:

- Program memory, standard ROM: 4096 bytes (1 k steps)
- Memory card: 512 bytes

If a file is transferred from a memory card to a program memory during a boot run, the size of available memory is changed after the file was transferred.

Table 6.7 List of File Size

Function	Estimated File Size (in bytes)
Drive header	64
Parameter	Default: 564 (increased by the parameter setting) For Reference: <ul style="list-style-type: none"> <li>• Boot setting to <math>70 + (18 \times (\text{Number of files}))</math></li> <li>• With the MELSECNET/H setting to maximum 4096 / units increased</li> <li>• With Ethernet setting to maximum 922 / units increased</li> <li>• With CC-LINK setting to maximum 251 / units increased</li> </ul>
Sequence program	$136 + (4 \times (\text{Number of steps}))$
Device comment	$74 + (\text{Total of comment data size of each device})$ <ul style="list-style-type: none"> <li>• Comment data size of a device = <math>10 + 10250 \times a + 40 \times b</math></li> <li>• a: quotient of <math>(\text{Number of device points}) / 256</math></li> <li>• b: remainder of <math>(\text{Number of device points}) / 256</math></li> </ul>
Device init	$66 + 44 \times n + 2 \times (\text{Total number of device points specified in the device initial value setting})$ <ul style="list-style-type: none"> <li>• n : specified number of device initial values</li> </ul>
File register	$2 \times (\text{Number of file register points})$
Sampling trace data	$362 + (20 + 2 \times (\text{Number of word device points}) + (\text{Number of bit device points}) / 8) \times (\text{Number of traces}) + 12 \times (\text{Device range}) * 1$
Failure history data	$72 + 54 \times (\text{Number of failures stored})$
SFC trace data	Maximum 48 k (in 1 k units)
Local device	$70 + 6 (\text{Type of specified device}) + 2 \times ((\text{total number of M and V points}) / 16 + (\text{D points}) + 18 \times (\text{Total points of T, ST and C}) / 16) \times (\text{number of programs}) * 1$ <ul style="list-style-type: none"> <li>• Symbols "M, V, D, T, ST, and C" stand for the following devices:  M: internal relay  V: edge relay  D: data register  T: timer  ST: relative timer  C: counter</li> </ul>

\*1: Round down the fractional portions of  $(\text{bit devices})/8$ ,  $(\text{total number of M and V points})/16$ , and  $(\text{total number of T, ST and C points})/16$ .

An example for calculating the amount of memory capacity required when writing the parameters and sequence programs in the program memory is shown below.

### (1) Writing file

File name	Program capacity *2
PARAM.QPA (parameter)	—
MAIN.QPG (sequence program)	5000 steps (20000 bytes)
SUB.QPG (sequence program)	11500 steps (46000 bytes)

\*2: Indicates the program capacity displayed with GX Developer (total number of file headers and created program steps.) (See Section 6.8.)

### (2) Writing conditions

- (a) Parameter: Default setting (564 bytes)
- (b) Secured writing steps during RUN: Default setting (500 steps (2000 bytes))

### (3) File memory capacity calculations

File name	File capacity (units: bytes)		Memory capacity *3
PARAM.QPA	564		4,096 bytes / 1 k steps
MAIN.QPG	Sequence program capacity	20,000	24,576 bytes / 6 k steps
	Secured writing steps during RUN	2,000	
	Total	22,000	
SUB.QPG	Sequence program capacity	46,000	49,152 bytes / 12 k steps
	Secured writing steps during RUN	2,000	
	Total	48,000	
File memory capacity total			77,824 bytes / 19 k steps

\*3: A program memory capacity in 4096 byte (1 k step) units is secured.

## 7 FUNCTION

Function of Process CPU module is as follows:

## 7.1 Function List

Functions of Process CPU are listed below:

Item	Description	Reference section
Online module change	This function is used to change the Q series analog or I/O module online.	* 1
Auto tuning function	Auto tuning is designed to make the initial setting of the PID constants. Auto tuning can be used with a relatively slow-response system, e.g. temperature control using the S.PID or S.2PID instruction.	* 2
Constant scan	This function executes the program in a set time interval regardless of the program scan time.	Section 7.2
Latch function	This function maintains the device data when performing the reset operation during power off.	Section 7.3
Output status selection function for transition from STOP status to RUN status	This function selects the output Y status (output before STOP/output after the calculation execution) when the CPU module is set from STOP status to RUN status.	Section 7.4
Clock function	This function executes the CPU module internal clock.	Section 7.5
Remote operation	This function operates the CPU module from a remote place.	Section 7.6
Remote RUN/STOP	This function stops and starts operating the CPU module.	Section 7.6.1
Remote PAUSE	This function stops the CPU module operation while retaining the output (Y) of the CPU module.	Section 7.6.2
Remote RESET	This function resets the CPU module when the CPU module is in a STOP status.	Section 7.6.3
Remote latch clear	This function clears the latch data of the CPU module when the CPU module is in a STOP status.	Section 7.6.4
Input response time selection for input module compatible with Q Series	The response time of the input module compatible with Q Series can be selected from 1 ms, 5 ms, 10 ms, 20 ms and 70 ms with this function. (Default: 10 ms)	Section 7.7.1
Input response time selection for high speed input module compatible with Q Series	The response time of the high speed input module compatible with Q Series can be selected from 0.1 ms, 0.2 ms, 0.4 ms, 0.6 ms and 1 ms with this function. (Default: 0.2 ms)	Section 7.7.2
Input response time selection for interrupt module compatible with Q Series	The response time of the interrupt module compatible with Q Series can be selected from 0.1 ms, 0.2 ms, 0.4 ms, 0.6 ms and 1 ms with this function. (Default: 0.2 ms)	Section 7.7.3
Switch setting of intelligent function module compatible with Q Series	Use this function for various settings of the intelligent function module. (Refer to each intelligent function module for the details of the setting.)	Section 7.8
Monitoring function	This function monitors the status of programs and devices on the CPU module by operating from the GX Developer.	Section 7.9
Set monitor conditions	This function monitors using a fine timing of the CPU module.	Section 7.9.1
Monitor/test local Devices	This function monitors and/or tests the local devices of the designated program using the GX Developer.	Section 7.9.2
Turn ON/OFF external I/O	This function forcibly turns the external I/O of the CPU module on or off from the GX Developer.	Section 7.9.3
Write during RUN	This function writes programs when the CPU module is in the RUN status.	Section 7.10
Measure execution time	This function displays the processing time of a program being executed, the number of times to execute an interrupt program, and the execution time of a program.	Section 7.11
Program list monitor	This function displays the processing time of a program being executed.	Section 7.11.1
Interrupt program monitor	This function displays the number of times to execute an interrupt program.	Section 7.11.2
Scan time measurement	This function measures the execution time of a program between selected steps.	Section 7.11.3
Sampling trace function	This function samples specified device data from the CPU module at a specified timing.	Section 7.12
Multiple-user debugging function	This function enables multiple users to debug programs by using several GX Developers.	Section 7.13
Watch dog timer	This function monitors operational delays caused by CPU module's hardware and program errors.	Section 7.14
Self-Diagnosis function	This function enables the CPU module to check for failures.	Section 7.15
Failure history	This function stores a failure history of diagnosis results in the memory.	Section 7.16
System protect	This function prevents the programs from being modified from GX Developer, serial communication module or like.	Section 7.17
Password registration	This function provides read/write protection for files stored in the CPU module against access from the GX Developer.	Section 7.17.1
Remote password	A function to prevent illegal access from external sources with serial communication modules and Ethernet modules.	Section 7.17.2
System display	This function connects to the GX Developer and monitors system configuration.	Section 7.18
LED display	This function enables the front-mounted LEDs to indicate the operating conditions of the CPU module.	Section 7.19
LED display	This function indicates the normal or abnormal operating conditions of the CPU module.	Section 7.19.1
Preference setting	This function sets failure preferences to turn off LED displays.	Section 7.19.2
Module service interval time read	This function monitors the access interval time (time between the access acceptance of the CPU module and the next access acceptance) of the intelligent function module, network module or peripheral device.	Section 7.20

\*1: Refer to Section 4.6 of the Process CPU User's Manual (Hardware Design/Maintenance and Inspection).

\*2: Refer to Chapter 13 of the Process CPU Programming Manual (Process Control Instructions).

7.2 Constant Scan

(1) What is Constant Scan?

The scan time differs because the processing time differs depending on whether the instruction, which is used in the sequence program, is executed or not.

Constant scan is a function to execute the sequence program repeatedly while maintaining the scan time at a constant time.

Because I/O refresh is made prior to execution of the sequence program, use of the constant scan function helps maintain the I/O refresh interval at a constant rate even if the sequence program execution time varies.

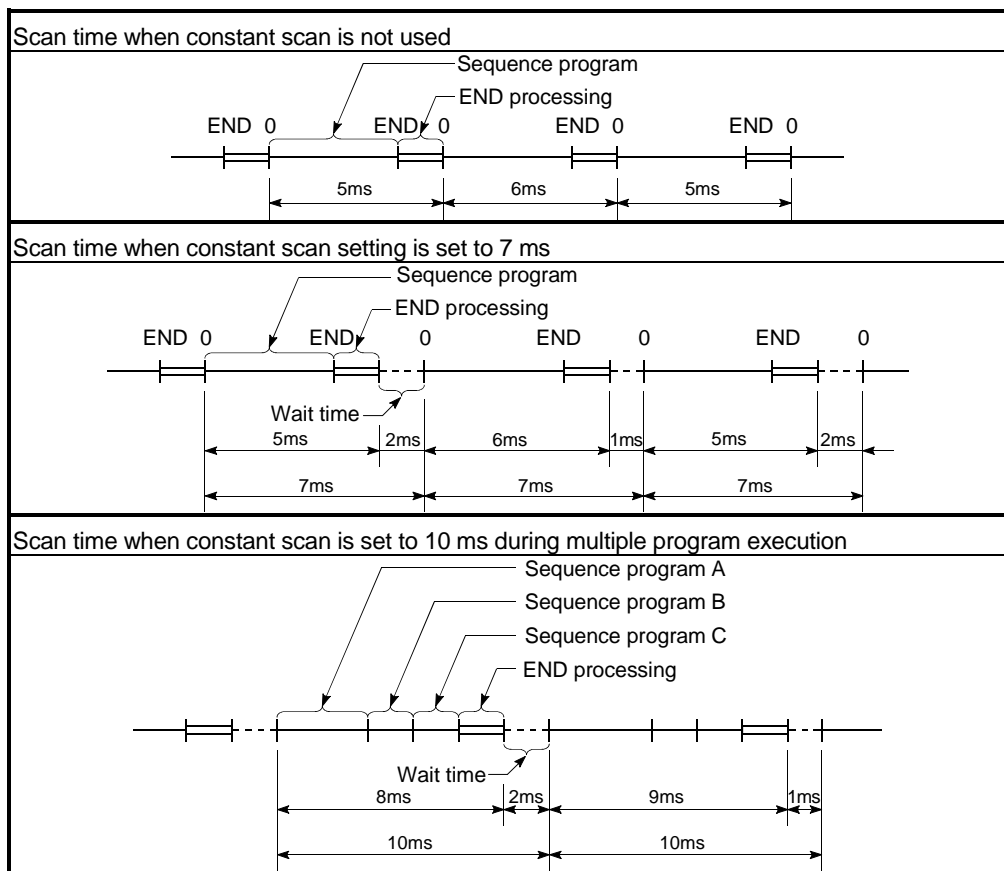


Fig. 7.1 Constant scan operation

**REMARK**

When using a low speed execution type program, the constant scan function setting or low speed execution type program execution time must be set.



(2) Setting the constant scan time

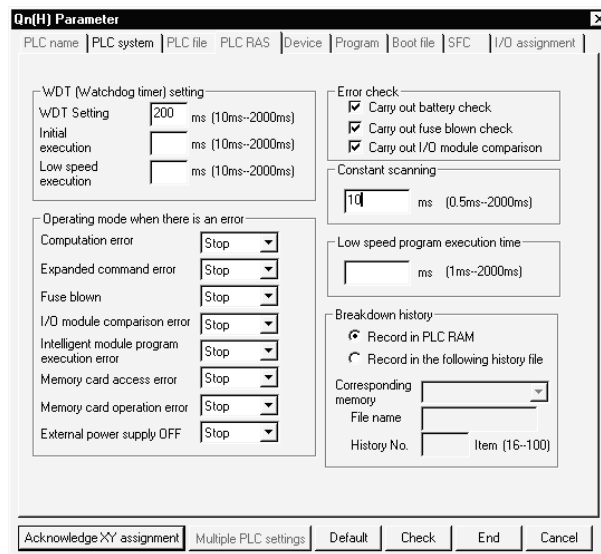
- (a) The constant scan time is set at the "PLC RAS" tab screen in the "(PLC) Parameter" dialog box.

The constant scan can be set in the range of 0.5 ms to 2000 ms.

A setting can be made in 0.5 ms units.

- When executing constant scan, set the constant scan time.
- When not executing a constant scan, leave the constant scan time blank.

[Example] When the constant scan is set to 10 ms.



- (b) Set the set time of the constant scan longer than the maximum scan time of the sequence program. Also, set the constant scan set time shorter than the WDT set time.

$$(WDT \text{ Set Time}) > (\text{Constant Scan Set Time}) > (\text{Sequence Program maximum Scan Time})$$

If the sequence program scan time is longer than the constant scan set time, the Process CPU detects PRG.TIME OVER (an error code: 5010), the sequence program is executed with the scan time by ignoring the constant scan.

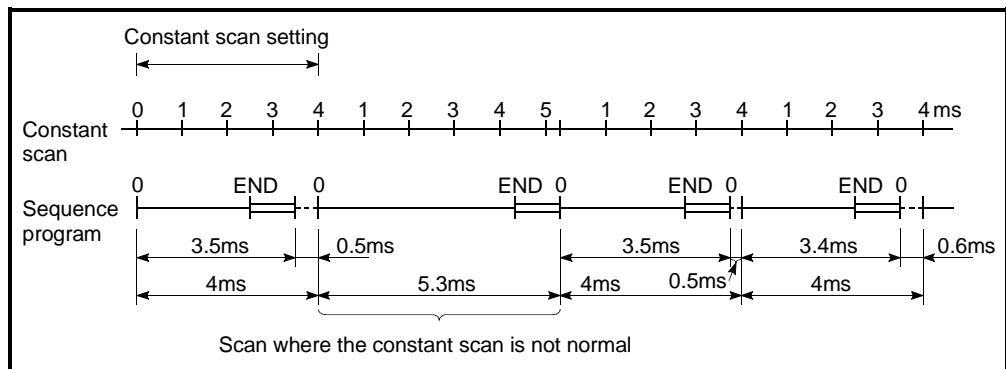


Fig. 7.2 Operation when the Scan Time is longer than the Constant Scan

If the time is longer than the WDT set time, the Process CPU detects a WDT error and stops the program execution.

- (c) The sequence program processing stops during the wait time from the last END processing execution until the next scan starts.
- 1) If a low speed execution type program is executed, it will be interrupted for - 0.5 ms (a constant scan time setting).
  - 2) If an interrupt factor occurs after the END processing is performed, the interrupt program or fixed scan execution type program is executed.
- (d) Constant Scan Time Accuracy
- This section describes the accuracy of a constant scan time setting.
- 1) The remaining portion (wait time) of a constant scan time setting is 0.01 ms when the following programs are not executed.
    - low speed execution type program
    - interrupt program
    - fixed scan execution type program
  - 2) Wait time is 0.5 ms when a low speed execution type program is used. If the maximum processing time for one instruction in a low speed execution type program is 0.5 ms, the remaining portion of constant scan time is the same as described in 1). If the maximum processing time exceeds 0.5 ms, constant scan delays for an excessive duration.
  - 3) Interrupt is enabled while an interrupt program/fixed scan execution type program is executed. If constant scan time runs out when an interrupt program/fixed scan execution type program is executed, constant scan cannot be finished. When an interrupt program/fixed scan execution type program is used, constant scan time could be shifted by the execution time of an interrupt program/fixed scan execution type program.

**REMARK**

Refer to "QCPU (Q mode)/QnACPU Programming Manual (Common Instructions)" for the command processing time.

### 7.3 Latch Functions

#### (1) What is Latch Functions?

- (a) The values of each Process CPU device are set back to the default (bit device: OFF and word device: 0) when;
- The PLC power is turned on.
  - The reset operation is performed.
  - There is a momentary power failure for more than the permissible amount of time.

Latch function maintains the device information when the above conditions occur.

The availability of latches does not affect the operation performed by a program.

- (b) The latch can be used to continue control by maintaining the production quantity, defect count, and address even when there is a momentary power failure for more than the permissible amount of time.

- (c) The following devices can use the latch function:  
(The default latch range is only the latch relay.)

- 1) Latch relay(L)
- 2) Link relay(B)
- 3) Annunciator(F)
- 4) Edge relay(V)
- 5) Timer(T)
- 6) Retentive timer(ST)
- 7) Counter(C)
- 8) Data register(D)
- 9) Link register(W)

#### (2) Latch Range Setting

The latch range setting is performed at the "Device" tab screen in the "(PLC) Parameter" dialog box.

There are two types of range in which the latch clear key (RESET/L.CLR switch) and remote latch clear operation become valid or invalid in the latch range setting.

**(3) Clearing the Latch Range Device Data**

The status of devices to which "latch clear" is made is shown in the table below.

Latch setting	Clear/retention after "latch clear"
Devices not designated in latch range	Clear
Latch (1) setting (Devices with "latch clear" option)	Clear
Latch (2) setting (Devices without "latch clear" option)	Retain *

\* : Refer to Section 4.6 for the clearing method.

POINT
File registers (R) cannot be cleared with latch clear. (See Section 10.7 for clearing file registers.)

**(4) Precautions**

- (a) Even if the device has been latch-specified, it will not be latched when the local device or the device initialization is specified.
- (b) The device details of the latch range are maintained with the battery (Q6BAT) attached to the Process CPU.
  - 1) The battery is necessary to latch the device if ROM operation is performed using the sequence program that has been stored on the standard ROM or memory card.
  - 2) Take care that, if the battery connector is disconnected from the connector of the Process CPU when the Process CPU is turned off, the latch range device memory is not retained but becomes undefined.

## 7.4 Setting the Output (Y) Status when Changing from/to STOP Status to/from RUN Status

## (1) Output (Y) Status when changing from STOP Status to RUN Status

When changing from RUN status to STOP status, the RUN status output (Y) is stored in the sequence and all the outputs (Y) are turned OFF.

The status after transition from STOP to RUN can be selected from the following two options with the Process CPU.

- The output status prior to STOP is output.
- The output is cleared.

(Default: After transition from STOP to RUN, the output (Y) status prior to STOP is output then the program is executed.)

## (a) Output (Y) status prior to STOP is output

After the output (Y) status before the STOP status is output, the sequence program calculations are performed.

## (b) Output is cleared

Clears all output (Y) and outputs the output (Y) after executing the sequence program calculations.

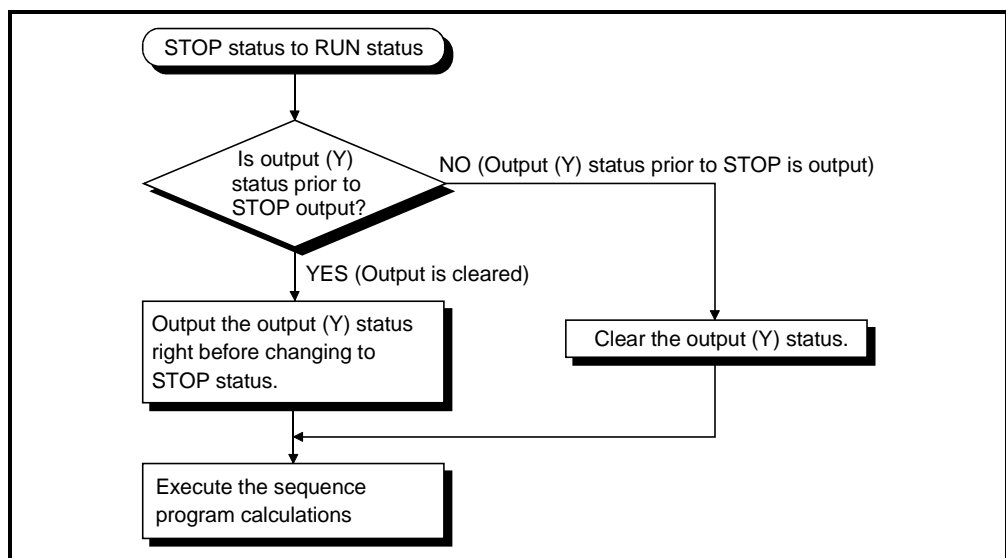
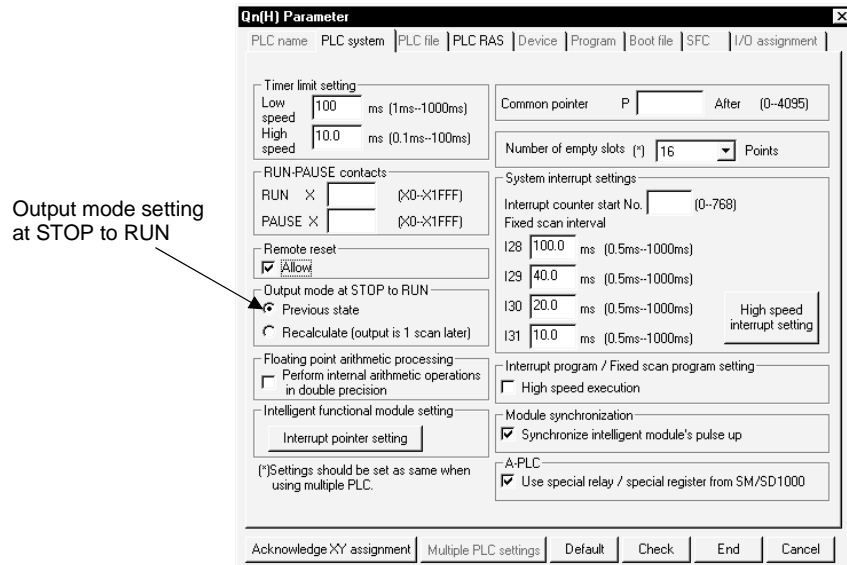


Fig. 7.3 Processing when Change from STOP Status to RUN Status

## (2) Setting the Output (Y) Status when Changing from STOP Status to RUN Status

The output (Y) status before the STOP status when switching from STOP status to Run status can be set at the "PLC System" tab screen in the "(PLC) Parameter" dialog box.



## (3) Precaution

If an output (Y) is forcefully turned ON with the Process CPU in the STOP status, it will not remain in the ON status even if the STOP status is switched to the RUN status.

The output status is effected as set for "Output mode at STOP to RUN" at the "PLC System" tab screen.

7.5 Clock Function

(1) What is Clock Function?

(a) Clock function reads the clock data inside the Process CPU with a sequence program and uses the data for clock management. Also, the time data is used for time maintenance for the Process CPU system functions such as those for failure history. The clock operations are maintained using the battery (Q6BAT) even when the PLC power is off or when a momentary power failure for longer than the permitted time occurs.

(b) Clock Data

The following table lists the time data, that are used for the Process CPU clock element.

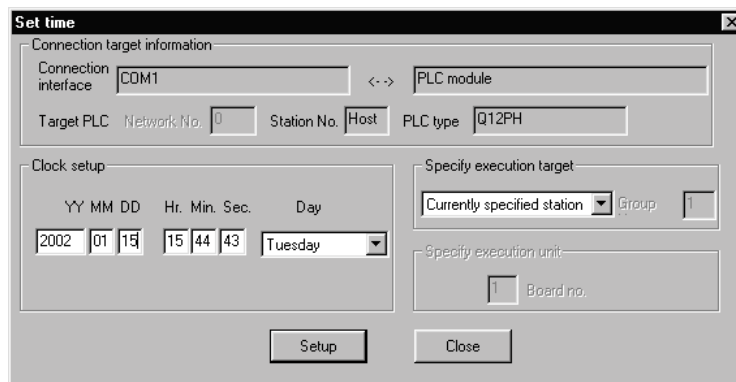
Data Name	Contents	
Year	Four digits in AD (Countable from 1980 to 2079)	
Month	1 to 12	
Day	1 to 31 (Automatic leap year calculation)	
Hour	0 to 23 (24 hours)	
Minute	0 to 59	
Second	0 to 59	
Day of the week	0	Sunday
	1	Monday
	2	Tuesday
	3	Wednesday
	4	Thursday
	5	Friday
	6	Saturday

(2) Writing/Reading Time Data To/From Clock Element

(a) The following two methods can be used to write to the time data clock element.

1) Method to write from GX Developer

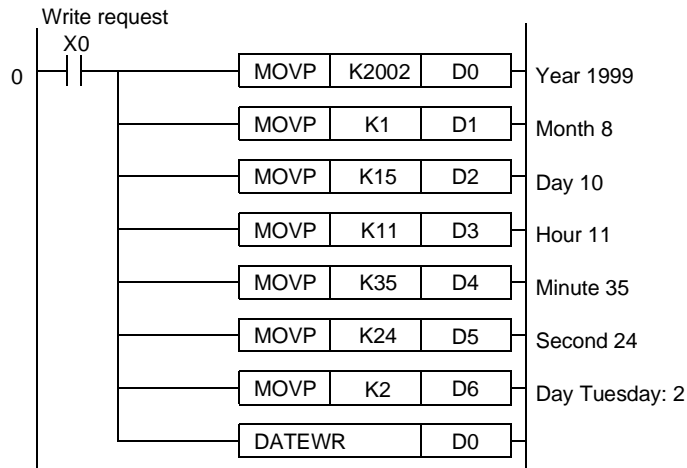
The time data is written to the clock element by displaying "Online" → "Set time" window.



2) Method to Write from the Program

The time data is written to the clock element by using the clock instruction (DATEWR).

A program example to write the time data using the time data write instruction (DATEWR).

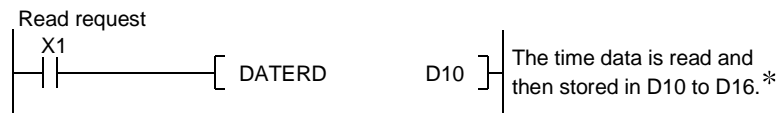


Refer to "QCPU (Q mode)/QnACPU Programming Manual (Common Instructions)" for details on the DATEWR instruction.

(b) Reading Time Data

When reading the time data to the data register, use the time data read instruction (DATERD) from the program.

The figure below shows an example of a program used to read the clock data with the DATERD instruction and then store it in D10 to D16.



Refer to the "QCPU (Q mode)/QnACPU Programming Manual (Common instructions) for the details on the DATERD instruction.

**REMARK**

- 1) Time Data can be written to and read from by special relays (SM210 to SM213) and special registers (SD210 to SD213). See Appendix 1 for details on special relay. See Appendix 2 for details on special registers.

- 2) \*: The figure below shows the clock data stored in D10 to D16.

D10	2002	4 digits in AD	} See Section 7.5(1).
D11	1	Month	
D12	15	Date	
D13	11	Hour	
D14	35	Minute	
D15	24	Second	
D16	2	Day of the week	



**(3) Precautions**

- (a) The clock data is not set prior to shipment.  
The clock data is used in Process CPU system and intelligent function module for failure history and other functions. Be sure to set the accurate time when operating the Process CPU for the first time.
- (b) Even when a part of the time data correcting, all data must be written to the clock element again.
- (c) The data to be written to the clock element is checked in the range described in (1) (b) of Section 7.5.  
For this reason, if improbable clock data in the range described in (1) (b) of Section 7.5 is written to the clock element, correct clock operation is unavailable.

**Example**

	Writing to clock element	CPU module operation status
February 30	Executed	When DATEWR instruction is executed: OPERATION ERROR (Error code 4100) When SM210 is on: SM211 is on
32 of month 13	Not executed	Error is not detected

**(4) Accuracy of Clock Data**

The accuracy of the clock function differs with the ambient temperature, as shown below:

Ambient Temperature (°C)	Accuracy (Day difference, S)
0	-3.18 to +5.25 (TYP.+2.12)
+25	-3.93 to +5.25 (TYP.+1.9)
+55	-14.69 to +3.53 (TYP.-3.67)

**(5) Comparison of Clock Data**

To compare Process CPU's clock data with a sequence program, use the DATERD instruction to read the clock data. The year data is read out in 4 digits. It can be compared as it is by using a compare instruction.

## 7.6 Remote Operation

The Process CPU provides the RUN/STOP switches for switching between the STOP status and the RUN status. The RESET/L.CLR switch also provides the Reset and Latch Clear functions.

The Process CPU can allow control of the Process CPU operation status by external operations

(GX Developer function, intelligent function module, and remote contact).

The following four options are available for remote operations:

- Remote RUN/STOP
- Remote PAUSE
- Remote RESET
- Remote LATCH CLEAR

### REMARK

The serial communication module is used as the example to describe the intelligent function module.

### 7.6.1 Remote RUN/STOP

#### (1) What is Remote RUN/STOP?

- (a) The remote RUN/STOP performs RUN/STOP of the Process CPU externally with the CPU module RUN/STOP switch at RUN.
- (b) Using remote RUN/STOP for the following remote operations are useful:
  - 1) When the Process CPU is at a position out of reach
  - 2) When performing RUN/STOP of the control board Process CPU externally

#### (c) Calculations during Remote RUN/STOP

The program calculation that performs remote RUN/STOP is as follows:

- 1) Remote STOP  
Executes the program to the END instruction and enters the STOP status.
- 2) Remote RUN  
When remote RUN is performed while in the STOP status using remote STOP, the status changes to RUN and executes the program from step 0.

(2) Method with Remote RUN/STOP

There are two ways to perform remote RUN/STOP:

(a) Method with remote RUN contact

The remote RUN contact is set at the "PLC system" tab screen in the "(PLC) Parameter" dialog box of GX Developer.

The device can be set in the range of input X0 to 1FFF.

By turning the set remote RUN contact ON/OFF, the remote RUN/STOP can be performed.

- 1) When the remote RUN contact is OFF, the QCPU enters the RUN status.
- 2) When the remote RUN contact is ON, the QCPU enters the STOP status.

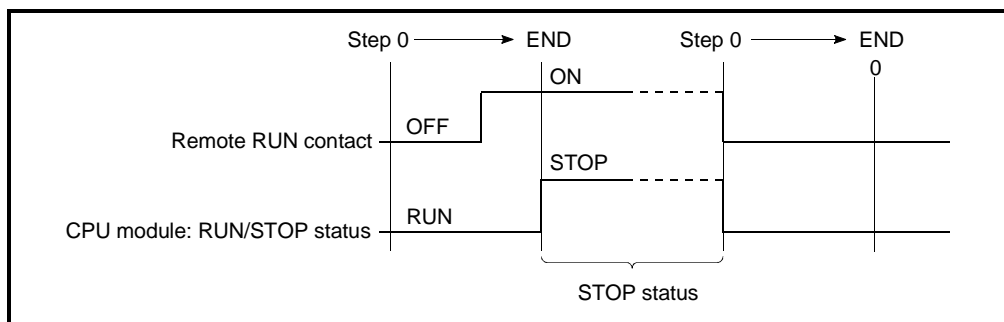


Fig. 7.4 Time Chart for RUN/STOP with Remote RUN Contact

(b) Method with GX Developer, serial communication module, etc.

Process CPU RUN/STOP can be performed by the remote RUN/STOP operation from the GX Developer, serial communication module, etc.

The GX Developer operation is performed with on-line remote operations.

The serial communication module and Ethernet interface module are controlled by commands complying with the MC protocol.

For details of the MC protocol, refer to the following manual.

- Q Corresponding MELSEC Communication Protocol Reference Manual

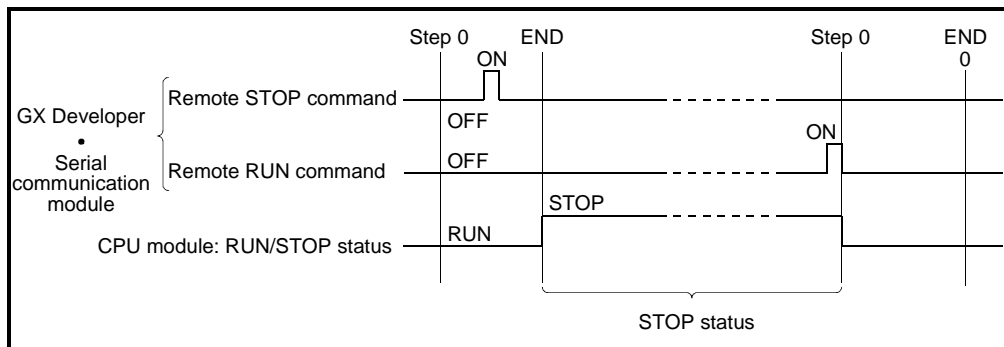


Fig. 7.5 Remote RUN/STOP Time Chart using GX Developer, serial communication module, etc.

### (3) Precautions

- (a) Take note of the following, because STOP has priority in Process CPU:
- 1) The Process CPU enters the STOP status when remote STOP is performed from remote RUN contact, GX Developer, or by using serial communication module.
  - 2) To set the Process CPU to RUN status from STOP status again, perform the remote RUN from the external factor (remote RUN contact, GX Developer, serial communication module, etc.) from which the remote STOP was performed.

#### REMARK

The RUN/STOP status is described below:

- RUN Status ..... Status in which the calculations are repeatedly executed from step 0 to the END/FEND instruction in the sequence program.
- STOP Status ..... Status in which the sequence program calculations are stopped and the output (Y) is all OFF.

7.6.2 Remote PAUSE

(1) What is Remote PAUSE?

- (a) The remote PAUSE performs PAUSE of the Process CPU externally with the CPU module RUN/STOP switch at RUN position. The PAUSE function stops the Process CPU calculations while maintaining the ON/OFF status of all output (Y).
- (b) This can be used to maintain the output (Y) on even if the Process CPU is changed to STOP status, in such areas as process control.

**POINT**

The output (Y) is turned off upon a stopping error.  
 To retain the output even upon a stopping error, use I/O allocation of PC parameters to set output retention.

(2) Method with Remote PAUSE

There are two ways to use remote PAUSE:

(a) Method with remote PAUSE Contact

The remote PAUSE contact is set at the "PLC system" tab screen in the "(PLC) Parameter" dialog box of GX Developer.

The device can be set in the range of input X0 to 1FFF.

- 1) The PAUSE status contact (SM204) is turned on when the END processing is executed for the scan with both remote PAUSE contact and PAUSE permission flag (SM206) on.
- 2) When the remote PAUSE contact is off or SM206 is turned off, the PAUSE status is canceled, and the sequence program calculation is performed again from step 0.

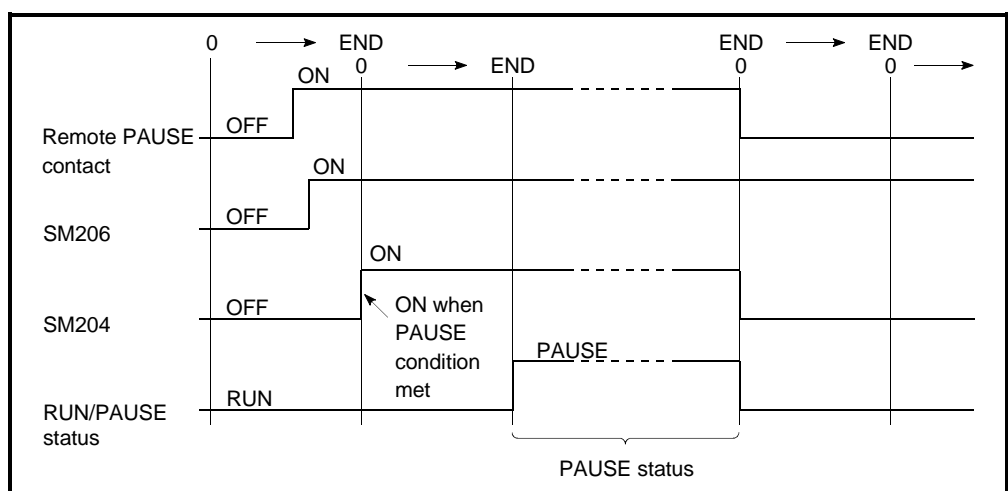


Fig. 7.6 PAUSE Time Chart with Remote PAUSE Contact

(b) Method with GX Developer, Serial Communication Module etc.

The remote PAUSE operation can be performed from the GX Developer or by using serial communication module.

The GX Developer operation is performed by on-line remote operation.

The serial communication module and Ethernet interface module are controlled by commands complying with the MC protocol.

For details of the MC protocol, refer to the following manual.

• Q Corresponding MELSEC Communication Protocol Reference Manual

- 1) When the END processing is performed for the scan where the remote PAUSE command was accepted, the PAUSE status contact (SM204) is turned on.

When the scan after the PAUSE status contact is turned on is executed to the END process, it enters the PAUSE status and stops the calculations.

- 2) When the remote RUN command is received, the sequence program calculations are performed again from step 0.

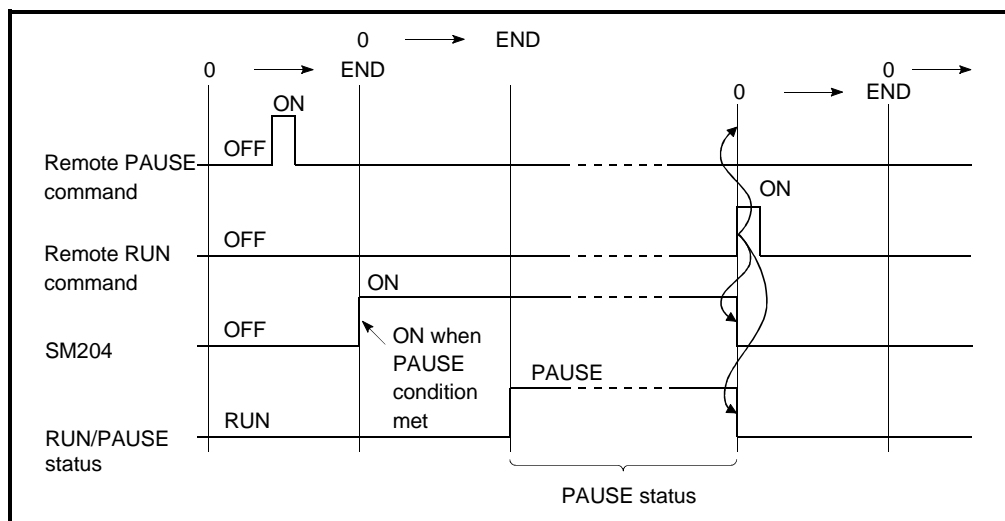
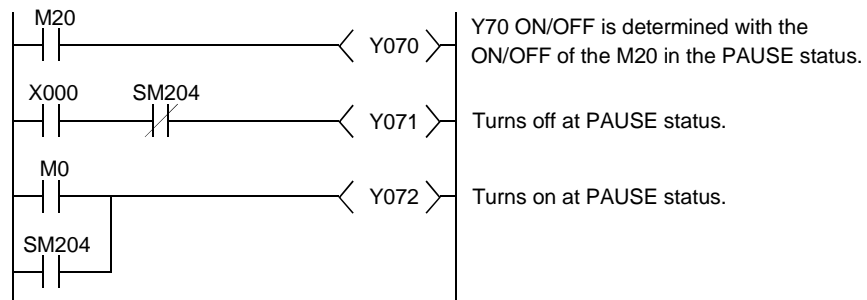


Fig. 7.7 PAUSE Time Chart with GX Developer

(3) Precaution

To set the output (Y) ON/OFF status when change to the PAUSE status, perform an interlock with the PAUSE status contact (SM204).



## 7.6.3 Remote RESET

## (1) What is Remote RESET?

- (a) The remote RESET resets the Process CPU externally when the Process CPU is at STOP status.

Even if the Process CPU RUN/STOP switch is at RUN, the reset can be performed when the Process CPU is stopped and an error that can be detected by the self-diagnosis function occurs.

- (b) Remote RESET can reset the Process CPU remotely when an error occurs for which the Process CPU cannot be operated directly.

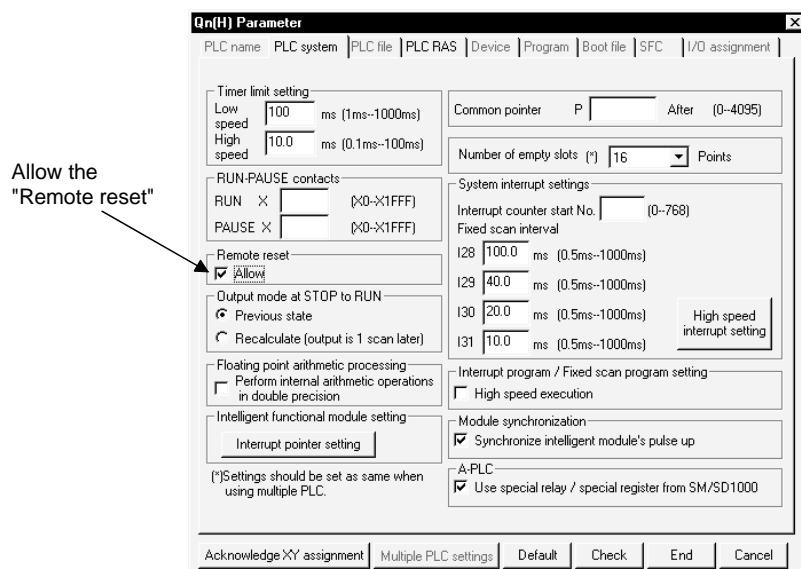
Remote RESET can be executed only in STOP status. When the Process CPU is in RUN status, use Remote STOP to arrange the STOP status.

## (2) Remote RESET Method

The remote RESET can only be performed from GX Developer or by operating serial communication module.

To perform the remote RESET, follow the following steps:

- (a) At the "PLC system" tab screen in the "(PLC) Parameter" dialog box, check the "Allow" check box at the "Remote reset" section, and then write parameters to the Process CPU.



- (b) When the Process CPU is in RUN status, use remote STOP to arrange the STOP status.

- (c) Reset Process CPU by the remote RESET operation.

1) For the GX Developer, this is performed by on-line remote operation.

2) The serial communication module and Ethernet interface module are controlled by commands complying with the MC protocol.

For details of the MC protocol, refer to the following manual.

- Q Corresponding MELSEC Communication Protocol Reference Manual

### (3) Precautions

- (a) To perform the remote RESET, check the "Allow" check box of the "Remote reset" section at the "PLC system" tab screen in the "(PLC) Parameter" dialog box, and then write parameters into Process CPU.  
If the "Allow" check box is not checked, a remote RESET operation is not performed.
- (b) Remote RESET cannot be performed when the Process CPU is in RUN status.
- (c) After the reset operation is complete, the Process CPU will enter operation status set at the RUN/STOP switch.
  - 1) With the RUN/STOP switch in the "STOP" position, the Process CPU enters into the "STOP" status.
  - 2) With the RUN/STOP switch in the "RUN" position, the Process CPU enters into the "RUN" status.
- (d) Take care that Remote RESET does not reset Process CPU if an error occurs in the Process CPU due to noise.  
If Remote RESET does not reset, use the RESET/L.CLR switch to reset or turn the PLC off.

POINT
(1) If Remote RESET is executed when the Process CPU is stopped due to an error, the Process CPU enters the operation status set at the RUN/STOP switch after it is reset.
(2) Even if "Remote reset" is set as "Allow" at the "PLC system" tab screen in the "(PLC) Parameter" dialog box, the remote process of the GX Developer is completed. However, the Process CPU is not reset since the reset process is not performed in it. If the status of the Process CPU does not change though a reset process is performed from GX Developer, check if the "Remote reset" is set as "Allow" at the "PLC System" tab screen in the "(PLC) Parameter" dialog box.



### 7.6.4 Remote latch clear

#### (1) What is Remote Latch Clear?

- (a) The remote latch clear resets the device data latched to the Process CPU using the GX Developer etc., when the Process CPU is in STOP status.
- (b) Remote latch clear is useful when the Process CPU is in the following areas. In these cases, the operations are performed in combination with the remote RUN/STOP.
  - When the Process CPU is at a position out of reach
  - When externally performing latch clear of the Process CPU inside a control panel.

#### (2) Remote Latch Clear Method

The remote latch clear can only be performed from GX Developer or by using serial communication module.

To perform the remote latch clear, follow the following steps:

- (a) Use the remote STOP to bring the Process CPU to STOP status.
- (b) Use the Latch Clear to bring the Process CPU to the Latch Clear status.
  - 1) The GX Developer operations are performed by on-line remote operation.
  - 2) The serial communication module and Ethernet interface module are controlled by commands complying with the MC protocol.  
For details of the MC protocol, refer to the following manual.
    - Q Corresponding MELSEC Communication Protocol Reference Manual
- (c) To return the Process CPU to RUN status after the remote latch clear, perform a remote RUN operation.

#### (3) Precautions

- (a) Either remote latch clear or latch clear by RESET/L.CLR switch cannot be performed when the Process CPU is in RUN status.
- (b) The latch range for the device set at the "Device" tab screen in the "(PLC) Parameter" dialog box includes a range that makes latch clear (RESET/L.CLR switch) valid or invalid.  
Remote latch clear operation is reset in the range of latch clear valid setting.
- (c) Devices that are not latched are cleared when the remote latch clear is performed.  
The data in the failure history storage memory of the Process CPU will also be cleared by a remote latch clear operation.

## 7.6.5 Relationship of the remote operation and Process CPU RUN/STOP switch

## (1) Relationship of the Remote Operation and Process CPU Switch

The Process CPU operation status is as follows with the combination of remote operations to RUN/STOP switch.

Remote operation RUN/STOP switch	RUN *1	STOP	PAUSE *2	RESET *3	Latch clear
RUN	RUN	STOP	PAUSE	Cannot operate *4	Cannot operate *4
STOP	STOP	STOP	STOP	RESET *5	Latch clear

\*1 When performing the operation with remote RUN contact, "RUN-PAUSE contact" must be set at the "PLC system" tab screen in the "(PLC) Parameter" dialog box.

\*2 When performing the operation with remote PAUSE contact, "RUN-PAUSE contact" must be set at the "PLC system" tab screen in the "(PLC) Parameter" dialog box. In addition, the remote PAUSE enable coil (SM206) must be set ON.

\*3 "Remote reset enable" must be set at the "PLC system" tab screen in the "(PLC) Parameter" dialog box.

\*4 RESET or LATCH CLEAR can be performed if the Process CPU changed to the STOP status by a remote operation.

\*5 This includes a situation where the Process CPU is stopped due to error.

## (2) Remote Operations from the Same GX Developers

When remote operations are performed from the same GX Developer, the status of the remote operation that is executed last will be effective.

## (3) Remote Operations from Multiple GX Developers

While a remote operation is being performed by one GX Developer, another remote operation cannot be performed by another GX Developer.

After a remote operation that is being performed by one GX Developer is cancelled, a new remote operation can be performed by another GX Developer.

For example, a remote PAUSE operation is being performed by one GX Developer, the PAUSE status will remain active even if a remote STOP/remote RUN operation is attempted by another GX Developer.

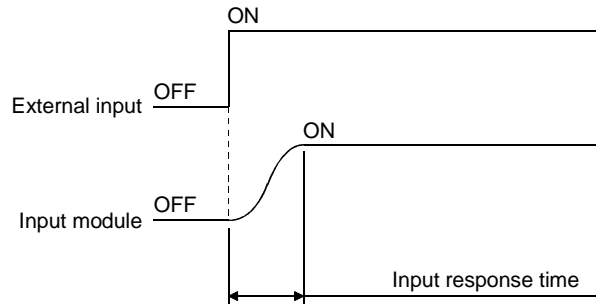
When a remote RUN operation is performed by the GX Developer that is performing a remote PAUSE operation, and then that remote operation is cancelled, a new remote operation can be performed by another GX Developer.

7.7 Selecting the Response Speed of the Q Series Module (I/O Response Time)

7.7.1 Selecting the response time of the input module

(1) Selecting the response time of the input module

The input response time of a Q Series input module can be set to a desired response time: 1 ms, 5 ms, 10 ms, 20 ms or 70 ms. The input module reads external inputs at the specified response time. The default value of an input response time is 10 ms.



(2) Setting the Input Response Time

At the "I/O Assignment" tab screen in the "(PLC) Parameter" dialog box, specify the desired input response time. Select "Input" in the "Type" column of a slot for which to specify the desired input response time.

Select "Input".                      Select "Detailed setting".                      Select "I/O response time".

The first screenshot shows the 'Qn(H) Parameter' dialog box with the 'I/O Assignment' tab selected. A table lists slots 0 through 7. Slot 1 is highlighted with 'Type' set to 'Input'. The second screenshot shows the 'Intelligent functional module detailed setting' dialog box for slot 1, with the 'I/O response time' dropdown menu open, showing options: 10ms, 1ms, 5ms, 10ms, 20ms, and 70ms.

(3) Reactions

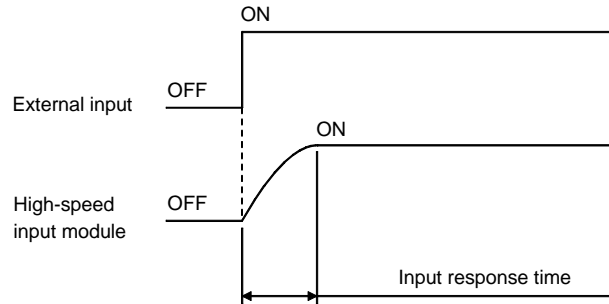
- (a) Higher input response time may result in response to inputs being influenced by noise. Set the desired input response time by taking into consideration the operating environment of an input module in use.
- (b) The input response speed setting is valid in the following cases.
  - After the PLC is turned on
  - When the Process CPU is reset

7.7.2 Selecting the response time of the high speed input module

(1) Selecting the response time of the high speed input module

Changing the response time of the high speed input module means to amend the input response speed for high speed input modules (QX40-S1) that support the Q Series to 0.1 ms, 0.2 ms, 0.4 ms, 0.6 ms and 1 ms.

Input from external devices is accepted at the input response speed set for the high speed input module. The default setting for the input response time is 0.2 ms.



(2) Setting the Input Response Time

Input response time is set at the "I/O assignment" tab screen in the "(PLC) Parameter" dialog box.

Select "Hi. input" among the slot types for which the input response time is to be set.

The image shows two screenshots of software dialog boxes. The first is the 'Qn(H) Parameter' dialog box, with an arrow pointing to the 'Hi. input' type in the 'I/O Assignment' table. The second is the 'Intelligent functional module detailed setting' dialog box, with an arrow pointing to the 'I/O response time' column in the table. The table in the second dialog box has the following data:

Slot	Type	Model name	Error time output mode	H/W error time PLC operation mode	I/O response time	Control PLC (*)
0	PLC					
1	0(*-0)	Hi. input			0.2ms	
2	1(*-1)				0.1ms	
3	2(*-2)				0.2ms	
4	3(*-3)				0.4ms	
5	4(*-4)				0.6ms	
6	5(*-5)				1ms	
7	6(*-6)					
8	7(*-7)					
9	8(*-8)					
10	9(*-9)					
11	10(*-10)					
12	11(*-11)					
13	12(*-12)					
14	13(*-13)					
15	14(*-14)					

(3) Precautions

(a) The system will be adversely affected by noise, etc., when the input response time is set to high speed. Set the input response time in consideration of the operating environment.

(b) The input response speed setting is valid in the following cases.

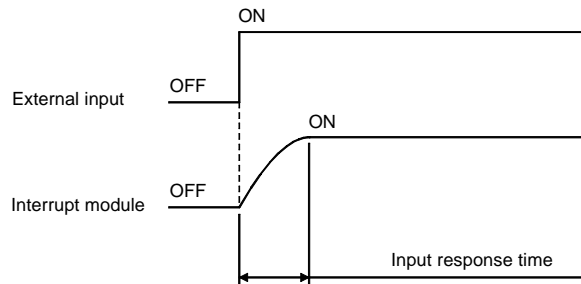
- After the PLC is turned on
- When the Process CPU is reset

7.7.3 Selecting the response time of the interrupt module

(1) Selecting the response time of the interrupt module

Changing the response time of the interrupt module means to amend the input response speed for interrupt modules (QI60) that support the Q Series to 0.1 ms, 0.2 ms, 0.4 ms, 0.6 ms and 1 ms.

Input from external devices is accepted at the input response speed set for the interrupt module. The default setting for the input response time is 0.2 ms.



(2) Setting the Input Response Time

Input response time is set up at the "I/O assignment" tab screen in the "(PLC) Parameter" dialog box.

Select "Interrupt" among the slot types for which the input response time is to be set.

The image shows two screenshots from a software interface. The left screenshot is the 'Qn(H) Parameter' dialog box, with the 'I/O assignment' tab selected. A table lists slots 0-7. Slot 1 is set to 'Interrupt'. An arrow points to this slot with the label 'Select "Interrupt"'. Another arrow points to the 'Detailed setting' button for slot 1 with the label 'Select "Detailed settings"'. The right screenshot is the 'Intelligent functional module detailed setting' dialog box. It shows a table with columns for Slot, Type, Model name, Error time output mode, H/W error times PLC operation mode, I/O response time, and Control PLC. The 'I/O response time' column for slot 1 has a dropdown menu open, showing options: 0.1ms, 0.2ms, 0.4ms, 0.6ms, and 1ms. An arrow points to this dropdown with the label 'Select "Input response time"'. At the bottom of the right dialog, there are 'End' and 'Cancel' buttons.

(3) Precautions

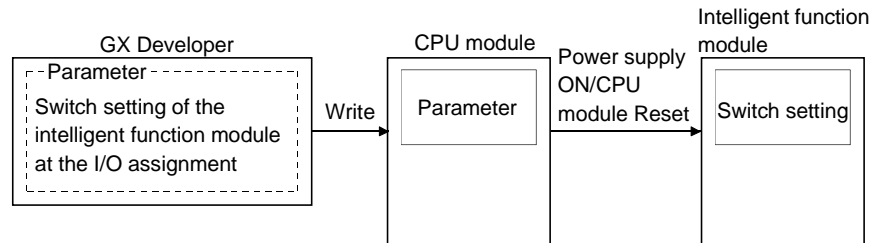
- (a) The system will be adversely affected by noise, etc., when the input response time is set to high speed. Set the input response time in consideration of the operating environment.
- (b) The input response speed setting is valid in the following cases.
  - After the PLC is turned on
  - When the Process CPU is reset

7.8 Setting the Switches of the Intelligent Function Module

(1) Setting the Switches of the Intelligent Function Module

The switches of the intelligent function module is to set the switches of an Q Series intelligent function module using GX Developer.

The settings of the switches set by GX Developer is written from Process CPU to each intelligent function module at the leading edge or reset of Process CPU.



(2) Setting the Switches of the Intelligent Function Module

At the "I/O assignment" tab screen in the "(PLC) Parameter" dialog box, specify the desired switch setting. Select "Intelli." in the "Type" column of a slot for which to set the switches of the intelligent function module.

Select "Intelli.".

Select "Switch Setting".

Designate the contents of the intelligent function module switch.

Slot	Type	Model name	Switch 1	Switch 2	Switch 3	Switch 4	Switch 5
0	PLC	PLC					
1	0(-0)	Intell.					
2	1(-1)						
3	2(-2)						
4	3(-3)						
5	4(-4)						
6	5(-5)						
7	6(-6)						
8	7(-7)						
9	8(-8)						
10	9(-9)						
11	10(-10)						
12	11(-11)						
13	12(-12)						
14	13(-13)						
15	14(-14)						

(3) Precautions

- (a) For details on the switch setting for an intelligent function module, refer to the manual of the intelligent function module in use.
- (b) The switch setting of the intelligent function module is valid in the following cases.
  - After the PLC is turned on
  - When the Process CPU is reset

## 7.9 Monitoring Function

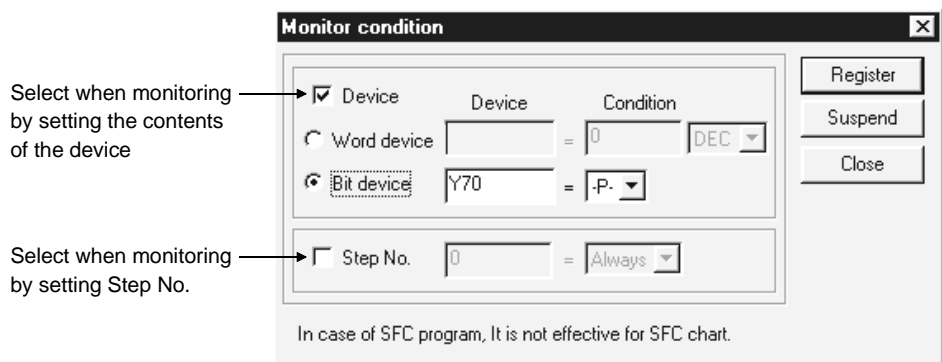
## (1) What is Monitoring Function?

- (a) This is a function to read the program, device and intelligent function module status of the Process CPU by using GX Developer. The Process CPU performs the END processing to handle monitor requests from GX Developer. The results of Process CPU's END processing are displayed on the GX Developer side.
- (b) By setting the monitoring conditions with GX Developer, it is possible to monitor the Process CPU operation status under the specified conditions. It is also possible to maintain the monitoring status under the specified conditions by setting the monitoring stop conditions.
- (c) The use of local devices for execution of multiple programs makes it possible to monitor local device data.

## 7.9.1 Monitor condition setting

## (1) Setting monitor execution conditions when monitoring circuits

Choose "Online" → "Monitor" → "Monitor condition" to open the Monitor Condition dialog box. The following shows an example in which to start a monitoring operation at the leading edge of Y70.



- (a) When only "Step No." is specified:
  - 1) The monitor data sampled when the status previous to execution of the specified step becomes "the specified".
  - 2) The specification method for the execution status is indicated below:
    - a) When changing from non-execution status to executing status : <-P->
    - b) When changing from executing status to non-execution status : <-F->
    - c) Always when executing only : <ON>
    - d) Always when not executing only : <OFF>
    - e) Always regardless of status : <Always>

**REMARK**

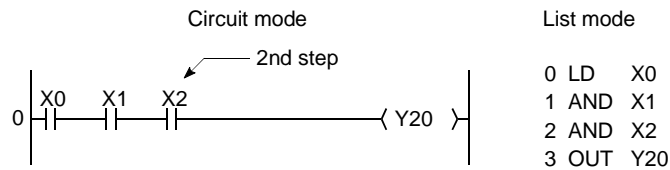
When "Step No. [ 0]" is specified, set the condition to "Always".

**POINT**

If a step between the AND/OR blocks is specified as a monitor condition, monitor data is sampled when the status previous to execution of the specified step is specified by the LD instruction. The monitor timing depends on the step specified as a monitor condition. The following shows examples of monitoring when the 2nd step is ON (Step No. [ 2] = <ON>).

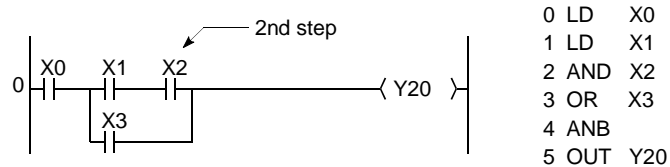
(1) When the 2nd step is connected by the AND instruction:

As shown below, the monitor execution condition is established when both "X0" and "X1" are ON.

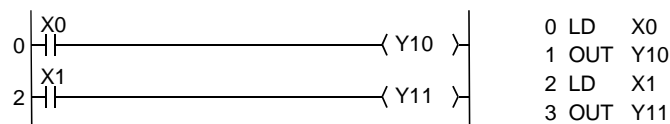


(2) When the 2nd step is connected between the AND/OR blocks:

As shown below, the monitor execution condition is established when "X1" is ON. Whether "X0" is ON or OFF, it does not affect the monitor execution condition.



(3) If the beginning of a ladder block not at Step 0 is specified in Step No. as a detailed condition, monitor data is collected when the execution status of the instruction immediately before execution becomes the specified status. If (Step No. [ 2] = <ON>) is specified in the following ladder, monitor data is collected when OUT Y10 turns ON.



(b) When only "Device" is specified:

"Word Device" or "Bit Device" can be specified.

1) When "Word Device" is selected:

The monitor data is sampled is when the current value of the specified word device becomes the specified value.

Type a current value in decimal digits or hexadecimal digits.

2) When "Bit Device" is specified:

The monitor data is sampled is when the execution status of the specified bit device becomes the specified value.

Either the leading edge or the fall can be specified for execution condition.


(c) When "Step No." and "Device" is selected:

The monitor data is sampled when the status previous to execution of the specified status or the status (current value) of the specified bit device (word device) is specified.

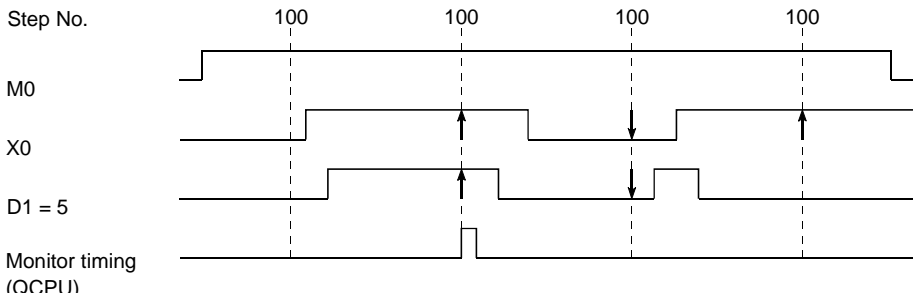


**POINT**

When "Step No.[100]=<-P->, Word Device [D1]=[K5]" is specified as the detailed condition in the following circuit, a monitor execution condition is established at the leading edge of the 100th step where D1=5.

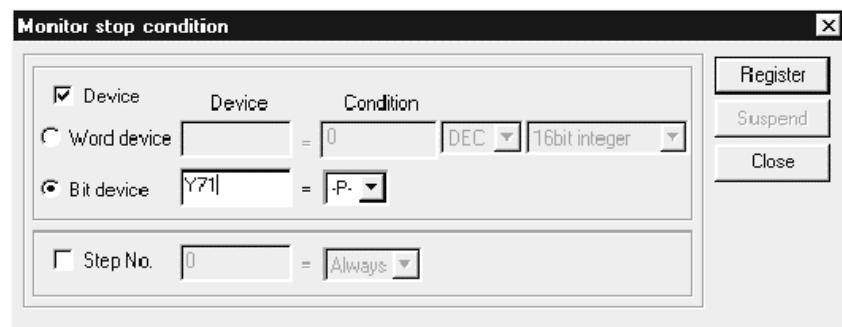


The monitor interval of GX Developer depends on the processing speed of GX Developer. When a monitor condition is established during the monitor interval of GX Developer, the monitor will be performed, even if a monitor condition is established at a shorter interval than the monitor interval.



## (2) Monitor Stop Condition Set Up

Choose "Online" → "Monitor" → "Monitor stop condition" to open the "Monitor Stop Condition" dialog box. The following shows an example of stopping a monitoring operation at the leading edge of Y71.



- (a) When "Step No." is specified:
- 1) Monitoring is stopped when the status at execution of the specified step becomes as specified.
  - 2) The specification method for the execution status is shown below:
    - a) When changing from non-execution status to executing status : <-P->
    - b) When changing from executing status to non-execution status : <-F->
    - c) Always when executing only : <ON>
    - d) Always when not executing only : <OFF>
    - e) Always regardless of status : <Always>
  - 3) When "Step No." is not specified, the monitoring operation is stopped after the Process CPU END processing.

- (b) When "Device" is specified:

"Word Device" or "Bit Device" can be specified.

  - 1) When "Word Device" is selected:

The monitoring operation is stopped when the current value of the specified word device becomes the specified value.  
A current value can be expressed in decimal digits, hexadecimal digits, 16-bit integral numbers, 32-bit integral numbers, or real numbers.
  - 2) When "Bit Device" is specified:

The monitoring operation is stopped when the execution status of the specified bit device becomes the specified value.  
Either the leading edge or the fall can be specified for execution condition.

### (3) Precautions

- (a) When monitoring after setting the monitor condition, the file displayed on GX Developer is monitored. Match the file to be monitored by executing the "New PLC Read" and file name on GX Developer.
- (b) When monitoring the file register which is not specified, 0 is displayed.
- (c) Perform the monitoring by matching the device allocation of the Process CPU and GX Developer.
- (d) When monitoring the buffer memory of the intelligent function module, the scan time takes longer, as well as when executing the FROM/TO instruction.
- (e) Multiple users can perform monitoring at the same time.

When multiple users are performing monitoring at the same time, take note of the following:

  - High speed monitoring can be performed by increasing 1k step in the system area for other station's monitor file when formatting of program memory.  
Up to 15 stations can be set as the station monitor file, but the program space will be reduced.
  - The detailed condition setting for the monitoring can only be set for one user.
- (f) The monitoring detailed condition setting can only be set in circuit monitor.
- (g) When the same device is specified as the monitor condition and monitor stop condition, specify "ON" or "OFF".
- (h) The monitoring conditions will not be established unless the following specified steps commands are executed when "Step No." has been specified for the monitoring conditions.
  - 1) When skipping steps specified with the CJ command, the SCJ command and the JMP command.
  - 2) When the specified step is the END command, the FEND command exists while the program is running, and the END command is not executed.
- (i) Do not reset the Process CPU while monitoring conditions are being registered.

7.9.2 Monitoring test for local device

(1) Monitoring and Testing Local Devices

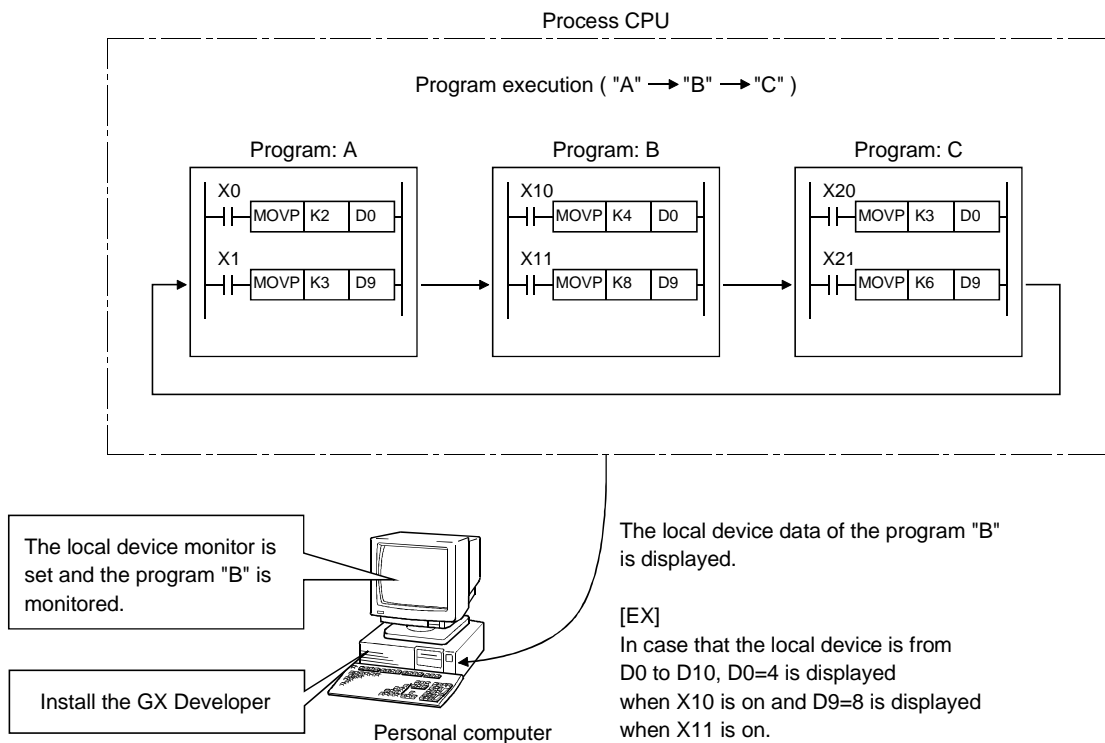
(a) Local devices specified at the "Device" tab screen in the "(PLC) Parameter" dialog box can be monitored or tested by operating from GX Developer. This function is useful when debugging a program and monitoring local devices in a program monitored by GX Developer. See Section 10.13.1 for local devices.

(b) Monitoring the Local Devices

The table below shows the status of three programs "A", "B", and "C" being executed on the Process CPU, with local devices D0 to D99 specified. It assumes that these three programs are executed in the order of A → B → C → (END processing) → A → B ....

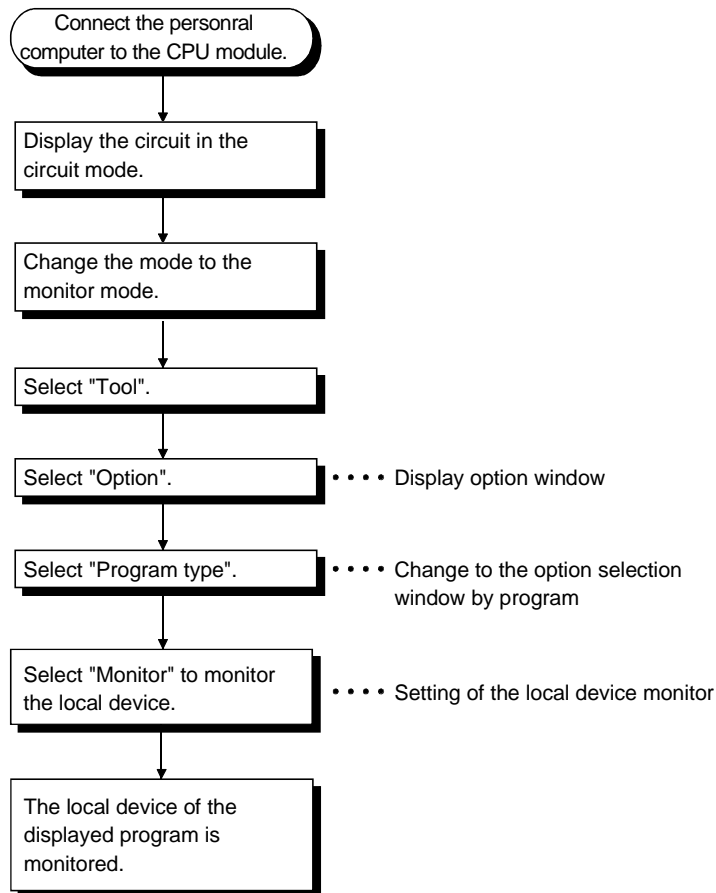
	Monitor Device	
	D0	D100
When local devices are specified	D0 in Program "C" is monitored.	D100 is monitored after Program "C" is executed.
When local devices are not specified	D0 in the displayed program is monitored.	D100 is monitored after the displayed program is executed.

If the local device monitor setting is made and Program "B" is displayed, for example, this makes it possible to monitor the local devices in Program "B".



## (2) Monitoring the Local Devices

Monitor local devices in the following steps:



## (3) Precautions

- (a) It is only a single program that local devices can be monitored or tested by operating from a single GX Developer. Local devices in multiple programs cannot be monitored or tested by operating from a single GX Developer.
- (b) It is a maximum of 16 programs that local devices can be monitored or tested by operating from multiple GX Developers connected to a RS-232 serial communication module of the Process CPU.
- (c) If local devices in a stand-by type program are monitored, scan time is extended for some time because local device data is read and saved. See Section 10.13.1 for details.
- (d) Local devices in a fix scan execution type program cannot be monitored or tested.

7.9.3 Enforced ON/OFF for external I/O

Enforced ON/OFF operations from GX Developer will forcibly switch the external I/O on and off.

The information registered for ON/OFF will be cancelled with GX Developer operations.

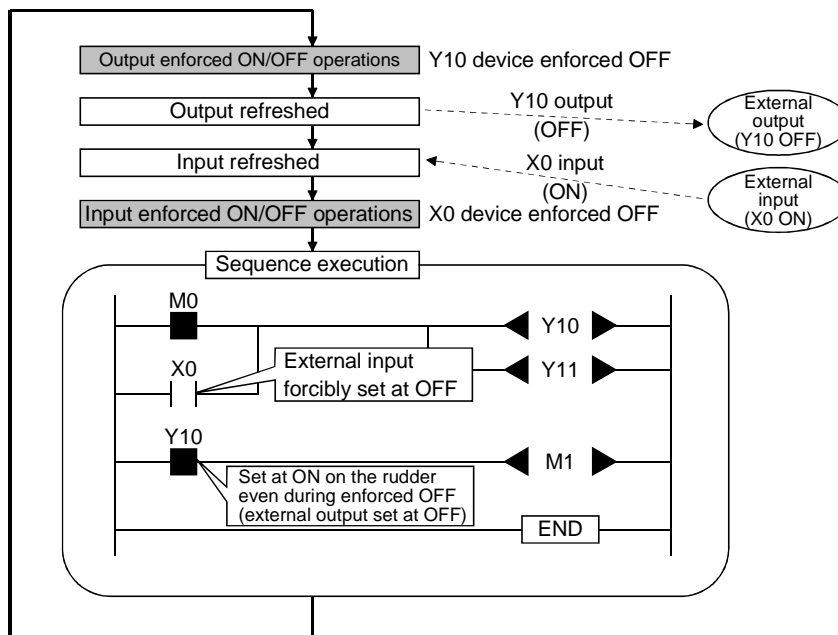
A GX Developer Version 6 or higher is required to use this function.

It is possible to perform enforced ON (enforced ON registration,) enforced OFF (enforced OFF registration) and cancel enforced ON/OFF (cancel registration) with the enforced ON/OFF function.

The operations for performing enforced ON, enforced OFF and canceling enforced ON/OFF are shown in the table below.

Operation	Input (X) operation	Output (Y) operation
During canceling (no operations)	Performs sequence program operations with external input.	Outputs the results of sequence program operations externally.
During enforced ON	Performs sequence program operations in the enforced ON status.	Outputs "ON" externally regardless of the results of sequence program operations.
During enforced OFF	Performs sequence program operations in the enforced OFF status.	Outputs "OFF" externally regardless of the results of sequence program operations.

The operations when enforced ON/OFF is performed are shown in the diagram below.



(1) Explanation of specifications

- (a) Enforced ON/OFF can be performed regardless of the Process CPU's RUN/STOP status. However, enforced ON/OFF is only allowed for input during stop errors. The output is only performed to device Y.
- (b) Devices can be registered within the ranges: input (X0 to X1FFF), output (Y0 to Y1FFF).

- (c) The input and output eligible for enforced ON/OFF are shown below.
- 1) Input (X) and output (Y) for modules mounted on the base unit.
  - 2) I/O (X/Y) of Process CPU or I/O (LX/LY) of MELSECNET/H modules to be refreshed Process CPU.
  - 3) I/O (X/Y) of Process CPU or I/O (RX/RX) of CC-Link to be refreshed Process CPU.

When enforced ON/OFF registration is performed for devices outside the above refresh ranges (ex: empty slots) only the Process CPU device memory is set at ON/OFF, and this is not output externally.

- (d) Canceling ON/OFF registration information
- 1) ON/OFF registration information can be canceled from GX Developer. Devices for which enforced ON/OFF has been performed will assume the following statuses when ON/OFF registered information has been cancelled.

Enforced ON/OFF device		ON/OFF performed with sequence programs	ON/OFF not performed with sequence programs
Input	Input from modules mounted on the base unit	Assumes the ON/OFF status received from the module.	
	Input of Process CPUs to be refreshed from LX of MELSECNET/H module	Assumes the refreshed ON/OFF status from MELSECNET/H.	
	Input of Process CPUs to be refreshed from RX of CC-Link	Assumes the refreshed ON/OFF status from CC-Link.	
	Input other than above (outside of the refresh range)	Maintains the enforced ON/OFF status.	
Output	Output from modules mounted on the base unit	Outputs the results of the sequence program operations.	OFF is output.
	Output of Process CPUs to be refreshed from LX of MELSECNET/H module	Outputs the results of the sequence program operations.	OFF is output.
	Output of Process CPUs to be refreshed from RX of CC-Link	Outputs the results of the sequence program operations.	OFF is output.
	Output other than above (outside of the refresh range)	Assumes the result of the sequence program operations.	Assumes the OFF status.

- 2) The enforced ON/OFF settings are cleared with the following operations.
  - Power supply OFF → ON
  - Reset with the Process CPU RESET/L. CLR switch
  - Reset with remote reset operations

(e) The timing for external I/O enforced ON/OFF is shown in the table below.

Refresh area	Input	Output
I/O modules on the base unit (X, Y)	<ul style="list-style-type: none"> <li>• During END processing (input refresh)</li> <li>• During the execution of commands that used direct access input (DX) (LD, LDI, AND, ANI, OR, ORI, LDP, LDF, ANDP, ANDF, ORP, ORF)</li> </ul>	<ul style="list-style-type: none"> <li>• During END processing (output refresh)</li> <li>• During the execution of commands that used direct access output (DY) (OUT, SET, DELTA, RST, PLS, PLF, FF, LDF, MC)</li> </ul>
I/O of Process CPU to be refreshed from LX, LY of MELSECNET/H	<ul style="list-style-type: none"> <li>• During END processing (MELSECNET/H refresh)</li> <li>• During execution of the COM command</li> <li>• During execution of the ZCOM command</li> </ul>	
I/O of Process CPU to be refreshed from RX, RY of CC-Link	<ul style="list-style-type: none"> <li>• During END processing (CC-Link refresh)</li> <li>• During execution of the COM command</li> <li>• During execution of the ZCOM command</li> </ul>	

- (f) A total of thirty-two devices can be registered for enforced ON and OFF.
- (g) Sequence program operations take precedence when used with an output Y contact.
- (h) The enforced ON, OFF and cancelled status (including those that are not set up) can be confirmed with GX Developer. Confirmation is also allowed with the MODE judgment LED when at least one device is registered. (the MODE LED will flicker.)
- (i) It is possible to register enforced ON/OFF for external I/O in the same CPU module from multiple GX Developers connected to the network. However, when enforced ON/OFF is registered in the same device from multiple GX Developers, it will assume the most recent registered ON/OFF status. Owing to this, there are cases when the GX Developer executed first will display different ON/OFF information to the CPU module ON/OFF information. When performing enforced ON/OFF from multiple GX Developers, ensure that the most up-to-date information is set with the "Load Registration Status" switch before executing the enforced ON/OFF procedure.

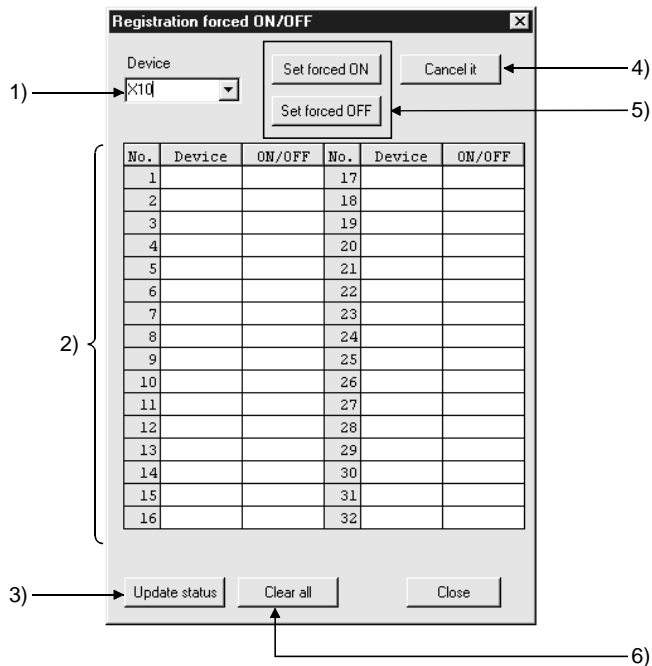
(2) Operation procedure

The operation procedure is explained below.

(a) Register enforced ON/OFF for the specified device.

[Online] → [Debug] → [Enforced I/O Registration/Cancellation]

It is possible to perform enforced ON or enforced OFF for a specified device by selecting [Enforced ON Registration] or [Enforced OFF Registration] after the device has been specified on the [Enforced I/O Registration/Cancellation] setup screen.



(b) Descriptions of the fields to set up are provided below.

No.	Name of setup field	Function description
1)	Device	Enter the I/O number for which enforced ON/OFF is to be set, or for which enforced ON/OFF is to be cancelled.
2)	Registration status displayed area	Displays the registration status of registered enforced input and output.
3)	Load registration status	Displays the registration status loaded from CPU module.
4)	Enforced ON/OFF registration	Performed enforced ON/OFF registration for specified devices.
5)	Registration cancellation	Cancels the enforced ON/OFF for registered devices.
6)	Bulk registration cancellation	Cancels all registered enforced I/O registrations.



## 7.10 Writing in Program during Process CPU RUN

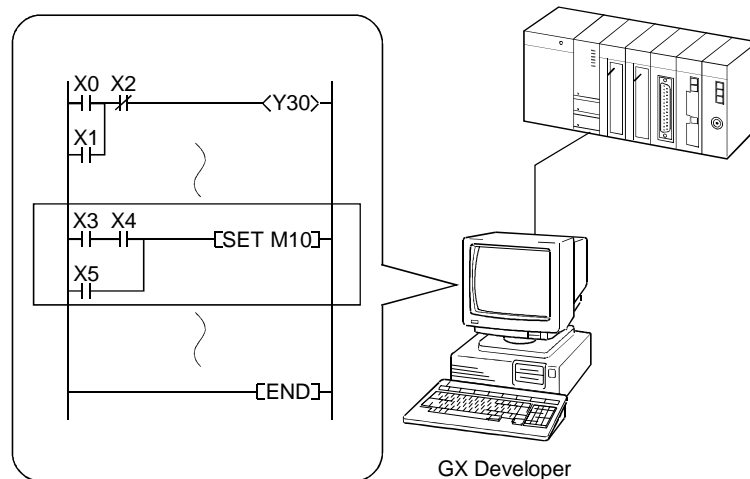
When the Process CPU is in the RUN status, you can write programs or files in any of the following steps:

- Writing data in the circuit mode during RUN.
- Writing data by using pointers during RUN (see Section 7.13.2).
- Writing a batch of files during RUN.

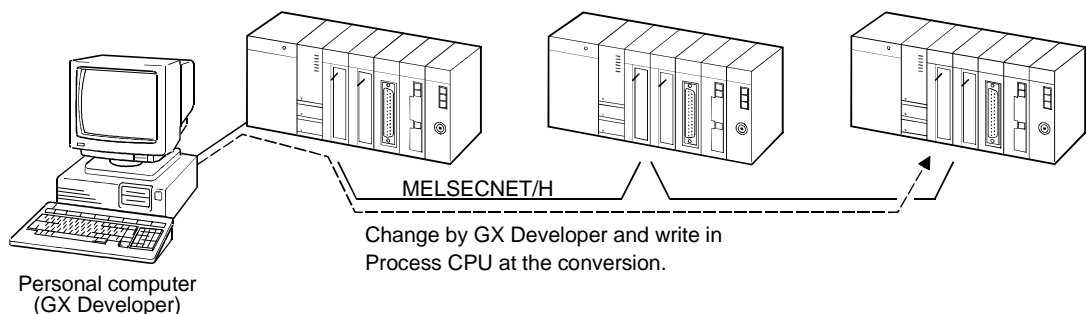
### 7.10.1 Writing data in the circuit mode during RUN

#### (1) Writing data in the circuit mode during RUN Status

- Writing data in the circuit mode during RUN is a function to write a program during the Process CPU RUN status.
- The program can be changed without stopping the process in Process CPU program by performing writing data in the circuit mode during RUN status.



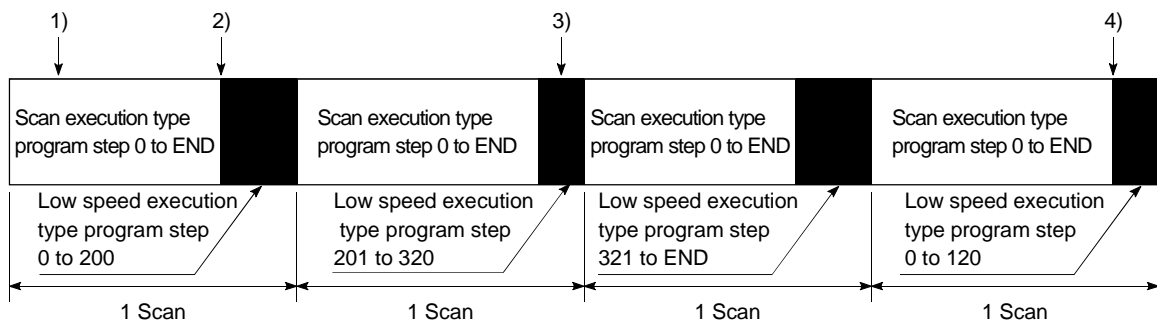
- Writing program during RUN can be performed from a GX Developer connected to another station in the network.



## (2) Precautions

Take a note of the following when writing during RUN:

- (a) The memory that can be written during RUN is only program memory.
  - 1) If the write during RUN is performed while booting a program from a memory card (RAM), the program to be booted will be changed. While booting, it takes some time until the write during RUN is completely executed.
  - 2) If the write during RUN is performed while booting a program from the standard ROM or memory card (ROM), the program to be booted will not be changed.  
Before turning off the PLC or resetting the Process CPU, write the program memory into the standard ROM or memory card (ROM).
- (b) A maximum of 512 steps can be written at once during RUN.
- (c) When a low speed execution type program is being executed, the RUN write is started once the low speed execution type program is complete. Also, the low speed execution is stopped temporarily during a RUN write.



- 1): RUN write command of the scan execution type program
  - 2): RUN write execution of the scan execution type program
  - 3): RUN write command of the low speed execution type program
  - 4): RUN write execution of the low speed execution type program
- (d) If the write during RUN is executed while the PLOAD, PUNLOAD or PSWAP instruction is executed, the processing will enter into a stand-by status for the write during RUN. If the write during RUN is executed while the PLOAD, PUNLOAD or PSWAP instruction is executed, the execution of the instruction is delayed until the write during RUN is executed.

- (e) The capacity of a Process CPU's program file is a sum of the capacity of the program created and steps used for the write during RUN. The write during RUN is executed when the capacity of a program file is increased. If the capacity of a program file becomes larger than what it was before, steps can be assigned for the write during RUN. This means that the write during RUN can be executed only when enough space is available in a user memory area. If steps are assigned again while the write during RUN is executed, scan time could be extended for a value shown below in the table. Controls are interrupted for a value shown below in the table.

CPU Type	Step for Write During RUN	
	If Not Changed	If Assigned Again
QnPHCPU	max. 1 ms	max. 90 ms

- (f) Process CPU does not work correctly, if the following instructions are written during RUN write.
- 1) Trailing edge instruction  
If the execution conditions of the following trailing edge instructions are not arranged upon completion of writing, the trailing edge instruction is executed.
    - LDF
    - ANDF
    - ORF
    - MEF
    - PLF
  - 2) Leading edge instruction  
If the execution conditions for leading edge instructions (PLS instruction and □P instruction) are arranged upon completion of writing, leading edge instruction is not executed.  
The leading edge instruction is executed when the execution conditions are OFF then ON.
  - 3) SCJ instruction  
If the execution conditions of the SCJ instruction are arranged upon completion of writing, a jump to the designated pointer occurs even in a scan cycle.

7.10.2 Writing a batch of files during RUN

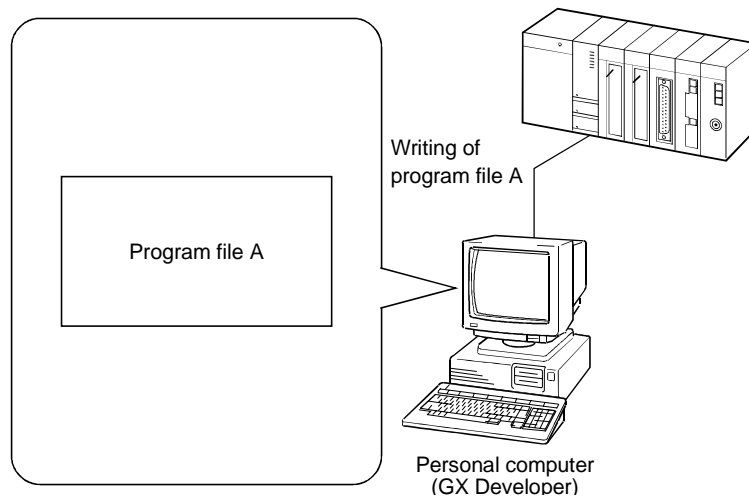
(1) File-Write During RUN function

(a) The file-write during RUN function is used to write a batch of files to the Process CPU as shown below in the table.

Memory Name	Process CPU Built-in			Memory Card (RAM)	Memory Card (ROM)	
	Program Memory	Standard RAM	Standard ROM	SRAM Card	Flash Card	ATA Card
Parameter	×	×	×	×	×	×
Intelligent function module parameter	×	×	×	×	×	×
Program	○	×	×	○	×	○
Device comment	○	×	×	△	×	△
Device initial value	×	×	×	×	×	×
File register	×	△	×	△	×	×
Local device	×	×	×	×	×	×
Debug data	×	×	×	×	×	×
Failure history data	×	×	×	×	×	×
PLC user data	×	×	×	×	×	×

○ : Writable data , × : Unwritable data

△ : Writable data if access is not being made in sequence program



**POINT**

The file-write during RUN allows writing three types of files:

- Program: program memory, SRAM card, ATA card
- Device comment: program memory, SRAM card, ATA card
- File register: standard RAM, SRAM card

Any other files cannot be written while the Process CPU is in the RUN status.

## (2) Precautions

The precautions for file-write during RUN are as follows.

- (a) The file-write during RUN can be executed when any of the following conditions is met. A SFC program does not allow writing a batch of files during the RUN status.
- 1) Program memory
    - When continuous space is available.
    - When space is available.
  - 2) Memory card
    - When space is available.
- (b) Please note that scan time could be extended as shown below in the table if the file-write during RUN is executed. Controls are stopped for some time as specified by a value in the table.

Event	QnPHCPU
When continuous space is available in a program memory	max. 300 ms
When space is available in a program memory	max. 300 ms
When space is available in a memory card (except ATA card)	max. 570 ms

Please note that scan time is extended for 1.25 seconds at 30 k step when an ATA card is in use.

- (c) Please note that no access can be made from an instruction in a sequence program while a batch of files is written, with the Process CPU in the RUN status. While the file-write during RUN is being executed, an instruction to make access to a file is not executed.
- (d) If a program file being executed is written when the Process CPU is in the RUN status, the following will not work properly. After the write is complete, a fall instruction is executed only when its execution condition is OFF.
- LDF
  - ANDF
  - ORF
  - MEF
  - PLF

7.11 Execution Time Measurement

This is a function to display the processing time of the program being executed.

This is used to find out the effect of each program's processing time on the total scan time.

There are three functions to the execution time measurement. The details of each function are indicated in sections 7.11.1 to 7.11.3.

- Program monitor list
- Interrupt program monitor list
- Scan time measurement

7.11.1 Program monitor list

(1) What is Program Monitor List?

- (a) This is a function to display the processing time of the program being executed.
- (b) The scan time, number of times executed, and processing time by item can be displayed for each program.

(2) Using the Program Monitor List

- (a) Choose "Online" → "Monitor" → "Program monitor list". "Program Monitor List" dialog box appears on screen.
- (b) The following shows an example of executing program monitor list.

The screenshot shows the 'Program monitor list' dialog box with the following data:

**Total scan time**

	Monitor time(ms)	Sum of scan time(ms)
Scan	200	2.000
Initial		2.000
Low speed		0.100

**Scan execution part, detailed scan time**

	Program(ms)	
	0.100	
END operation time(ms)		0.500
Low speed program(ms)		1.100
Constant waiting(ms)		0.300

**Each program execution status**

	Program	Execute	Scan time(ms)	Execute count
1	MAIN	Scan	0.000	24995
2	MAIN1	Scan	0.000	24995
3	MAIN5	Initial	0.000	1
4	MAIN4	Low speed	0.000	47167
5	MAIN3	Fixed Scan	.....	0
6	MAIN2	Wait	0.000	0
7				
8				
9				
10				
11				

Buttons at the bottom: Start monitor, Stop monitor, Startup program, Stop program, Close.

- a) "Total Scan Time"

The monitor time set in WDT(the watch dog timer) of "PLC RAS" tab screen in the (PLC) "Parameter" dialog box and total scan time for each program type are displayed.

  - 1) "Monitor Time"

The monitoring time for the scan execution type program, initialization program, and low speed execution type program are displayed.

If the scan time exceeds this time, the Process CPU displays the watch dog timer error.
  - 2) "Sum of Scan Time"

The total time in each item stated in "Scan Time Details for Scan Execution" are displayed.

"Constant" indicates the constant scan waiting time when the setting is made for constant scan.
- b) "Scan Time Details for Scan Execution"

The details of the scan time are displayed.

  - 1) "Program"

The total execution time of the scan execution type program is displayed.
  - 2) "END operation time"

The END operation time is displayed.
  - 3) "Low speed program"

This indicates the total execution time of a low speed execution type program when making the setting for the execution time of a low speed execution type program or constant scan time.
  - 4) "Constant waiting"

The constant scan waiting time is displayed when setting the constant scan time. However, when the low speed execution type program execution time is set as well, this value is 0.000 ms.
- c) "Each Program Execution Status"

The execution status of program specified at the "Program" tab screen in the (PLC) "Parameter" dialog box is displayed.

  - 1) "Program"

The program name is displayed in the order set in the parameter.
  - 2) "Execute"

The program type set in the parameter is displayed.
  - 3) "Scan Time"

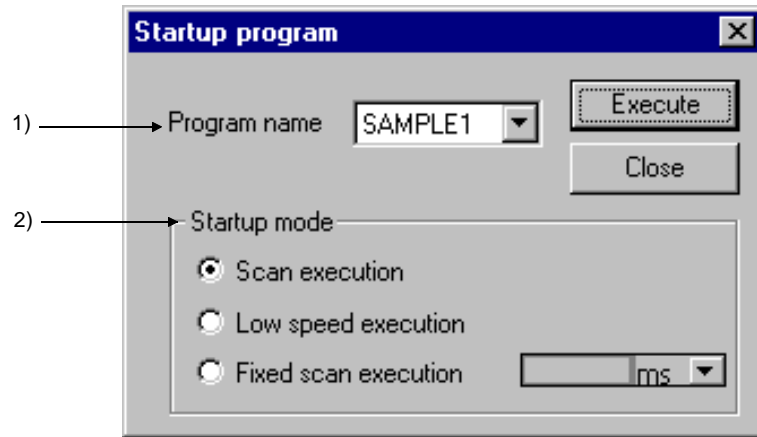
The actual scan time (current value) is displayed. At the program stop (wait) status, the scan time is displayed as 0.000 ms.
  - 4) "Execute count"

The number of times the program was executed is displayed, setting the starting point of when the measurement is started as "0". The number of execution times is displayed up to 65535 times and returns to 0 when the 65536th time measurement is made. The ex times remains even when the program is stopped.

(3) Program can be started and stopped on the program list monitor screen.

(a) Startup program button

Clicking the startup program button displays the following dialog box.



1) Program name

Only the program, that is set at the "Program" tab screen in "(PLC Parameter)" dialog box, can be selected. It is not allowed to enter a program name freely.

2) Startup mode

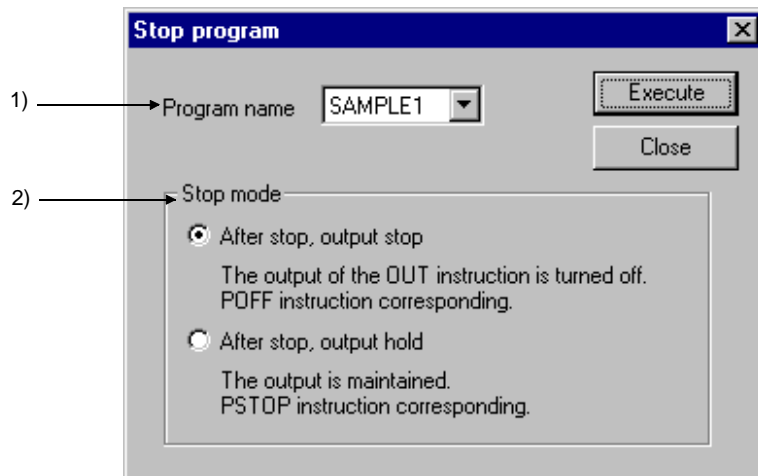
A stand-by type program for "Scan execution", "Low speed execution" or "Fixed scan execution" can be set.

Startup mode defaults to the value that was set by choosing [PLC Parameter] - <Program>. ms or s can be selected as the unit.



## (b) Stop program button

Clicking the stop program button displays the following dialog box.



## 1) Program name

Only the program, that is set at the <Program> tab in the "(PLC) Parameter" dialog box, can be selected.  
It is not allowed to enter a program name freely.

## 2) Stop mode

- Executing "After stop, output stop" for the scan execution type turns off the output (non-execution processing) at the next scan. The program is put in the standby status at and after the next scan. (This operation is the same as performed when the POFF instruction is executed.)
- Executing "After stop, output stop" for the low speed execution type suspends the execution of the low speed execution type and turns off the output at the next scan. The program is put in the standby status at and after the next scan. (This operation is the same as performed when the POFF instruction is executed.)
- Executing "After stop, output stop" for the standby program stops the program after one-scan OFF is executed as scan execution. For this reason, "Execute count" is also increased by 1.
- "Execute count" is also increased by 1 if an error occurs in the RET/IRET instruction during execution of one-scan OFF in the standby program.  
At this time, the execution type is "scan execution".

**POINT**

Depending on the instruction, the output may not turn OFF if "After stop, output stop" is executed.

For details, refer to the section of the POFF instruction in the following manual.

- QCPU (Q Mode)/QnACPU Programming Manual (Common Instructions)

## (4) Precaution

The scan time of a constant scan execution type program being executed is not displayed on screen, but a dash (-) is displayed in the Scan Time column.

## 7.11.2 Interrupt program monitor list

## (1) What is Interrupt Program Monitor List?

- (a) This function displays execution count of the interrupt program (I0 to I255).
- (b) This is used to confirm the execution status of the interrupt program.

## (2) Using the Interrupt Program Monitor List

Choose "Online" → "Monitor" → "Interrupt program monitor list". The "Interrupt Program Monitor List" dialog box appears on screen.

The following shows an execution example of the interrupt program monitor list:

Cut in pointer	Execute count	Common comment
I28	2512	100ms
I29	6280	40ms
I30	12560	20ms
I31	0	
I32	0	
I33	0	
I34	0	
I35	0	
I36	0	
I37	0	
I38	0	
I39	0	
I40	0	
I41	0	
I42	0	
I43	0	

a)

b)

## a) "Execute count"

The number of times the interrupt program was executed is displayed. This function starts counting the number when Process CPU is in RUN status (When the number reaches 65536 times, it is reset to 0).

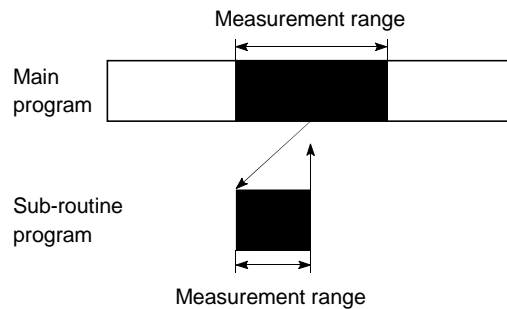
## b) "Common Comment"

This indicates device comments created on interrupt points (I0 to I255).

## 7.11.3 Scan time measurement

## (1) What is Scan Time Measurement?

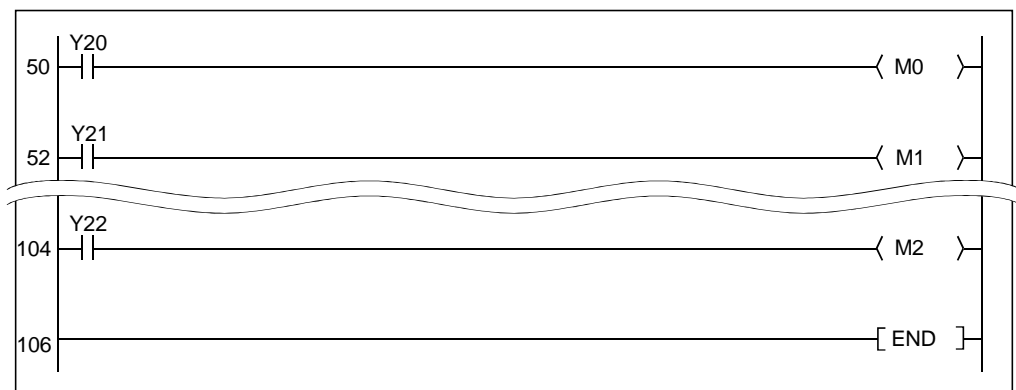
- (a) This function displays the set program interval processing time.
- (b) To specify a scan time measurement range, follow either of the following two steps:
  - Make the setting on the "Ladder monitor" window.
  - Make the setting on the "Scan Time Measurement" dialog box.
- (c) The time for the subroutines and interrupt program can be measured as well.
- (d) The time includes the time required for processing sub-routines, when the sub-routine CALL command is within the range of scan time measurement. The amount of time required for executing interruption programs and fixed scan execution type programs is all added to this.



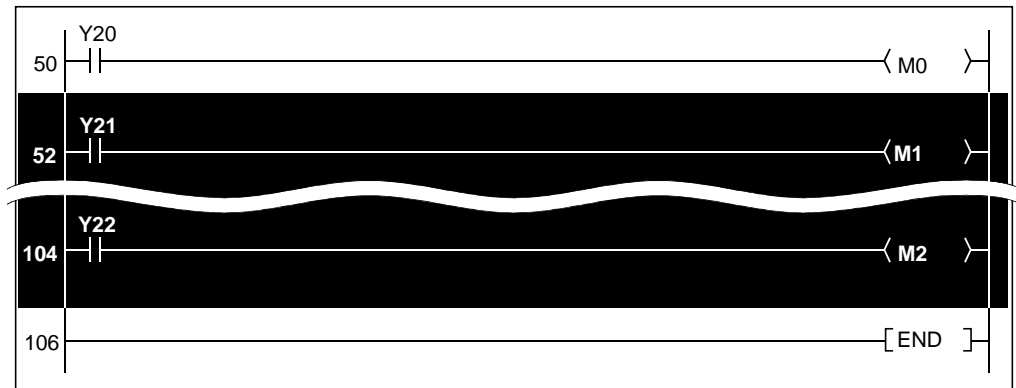
## (2) Measuring Scan Time

To measure scan time, follow the following steps.

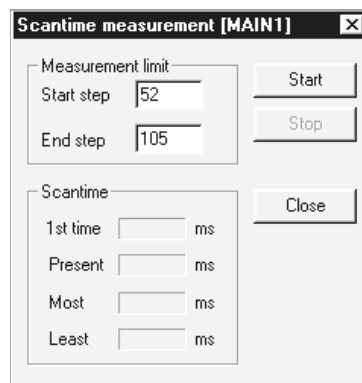
- (a) Display the leading edge of the circuit of which scan time to be measured, and set the monitor mode.



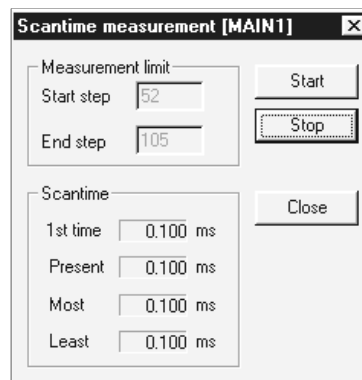
- (b) The scan time measurement range is specified.  
(The specified area is highlighted.)



- (c) Choose "Online" → "Monitor" → "Scantime measurement" to open "Scan time Measurement" dialog box.



- (d) Click on the "Start" button.



### (3) Precautions

- Set the "Measurement limit" so that the value of "Start step" is larger than that of "End step".
- The scan time to skip to another program file cannot be measured.
- If the measurement time is less than 0.100 ms, 0.000 ms is displayed.
- If a measurement range is specified between the FOR instruction and the NEXT instruction, scan time will show the execution time of making a measurement in the measurement range between specified steps.

7.12 Sampling Trace Function

POINT
<p>(1) The SRAM card (Q2MEM-1MBS, Q2MEM-2MBS) is required to store the trace data and trace results. After mounting the SRAM card to the Process CPU, execute sampling trace.</p> <p>(2) Sampling trace is not executed if the Flash card (Q2MEM-2MBF, Q2MEM-4MBF) or ATA card (Q2MEM-8MBA, Q2MEM-16MBA, Q2MEM-32MBA) is installed, because the cards cannot store the trace data and trace results.</p>

(1) What is Sampling Trace Function?

- (a) This function samples the device continuously on the Process CPU at specified timings.
- (b) The changed contents of the device that program uses during debugging can be checked at the specified timing.  
The sampling trace function reads device contents if trigger conditions are satisfied.
- (c) The sampling trace samples the contents of the specified device at a set interval (sampling cycle), and stores the trace results at the sampling trace file in the memory card.
- (d) The sampling trace file stores the trace condition data and trace execution data necessary to perform the sampling trace. When trace is started by using GX Developer, the trace is performed as many times as specified.  
The sampling trace area is 60 kbyte.  
The number of traces can be obtained by dividing 60 kbyte by the number of bytes specified as a device. The expression is:  $(\text{Number of Bit Devices}) / 8 + 2 \times (\text{Number of Word Devices})^{*1}$   
\*1: Round up result of "(number of Bit Devices)/8" in the expression to the right of the decimal point.

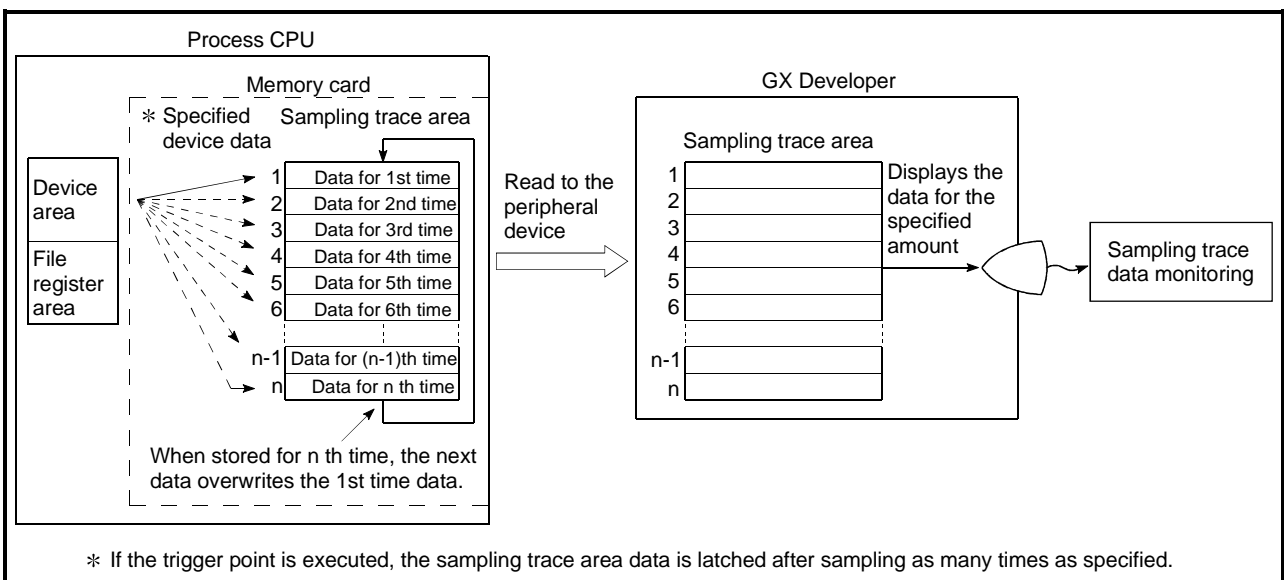
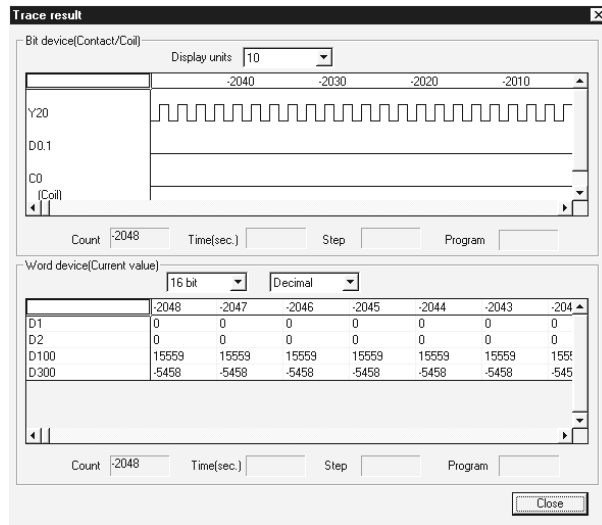


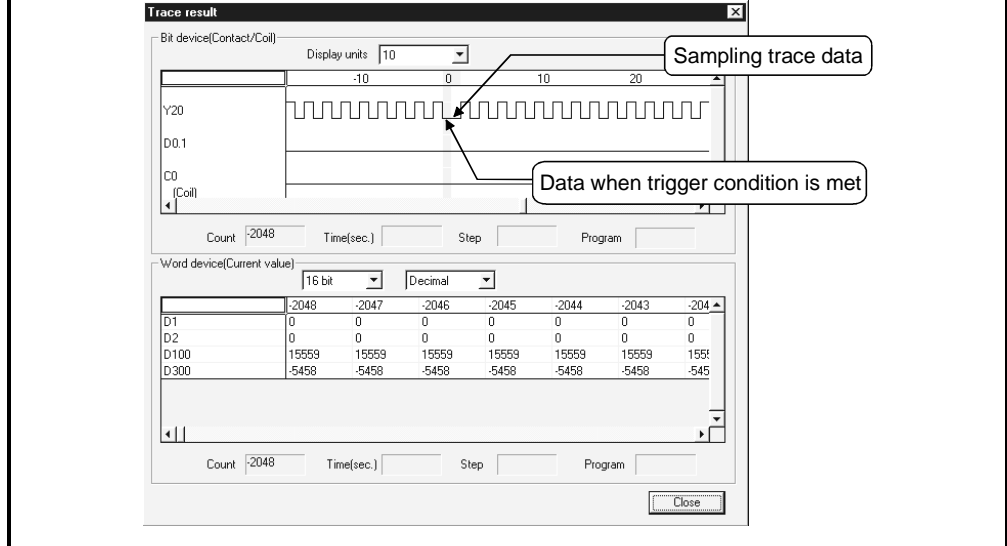
Fig. 7.8 Sampling Trace Operation

- (e) The trace result displays the ON/OFF status of the bit device for the sampling cycle, and the current value of the word device.

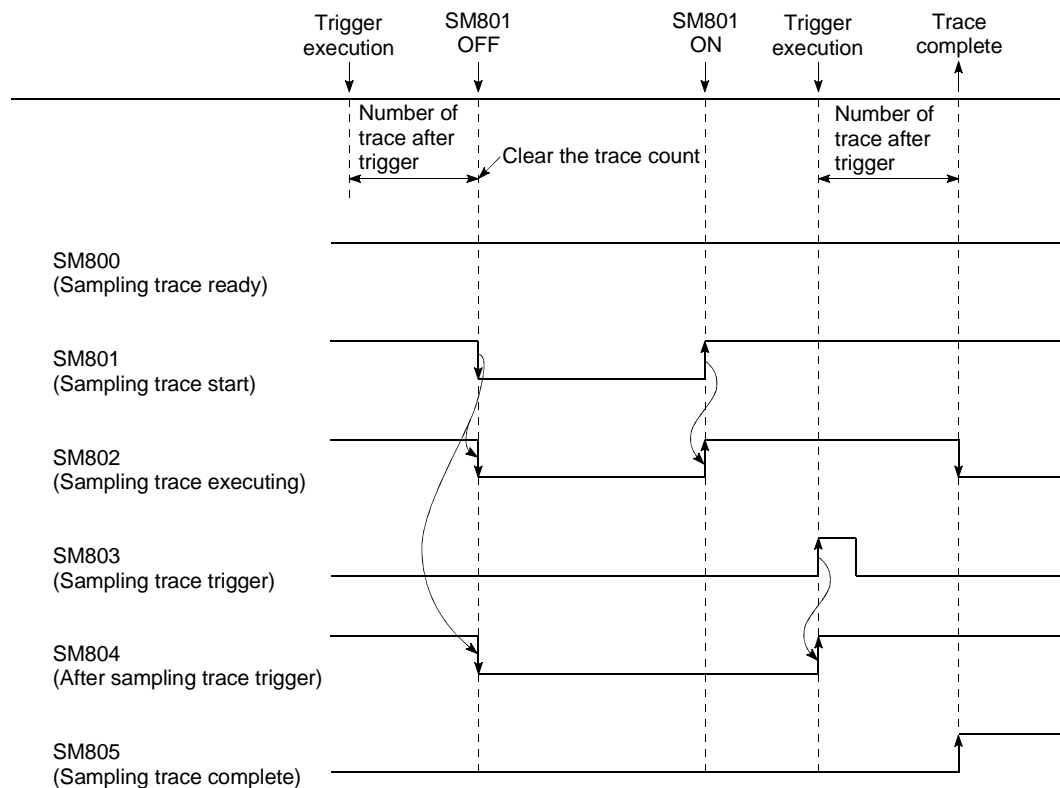


**POINT**

Device details are read under trigger conditions specified in the trigger point setting. Sampling is performed for each scan. Before the sampling is finished by a trigger operation of a peripheral device, data is sampled twice because the sampling timing is the same as that of trigger conditions.



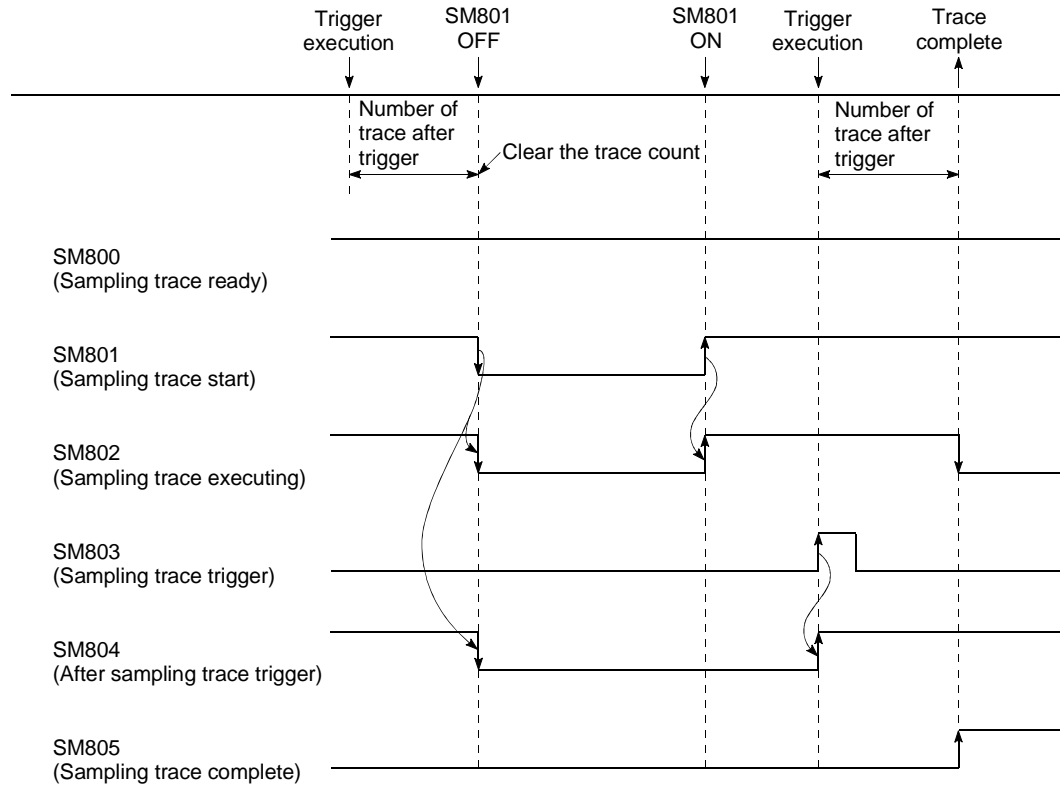
- (f) The execution status of the sampling trace function is stored in the special relay (SM800, SM802, SM804 and SM805).  
 If an error occurs while the sampling trace function is used, SM826 turns on. By using special relays in a sequence program, the execution status of the sampling trace function can be checked.
- 1) After the "trace data" and "trace conditions" set using GX Developer are written to the Process CPU, SM800 (sampling trace ready) turns on. SM800 indicates whether the sampling trace can be executed or not.
  - 2) When a sampling trace start request is accepted, the sampling trace starts and SM802 (sampling trace executing) turns on. SM802 indicates whether the sampling trace is executed or not.
    - A trace from GX Developer starts.
    - SM801 is turned on.
  - 3) When a next trigger condition is satisfied, SM804 (after sampling trace trigger) turns on. SM804 indicates whether the trigger conditions are satisfied or not.
    - A trigger from GX Developer executed.
    - The TRACE instruction is executed.
    - SM803 is turned on.
  - 4) After the sampling trace is completed, SM805 (sampling trace complete) is turned on.



When trace is interrupted from GX Developer, the SM800 is also turned off.

(g) Trace interrupt

- 1) When SM801 (sampling trace start) is turned off during sampling trace, the sampling trace is interrupted. In the meantime, the number of traces is cleared.
- 2) When turning on SM801 again, trace is restarted.



When trace is interrupted from GX Developer, the SM800 is also turned off.



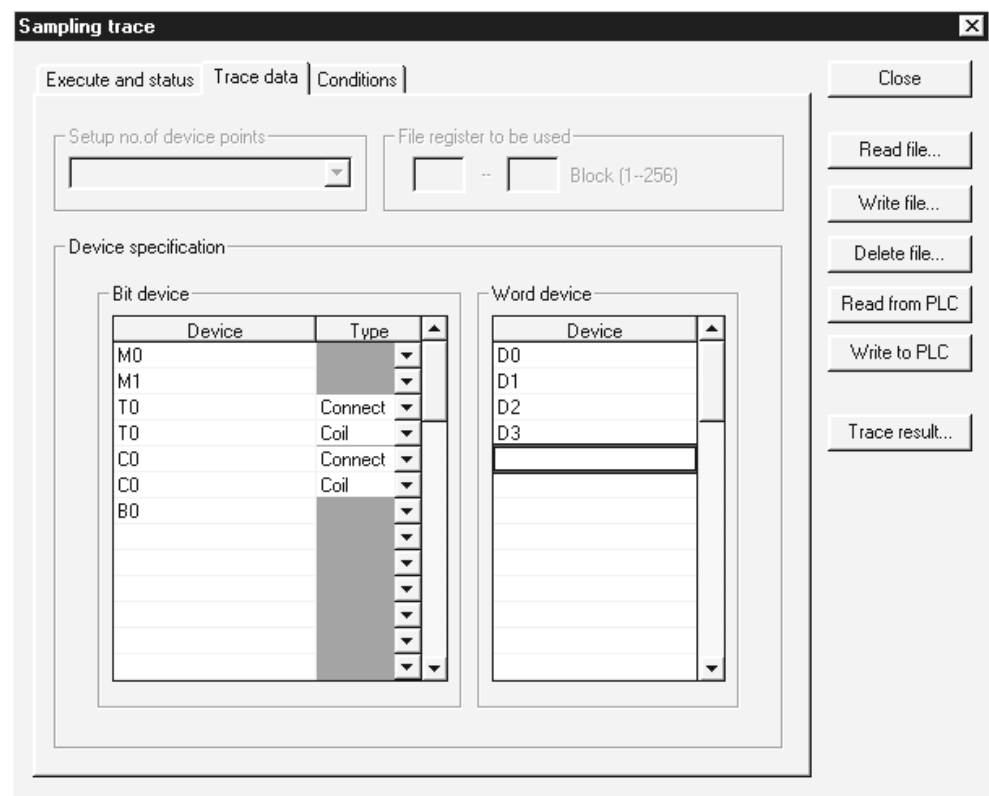
## (2) Operation Procedure

The sampling trace operation is performed in the following procedures:

Each operation is performed on the "Sampling trace" dialog box within the online mode trace menu.

## (a) Trace Device Setting

Set the device to perform sampling trace at the "Trace data" tab screen in the "Sampling trace" dialog box.



## 1) Bit Device

Maximum of 50 bit devices can be set as follows.

- X, DX, Y, DY, M, L, F, SM, V, B, SB
- T(contact), T(coil), ST(contact), ST(coil)
- C(contact), C(coil)
- J□\X, J□\Y, J□\B, J□\SB, BL□\S

## 2) Word Device

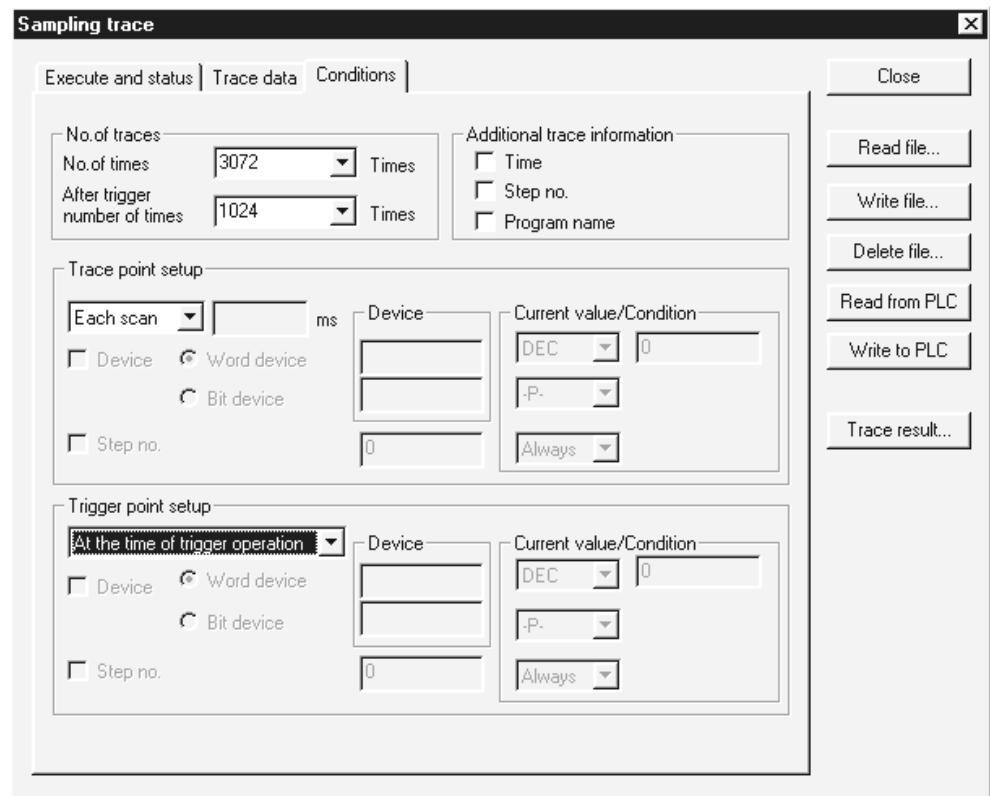
Maximum of 50 word devices can be set as follows.

- T(current value), ST(current value), C(current value), D, SD, W, SW, R, Z, ZR,
- U□\G, J□\W, J□\SW

(b) Setting the Trace Condition

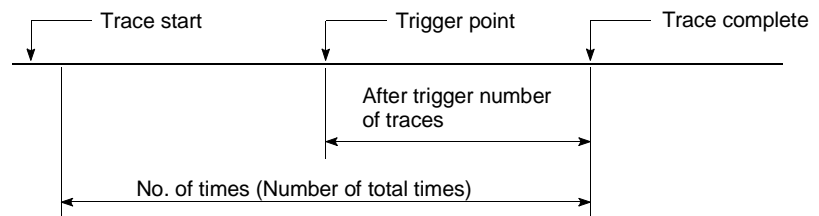
Set the trace condition at the "Conditions" tab screen in the "Sampling trace" dialog box.

The trace condition setting can set to "No. of traces", "Trace point setup", "Trigger point setup", and "Additional trace information".



1) No. of traces

- a) The "No. of times" sets the number of times to execute the sampling trace from trace execution to trace complete.
- b) The "After trigger number of times" sets the number of times to executes the sampling trace from trigger execution to trace complete.



- c) The setting range for each number of times is shown below:  
 (After trigger number of times) ≤ (No. of times) ≤ (8192)

## 2) Trace Point Setup

This sets the timing to collect trace data. Select one from the following:

## a) Each Scan

Collects trace data for every scan (END processing).

## b) Interval

Collects trace data at specified times.

## c) Detailed

Sets the device and step no. The setting method and trace data sampling timing is the same as mentioned in section 7.9.1., (when setting the monitor condition.)

The devices that can be set in the detailed condition are as follows:

- Bit Device : X, Y, M, L, F, SM, V, B, SB, T(contact), ST(contact), C(contact), J  \X, J  \Y, J  \B, J  \SB, BL  \S
- Word Device : T(current value), ST(current value), C(current value), D, SD, W, SW, R, Z, ZR, U  \G, J  \W, J  \SW

The following attributes can be set for the above devices:

- Bit device number of digits specification
- Word device bit number specification

## 3) Trigger Point setup

This sets the point to execute the trigger. Select one from the following:

## a) At the time of TRACE order:

The time of execution of TRACE instruction is set as the trigger.

## b) At the time of trigger operation:

The trigger operation from GX Developer device is set as the trigger.

## c) Detailed setting

The device and step number is set. The setting method and trigger execution timing is the same as mentioned in Section 7.9.1., (the monitor condition setting.)

## 4) Additional trace information

The information to be added for every trace is set. Multiple items can be selected from the following (of none of the items have to be selected):

## a) Time

Stores the time when the trace was executed.

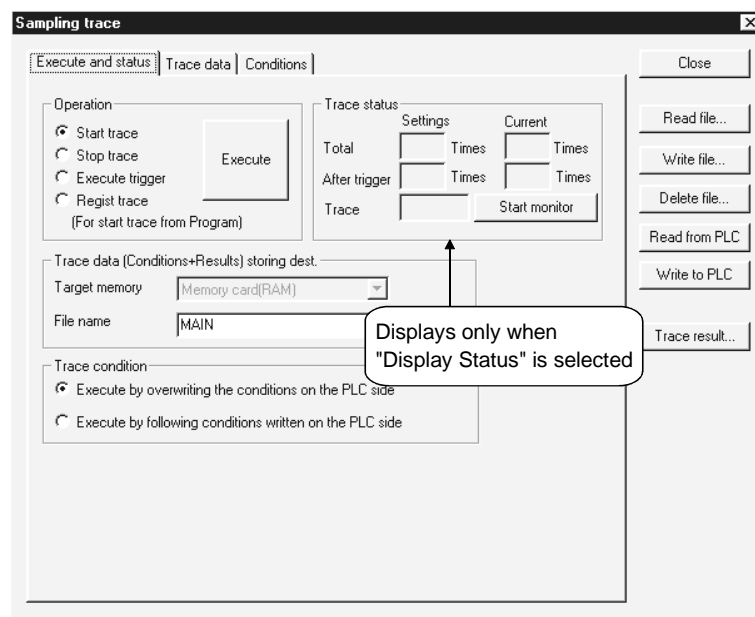
## b) Step No.

Stores the step number when the trace was executed.

## c) Program Name

Stores the program name that executed the trace.

- (c) The created trace data and trace condition is written to the memory card.  
 The trace file is written to the memory card (SRAM card).  
 The trace file is written to the memory card (SRAM card) from the "Write to PLC" dialog box in the "Sampling Trace" dialog box.  
 The files are written in the memory card (SRAM card) with file names, so multiple trace files can be stored.
- (d) Sampling trace is executed.  
 The sampling trace is executed at the "Execute and status" tab screen in the "Sampling Trace" dialog box.



"Operation", "Trace data (Condition + Results) storing dest", and "Trace condition" can be set when "Execute and Status" is displayed.

- 1) At the "Operation" section, select one of the following:
  - Start trace  
The trace is started. Starts to count the trace count.
  - Stop trace  
The trace is interrupted. The total trace count and trace count after trigger are cleared. (When restarting trace, select "Start trace" again.)
  - Execute trigger  
Starts to count the trace count after trigger. The trace is complete when the trace count reaches the specified trace count after trigger.
  - Regist trace  
Registers trace data when a program is executed.
- 2) In the "Trace data (Conditions+Results) storing dest." section, specify a file name of a file in which to store trace data and trace conditions.  
 Trace results are also stored in a selected file with a specified file name.

- 3) At the "Trace Condition" section, select one of the following:
  - Execute by overwriting the conditions on PLC side.  
Overwrites trace condition to the existing trace file.
  - Execute by following conditions written on PLC side  
Executes the program with the conditions in the trace file specified in "Trace Data (Condition + Results) storing dest".
- (e) Read the trace results from the Process CPU and display the data.
  - 1) "Read from PLC" reads the trace result from the Process CPU.
  - 2) The read trace results appears in "Trace results" display.

<b>POINT</b>
--------------

Sampling trace is executed only once.

When re-executing, execute the TRACE instruction, and reset the sampling trace.

### (3) Precautions

- (a) SRAM card is required for sampling trace.  
Set the sampling trace file in the memory card (SRAM).
- (b) The sampling trace can be executed from other station on the network or serial communication module. However, the trace cannot be executed from multiple areas at once. The trace can only be executed from one area with Process CPU.
- (c) The trace information (trace file) registered in the Process CPU is registered in the SRAM card and latched. As the condition data is stored in the trace file, even if the power is off or the Process CPU is reset, the sampling trace can be executed under registered trace conditions.  
At power on/reset of Process CPU, latched trace information is cleared in the cases where:
  - The SRAM card registered in a trace file is not inserted
  - The trace file is corrupted
 This requires registering trace information once again by operating from GX Developer.  
To clear data, perform the latch-clear operation with the RESET/L.CLR switch.  
To perform sampling trace again after latch clear, execute sampling trace after selecting "Regist trace".
- (d) This is performed by connecting the Process CPU and GX Developer.
- (e) While in STOP status, the Process CPU cannot read sampling trace results. To enable the Process CPU to read the sampling trace results, enter the Process CPU into RUN status.
- (f) When executing the sampling trace, ensure that trigger conditions cannot be satisfied at trigger points. If the trigger conditions are met when executing the sampling trace, they will not be recognized as trigger conditions.

## 7.13 Debug Function with Multiple Users

## (1) What is Debug Function with Multiple Users?

- (a) This function performs debugging from multiple GX Developer connected to Process CPU or Serial communication module at the same time.
- (b) If debugging tasks are classified by process or by function, this function is used to perform debugging of different files from multiple GX Developer at once.

## (2) Function Description

The debug function combination for multiple users are as follows:

Functions to be executed later Functions being executed	Monitor	Write during RUN	Execution time measurement	Sampling trace
Monitor	○	×	○	○
Write during RUN	×	○	×	×
Execution time measurement	○	×	×	○
Sampling trace	○	×	○	×

- : Can be performed at the same time. (However, the detailed condition can only be set from one GX Developer. In this case, the detailed condition setting cannot be performed from another GX Developer.)
  - ×
- ×
  - ×

×

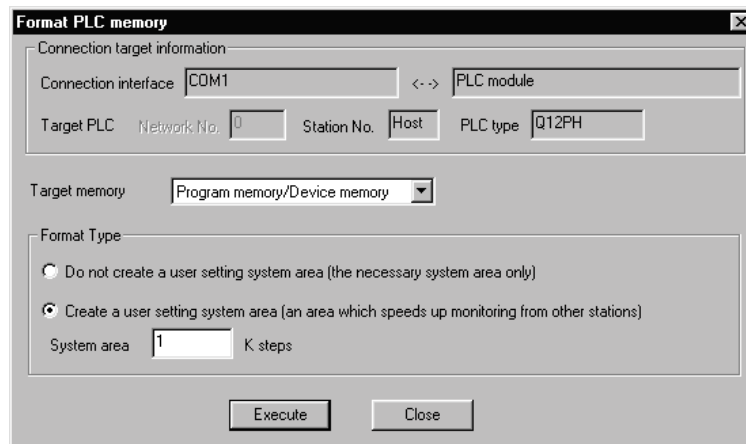
## 7.13.1 Multiple-user monitoring function

## (1) What is Multiple-User Monitoring Function?

- (a) The multiple-user monitoring operation can be performed by operating from multiple GX Developers connected to the Process CPU or the Serial communications module.
- (b) Multiple users can monitor at the same time. By setting a station monitor file, high speed monitoring can be performed. (It is not necessary to set host station monitor file.)

## (2) Operation Procedure

- (a) For multi-user monitoring operation, create a user-defined system file in the following steps.
  - 1) Choose "Online" → "Format PLC Memory" to open the "Format PLC Memory" dialog box.
  - 2) Select "program memory" from the "Target Memory list box".
  - 3) At the "Format Type" section, select "Create a user setting system area..." so that its radio button is checked.
  - 4) Specify the desired k steps in the "System Area" text box.
- (b) The following figure illustrates an example in which "1k step" is specified in the "System Area" text box.



- 1) A maximum of 15 k steps can be set in 1 k step modules as a system area. Only 1 k step can correspond to one station monitor file. Therefore, a maximum of 15 station monitor files can be set.

## (3) Precautions

- (a) The detailed condition setting of the monitor can only be set from one area.
- (b) Monitoring can be performed even if a station monitor file is not set, but high speed monitoring cannot be performed.  
The system area is in the same area as the program memory, so the area of the stored program decreases when the system area is set.
- (c) Once the user-defined system area is allocated, a single PLC can be accessed from 16 stations.

## 7.13.2 Multiple-user RUN write function

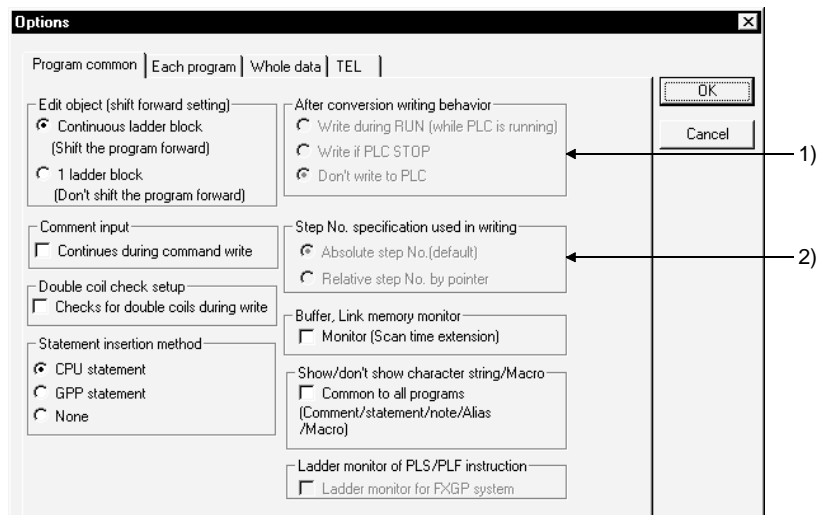
## (1) What is Multiple-User RUN Write Function?

- (a) Multiple users can write to one file or different files during RUN.
- (b) To enable multiple users to write to a single file at the same time during RUN operation, specify the desired pointer for the "write during RUN" in advance, and then select "Relative step No. by pointer" so that its radio button is checked.

## (2) Operation Procedure

The multiple-user RUN write operation is performed in the following procedures:

- (a) Select Tool from Option menu and set "After conversion writing behavior" and "Step No. specification used in writing".

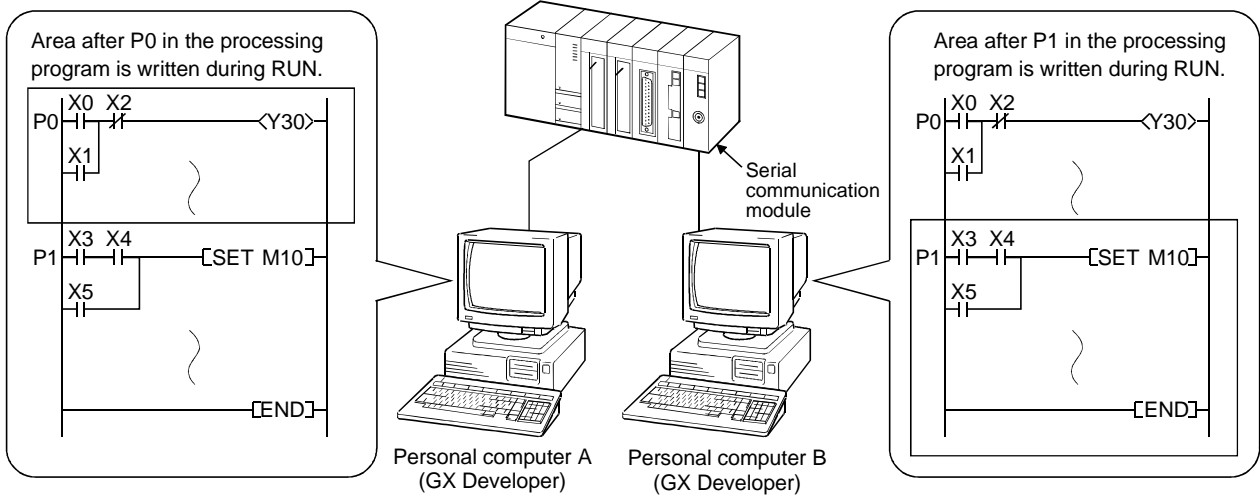


- 1) Set "Write during RUN (while PLC is running)" in "After conversion writing behavior".
- 2) Select "Absolute step No. (default)" or "Relative step No. by pointer" in "Step No. specification used in writing".



- (b) The specified circuit of the pointer is displayed to write the circuit after conversion during RUN.

The following is an example of GX Developer A writing during RUN from P0 and GX Developer B writing during RUN from P1. The program area surrounded with  is the area to be written during RUN.



**(3) Precautions**

Precautions on "write during RUN" is the same as precautions on "write during RUN in the circuit mode" in Section 7.10.1. For further information, see Section 7.10.1.

## 7.14 Watch dog Timer (WDT)

## (1) What is Watch dog Timer (WDT)?

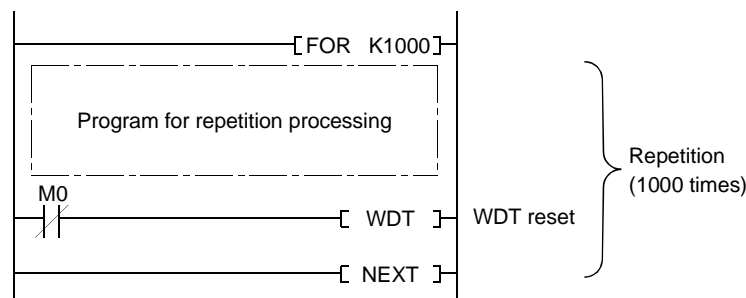
- (a) The watch dog timer is an internal sequence timer to detect Process CPU hardware and sequence program error.
- (b) When the watch dog timer expires, a watch dog timer error occurs. The Process CPU responds to the watch dog timer error as follows:
  - 1) The Process CPU turns off all outputs.
  - 2) The front-mounted RUN LED turned off, and the ERR. LED starts flickering.
  - 3) SM1 turns ON and the error code is stored in SD0.
- (c) The default value of the watch dog timer is 200 ms. The setting range is 10 to 2000 ms (in 10ms units).

## (2) Watch dog Timer Setting and Reset

- (a) The watch dog timer setting can be changed at the "PLC RAS" tab screen in the "(PLC) Parameter" dialog box.
- (b) Process CPU resets the watch dog timer during the END processing.
  - 1) When the END/FEND instruction is executed within the set value of the watch dog timer in the sequence program and the Process CPU is operating correctly, the watch dog timer does not time out.
  - 2) When the scan time of a sequence program is extended due to the Process CPU hardware error or execution of interrupt program/fixed scan execution type program, and END/FEND instruction cannot be executed within the set watch dog timer value, the watch dog timer times out.

## (3) Precautions

- (a) An error of 0 to 10 ms occurs in the measurement time of the watch dog timer. Set the watch dog timer for a desired value by taking such an error into account.
- (b) The watch dog timer is reset with the WDT instruction in the sequence program. If the watch dog timer expires while the FOR and NEXT instructions are repetitiously executed, reset the watch dog time with the WDT instruction.



- (c) The scan time value is not reset even if the watch dog timer is reset in the sequence program.

The scan time value is measured to the END instruction.

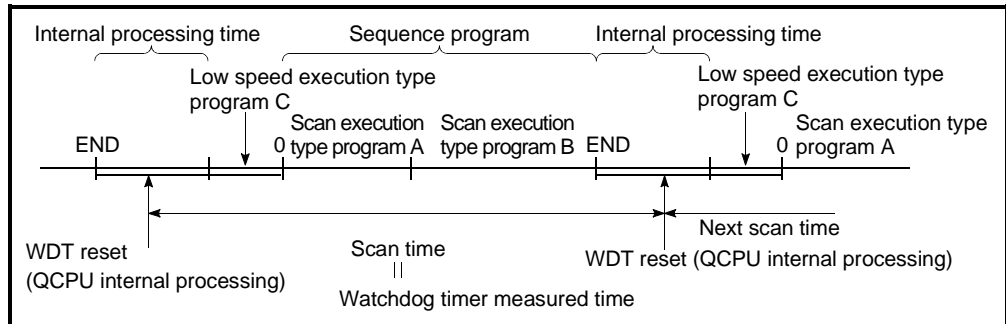


Fig. 7.9 Watch dog Timer Reset

#### REMARK

- Scan time is the time from when the Process CPU starts processing a sequence program at Step 0 until it restarts processing another sequence program with the same filename at Step 0.  
The scan time is not the same at every scan, and differs, depending on
  - Whether the commands used are executed or not executed.
  - Whether to execute or not an interrupt program and a fixed scan execution type program.
- To execute at the same scan time at every scan, use the constant scan function. For details of the constant scan function, see section 7.2.

### 7.15 Self-Diagnosis Function

- (1) What is Self-Diagnosis Function
  - (a) The self-diagnosis is a function performed by the Process CPU itself to diagnose whether there is an error in the Process CPU.
  - (b) The self-diagnosis function is used to prevent the Process CPU erroneous operation as well as preventive maintenance.  
The self-diagnosis processing detects and displays the error when an error occurs at the Process CPU power on or during Process CPU RUN mode. It also stops Process CPU calculations.
- (2) Processing for Error Detection
  - (a) When the Process CPU detects an error, it turns on ERR. LEDs. When an error is detected, special relays (SM0, SM1) are turned ON and an error code of the error is stored in the special register SD0. When multiple errors are detected, error codes of the latest errors are stored in the special register SD0. For error detection, use special relays and special registers in programs so that these devices can interlock with sequencers and mechanical systems.
  - (b) The Process CPU stores 16 latest error codes. (See Section 7.16.)  
The failure history can be checked in the GX Developer function PLC diagnostics mode.  
The failure history can be stored even when the power is shut off using the battery backup.
- (3) Process CPU operation at the time of error detection
  - (a) When an error is detected from the self-diagnosis, there are two types of modes that the Process CPU operation can change to.
    - 1) Process CPU calculation stop mode  
The calculation is stopped on detecting an error, and all outputs of modules are set to OFF if the outputs for the modules have been set to "Clear (Default)" at the "Error time output mode" section in the "I/O assignment" tab screen within the "(PLC) Parameter" dialog box. And output (Y) is held.  
However, the outputs of the modules are held if they have been set to "Hold" there. The output (Y) is also held.
    - 2) Process CPU calculation continue mode  
When an error is detected, the program (Instruction) area where the error occurred is skipped and the rest of the program is executed.
  - (b) The calculation "continue/stop" can be set at the "PLC RAS" tab screen in the (PLC) "Parameter" dialog box if the following error occur.  
(All parameter defaults are set at "Stop".)
    - 1) Computation error
    - 2) Expanded Command error
    - 3) Fuse blown
    - 4) I/O module comparison error
    - 5) Intelligent module program execution error
    - 6) Memory card access error
    - 7) Memory card operation errorFor example, when the I/O module verification error is set to "continues", the calculations are continued in the I/O address before the error occurred.

## (4) Error check selection

The following error checking can be set to "yes/no" at the "PLC RAS" tab screen in the "(PLC) Parameter" dialog box.

(All parameter defaults are set at "Yes".)

- (a) Battery check
- (b) Fuse blown check
- (c) I/O unit comparison

## Self-Diagnosis List

	Diagnosis description	Error message	Diagnostic timing
Hardware failure	CPU error	MAIN CPU DOWN	• Always
	END instruction not executed	END NOT EXECUTE	• When the END instruction is executed
	RAM check	RAM ERROR	• When the power is turned on/when reset
	Calculation circuit check	OPE.CIRCUIT ERR.	• When the power is turned on/when reset
	Fuse blown (default... stop) * 1	FUSE BRAKE OFF	• When the END instruction is executed (Default... Yes) * 2
	I/O interrupt error	I/O INT ERROR	• When an interrupt occurs
	Intelligent function module error	SP.UNIT DOWN	• When the power is turned on/when reset • When the FROM/TO instruction is executed
	Control bus error	CONTROL-BUS ERROR.	• When the power is turned on/when reset • When the END instruction is executed • When the FROM/TO instruction is executed
	Momentary stop occurred	AC/DC DOWN	• Always
	Battery low	BATTERY ERROR	• Always (Default...Yes) * 3
Handling error	I/O module verification (Default... Stop) * 1	UNIT VERIFY ERROR	• When the END instruction is executed (Default... Yes) * 2
	Intelligent function module allocation error	SP.UNIT LAY ERR.	• When the power is turned on/when reset • When switched from STOP to RUN
	Intelligent program execution error (Default... Stop) * 1	SP.UNIT ERROR	• When the FROM/TO instruction is executed
	Intelligent function module version error	SP.UNIT VER.ERR.	• When the power is turned on/when reset
	No parameter	MISSING PARA.	• When the power is turned on/when reset
	Boot error	BOOT ERROR	• When the power is turned on/when reset
	Memory card operation error (Default... Stop) * 1	ICM.OPE.ERROR	• When the memory card is installed/removed
	File setting error	FILE SET ERROR	• When the power is turned on/when reset
	File access error (Default... Stop) * 1	FILE OPE.ERROR	• When an instruction is executed
	Instruction execution not possible	CAN'T EXE.PRG.	• When the power is turned on/when reset
Parameter error	Parameter setting check	PARAMETER ERROR	• When the power is turned on/when reset • When switched from STOP to RUN
	Link parameter error	LINK PARA.ERROR	• When the power is turned on/when reset • When switched from STOP to RUN
	SFC parameter error	SFC PARA.ERROR	• When switched from STOP to RUN
	Intelligent function module parameter error	SP.PARA.ERROR	• When the power is turned on/when reset

\*1:Can be changed to "Continue" in the GX Developer function parameter setting.

\*2:Can be set to "No" in the GX Developer function parameter setting. Also, checking is not performed when SM251 is on.

\*3:Can be set to "No" in the GX Developer function parameter setting.

## Self-Diagnosis List (Continued from the preceding page)

Diagnosis description		Error message	Diagnostic timing
Password error		REMOTE PASS.ERR.	<ul style="list-style-type: none"> <li>When the power is turned on/when reset</li> <li>When switched from STOP to RUN</li> </ul>
Program error	Instruction code check	INSTRUCT CODE.ERR.	<ul style="list-style-type: none"> <li>When the power is turned on/when reset</li> <li>When switched from STOP to RUN</li> </ul>
	No END instruction	MISSING END INS.	<ul style="list-style-type: none"> <li>When the power is turned on/when reset</li> <li>When switched from STOP to RUN</li> </ul>
	Pointer setting error	CAN'T SET(P)	<ul style="list-style-type: none"> <li>When the power is turned on/when reset</li> <li>When switched from STOP to RUN</li> </ul>
	Pointer setting error	CAN'T SET(I)	<ul style="list-style-type: none"> <li>When the power is turned on/when reset</li> <li>When switched from STOP to RUN</li> </ul>
	Operation check error (Default... Stop) * 1	OPERATION ERROR	When an instruction is executed
	FOR to NEXT instruction structure error	FOR NEXT ERROR	When an instruction is executed
	CALL to RET instruction structure error	CAN'T EXECUTE(P)	When an instruction is executed
	Interrupt program error	CAN'T EXECUTE(I)	When an instruction is executed
	Instruction execution not possible	INST.FORMAT ERR.	When an instruction is executed
	SFC program structure error	SFCP.CODE ERROR	When switched from STOP to RUN
	SFC block structure error	CAN'T SET(BL)	When switched from STOP to RUN
	SFC step structure error	CAN'T SET(S)	When switched from STOP to RUN
	SFC syntax error	SFCP.FORMAT ERR.	When switched from STOP to RUN
	SFC operation check error (Default... Stop) * 1	SFCP.OPE.ERROR	When an instruction is executed
	SFC program execution error	SFCP.EXE.ERROR	When switched from STOP to RUN
	SFC block execution error	BLOCK EXE.ERROR	When an instruction is executed
	SFC step execution error	STEP EXE.ERROR	When an instruction is executed
PLC error	Watch dog error supervision	WDT ERROR	Always
	Program time exceeded	PRG.TIME OVER	Always
Multiple PLC	Other PLC major error	MULTI CPU DOWN	<ul style="list-style-type: none"> <li>Always</li> <li>When the power is turned on/when reset</li> </ul>
	Multiple PLC consistency error	CPU VER.ERR.	<ul style="list-style-type: none"> <li>When the power is turned on/when reset</li> </ul>
	Other PLC minor error	MULTI CPU ERR.	<ul style="list-style-type: none"> <li>Always</li> </ul>
BOOT OK		BOOT OK	<ul style="list-style-type: none"> <li>When the power is turned on/when reset</li> </ul>
Annunciator check		F * * * *	When an instruction is executed
CHK Instruction check		<CHK>ERR * * * - * * *	When an instruction is executed

\* 1: Can be changed to "continues" in the GX Developer function parameter setting.

### 7.15.1 Interrupt due to error occurrence

The Process CPU can execute the interrupt program of the interrupt pointer that is set as the interrupt object when an error occurs.

Only when the error set to "continue" at the "PLC RAS" tab screen in the "(PLC) Parameter" dialog box occurs, the Process CPU executes the interrupt program corresponding to the error. When the error set to "stop" there occurs, the interrupt program (I32) for "Stop all errors" is executed.

Interrupt pointer	Corresponding error message
I32	Stop all errors *
I33	Empty
I34	UNIT VERIFY ERR. FUSE BREAK OFF SP.UNIT ERROR
I35	OPERATION ERROR SFCP OPE.ERROR SFCP EXE.ERROR
I36	ICM.OPE.ERROR FILE OPE.ERROR
I37	EXTEND INS.ERR.
I38	PRG.TIME OVER
I39	CHK instruction Annunciator detect
I40 to I47	Empty

Errors that occur when the system can continue the drive mode, where or "continue" is selected from "continues/stops".

POINT
<p>(1) The interrupt pointers I32 to I39 is at an execution disable mode when the power is started or Process CPU is reset. When using I32 to I39, use the IMASK instruction and EI instruction to enable execution.</p> <p>(2) *: The I32 interrupt program is not executed upon the following serious errors.</p> <ul style="list-style-type: none"> <li>• MAIN CPU DOWN</li> <li>• END NOT EXECUTE</li> <li>• RAM ERROR</li> <li>• OPE CIRCUIT ERR.</li> </ul>

### 7.15.2 LED display when error occurs

When an error occurs, the LED located on the front of the Process CPU turns on / flickers.

See Section 7.19 for the details on the LED operation.

### 7.15.3 Error cancellation

Process CPU error cancel operation can be performed only for error that can continue the Process CPU operation.

#### (1) Error cancellation

##### (a) Procedures for error cancellation

The error cancel is performed as follows:

- 1) Resolve the cause of error.
- 2) Store the error code of the error to be canceled in the special register SD50.
- 3) Switch special relay SM50 from OFF to ON.
- 4) The error is canceled.

##### (b) Status after error cancellation

When the CPU module is recovered by canceling the error, the special relay, special register, and LED affected by the error are set to the status before the error occurred.

When the same error occurs after canceling the error, it is logged again in the failure history.

##### (c) Cancellation of annunciator

For the cancellation of the annunciator detected multiple times, only the first detected "F" is canceled.

POINT
When error cancellation is performed by storing the code of the error to cancel is stored in SD50, the lower 2 digits of the code number is ignored. [Example] When 2100 and 2111 occur in the error code and error code 2100 is canceled, error code 2111 is canceled as well.



## 7.16 Failure History

The Process CPU can store the failure history (results detected from the self-diagnosis function and the time) in the memory.

<b>POINT</b>	The detection time uses the Process CPU internal clock, so make sure to set the correct time when using the Process CPU for the first time.
--------------	---

### (1) Storage Area

- (a) The latest 16 failures are stored in the latched Process CPU failure history storage memory.
- (b) When storing more than 16, the history can be stored in the memory card file using PLC RAS setting in the "(PLC) Parameter" box.
- (c) When the history count set in the parameter and that stored in the memory card are different after the following operation is performed, the contents of the memory card history file is cleared, then the 16 failure data in the Process CPU failure history storage memory is transferred to the history file.
  - 1) When the history count in the parameter history file is changed in the middle of operation.
  - 2) When a memory card, which has a different history count from that set in the parameter, is mounted.
- (d) The storage area in the failure history file is as follows:

Storage area	File in the set memory card
Amount that can be stored	Max. 100 (can be changed) * 1

\*1: When the number of storage exceed the amount that can be stored, the oldest history is overwritten with the latest history.

<b>POINT</b>	Even if the failure history file set in the parameter does not exist in the memory card, the error will not occur in the Process CPU. The Process CPU stores the failure to the failure history storage file.
--------------	--

### (2) Failure History Clearing Method

The failure history storage memory/failure history file are cleared using the failure history clear in the GX Developer PLC diagnosis mode.

Data stored in both the Process CPU failure history storage memory and failure history file within the memory card can be cleared with a failure history clear.

## 7.17 System Protect

The Process CPU has a few protection functions (system protect) to prevent the program changes by a third party other than the designer (from GX Developer function or serial communication module).

There are the following methods for system protects.

Item to protect	Protect valid file	Protection description	Method	Valid Timing	Remarks
All of CPU	All files	Prohibits all write/control instructions to the Process CPU.	Set the Process CPU system setting switch SW1 on.	Always	Valid for devices too
Memory card module	All files	Performs drive protect for the memory card, and write protect.	Set write-protect switch on the memory card on.	Always	—
File module	Programs Device comments Device initial values	Changes the attribute for each file as follows: 1) Read/Write display prohibit 2) Write prohibit	Change the attribute for the file in the Password Registration.	Always	—

\*The control instruction, read/write display, and write mentioned above are as follows:

Item	Description
Control instruction	Process CPU operation instruction by remote operation. (Remote RUN, remote STOP, etc.)
Read/Write display	Program read/write operations.
Write	Operation related with write processing such as program writes the program and tests.

POINT
<p>The following functions set the "(PLC) Parameter" and Process CPU dip switches are performed even when the Process CPU system's SW1 setup switch is set to ON and the system protect function is activated.</p> <ul style="list-style-type: none"> <li>• Booting from the standard ROM and the memory card</li> <li>• Automatic write to standard ROM</li> </ul>

## 7.17.1 Password registration

Password is used to prohibit reading and writing data of the program and comments in Process CPU from GX Developer.

The Password Registration is set for the specified memory (program memory/standard memory/memory card) program file, device comment file, and device initial file.

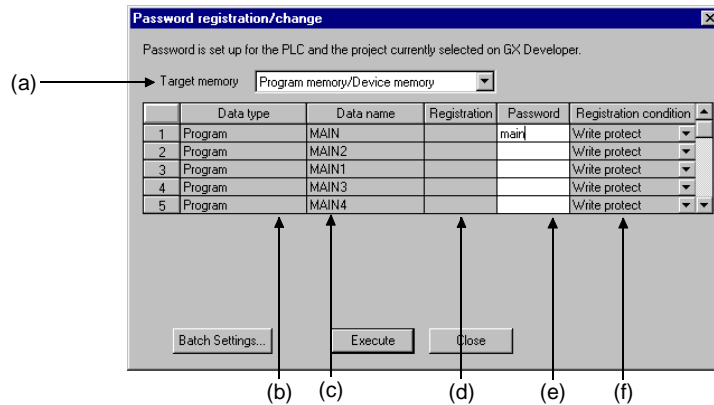
Either of the following two descriptions is to be registered.

- The file name is not displayed and read/write cannot be performed as well.
- Write cannot be performed to the file. (Read only)

If the password is registered, file operations from GX Developer cannot be performed unless the same password is input.

## (1) Password Registration

To register the password, select GX Developer Online → Password setup/keyword set up for writing to PLC → Register password.



Each item is described below:

- (a) Target memory ..... Specifies the memory storing the file whose password is to be registered or changed.
- (b) Data type..... Displays the type of a file stored in the target memory.
- (c) Data name ..... Displays a filename of a file stored in the target memory.
- (d) Registration..... Displays an asterisks " \* " that indicates a password-protected file.
- (e) Password ..... Defines or changes a password.
- (f) Registration Condition
- 1) Write Protect ..... Write operation is restricted by a password. (Reading is not allowed.)
  - 2) Read/Write protect..... Read/Write operation is restricted by a password.
  - 3) Clear..... Password is cleared. (Sets password currently registered in "Password".)

**POINT**

- (1) Password-protected files are limited to program files, device comment files, and device initial value files. Other files cannot be password-protected.
- (2) The password registered to a file can not read out from the file. If the password can not be remembered, file operation other than following can not be performed.
  - Program memory/Memory card: Format PLC memory
  - Standard ROM: Write to PLC (Flash ROM)
 Take notes of the password registered and keep it on hand.

## 7.17.2 Remote passwords

The remote password function prevents illegal access to the Process CPU by users in remote locations.

The remote password function is enabled for use by setting it up in the Process CPU. When the remote password function has been set, a check will be run on remote passwords when users in remote locations attempt to access the Process CPU with serial communication modules or Ethernet modules with modem functions.

## (1) Setting up, amending and canceling remote passwords

## (a) Remote password setup

Remote passwords are set up on the GX Developer's remote password setup screen. The GX Developer is then connected to the Process CPU into which the remote password is to be set, and the password uploaded. The Process CPU will transmit the remote password to specified serial communication modules and Ethernet modules when the power supply to the sequence is switched on or the Process CPU is reset.

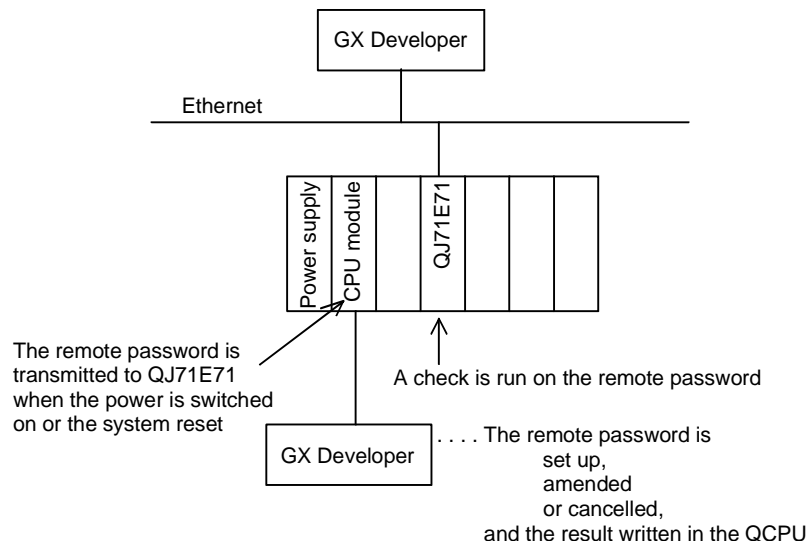
## (b) Amending and canceling remote passwords

It is possible to amend and cancel remote passwords by connecting the GX Developer to the relevant Process CPU.

Remote passwords set in the Process CPU can be amended or cancelled by setting up an amended password or canceling a remote password with the GX Developer.

Remote passwords cannot be amended or cancelled from a remote location.

For example, an outline of what will happen when a remote passwords is set up, amended or cancelled from an Ethernet module is shown below.

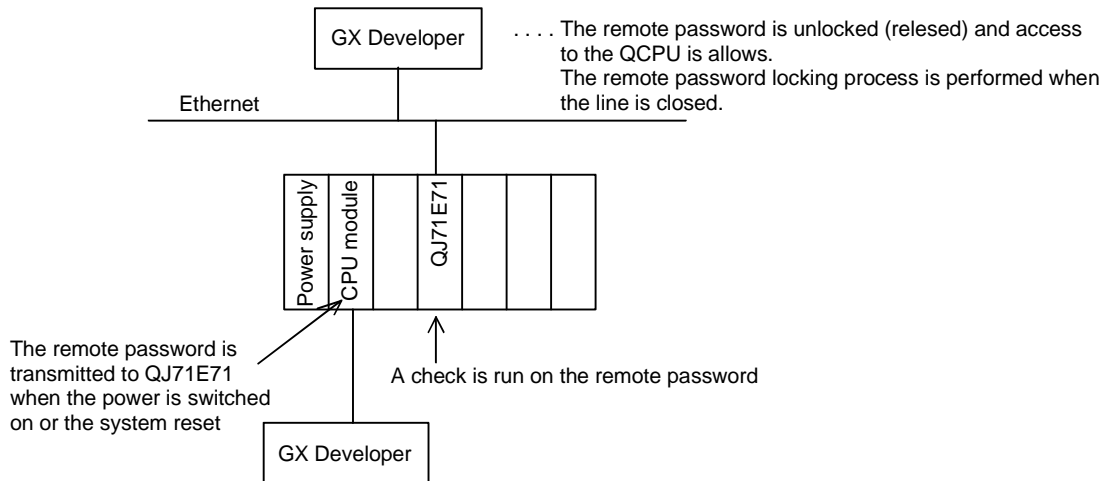


(2) Remote password lock/unlock processing

Unlocks the Ethernet module remote passwords for the access source via modems, serial communication modules and the Ethernet.

Access to the High Performance model QCPU is enabled if the remote password matches up.

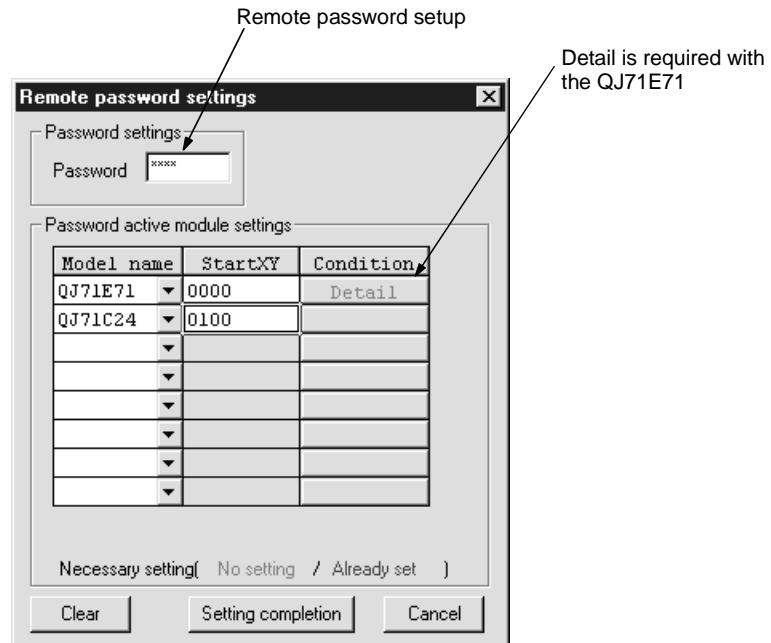
For example, an outline of what will happen during remote password lock/unlock processing with an Ethernet module is shown below.



(3) Procedure for setting up the remote password

[GX Developer] → [Remote Password] → [Remote Password Setup] screen → [Advanced Remote Password Setup] screen.

(a) Setup screen



(b) Setup fields

Field		Description	Setup range/Selection range
Password settings		Remote password entry	4 bytes, alphanumeric, special characters
Password active module settings	Model name	Model selection	QJ71E71/QJ71C24
	Start XY	Module's head address setup	0000 <sub>H</sub> to 0FE0 <sub>H</sub>
Detail		—	Setup/Not setup
User's connection No.		User's connection No. setup	Connection No. 1 to Connection No. 16
System connection	Automatic open UDP port	Adds a check to the valid remote password port	—
	FTP communication port (TCP/IP)		
	GX Developer communication port (TCP/IP)		
	GX Developer communication port (UDP/IP)		
	HTTP port		

**POINT**

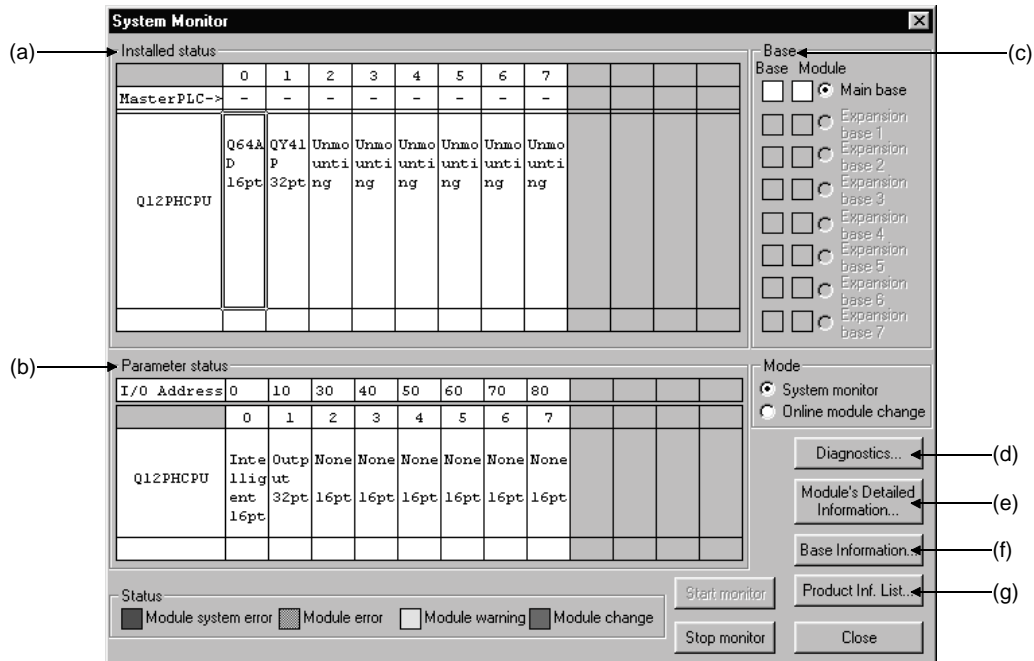
Refer to the following manuals for further details on the remote password function.

- Using Serial Communication Modules  
Q Corresponding Serial Communication Module Users' Manual (Application)
- Using Ethernet Modules  
Q Corresponding Ethernet Interface Module Users' Manual (Basic)

## 7.18 Monitoring Process CPU System Status from GX Developer (System Monitor)

It is possible to confirm the following information for Process CPUs connected to personal computers with the GX Developer system monitor (see illustration below.)

- Installed status
- Operation status
- Module's detailed information
- Product information



## (a) Installed status

Enables the controlling CPU, the model and the number of modules mounted onto the selected base unit to be confirmed.

"Not installed" will be displayed for slots in which modules have not been mounted.

When slots have been set as "Empty" at the "I/O assignment" tab screen in the "(PLC) Parameter" dialog box, the module's model will not be displayed when a module has been mounted.

## (b) Parameter status

Enables the I/O number, the module type and the number of modules mounted for each of the slots on the selected base unit to be confirmed.

If the operation status shows 0 empty points and an allocation error is displayed, it means that the PLC parameter's I/O allocation and the actual status are different.

In this event, align the PLC parameter's I/O allocation with the actual status by allocating an I/O.

## (c) Base

Enables the status of the modules mounted onto the base unit in use to be confirmed.

The status will be displayed in the unit column when an error has occurred for even one of the modules.

## (d) Diagnostics

This function is used to confirm the status of the Process CPU and errors.





## 7.19 LED Display

The Process CPU has an LED to indicate the Process CPU operation status on the front of the Process CPU.

The display details of each LED are described below.

## 7.19.1 LED display

(1) The details of the LED display are shown below:

LED name	Display Description
Mode	Indicates the Process CPU mode ON (green): Q mode (No registration of enforced ON/OFF for external I/O) Flicker (green) : with registration of enforced ON/OFF for external I/O
RUN	Indicates the CPU module operation status. On : When operating with the RUN/STOP switch at "RUN". Off : When stopped with the RUN/STOP switch at "STOP". Or when an error that stops operation is detected. Flicker : When writing parameters and programs during STOP, and when setting the RUN/STOP switch from [STOP] → [RUN]. Perform the following operations in order to illuminate the RUN LED after program writing. • Set the RUN/STOP switch to [RUN] → [STOP] → [RUN]. • Reset the system with the RESET/L. CLR switch. • Switch on the power to the PLC again. Perform the following operations in order to illuminate the RUN LED after parameter writing. • Reset the system with the RESET/L. CLR switch. • Switch on the power to the PLC again. (When the RUN/STOP switch has been set to [RUN] → [STOP] → [RUN] after the parameters have been amended, the parameters related to intelligent function modules and other network parameters will not be reflected back.)
ERR.	Indicates the CPU module error detection status. On : When a self-diagnosis error that does not stop the operation (except for battery error) is detected. (Set the operation error set mode to "continue" in the parameter mode PLC RAS setting.) Off : Normal Flicker : When an error that stops the operation is detected. When automatic write to standard ROM is complete normally (BOOT LED also flickers)
USER	The detection status for the CHK instruction or annunciator F status is indicated. On : When an error is detected with the CHK instruction, or when the annunciator is turned on. Off : Normal Flicker : When the latch clear is executed.
BAT.	Indicates the CPU module and memory card (SRAM card) battery status. On : When a battery error is detected due to low battery voltage. Off : Normal
BOOT	Indicates the execution status of the boot operation. On : When the execution is complete. Off : When not executed. Flicker : When automatic write to standard ROM is complete normally. (ERR. LED also flickers)

(2) Method to turn off the LED

The LED that is on can be turned off by the following operation. (Except for the reset operation.)

Method to Turn LED Off	Applicable LED			
	ERR.	USER	BAT.	BOOT
Executing the LEDR instruction after resolving the cause of error.	○	○	○	×
After the cause of error is resolved, cancel the error by operating the special relay SM50 and special register SD50. (Only for the operation continue errors.)	○	○	○	×
Turn off the LED by operating the special relay SM202 and special register SD202.	×	○	×	○

○ : Valid    × : Invalid

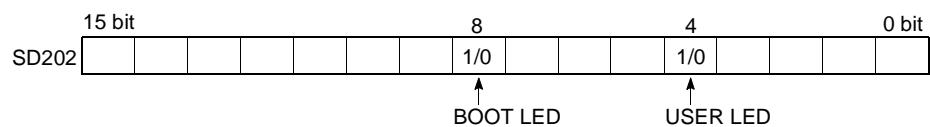
\*1: Special relay and special register contents

SM50 ..... When switch from OFF to ON, the error is canceled for the error code stored in the SD50.

SD50 ..... The error code for the error to be canceled is stored.  
(For further information on error codes, see the Process CPU Users Manual (Hardware Design, Maintenance and Inspection))

SM202 ..... When turned from OFF to ON, the LED corresponding to each bit in the SD202 is turned off.

SD202 ..... This specifies the LED to turn off. (Only USER LED and BOOT LED can be turned off.)



1 means "turn off" and 0 means "leave on" in the setting.  
The setting to turn off each LED is as follows. (All in hexadecimal.)

- When turning off both LEDs: SD202=110H
- When turning off only the BOOT LED: SD202=100H
- When turning off only the USER LED: SD202=10H

(3) Method to not display the ERR. LED, USER LED, and BAT. LED

The ERR. LED, USER LED, and BAT. LED have the same priorities explained in Section 7.19.2.

When an error number for an LED is deleted from this priority, the LED will not turn on even if an error with that error number occurs.

(See **POINT** in Section 7.19.2 for the setting method.)

7.19.2 Priority setting

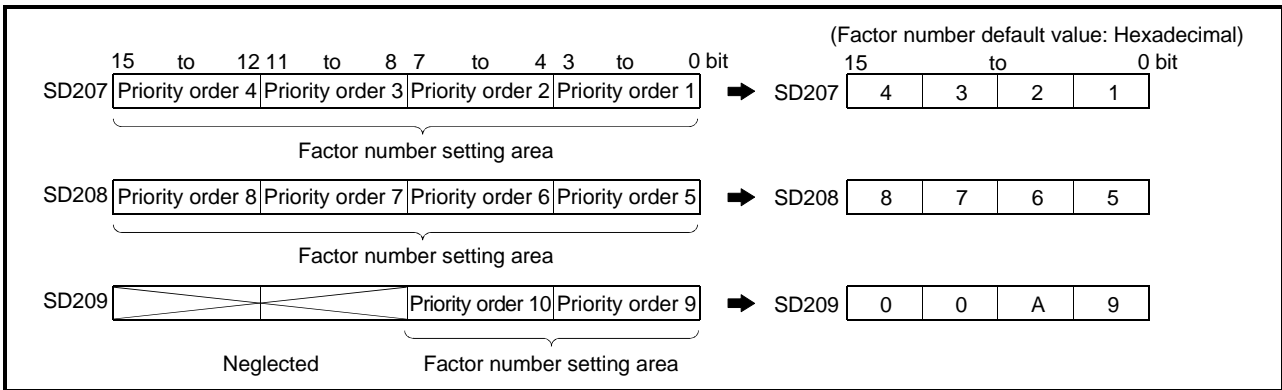
When multiple factors that can be displayed occur, the display is performed with the following conditions:

- 1) A stop error is displayed without condition.
- 2) An operation continue error is displayed according to the priority factor number set as the default.

The priority can be changed. (Set with special registers SD207 to SD209)

- 3) When errors with the same priority level occur, the error detected first is displayed.

The priority is set with the special registers SD207 to SD 209 in the following manner:



The description and default priority for the factor number to be set in the special registers SD207 to SD209 are as follows:

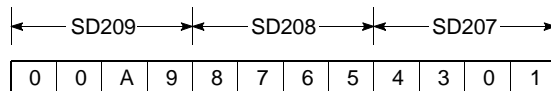
Priority	Factor number (Hexadecimal)	Description	Remarks
1	1	AC/DC DOWN	Power shutoff
2	2	UNIT VERIFY ERR.	I/O module verification error
		FUSE BREAK OFF	Fuse shutoff
		SP.UNIT ERROR	Intelligent function module verify error
3	3	OPERATIN ERROR	Calculation error
		LINK PARA. ERROR	Link parameter error
		SFCP OPE.ERROR	SFC instruction calculation error
		SFCP EXE.ERROR	SFC program execution error
4	4	ICM.OPE.ERROR	Memory card operation error
		FILE OPE.ERROR	File access error
5	5	PRG.TIME OVER	Constant scan setting time time up over Low -speed execution monitoring time time up
6	6	CHK instruction	
7	7	Annunciator	
8	8	—	
9	9	BATTERY ERR.	
10	A	Clock data	

**POINT**

(1) When leaving the LED turned off at the error described above, set the factor number setting area (each 4 bits), which stores the factor number corresponding to SD207 to SD209 to "0".

[Example]

To leave the ERR. LED off when a fuse shutoff error is detected, set the factor number setting area to "0" where the error number is "2".



Because the factor number "2" is not set, the ERR. LED remains off even if the fuse shutoff is detected. In this case, even if another error with the factor number "2" (I/O module verify error or intelligent function module verify error) is detected, the ERR. LED remains off.

(2) Even if the LED is set to be turned off, error code storage is performed for SM0 (diagnosis error flag) on, SM1 (self-diagnosis flag) on, and SD0 (CPU diagnosis error register).

7.20 Module Service Interval Time Reading\*

The Process CPU can monitor the service interval time (time from service acceptance to next service acceptance) of the intelligent function module, network module or GX Developer. This indicates the frequency at which access to the CPU occurs from outside.

To read the module service interval time, operate the following special relay and special registers.

(1) Special relay

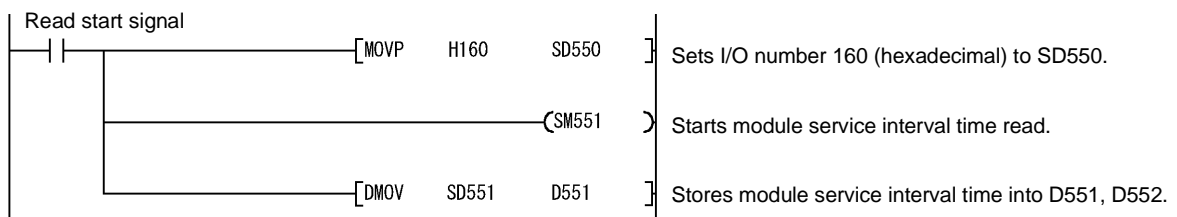
Number	Name	Description
SM551	Module service interval time read	Turning this relay from OFF to ON reads to SD551 and SD552 the module service interval time of the intelligent function module specified in the special register SD550. ON: Read OFF: No processing

(2) Special registers

Number	Name	Description
SD550	Module service interval time measured module	Set the I/O number of the module whose module service interval time will be measured. Set the I/O number of the peripheral device connected to the RS-232 or USB interface of the CPU module to FFFF <sub>H</sub> .
SD551 to SD552	Module service interval time	Stores the service interval time from the module specified in SD550 when SM551 is turned on. SD551: 1ms units (range 0 to 65535) SD552: 100 μs units (range 0 to 900, stored at intervals of 100 μs) (Example) When module service interval time is 123.4ms SD551 = 123, SD552 = 400

(Program example)

When reading the module service interval time of the intelligent function module of X/Y160



POINT
To read the service interval time when access is made from GX Developer of the other station on the network, set the I/O number of the network module.

**REMARK**

\*: The module service interval indicates the time between a transient request such as monitor, test, program read/write.

The access interval in cyclic communication from the network module is not stored.

## 8 COMMUNICATION WITH INTELLIGENT FUNCTION MODULE

## (1) Description of intelligent function modules

Process CPU allows the use of the Q Series compatible intelligent function modules.

The intelligent function module is a module that allows Process CPU to process analog values or high speed pulses which cannot be processed with I/O modules.

For example, an analog value is converted into a digital value with the analog/digital conversion module, one of the intelligent function modules, before being used.

## (2) Communication with intelligent function modules

The intelligent function module is equipped with memory (buffer memory) to store the data received from or output to external devices.

Process CPU reads/writes the data from/to the buffer memory.

## 8.1 Communication Between Process CPU and Intelligent Function Modules

The following methods enable the communication between Process CPU and intelligent function modules:

- Initial setting or automatic refresh setting using GX Configurator
- Device initial value
- FROM/TO instruction
- Intelligent function module device
- Instructions dedicated for intelligent function modules

The following table shows the communication timing for the communication methods with intelligent function modules described above:

Communication method with intelligent function modules		Communication timing					Storage location * 1	
		Power ON	High Performance model QCPU reset	STOP → RUN	Instruction execution	END processing	High Performance model QCPU * 2	Intelligent * 3
GX Configurator	Initial setting	○	○	○	—	—	○	—
	Automatic refresh setting	—	—	—	—	○	○	—
Device initial value		○	○	○	—	—	○	—
FROM/TO instruction * 4		—	—	—	○	—	○	—
Intelligent function module device * 4		—	—	—	○	—	○	—
Instructions dedicated for intelligent function modules * 4		—	—	—	○	—	○	—

○: Can be stored. —: Cannot be stored.

**REMARK**

- \*1: Indicates whether the data (designated by the GX Configurator, of the device initial value, etc.) is stored in Process CPU or in an intelligent function module.
- \*2: Represents the internal memory of Process CPU or a memory card.
- \*3: "Intelligent" represents an intelligent function module.
- \*4: Represents the program using the intelligent function module device, the FROM/TO instruction, or the instructions dedicated for intelligent function modules.

## 8.1.1 Initial setting and automatic refresh setting using GX Configurator

- (1) Initial and automatic refresh settings of intelligent function modules  
Installing the GX Configurator compatible with the intelligent function module enables the initial setting and automatic refresh setting with GX Developer. When the initial setting and automatic refresh setting of the intelligent function module is designated with GX Developer, you can write/read data without creating the program for the communication with the intelligent function module. Moreover, you can conduct the initial setting or automatic refresh setting without designating the buffer memory address of the intelligent function module.
- (2) Setting using the GX Configurator  
This section describes the example to set the initial setting and automatic refresh setting of A/D conversion module Q64AD.
- (a) Initial setting

The initial setting of Q64AD offers the following four settings:

- A/D conversion enable/disable setting
- Sampling process/averaging process setting
- Time/number of times specifying
- Average time/average number of times setting

The initial setting of Q64AD is designated on the following initial setting screen of GX Configurator.

[Initial setting screen]

The screenshot shows the 'Initial setting' dialog box for the Q64AD module. The 'Module information' section displays 'Module model name: Q64AD', 'Start I/O No.: 0000', and 'Module type: A-D Conversion Module'. Below this is a table with two columns: 'Setting item' and 'Setting value'. The table contains settings for CH1 and CH2, including A/D conversion enable/disable, sampling process/averaging process, and time/number of times specifying. At the bottom, there are buttons for 'Make text file', 'End setup', and 'Cancel', along with a 'Details' section for 'Select input'.

Setting item	Setting value
CH1 A-D conversion enable/disable setting	Enable
CH1 Sampling process/averaging process setting	Sampling
CH1 Time/number of times specifying	Number of times
CH1 Average time/average number of times setting (Setting range) Time: 2 to 5000 ms Number of times: 4 to 62500 times	4
CH2 A-D conversion enable/disable setting	Enable
CH2 Sampling process/averaging process setting	Sampling

The designated initial setting data is stored in the intelligent function module.



## (b) Auto refresh setting

For the auto refresh setting, designate the device at Process CPU to store the following data.

- Digital output of Q64AD
- Maximum/minimum values of Q64AD
- Error code

The auto refresh setting of Q64AD is designated on the following auto refresh setting screen of GX Configurator.

[Auto refresh setting screen]

Setting item	Module side Buffer size	Module side Transfer word count	Transfer direction	PLC side Device
CH1 Digital output value	1	1	->	D11
CH2 Digital output value	1	1	->	D12
CH3 Digital output value	1	1	->	D13
CH4 Digital output value	1	1	->	
CH1 Maximum value	1	1	->	
CH1 Minimum value	1	1	->	
CH2 Maximum value	1	1	->	
CH2 Minimum value	1	1	->	
CH3 Maximum value	1	1	->	

The designated auto refresh setting data is stored in the intelligent function parameters of Process CPU.

**REMARK**

For the details of GX Configurator, refer to the manual of the intelligent function module being used.

## 8.1.2 Communication using device initial value

## (1) Device initial value

The device initial value is used to designate the initial setting of the intelligent function module without using a program.

The designated device initial value is written from Process CPU to the intelligent function module when Process CPU is turned ON, is reset, or is switched from STOP to RUN.

## (2) Designation of the device initial value

Using the device memory of GX Developer, designate the data of the intelligent function module to be used as the device initial value.

In the device initial value setting of GX Developer, designate the range to be used with the intelligent function module device as the device of the device initial value.

**REMARK**

1) For the device initial value, see Section 10.13.2.

2) For the intelligent function module device, see Section 10.5.

### 8.1.3 Communication using FROM/TO instruction

#### (1) FROM/TO instruction

At the execution of the FROM/TO instruction, the data stored in the buffer memory of the intelligent function module can be read, or data can be written to the buffer memory of the intelligent function module.

The FROM instruction stores the data read from the buffer memory of the intelligent function module to the designated device.

The TO instruction writes the data of the designated device to the buffer memory of the intelligent function module.

#### REMARK

- 1) For the details of the FROM/TO instruction, refer to the following manuals.
  - QCPU (Q mode)/QnACPU Programming Manual (Common Instructions)
- 2) For the details of the buffer memory of the intelligent function module, refer to the manual of the intelligent function module being used.

### 8.1.4 Communication using the intelligent function module device

#### (1) Intelligent function module device

The intelligent function module device is the buffer memory of the intelligent function module represented as a device of Process CPU in Process CPU programs.

It enables reading data stored in the buffer memory of the intelligent function module, or enables writing data to the buffer memory of the intelligent function module.

#### (2) Difference from the FROM/TO instruction

The intelligent function module device can be handled as a device of Process CPU, enabling the processing of data read from the intelligent function module with one instruction.

This saves the number of steps in the entire program.

The processing speed is the total of the instruction execution time and the access time to/from the intelligent function modules.

#### POINT

When reading and processing the data of the intelligent function module frequently in the program, use the FROM instruction to read the data at one point in the program and store and process it in a data register, instead of using the intelligent function module device every time.

Otherwise, the intelligent function module device accesses the intelligent function module every time the instruction is executed, resulting in longer scan time for the program.

#### REMARK

For the intelligent function module device, see Section 10.5.

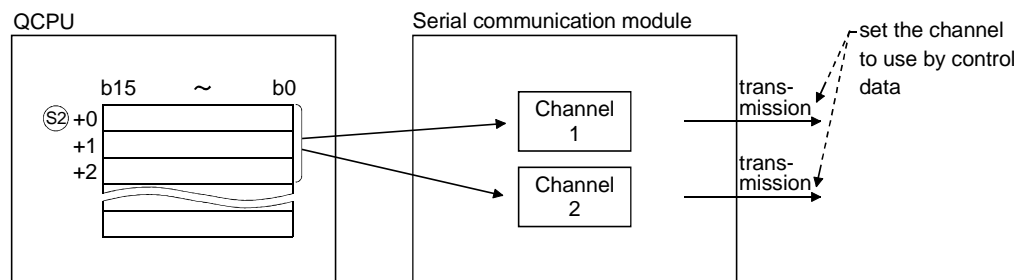
## 8.1.5 Communication using the instructions dedicated for intelligent function modules

## (1) Description of the instructions dedicated for intelligent function modules

- (a) The instructions dedicated for intelligent function modules are the instructions that facilitate programming using the functions of the intelligent function modules.

For example, the OUTPUT instruction, which is the instruction dedicated for serial communication modules, allows data transmission in user-specified message format with no handshaking protocol.

In this case, the communication is possible without considering the buffer memory address of the objective serial communication module.



- (b) A completion device should be designated for the instruction dedicated for intelligent function modules.

The designated completion device turns ON for one scan when the execution of the instruction dedicated for intelligent function modules is completed.

When the completion device turns ON, another instruction dedicated for intelligent function modules can be executed to the same intelligent function module.

To use two or more instructions dedicated for intelligent function modules to one intelligent function module, be sure to execute the next instruction dedicated for intelligent function modules after the completion device turns ON.

## (2) Note

- (a) If the instruction dedicated for intelligent function modules are executed and Process CPU is switched from RUN to STOP before the completion device turns ON, the completion device turns ON one scan later when Process CPU is switched to RUN next time.
- (b) The instruction dedicated for intelligent function modules can be executed to the intelligent function modules of the main base unit and extension base unit.  
The instruction dedicated for intelligent function modules cannot be executed to the intelligent function module installed to the remote I/O station of MELSECNET/H.

**REMARK**

For the instruction dedicated for intelligent function modules and the completion device, refer to the manual of the intelligent function module being used.

## 8.2 Request from Intelligent Function Module to Process CPU

## 8.2.1 Interrupt from the intelligent function module

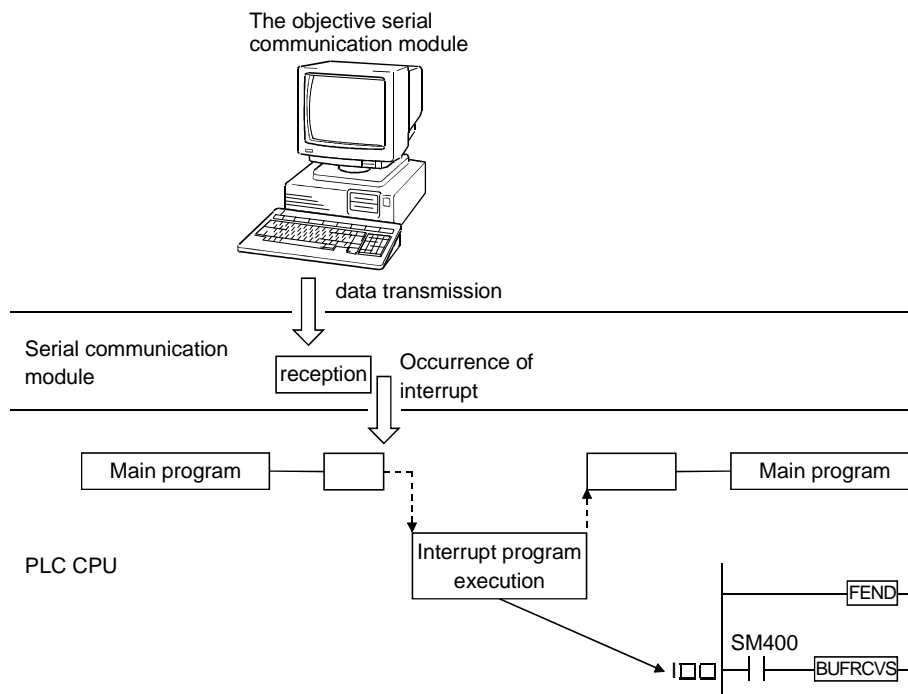
## (1) Interrupt from the intelligent function module

Process CPU executes an interrupt program (I50 to I255) by the interrupt request from the intelligent function module.

For example, the serial communication module processes the data reception by an interrupt program when the following data communication functions are executed.

- Data reception during the communication with no handshaking protocol
- Data reception during the communication with bi-directional protocol

Processing data reception with an interrupt program improves the data reception speed of Process CPU.



## (2) Setting an interrupt from the intelligent function module

To execute an interrupt program by the interrupt of the intelligent function module, it is necessary to designate the "Intelligent function module setting (Interrupt pointer setting)" at the "PLC system" tab screen in the "(PLC) Parameter" dialog box.

You should also designate "System setting" at the intelligent function module.

To execute an interrupt program by the interrupt from the intelligent function module, refer to the manual of the intelligent function module being used.



## 9 PARAMETER LIST

There are two types of parameters used in Process CPU's procedures: "PLC parameters" that are used when operating a PLC and "network parameters" that are used when connecting to the MELSECNET/H or CC-Link system.

This chapter shows a list of PLC parameters and network parameters used for GX Developer.

For details on each setting item, refer to the section or manual indicated.

For GX Developer setting procedures, refer to the GX Developer Operating Manual.

The parameters written from the GX Developer will be validated within the QCPU in the following cases:

- When the power supply to the PLC is switched on.
- When the CPU module is reset.
- When the CPU module changes from STOP to RUN.

However, the PLC parameter's I/O assignment switch settings and the network parameters will be transmitted from the Process CPU to a specified intelligent function module in the following cases, and will be validated within the intelligent function module.

- When the power supply to the PLC is switched on.
- When the CPU module is reset.

The PLC parameter's I/O assignment switch settings and the network parameters will not be transmitted from the Process CPU to a specified intelligent function module when the Process CPU is changed from STOP to RUN.

Switch the power supply to the PLC on once again (ON → OFF → ON) or reset the Process CPU when the PLC parameter's I/O assignment switch settings and the network parameters have been amended.

If the Process CPU is changed from STOP to RUN after PLC parameter change without this procedure, a PARAMETER ERROR (error code: 3000) is caused.

POINT
<p>If the PLC parameter's I/O assignment switch settings and the network parameters are changed, switch the power supply to the PLC on once again (ON → OFF → ON) or reset the Process CPU.</p> <p>Otherwise, the new PLC parameter's I/O assignment switch settings and network parameters are not validated.</p>

Table 9.1 Parameter List

Item	Parameter No.	Description	
PLC name	—	Designate the label and comment for the CPU module to be used. These settings do not affect CPU operation	
Label	0000H	Designates the label setting (name and use).	
Comment	0001H	Designates the comment setting.	
PLC system	—	These are the settings required for using the CPU module. Default values are available for PLC control.	
Timer limit setting	Low Speed High Speed	1000H	Designates the low speed/high speed timer settings
RUN-PAUSE contacts	1001H	Designates the contact which controls the CPU module's RUN/PAUSE operation.	
Remote reset	1002H	Enables/disables the remote reset operation from the GX Developer.	
Output mode at STOP to RUN	1003H	Designates the output(Y) mode at STOP-RUN switching.	
Floating point arithmetic processing	—	—	
Intelligent functional module setting (interrupt pointer setting)	100AH	Specifies the assignment of interrupt pointers (I50 to I255), leading I/O Nos. and leading SI Nos. of an intelligent function module.	
Common pointer	1005H	Designates the common pointer "first No."	
Number of empty slots	1007H	Designates the number of empty slot points in the main/extension base units.	
System interrupt settings	Interrupt counter start No.	1008H	Designates the interrupt counter "first No."
	Fixed scan interval		Specifies time intervals at which to execute interrupt pointers (I28 to I31).
Interrupt program/fixed scan program setting	1008H	Specifies whether to perform the high speed execution of an interrupt program.	
Module synchronization	100CH	Specifies whether to bring the start of a CPU module into synchronization with the start of an intelligent function module.	
A-PLC	100DH	Specifies whether to use MELSEC-A Series special relays/special registers (SM1000/SD1000 to SM1299/SD1299).	
PLC file	—	Designates the various files used in the CPU module.	
File register	1100H	Designates the file for file registers to be used in the program.	
Comment file used in a command	1101H	Designates the file for comments to be used in the program.	
Initial Device value	1102H	Designates the file for the device initial values to be used in the CPU module.	
File for local device	1103H	Designates the file for local devices to be used in the program.	

	Default Value	Setting Range	Reference Section
	—	—	—
	No setting	Max. of 10 characters	—
	No setting	Max. of 64 characters	—
	—	—	—
	100 ms	1 to 1000 ms(1 ms units)	Section 10.2.10
	10.0 ms	0.1 to 100.0 ms	Section 10.2.10
	No setting	X0 to X1FFF	Section 7.6.1
	Disabled	Enabled/Disabled	Section 7.6.3
	Previous status (produce the status of an output (X) before STOP	Produce the status of an output (X) before STOP/Clear the output (output is 1 scan later)	Section 7.4
	—	—	—
	No setting	I50 to I255, leading I/O No, leading SI No.	Section 10.10
	No setting	P0 to P4095	Section 10.9.2
	16 points	0/16/32/64/128/256/512/1024 points	Section 5.6.1
	No setting	C0 to C22722 (Counter setting points can be set up to 256.)	Section 10.2.11
	I28: 100.0 ms I29: 40.0 ms I30: 20.0 ms I31: 10.0 ms	0.5 to 1000 ms (0.5 ms units)	Section 10.10
	The high speed execution is disabled.	Enable/Disable the high speed execution.	Section 4.1.3 Section 4.2.5
	The start of an intelligent function module is synchronized.	Yes/No to synchronize the start of an intelligent function module.	—
	Special relays/special registers after SM1000/SD1000 are used.	Yes/NO to use the special relays/special registers after SM1000/SD1000.	Section 10.3.2 Section 10.3.3
	—	—	—
	Not used	<ul style="list-style-type: none"> <li>• Not used</li> <li>• Use the same file name as the program</li> <li>• Use the following file</li> </ul>	Section 10.7
	Not used	<ul style="list-style-type: none"> <li>• Not used</li> <li>• Use the same file name as the program</li> <li>• Use the following file</li> </ul>	—
	Not used	<ul style="list-style-type: none"> <li>• Not used</li> <li>• Use the same file name as the program</li> <li>• Use the following file</li> </ul>	Section 10.13.2
	Not used	<ul style="list-style-type: none"> <li>• Not used</li> <li>• Use the following file</li> </ul>	Section 10.13.1



Table 9.1 Parameter List (continued)

Item		Parameter No.	Description
PLC RAS		—	These settings are used for the RAS function.
WDT settings	WDT (Watch dog timer) setting	3000H	Set the watchdog timer of the CPU module.
	Initial execution		Set the watchdog timer for the use of an initial execution type program.
	Low speed execution		Set the watchdog timer for the use of a low speed execution type program.
Operating mode when there is an error		3002H	Designates the CPU module operation mode to be established when an error is detected.
Error check		3001H	Designates whether or not to detect a specified error .
Constant scanning		3003H	Designates the constant scanning time.
Low speed program execution time		3006H	Designates the time setting for low speed execution program execution at each scanning.
Breakdown history		3005H	Designates the storage designation for the CPU module fault history.
Device		—	These settings designate the number of points for each device, the latch range, and the local device range.
Device point		2000H	Designates the number of device points used.
Latch(1) range (Latch clear key enabled)		2001H	Designates the latch range where the latch clear key is enabled.
Latch(2) range (Latch clear key disabled)		2002H	Designates the latch range where the latch clear key is disabled.
Local device setting		2003H	Designates the device range used for local devices.
Program		7000H	Specifies a program name and execution conditions to write several programs onto the CPU module.
Boot file setting	Boot option		Designates whether the program memory is cleared or not during boot.
	Boot file setting		Designates the boot operation program file type, data name and destination drive.
Automatic write to standard ROM			Designates whether automatic refresh to the standard ROM is made or not.
SFC	SFC program start mode	8002H	Designates the SFC program start mode, starting conditions, and the output mode in a block stop for SFC program use.
	Starting conditions	8003H	
	Output mode when the block is stopped	8005H	

	Default Value	Setting Range	Reference Section
	—	—	—
	200 ms	10 to 2000 ms (10 ms units)	Section 4.2.2
	No setting	10 to 2000 ms (10 ms units)	Section 4.2.1
	No setting	10 to 2000 ms (10 ms units)	Section 4.2.3
	Stop	Stop/Continue	Section 7.1.5
	Checked	Checked/Not checked	Section 7.15
	No setting	0.5 to 2000 ms(0.5 ms units)	Section 7.2
	No setting	1 to 2000 ms	Section 4.2.3
	Record in PLC RAM	Record in PLC RAM/Record in the following history file	Section 7.16
	—	—	—
	X: 8 k points Y: 8 k points M: 8 k points L: 8 k points B: 8 k points F: 2 k points SB: 2 k points V: 2 k points S: 8 k points T: 2 k points ST: 0 k point C: 1 k point D: 12 k points W: 8 k points SW: 2 k points	X(8 k points), Y(8 k points), S(8 k points), SB(2k points) and SW(2 k points) are fixed. Including the above points(3.7 k words), a total range of 29 k words is available. • For one device: Max. 32 k points • Total number for the bit devices: Max. 64 k points	Section 10.1 Section 10.2
	No setting	Only 1 range is designated for each device of B, F, V, T, ST, C, D, W.	Section 7.3
	No setting	Only 1 range is designated for each device of L, B, F, V, T, ST, C, D, W.	Section 7.3
	No setting	Only 1 range is designated for each device of M, V, T, ST, C, D.	Section 10.13.1
	No setting	Program name, execution type (fixed scan for fixed scan execution), file use setting, I/O refresh setting	Section 4.2
	Do not clear the program memory during boot.	Do not clear the program memory during boot. / Clear the program memory during boot.	Section 6.6.2
	No setting	Type, data name and source drive (The destination drive is automatically set in the program memory.)	Section 6.6
	Do not execute automatic refresh to the standard ROM.	Do not execute automatic refresh to the standard ROM. / Do not execute automatic refresh to the standard ROM.	Section 6.6.2
	—	See the QCPU (Q mode) / QnACPU Programming Manual (SFC).	—

Table 9.1 Parameter List (continued)

Item		Parameter No.	Description
I/O assignment		—	Designates the state of installation of each module of the system.
I/O Assignment	Type	400H	Designates the type of the installed module.
	Model name		Designates the model of the installed module. (Memorandum for users who do not use the CPU module.)
	Points		Designates the number of points of each slot.
	Start		Designates the first input and output numbers of each slot.
Standard setting	Base model name	401H	Designates the model of the used main base unit and extension base unit. (Memorandum for users who do not use the CPU module.)
	Power model name		Designates the model of the power supply module installed to the main and extension base units. (Memorandum for users who do not use the CPU module)
	Extension cable		Designates the model of the extension cable. (Memorandum for users who do not use the CPU module)
	Points		Designates the number of slots of the main and extension base units. The number of slots is designated for each base unit.
Switch setting		407H	Designates various switches of the intelligent function module.
Detailed setting	Error time output module	403H	Designates whether the output is cleared or retained upon a stopping error of the control PLC.
	H/W error time PLC operation mode	404H	Designates whether the control PLC continues operation or it is stopped upon a hardware error of the intelligent function module.
	I/O response time	405H	Designates the response time of the input module, high speed input module and I/O mixture module.
	Control PLC	406H	Designates the control PLC of the I/O module and intelligent function module.
Acknowledge XY assignment		—	Contents of I/O allocation, MELSECNET/Ethernet setting and CC-Link setting can be checked.
Multiple CPU setting		—	Defines settings for establishment of a multiple CPU system.
No. of PLC		E00H	Designates the number of CPUs used in the multiple CPU system.
Operating mode		E01H	Designates the operation of the multiple CPU system upon a stopping error of the PLC No.2 to No.4 CPU modules. The multiple CPU system is stopped if a stopping error occurs to the PLC No.1 (Fixed)
Online module change setting		E006H	Designates whether online module change will be made or not in a multiple PLC system.
Out of group input setting		E04H	Designates whether the input state of the input module and intelligent function module controlled by other PLCs are acquired or not.
Out of group output setting			Designates whether the output state of the output module controlled by other PLCs are acquired or not.
Refresh settings		E002H E003H	Designates the devices and the number of points of data transfer in automatic refresh between CPU modules of the multiple PLC system.

	Default Value	Setting Range	Reference Section
	—	—	—
	No setting	<ul style="list-style-type: none"> <li>• PLC CPU No.2 to No.4: PLC No.n/Empty (Designate "CPU (empty)" for slots where no CPU module is installed.)</li> <li>• Input/output module and intelligent function module</li> <li>• Input, high speed input, output, intelligent, input/output mixture, interrupt</li> </ul>	Section 5.6
	No setting	<ul style="list-style-type: none"> <li>• 16 single-byte characters</li> </ul>	
	No setting	<ul style="list-style-type: none"> <li>• 0 point, 16 points, 32 points, 48 points, 64 points, 128 points, 256 points, 512 points, 1024 points</li> </ul>	
	No setting	<ul style="list-style-type: none"> <li>• 0H to FF0H</li> </ul>	
	No setting	<ul style="list-style-type: none"> <li>• 16 single-byte characters</li> </ul>	Section 5.3
	No setting	<ul style="list-style-type: none"> <li>• 16 single-byte characters</li> </ul>	
	No setting	<ul style="list-style-type: none"> <li>• 16 single-byte characters</li> </ul>	
	No setting	<ul style="list-style-type: none"> <li>• 2,3,5,8,10,12</li> </ul>	
	No setting	<ul style="list-style-type: none"> <li>• See the manual of the intelligent function module to be used.</li> </ul>	Section 7.6
	Clear	<ul style="list-style-type: none"> <li>• Cleared/retained</li> </ul>	—
	Stop	<ul style="list-style-type: none"> <li>• Stopped/continue</li> </ul>	
	Input, I/O mixture: 10 ms High speed input: 0.2 ms	<ul style="list-style-type: none"> <li>• Input, I/O mixture: 1 ms, 5 ms, 10 ms, 20 ms, 70 ms</li> <li>• High speed input: 0.1 ms, 0.2 ms, 0.4 ms, 0.6 ms, 1.0 ms</li> </ul>	Section 7.7
	PLC No.1	<ul style="list-style-type: none"> <li>• PLC No.1, PLC No.2, PLC No.3, No.4</li> </ul>	Section 14.2.1
	—	—	—
	—	—	—
	1 module	<ul style="list-style-type: none"> <li>• 1 to 4 modules</li> </ul>	Section 14.2.1
	Stop all PLCs upon error of PLC No.n	<ul style="list-style-type: none"> <li>• Stop or do not stop all PLCs upon an error of PLC No.n.</li> </ul>	Section 14.2.8
	Enable online module change	Enable or disable online module change.	Section 14.2.9
	Do not permit inputs from outside group	<ul style="list-style-type: none"> <li>• Permit or do not permit inputs from outside the group.</li> </ul>	Section 17.2
	Do not permit outputs to outside group	<ul style="list-style-type: none"> <li>• Permit or do not permit outputs to outside the group.</li> </ul>	Section 17.2
	No setting	<ul style="list-style-type: none"> <li>• Setting range of each CPU: 0 to 2048 points (in 2-point intervals) / module Max. 4k points (4096 points) / system</li> <li>• Device on CPU side: B, M, Y, D, R, ZR Devices equivalent to the number of points set for the transmission range from the designated device number are occupied.                             <ul style="list-style-type: none"> <li>• 16 points are occupied with B, M and Y for each point of transmission range.</li> <li>• 1 point is occupied with D, W, R and ZR for each point of transmission range.</li> </ul> </li> </ul>	Section 16.1

Table 9.1 Parameter List (continued)

Item	Parameter No.	Description
Network parameter		Designates parameters for MELSECNET/H, Ethernet and CC-Link.
MELSECNET/H setting *1		Designates network parameters for MELSECNET/H.
No. of boards in module	5000H	
Valid module during other station access	5001H	
Interlink transmission parameter	5002H	
Routing parameters	5003H	
Network setting	5NM0H	
Refresh parameters	5NM1H	
Common parameter	5NM2H	
Station inherent parameter	5NM3H	
	5NM5H	
Common parameter No.2	5NMAH	
Station inherent parameter No.2	5NMBH	
Ethernet setting *1		Designates network parameters for Ethernet.
No. of boards in module	9000H	
Starting I/O No.	9N00H	
Network No.		
Operational settings		
Initial settings		
Open settings		
Routing information		
MNET/10 routing information		
FTP Parameters		
E-mail setting		
CC-Link setting *2		Designates network parameters for CC-Link.
No. of boards in module	C000H	
Remote input (RX)	CNM1H	
Remote output (RY)		
Remote register (RW <sub>r</sub> )		
Remote register (RW <sub>w</sub> )		
Special relay (SB)		
Special register (SW)		
Start I/O No.	CNM2H	
All connect count		
Retry count		
Automatic reconnection station count		
Stand by master station No.		
PLC down select		
Scan mode setting		
Delay information setting		
Station information setting		
Remote device station initial setting		

	Default Value	Setting Range	Reference Section
	—	—	—
	No setting	<ul style="list-style-type: none"> <li>• Refer to the Q Corresponding MELSECNET/H manual.</li> </ul>	—
	No setting	<ul style="list-style-type: none"> <li>• Refer to the Q Corresponding Ethernet manual.</li> </ul>	—
	No setting	<ul style="list-style-type: none"> <li>• Refer to the CC-Link manual.</li> </ul>	—

\*1: N and M indicate the following.

N: Indicates the module number.

M: Indicates the network type.

M	Network Type
1H	MELSECNET/10 mode (Control station), MELSECNET/H mode (Control station)
2H	MELSECNET/10 mode (Normal station), MELSECNET/H mode (Normal station)
5H	MELSECNET/H (Remote master)
AH	MELSECNET/H Stand by station

\*2: N and M indicate the following.

N: Indicates the module number.

M: Indicates the network type.

M	Network Type
0H	Master station
1H	Local station
2H	Standby master station

## 10 DEVICES

This chapter describes all devices that can be used in the Process CPU.

## 10.1 Device List

The names and data ranges of devices which can be used in the Process CPU are shown in Table 10.1 below.

Table 10.1 Device List

Class	Type	Device Name	Default Values		Parameter Designated Setting Range	Reference Section
			Number of Points	Range Used		
Internal user devices	Bit devices	Input * 3	8192 points	X0 to X1FFF	Changeable within 29k words. * 3	Section 10.2.1
		Output * 3	8192 points	Y0 to Y1FFF		Section 10.2.2
		Internal relay	8192 points	M0 to M8191		Section 10.2.3
		Latch relay	8192 points	L0 to L8191		Section 10.2.4
		Anunciator	2048 points	F0 to F2047		Section 10.2.5
		Edge relay	2048 points	V0 to V2047		Section 10.2.6
		Step relay * 3	8192 points	S0 to S511 / block		Section 10.2.9
		Link special relay * 3	2048 points	SB0 to SB7FF		Section 10.2.8
		Link relay	8192 points	B0 to B1FFF		Section 10.2.7
	Word devices	Timer * 1	2048 points	T0 to T2047		Section 10.2.10
		Retentive timer * 1	0 points	(ST0 to ST2047)		
		Counter * 1	1024 points	C0 to C1023		Section 10.2.11
		Data register	12288 points	D0 to D12287		Section 10.2.12
		Link register	8192 points	W0 to W1FFF		Section 10.2.13
		Link special register * 1	2048 points	SW0 to SW7FF		Section 10.2.14
Internal system devices	Bit devices	Function input	5 points	FX0 to FX4	Unchangeable	Section 10.3.1
		Function output	5 points	FY0 to FY4		Section 10.3.1
		Special relay	2048 points	SM0 to SM2047		Section 10.3.2
	Word devices	Function register	5 points	FD0 to FD4		Section 10.3.1
		Special register	2048 points	SD0 to SD2047		Section 10.3.3
Link direct devices	Bit device	Link input	8192 points	Jn\X0 to Jn\X1FFF	Unchangeable	Section 10.4
		Link output	8192 points	Jn\Y0 to Jn\Y1FFF		
		Link relay	16384 points	Jn\B0 to Jn\B3FFF		
		Link special relay	512 points	Jn\SB0 to Jn\SB1FF		
	Word device	Link register	16384 points	Jn\W0 to Jn\W3FFF		
		Link special register	512 points	Jn\SW0 to Jn\SW1FF		



Class	Type	Device Name	Default Values		Parameter Designated Setting Range	Reference Section
			Number of Points	Range Used		
Intelligent function module device	Word device	Buffer register	65536 points	Un\G0 to Un\G65535 * 2	Unchangeable	Section 10.5
Index register	Word device	Index register	16 points	Z0 to Z15	Unchangeable	Section 10.6
File register	Word device	File register	0 points	—	0 to 1018 k points (1 k units)	Section 10.7
Nesting	—	Nesting	15 points	N0 to N14	Unchangeable	Section 10.8
Pointers	—	Pointer	4096 points	P0 to P4095	Unchangeable	Section 10.9
		Interrupt pointer	256 points	I0 to I255		Section 10.10
Other	Bit devices	SFC block	320 points	BL0 to BL319	Unchangeable	Section 10.11.1
		SFC transition device	512 points	TR0 to TR511		Section 10.11.2
	—	Network No	256 points	J1 to J255		Section 10.11.3
		I/O No	—	U0 to UFF		Section 10.11.4
Constants	—	Decimal constants	K-2147483648 to K2147483647			Section 10.12.1
		Hexadecimal constants	H0 to HFFFFFFF			Section 10.12.2
		Real number constants	E±1.17549-38 to E±3.40282+38			Section 10.12.3
		Character string constants	"ABC" and "123"			Section 10.12.4

### REMARK

- \*1: For the timer, retentive timer, and counter, bit devices are used for the "contact" and the "coil", and the word device is used for the "present value".
- \*2: The actual number of usable points varies according to the intelligent/special function module.  
For details regarding the buffer memory's "number of points", refer to the Intelligent/Special Function Module Manual.
- \*3: Inputs, outputs, step relays, link special relays, link special registers remain at their default values, which cannot be changed.

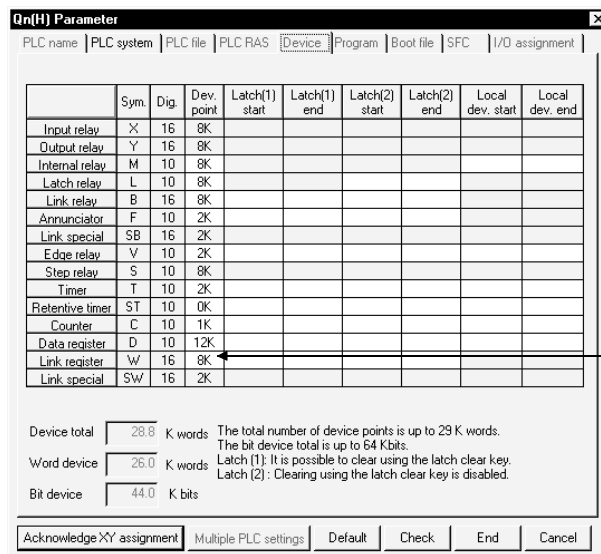
10.2 Internal User Devices

Internal user devices can be used for various user applications.

The "number of usable points" setting is designated in advance (default value) for internal user devices.

However, this setting can be changed at the "Device" tab screen in the "(PLC) Parameter" dialog box.

[Device setting screen]



Default value  
"Dev. point" can be changed for the device where a "Dev. point" value is shown in brackets.

(1) Setting range in the internal user device

The number of points for internal user devices other than the input(X), output(Y), step relay(S), link special relay(SB), and link special registers(SW) can be changed within a 29 k words (including 3.7 k words for an internal user device) range, at the "Device" tab screen in the "(PLC) Parameter" dialog box.

The following gives more information.

(a) Setting range

1) The number of device points is designated in 16-point units.

2) A maximum of 32 k points can be designated for one device.

The maximum total number of points for the internal relay, latch relay, annunciator, edge relay, link relay, link special relay, step relay, timer, retentive timer, and counter, is 64 k points.

1 point is calculated as 2 points (1 for coil, 1 for contact) for the timer, retentive timer, and counter.

(2) Memory capacity

Use the following expression to obtain the memory capacity of an internal user device.

$$3.7 + (\text{Bit devices capacity}) + (\text{Word devices capacity}) + (\text{Timer, retentive timer and counter capacity}) \leq 29k$$

(a) For bit devices:

For bit devices, 16 points are calculated as 1 word.

$$(\text{Bit device capacity}) = \frac{(\text{M+L+F+V+B total number of points})}{16} (\text{Word})$$

- (b) For timer (T) retentive timer (ST), and Counter (C):

For the timer, retentive timer, and counter, 16 points are calculated as 18 words.

$$\text{(Timer, retentive, counter capacity)} = \frac{\text{(T, ST, C total number of points)}}{16} \times 18 \text{ (Word)}$$

- (c) For word devices:

For data registers (D) and link registers (W), 16 points are calculated as 16 words.

$$\text{(Word device capacity)} = \frac{\text{(D, W total number of points)}}{16} \times 16 \text{ (Word)}$$

#### POINT

(1) When an internal user device's "number of usable points" setting is changed, the following files which were created under the previous setting cannot be used as they are.

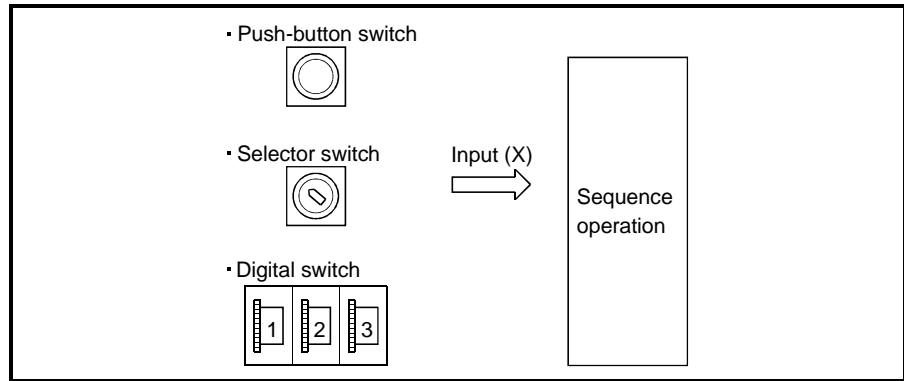
- The sequence program
- The SFC program

After changing the setting, the sequence program and SFC program must be read from the Process CPU to GX Developer, and then they must be written back to the Process CPU again.

10.2.1 Inputs (X)

(1) Definition

- (a) Inputs transmit commands or data to the Process CPU from an external device such as push-button switches, selector switches, limit switches, digital switches.



- (b) If the input point is the Xn virtual relay inside the Process CPU, the program uses the Xn's N/O contact or N/C contact.

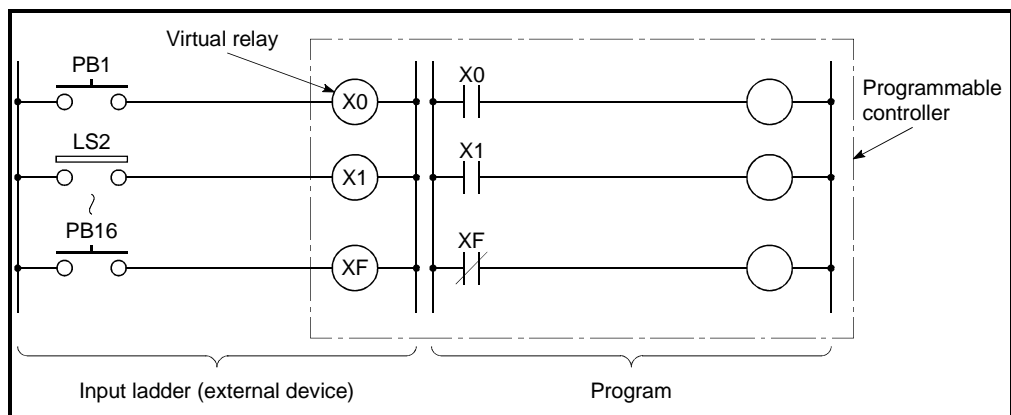


Figure 10.1 Inputs(X)

- (c) There are no restrictions on the number of Xn N/O contacts and N/C contacts used in a program, provided the program capacity is not exceeded.

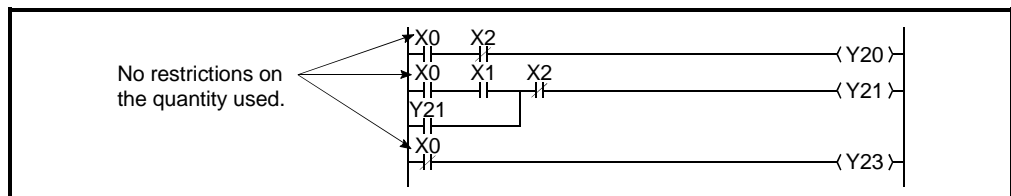
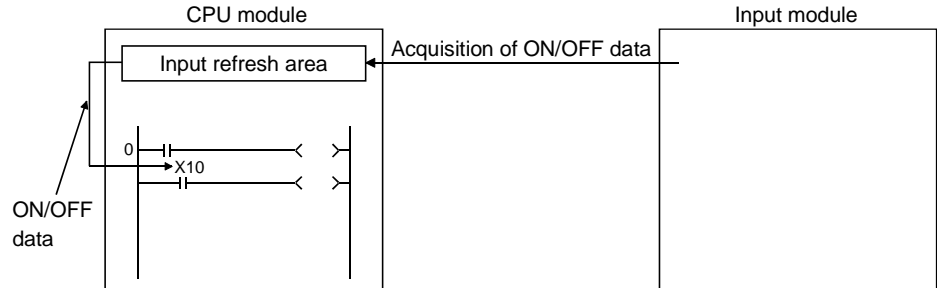


Figure 10.2 Input(X) Used in Program

(2) Reading the inputs

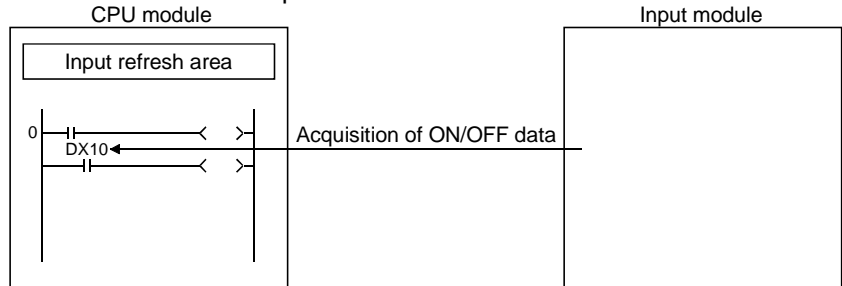
(a) There are 2 types of input: "refresh inputs" and "direct access inputs".

1) The refresh input executes an operation with ON/OFF data. The data is read by performing an input refresh before the sequence programs is executed. \*1



The refresh input is indicated as "X[]" in the sequence program. For example, a "10" input becomes "X10".

2) The direct access input executes an operation with ON/OFF data. The data is read from an input module when the instruction is executed. \*2



The direct access is indicated as "DX[]" in the sequence program. For example, a "10" input becomes "DX10".

The direct access input can be made in a LD/AND/OR instruction that uses an input in units of 1 point.

(b) Differences between refresh input and direct access input

The direct access input accesses an input module directly when an instruction is executed, which results in slower processing speed compared with the refresh input.

The direct access input is used only for inputting to the input module or the intelligent function module mounted on the base unit or extension base unit.

The refresh input and direct access input differences are shown in Table 10.2 below.

Table 10.2 Differences Between Refresh

Item		Refresh Input	Direct Access Inputs
Processing speed (LD X/DX)	Q12PHCPU, Q25PHCPU	0.034 μs	Main base unit : 4.0 μs Extension base unit : 4.8 μs
Input module mounted on base/extension base unit		Usable	Usable
Input of intelligent function module mounted on base/extension base unit			
Input of I/O link module mounted on extension base unit			
Input used at MELSECNET/H network system or CC-Link system		Usable	Unusable

**REMARK**

\*1: See Section 4.7.1 for details on the refresh mode.

- (c) The same input number can be designated for a refresh input and a direct access input.  
 If the number is used as a refresh input after being used as a direct access input, the operation is executed with the ON/OFF data read by performing a direct access input.

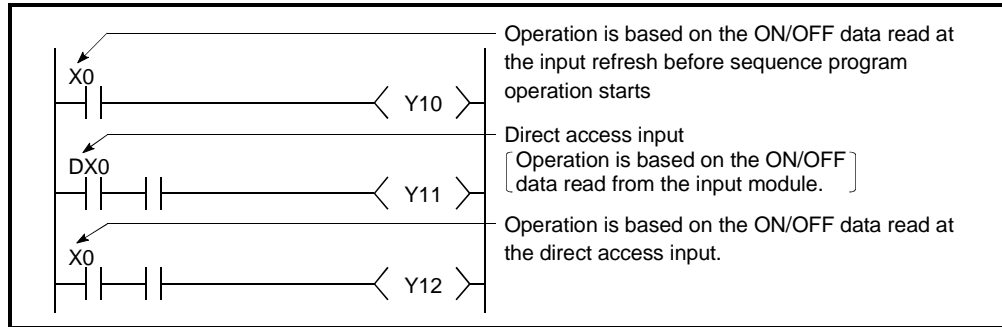


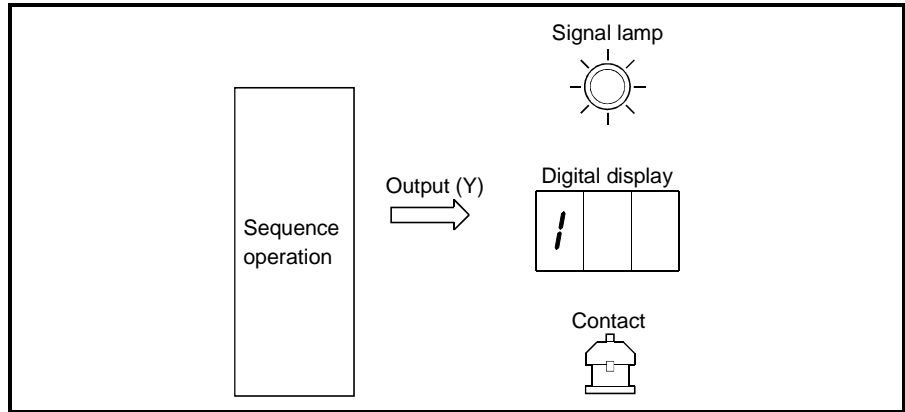
Figure 10.3 Refresh Input & Direct Access Input

POINT
<p>(1) When debugging a program, an input (X) can be set to ON/OFF as described below.</p> <ul style="list-style-type: none"> <li>• OUT Xn instruction</li> </ul> <div style="text-align: center; margin: 10px 0;"> </div> <ul style="list-style-type: none"> <li>• GX Developer test operation</li> </ul> <p>(2) An input (X) can be used in the following cases.</p> <ul style="list-style-type: none"> <li>• Destination device for RX refresh of CC-link</li> <li>• Destination device for refresh of link input of MELSECNET/H</li> </ul>

10.2.2 Outputs (Y)

(1) Definition

- (a) Outputs give out the program control results to the external devices such as solenoid, electromagnetic switch, signal lamp and digital display.



- (b) Outputs give out the result equivalent to one N/O contact.
- (c) There are no restrictions on the number of output Yn N/O contacts and N/C contacts used in a program, provided the program capacity is not exceeded.

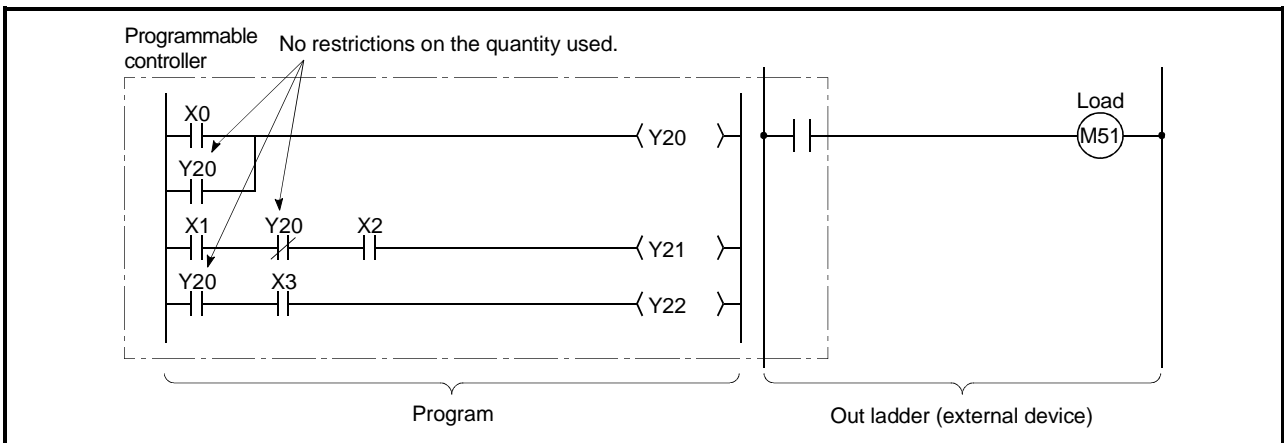
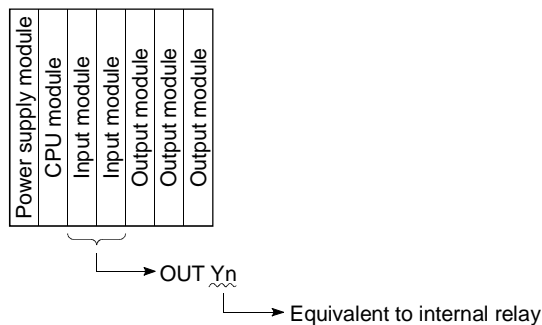


Figure 10.4 Output(Y)

(2) Using outputs as internal relays (M)

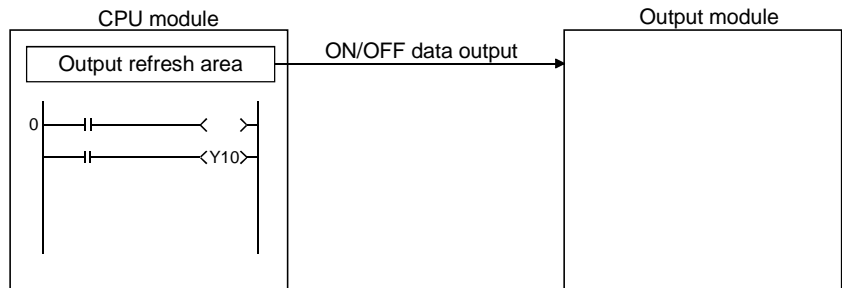
"Y" corresponding to the slots installed with input modules and empty slots can serve as internal relays (M).



(3) Output method

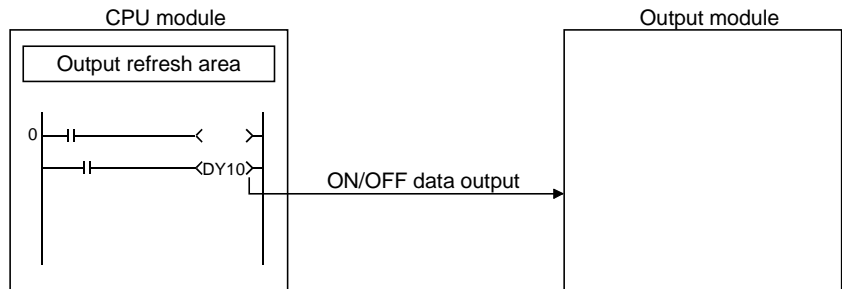
(a) There are 2 types of output: "refresh outputs" and "direct access outputs".

- 1) The refresh output gives out the ON/OFF data to an output module by performing an output refresh before the sequence program is executed. \*1



The refresh output is indicated as "Y[]" in the sequence program. For example, a "10" output becomes "Y10".

- 2) The direct access output gives out the ON/OFF data to an output module when the instruction is executed.



The direct access output is indicated as "DY[]" in the sequence program. For example, a "10" output becomes "DY10".

- (b) Differences between refresh output and direct access output  
 The direct access output accesses an output module directly when an instruction is executed, which realizes shorter external output time. However, it processes an instruction slower compared with the refresh output.  
 The direct access output is used only for outputting to the output module or the intelligent function module/special function module mounted on the base unit or extension base unit.  
 The refresh and direct output differences are shown in Table 10.3 below.

Table 10.3 Differences Between Refresh Outputs & Direct Access Outputs

Item	Refresh Input	Direct Access Outputs
Processing speed (OUT Y/DY)	Q12PHCPU, Q25PHCPU	0.068 μs
Output module installed at base/extension base unit	Usable	Main base unit : 4.0 μs Extension base unit : 4.8 μs
Outputs of intelligent function module installed at base/extension base unit		Usable
Outputs of I/O link module installed at extension base unit	Usable	Unusable
Outputs used at MELSECNET/H network system or CC-Link system		

**REMARK**

\*1: See Section 4.7.1 for details on the refresh mode.



10.2.3 Internal relays (M)

(1) Definition

- (a) Internal relays are auxiliary relays which cannot be latched by the programmable controller's internal latch (memory backup). All internal relays are switched OFF at the following times:
  - When power is switched from OFF to ON.
  - When reset occurs.
  - When latch clear operation is executed.
- (b) There are no restrictions on the number of contacts (N/O contacts, N/C contacts) used in the program, provided the program capacity is not exceeded.

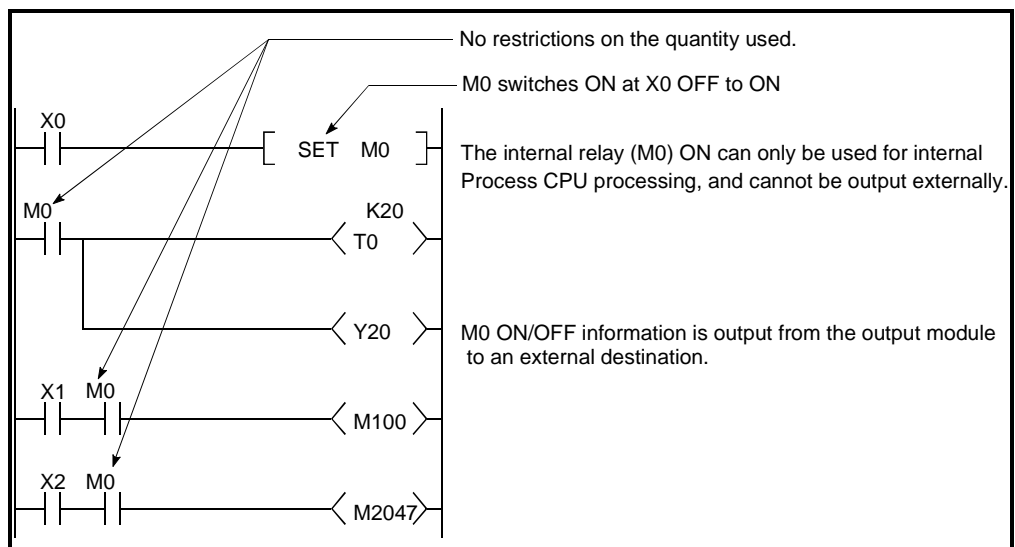


Figure 10.5 Internal Relay

(2) Procedure for external outputs

Outputs (Y) are used to output sequence program operation results to an external destination.

**REMARK**

- 1) Latch relays (L) should be used when a latch (memory backup) is required. See Section 10.2.4 for details on latch relays.

10.2.4 Latch relays (L)

(1) Definition

(a) Latch relays are auxiliary relays which can be latched by the programmable controller's internal latch (memory backup).

Latch relay operation results (ON/OFF information) are saved even in the following cases:

- When power is switched from OFF to ON.
- When reset occurs.

The latch is backed up by the Process CPU battery.

(b) Latch relays can be switched OFF by performing latch clear for the Process CPU. However, the latch relay set as "Latch (2): Cannot clear with Latch Clear key" at the "Device" tab screen in the "(PLC) Parameter" dialog box cannot be turned off, even when the RESET/L.CLR switch/remote latch clear is made for latch clear of it.

(c) There are no restrictions on the number of contacts (N/O contacts, N/C contacts) used in the program, provided the program capacity is not exceeded.

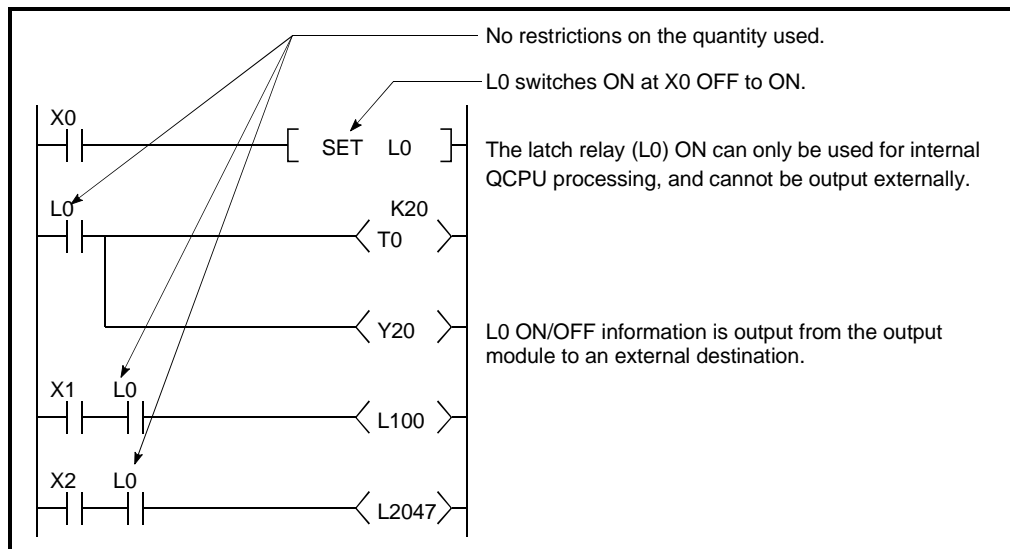


Figure 10.6 Latch Relay

(2) Procedure for external outputs

Outputs (Y) are used to output sequence program operation results to an external destination.

**REMARK**

Internal relays (M) should be used when a latch (memory backup) is not required. See Section 10.2.3 for details on internal relays.

10.2.5 Anunciators (F)

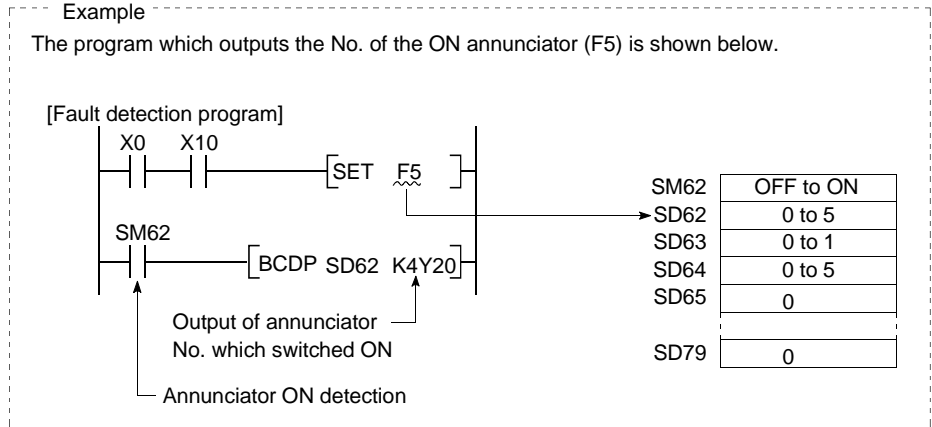
(1) Definition

- (a) Anunciators are internal relays used for fault detection programs created by the user.
- (b) When annunciators switch ON, a special relay (SM62) switches ON, and the Nos. and quantity of the annunciators which switched ON are stored at the special registers (SD62 to SD79).
  - Special relay :SM62..... :Switches ON if even one annunciator switches ON.
  - Special register ..... :SD62 No. of first annunciator which switched ON is stored here.  
SD63 ..... The number (quantity) of annunciators which are ON is stored here.  
SD64 to SD79..... Annunciator Nos. are stored in the order in which they switched ON.  
(The same annunciator No. is stored at SD62 and SD64.)

The annunciator No. stored at SD62 is also registered in the "fault history area".
- (c) Using annunciators for a fault detection program, an equipment fault or fault presence/absence (annunciator number) can be checked by monitoring the special register (SD62 to SD79) when the special relay (SM62) switches ON.

Example

The program which outputs the No. of the ON annunciator (F5) is shown below.



(2) Annunciator ON procedure

(a) Annunciator ON procedure

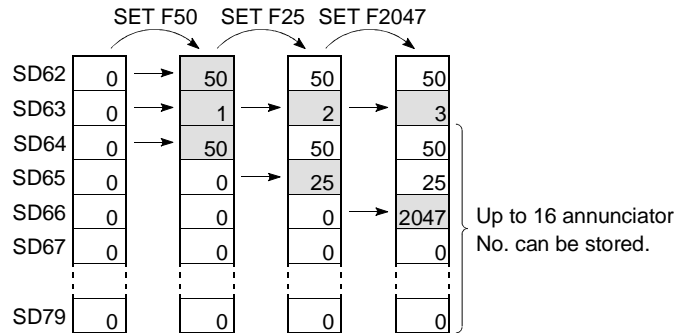
Annunciator operation can be controlled by the SET F□ and OUT F□ instructions.

- 1) The SET F□ instruction switches the annunciator ON only at the leading edge (OFF to ON) of the input condition, and keeps the annunciator ON when the input condition switches OFF.  
In cases where many annunciators are used, the OUT F□ instruction can be used to speed up the scan time.
- 2) The OUT F□ instruction can switch the annunciator ON or OFF. It takes longer to do so than the SET F□ instruction. If the annunciator is switched OFF by using an OUT F□ instruction, this will require the execution of an RST F□ or LEDR instruction. Use a SET F□ instruction to switch the annunciator ON.

POINT
(1) If switched ON by any method other than the SET F□ and OUT F□ instructions, the annunciator functions in the same way as the internal relay. (Does not switch ON at SM62, and annunciator Nos. are not stored at SD62, SD64 to SD79.)

(b) Processing at annunciator ON

- 1) Data stored at special registers (SD62 to SD79)
  - a) Nos. of annunciators which switched ON are stored in order at SD64 to SD79.
  - b) The annunciator No. which was stored at SD64 is stored at SD62.
  - c) "1" is added to the SD63 value.



2) Processing at CPU

"USER" LED at High Performance model QCPU front is ON.

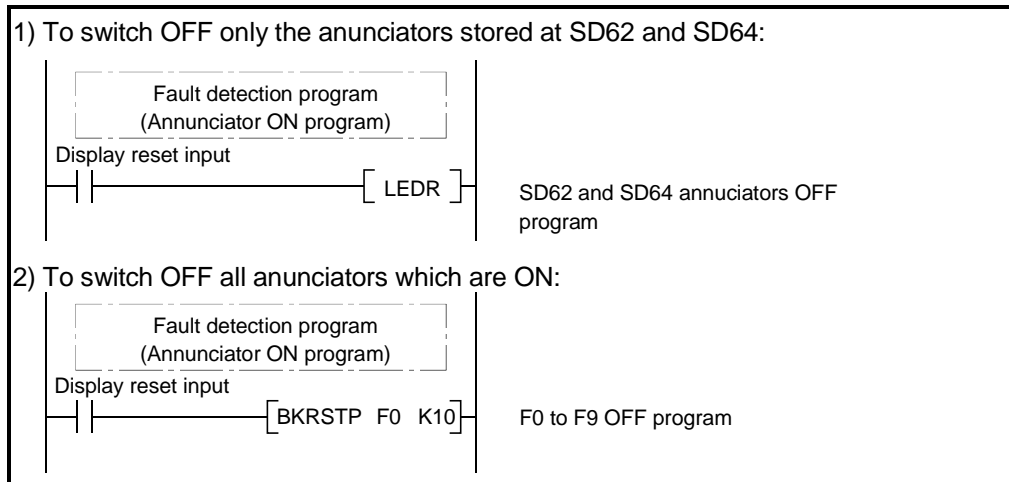
(3) Annunciator OFF procedure and processing content

(a) Annunciator OFF procedure

An annunciator can be switched OFF by the RST F□, LEDR, BKRST, and OUT F□ instructions.

- 1) An annunciator No. which has been switched ON by the SET F□ instruction can be switched OFF by the RST F□ instruction.
- 2) The LEDR instruction is used to switch OFF the annunciator Nos. stored at SD62 and SD64.
- 3) The BKRST instruction is used to switch all the annunciator Nos. within a specified range.

- 4) The OUT F□ instruction can execute ON/OFF of the annunciator No. by the same instruction.  
 However, if an annunciator is switched OFF by the OUT F□ instruction, the "processing at annunciator OFF" (item (b) below) is not performed.  
 Execute the RST F□, LEDR or BKRST instructions after the annunciator has been switched OFF by the OUT F□ instruction.

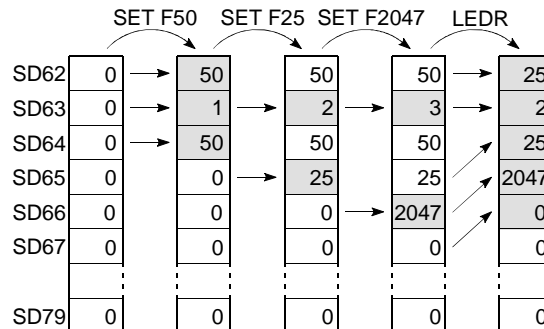


**REMARK**

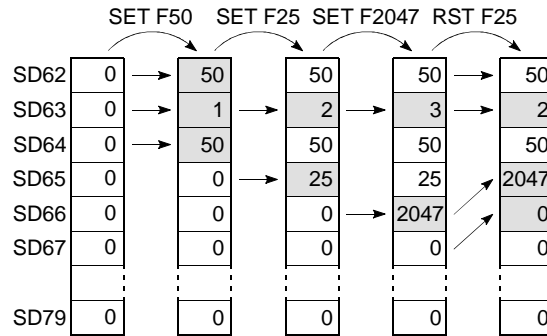
For details on the LEDR and BKRST instruction, refer to the QCPU(Q mode)/QnACPU Programming Manual(Common Instructions).

(b) Processing at annunciator OFF

- 1) Special register (SD62 to SD79) data operation at execution of LEDR instruction
  - a) Annunciator No. stored at SD64 is deleted, and annunciator Nos. stored at subsequent registers (SD65 to SD79) are moved up to fill the empty space.
  - b) The annunciator No. stored at SD64 is stored at SD62.
  - c) "-1" is subtracted from the SD63 value.
  - d) If the SD63 value is "0", SM62 is switched OFF.



- 2) Special register (SD62 to SD79) data operation when an annunciator is switched OFF by the RST F□ instruction
  - a) The annunciator No. which was switched OFF is deleted, and all subsequent annunciator Nos. are moved up to fill the empty space.
  - b) If the annunciator No. stored at SD64 was switched OFF, the new annunciator No. which is stored at SD64 is stored at SD62.
  - c) "-1" is subtracted from the SD63 value.
  - d) If the SD63 value is "0", SM62 is switched OFF.



- 3) Processing by Process CPU
 

If all SD64 to SD79 annunciator Nos. are switched OFF, the "USER" LED on the Process CPU front display is switched OFF.

**POINT**

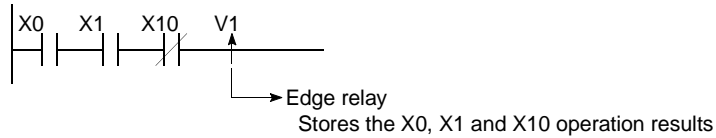
If an error occurs to continue operation with the higher-priority over an annunciator when the annunciator is switched ON, eliminate the error by executing an LEDR instruction. See Section 7.20.2 for priority. In this case, executing an LEDR instruction will not switch the annunciator OFF. To switch the annunciator OFF, you must first eliminate the error before executing the LEDR instruction because the error takes priority over the annunciator.

10.2.6 Edge relay (V)

(1) Definition

(a) An edge relay is a device which stores the operation results (ON/OFF information) from the beginning of the ladder block.

Edge relays can only be used at contacts, and cannot be used as coils.

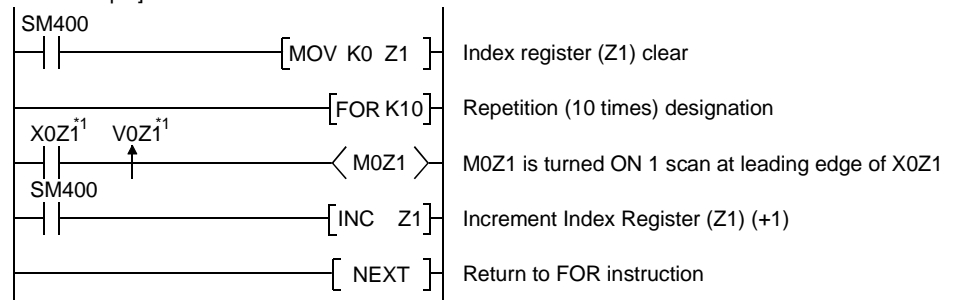


(b) The same edge relay number cannot be used twice in programs executed by the Process CPU.

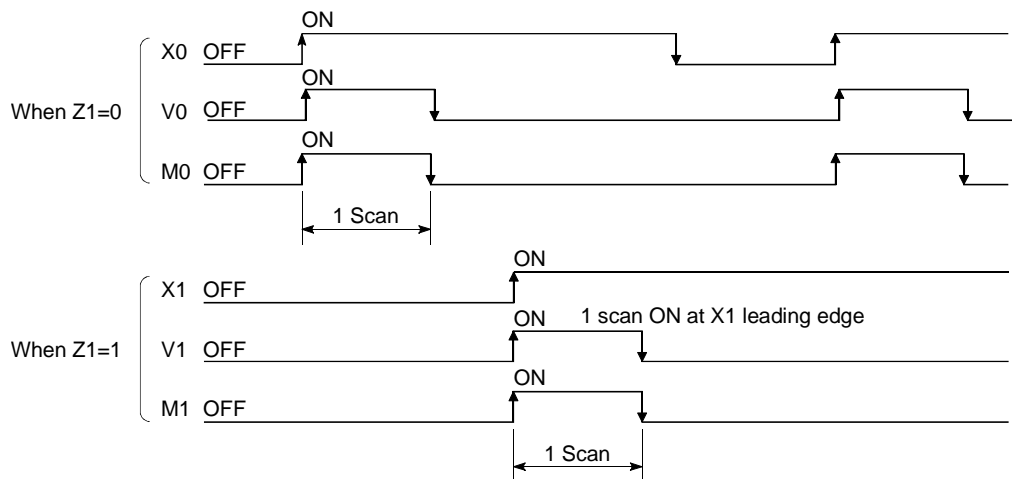
(2) Edge relay applications

Edge relays are used for detecting the leading edge (OFF to ON) in programs configured using index modification.

[Ladder example]



[Timing chart]



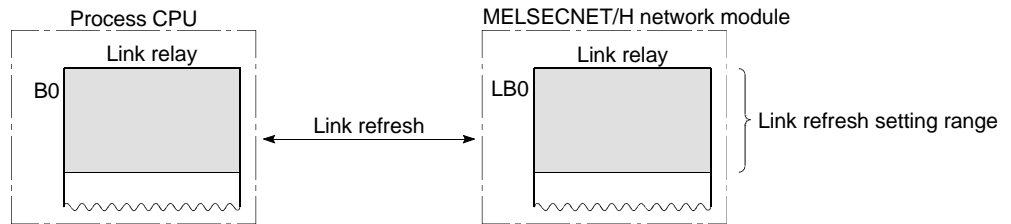
**REMARK**

- 1) \*1: The ON/OFF information for X0Z1 is stored at the V0Z1 edge relay. For example, the X0 ON/OFF information is stored at V0, and the X1 ON/OFF information is stored at V1.

10.2.7 Link relays (B)

(1) Definition

- (a) A link relay is the Process CPU relay used to refresh the Process CPU from the MELSECNET/H network module's link relay (LB) and to refresh the MELSECNET/H network module's link relay (LB) from the Process CPU data.



Internal relays or latch relays can be used for data ranges not used by the MELSECNET/H network system.

- Range where no link relay latch is performed...Internal relay
- Range where link relay latch is performed.....Latch relay

- (b) There are no restrictions on the number of contacts (N/O contacts, N/C contacts) used in the program.

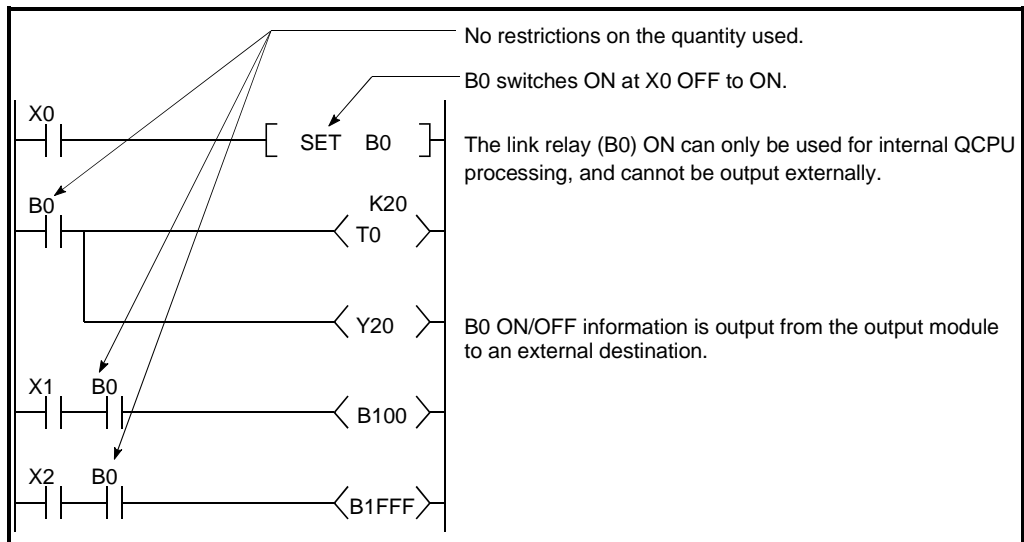


Figure 10.7 Link Relay

(2) Using link relays in the network system

In order to use link relays in the network system, a network parameter setting is required. Link relays for which no network parameter setting has been designated can be used as internal relays or latch relays.

**REMARK**

- 1) For details on the network parameters, refer to the For Q Corresponding MELSECNET/H Network System Reference Manual.
- 2) The MELSECNET/H Network Module has 16384 link relay points assigned. Process CPU has 8192 link relay points assigned. When using subsequent points after Point 8192, change the number of link relay points at the "Device" tab screen in the "(PLC) Parameter" dialog box.



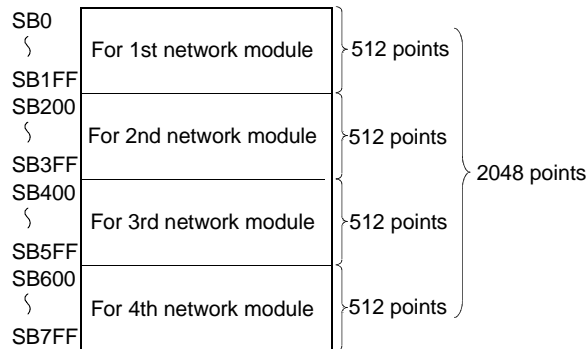
10.2.8 Link special relays (SB)

(1) Definition

- (a) A link special relay indicates the communication status and error detection of an intelligent function module, such as the MELSECNET/H Network Module.
- (b) Because link special relays are switched ON and OFF in accordance with various problems which may occur during a data link, they serve as a tool for identifying data link problems.

(2) Number of link special relay points

There are a total of 2048 link special relay points between SB0 and SB7FF. Link special relays are assigned at a rate of 512 points per each intelligent function module, such as the MELSECNET/H Network Module. Link special relays are assigned as shown below.



**REMARK**

For details on link special relays used at the QCPU, refer to the QCPU (Q mode)/QnACPU Programming Manual (Common Instructions).

10.2.9 Step relays (S)

A step relay is an SFC program device.

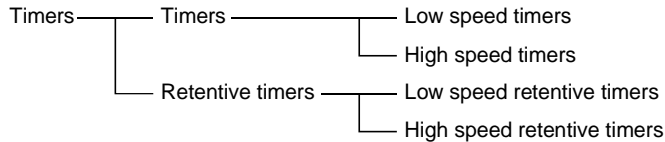
For details regarding procedures for using step relays, refer to the QCPU (Q mode)/QnACPU Programming Manual (SFC).

**POINT**

Because the step relay is a device exclusively for the SFC program, it cannot be used as an internal relay in the sequence program. If used in this manner a SFC error will occur, and system operation will be stopped (system down).

10.2.10 Timers (T)

Timers are of up-timing, with the time measurement beginning when the coil switches ON, and ending (time out) when the current value exceeds the set value. The current value matches the set value when a "time-out" occurs. There are two types of timers: a low/high speed that allows the current value to return to "0" when a timer coil switches OFF, and a retentive timer that retains the current value even when a timer coil switches OFF.

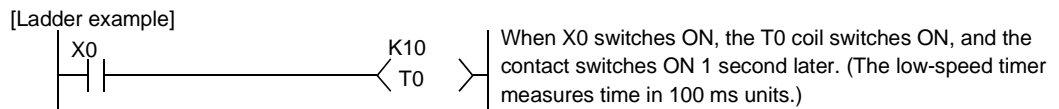


With a timer setting (instruction format), a device is assigned for a low speed timer or high speed timer. The OUT T0 instruction is used to assign a device for a low -speed timer. The OUTH T0 instruction is used to assign a device for a high speed timer. With a timer setting (instruction format), a device is assigned for a low speed retentive timer or high speed retentive timer. The OUT T0 instruction is used to assign a device for a low speed retentive timer. The OUTH T0 instruction is used to assign a device for a high speed retentive timer.

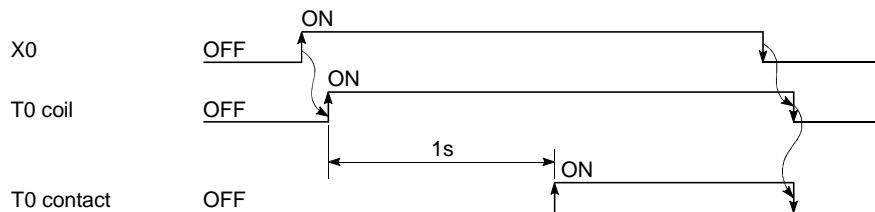
**Low-speed timers**

(1) Definition

- (a) Low speed timers are valid only while the coil is ON.
- (b) The time measurement begins when the timer's coil switches ON, and the contact switches ON when a "time-out" occurs. When the timer's coil switches OFF, the current value becomes "0", and the contact switches OFF.



[Time chart]



(2) Measurement units

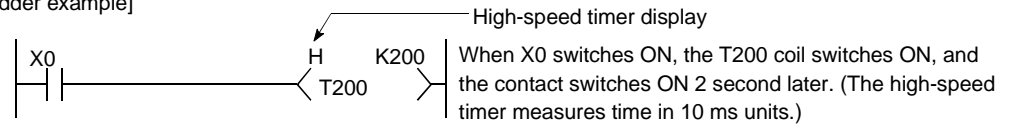
- (a) The default time measurement units setting for low speed timers is 100 ms.
- (b) The time measurement units setting can be designated in 1 ms units within a 1 ms to 1000 ms range. This setting is designated at the "PLC system" tab screen in the "(PLC) Parameter" dialog box.

**High-speed timers**

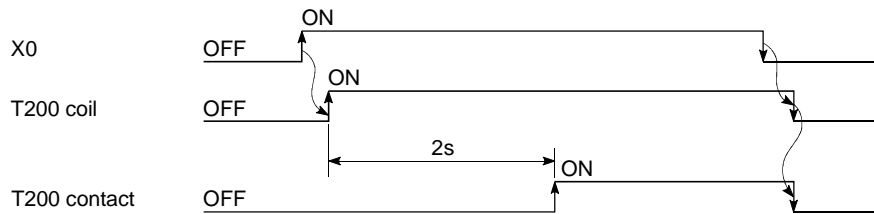
**(1) Definition**

- (a) High speed timers are valid only while the coil is ON. A high speed timer is marked with a symbol "H".
- (b) The time measurement begins when the timer's coil switches ON, and the contact switches ON when the time elapses. When the timer's coil switches OFF, the current value becomes "0", and the contact switches OFF.

[Ladder example]



[Time chart]



**(2) Measurement units**

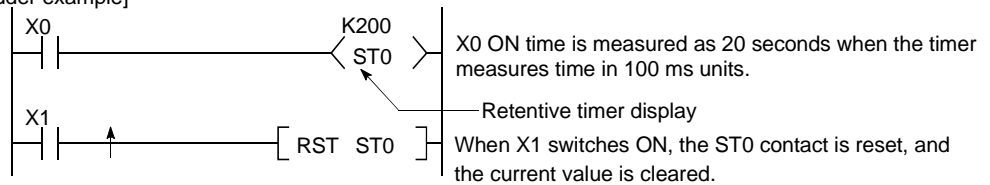
- (a) The default time measurement units setting for high speed timers is 10 ms.
- (b) The time measurement units setting can be designated in 0.1ms units within a 0.1 ms to 100 ms range.  
This setting is designated at the "PLC system" tab screen in the "(PLC) Parameter" dialog box.

**Retentive timers**

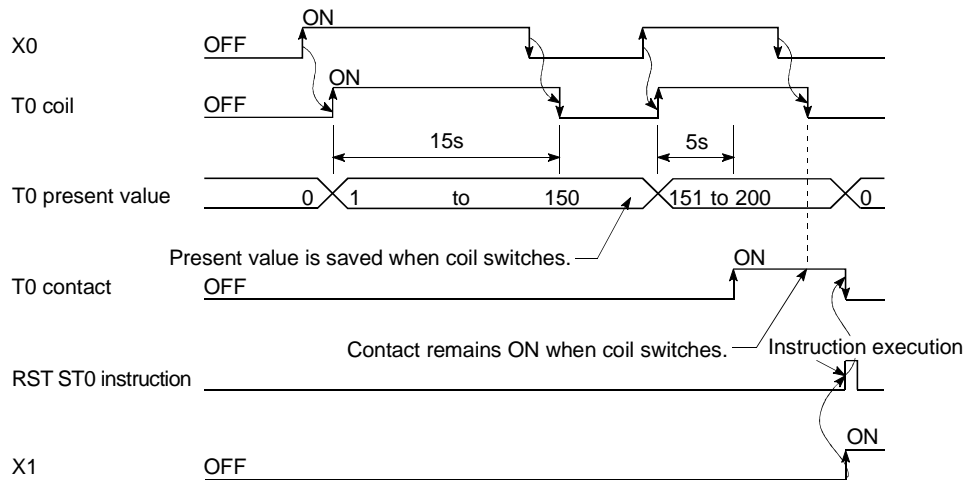
(1) Definition

- (a) Retentive timers measure the "coil ON" time.
- (b) The measurement begins when the timer coil switches ON, and the contact switches ON when a time-out (coil OFF) occurs. Even when the timer coil is OFF, the current value and the contact ON/OFF status are saved. When the coil is switched ON again, the time measurement resumes from the current value which was saved.
- (c) There are 2 retentive timer types: low speed retentive timer, and high speed retentive timer.
- (d) The RST T[] instruction is used to clear (reset) the current value and switch the contact OFF.

[Ladder example]



[Time chart]



(2) Measurement units

- (a) The measurement units settings for retentive timers are the same as those for low speed timers and high speed timers.
  - Low speed retentive timer: Same as low speed timer
  - High speed retentive timer: Same as high speed timer

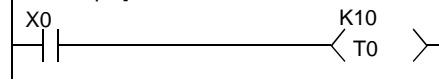
**REMARK**

In order to use retentive timers, a retentive timer "number of points used" setting must be designated at the "Device" tab screen in the "(PLC) Parameter" dialog box.

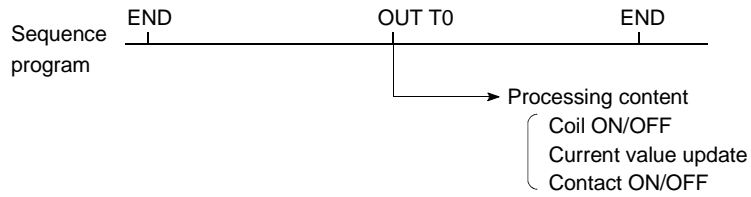
**Timer Processing and accuracy**

- (a) When an OUT T□ instruction is executed, the following is processed: timer coil ON/OFF, current value update and contact ON/OFF processing. Timer current value update and contact ON/OFF processing are not performed at END processing.

[Ladder example]

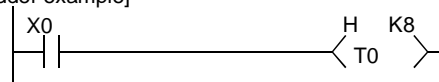


[Processing at execution of OUT T0 instruction]

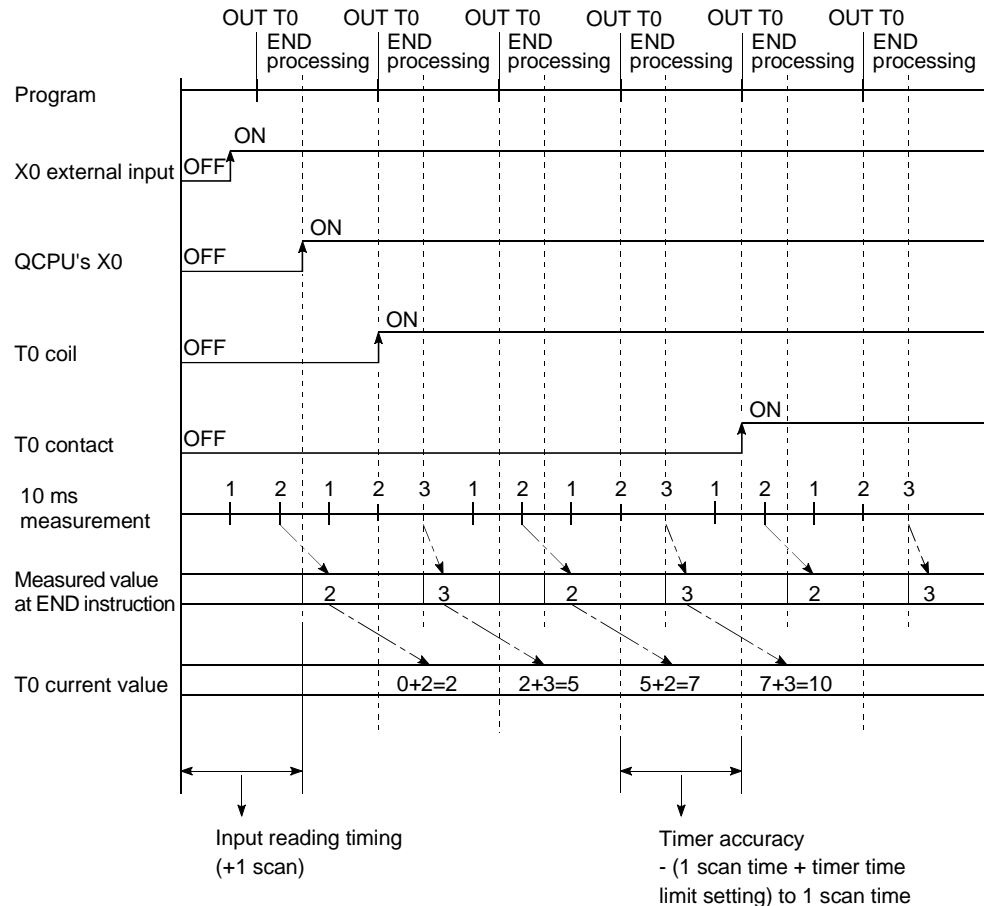


- (b) When the OUT T□ instruction is executed, the current value is added to the scan time measured at the END instruction. If the timer coil is OFF when the OUT T□ instruction is executed, the current value is not updated.

[Ladder example]



[Current value update timing]

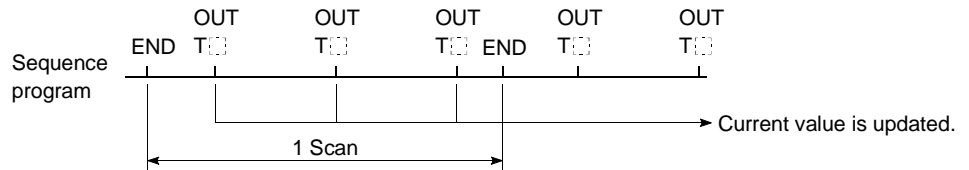


- (c) The timer response accuracy from when reading input (X), until when outputting it is + (2-scan time + timer time limit setting).

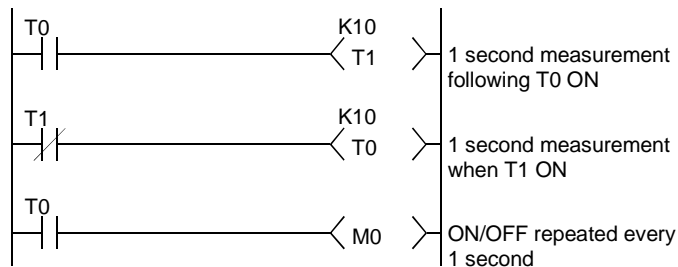
**Precautions for using timers**

The following are a few precautions regarding timer use:

- (a) A given timer cannot be designated (by OUT T[]) more than once in a single scan.  
This designation results in measurement, since the timer current value is updated at execution of each OUT T[] instruction.



- (b) When a timer (for example, T1) coil is ON, the OUT T1 instruction cannot be skipped using a CJ instruction, and so forth.  
If the OUT T[] instruction is skipped, the timer current value will not be updated.
- (c) Timers cannot be used in interrupt programs and fixed scan execution programs.
- (d) If the timer set value is "0", the contact turns ON when the OUT T[] instruction is executed.
- (e) If the set value changes to a value which is higher than the current value following a timer "time-out", the "time-out" status will remain in effect, and timer operation will not be performed.
- (f) If a timer is used at a low speed execution type program, the current value will be added to the low speed scan time when the OUT T[] instruction is executed.  
See Section 4.3.2 for details on the low speed scan time.
- (g) If two timers are used, the ON/OFF ladders should be created as shown below.



10.2.11 Counters (C)

Counters are "up-timing" types, with the contact being switched ON when the count value equals the set value (count-out condition).

There are two counter types: counters which count the number of input condition start-ups (leading edges) in sequence programs, and counters which count the number of interrupt factor occurrences.

**Counters**

(1) Definition

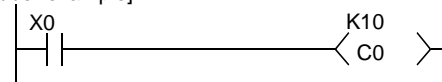
A counter is a device which counts the number of input condition leading edges in sequence programs.

(2) Count processing

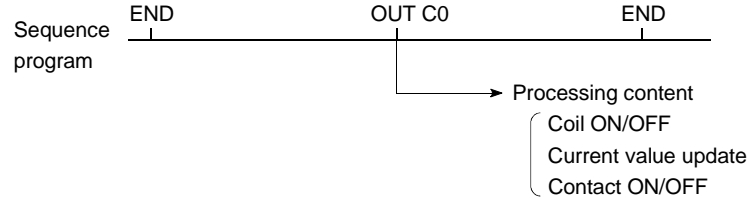
(a) When and OUT C[] instruction is executed, the following counter processing occurs: coil ON/OFF, current value update (count value + 1), and contact ON/OFF.

Counter current value update and contact ON/OFF processing are not performed at END processing.

[Ladder example]



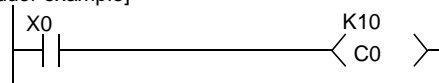
[Processing at OUT C0 Instruction (X0: OFF to ON)]



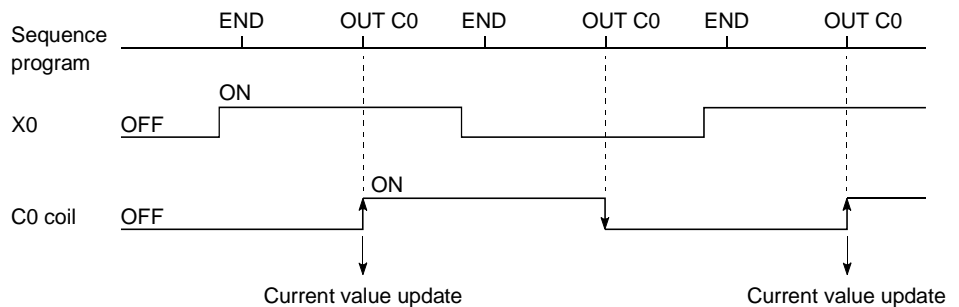
(b) The current value update (count value + 1) is performed at the leading edge (OFF to ON) of the OUT C[] instruction.

The current value is not updated in the following OUT C[] instruction statuses: OFF, ON to ON, ON to OFF

[Ladder example]

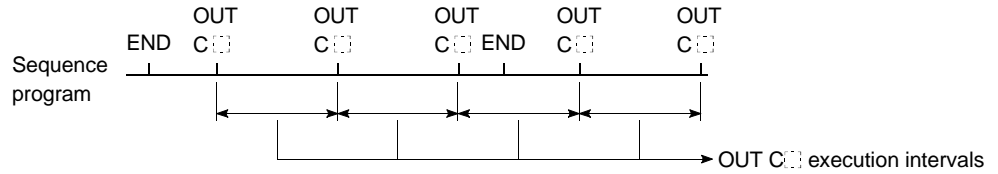


[Current value update timing]



- (c) Multiple counters can be used within a single scan to achieve the maximum counting speed.

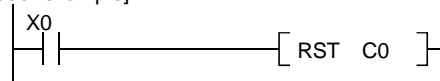
In such cases, the direct access input (DX[]) method should be used for the counter input signals. \*1



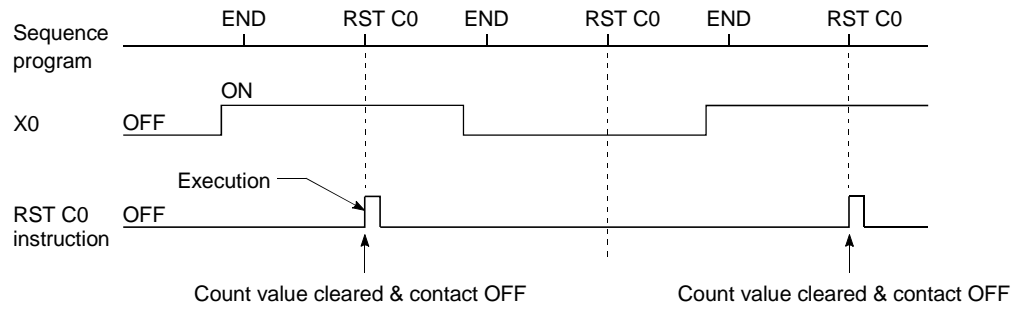
(3) Resetting the counter

- (a) Counter current values are not cleared even if the OUT C[] instruction switches OFF. Use the RST C[] instruction to clear the counter's current value and switch the contact OFF.
- (b) The count value is cleared and the contact is switched OFF at execution of when the RST C[] instruction.

[Ladder example]



[Counter reset timing]



(4) Maximum counting speed

The counter can count only when the input condition ON/OFF time is longer than the execution interval of the corresponding OUT C[] instruction.

The maximum counting speed is calculated by the following expression:

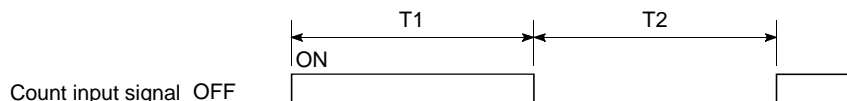
$$\text{Maximum counting speed (Cmax)} = \frac{n}{100} \times \frac{1}{T} [\text{times/s}]$$

n: Duty(%) \*2

T: Execution interval of the OUT C[] instruction

**REMARK**

- 1) \*1: See Section 10.2.1 for details on direct access inputs.
- 2) \*2: The "duty" is the count input signal's ON-OFF time ratio expressed as a percentage value.
  - When  $T1 \geq T2$   $n = \frac{T1}{T1+T2} \times 100\%$
  - When  $T1 < T2$   $n = \frac{T2}{T1+T2} \times 100\%$





**Interrupt counters**

**(1) Definition**

Interrupt counters are devices which count the number of interrupt factor occurrences.

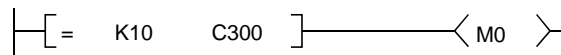
**(2) Count processing**

(a) The interrupt counter's current value is updated when an interruption occurs. It is not necessary to create a program which includes an interrupt counter function.

(b) Interrupt counter operation requires more than the simple designation of a set value.

To use the interrupt counter for control purposes, comparison instructions (=, <=, etc.) must also be used to enable comparisons with the set value, with an internal relay (M), etc., being switched ON or OFF according to the comparison result.

The figure below shows a sample program in which M0 is switched ON after 10 interrupt inputs are performed. (In this example, "C300" is the interrupt counter No. corresponding to I0.)

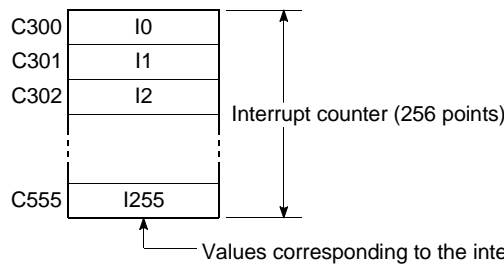


**(3) Setting the interrupt counter**

(a) In order to use interrupt counters, at first interrupt counter No. setting must be designated at the "PLC system" tab screen in the "(PLC) Parameter" dialog box.

256 points are then allocated for interrupt counters, beginning from the "first counter No." which is designated.

If C300 is designated as the first interrupt counter No., numbers C300 to C555 will be allocated for interrupt counters.



(b) In order to use an interrupt counter, an "interruption permitted" status must be established by E1 instruction at the main routine program.

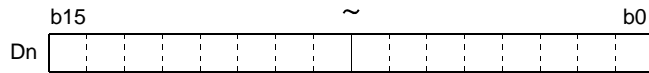
#### (4) Precautions

- (a) One interrupt pointer is insufficient to execute interrupt counter and interrupt program operation.  
Moreover, an interrupt program cannot be executed by an interrupt counter setting designated at the "PLC system" tab screen in the "(PLC) Parameter" dialog box.
- (b) If the processing items shown below are in progress when an interruption occurs, the counting operation will be delayed until processing of these items is completed.  
The count processing starts after the execution of programs is completed. Even if the same interruption occurs again while processing of these items is in process, only one interruption will be counted.
- During execution of sequence program instructions
  - During interrupt program execution
  - During execution of a fixed scan execution type program
- (c) The maximum counting speed of the interrupt timer is determined by the longest processing time of the items shown below.
- Instruction with the longest processing time among the instructions used in the program
  - Interrupt program processing time
  - The processing time of a fixed scan execution type program
- (d) The use of too many interrupt counters will increase the sequence program processing time, and may cause a "WDT ERROR".  
If this occurs, reduce the number of interrupt counters or the counting speed for the input pulse signal.
- (e) The interrupt counter's count value can be reset by using the RST C[] instruction in the sequence program prior to the FEND instruction.
- (f) The interrupt counter's count value can be read out by using the sequence program MOV instruction.

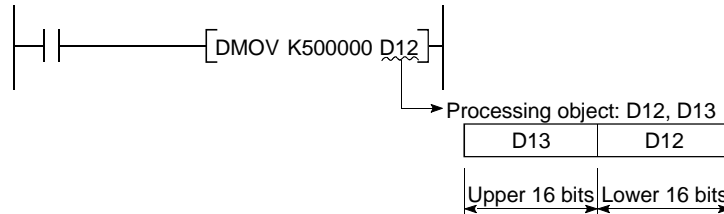
10.2.12 Data registers (D)

(1) Definition

- (a) Data registers are memory devices which store numeric data (-32768 to 32767, or 0000H to FFFFH).
- (b) Data registers, which consist of 16 bits per point, read and write data in 16-bit units.



- (c) If the data registers are used for 32-bit instructions, the data will be stored in registers Dn and Dn + 1. The lower 16 bits of data are stored at the data register No. (Dn) designated in the sequence program, and the higher 16 bits of data are stored in the designated register No. + 1 (Dn + 1). For example, if register D12 is designated in the DMOV instruction, the lower 16 bits are stored in D12, and the upper 16 bits are stored in D13.



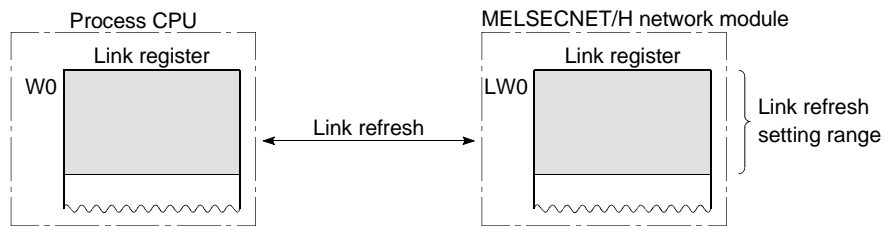
Two data registers can store a range of numeric data from -2147483648 to 2147483647 or from 0H to FFFFFFFFH.

- (d) Data stored by the sequence program is maintained until another data save operation occurs.

10.2.13 Link registers (W)

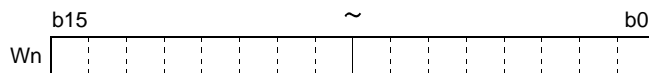
(1) Definition

- (a) A link register is the Process CPU memory used to refresh the Process CPU with data from the link registers (LW) of intelligent function modules including MELSECNET/H network module.  
Link registers are used to store numeric data (-32768 to 32767, or 0000H to FFFFH).

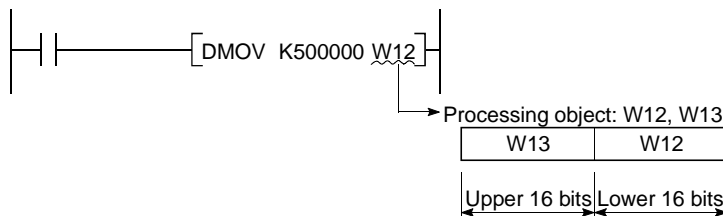


When used outside the MELSECNET/H network system's range, link registers can serve as data registers.

- (b) Link registers, which consist of 16 bits per point, read and write data in 16 bit units.



- (c) If the link registers are used for 32-bit instructions, the data is stored in registers Wn and Wn + 1. The lower 16 bits of data are stored in the link register No. (Wn) designated in the sequence program, and the higher 16 bits of data are stored in the designated register No. + 1 (Wn + 1).  
For example, if link register W12 is designated in the DMOV instruction, the lower 16 bits are stored in W12, and the upper 16 bits are stored in W13.



In two link register points, -2147483648 to 2147483647 or 0H to FFFFFFFFH data can be stored.

- (d) Data stored by the link register is maintained until another data is save.

**REMARK**

The MELSECNET/H network module has 16384 link register points. The Process CPU has 8192 link register points. When subsequent points after Point 8192 are used for link registers, change a "number of points" setting of link registers at the "Device" tab screen in the "(PLC) Parameter" dialog box.

(2) Using link registers in a network system

In order to use link registers in the network system, network parameter settings must be made.

Link registers not set in the network parameter settings can be used as data registers.

**REMARK**

- 1) For details on network parameters, refer to the Q Corresponding MELSECNET/H Network System Reference Manual.

10.2.14 Link special registers (SW)

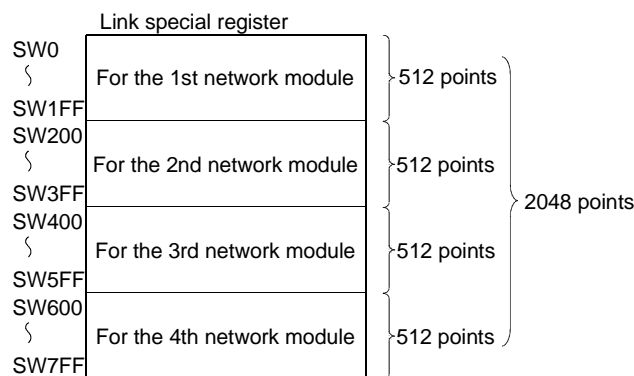
(1) Definition

- (a) Link special registers are used to store data on the communication status and errors of an intelligent function
- (b) Because the data link information is stored as numeric data, the link special registers serve as a tool for identifying the locations and causes of faults.

(2) Number of link special register points

There are 2048 link special register points from SW0 to SW7FF. The link special register points are assigned at the rate of 512 points per intelligent function module, such as a MELSECNET/H network module.

By default, the following points are assigned for link registers as shown below.



**REMARK**

For details on link special registers used in the QCPU, refer to the QCPU(Q mode)/QnACPU Programming Manual (Common Instructions).

### 10.3 Internal System Devices

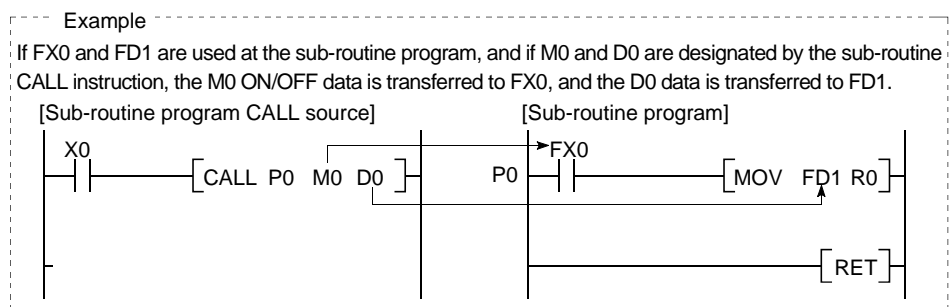
Internal system devices are used for system operations.

The allocations and sizes of internal system devices are fixed, and cannot be changed by the user.

#### 10.3.1 Function devices (FX, FY, FD)

##### (1) Definition

- (a) Function devices are used in sub-routine programs with arguments to permit data transfers between the sub-routine program with argument, and the CALL source for that sub-routine.



- (b) Because the function devices used for each sub-routine program CALL source can be set, the same sub-routine program can be used without regard to other sub-routine CALL sources.

##### (2) Types of function devices

There are 3 function device types: function input devices (FX), function output devices (FY), and function register devices (FD).

###### (a) Function input devices (FX)

- These devices are used to designate inputs of ON/OFF data to a sub-routine program.
- In the sub-routine program, these devices are used for reading and processing bit data designated by sub-routine with argument CALL instruction.
- All the QCPU bit data designation devices can be used.

###### (b) Function output devices (FY)

- These devices are used to designate outputs of sub-routine program operation results (ON/OFF data) to the sub-routine program CALL source.
- The operation results are stored at the device designated by using sub-routine programs with arguments.
- All bit data designation devices except Process CPU inputs (X, DX) can be used.

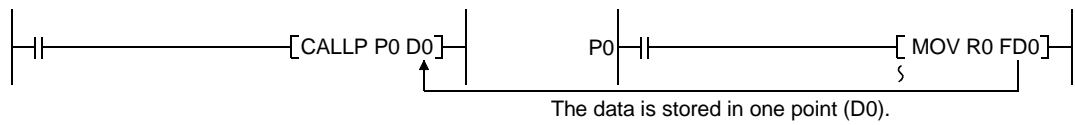
(c) Function registers (FD)

- Function registers are used to designate data transfers between the sub-routine CALL source and the sub-routine program.
- The function register I/O condition is automatically determined by the Process CPU. If the sub-routine program data is the source data, the data is designated as sub-routine input data.  
If the sub-routine program data is the destination data, the data is designated as sub-routine output data.

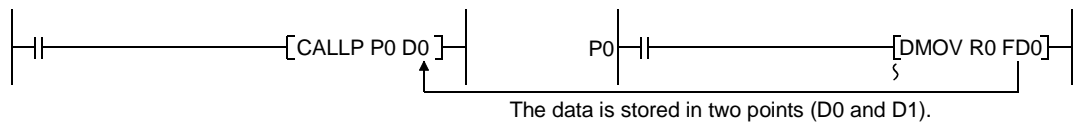
- 1 point occupies 4 words.

The number of words used depends on an instruction in a sub-routine program.

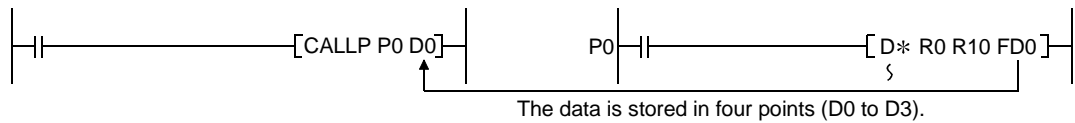
A one-word instruction requires 1 word.



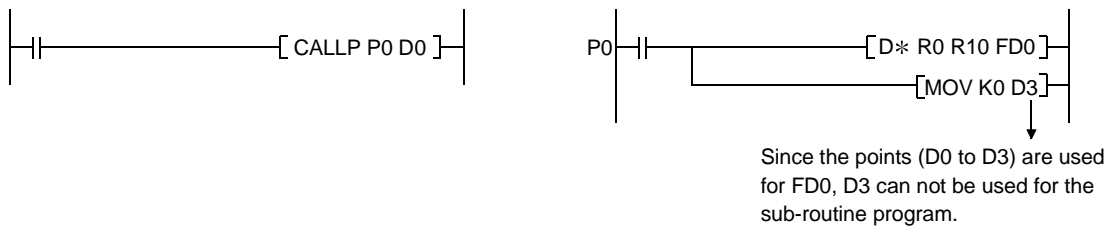
A two-words instruction requires 2 words.



The destination of 32-bit multiplication/division operation requires 4 words.



- Valid devices cannot be used in a sub-routine program that contains arguments. If devices assigned for function registers are used, values of the function registers will not correctly be returned to a calling program.



- Process CPU's word data devices can be used.

**REMARK**

1) For a procedure for using function devices, refer to the QCPU (Q mode)/QnACPU Programming Manual (Common Instructions).

### 10.3.2 Special relays (SM)

(1) Definition

A special relay is used to store Process CPU status data.

(2) Special relay classifications

Special relays are classified according to their applications, as shown below.

- (a) For fault diagnosis : SM0 to SM199
- (b) System information : SM200 to SM399
- (c) System clock/system counter : SM400 to SM499
- (d) Scan information : SM500 to SM599
- (e) Memory card information : SM600 to SM699
- (f) Instruction related : SM700 to SM799
- (g) For debugging : SM800 to SM899
- (h) Latch area : SM900 to SM999
- (i) For A-PLC : SM1000 to SM1299\*

**REMARK**

- 1) For details on special relays which can be used by the Process CPU, refer to Appendix 1.
- 2) \*: This takes effect only after you have turned on the "Use special relay/special register form SM1000/SD1000" check box in the "Compatibility with A-PLC" section at the "PLC system" tab screen in the "(PLC) Parameter" dialog box.



### 10.3.3 Special registers (SD)

#### (1) Definition

A special register is used to store Process CPU status data (diagnosis and system information).

#### (2) Special register classifications

Special registers are classified according to their applications, as shown below.

- (a) For fault diagnosis : SD0 to SD199
- (b) System information : SD200 to SD399
- (c) System clock/system counter : SD400 to SD499
- (d) Scan information : SD500 to SD599
- (e) Memory card information : SD600 to SD699
- (f) Instruction related : SD700 to SD799
- (g) For debugging : SD800 to SD899
- (h) Latch area : SD900 to SD999
- (i) For A-PLC : SD1000 to SD1299\*
- (j) Fuse-blown module : SD1300 to SD1399
- (k) Check of I/O modules : SD1400 to SD1499

#### REMARK

- 1) For details on special relays which can be used by the Process CPU, refer to Appendix 2.
- 2) \*: This takes effect only after you have turned on the "Use special relay/special register form SM1000/SD1000" check box in the "Compatibility with A-PLC" section at the "PLC system" tab screen in the "(PLC) Parameter" dialog box.

10.4 Link Direct Devices (J□\□)

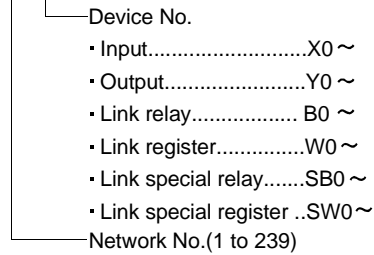
(1) Definition

(a) At END processing of sequence program, a data refresh (data transfer) is performed between the Process CPU and the MELSECNET/H network modules. Link direct devices are used to directly access the link devices in the MELSECNET/H network modules.

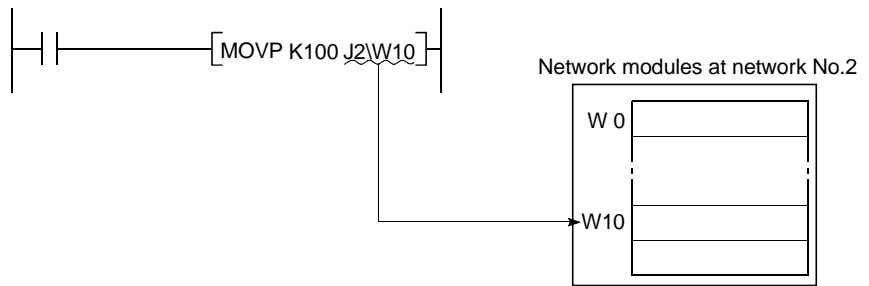
(b) Designation method

- Link direct devices are designated by network No. and device No.

Designation method: J□\□



- For link register 10 (W10) of network No.2, the designation would be "J2W10"



- For a bit device (X, Y, B, SB), digit designation is necessary.

Designation example : J1\K1X0, J10\K4B0

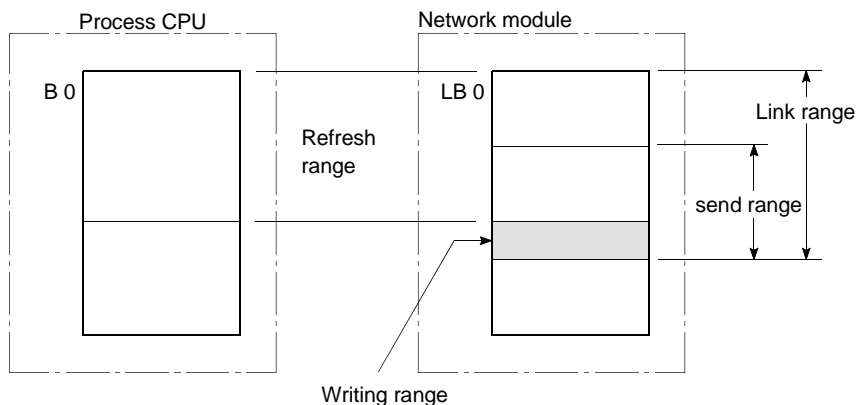
(2) Designation range

Link direct device designations are allowed for all the link devices in network modules.

( Device outside the range specified by the network refresh parameters can also be designated. )

(a) Writing

- 1) Writing is executed within that part of the link device range set as the send range in the common parameters of the network parameters that is outside the range specified as the "refresh range" in the network refresh parameters.

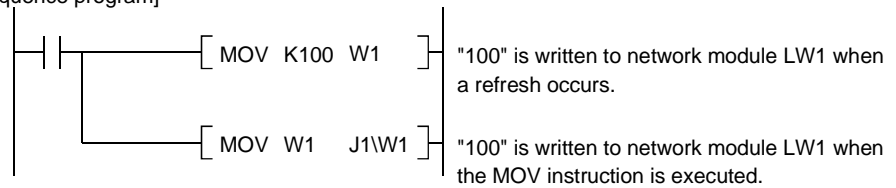


- 2) Although writing is also allowed in the "refresh range" portion of the link device range (specified by refresh parameters), the link module's link device data will be rewritten when a refresh operation occurs. Therefore, when writing by link direct device, the same data should also be written to the Process CPU related devices designated by refresh parameter.

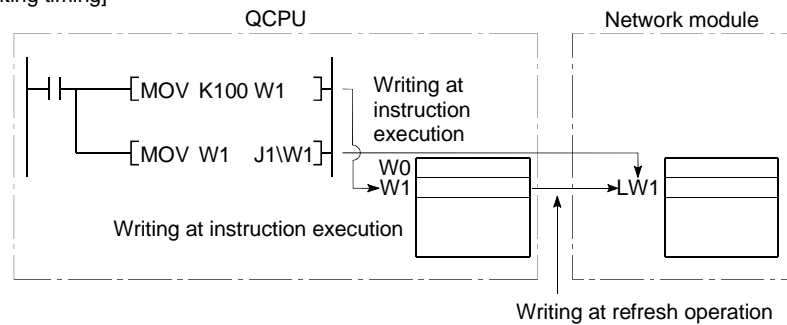
[Refresh parameter settings]

- Network No. : 1
- Process CPU (W0 to W3F) ↔ Network module (LW0 to LW3F)

[Sequence program]



[Writing timing]



- 3) When data is written to another station's writing range using a link direct device, the data which is received from that station will replace the written data.

(b) Reading

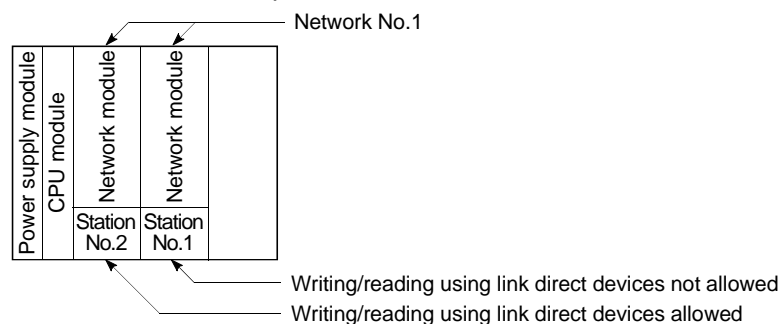
Reading by link direct device is allowed in the entire link device range of network modules.

**POINT**

Only one network module capable of writing/reading link direct devices can be used per network number.

If two or more network modules are installed at the same network number, the network module with the lowest first I/O number will be the one that handles writing/reading using link direct devices.

For example, if station No.1 and station No.2 network modules are installed in network No.1 as shown in the figure below, the station No.2 network module will handle link direct device operations.



## (3) Differences between "link direct devices" and "link refresh"

The differences between "link direct devices" and "link refresh" are shown in Table 10.4 below.

Table 10.4 Differences Between "Link Direct Devices" and "Link Refresh"

Item		Link Direct Device	Link Refresh
Program notation method	Link relay	J[ ]\K4B0 or later	B0 or later
	Link register	J[ ]\W0 or later	W0 or later
	Link special relay	J[ ]\K4SB0 or later	SB0 or later
	Link special register	J[ ]\SW0 or later	SW0 or later
Number of steps		2 steps	1 step
Network module access range		All network module link devices	Refresh parameter designated range
Access data guarantee range		Word units (16 bits)	

**REMARK**

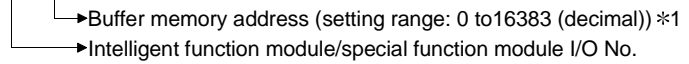
- 1) For details on the MELSECNET/H network system, refer to the Q Corresponding MELSECNET/H Network System Reference Manual.
- 2) For details on network parameters, common parameters, and network refresh parameters, refer to the following manuals:
  - Detailed information : Q Corresponding MELSECNET/H Network System Reference Manual
  - Setting procedures : GX Developer Operating Manual, Windows Version

10.5 Intelligent Function Module Devices (U□\G□)

(1) Definition

- (a) The intelligent function module devices allow the Process CPU to directly access the buffer memories of intelligent function modules which are mounted on at the main base unit and extension base units.
- (b) Intelligent function module devices are designated by the intelligent function module/special function module I/O No., and the buffer memory address.

Designation method: U□\G□



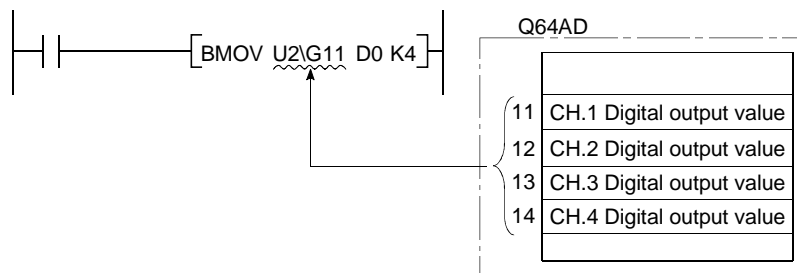
\*Setting: If the I/O No. is a 3-digit value, designate the first 2 digits.

For X/YF0.....X/Y1F0

Designate "1F"

\*Setting range: 00H to FEH

When digital output values of channels (CH.1 to CH.4) of the Q64AD Type Analog-Digital Conversion Module (X/Y20 to 2F) mounted at Slot 2 of the main base unit are stored in D0 to D3, the I/O number and the buffer memory address are specified as shown below.



(2) Processing speed

The processing speed for intelligent function module devices is;

- (a) Reading or writing the buffer memory of the intelligent function module is rather faster than the "processing speed of FROM/TO instructions." (For example, case of "MOV U2\G11 D0")
- (b) To conduct reading the buffer memory of the intelligent function module and another process in a single instruction, add the "processing speed of FROM/TO instruction" and "processing speed of instruction" to setup the reference value.  
(For example, case of "+ U2\G11 D0 D10")

If the same buffer memory of the same intelligent function module is used two or more times in a sequence program, the processing speed can be increased by using the FROM instruction to read that buffer memory data to a Process CPU device.

**REMARK**

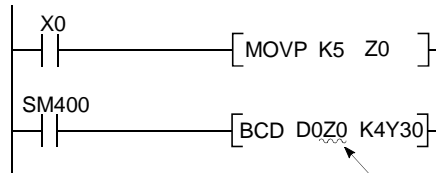
- 1) \*1: For details on buffer memory addresses and applications, refer to the intelligent function module manual.

10.6 Index Registers (Z)

(1) Definition

(a) Index registers are used in the sequence program for indirect setting (index qualification) designations.

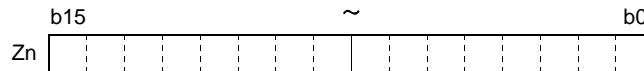
An index register point is used for index modification.



Index registers consist of 16 bits per point.

(b) There are 16 index registers (Z0-Z15).

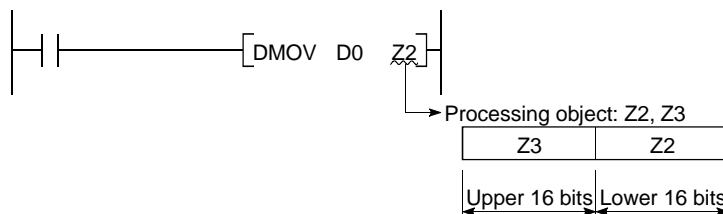
(c) Index registers, which consist of 16 bits per point, read and write data in 16bit units.



(d) If the index registers are used for 32-bit instructions, the data is stored in registers Zn and Zn + 1.

The lower 16 bits of data are stored in the index register No. (Zn) designated in the sequence program, and the upper 16 bits of data are stored in the designated index register No. + 1.

For example, if register Z2 is designated in the DMOV instruction, the lower 16 bits are stored in Z2, and the upper 16 bits are stored at Z3.



**REMARK**

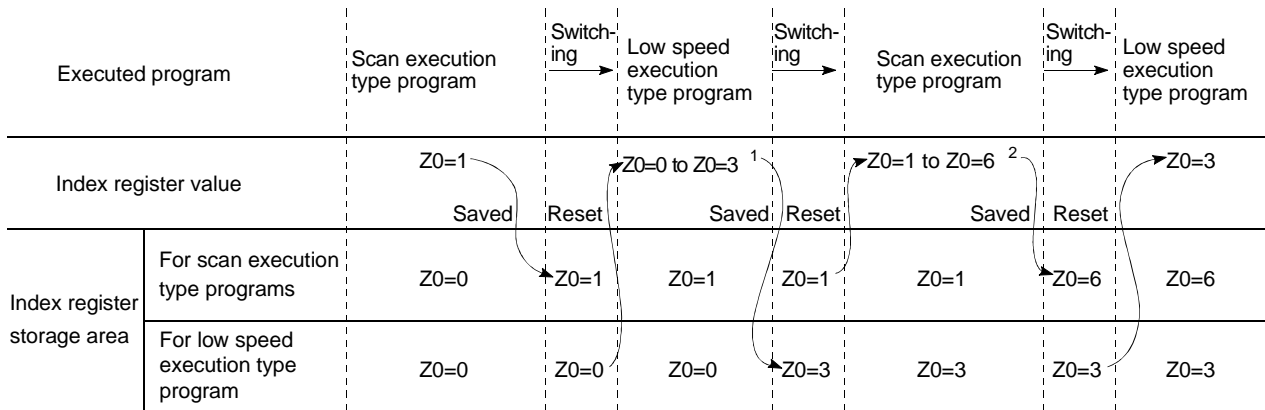
For index modification using the index register, refer to the following manual.  
 QCPU (Q mode) / QnACPU Programming Manual (Common instructions)

### 10.6.1 Switching between scan execution type programs and low speed execution type programs

When switching from a scan execution type programs or low speed execution type program to another program type, the index register (Z0 to Z15) data is saved (protected) and reset.

#### (1) Index register processing at switching between scan execution type programs and low speed execution type programs

- (a) When switching from a scan execution type program to a low speed execution type program occurs, the scan execution type program's index register data is saved, and the low speed execution type program's index register data is restored.
- (b) When switching from a low speed execution program to a scan execution type program occurs, the low speed execution type program's index register data is saved, and the scan execution type program's index register data is restored.



\* 1: For low-speed execution type program, Z0 is changed to 3.  
 \* 2: For scan execution type program, Z0 is changed to 6.

#### (2) Exchanges of index register data

Word devices should be used for exchanges of index register data between scan execution type programs and low speed execution type programs.

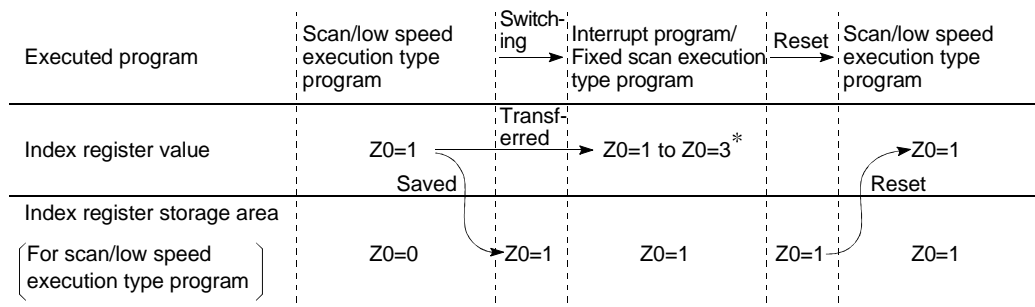
### 10.6.2 Switching between scan/low speed execution type programs and interrupt/fixed scan execution type programs

The "PLC system" tab screen in the "(PLC) Parameter" dialog box provides the option to save (protect) or restore index register data (Z0 to Z15) when switching between a scan execution type program and a low speed execution type program or between an interrupt program and a fixed scan execution type program.

When not writing data to index registers check by using an interrupt program/fixed scan execution type program, the "High speed execution" check box in the "Interrupt program/Fixed scan program setting" section at the "PLC system" tab screen in the "(PLC) Parameter" dialog box. This will switch between programs quickly.

(1) When the "High speed execution" check box is OFF:

- (a) When the scan/low speed execution type program is switched to the interrupt/fixed scan execution type program, the scan/low speed execution type program's index register value is first saved, and is then transferred to the interrupt/fixed scan execution type program.
- (b) When the interrupt/fixed scan execution type program is switched to the scan/low speed execution type program, the saved index register value is reset.



\*: For interrupt program, Z0 is changed to 3.

Word devices should be used to transfer index register data from an interrupt or fixed scan execution type program to a scan or low speed execution type program.



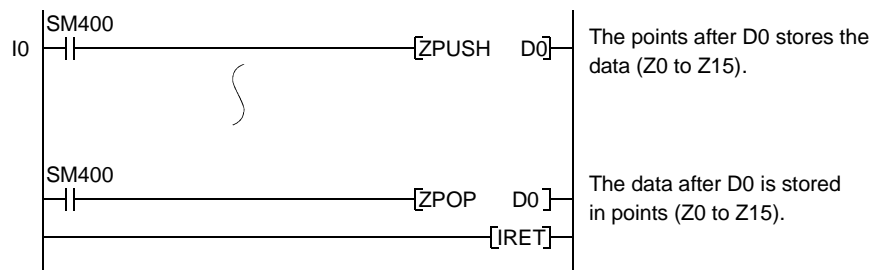
(2) When the "High speed execution" check box is checked:

- (a) If a scan execution type program/low speed execution type program is switched to an interrupt program/fixed scan execution type program, index register data will not be saved/restored.
- (b) If data is written to index registers by using an interrupt program/fixed scan execution type program, the values of index registers used for a scan/low speed execution type program will be corrupted.

Executed program	Scan/low speed execution type program	Switching	Interrupt program/ Fixed scan execution type program	Reset	Scan/low speed execution type program
Index register value	Z0=1	Transferred	Z0=1 to Z0=3*	Transferred	Z0=3
Index register storage area (For scan/low speed execution type program)	Z0=0	Z0=0	Z0=0	Z0=0	Z0=0

\*: For interrupt program, Z0 is changed to 3.

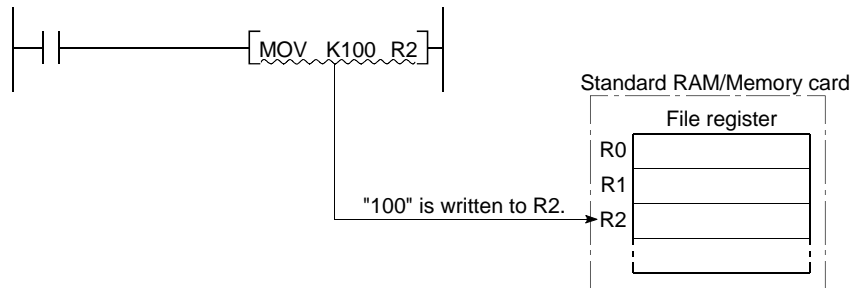
- (c) Before writing data to index registers by using an interrupt program/fixed scan execution type program, use the ZPUSH/ZPOP instruction to save/restore the data.



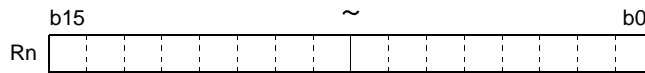
10.7 File Registers (R)

(1) Definition

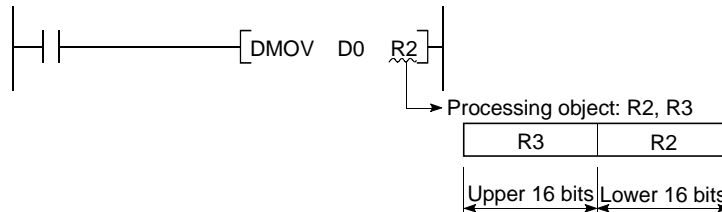
- (a) File registers are expansion devices for data registers.
- (b) File register data is stored in files in the standard RAM, the memory card.
  - 1) The standard RAM has 128k points assigned for file registers. File registers can be used at the same processing speed as data registers.
  - 2) Use a memory card if 128k or more points are assigned for file registers.



- (c) File registers, which consist of 16 bits per point, read and write data in 16bit units.



- (d) If the file registers are used for 32-bit instructions, the data will be stored in registers Rn and Rn + 1. The lower 16 bits of data are stored in the file register No. (Rn) designated in the sequence program, and the upper 16 bits of data are stored in the designated file register No.+ 1. For example, if file register R2 is designated in the DMOV instruction, the lower 16 bits are stored in R2, and the upper 16 bits are stored in R3.



Two file registers can be used to store numeric data from -2147483648 to 2147483647 or from 0H to FFFFFFFFH.

- (e) The content of the file register is retained even when the power is turned off or reset. (It is not initialized even if latch clear is performed.) Use a sequence program to initialize the file register when the power is turned off or reset. For example, to clear the R0 to R2047 file registers upon power-on of the PLC, write "0" using an FMOV instruction.

## 10.7.1 File register capacity

## (1) Using the Standard RAM

A maximum of 128 k file register points can be stored in the standard RAM. The standard RAM holds file registers and local devices. When local devices are not used, all 128 k points can be assigned for file registers.

## (2) Using the SRAM Card

The size of a file can be expanded at the rate of 32 k words per block, up to 32 blocks, 1017 k words. The number of expandable blocks depends on the size of programs or device comments stored on a memory card.

## (3) Using the Flash Card

The size of a file can be expanded at the rate of 32 k words per block up to 32 blocks, 1018 k words. The number of expandable blocks depends on the size of programs or device comments stored on a memory card.

**REMARK**

For details regarding the Process CPU memory cards, see Section 6.1.

## 10.7.2 Differences in memory card access method by memory card type

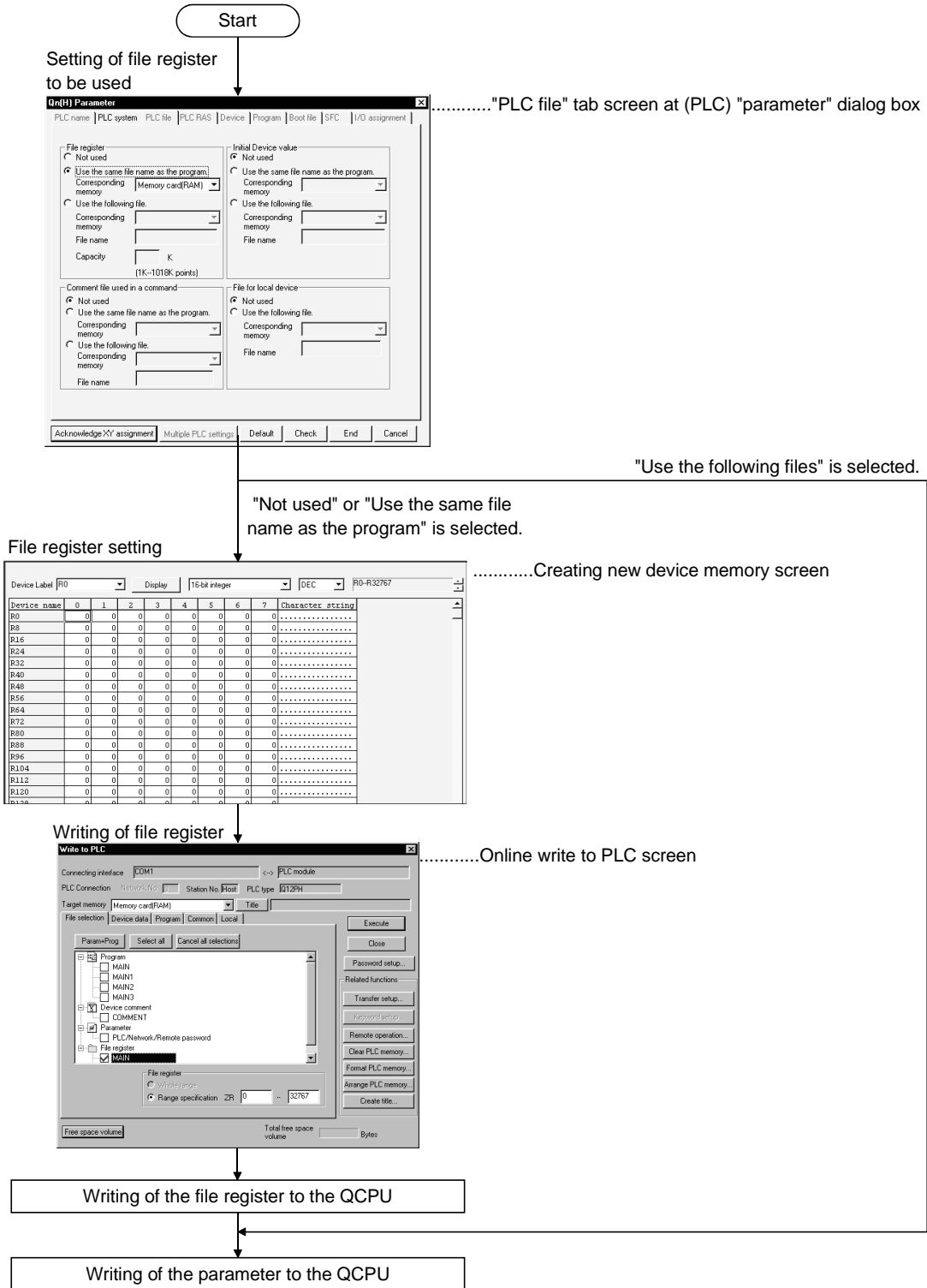
File registers are stored in three types of memories: standard RAM, SRAM card, and Flash card.

Note that the file register access method differs depending on the memory type.

How to Access		Standard RAM	SRAM Card	Flash Card
Read with a user's program		○	○	○
Write with a user's program		○	○	×
PLC read through the device setting		○	○	○
PLC write through the device setting		○	○	×
How to Modify the Stored Data	Online test operation from GX Developer	○	○	×
	PLC write from GX Developer	○	○	×
	PLC write from GX Developer (Flash ROM)	×	×	○
	Batch write from serial communication module	○	○	×
	Device write from GOT900 Series	○	○	×
Random write command from GOT 900 Series		○	○	×

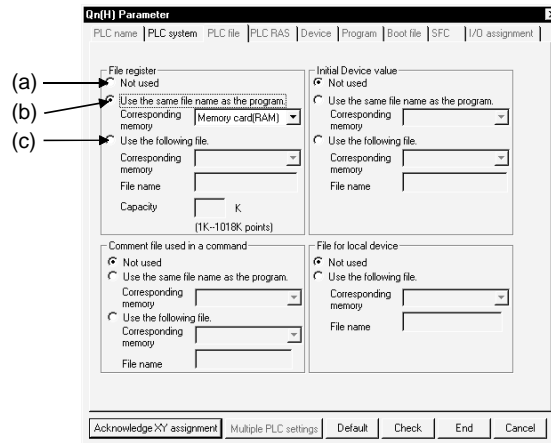
### 10.7.3 Registering the file registers

To use file registers, register the file registers with the Process CPU in the following steps.



(1) Designating file registers for use

The standard RAM or the memory card file registers which are to be used in the sequence program are determined at the "PLC file" tab screen in the "(PLC) Parameter" dialog box.



(a) When selecting "Not used"

This setting should be selected for the following cases:

- When not using the file registers
- When designating the file registers to be used in the sequence program. The QDRSET instruction is used to designate which file registers are to be used.

(b) When selecting "Use the same file name as the program"

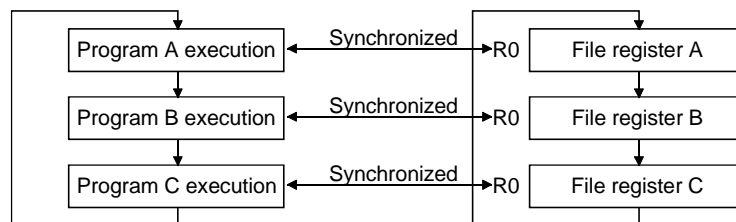
- 1) This setting should be selected when the file registers having the same file name as the sequence program are to be used.
- 2) If the program is changed, the file registers are automatically changed to conform to the new program name. There are also cases where it is convenient to use the file registers as local devices which can only be used with the program currently being executed.

3) The number of file register to use can be set by writing to PLC online.

Example

When file registers (A to C) having the same name as the programs (A to C) are to be used, operation is as shown below.

- At program A execution --- File register A is accessed.
- At program B execution --- File register B is accessed.
- At program C execution --- File register C is accessed.



**POINT**

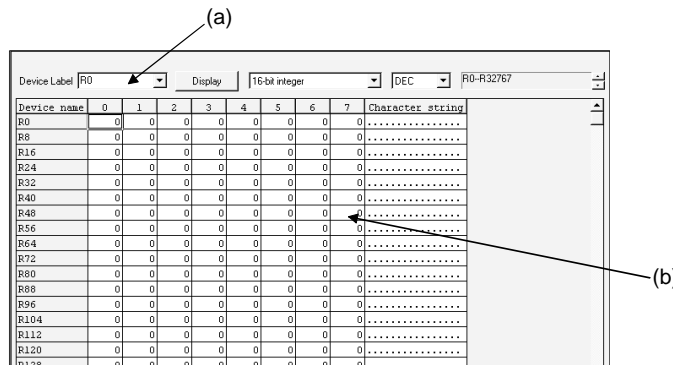
File registers dedicated to each program may not be designated with some instructions. Refer to the allowable device in the programming manual of each instruction for details.

(c) When selecting "Use the following file"

- 1) This setting should be selected when a given file register is to be shared by all executed programs.
- 2) Specify the desired parameters in the "Corresponding memory", "File name", and "Capacity" text boxes. The Process CPU creates a file register file with the specified parameters. If a parameter is not specified in the Capacity test box, this may result in the following:
  - If a file register file with the specified filename is stored on the specified drive, that file register file is used.
  - If a file register file with the specified filename is not found on the specified drive, a "PARAMETER ERROR (3002)" will occur.
  - When an ATA card is used, a memory card (ROM) cannot be registered with the targeted memory. If a memory card is registered with the targeted memory, a parameter error (3000) will occur when a file register file is written to the Process CPU.

(2) File Register Setting

Use the device memory screen to specify a filename of a file register file.



(a) Setting the file registers

Type "Rn" in the list box to view a listing of file registers.

(b) Setting the parameters

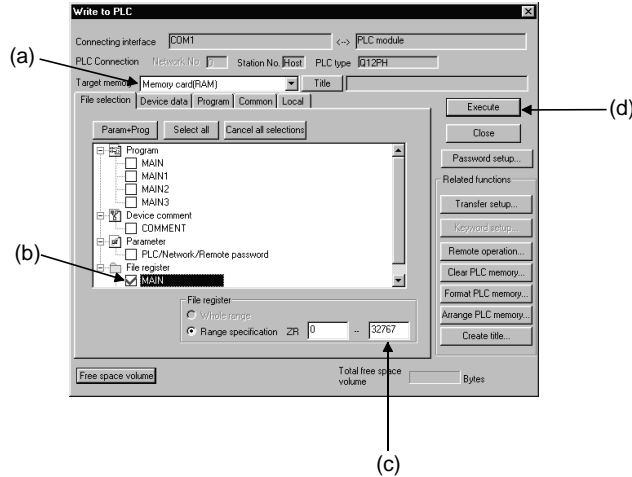
Enter the desired data in columns to specify file registers. This step is not needed when you specify only the capacity of file registers.

(3) Registering the File Register File with the Process CPU

If you click on the following check boxes at the "PLC file" tab screen in the "(PLC) Parameter" dialog box, you must register a file register file with the Process CPU:

- Not used
- Use the same file name as the program

For registration of a file register file, use the "Write to PLC" dialog box.



- (a) Selecting a memory to store file registers  
Choose the standard RAM, memory card (RAM), or memory card (ROM) from this list box to specify a memory to store file registers. If you want to use the same filename as that of a program, store a file register file in the memory specified in the PLC File sheet of the PLC Parameter dialog box.
- (b) Selecting a file register file  
If a memory for file registers is selected, a filename of a file register file is displayed. Select the desired filename of a file register file.
- (c) Specifying the capacity and filename  
This section is used to specify the capacity of file registers and a filename of the file register file to be written onto the Process CPU (QCPU-side filename).
  - 1) The capacity of file registers can be specified from ZR0 in the units of 1 point. Note that the capacity is secured in 256 point units as a file. If file registers cannot be assigned from ZR0, this will result in a file register file that contains points from ZR0 to the last point. For example, if the storing range of file registers are designated from ZR1000 to ZR1791, a file register file will contain points from ZR0 to ZR1791. Specify file registers from ZR0 because undefined data is from ZR0 to ZR999. A check on the capacity of file registers is made in the units of 1k points. The capacity of file registers should be specified from R0 in the units of 1k points.
- (d) Storing a file register file in the Process CPU's memory  
This button is used to store a file register file with the specified number of points in the specified Process CPU's memory.

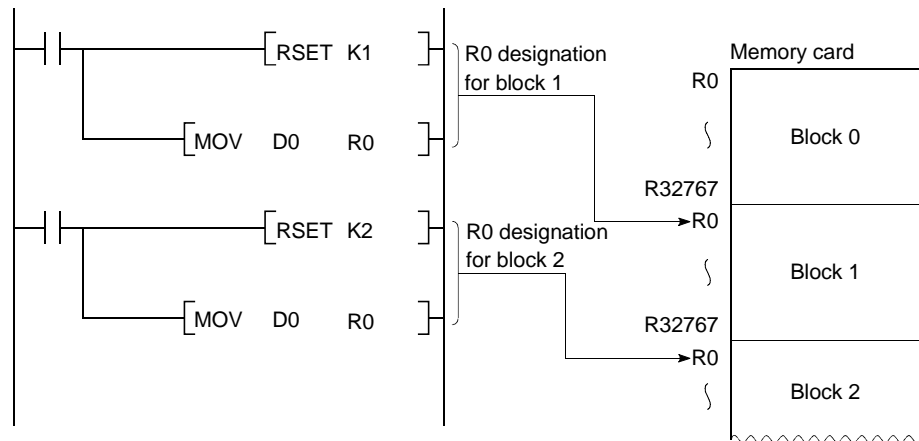
10.7.4 File register designation method

(1) Block switching format

The block switching format designates the number of file register points in 32k point (R0 to R32767) units.

If multiple blocks are used, switch to the block No. to be used in the RSET instruction for further file register settings.

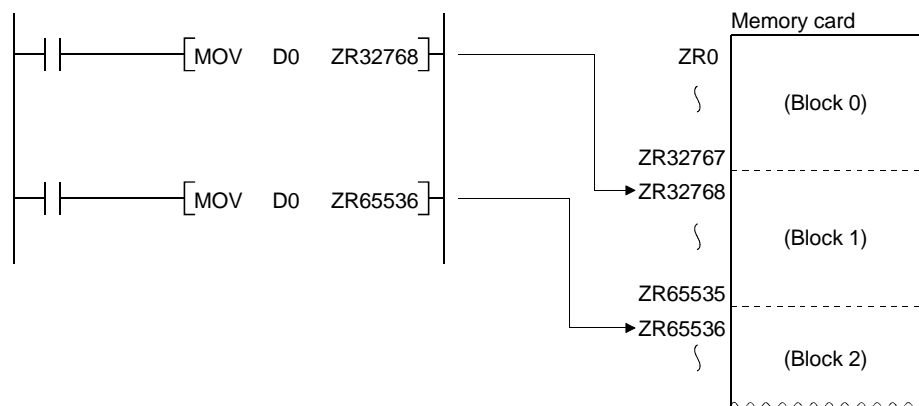
Settings are designated in the R0 to R32767 range for each block.



(2) Serial number access format

This format is used for designating file register beyond 32k points by device name.

Multiple blocks of file registers can be used as a continuous file register.





## 10.7.5 Precautions in using file registers

## (1) Using file register Nos. not registered or outside the registered range

- (a) When file register files are not registered in the Process CPU, no error occurs even if reading/writing to file registers

Reading data from a file register results in the following:

- Undefined data is stored in the standard RAM.
- "0H" is stored in a memory card.

- (b) Writing/reading file register Nos. outside the registered range (points)

No error occurs even if reading/writing occurs to these file registers.

Reading data from a file register results in the following:

- Undefined data is stored in the standard RAM.
- "0H" is stored in a memory card.

## (2) File register capacity check

- (a) Perform a file register capacity check in the sequence program, so that reading/writing from/to the file register is performed within the size (number of points) set in the Process CPU.

- A file register capacity check should be executed at step 0 of programs in which file registers are used.
- After switching to another file register file using the QDRSET instruction, execute a file register capacity check.
- When using the RSET instruction to switch blocks, confirm that the switching destination block has a capacity of 1k points or more before executing the RSET instruction.

$$\text{(File register capacity)} > [32\text{k points} \times (\text{switching block No.}) + 1\text{k points}]$$

- (b) The available file register capacity can be checked in the file register capacity storage register (SD 647). \*1

The file register capacity is stored in SD647 in 1k point units.

The "less than 1k points" surplus portion of a file register capacity is not stored.  
In order to ensure an accurate "range of use" check, be sure to designate the file register setting in 1k point (1024 points) units.

**REMARK**

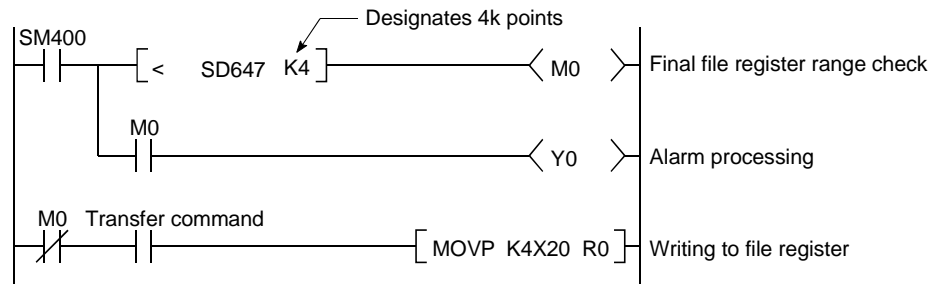
\*1 : If a file register file is switched to another, the file register capacity of the currently selected file register file is stored in SD647.

(c) Checking the file register capacity

- 1) Check The file register capacity used for each sequence program.
- 2) Determine if the file register capacity exceeds the number of points used, on the basis of the total file register capacity set in SD647 in the sequence program.

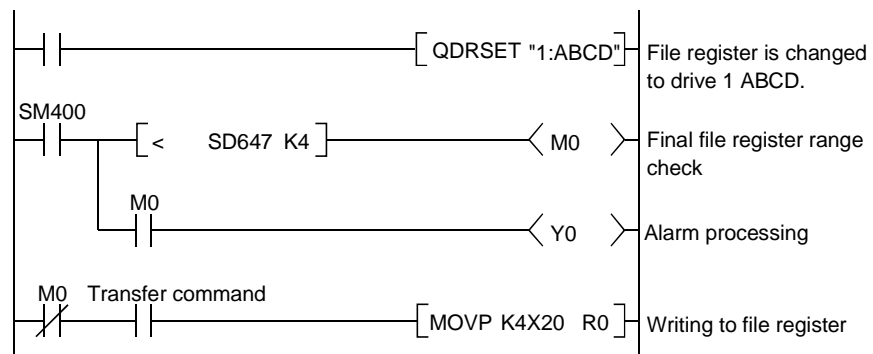
[Program example 1]

The file register "range of use" is checked at the beginning of each program.



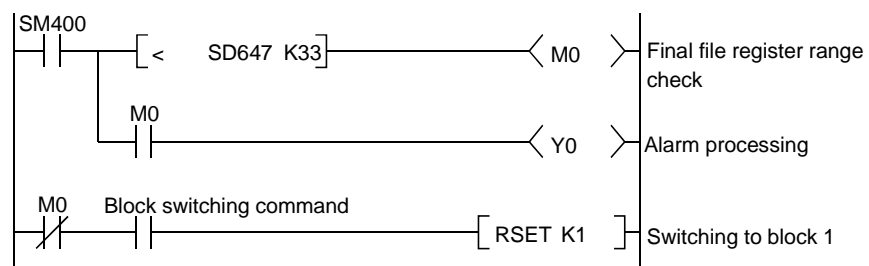
[Program example 2]

The file register "range of use" is checked after executing the QDRSET instruction.



[Program example 3]

For block switching.



(3) Deleting a File Register

To erase unwanted file register files, perform the PLC data deletion online.

10.8 Nesting (N)

(1) Definition

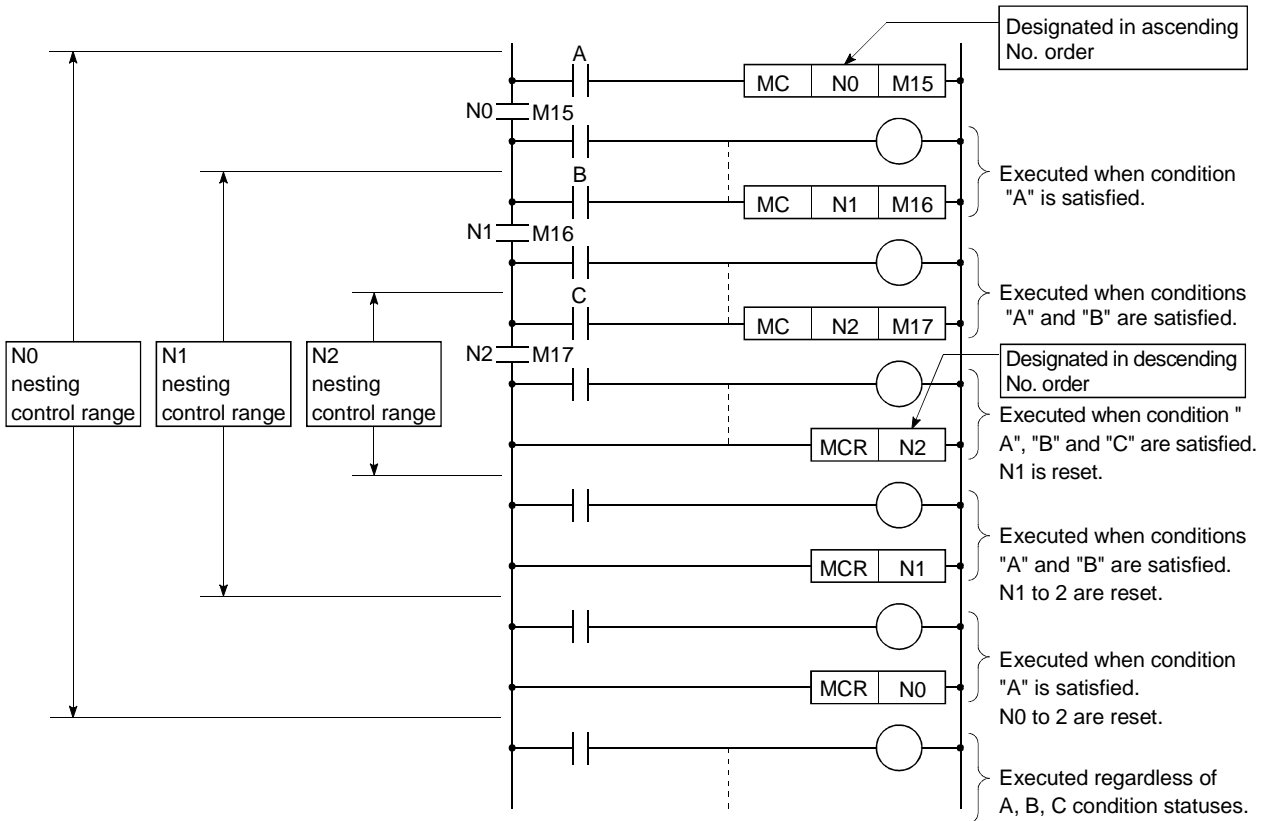
Nesting devices are used to nest MC or MCR master control instructions when programming operating conditions.

(2) Designation method with master control

The master control instructions are used to open and close the ladders' common bus so that switching of ladders may be executed efficiently by the sequence program.

Nesting devices must be numbered in descending order (from N0 to N7) of nested relation.

For details on how to use master control, refer to the QCPU(Q mode)/QnACPU Programming Manual (Common Instructions).



10.9 Pointers (P)

(1) Definition

Pointer devices are used in jump instructions (CJ, SCJ, JUMP) or sub-routine call instructions (CALL, ECALL).

A total of 4096 pointers can be used (total for all programs being executed).

(2) Pointer applications

(a) Pointers are used in jump instructions (CJ, SCJ, JMP) to designate jump destinations and labels (jump destination beginning).

(b) Pointers are used in sub-routine CALL instructions (CALL, CALLP) to designate the CALL destination and label (sub-routine beginning).

(3) Pointer types

There are 2 pointer types: "local pointers (Section 10.9.1)" which are used independently in programs, and "common pointers (Section 10.9.1)" which are used to call sub-routine programs from all programs executed in the CPU.

10.9.1 Local pointers

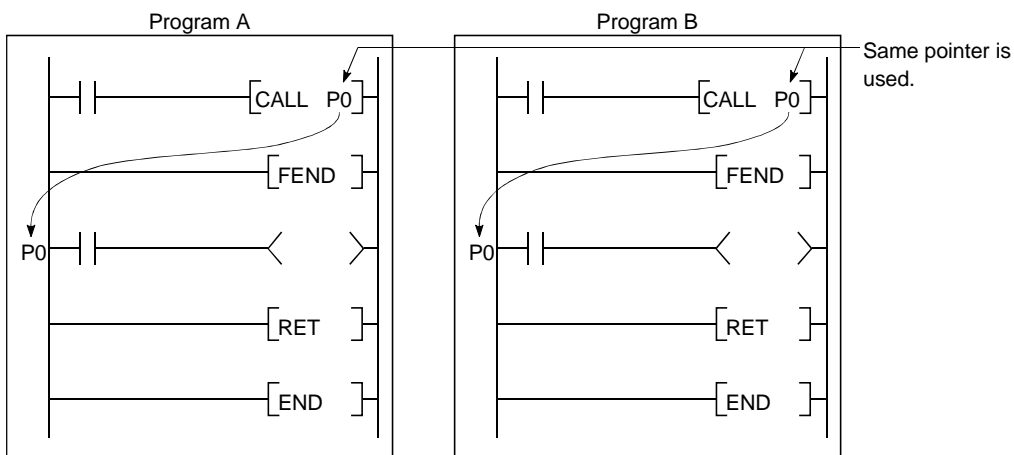
(1) Definition

(a) Local pointers are pointers which can be used independently in program jump instructions and sub-routine call instructions.

Local pointers cannot be used from other program jump instructions and sub-routine CALL instructions.

Use an ECALL instruction to call a sub-routine subprogram in a program file that contains local pointers.

(b) The same pointer No. can be used in each of the programs.



**REMARK**

For further information on jump instructions and sub-routine call instructions, see the QCPU (Q Mode)/QnACPU Programming Manual (Common Instructions).

(2) Number of local pointer points

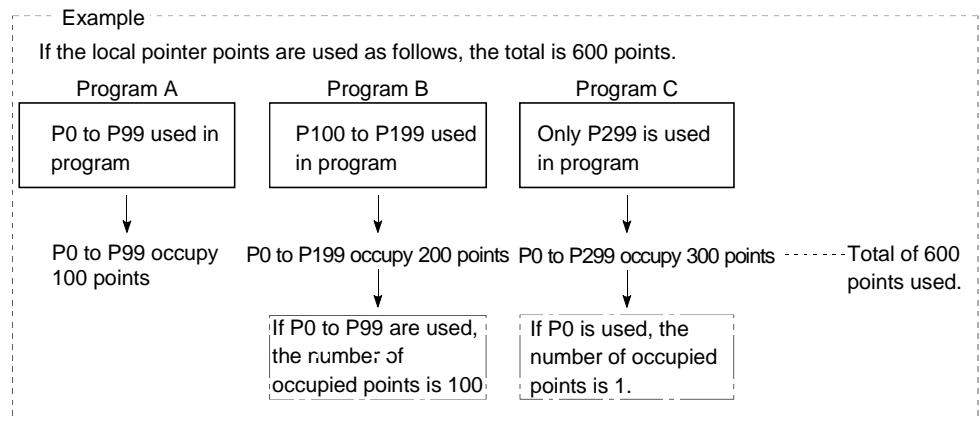
Local pointers can be divided among all the programs stored in the program memory.

The local pointer No. ranges from P0 to the highest No. of the local pointer in use. (The Process CPU's OS computes the number of points used.)

Even if only P99 is used in a program, for example, the number of points used will be counted as 100 between P0 and P99.

Therefore, when local pointers are used at several programs, the pointer settings should begin from P0.

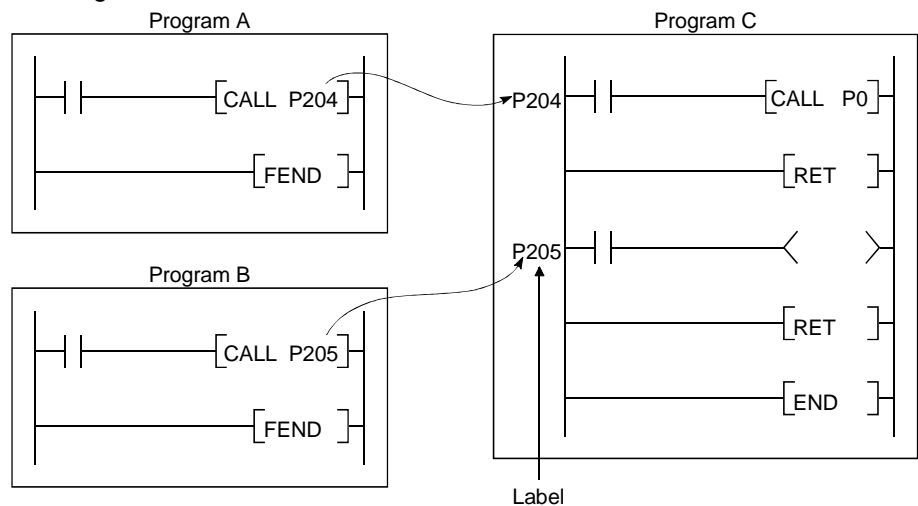
If the total number of pointers (total for all programs) exceeds 4096 points, a pointer configuration error (error code:4020) occurs.



10.9.2 Common pointers

(1) Definition

(a) Common pointers are used to call sub-routine programs from all programs being executed in the Process CPU.



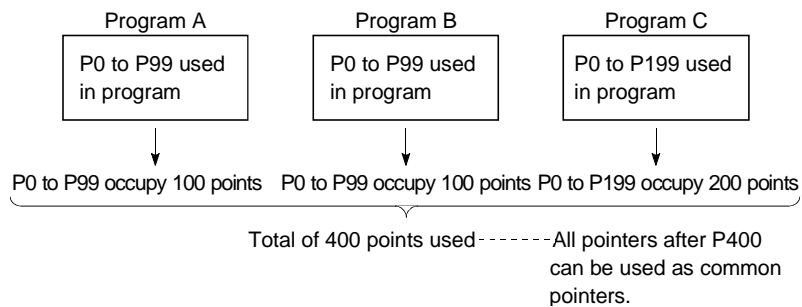
(b) The same pointer No. cannot be used again as a label. Such use will result in a pointer configuration error (error code:4021).

(2) Common pointer range of use

In order to use common pointers, the first common pointer No. must be designated at the "PLC system" tab screen in the "(PLC) Parameter" dialog box. A range of common pointers starts from a specified pointer number to P4095. However, only pointer numbers subsequent to the local pointer range can be designated by parameter setting as common pointers.

If a total of 400 points are used in three programs (100 points in Program A, 100 points in Program B, and 200 points in Program C), for example, all local pointers after P400 can be used as common pointers.

If the last number of local pointers used in several programs overlaps the first number of common pointers, a "pointer configuration error (Error Code: 4020) will occur.



[Common pointer settings screen]

Qn(H) Parameter

PLC name | PLC system | PLC file | PLC RAS | Device | Program | Boot file | SFC | I/O assignment

Timer limit setting  
 Low speed: 100 ms (1ms-1000ms)  
 High speed: 10.0 ms (0.1ms-100ms)

RUN-PAUSE contacts  
 RUN: X [ ] (X0-X1FFF)  
 PAUSE: X [ ] (X0-X1FFF)

Remote reset:  Allow

Output mode at STOP to RUN:  Previous state,  Recalculate (output is 1 scan later)

Floating point arithmetic processing:  Perform internal arithmetic operations in double precision

Intelligent functional module setting:

(\*)Settings should be set as same when using multiple PLC.

Common pointer: P 400 After (0-4095)

Number of empty slots (\*): 16 Points

System interrupt settings  
 Interrupt counter start No. [ ] (0-768)  
 Fixed scan interval:  
 I28: 100.0 ms (0.5ms-1000ms)  
 I29: 40.0 ms (0.5ms-1000ms)  
 I30: 20.0 ms (0.5ms-1000ms) High speed interrupt setting  
 I31: 10.0 ms (0.5ms-1000ms)

Interrupt program / Fixed scan program setting:  High speed execution

Module synchronization:  Synchronize intelligent module's pulse up

A-PLC:  Use special relay / special register from SM/SD1000

Acknowledge XY assignment | Multiple PLC settings | Default | Check | End | Cancel

**POINT**

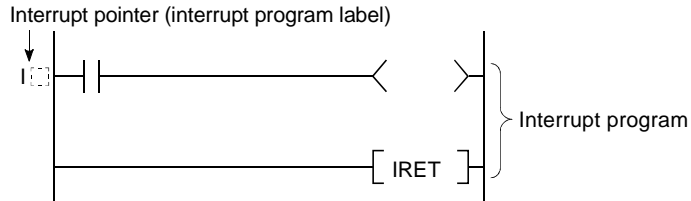
(1) In the jump instruction, jumping to common pointers in other programs is not allowed.

Common pointers should be used only with sub-routine call instructions.

10.10 Interrupt Pointers (I)

(1) Definition

(a) Interrupt pointers are used as labels at the beginning of interrupt programs.



(b) A total of 256 interrupt points (I0 to I255) can be used (total for all programs being executed).

(2) Interrupt pointer No. & interrupt factor

(a) As shown below, there are four types of interrupt factor.

- QI60/A1SI61 factor ..... Interrupt input from the QI60/A1SI61 interruption module.
- Internal time factor ..... Fixed scan interruption by Process CPU's internal timer.
- Error interruption ..... Interruption by an error that does not stop sequence program operation.
- Intelligent function ..... Interruption by an intelligent function module. module interrupt\*1

**REMARK**

\*1: To use the intelligent function module interrupt, the intelligent function module setting (interrupt points setting) is required at the "PLC system" tab screen in the "(PLC) Parameter" dialog box.  
(For the interrupts from the intelligent function module, see Section 8.2.1.)

(b) A list of interrupt pointer Nos. and interrupt factors is given in Table 10.5 below.

Table 10.5 List of Interrupt Pointer Nos. and Interrupt Factors

I No.	Interrupt Factors	Priority Ranking	I No.	Interrupt factors	Priority Ranking		
I0	QI60 interrupt module factor	1st point	237	I32 * 2	Errors that stop operation	1	
I1		2nd point	238	I33	Empty	—	
I2		3rd point	239	I34	UNIT VERIFY ERR. FUSE BREAK OFF SP. UNIT ERROR	2	
I3		4th point	240				
I4		5th point	241	I35	OPERATION ERROR SFCP OPE. ERROR SFCP ECE. ERROR EX. POWER OFF	3	
I5		6th point	242				
I6		7th point	243				
I7		8th point	244				
I8		9th point	245	I36	ICM. OPE ERROR FILE OPE. ERROR	4	
I9		10th point	246				
I10		11th point	247	I37	Empty	—	
I11		12th point	248	I38	PRG. TIME OVER	5	
I12		13th point	249				
I13		14th point	250	I39	CHK instruction execution Anunciator detection	6	
I14		15th point	251				
I15		16th point	252	I40 to I49	—	Empty	—
I16	—	Empty	—				
I17							
I18							
I19							
I20							
I21							
I22							
I23				I50 to I255	Intelligent function module factor * 4	Specifies which intelligent function module is used with parameters.	18 to 223
I24							
I25							
I26							
I27							
I28	Internal timer factor * 1	100ms	256	—	—		
I29		40ms	255				
I30		20ms	254				
I31		10ms	253				

### REMARK

- \*1 : The internal times shown are the default setting times.  
These times can be designated in 0.5 ms units through a 0.5 to 1000 ms range set at the "PLC system" tab screen in the "(PLC) Parameter" dialog box.
- \*2 : When an error interruption with "I32 (error that stops operation)" occurs, the Process CPU is not stopped until I32 processing is completed.
- \*3 : Execution of error interruptions is prohibited for the interrupt pointer Nos. I32 to I39 when the power is turned on and during a Process CPU reset. When using interrupt pointer Nos. I32 to I39, set the interruption permitted status by using the IMASK instruction.
- \*4 : To use the intelligent function module interrupt, the intelligent function module setting (interrupt points setting) is required at the "PLC system" tab screen in the "(PLC) Parameter" dialog box.  
(For the interrupts from the intelligent function module, see Section 8.2.1.)



## 10.11 Other Devices

### 10.11.1 SFC block device (BL)

This device is used for checking if the block designated by the SFC program is valid. For details on the use of SFC block devices, refer to the QCPU(Q mode)/QnACPU Programming Manual (SFC).

### 10.11.2 SFC transition device (TR)

This device is used for checking if a forced transition is designated for a specified transition condition in a specified SFC program block. For details regarding the use of SFC transition devices, refer to the QCPU(Q mode)/QnACPU Programming Manual (SFC).

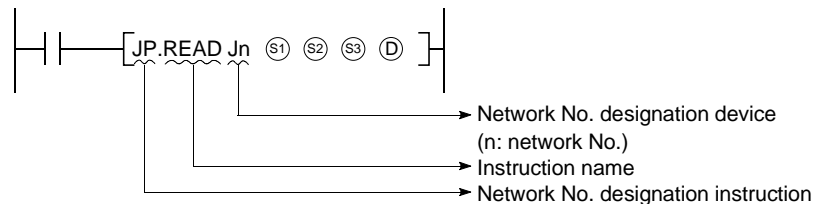
### 10.11.3 Network No. designation device (J)

#### (1) Definition

The network No. designation device is used to designate the network No. in data link instructions.

#### (2) Designating network No. designation device

The network No. designation device is designated in the data link instruction as shown below.



#### REMARK

For details on data link instructions, refer to the Q Corresponding MELSECNET/H Network System Reference Manual.

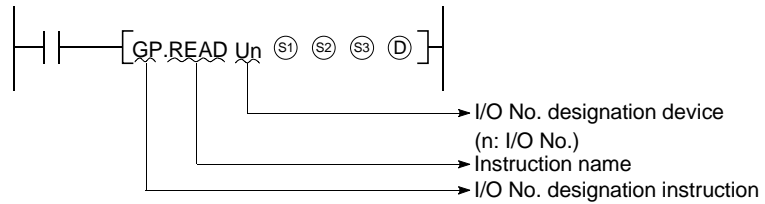
## 10.11.4 I/O No. designation device (U)

## (1) Definition

I/O No. designation devices are used with instructions dedicated to intelligent function module to designate I/O numbers.

## (2) Designating the I/O No. designation device

I/O No. designation devices are designated with the intelligent function module instructions as shown below.

**REMARK**

For details on intelligent function module instructions, refer to the corresponding manual for the intelligent function module to be used.

10.11.5 Macro instruction argument device (VD)

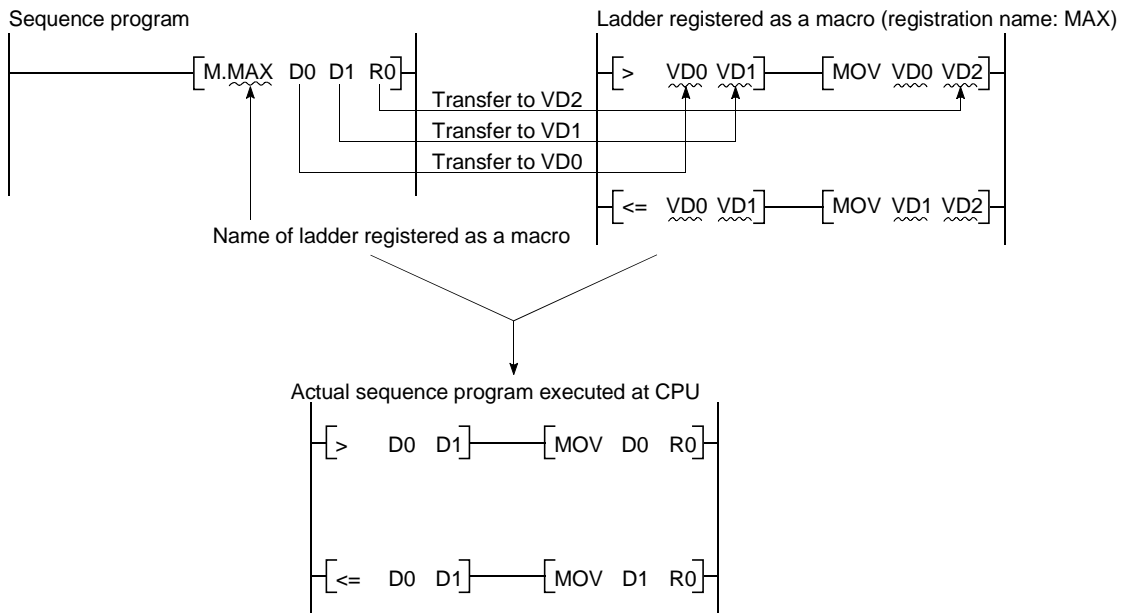
(1) Definition

Macro instruction argument devices are used with ladders registered as macros. When a VD□ setting is designated for a ladder registered as a macro, conversion to the designated device is performed when the macro instruction is executed.

(2) Designating macro instruction argument devices

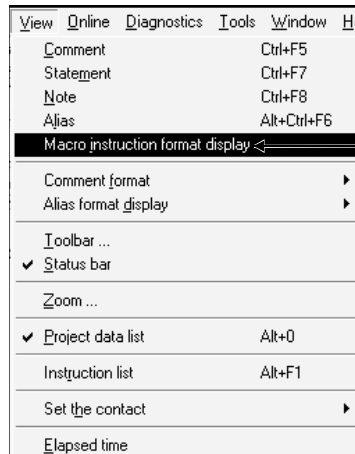
Specify the devices transferred from sequence programs to macro registration ladders as macro instruction argument devices among the devices used in the ladders registered as macro with GX Developer. \*1

Designate devices that correspond to the macro argument devices used in the macro registration ladders in ascending order, when using macro instructions in a sequence program.



**REMARK**

- 1) \*1 : With the macro instruction argument device, VD0 to VD9 can be used in one ladder registered as a macro instruction.
- 2) The GX Developer read mode provides an option to view a program in macro instruction format.(Choose "View" - "Macro Instruction format display" to view macro instructions.)



Change of macro instruction display

## 10.12 Constants

### 10.12.1 Decimal constants (K)

#### (1) Definition

Decimal constants are devices which designate decimal data in sequence programs.

They are designated as "K□" settings (e.g. K1234), and are stored in the Process CPU in binary (BIN) code.

See Section 4.8.1 for details on binary code.

#### (2) Designation range

The setting ranges for decimal constants are as follows:

- For word data (16 bits) .....K-32768 to K32767
- For 2-word data (32 bits) .....K-2147483648 to K2147483647

### 10.12.2 Hexadecimal constants (H)

#### (1) Definition

Hexadecimal constants are devices which designate hexadecimal or BCD data in sequence programs.

(For BCD data designations, 0 to 9 digit designations are used.)

Hexadecimal constants are designated as "H□" settings (e.g. H1234).

See Section 4.8.3 for details on hexadecimal code.

#### (2) Designation range

The setting ranges for hexadecimal constants are as follows:

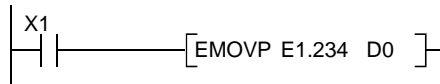
- For word data (16 bits) ..... H0 to HFFFF (H0 to H9999 for BCD)
- For 2-word data (32 bits) ..... H0 to HFFFFFFFF (H0 to H99999999 for BCD)

## 10.12.3 Real numbers (E)

## (1) Definition

Real numbers are devices which designate real numbers in the sequence program.

Real numbers are designated as "E[]" settings (e.g. E1.234).



See Section 4.8.4 for details on real numbers.

## (2) Designation range

The setting range for real numbers is  $-1.0 \times 2^{128}$  to  $-1.0 \times 2^{-126}$ , 0 and  $1.0 \times 2^{-126}$  to  $1.0 \times 2^{128}$ .

## (3) Designation method

Real numbers can be designated in sequence programs by a "normal expression" or an "exponential expression".

- Normal expression..... The specified value is designated as it is.  
For example, 10.2345 becomes E10.2345.
- Exponential expression .... The specified value is multiplied by a " $\times 10^n$ " exponent.  
For example, 1234 becomes E1.234 + 3. \*1

**REMARK**

\*1: The "+3" in the above example represents a  $10^n$  value ( $10^3$ ).

## 10.12.4 Character string ( " " )

## (1) Definition

Character string constants are devices used to designate character strings in sequence programs.

They are designated by quotation marks (e.g. "ABCD1234").

## (2) Usable characters

All ASCII code characters can be used in character strings.

The QCPU is sensitive to uppercase and lowercase characters.

## (3) Number of designated characters

Character strings extend from the designated character to the NUL code (00H).

You can use up to 32 characters for a character string in an instruction such as \$MOV.

10.13 Convenient Uses for Devices

When executing multiple programs in the Process CPU, local devices among the internal user devices can be designated to execute each of the programs in an independent manner.

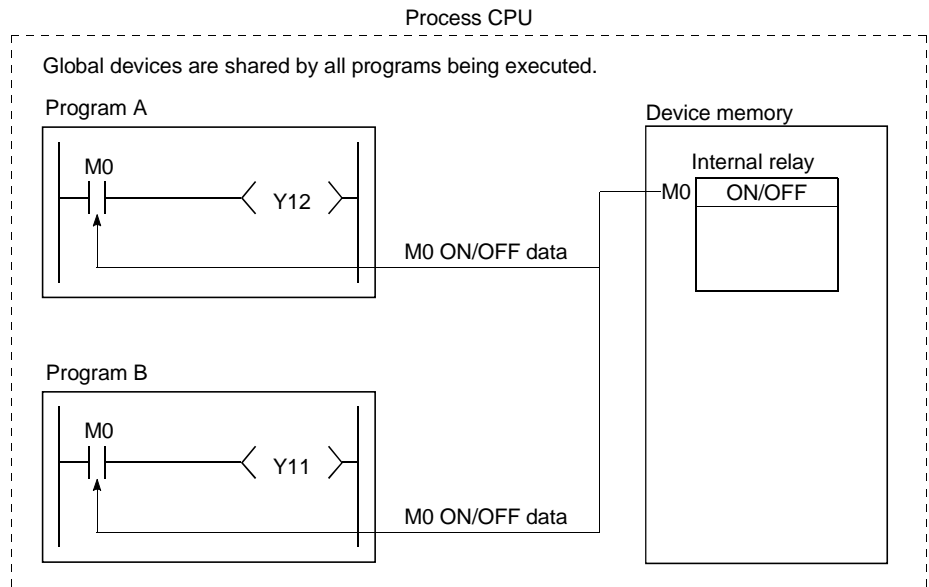
Moreover, the device initial settings allow the data setting for devices and intelligent function modules without using a program.

10.13.1 Global devices and local devices

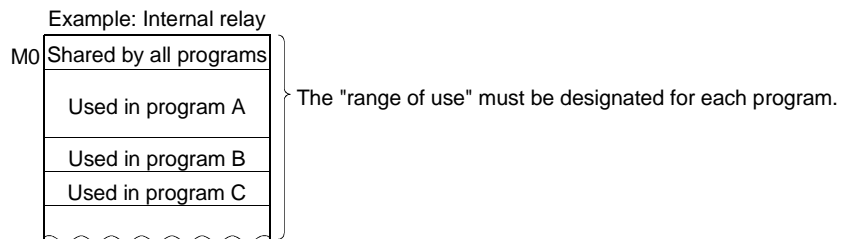
A number of programs can be stored and executed in the Process CPU. Process CPU devices are classified into "global devices" shared by all the programs being executed and "local devices" used independently by each of the programs.

(1) Global devices

- (a) Global devices can be shared by all the programs being executed in the Process CPU. Global device data are stored in the Process CPU's device memory, and can be used by all programs.

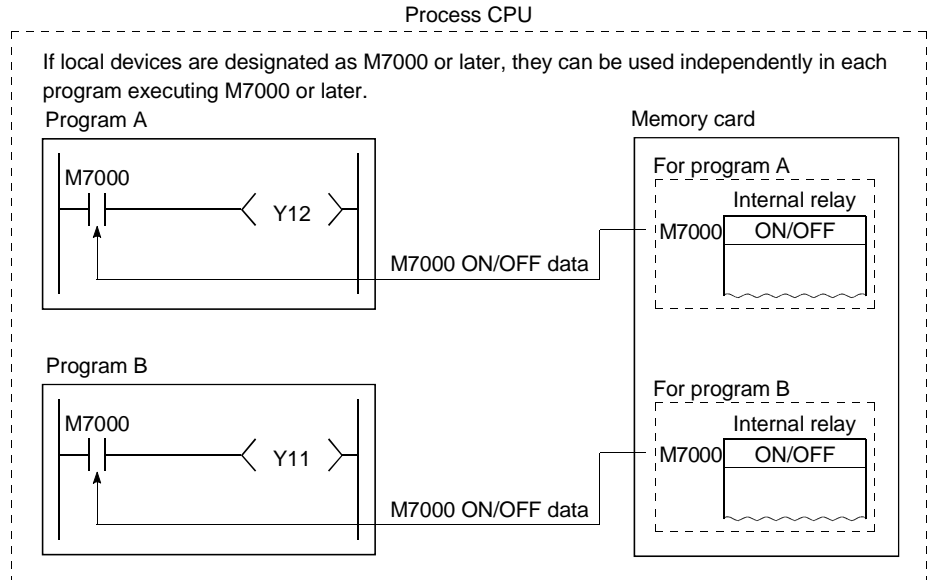


- (b) When executing multiple programs, the "shared range" for all programs, and the "independent range" for each program must be designated in advance.

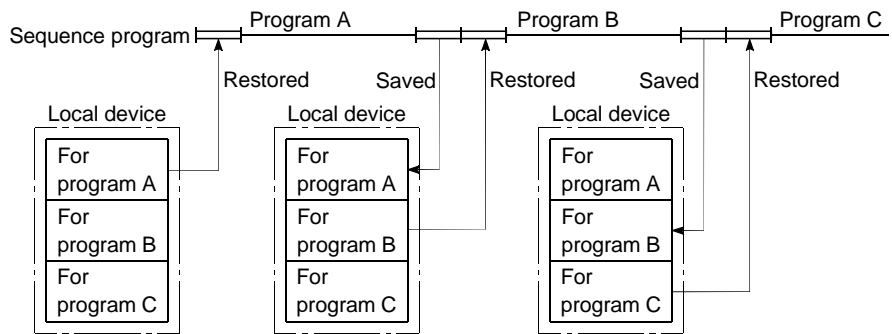


(2) Local devices

- (a) Local devices are used independently by the programs.  
 The use of local devices permits programming of multiple "independent execution" programs without regard to other programs.  
 Local devices data can be stored in the standard RAM and the memory card.



- (b) Five device types can be used as local devices: internal relays (M), edge relays (V), timers (T, ST), counters (C), and data registers (D).
- (c) Programs used as local devices exchange the local device file data stored in the memory card with the data in the device memory of Process CPU. Therefore the scan time is extended by this data exchange time.



**POINT**

The local device may not be designated with some instructions. Refer to the allowable device in the programming manual of each instruction for details.

**REMARK**

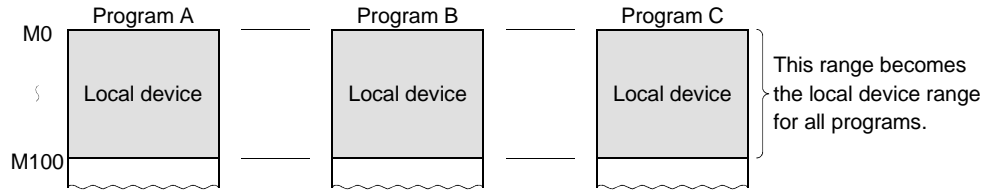
See Section 10.1.2 (item 2) for details on the "number of words" for local devices.

(d) Local device designation

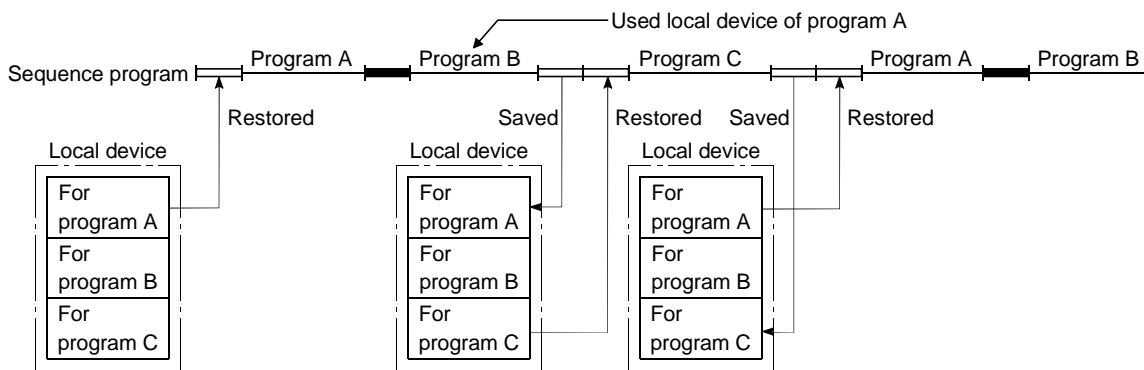
- 1) In order to use the above devices as local devices, the usable local device range must be designated at the "Device" tab screen in the "(PLC) Parameter" dialog box.

Note that the range designated for local devices applies to all programs, and cannot be changed for individual programs.

For example, if the local device range is designated as M0 to M100, this range will be used for local devices in all programs.



- 2) When local device settings are designated, the drive and file name where the local device data is to be stored must be designated at the "PLC file" tab screen in the "(PLC) Parameter" dialog box.
- 3) To write data from the GX Developer onto the Process CPU, specify whether to use a local device at the "PLC file" tab screen in the "(PLC) Parameter" dialog box. If a local device is not specified, the local devices used for previously-executed programs are selected. This does not require replacing local devices in a memory card with the device memory of the Process CPU. If local devices are not used for Program B while executing Programs A, B, and C, the local devices are used as shown below.



**POINT**

Unless designated as "local devices", all devices are global devices.

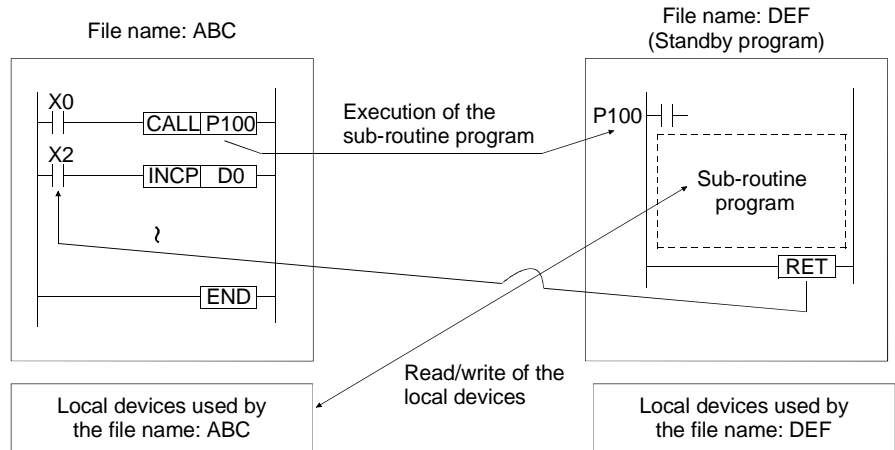
- (e) Using local devices used by the file where a sub-routine program is stored  
 It is possible to use local devices that are used by the file where a sub-routine program is stored when executing a sub-routine program.  
 Whether or not such local devices are used is set by special relay "SM776" ON/OFF setting.



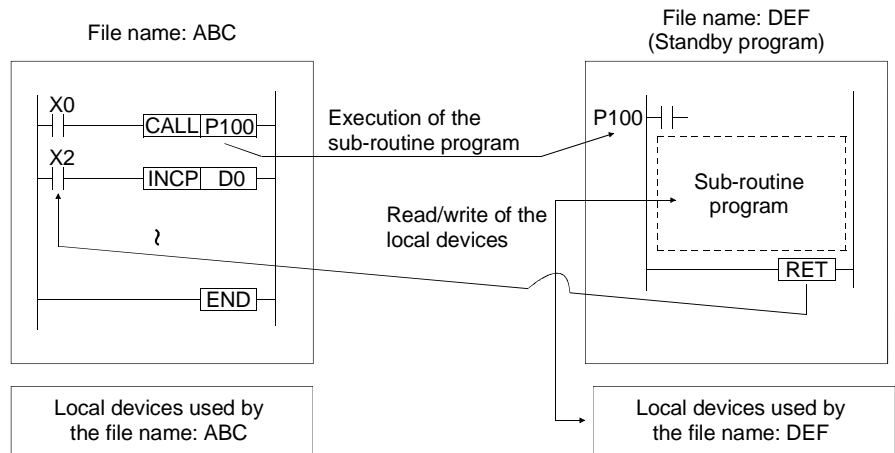
1) Switching over local devices by setting ON/OFF for a special relay (SM776)

	SM776
OFF	Executes calculation by the local devices that are used by the file where the sub-routine program was called
ON	Executes calculation by the local devices that are used by the file where the sub-routine program is stored.

[Operation at "SM776 : OFF"]



[Operation at "SM776 : ON"]



2) Cautions

- If SM776 is ON, the local device data is read when the sub-routine program is called and the local device data is saved after the execution of the RET instruction. Accordingly, scan time is elongated by the time as when a sub-routine program is executed once with the setting of "SM776: ON". (See Section 10.13.1)
- ON/OFF setting of SM776 is enabled in CPU modules. Setting in file units is not enabled.
- If the ON/OFF setting of SM776 is changed while a sequence program is executed, the control is made according to the information after change.

**REMARK**

For details on SM776, see Appendix 1.

(f) Using local devices when executing an interrupt/fixed scan execution type program

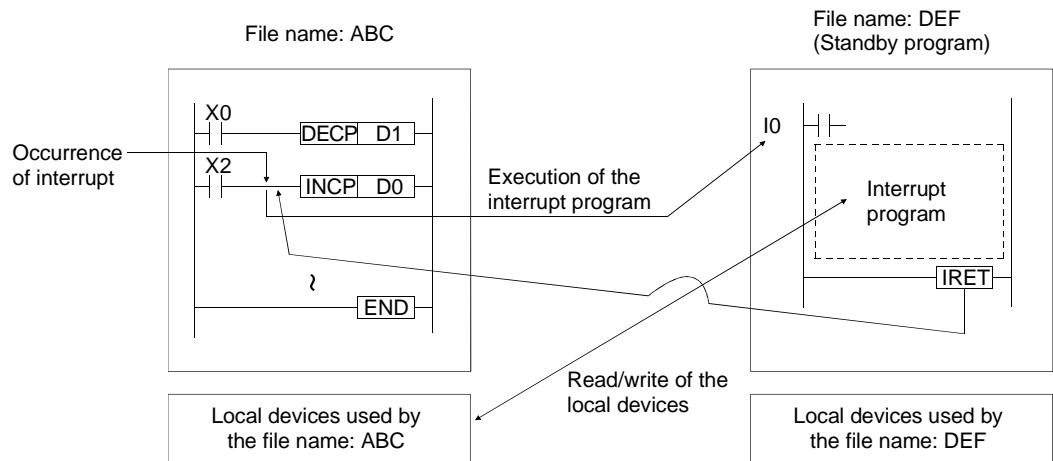
It is possible to use local devices in the file where an interrupt/fixed scan execution type program is stored when executing an interrupt/fixed scan execution type program.

The local devices can be set available/unavailable by special relay "SM777" ON/OFF setting.

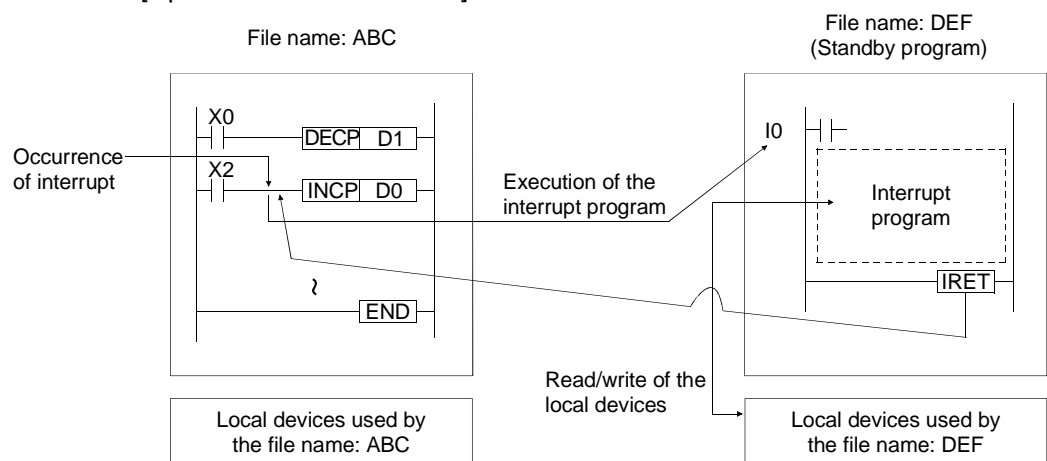
- 1) Switching over local devices by setting ON/OFF for a special relay (SM777)

	SM777
OFF	Executes operation with the local devices in the file which was executed before the execution of the interrupt/fixed scan execution type program.
ON	Executes operation with the local devices in the file where the interrupt/fixed scan execution type program is stored.

[Operation at "SM777 : OFF"]



[Operation at "SM777 : ON"]



**REMARK**

For details on SM777, see Appendix 1.

## 2) Cautions

- If SM777 is ON, the local device data is read before the interrupt/fixed scan execution type program is executed and the local device data is saved after the execution of the IRET instruction. Accordingly, scan time increases when an interrupt/fixed scan execution type program is executed once with the setting of "SM777: ON". (See Section 10.13.1)
- ON/OFF setting of SM777 is enabled in CPU module units. Setting in file unit is not enabled.
- If the ON/OFF setting of SM777 is changed while a sequence program is executed, the control is made according to the information after change.

## (g) Clearing the Local Device Data

The local device data is cleared in the following cases where:

- 1) The PLC is powered on or the CPU module is reset.
- 2) The CPU module enters into the RUN status from the STOP status.

The local device data cannot be cleared by operating from the GX Developer. To clear the local device data, follow the above-listed steps 1) and 2).

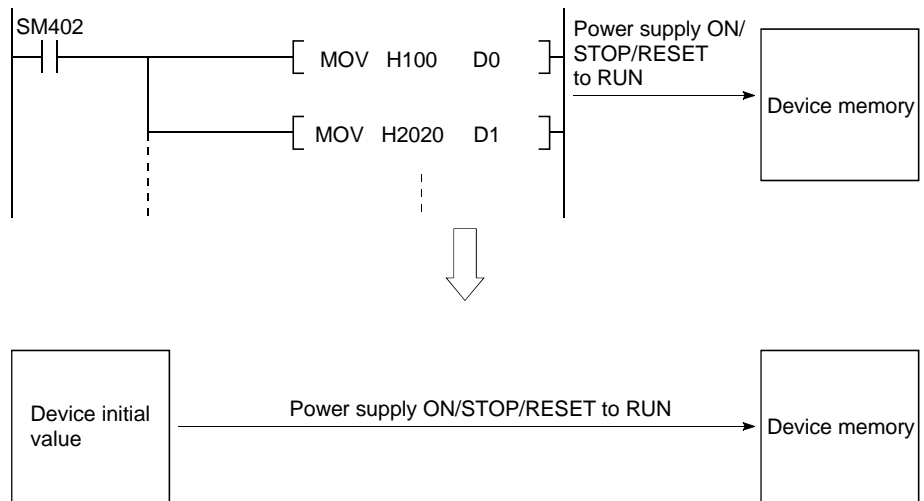
10.13.2 Device initial values

(1) Definition

- (a) Using device initial value registers, the data used for a program in device or intelligent function module buffer memories without using a data setting program.

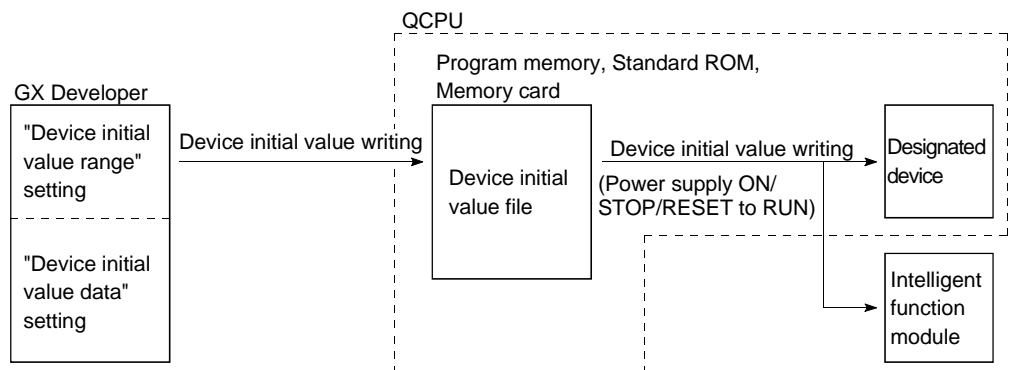
The use of device initial values provides a shortcut to specify device data in a program without using a device data setting program (initial program).

[Data setting by initial processing program]



- (b) In order to use the device initial values, the device initial data must be created with GX Developer in advance, and this data must be stored as a device initial value file in the Process CPU's program memory, standard RAM or memory card.

At power ON, or on switching from STOP to RUN, the Process CPU writes the data from the device initial value file to the specified device or intelligent function module buffer memory.



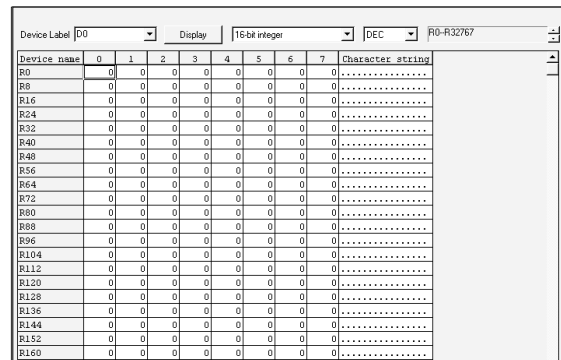
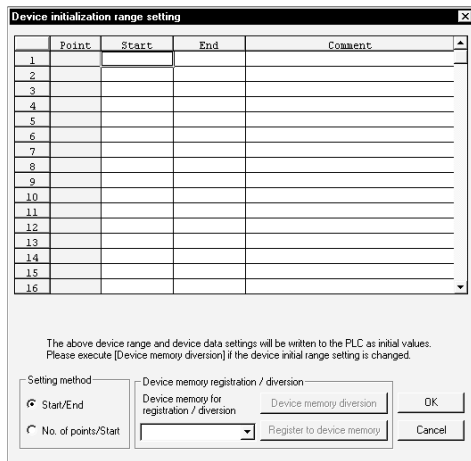
- (c) Device initial values can be used by the following devices:
- 1) Timer present value (T)
  - 2) Retentive timer present value (ST)
  - 3) Counter present value (C)
  - 4) Data register (D)
  - 5) Special register (SD)
  - 6) Link register (W)
  - 7) Link special register (SW)
  - 8) File register (R0 to R32767)
  - 9) Intelligent function module device (U□\G□)
  - 10) Link direct device (J□\W□, J□\SW□)

(2) Procedure for using device initial values

- (a) Designate the device initial value range settings in the device mode, in the "Device initial value setting" screen.
- (b) Designate the device initial value data settings in the "device mode" screen.

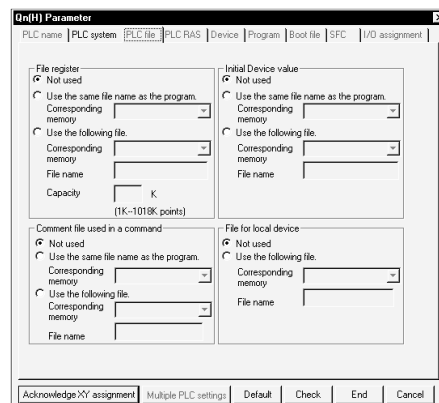
[Device initialization range setting screen]

[Device mode screen]



- (c) At the "PLC file" tab screen in the "(PLC) Parameter" dialog box, designate the name of the file where the device initial value data is to be stored.

[PLC file screen]



- (d) Write the device initial value data and parameter settings to the Process CPU.

### (3) Precautions for the use of device initial values

- (a) In cases where both device initial value data and latch range data are overlapped, the device initial value data takes priority. Therefore, the latch range data is rewritten by device initial value data at power ON.
- (b) Device initial values cannot be used in areas where no setting is made for switching from STOP to RUN (for data that is changed by a program at power ON). Create a program to specify a device by using the MOV instruction in the main routine program. Use the TO instruction to write data to the buffer memory of the intelligent function module.

#### REMARK

For details on the setting procedures for the "device initial value range", "device initial value data" items, and for writing the device initial values to the Process CPU, refer to the GX Developer Operating Manual.

## 11 PROCESS CPU PROCESSING TIME

This chapter describes how to estimate the length of Process CPU processing time.

### 11.1 Reading Process CPU's Scan Time

The length of scan time is the total of the following times:

- I/O refresh time
- Instruction execution time
- END processing time

#### (1) I/O refresh time

(a) I/O refresh time is the total time required for refreshing I/O data of the following modules:

- Input module
- Output module
- Intelligent function module

(b) I/O refresh time is given in the formula:

$$(I/O \text{ refresh time}) = (\text{Number of inputs point}/16) \times N1 + (\text{Number of outputs point}/16) \times N2$$

(c) The table below shows N1 and N2.

CPU type	N1		N2	
	Q3□B	Q5□B /Q6□B	Q3□B	Q5□B /Q6□B
Q12PHCPU Q25PHCPU	1.7 μs	2.4 μs	1.3 μs	2.1 μs

#### (2) Instruction execution time

(a) Instruction execution time is the total processing time required to execute an instruction in a program on the Process CPU.

For details on the execution time of each instruction, see the QCPU (Q Mode)/QnACPU Programming Manual (Common Instructions).

(b) Overhead time is required for an interrupt program/fixed scan execution type program. Add overhead time to execution time.

#### (3) END processing time

(a) END processing time is the Process CPU processing time common to the above-listed items (1) and (2).

(b) The table below shows the length of END processing time.

CPU Type	END Processing Time
Q12PHCPU, Q25PHCPU	0.15 ms

## 11.2 Factors Responsible for Extended Scan Time

The following functions increase the length of scan time. When using any of the following functions, add a value of extended time to values obtained from Section 11.1.

- MELSECNET/H refresh
- CC-Link automatic refresh
- Sampling trace
- GX Developer monitoring
- Local devices
- Execution of multiple programs
- Installation/removal of a memory card
- File register with the same filename as a program.

### (1) MELSECNET/H refresh

MELSECNET/H refresh requires additional processing time to refresh data between the Process CPU and the MELSECNET/H network module. For details on MELSECNET/H refresh time, see Q Corresponding MELSECNET/H Network System Reference Manual.

### (2) CC-Link automatic refresh

CC-Link automatic refresh requires additional processing time to refresh data between the Process CPU and the CC-Link's master local module. When a CC-Link master local module is installed, extended scan time can be shortened by adjusting a CC-Link setting to a system setting. For details on CC-Link automatic refresh time, see the QJ61BT11 Type CC-Link System Master Local Module Users Manual.

### (3) Sampling trace time

Sampling trace requires additional processing time. When sampling trace data is specified to execute the sampling trace function, add the sampling trace time to the total processing time.

The table below shows the length of processing time required when sampling trace data is specified to assign 50 internal relay points for bit devices and 50 data register points for word devices.

CPU Type	Processing Time
Q12PHCPU, Q25PHCPU	0.12 ms



## (4) GX Developer Monitoring

GX Developer monitoring requires additional processing time. Add the GX Developer monitoring time to the total processing time.

- (a) The table below shows the processing time required when 64 data register points are assigned by the registered monitor.

CPU Type	Processing Time
Q12PHCPU, Q25PHCPU	0.06 ms

- (b) The table below shows the processing time required when monitoring conditions are specified.

CPU Type	Processing Time	
	When steps are in match	When devices are in match
Q12PHCPU, Q25PHCPU	0.03 ms	0.01 ms

## (5) Local devices

Local devices require additional processing time. Add the processing time of local devices to the total processing time.

CPU Type		Processing Time
Standard RAM	Q12PHCPU, Q25PHCPU	$0.39+0.17 \times n$ ms
SRAM Card	Q12PHCPU, Q25PHCPU	$0.39+0.95 \times n$ ms

Conditions Local devices: 1k points, n: number of program files

## (6) Execution of multiple programs

Execution of multiple programs requires overhead time of each program being executed. Add overhead time to the total processing time.

CPU Type	Processing Time
Q12PHCPU, Q25PHCPU	$0.03 \times n$ ms

Conditions n: Number of program files

## (7) Installation/Removal of a memory card

Installation/removal of a memory card requires additional processing time. If a memory card is installed or removed, add 1-scan time to the total processing time.

CPU Type	Processing Time	
	Memory Card Inserted	Memory Card Removed
Q12PHCPU, Q25PHCPU	0.08 ms	0.04 ms

## (8) File register

File register requires additional processing time. Add the processing time of file registers to the total processing time.

CPU Type		Processing Time
Standard RAM	Q12PHCPU, Q25PHCPU	0.41 ms
SRAM Card	Q12PHCPU, Q25PHCPU	$0.40+0.1 \times n$ ms

Conditions n: number of program files

## 11.3 Factors Responsible for Shortened Scan Time

The length of scan time can be shorted by making changes to the PLC Parameter setting as follows:

- A-PLC (Compatibility with A-Series CPU)

## (1) A-PLC (Compatibility with A-Series CPU)

When "Use special relay/special register after SM1000/SD1000" is set in the PLC system settings of the PLC parameter, the scan time can be reduced by the value in the following table by setting to "Do not use special relay/special register after SM1000/SD1000."

In this case, the A-series compatible special relays/special registers SM1000/SD1000 to SM1299/SD1999 must be replaced with the Q-series dedicated special relays/special registers SM0/SD0 to SM999/SD999.

CPU Type	Processing Time
Q12PHCPU, Q25PHCPU	0.03 ms

## 12 PROCEDURE FOR WRITING PROGRAMS TO PROCESS CPU

This chapter describes the procedure for writing programs created at the GX Developer to the Process CPU.

### 12

### 12.1 Writing Procedure for 1 Program

This section describes the procedure for writing one program to the Process CPU and executing it.

#### 12.1.1 Items to consider when creating one program

In order to create a program, the program size, number of device points used, and the program file name, etc., must be set in advance.

##### (1) Program size considerations

Check that CPU module's program capacity is adequate for storing the program and parameter data.

The program capacities of the CPUs are shown below:

- Q12PHCPU : 124 k steps
- Q25PHCPU : 252 k steps

If the CPU module capacity is only adequate for the program, the parameter data should be stored in the standard ROM/memory card.

##### (2) Designating a program file name

The file name of the program to be stored in the Process CPU must be designated.

This file name is used when writing the program and parameters from GX Developer to the Process CPU, and when designating the program to be executed in the Process CPU.

See Chapter 6 for details regarding file names.

##### (3) Designating devices

The number of devices required for the program must be determined.

See Chapter 10 for details regarding devices which can be used in the Process CPU.

##### (4) Device initial value setting

Designate whether or not the device initial value settings are to be used in the Process CPU devices and intelligent function modules.

See Section 10.13.2 for details regarding device initial values.

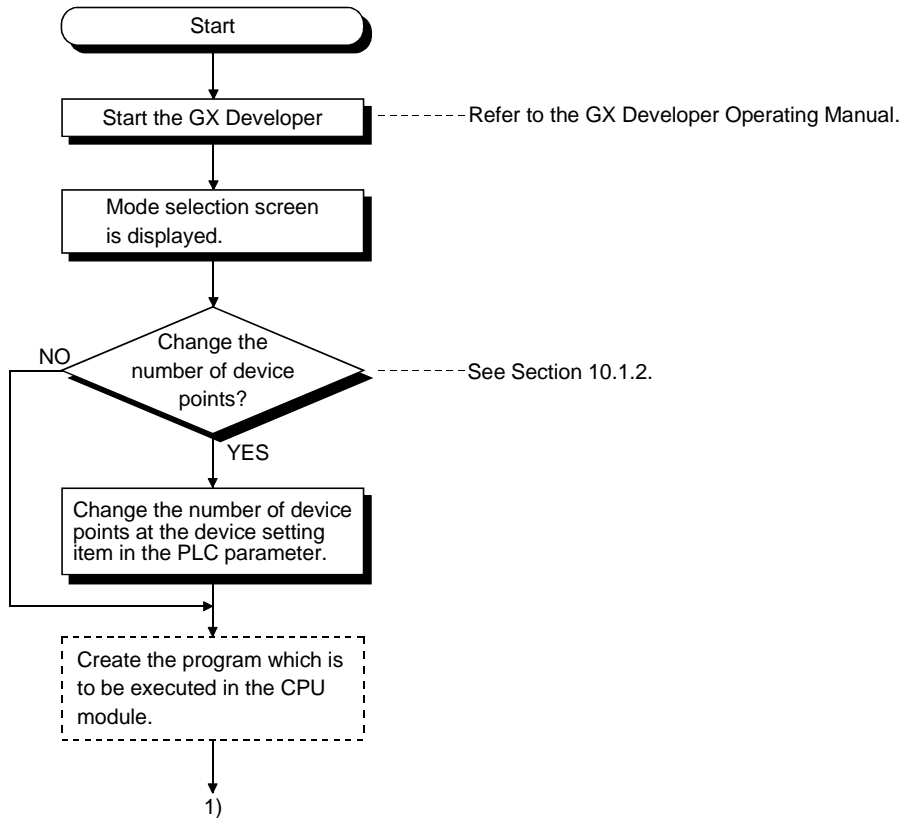
12.1.2 Procedure for writing programs to the Process CPU

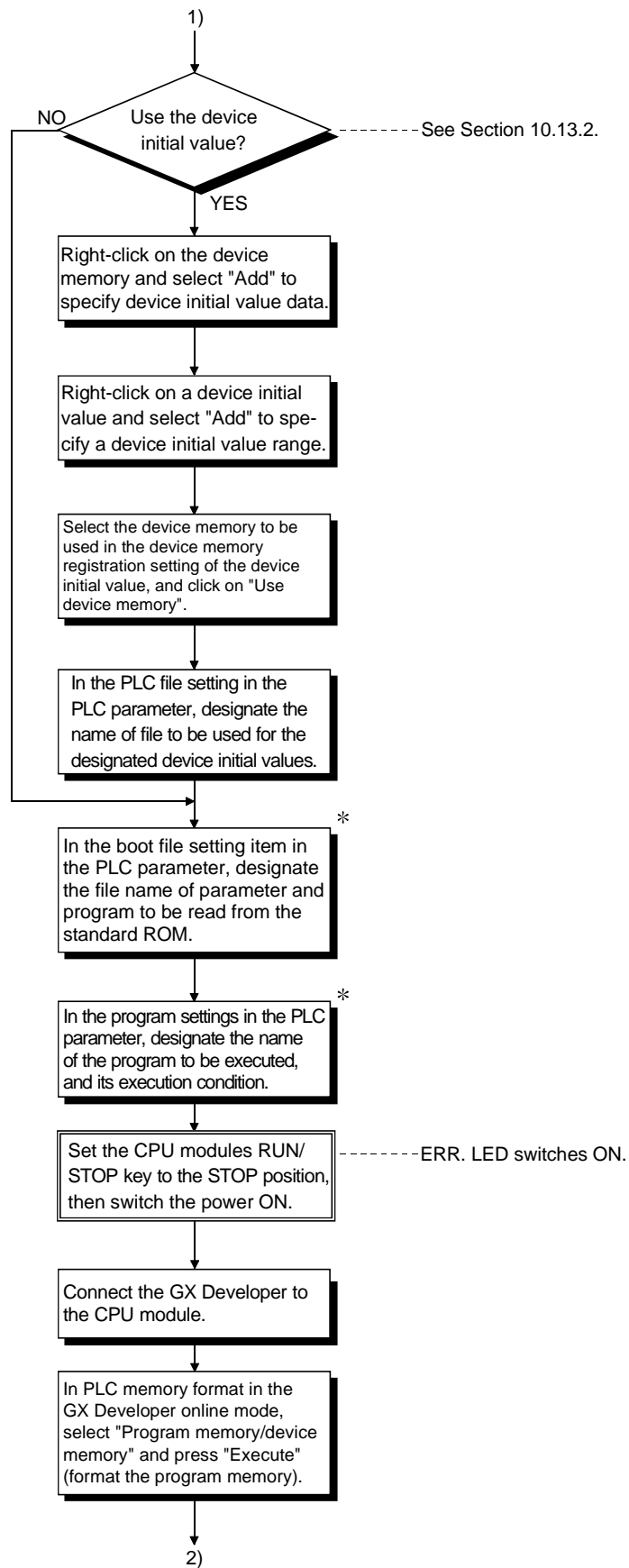
The procedure for writing programs and parameters created with GX Developer to the Process CPU standard ROM is shown below.

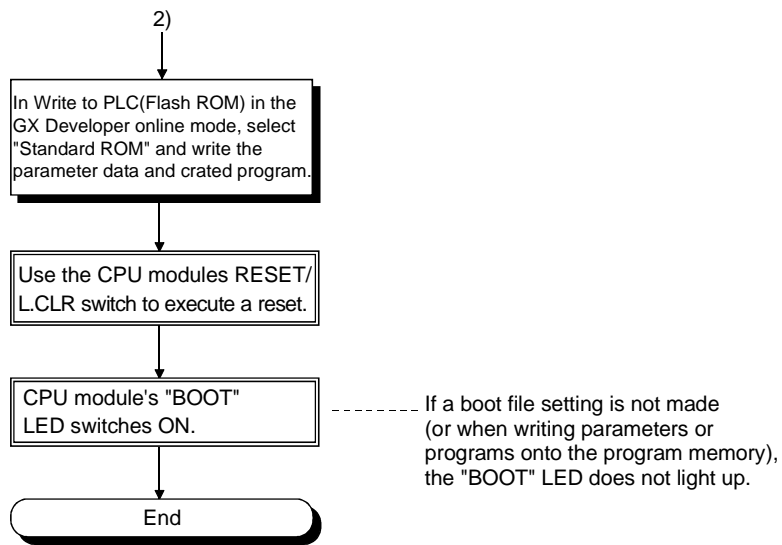
In order to write programs and parameters to the Process CPU standard ROM, the valid parameters settings must be designated by the Process CPU DIP switches (SW2, SW3), and the boot settings must be designated in the PLC parameter mode. For details regarding Process CPU DIP switches, refer to the Process CPU User's Manual(Hardware Design, Maintenance and Inspection).

When writing programs and parameters to the Process CPU program memory, the steps indicated by asterisks (\*) below are not required.

Procedural steps shown in □ boxes are performed at the GX Developer, and those shown in ▭ boxes are performed in the Process CPU.







## 12.2 Procedure for Multiple Programs

This section describes the procedure for writing multiple programs split up according to function, process, designer to the Process CPU and executing them.

### 12.2.1 Items to consider when creating multiple programs

To create multiple programs, it is necessary to set in advance the size of each program, the device used, and the program file name, etc.

#### (1) Program size considerations

Set the program capacity within the range of the Process CPU program capacity. The program capacities of the Process CPU's are shown below:

- Q12PHCPU : 124 k steps
- Q25PHCPU : 252 k steps

Decide whether the parameters are to be stored in the program memory, the standard ROM, or the memory card.

If they are to be stored in the program memory/the standard ROM, the area available for the program will be the capacity shown above, minus the parameter data size.

#### (2) Designating a program file name

Designate the file name of the program to be stored in the Process CPU. This file name is used when writing the program and parameters from GX Developer to the Process CPU, and when designating the program to be executed in the Process CPU. See Chapter 6 for details regarding file names.

#### (3) Designating the program execution conditions

In order to execute multiple programs in the Process CPU, execution conditions must be designated for each program. Execution is impossible for programs without file name and execution condition settings. See Section 4.2 for details regarding execution conditions.

#### (4) Designating devices

- (a) Designate the number of device points used in each program, and the number of device points which are shared by all programs. See Chapter 10 for details regarding devices which can be used in the Process CPU.
- (b) Designate whether or not the internal relays, edge relays, timers, counters, and data registers of each program are to be designated as local devices. See Section 10.13.1 for details regarding local devices.
- (c) When creating sub-routine programs, designate whether or not common pointers are to be used. See Section 10.9.2 for details regarding common pointers.

#### (5) Device initial value setting

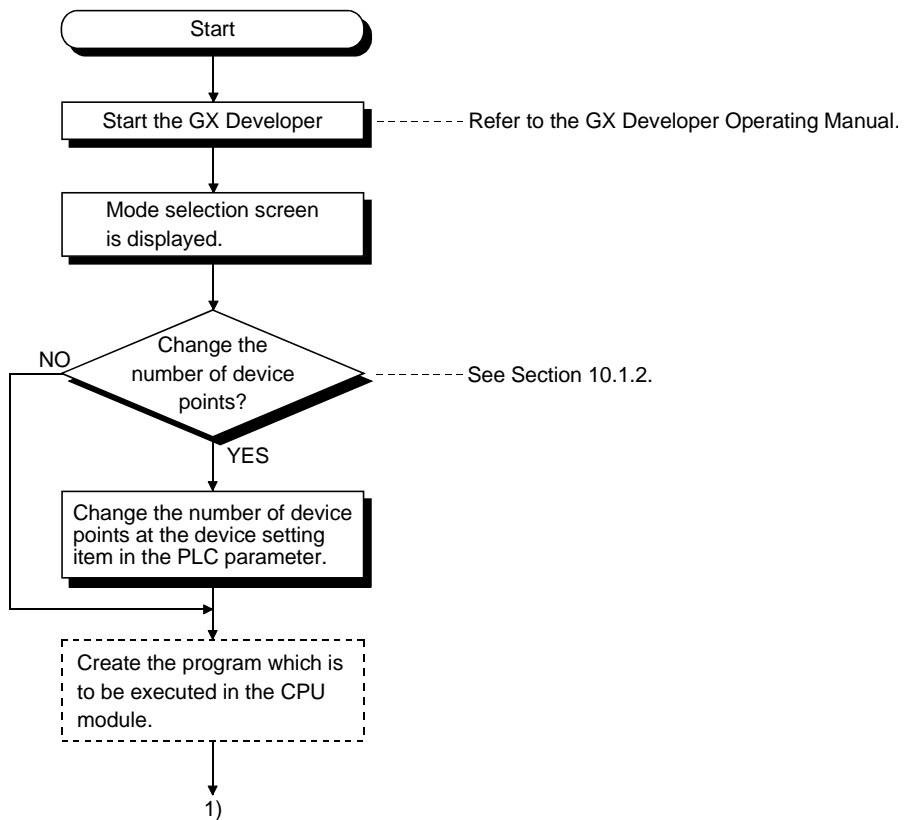
Designate whether or not the device initial value settings are to be used for the Process CPU devices and intelligent function modules. See Section 10.13.2 for details regarding device initial values.

12.2.2 Procedure for writing programs to the Process CPU

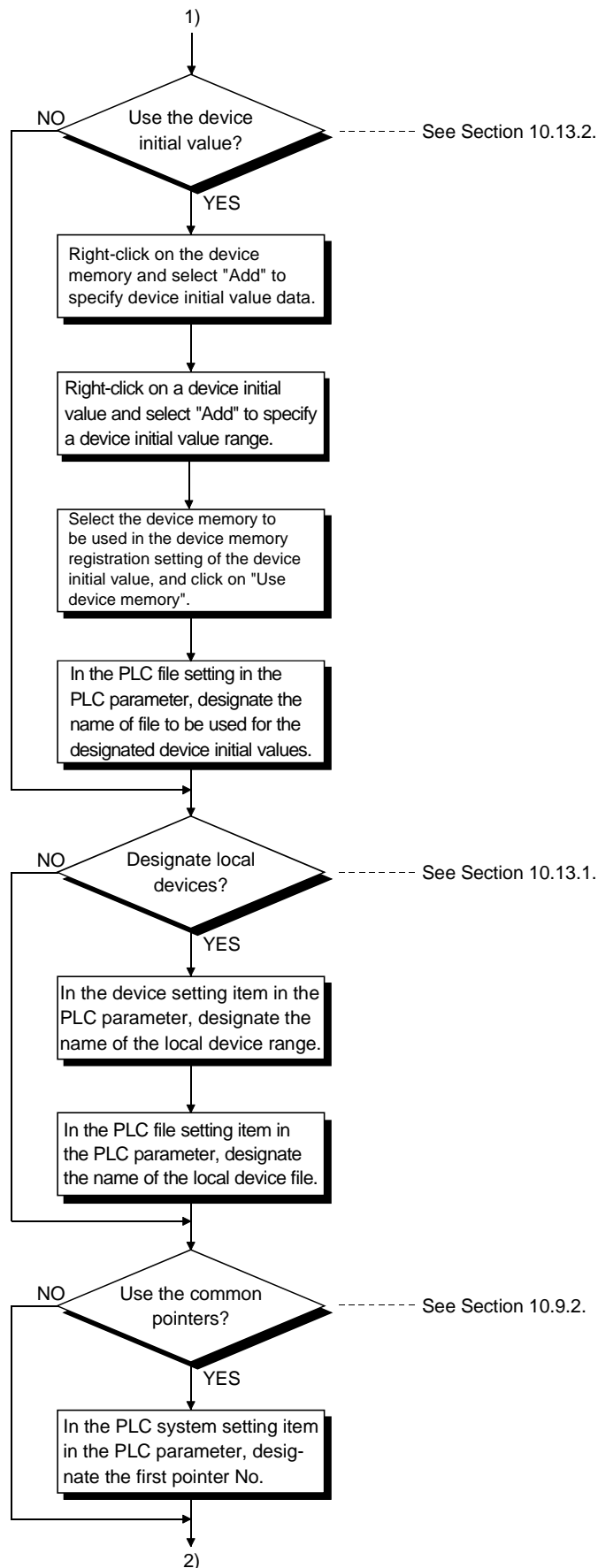
The procedure for writing programs and parameters created by GX Developer to the memory card mounted in the Process CPU memory card interface is shown below. In order to write programs and parameters to the Process CPU memory card, the memory card must be mounted, the valid parameters drive settings must be designated by the Process CPU DIP switches (SW 2, SW 3), and the boot settings for the PLC parameters must be designated by GX Developer. For details regarding Process CPU DIP switches, refer to the Process CPU User's Manual (Hardware Design, Maintenance and Inspection).

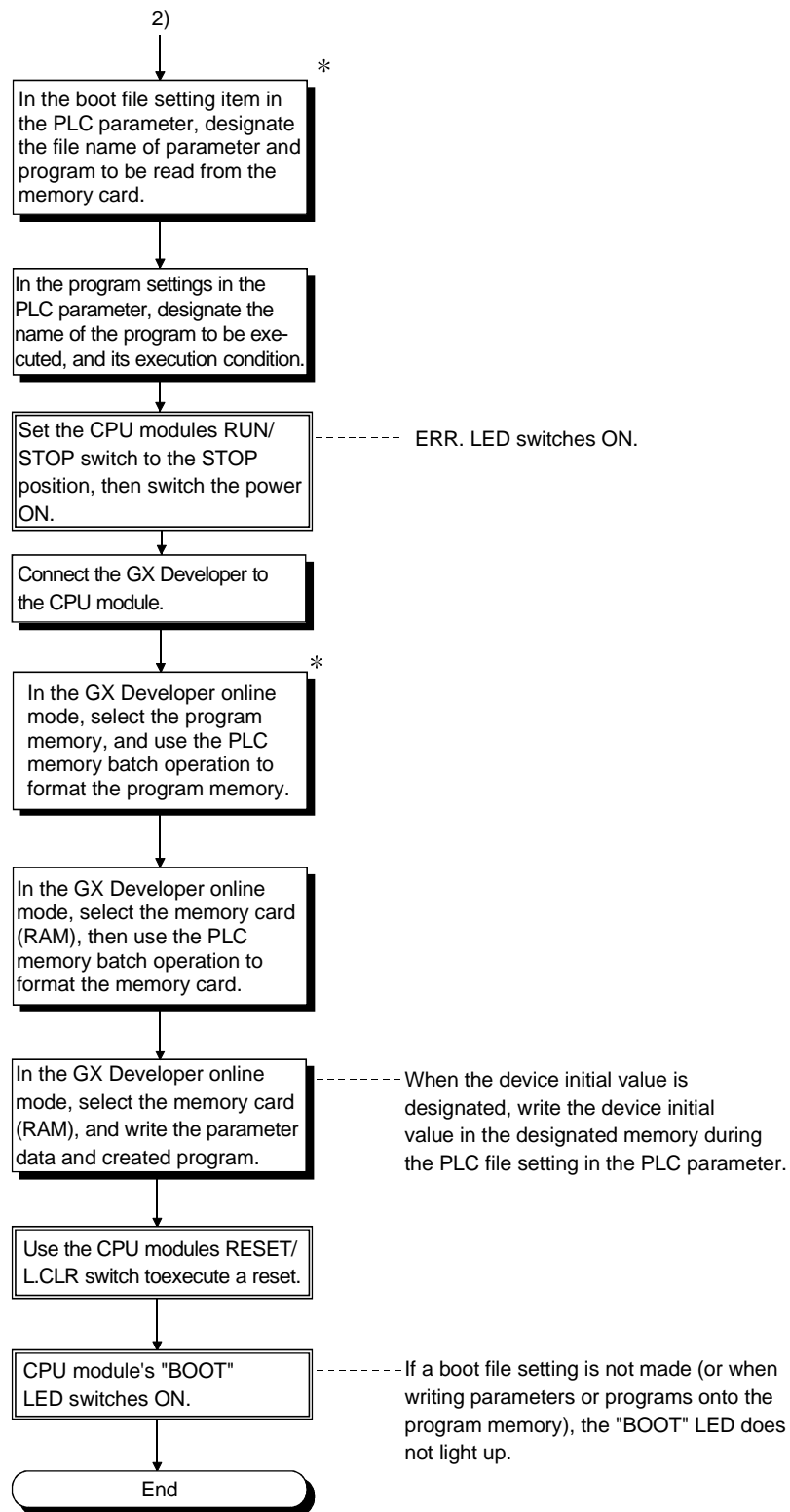
When writing programs and parameters to the Process CPU program memory, the steps indicated by asterisks (\*) below are not required.

Procedural steps shown in □ boxes are performed at GX Developer side, and those shown in ▢ boxes are performed at the Process CPU side.









13 OUTLINE OF MULTIPLE PLC SYSTEMS

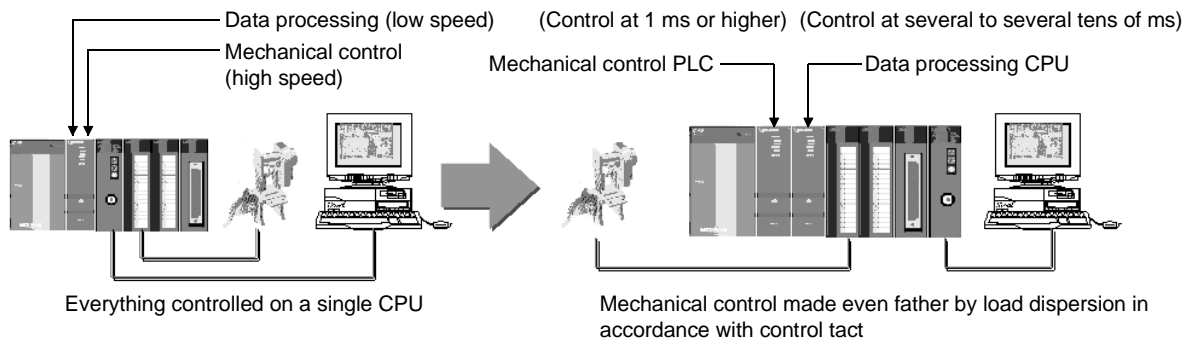
13.1 Features

(1) Multi control

- (a) Since each system is not configured on one Process CPU but on the Process CPU, Motion CPU, and PC CPU module according to the system, the development efficiency and ease of maintenance of the system can be enhanced.
- (b) Each CPU module in the multiple PLC system controls the I/O module and intelligent function module of the base unit slot-by-slot. GX Developer groups the I/O modules and intelligent function modules controlled by each CPU module in the multiple PLC system.

(2) Enables system configuration through load dispersion

- (a) By dispersing the high-load processing performed on a single Process CPU between several Process CPU's, it is possible to reduce the overall system scan time.



- (b) It is possible to increase the amount of memory used throughout the entire system by spreading the memory used between several Process CPU's.



(3) Enables system configuration through function dispersion

By dispersing the functions so that control for production line A and control for production line B is performed on different Process CPU's, it is possible to debug each function individually.

(4) Communication can be made between CPU modules in the multiple PLC system

The following data transfer can be made between CPU modules in the multiple PLC system.

- (a) Automatic refresh setting at GX Developer enables the data transfer between CPU modules.
- (b) The Process CPU can use the FROM/S.TO instruction to read data from other PLC as necessary.
- (c) Instructions dedicated to Motion can be used to issue control commands from the Process CPU to the Motion CPU. \*1
- (d) The Process CPU can issue instructions dedicated to communication between multiple PLCs, to read or write device data from/to the Motion CPU or PC CPU module.  
The Process CPU can issue events to the PC CPU module. \*2

**REMARK**

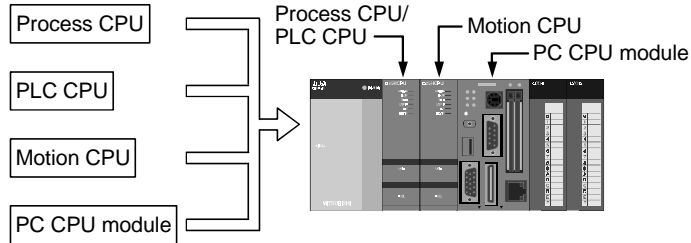
\*1: Refer to the manual of the Motion CPU for instructions dedicated to Motion.

\*2: Refer to the manuals of Motion CPU and PC CPU module for instructions dedicated to the communication between multiple PLCs.

13.2 Outline of Multiple PLC Systems

(1) What is a multiple PLC system?

(a) A multiple PLC system is a system in which main base units are mounted on several (maximum four) CPU modules in order to control the I/O modules and intelligent function modules.

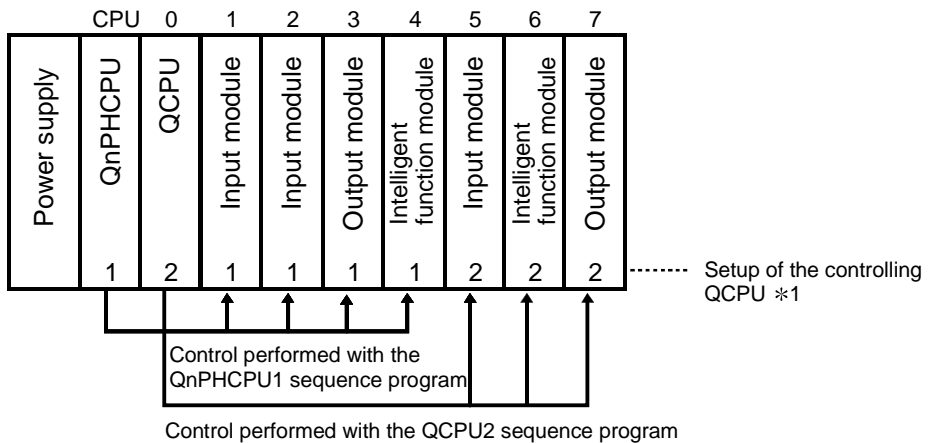


The allowable CPU modules are shown in the table below.

Process CPU	Q12PHCPU, Q25PHCPU
PLC CPU	Q02CPU, Q02HCPU, Q06HCPU, Q12HCPU, Q25HCPU,
Motion CPU	Q172CPU, Q173CPU, Q172CPUN, Q173CPUN
PC CPU module	PPC-CPU686(MS)-64, PPC-CPU686(MS)-128

Choose the CPU modules suitable to the system size and application to configure the system.

It is necessary to set (control PLC setup) which CPU modules are to control which I/O modules and intelligent function modules with a multiple PLC system.



(b) The CPU module that controls the I/O modules and intelligent function modules is known as the "Control PLC". The I/O modules and intelligent function modules controlled by the control PLC are known "controlled modules". Other modules not controlled by the control PLC are known as "non-controlled modules".

**REMARK**

\*1: Indicates the grouping configuration on the GX Developer.  
 QCPU1 indicates the "PLC No.," and "1" on the I/O module and intelligent function module indicates that their control PLC is the PLC No.1.

(2) Multiple PLC system setup

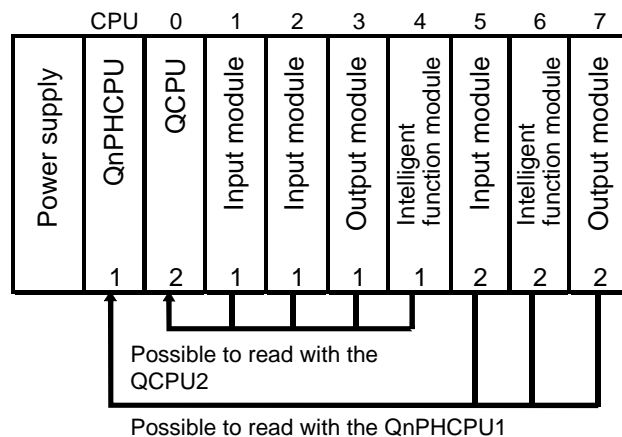
It is necessary to set up the "Number of mounted CPU modules" and the "Control PLC" with PLC parameters in all CPU modules onto which main base units are mounted in order to control a multiple PLC system (see Chapter 9.)

(3) Multiple PLC system access range

- (a) It is possible for a multiple PLC system's control PLC to perform the I/O refresh procedure on control modules and write in the buffer memory of intelligent function modules in the same way as a single CPU system.
- (b) It is possible to access non-control modules in the following ways.
  - Refresh the input for I/O modules and intelligent function modules (the PLC parameter multiple PLC setup is necessary.)
  - Read the intelligent function module's buffer memory.
  - Download the output data for the output module, the I/O combination module and the intelligent function modules. (the PLC parameter multiple PLC setup is necessary.)

However, it is not possible to access non-control modules in the following ways.

- Outputting data to the output module and intelligent function module.
- Writing data into the intelligent function module's buffer memory.



(4) GX Developer access range

- (a) It is possible to write parameter programs and perform monitoring and tests in Process CPUs connected to personal computers, To access Process CPUs that are not connected to personal computers, specify the Process CPU to be accessed (connection destination specification) with the GX Developer.
- (b) It is possible for the GX Developer to access the Process CPU regardless of the control modules and non-control modules. By connecting a single Process CPU to a personal computer, it is possible to perform monitoring and tests on all modules being controlled by the multiple PLC system's Process CPU in the same way as with a single CPU system. Other station Process CPUs on the same MELSECNET/H, Ethernet or other network can also be accessed.
- (c) It is possible for all Process CPUs on a multiple PLC system to be accessed from a GX Developer that is connected to other stations on the same network.

### 13.3 Differences with Single CPU Systems

The differences between single CPU systems and multiple PLC systems are explained below.

- (1) **Function versions (see Sections 14.2.1 to 14.2.5)**
  - (a) Process CPUs are supported by multiple PLC systems.
  - (b) All I/O modules can be used on a multiple PLC system.
  - (c) Use function version B intelligent function modules on the multiple PLC system.  
Function version A intelligent function modules can be used if set up as control PLC by the PLC No.1.
- (2) **Mounting position of CPU module (see Section 14.2.1)**

Process CPUs can be mounted on the CPU slot from the right-hand side of the power unit sequentially. The Motion CPUs are mounted together on the slot to the right of the Process CPUs.  
The PC CPU module is installed on the extreme right side in the multiple PLC system.  
The total number of Process CPU, Motion CPU and PC CPU module must be up to four.
- (3) **Multiple PLC system parameters (see Section 14.2.6)**

In comparison with independent CPU systems, there are more PLC parameter items on a multiple PLC system.  
Of the PC parameters that have been added to the multiple PLC system, the parameters that must be set are listed below.

  - Number of CPUs: Sets the number of mounted Process CPUs, Motion CPUs and PC CPU module that are in use.
  - Control PLC settings: Sets which Process CPU, Motion CPU and PC CPU module controls while modules.
- (4) **Sameness check (see Section 14.2.6)**

A setting exists to indicate that the Process CPU / Motion CPU / PC CPU module used are the same in the number of CPUs, control PLC settings and other multiple PLC system parameters.  
The Process CPU / Motion CPU / PC CPU module run a check (sameness check) to ascertain that the multiple PLC system parameters are the same when the PLC power is set at ON, the Process CPU is reset, and the STOP status is changed to the RUN status.  
The multiple PLC system will not start up if an error is triggered during the sameness check.
- (5) **Concept of the I/O number (see Section 15.1)**

The right side of the installed CPU module is I/O number "00H" in the multiple PLC system. For this reason, the position of I/O number "00H" varies according to the number of installed CPUs. However, because each PC CPU module occupies two slots (one slot for CPU and one empty slot), the I/O number deviates by the number of points set to the empty slot. (Default: empty 16 points)

(6) Interactive transmission with non-control PLCs (see Chapter 17)

(a) It is possible to control I/O modules and intelligent function modules controlled by the host PLC in the same way as on a single CPU system.

(b) It is not possible to output ON/OFF data to modules that are not controlled by the host PLC or write in the buffer memory of intelligent function modules.

It is possible to read I/O data from non-control modules with PLC parameter settings.

It is possible to confirm the status of modules controlled by other PLCs, the control status of other PLCs, and control the host PLC.

(7) Interactive transmission between each CPU modules on a multiple PLC system (see Chapter 16)

It is possible to perform the following interactive transmission between each CPU modules with a multiple PLC system.

- Automatically refreshing the device data between each CPU modules with multiple PLC system parameter settings.
- Data transfer between other Process CPU and PC CPU module via CPU shared memory using multiple PLC instructions (FROM, S.TO instructions)
- Reading CPU shared memory of Motion CPU from Process CPU with multiple PLC instructions (FROM instruction).
- Control instruction from the Process CPU to the Motion CPU with Motion dedicated PLC instructions.
- Writing and reading of the device data from the Process CPU to the Motion CPU/PC CPU module with communication dedicated instructions between multiple PLCs.
- Event issuance from Process CPU to PC CPU module using instructions dedicated to multiple PLC communication

(8) Processing during resets and errors (see Sections 14.2.7 and 14.2.8)

The processing performed when resets and errors occur are different for the multiple PLC system's PLC No.1 and the PLC No.2 to PLC No.4.

(a) Process CPU/High Performance model QCPU for PLC No.1 can be reset with a multiple PLC system.

CPU modules for PLC No.2 to No.4 and Motion CPU cannot be reset.

(b) Multiple PLC system operations will be suspended when a stop error occurs with the PLC No.1.

It is possible to select whether to suspend or continue with multiple PLC system operations when a stop error occurs with PLC Nos. 2 to 4 and Motion CPU.

(9) Clock function

An intelligent function module with which the error code and time of occurrence is stored in the buffer memory when an error is triggered is available (time data read from the Process CPU.)

The PLC No.1 time data will be stored as the time that the error occurred regardless of whether the module concerned is a control PLC or a non-control PLC.



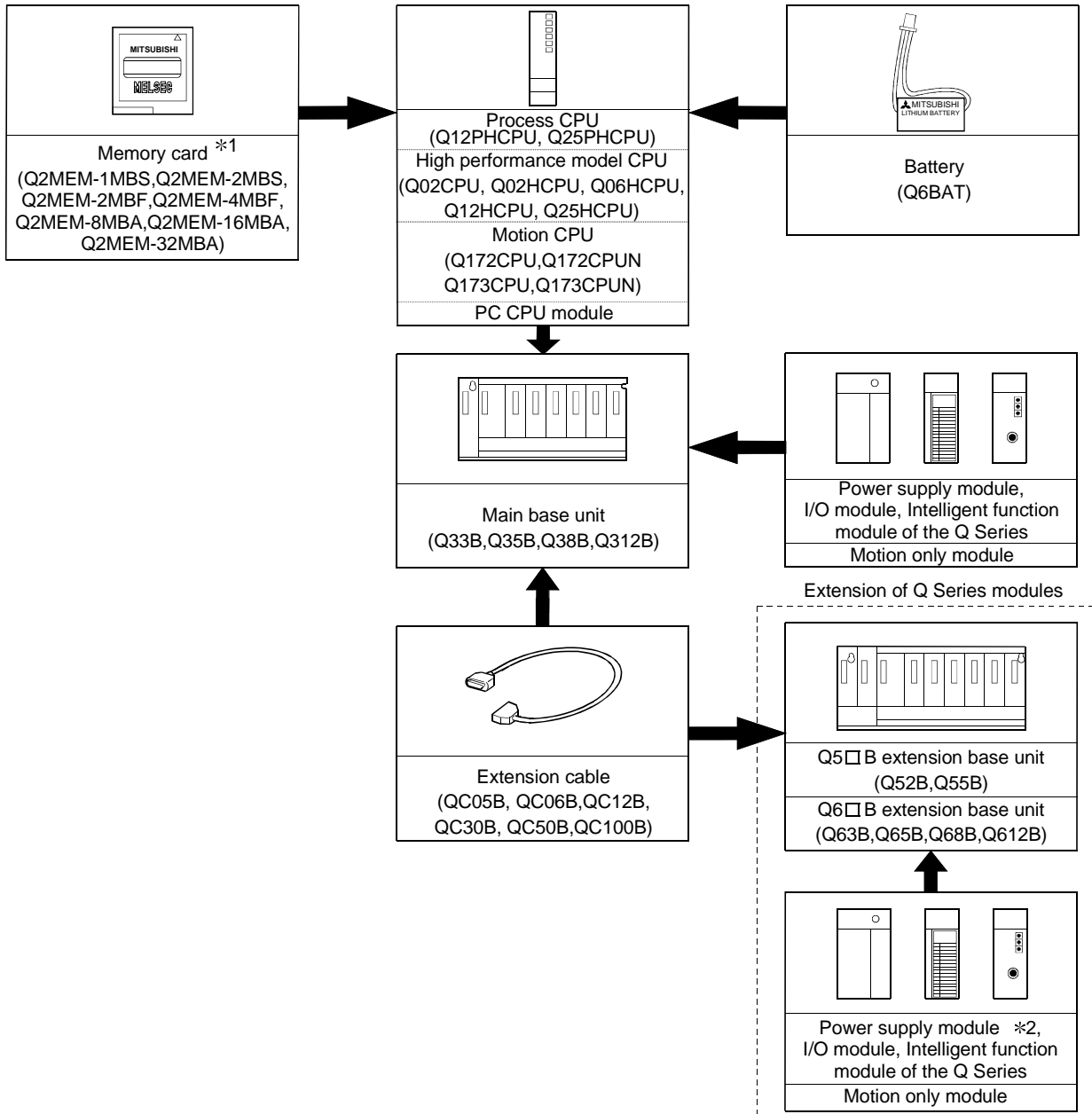
## 14 SYSTEM CONFIGURATION OF MULTIPLE PLC SYSTEM

This chapter explains the system configuration of multiple PLC systems, and the precautions for multiple PLC system configuration.

### 14.1 System Configuration

This section explains the equipment configuration of multiple PLC systems, the connections with peripheral device, and an output of the system's configuration.

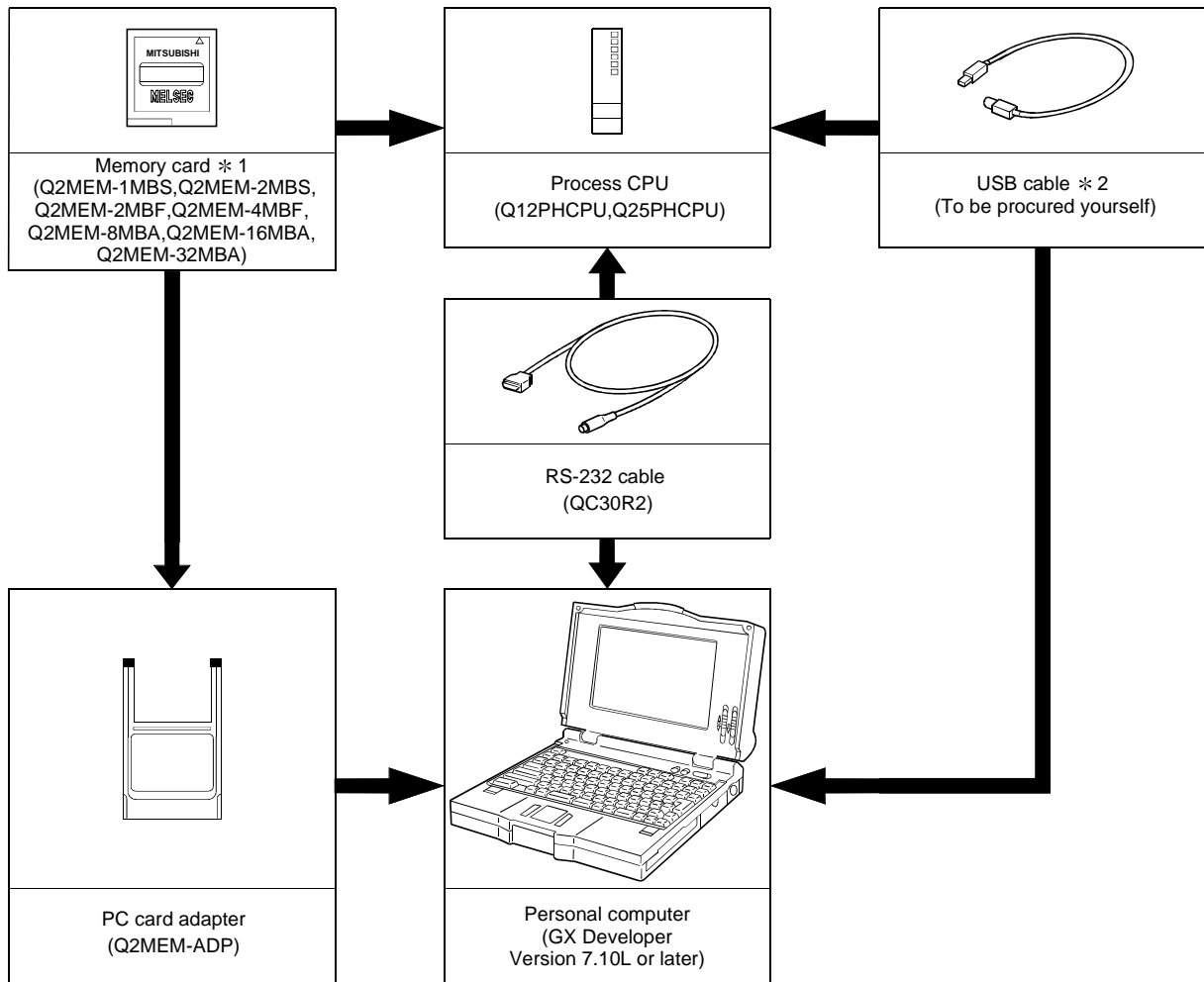
#### (1) Equipment configuration of multiple PLC system



**POINT**

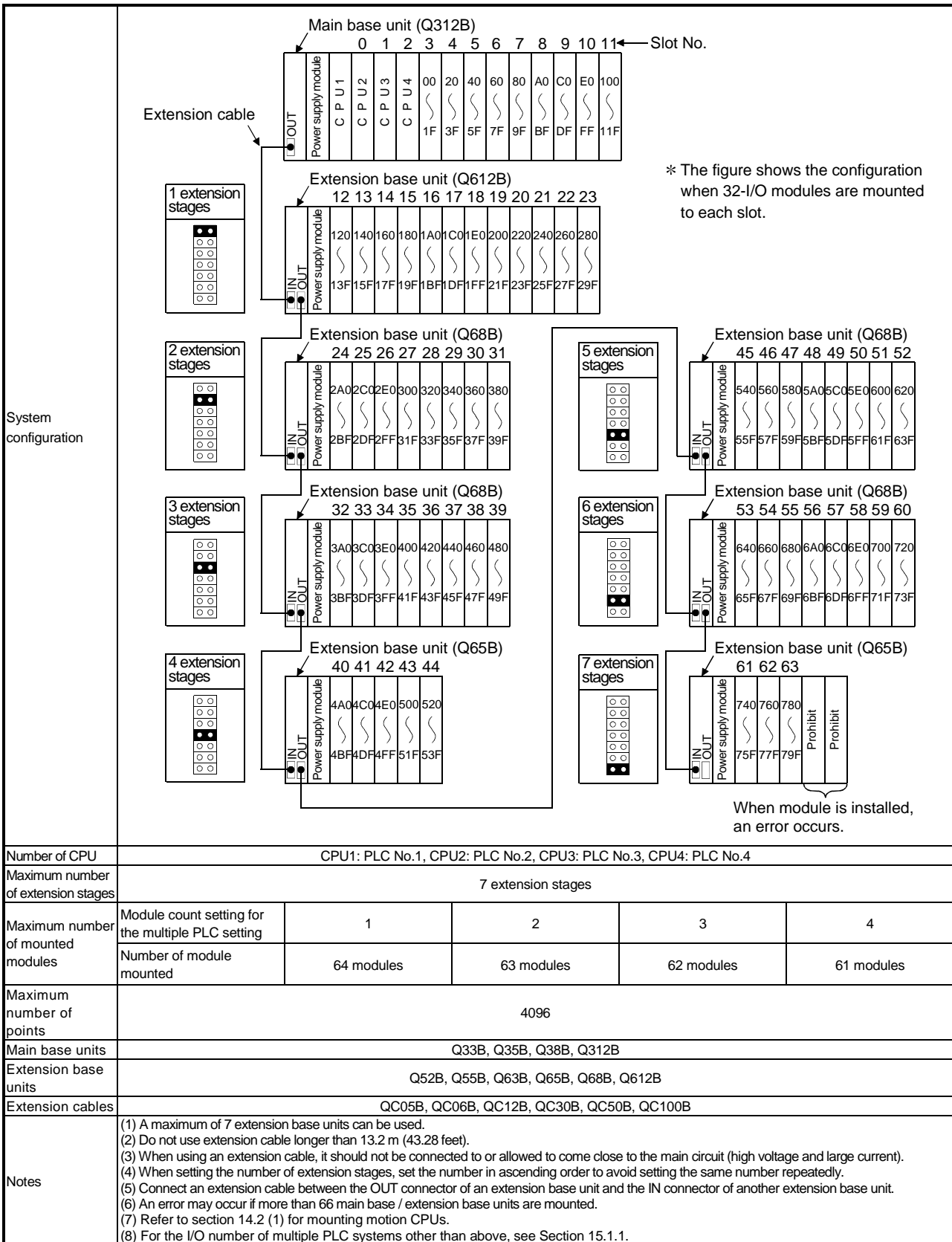
- \*1: Only one memory card can be mounted.  
Select the memory card SRAM, Flash and ATA in accordance with application and capacity.  
When commercial memory cards, the operation is not assured.
- \*2: The Q Series power supply module is not required for the Q5□B extension base unit.

(2) Configuration of peripheral device



\*1: For writing into memory card on GX Developer, and USB cable, refer to the operating manual of the GX Developer.

- | POINT  |
|--|
| <ul style="list-style-type: none"> <li>• Refer to the Motion Controller User's Manual for connection between the Motion CPU and peripheral modules.</li> <li>• The GX Developer installed in a Personal computer connected to the Motion CPU is not used to communicate with the Process CPU.</li> <li>• You cannot install GX Developer and Motion CPU software package in a single PC.</li> <li>• Refer to the manual of the PC CPU module for the connection between the PC CPU module and peripheral modules.</li> </ul> |



Number of CPU	CPU1: PLC No.1, CPU2: PLC No.2, CPU3: PLC No.3, CPU4: PLC No.4				
Maximum number of extension stages	7 extension stages				
Maximum number of mounted modules	Module count setting for the multiple PLC setting	1	2	3	4
	Number of module mounted	64 modules	63 modules	62 modules	61 modules
Maximum number of points	4096				
Main base units	Q33B, Q35B, Q38B, Q312B				
Extension base units	Q52B, Q55B, Q63B, Q65B, Q68B, Q612B				
Extension cables	QC05B, QC06B, QC12B, QC30B, QC50B, QC100B				
Notes	(1) A maximum of 7 extension base units can be used. (2) Do not use extension cable longer than 13.2 m (43.28 feet). (3) When using an extension cable, it should not be connected to or allowed to come close to the main circuit (high voltage and large current). (4) When setting the number of extension stages, set the number in ascending order to avoid setting the same number repeatedly. (5) Connect an extension cable between the OUT connector of an extension base unit and the IN connector of another extension base unit. (6) An error may occur if more than 66 main base / extension base units are mounted. (7) Refer to section 14.2 (1) for mounting motion CPUs. (8) For the I/O number of multiple PLC systems other than above, see Section 15.1.1.				

14.2 Precautions For Multiple PLC System Configuration

14.2.1 CPU module mounting positions

(1) CPU module mounting positions

- (a) Up to four modules of Process CPU and High Performance model QCPU can be mounted in the CPU slots (starting from the slot on the right side of power supply module closely) and the neighboring slots up to slot 2. There must be no empty slot between CPU modules.

Mount the Motion CPU or PC CPU module in the following way.

- Mount the Motion CPU on the right side of the Process CPU and High Performance model QCPU.
- Mount only one PC CPU module at the right end of CPU modules. (No CPU module can be mounted on the right side of the PC CPU module.)

Table 14.2 Installation positions of CPU modules

Number of CPUs	Mounting positions of CPU modules		
1	CPU 0 1 2 Power supply QCPU	—	
2	CPU 0 1 2 Power supply QCPU QCPU	CPU 0 1 2 Power supply QCPU Motion CPU	CPU 0 1 2 Power supply QCPU PC CPU module *2
3	CPU 0 1 2 Power supply QCPU QCPU QCPU	CPU 0 1 2 Power supply QCPU QCPU Motion CPU	CPU 0 1 2 Power supply QCPU Motion CPU Motion CPU
	CPU 0 1 2 Power supply QCPU QCPU PC CPU module *1	CPU 0 1 2 Power supply QCPU Motion CPU PC CPU module *1	—
4	CPU 0 1 2 Power supply QCPU QCPU QCPU QCPU	CPU 0 1 2 Power supply QCPU QCPU QCPU Motion CPU	CPU 0 1 2 Power supply QCPU QCPU Motion CPU Motion CPU

\*1: The PC CPU module occupies two slots.

Note: The QCPU indicates the Process CPU or High Performance model QCPU.

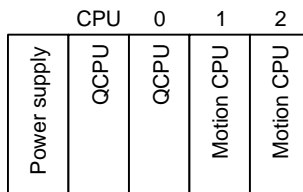
Number of CPUs	Mounting positions of CPU modules																
	CPU 0 1 2					CPU 0 1 2 3				CPU 0 1 2 3							
	Power supply	QCPU	Motion CPU	Motion CPU	Motion CPU	Power supply	QCPU	QCPU	QCPU	PC CPU module *1		Power supply	QCPU	QCPU	Motion CPU	PC CPU module *1	
	Power supply	QCPU	Motion CPU	Motion CPU	PC CPU module *1												

\*1: The PC CPU module occupies two slots.

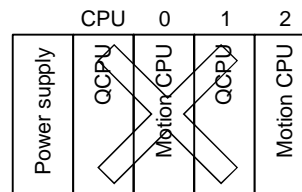
Note: The QCPU indicates the Process CPU or High Performance model QCPU.

- (b) Motion CPUs are mounted together on the slot to the right of the Process CPU or High Performance model QCPU. Process CPU and High Performance model QCPU's cannot be mounted to the right of Motion CPUs.

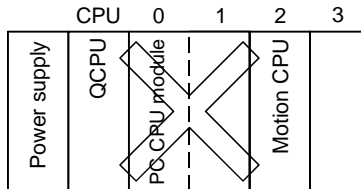
Mounting is allowed



Mounting is not allowed

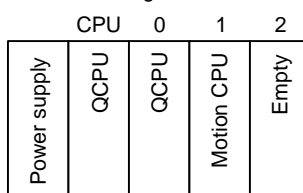


- (c) Mount the PC CPU module at the right end in the multiple PLC system. No CPU module can be mounted on the right side of the PC CPU module.

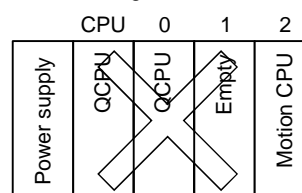


- (d) An empty slot is secured for future addition of a CPU module. The number of CPUs including empty slots are set with the No. of PLC setting, and the type is set in the "CPU (empty)" setting from the slot immediately to the right of the number of CPUs set at the "I/O Assignment" tab screen in the (PLC) "Parameter" dialog box. For example, when four CPUs have been set with the multiple PLC setting and two Process CPUs and one Motion CPU have been mounted, the Process CPUs are mounted in the CPU slot and slot 0, the Motion CPU is mounted in slot 1, and slot 2 is left empty. However, the empty slot must be on the right side of CPU modules.

Mounting is allowed



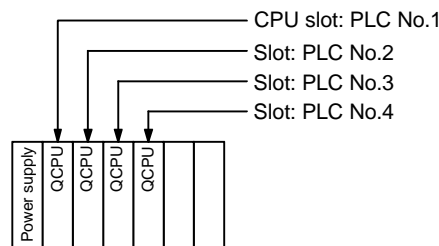
Mounting is not allowed



**POINT**  
 To add a Process CPU, High Performance model QCPU or Motion CPU to a system where the PC CPU module is used, shift the PC CPU module to the right because no CPU module is allowed on the right side of the PC CPU module.

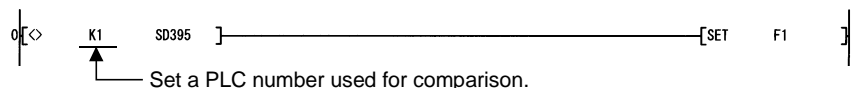
(2) CPU module PLC numbers

- (a) PLC numbers are allocated for identifying the CPU modules mounted on the main base unit in the multiple PLC system. The PLC No.1 is allocated to the CPU slot, and the PLC No.2, No.3 and No.4 are allocated to the right of the PLC No.1.



These PLC numbers are used for the following purposes of

- To access the Process CPU and High Performance model QCPU when the GX Developer (personal computer) is not connected in the multiple PLC system.
  - To set up control PLCs with the I/O Assignment in the multiple PLC system.
- (b) The Process CPU and High Performance model QCPU stores the host number in the special register (SD395). It is recommended to build a program for checking the host number using the Process CPU and High Performance model QCPU. This will enable easy verification when Process CPU and High Performance model QCPU are not mounted correctly and when programs are written into other PLCs with the GX Developer. In the program shown below, the annunciator (F1) is set to ON when the Process CPU and High Performance model QCPU writing programs is a PLC other than the PLC No.1 (SD395 = 1.) The "USER" LED on the front of the Process CPU and High Performance model QCPU is illuminated when the annunciator (F1) is set to ON. The number of the annunciator that has been set at ON will also be stored in a special register (SD62).



**REMARK**

For the own number confirmation method for the Motion CPU and PC CPU module, refer to the manual of the Motion CPU and PC CPU module.

14.2.2 Precautions when using Q Series I/O modules and intelligent function modules

(1) Compatible I/O modules

All I/O modules (QX□, QY□) are compatible with to multiple PLC system. They can be used by setting any of PLC No.1 to No.4 as a control PLC.

(2) Compatible intelligent function modules

(a) The intelligent function modules compatible with the multiple PLC system are those of function version B or later. They can be used by setting any of PLC No.1 to No.4 as a control PLC.

(b) Q Series high speed count modules (QD62, QD62D, QD62E) are compatible with by multiple PLC system are those of function version A or later. They can be used by setting any of PLC No.1 to No.4 as a control PLC.

(c) Q Series interruption modules (QI60) do not have a function version, but are supported by multiple PLC systems. PLCs No.1 to No.4 can be set up as control PLCs.

(d) Intelligent function modules of function version A can be used in multiple PLC system by setting PLC No.1 as a control PLC. However, only control PLC can be accessed from serial communication modules and other external modules. (MELSECNET/H, serial communication modules and other external modules cannot access non-control PLCs.)  
The "SP. UNIT VER. ERR (error code: 2150)" occurs if any of PLC No.2 to No.4 has been set as a control PLC, and the multiple PLC system will not be a started up.

(3) Ranges of access to control and non-control modules

In a multiple PLC system, non-control modules can be accessed by setting "I/O setting outside of the group" at the "Multiple PLC settings" dialog box in "PLC Parameter". The following table indicates accessibility to the control and non-control modules in the multiple PLC system.

Access target		Accessibility		
		Control module	Non-control module (I/O setting outside of the group)	
			Disabled	Enabled
Input (X)		○	×	○
Output (Y)	Read	○	×	○
	Write	○	×	×
Buffer memory	Read	○	○	○
	Write	○	×	×

○: Accessible      ×: Inaccessible

**REMARK**

- The function version of intelligent function modules can be confirmed at the rated name plate of the intelligent function module and with the GX Developer's "System monitor product information list window" (see Section 2.3.)
- See Section 14.2.4 for details on restrictions on the number that can be used with intelligent function modules.

## 14.2.3 Modules that have mounting restrictions

The following table indicates restrictions on the number of modules that can be mounted in multiple PLC systems. Ensure that the number of modules mounted is within these ranges.

Product	Model	Number of modules that can be mounted per system	Number of modules that can be mounted per PLC
Q series MELSECNET/H network modules	<ul style="list-style-type: none"> <li>• QJ71LP21</li> <li>• QJ71BR11</li> <li>• QJ71LP21-25</li> <li>• QJ71LP21G</li> <li>• QJ71LP21GE</li> </ul>	Maximum of four PLC to PLC networks and remote I/O networks	Maximum of four PLC to PLC networks and remote I/O networks
Q series Ethernet interface modules	<ul style="list-style-type: none"> <li>• QJ71E71</li> <li>• QJ71E71-B2</li> <li>• QJ71E71-100</li> </ul>	Maximum of four	Maximum of four
Q series CC-Link system master/local modules	<ul style="list-style-type: none"> <li>• QJ61BT11</li> </ul>	No limit *	No limit *
Interruption modules	<ul style="list-style-type: none"> <li>• QI60</li> </ul>	Maximum of four	Only one

\*: A maximum of 4 modules per PLC (16 modules per system) can be controlled if the network parameters for CC-Link are set and controlled by GX Developer. There is no restriction in the number of modules when the parameters are set by the instructions dedicated to the CC-Link.



#### 14.2.4 Compatible GX Developers and GX Configurators

(1) Compatible GX Developers

GX Developer Version 7.10L or later are compatible with on multiple PLC systems.

GX Developer Version 7.09K or earlier are not compatible with multiple PLC system.

(2) Compatible GX Configurators

The GX Configurators listed can be used on multiple PLC systems without modification.

14.2.5 Parameters that enable the use of multiple PLC system

- (1) Parameters that enable the use of multiple PLC system  
 Compared with the single CPU system, the multiple PLC system includes the "CPU count", "control PLC", "refresh setting (automatic refresh setting)" of PLC parameters. The PLC parameters must be set to the same for all the CPU modules used in the multiple PLC system, except some modules.  
 Make similar settings to the PC CPU module, if one is included, using the PC CPU module setting utility.  
 For the setting method, refer to the manual of the PC CPU module.
- (2) The PLC parameter settings for use with multiple PLC system  
 The PLC parameters, necessity of setup, and descriptions that are required for using multiple PLC system are listed in table 14.3.

Table 14.3 Setting list for the multiple PLC and I/O Assignment

PC parameter		Necessity of setup *1	Description *2
I/O Assignment	I/O Assignment		
	Type	—	○
	Model name	—	—
	Points	—	○
	Start	—	○
	Standard setting		
	Base model name	—	—
	Power model name	—	—
	Extension cable	—	—
	Points	—	○
	Switch settings		
	Detailed settings		
	Error time output mode	—	—
	H/W error time PLC operation mode	—	—
	I/O response time	—	—
	Control PLC	○	○
PLC system settings	Number of empty slots	—	○
Multiple PLC settings	No. of PLC	○	○
	Operation mode	△	○
	Online module change	○	○
	Out of group input/output setting		
	The input condition outside of the group is taken	△	△
	The output condition outside of the group is taken	△	△
	Refresh setting		
	Send range for each PLC	△	○
PLC side devices	△	—	

\*1: Necessity of setup column

- : Items that must be set up for multiple PLC system (operations not possible if not set up.)
- △: Items that may be set up when required for multiple PLC system (Operations carried out with the default values when not set up.)
- : Items that are the same as single CPU systems.

\*2: Descriptions

- : Items that have the same settings for all CPU modules on the multiple PLC system.
- △: Items that have the same settings for all Process CPU, High Performance model QCPUs and PC CPU module on the multiple PLC system (items that do not have settings for motion CPUs).
- : Items that can be setup up individually for each CPU modules on the multiple PLC system.

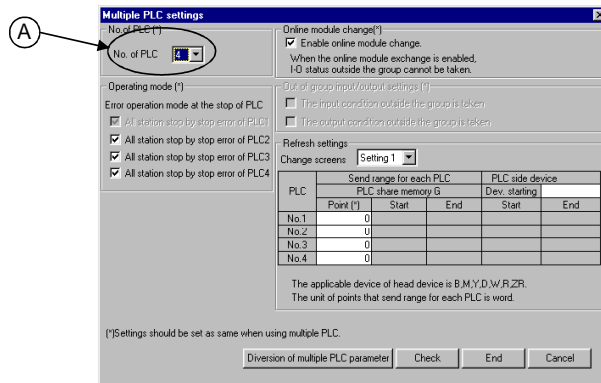
After parameters such as multiple PLC settings are changed, reflect the changes to keep uniformity among all PLCs in the multiple PLC system, then reset the PLC No.1.

It is possible to transfer across and use the CPU settings and I/O Assignments set up for other projects with GX Developer.

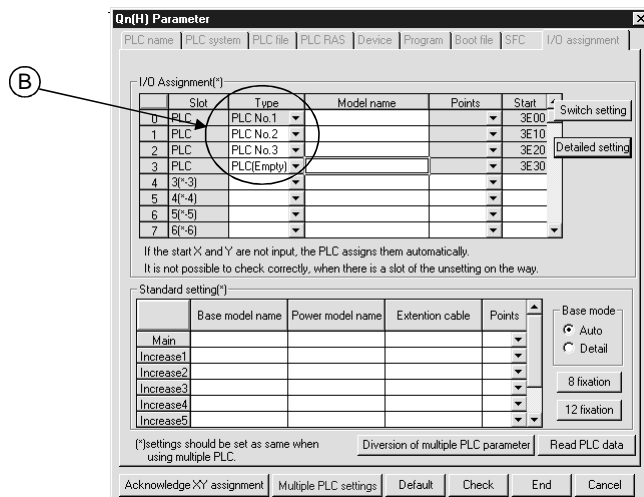
(See section 19.2.3 for details on transferring and using multiple PLC settings and I/O Assignments.)

(a) CPU count setting (setup necessary)

- 1) The number of CPU modules to be used on a multiple PLC system are set at the PLC parameter's "Multiple PLC settings" screen in the (PLC) Parameter dialog (indicated with the "A" arrow.)



- 2) Ensure that the CPU count set for the multiple PLC system is the same as the number of CPUs actually mounted. When an empty slot is secured for the purpose of mounting additional CPU modules in the future, set "PLC (Empty)" at the "I/O assignment" tab screen in the (PLC) "Parameter" dialog box. For example, when setting "4" as "No. of PLC" in the "Multiple PLC settings" screen and securing one of them for future use, set slot 3 to "PLC (Empty)" (indicated with the "B" arrow.)



- 3) A "PARAMETER ERROR (error code: 3010)" occurs to all mounted CPU modules in the following cases.
  - The number of mounted CPU modules exceeds the number set with the CPU count setting.
  - No CPU module is installed in slots set for PLC No.1 to No.4.

- (b) Operation mode setting (optional)  
 This is set to continue operation of other PLCs where a stopping error has not occurred when an error occurs at any of PLCs No.2 to No.4.  
 The operation mode for the PLC No.1 cannot be changed (all PLCs will suspend operations when a stop error is triggered for the PLC No.1.)  
 See Section 14.2.8 for further details.
- (c) I/O settings outside of the group (optional)  
 This is set when the input and output (X, Y) for I/O modules and intelligent function modules being controlled by other PLCs is to be downloaded to the host PLC.  
 See Section 17.2 for further details.
- (d) Refresh setting (optional)  
 This is set up to automatically refresh the device data on the multiple PLC system.  
 See Section 16.1 for further details.
- (e) Control PLC settings (optional)  
 Sets up the control PLCs for the I/O modules and intelligent function modules mounted on the base units on the multiple PLC system (indicated by the "C" arrow.)  
 All default settings are set for the PLC No.1.

Slot	Type	Model name	Error time output mode	H/W error time PLC operation mode	I/O response time	Control PLC (*)
0	PLC	PLC No.1				
1	PLC	PLC No.2				
2	PLC	PLC No.3				
3	PLC	PLC(Empty)				
4	3(*-3)					PLC No.1
5	4(*-4)					PLC No.1
6	5(*-5)					PLC No.1
7	6(*-6)					PLC No.1
8	7(*-7)					PLC No.1
9	8(*-8)					PLC No.1
10	9(*-9)					PLC No.1
11	10(*-10)					PLC No.1
12	11(*-11)					PLC No.1
13	12(*-12)					PLC No.1
14	13(*-13)					PLC No.1
15	14(*-14)					PLC No.1

(\*):settings should be set as same when using multiple PLC.

(3) Multiple PLC setting and I/O Assignment checks

Checks, as shown in table 14.4, will be run to ascertain that all CPU modules have the same settings (sameness check) when the description column in table 14.3 has been set with the "O" symbol and the power to the sequence is switched on, the Process CPU is reset, or the status is changed from STOP to RUN.

- (a) The multiple PLC system will be started up if all PLCs have the same settings.
- (b) The operations described in table 14.4 will be performed when all PLCs do not have the same settings.  
 In this event, check the multiple PLC settings and I/O Assignment, and set all PLCs with the same settings.  
 To start the multiple PLC system, reset the Process CPU for PLC No.1 or turn off and on the PLC (power ON → OFF → ON).  
 (For the action after the Process CPU for PLC No.1 is reset, see Section 14.2.7.)

Table 14.4. List of sameness check contents

Item	PLC No.1	PLC No.1 to 4
When the power to the PLC is switched on When PLC No.1 is reset	No sameness check will be run	<ul style="list-style-type: none"> <li>• A comparison check will be run on the multiple PLC settings and I/O Assignments for PLC No.1.</li> <li>• A "PARAMETER ERROR (error code: 3012)" will occur in the host PLC if they do not match.</li> </ul>
<ul style="list-style-type: none"> <li>• When the RUN/STOP switch has been changed from STOP to RUN.</li> <li>• When parameters are written with the GX Developer</li> </ul>	When PLCs in the RUN mode exist	<ul style="list-style-type: none"> <li>• A comparison check will be run on the multiple PLC settings and I/O Assignments for the PLC in the RUN mode with the lowest number.</li> <li>• A "PARAMETER ERROR (error code: 3012)" will occur in the host PLC if they do not match.</li> </ul>
	When PLCs in the RUN mode do not exist	<ul style="list-style-type: none"> <li>• A comparison check will be run on the multiple PLC settings and I/O Assignments for PLC No.2.</li> <li>• A "PARAMETER ERROR (error code: 3012)" will occur in the host PLC if they do not match.</li> </ul>
	When a stop error occurs at PLC No.1	—

**POINT**

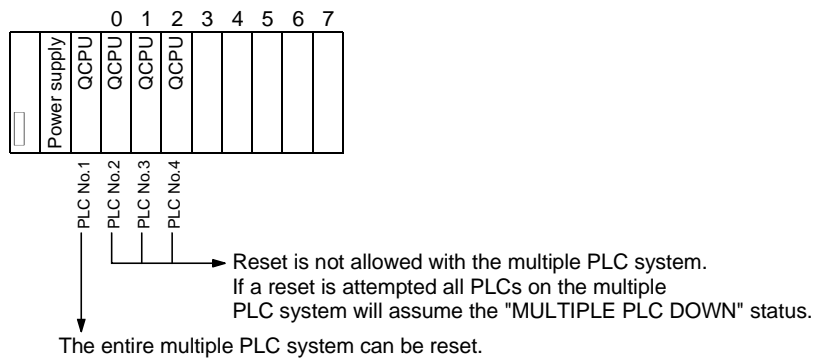
After multiple PLC system parameters unavailable with the Motion CPU are changed for the Process CPU, High Performance model QCPU or PC CPU module in a multiple PLC system including a Motion CPU, be sure to reset the Process CPU or High Performance model QCPU for PLC No.1 or turn off and on the PLC. (Otherwise the Process CPU, High Performance model QCPU or PC CPU module checks consistency with multiple PLC system parameters of the Motion CPU, causing a "PARAMETER ERROR (error code: 3012)."

14.2.6 Resetting the multiple PLC system

It is possible to reset the entire multiple PLC system by resetting the PLC No.1. The CPU modules for PLC No.2 to No.4, I/O modules and intelligent function modules will be reset when the PLC No.1 is reset.

If a stop error occurs for any of the PLCs on the multiple PLC system, either reset the PLC No.1 or restart the sequencer (power supply ON → OFF → ON) after the problem has been recovered.

(Recovery is not allowed by resetting the CPU modules for PLC No.2 to No.4 for which stop errors have occurred.)



**POINT**

- (1) It is not possible to reset the CPU modules for PLC No.2 to No.4 individually in the multiple PLC system. If an attempt to reset any of the CPU modules for PLC No.2 to No.4 during operation of the multiple PLC system, a "MULTIPLE PLC DOWN (error code: 7000)" error will occur for the other PLCs, and the entire multiple PLC system will be halted. However, depending on the timing in which the CPU modules have been reset, there are cases where errors other than the "MULTIPLE PLC DOWN" error will halt the other PLCs.
- (2) A "MULTIPLE PLC DOWN (error code: 7000)" error will occur regardless of the operation mode set at the "Multiple PLC settings" screen within the (PLC) Parameter dialog box. (stop/continue all other PLCs on the CPU modules for PLC No.2 to No.4 error) when the CPU modules for PLC No.2 to No.4 are reset (See Section 14.2.8 for details on the multiple PLC setting operation modes.)

14.2.7 Processing when CPU module stop errors occur

The operations for the entire system will differ when a PLC No.1 stop error occurs and when any of PLC No.2 to No.4 stop error occurs in the multiple PLC system.

(1) When a stop error occurs at the PLC No.1

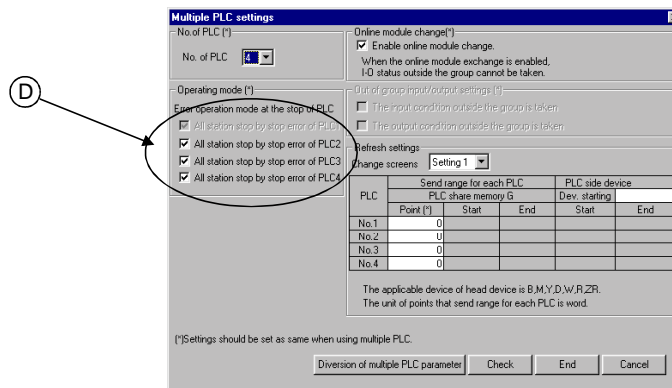
- (a) A "MULTIPLE PLC DOWN (error code: 7000)" error occurs for the CPU modules for PLC No.2 to No.4 and Motion CPUs and the multiple PLC system will be halted when a stop error occurs at the PLC No.1 (See point on the next page for details)
- (b) Observe the following procedures to restore the system.
  - 1) Confirm the cause of the PLC No.1 error with the PLC diagnosis function.
  - 2) Remove the cause of the error.
  - 3) Either reset the PLC No.1 or restart the power to the PLC.  
All PLCs on the entire multiple PLC system will be reset and the system restored when the PLC No.1 is reset or the power to the PLC is restarted.

(2) When a stop error occurs at the PLC No. other than No.1

Whether the entire system is halted or not is determined by the multiple PLC setting's "Operating Mode" setting when a stop error occurs in the CPU modules for PLC No.2 to No.4.

The default setting is for all PLCs to be stopped with a stop error.

When you do not want to stop all PLCs at occurrence of a stop error in any of the CPU modules, click the check box that corresponds to the PLC No. whose error will not stop all PLCs. (Arrow D)



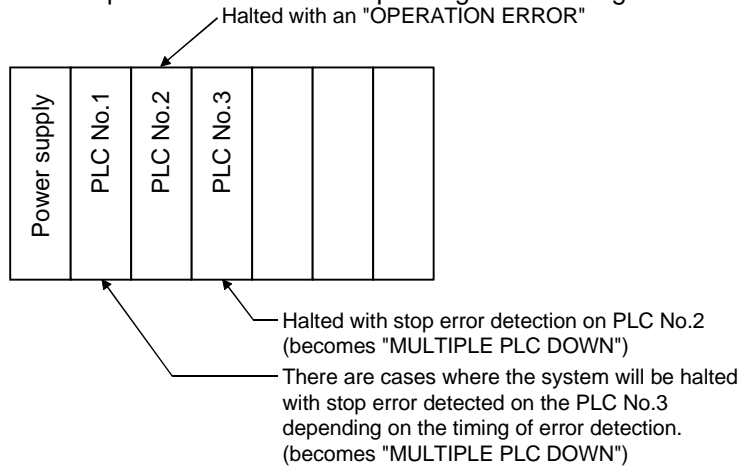
- (a) A "MULTIPLE PLC DOWN (error code: 7000)" error occurs for the CPU modules and the multiple PLC system will be halted when a stop error is occurs in CPU modules for which the "All station stop by stop error of PLC 'n' " has been set. (See POINT on the next page for details.)
- (b) A "MULTIPLE PLC ERROR (error code: 7010)" error occurs for all other PLCs but operations will continue when a stop error occurs in CPU modules for which the " All station stop by stop error of PLC 'n' " has not been set.

**POINT**

A "MULTIPLE PLC DOWN" stop error will occur for the PLC on which the error was detected when a stop error occurs.

There are cases where the timing of error detection will search for the PLC on which the stop error that has caused the "MULTIPLE PLC DOWN" error occurs, not the first PLC on which a stop error occurs, and the entire system will assume the "MULTIPLE PLC DOWN" status.

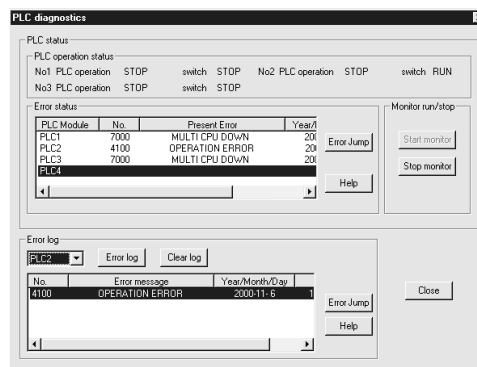
For example, if a stop error occurs in the PLC No.2 and the PLC No.3 is halted as a direct consequence of this, there are cases where the PLC No.1 will be halted because of the stop error on PLC No.3 depending on the timing of error detection.



Owing to this, there are cases where a different PLC No. to the PLC that initially caused the stop error will be stored in the error data's common information category.

In this event, remove the reason for the error on the PLC that caused the stop error in addition to the "MULTIPLE PLC DOWN" error when restoring the system.

In the illustration shown below, the cause of the PLC No.2 error that did not cause the "MULTIPLE PLC DOWN" error is removed.



- (c) Observe the following procedures to restore the system.
  - 1) Confirm the cause of the PLC No.1 error with the PLC diagnostics function.
  - 2) Remove the cause of the error.
  - 3) Either reset the PLC No.1 or restart the power to the PLC.

All PLCs on the entire multiple PLC system will be reset and the system restored when the PLC No.1 is reset or the power to the PLC is restarted.



### 14.2.8 Reducing the time required for multiple PLC system processing

#### (1) Multiple PLC system processing

A bus (base unit pattern, extension cable) is used by the CPU module when accessing the I/O module and intelligent function module, and this bus cannot be used by plural CPU module at the same time.

The CPU modules that attempted buss access afterwards when plural CPU module use the bus simultaneously will assume the "Standby" status until processing for the CPU module that executed the procedure first has been completed.

This "Standby" status (the amount of time the CPU module must wait) will cause delays in input and output on the multiple PLC system, and result in extended scan times.

See Chapter 18 for details on extended scan times.

#### (2) Maximum standby time

The host PLC will reach the maximum standby time in the following cases with a multiple PLC system.

- When four CPU modules are used on the multiple PLC system.
- When additional base units are in use.
- When intelligent function modules that possess vast quantities of data are mounted onto additional base units.
- When four CPU modules simultaneously access modules mounted onto additional base units.

#### (3) Reducing the time required for multiple PLC system processing

The following methods are available for reducing the amount of time required for multiple PLC system processing.

- Combine modules with many access points, such as MELSECNET/H and CC-LINK refresh, etc., together into a main base unit.
- Set modules with many access points, such as MELSECNET/H and CC-LINK refresh, etc., as control module on a single CPU module, and ensure that simultaneous access does not occur.
- Reduce the number of MELSECNET/H and CC-LINK refresh access points.
- Reduce the number of automatic refresh points between CPU modules.

POINT
<p>It is possible to reduce scan time by changing the following PLC parameter settings:</p> <ul style="list-style-type: none"> <li>• A Series CPU compatibility setting</li> </ul> <p>See Section 18.3 for details.</p>

### 14.2.9 Precautions for making online module change

Take the following precautions when making the online module change of modules used with the Process CPU in a multiple PLC system.

Refer to the following manual for details of the online module change.

- Process CPU User's Manual (Hardware Design/Maintenance and Inspection)

#### (1) Modules that can be changed online

The modules controlled by the Process CPU can be changed online.

The modules controlled by the High Performance model QCPU, Motion CPU and PC CPU module cannot be changed online.

#### (2) CPU module versions

When making the online module change of modules used with the Process CPU, configure a multiple PLC system with the CPU modules given in the following table.

CPU Module Type	Type	Function Version/Serial No.
Process CPU	Q12PHCPU, Q25PHCPU	Function version "C"
High Performance model QCPU	Q02CPU, Q02HCPU, Q06HCPU, Q12HCPU, Q25HCPU	First 5 digits of serial No. "04012" or later
Motion CPU	Q172CPU	Version "P" or later
	Q173CPU	Version "N" or later
	Q172CPUN, Q173CPUN	Version "A" or later
PC CPU module	PPC-CPU685(MS)-64, PPC-CPU686(MS)-128	Bus interface driver (PPC-DRV-01) version "1.05" or later

#### (3) Online module change setting

- (a) Enable "Online module change setting" of all CPU modules in the multiple PLC system.

If "Online module change setting" is disabled in any one of the CPU modules, "PARAMETER ERROR (error code: 3014)" occurs and control cannot be performed.

- (b) When the online module change setting is enabled, the non-group inputs/outputs cannot be imported.

#### (4) When PC CPU module is used

When the PC CPU module is used, online module change cannot be performed until the PC CPU module starts up.

## 15 ALLOCATING MULTIPLE PLC SYSTEM I/O NUMBERS

### 15.1 Concept behind Allocating I/O Numbers

Multiple PLC systems possess I/O numbers to enable interactive transmission between the CPU modules and the I/O modules and intelligent function modules, and I/O numbers to enable interactive transmission between the CPU modules.

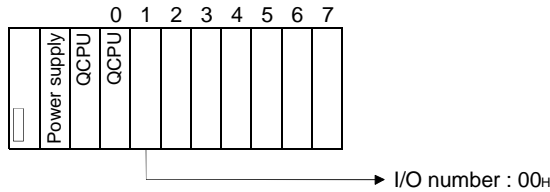
#### 15.1.1 I/O modules and intelligent function module I/O numbers

The difference with single CPU systems is the 00H position (slot) of the I/O number with multiple PLC systems. However, the concept behind the sequence for allocating I/O numbers, the I/O numbers for each slot, and the I/O numbers for empty slots is the same for both types of system. See Chapter 5 (Allocating I/O Numbers) for details on the concept behind the sequence for allocating I/O numbers, the I/O numbers for each slot, and the I/O numbers for empty slots.

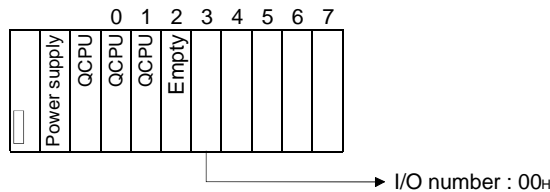
##### (1) "00H" position for I/O numbers

- (a) The number of slots set with the PLC parameters' multiple PLC settings are occupied by the CPU modules on the multiple PLC system.
- (b) The I/O modules and intelligent function modules are mounted from the right of the slots occupied by the CPU modules.
- (c) I/O number of a system without PC CPU module  
The I/O number for the I/O modules and intelligent function modules mounted from the right of the slots occupied by the CPU modules is set as "00H" and consecutive numbers are then allocated sequentially to the right.

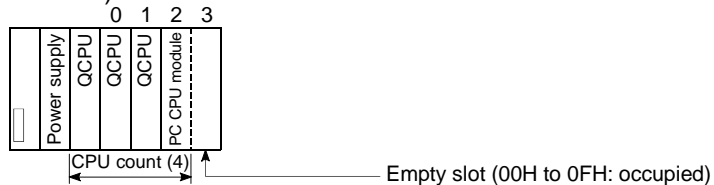
##### 1) Example: Two modules are mounted



##### 2) Example: Three modules are mounted and one empty slot exists



- (d) Input/output number of a system with PC CPU module  
The PC CPU module occupies two slots. The one on the right side among the two slots is handled as an empty slot. (16 empty points are occupied with default setting.) Therefore the I/O number of the slot on the right side of the PC CPU module is "10H." (Set the empty slot at zero point using I/O allocation of PLC Parameters dialog box, to assign "00H" to the first I/O number.)



### REMARK

- If the number of CPU modules mounted on the main base unit is smaller than the number set at the "Multiple PLC setting" of "(PLC) Parameter" dialog box, the slot(s) on the right of the actually mounted CPU modules is (are) set as "CPU (Empty)".
- The I/O number for the multiple PLC system can be confirmed with the system monitor.

15.1.2 I/O number of CPU module

I/O numbers are allocated to the CPU modules with the multiple PLC system in order to allow interactive communications between the CPU modules with the following commands.

- Multiple PLC commands
- Motion dedicated commands
- Dedicated communication commands between multiple PLCs

The I/O numbers for the CPU modules are fixed for the slots on which they are mounted and cannot be amended.

The table below shows the I/O number allocated to each CPU module when the multiple CPU system is composed.

CPU module mounting position	CPU slot	Slot 0	Slot 1	Slot 2
First I/O number	3E00H	3E10H	3E20H	3E30H

The CPU modules I/O numbers are used in the following cases.

- When writing data in the host PLC's CPU shared memory with the S.TO instruction. \*1
- When reading data from other PLC's CPU shared memory with the FROM instruction. \*1
- When reading data from other PLC's CPU shared memory with the intelligent function module device (U\\_G\\_). \*1
- When specifying the Process CPU to be accessed with the Ethernet module. \*1
- When specifying the Process CPU to be accessed with the serial communication module. \*3

**REMARK**

- \*1: See Chapter 16 for details on among CPU module.
- \*2: Refer to the Ethernet module's manual for details on accessing the Process CPU with the Ethernet module.
- \*3: Refer to the serial communication module's manual for details on accessing the Process CPU with the serial communication module.

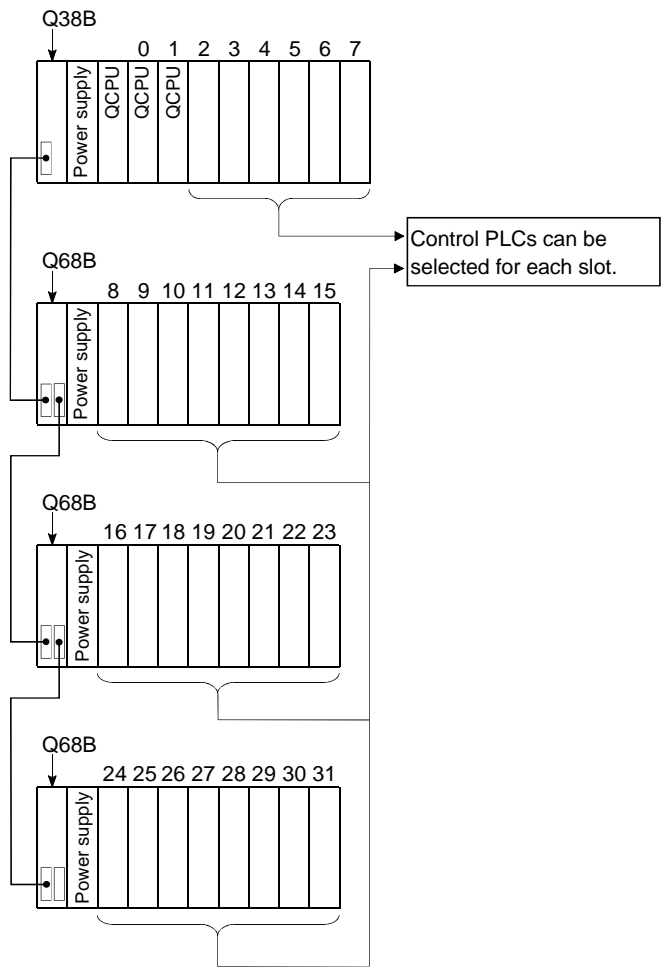
15.2 Purpose of PLC Parameter I/O Allocations with GX Developer

I/O allocations are performed with GX Developer in the following cases.

(1) Setting up control PLCs

Sets up the CPU module that are to control the multiple PLC system's I/O modules and intelligent function modules.

Q Series I/O modules and intelligent function modules can be selected as control PLCs for each slot.



16 COMMUNICATION BETWEEN CPU MODULES IN MULTIPLE PLC SYSTEM

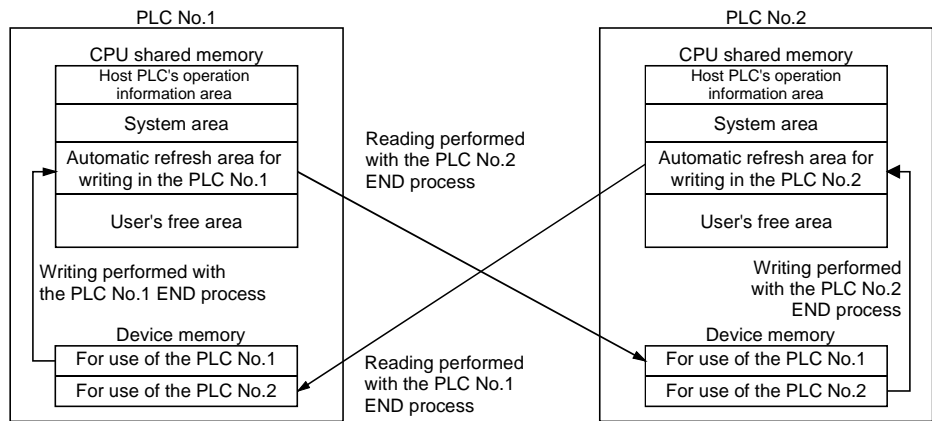
It is possible to perform the following interactive transmission between each CPU modules with a multiple PLC system.

- Automatically refreshing the device data between each CPU modules with multiple PLC system parameter settings.
- Data transfer between other Process CPU and PC CPU module via CPU shared memory using multiple PLC instructions  
Also, data reading of Process CPU from CPU shared memory of Motion CPU using multiple PLC instructions
- Control command from the Process CPU to the Motion CPU with Motion dedicated PLC instructions.
- Writing and reading of the device data from the Process CPU to the other CPU modules with communication dedicated instructions between multiple PLCs.  
Also, event issuance from Process CPU to PC CPU module using instructions dedicated to multiple PLC communication

(1) Automatic refresh of device data

Automatic refresh of the CPU shared memory is a function of automatic data transfer between CPU modules in END processing of the CPU.

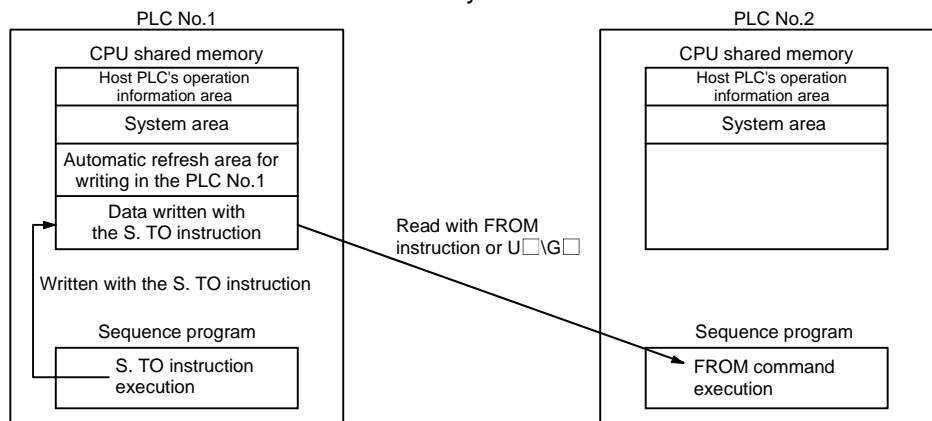
As the device memory data of other PLCs is automatically read when the automatic refresh function is used, is possible for the host PLC to use the device data of other PLCs.



(2) Exchanging data with multiple PLC instructions and instructions that use Intelligent function module device (U□\G□)

The CPUs on the multiple PLC system write data into the host PLC's CPU shared memory with the use of the S. TO instruction/FROM instruction. The data written to the CPU shared memory of the host PLC with the S. TO instruction is read by Process CPU of other PLCs with the use of the FROM instruction and U□\G□.

Non-linked device data also read directly when the command is executed.



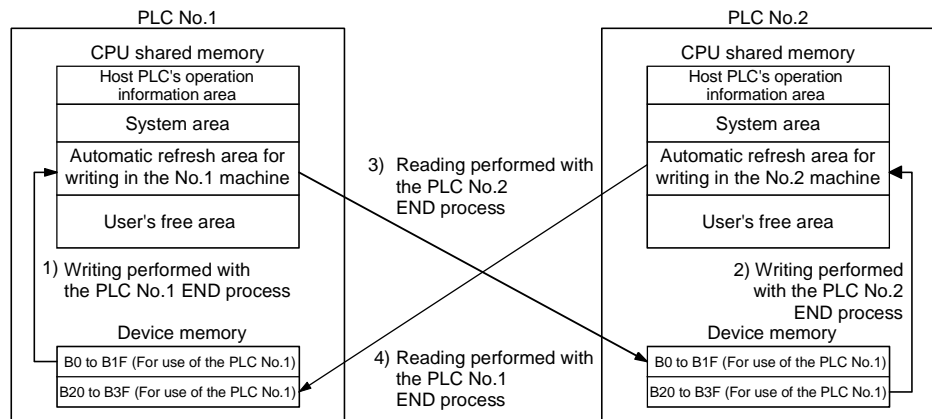
16.1 Automatic Refresh of CPU Shared Memory

(1) Automatic refresh of CPU shared memory

(a) Automatic refresh of the CPU shared memory is a function of automatic data transfer between CPU PLCs in END processing of the CPU. As the device memory data of other PLCs is automatically read when the automatic refresh function is used, is possible for the host PLC to use the device data of other PLCs. Data is transmitted between the following parties during automatic refresh of CPU shared memory.

- Between Process CPU and Process CPU
- Between Process CPU and Motion CPU
- Between Motion CPU and Motion CPU
- Between Process CPU and PC CPU module
- Between Motion CPU and PC CPU module

An outline of operations when the PLC No.1 performs automatic refresh on the 32 points between B0 and B1F, and when the PLC No.2 performs automatic refresh on the 32 points between B20 and B3F.



The processes performed during the PLC No.1 END process.

- 1): The B0 to B1F transmission device data for the PLC No.1 is transferred across to the host PLC shared memory automatic refresh area.
- 4): The data in the PLC No.2 CPU shared memory automatic refresh area is transferred across to B20 to B3F in the host PLC.

The processes performed during the PLC No.2 END process.

- 2): The B20 to B3F transmission device data for the PLC No.2 is transferred across to the host PLC shared memory automatic refresh area.
- 3): The data in the PLC No.1 CPU shared memory automatic refresh area is transferred across to B0 to B1F in the host PLC.

(b) Executing automatic refresh

Automatic refresh is executed when the CPU module is in RUN status, STOP status or PAUSE status. Automatic refresh cannot be performed when a stop error has been triggered in the CPU module. If a stop error occurs on one module, the other modules for which an error has not occurred will save the data prior to the stop error being triggered. For example, if a stop error occurs in the PLC No.2 when B20 is ON, the B20 in the PLC No.1 will remain at ON, as shown in the operation outline in fig. (a).

(c) When automatic refresh is carried out, it is necessary to set the points to be transmitted by each CPU and the device in which the data is to be stored (the device that will perform automatic refresh) with the PLC parameter multiple PLC settings.

(2) Automatic refresh settings

Set the points to be transmitted by each CPU and the device in which the data is to be stored with the PLC parameter multiple PLC settings for when automatic refresh is to be performed.

Range of transmission setting for each CPU module

Change screens Setting 1

PLC	Send range for each PLC			PLC side device	
	Point (*)	Start	End	Start	End
No.1	2	0800	0801	B0	B1F
No.2	2	0800	0801	B20	B3F
No.3	0				
No.4	0				

Switching between setting numbers

Sets the header number of the device for which automatic refresh is to be performed (uses consecutive numbers from the setup device number to the number of specified points)

(a) Setting switch/range of transmission for each CPU (refresh range)

1): It is possible to set four ranges from Setting 1 to Setting 4 for the refresh setting with the setting switch. For example, it is possible to set the refresh function to divide ON/OFF data into bit devices with Setting 1 and other data into word devices with Setting 2.

2): The transmission range for each CPU is set in units of two CPU shared memory points (two words.) (Becomes 2 points when specifying the word device with the CPU device, and 32 points when specifying the bit device.)

PLC data for which the point is set at "0" with the range of transmission for each CPU will not be refreshed.

As the bit device becomes 16 points at one point of the CPU shared memory when refreshing is performed with 32 points between B0 and B1F on the PLC No.1 and with 32 points between B20 and B3F on the PLC No.2, the number of transmission points is two for the PLC No.1 and two for the PLC No.2.

3): The number of transmission points is a maximum of 2 k points (2 k words) with a total of four ranges for each CPU module, making a total of 8 k points (8 k words) for all CPUs.

- 2 k points (2 k words) per CPU.
- 8 k points (8 k words) for all CPUs.
- Setting is in units of 2 points (2 words).

Change screens Setting 1

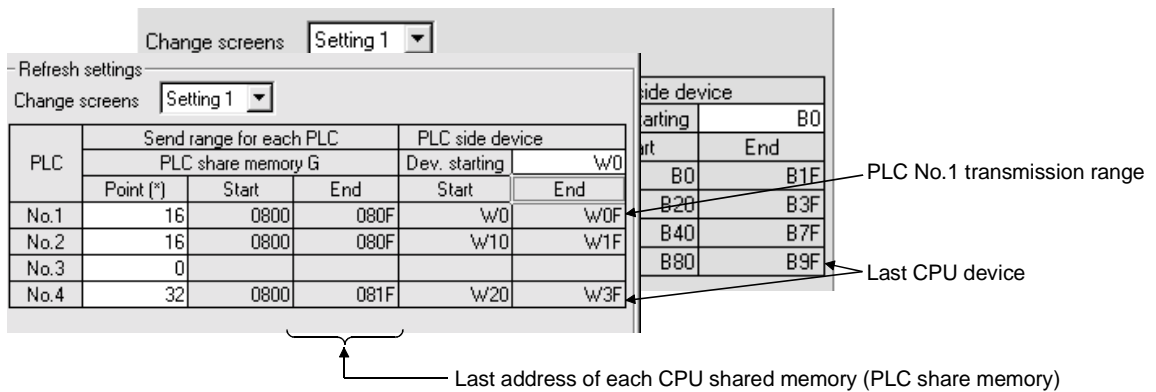
PLC	Send range for each PLC			PLC side device	
	Point (*)	Start	End	Start	End
No.1	2	0800	0801	B0	B1F
No.2	2	0800	0801	B20	B3F
No.3	4	0800	0803	B40	B7F
No.4	2	0800	0801	B80	B9F

The CPU shared memory (PLC share memory) is set in two points, and the bit device becomes 32 points when bit device is specified on the CPU device.

Not refreshed as the number of points for PLC No.3 and PLC No.4 is 0



- 4): The CPU shared memory occupied with automatic refresh refreshing becomes the total of setting 1 to setting 4. The first and last addresses of the CPU shared memory being used will be displayed in hexadecimal when the number of transmission points are set. The PLC for which the transmission points have been set in setting 1 and setting 2 will become the last address of the setting 2 CPU shared memory. (Up until 811H is used for PLC No.1 and PLC No.2, and up until 821H is used for the PLC No.4 in the illustration shown below.) The PLCs that transmits only setting 1 will become the last address of the setting 1 CPU shared memory. (PLC No.3 is up to the setting 1 address in the illustration shown below.)



- 5): The same number of transmission points must be set for all PLCs on the multiple PLC system. A "PARAMETER ERROR" occurs if the number of transmission points for one PLC is different.

(b) CPU devices

The following devices can be used for automatic refresh purposes (other devices cannot be set up with the GX Developer.)

Settable devices	Caution
Data register (D) Link register (W) File register (R, ZR)	• The device in the left column occupies one point for every transmission point
Link relay (B) Internal relay (M) Output (Y)	• Multiples of 0 or 16 are specified for the first number. • The device in the left column occupies one point for every transmission point.

- 1) CPU devices use the total amount of transmission point devices consecutively from the specified device number to the PLC No.1 to No.4 in the first set range. Set a device number so that the amount of transmission point devices can be secured. Sixteen times the number of transmission points will be set if a bit device is specified in the CPU device. For example, If the total number of transmission points for PLC No.1 to No.4 is ten, then 160 points will be set between B0 and B9F when the B0 link relay is specified.

2) The CPU devices are set as follows.

- It is possible to change the device and set up settings 1 to 4.  
The same devices can also be specified as long as the device range for settings 1 to 4 are not duplicated.

Setting 1: In the case of link relays

Change screens:

PLC	Send range for each PLC			PLC side device	
	PLC share memory G			Dev. starting	B0
	Point (*)	Start	End	Start	End
No.1	2	0800	0801	B0	B1F
No.2	2	0800	0801	B20	B3F
No.3	4	0800	0803	B40	B7F
No.4	2	0800	0801	B80	B9F

Setting 2: In the case of link registers

Change screens:

PLC	Send range for each PLC			PLC side device	
	PLC share memory G			Dev. starting	\W0
	Point (*)	Start	End	Start	End
No.1	16	0802	0811	\W0	\W0F
No.2	16	0802	0811	\W10	\W1F
No.3	0				
No.4	0				

Setting 3: In the case of link relays

Change screens:

PLC	Send range for each PLC			PLC side device	
	PLC share memory G			Dev. starting	B100
	Point (*)	Start	End	Start	End
No.1	2	0812	0813	B100	B11F
No.2	2	0812	0813	B120	B13F
No.3	4	0804	0807	B140	B17F
No.4	4	0802	0805	B180	B1BF

• It is possible to change the device and set up settings 1 to 4.

• The same devices can be specified for settings 1 to 4. However, as setting 1 in the illustration on the left uses 160 points between B0 and B9F, BA0 and higher can be used for setting 3. No part of a device number can be duplicated, as shown with B0 to B9F on setting 1 and B90 to B10F on setting 3.

The first and last will be calculated automatically with the GX Developer

- Each of the setting 1 to setting 4 devices can be set up independently.  
For example, the PLC No.1 can be set up as a link relay, and the PLC No.2 can be set up as an internal relay.

Refresh setting for PLC No.1

Change screens Setting 1

Change screens Setting 2

PLC	Send range for each PLC			PLC side device	
	Point (*)	Start	End	Start	End
No.1	16	0802	0811	w0	w0F
No.2	16	0802	0811	w10	w1F
No.3	0				
No.4	0				

PLC side device

End	w0
	B0
	B1F
	B3F
	B7F
	B9F

• When the PLC No.1 and PLC No.2 devices have been set up with different devices

Set the same point for all the PLC.

Refresh setting for PLC No.2

Change screens Setting 1

Change screens Setting 2

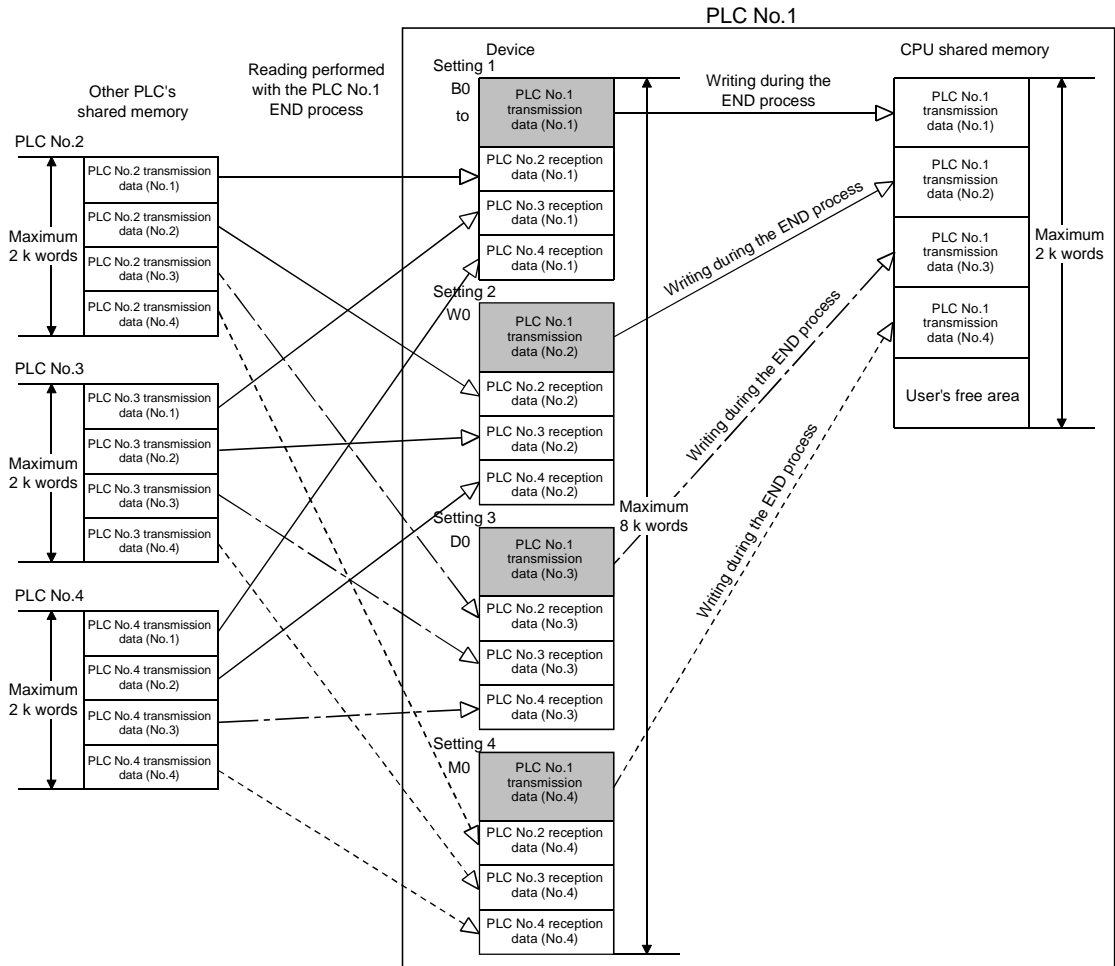
PLC	Send range for each PLC			PLC side device	
	Point (*)	Start	End	Start	End
No.1	16	0802	0811	w0	w0F
No.2	16	0802	0811	w10	w1F
No.3	0				
No.4	0				

PLC side device

End	w0
	B0
	B1F
	B3F
	B7F
	B9F

• When the PLC No.1 and PLC No.2 devices have been set up with the same device

- 3) An outline of the operations when the automatic refresh function is divided into four ranges (Setting 1: Link relay (B), Setting 2: Link register (W), Setting 3: Data register (D), Setting 4: Internal relay (M)) and then performed is shown in the illustration below.



(3) Precautions

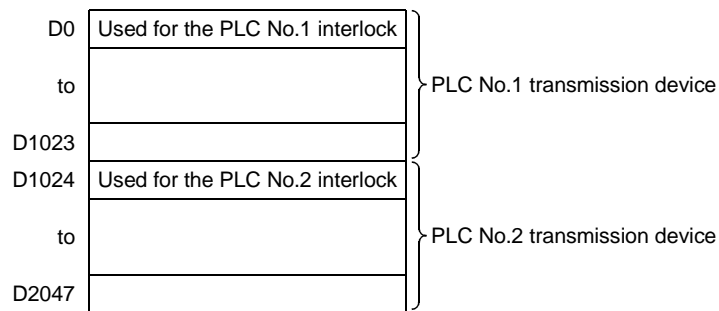
- (a) Device ranges set for the use of the automatic refresh function cannot be set in local devices.  
If the device ranges set for the use of the automatic refresh function are set in local devices, the settings will not be reflected back onto the refresh data.
- (b) Do not set devices for the use of the automatic refresh function in the file register of all programs.  
If devices for the use of the automatic refresh function are set in the file register of all programs, automatic refresh will be performed on the file register that corresponds with the last scan execution type program executed.

- (c) There are cases where old data and new data will become mixed up for each PLC depending on the timing of refreshing the host PLC and reading data from other PLCs.

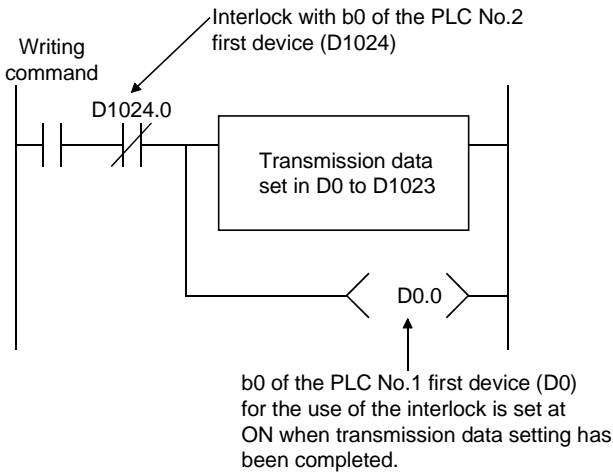
When performing the automatic refresh function, create an interlock program similar to the one shown below that uses the first device to be refreshed for each PLC, and do not use the data from other PLCs when old data does get mixed up with new data.

An example of a program set up with the following multiple PLC setting refresh settings is shown below.

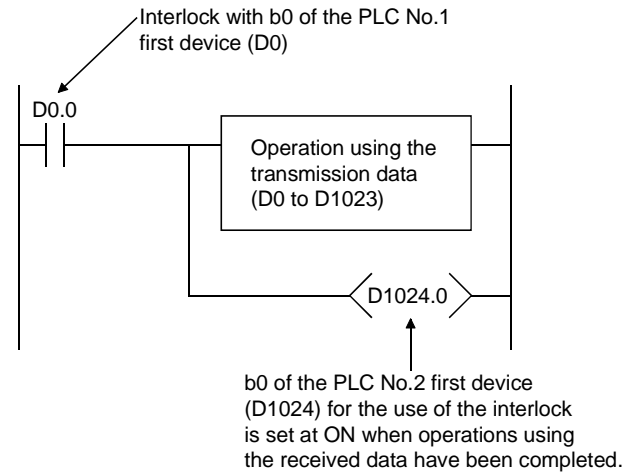
- CPU device: D0
- PLC No.1 transmission points: 1024 points (D0 to D1023)
- PLC No.2 transmission points: 1024 points (D1024 to D2047)



Example of a program on the transmission side

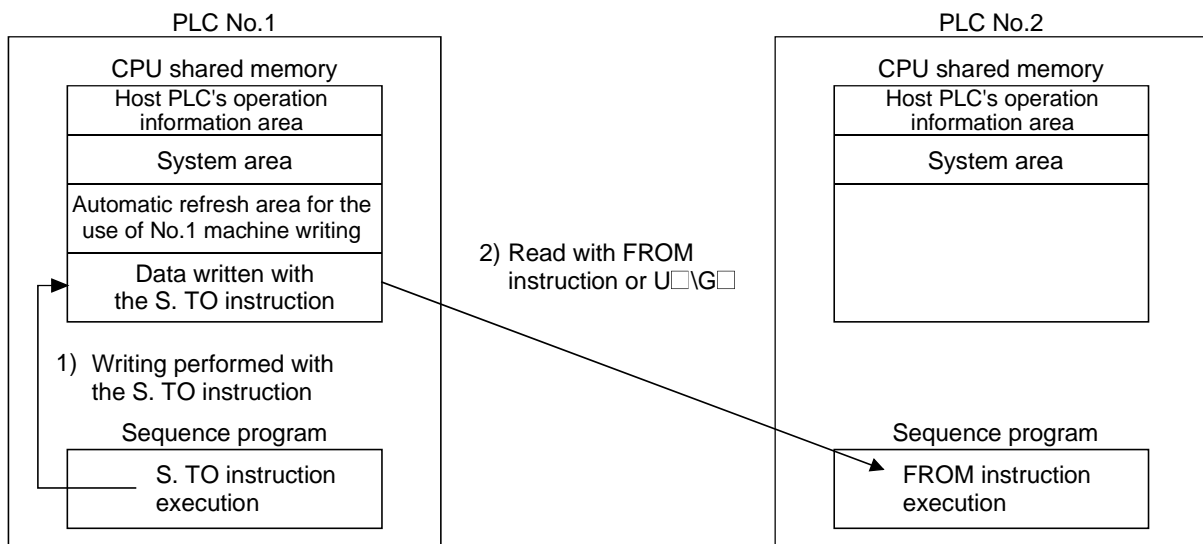


Example of a program on the reception side



16.2 Communication with Multiple PLC Instructions and Intelligent Function Module Devices

- (1) Communication with multiple PLC instructions (S. TO instruction / FROM instruction) and intelligent function module device (U□\G□)  
 The Process CPU of a multiple PLC system can use an S. TO instruction, FROM instruction and intelligent function module device (U□\G□) to access the CPU shared memory of the CPU module.  
 The data written in the CPU shared memory of the host PLC with an S. TO instruction can be read by another PLC using an FROM instruction or intelligent function module device (U□\G□).  
 Contrary to the automatic refresh function for the CPU shared memory, it is possible to read data directly when this instruction is executed.  
 An outline of a process where data written in the CPU shared memory of PLC No.1 with an S. TO instruction is read by the PLC No.2 using an FROM instruction or intelligent function module device (U□\G□) is shown in the figure below.



PLC No.1 processing

- 1): Data is written into the user's free area on the PLC No.1 with the S. TO instruction.

PLC No.2 processing

- 2): An FROM instruction or the intelligent function module device (U□\G□) is used to read data from the free user area of the PLC No.1 to the designated device.

Refer to the following manual for further details on the S. TO and FROM instructions.

QCPU (Q mode)/QnACPU Programming Manual (Common Instructions)

**POINT**

The Motion CPU cannot use the S. TO instruction, FROM instruction or intelligent function module device.  
 Use "automatic refresh of the CPU shared memory" or "communication dedicated instructions between multiple PLCs" to communicate between the Process CPU and Motion CPU.  
 For the accessing method from the PC CPU module to the CPU shared memory, refer to the manual of the PC CPU module command between multiple PLCs.

(2) Precautions

- (a) The following values are set in the CPU module's first I/O number with the FROM instruction, the S. TO instruction and instructions that use U□\G□.

PLC No.	PLC No.1	PLC No.2	PLC No.3	PLC No.4
Value set in the first I/O number	3E0H	3E1H	3E2H	3E3H

- (b) Do not perform writing as reading in the system area or automatic refresh area for the CPU shared memory (see Section 16.4).
- (c) An error will not occur when CPUs accessed with the FROM instruction, the S. TO instruction and instructions that use U□\G□ are reset. However, access execution flag (SM390) will remain OFF when instruction execution has been completed.
- (d) Establish an interlock to prevent simultaneous access during interactive data communication with the FROM instruction, the S. TO instruction and instructions that use U□\G□. There are cases where old data and new data will be mixed together if simultaneous access is carried out.
- (e) The instruction that uses the S. TO instruction/U□\G□ cannot be used to write data to the CPU shared memory of other PLCs. "SP. UNIT ERROR (error code: 2115)" occurs if data is written to the CPU shared memory of other PLCs with the instruction that uses U□\G□. "SP. UNIT ERROR (error code: 2117)" occurs if data is written to the CPU shared memory of other PLCs with the instruction that uses the S. TO instruction.
- (f) "SP. UNIT ERROR (error code: 2114)" also occurs if data is written into the CPU shared memory of the host PLC with instructions that use U□\G□.
- (g) "SP. UNIT ERROR (error code: 2114)" occurs if data is read from the CPU shared memory of the host PLC with the FROM instruction and instructions that use U□\G□.
- (h) "SP. UNIT ERROR (error code: 2110)" also occurs if access is attempted on a non-mounted PLC with instructions that use U□\G□.

16.3 Interactive Communications between The Process CPU and Motion CPU

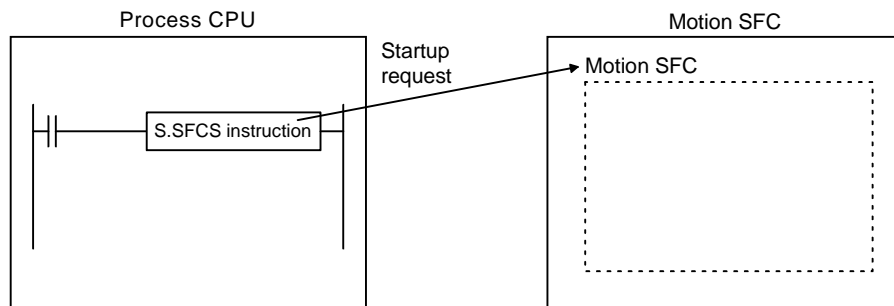
16.3.1 Control commands from the Process CPU to the Motion CPU

It is possible to issue control commands from the Process CPU to the Motion CPU, and read and write device data with the Motion dedicated PLC instructions listed below.

(Control commands from Motion CPU to Motion CPU can not be used.)

Instruction name	Description
S.SFCS SP.SFCS	Requests startup of the motion SFC program.
S.SVST SP.SVST	Requests the start of operations for the servo program.
S.CHGV SP.CHGV	Changes the speed of the axes during positioning and JOG operations.
S.CHGT SP.CHGT	Changes the torque control value during operation and suspension when in the real mode.
S.CHGA SP.CHGA	Changes the current values of the halted axes, the synchronized encoder, and the cam axes.

For example, it is possible to start up the Motion CPU's motion SFC from the Process CPU with the S (P).SFCS instruction.



**POINT**

One Process CPU module can operate up to 32 " Motion dedicated PLC instructions " and "communication dedicated commands between multiple PLCs (omitting the S (P).GINT instruction)" at one time. However, if the Motion dedicated PLC instructions and communication dedicated instructions between multiple PLCs (omitting S (P).GINT instruction) are made at the same time, the instructions will be executed in order from the first instruction accepted. If there are 33 or more unexecuted instructions, an "OPERATION ERROR (error code: 4107)" will be triggered.

**REMARK**

Refer to the Motion CPU Programming manual for details on and the necessity of use of the motion only instructions.

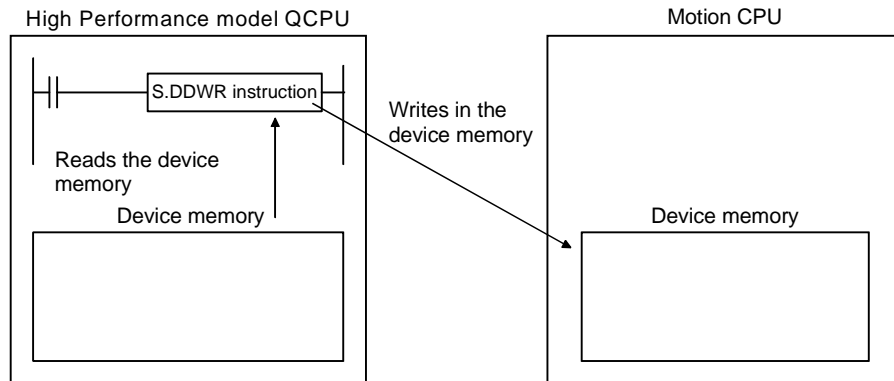


16.3.2 Reading and writing device data

It is possible to read and write device data into the Motion CPU/PC CPU module from the Process CPU with the the communication dedicated instructions between multiple PLCs listed in the table below.  
 (Reading or writing can not take place from the Process CPU to the Process CPU, Motion CPU to the Process CPU, or Motion CPU to Motion CPU.)

Instruction name	Description	CPU module	
		Motion CPU	PC CPU module
S.DDWR SP.DDWR	Writes host CPU device data into other CPU devices.	○	○
S.DDRD SP.DDRD	Reads other CPU device data into the host CPU.	○	○
S.GINT SP.GINT	Requests start up of other CPU interruption programs.	○	×

For example, Process CPU device data can be written into the Motion CPU's device data with the S.DDWR instruction of the communication dedicated instruction between multiple PLCs.



**POINT**  
 One Process CPU can operate up to 32 " Motion dedicated PLC instructions " and "communication dedicated commands between multiple PLCs (omitting the S (P).GINT instruction)" at one time. However, if the Motion dedicated PLC instructions and communication dedicated instructions between multiple PLCs (omitting S (P).GINT instruction) are made at the same time, the instructions will be executed in order from the first instruction accepted. If there are 33 or more unexecuted instructions, an "OPERATION ERROR (error code: 4107)" will be triggered.

**REMARK**

Refer to the Motion CPU Programming Manual for details on and the necessity of use of the communication dedicated instructions between multiple PLCs.

16.4 CPU Shared Memory

The CPU shared memory is for exchanging data between CPU modules, and consists of 4,096 words between 0H and FFFH.

The CPU shared memory consists of four areas; the host PLC operation information area, the system area, the automatic refresh area, and the user's free area. An area consisting of the number of automatic refresh points from 800H is used as the automatic refresh area when the automatic refresh of device data is set up. The beginning of the user's free area starts from the address immediately after the end of the automatic refresh area. 800H to 811H becomes the automatic refresh area if the number of automatic refresh points is 18 (11H points,) and the area after 812H becomes the user's free area. The configuration of the CPU shared memory and the necessity of accessing sequence programs are shown in the illustration below.

CPU shared memory		Host PLC		Other PLCs	
		Writing*1	Reading	Writing	Reading*2
0H	Host PLC operation information area	Disable	Disable	Disable	Enable
to 1FFH					
200H	System area	Disable	Disable	Disable	Disable
to 7FFH					
800H	Automatic refresh area	Disable	Disable	Disable	Disable
to FFFH	User's free area	Enable	Disable	Disable	Enable

**REMARK**

- \*1: Use the S. TO instruction to write the free user area of the host PLC from the Process CPU.  
The Motion CPU is not provided with an S. TO instruction, so that it cannot write in the free user area of the host PLC.  
For the writing method from the PC CPU module to the free user area of the host PLC, refer to the manual of the PC CPU module.
- \*2: To read from the Process CPU, use the FROM instruction or intelligent function module device (U□\G□).  
Because the Motion CPU is not provided with the FROM instruction or intelligent function module device, data cannot be read from the Motion CPU.  
For reading from the PC CPU module, refer to the manual of the PC CPU module.

(1) Host PLC operation information area (0H to 1FH)

- (a) The following information is stored in the host PLC with multiple PLC systems. These will all remain as 0 and will not change in the case of single CPU systems. \*1

Table 16.1 List of host PLC operation information area

CPU shared memory address	Name	Detail	Description * 2	Corresponding special register
0H	Availability of information	Information availability flag	The area to confirm if information is stored in the host PLC's operation information area (1H to 1FH,) or not. <ul style="list-style-type: none"> <li>• 0: Information not stored in the host PLC's operation information area</li> <li>• 1: Information stored in the host PLC's operation information area</li> </ul>	—
1H	Diagnostic error	Diagnostic error number	The numbers of errors during diagnostics is stored with BIN.	SD0
2H	Time the diagnosis error occurred	Time the diagnosis error occurred	The year and month that the error number was stored in the CPU shared memory's 1H address is stored with two digits of the BCD code.	SD1
3H			The day and time that the error number was stored in the CPU shared memory's 1H address is stored with two digits of the BCD code.	SD2
4H			The minutes and seconds that the error number was stored in the CPU shared memory's 1H address is stored with two digits of the BCD code.	SD3
5H	Error information identification code	Error information identification code	Stores an identification code to determine what error information has been stored in the common error information and individual error information.	SD4
6H to 10H	Common error information	Common error information	The common information corresponding with the number of the error during diagnostic is stored.	SD5 to SD15
11H to 1BH	Individual error information	Individual error information	The individual information corresponding with the number of the error during diagnostic is stored.	SD16 to SD26
1CH	Empty	—	Cannot be used	—
1DH	Switch status	CPU switch status	Stores the CPU module switch status.	SD200
1EH	LED status	CPU-LED status	Stores the CPU module's LED bit pattern.	SD201
1FH	CPU operation status	CPU operation status	Stores the CPU module's operation status.	SD203

- (b) The host PLC's operation information area is updated when the contents of the corresponding register change. However, there are times when changes in the corresponding register are relayed by a maximum of 200ms when the Process CPU's scan time is 200ms or less.  
 There are times when changes in the corresponding register are delayed by 200ms or more if the Process CPU's scan time exceeds 200ms.
- (c) The Process CPU of another PLC can use FROM instruction or intelligent function module device to read data from the action data area of the host PLC.  
 However, because there is a delay in data updating, use the read data for monitoring purposes.

**REMARK**

- \*1: For the Motion CPU, 5H to 1CH of the host PLC's operation information area is not used. If 5H to 1CH of the host PLC's operation information area is read from the Motion CPU, it will be read as "0."  
 \*2: Refer to the corresponding special registers for further details.

(2) System area (200H to 7FFH)

The area used by the CPU module systems (OS.) This is used by the OS when communication dedicated instructions between multiple PLCs are executed.

(3) Automatic refresh area

The area used when the multiple PLC system is automatically refreshed. Writing is not enabled with the S. TO instruction, and reading is not enabled with the FROM instruction or intelligent function module device (U□\G□).

(4) User's free area

The area for performing communication between CPU modules with the multiple PLC system's S. TO instruction, FROM instruction and intelligent function module device (U□\G□).

The area used after the number of points set for automatic refresh is used. (An area between 800H and FFH can be used as the user's free area when automatic refresh is not being performed.)

## 17 COMMUNICATIONS BETWEEN THE MULTIPLE PLC SYSTEM'S I/O MODULES AND INTELLIGENT FUNCTION MODULES

### 17.1 Range of Control PLC Communications

The relationship between control PLCs and control modules (I/O modules, intelligent function modules) is the same as with independent CPU systems.

There is no restriction to control the control module with the control PLC.

### 17.2 Range of Non-control PLC Communications

It is possible for non-control PLCs to read the contents of the intelligent function module's buffer memory.

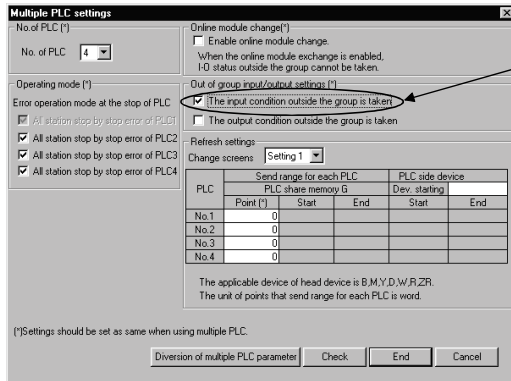
It is also possible to load non-control module input (X) ON/OFF data and another PLC module output (Y) ON/OFF data with the PLC parameters.

Input modules controlled by other PLCs can be used as interlocks for the host PLC, and the output status to external equipment being controlled by other PLCs can be confirmed.

However, it is not possible for non-control PLCs to output ON/OFF data to output modules or intelligent function modules, or write in the buffer memory of intelligent function modules.

(1) Loading input (X) from input modules and intelligent function modules

The "Out of group input/output settings" setting in the PLC parameter's multiple PLC settings determines whether input can be loaded from input modules and intelligent function modules being controlled by other PLCs.



Input outside of group setting  
 Input condition of group outside is taken:  
 "Do not load input condition outside of group" setting  
 Input condition of group outside is taken:  
 "Load input condition outside of group" setting

(a) When "Load input condition outside of group" has been set

- 1) Loads ON/OFF data from the input and intelligent function modules being controlled by the other PLCs by performing input refresh before a sequence program calculation starts.
- 2) Input (X) loading is performed for the modules mounted onto the following additional base unit slots.

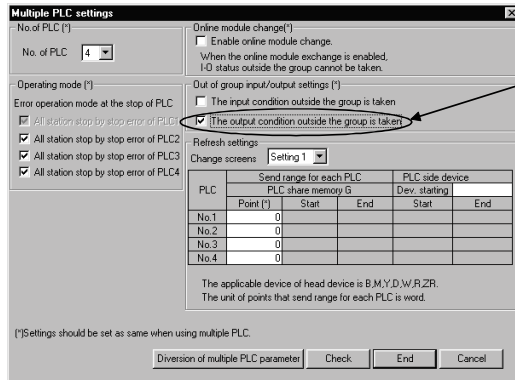
I/O allocation type	Mounted module	Remarks
None	Input module	—
	Intelligent function module	—
Input	Input module	—
	Output module	Loads OFF data
Intelli.	Intelligent function module	—

- 3) It is possible to load ON/OFF data from input modules and intelligent function modules with direct access input.
- 4) Remote station input, such as empty slots, MELSECNET/H and CC-Link, cannot be loaded.  
Use automatic refresh of device data to use the ON/OFF input data for MELSECNET/H, CC-Link and other remote stations in other PLCs.

(b) When "Do not load input condition outside of group" has been set  
 It is not possible to loads ON/OFF data from input modules and intelligent function modules being controlled by other PLCs (remains at OFF.)

(2) Loading output (Y)

The "Out of group input/output settings" setting in the PLC parameter's multiple PLC settings determines whether output can be loaded from output modules and intelligent function modules being controlled by other PLCs.



- Input outside of group setting
- Output condition of group is taken:  
"Do not load output outside of group" setting
  - Output condition of group is taken:  
"Load output outside of group" setting

(a) When "Load output condition outside of group" has been set

- 1) Loads to the host PLC's output (Y) the ON/OFF data that is output to the output and intelligent function modules by the other PLCs by performing output refresh before a sequence program calculation starts.
- 2) Output (Y) loading is performed for the modules mounted onto the following additional base unit slots.

I/O allocation type	Mounted module	Remarks
None	Output module	—
	Intelligent function module	—
Output	Input module	—
	Output module	—
Intelli.	Intelligent function module	—

- 3) It is possible to load output ON/OFF data being controlled by other PLCs with direct access output.
- 4) Remote station output, such as empty slots, MELSECNET/H and CC-Link, cannot be loaded.  
Use automatic refresh of CPU shared memory and send the ON/OFF output data for remote stations to use the ON/OFF output data for MELSECNET/H, CC-Link and other remote stations in other PLCs.

(b) When "Do not load output condition outside of group" has been set  
It is not possible to load ON/OFF data output to output modules and intelligent function modules by other PLCs into the host PLC's output (Y) (remains at OFF.)

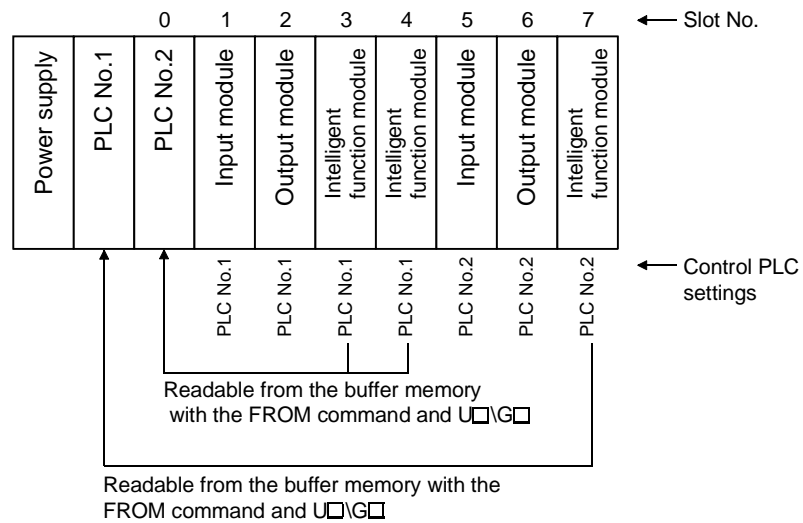
(3) Output to output modules and intelligent function modules

It is not possible to output ON/OFF data to non-control modules. ON/OFF will be performed within the Process CPU when the output from output modules and intelligent function modules controlled by other PLCs, such as sequence programs, have been set to ON/OFF, but this will not be output to output modules or intelligent function modules.

(4) Accessing the intelligent function module buffer memory

(a) It is possible to read data from the buffer memory of intelligent function modules being controlled by other PLCs with the commands listed below.

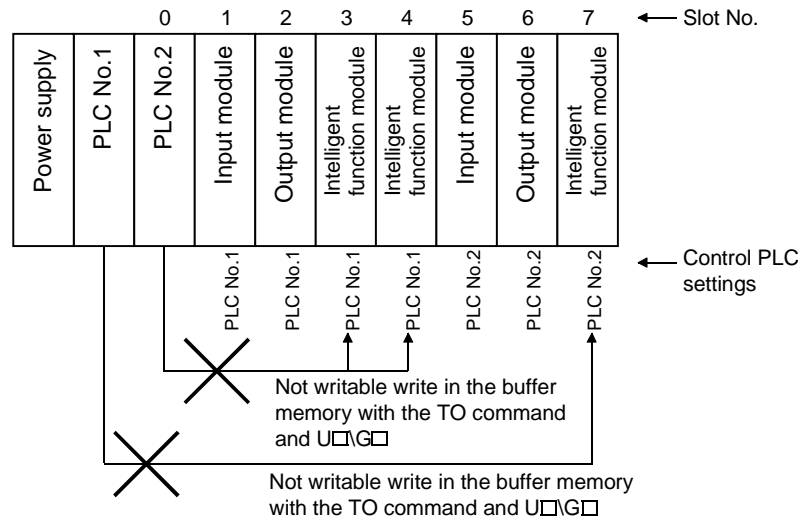
- FROM command
- Commands that use intelligent function module devices (U□\G□)



(b) It is not possible to write in the buffer memory of intelligent function modules being controlled by other PLCs.

- TO instruction
- Intelligent function module devices (U□\G□)
- Intelligent function modules dedicated commands

An "SP UNIT ERROR (error code: 2116)" will be triggered if an attempt to write in the intelligent function module controlled by other PLCs is carried out.





(5) Accessing MELSECNET/H modules

Only control PLCs can access MELSECNET/H modules.

Link direct devices cannot be used in MELSECNET/H modules being controlled by other PLCs.

"OPERATION ERROR (error code: 4102)" occurs if a program that uses link direct devices is used in MELSECNET/H modules being controlled by other PLCs.

## 18 PROCESSING TIME FOR MULTIPLE PLC SYSTEM PROCESS CPUS

### 18.1 Concept behind CPU Scanning Time

The concept behind multiple PLC system scanning time is the same as the single CPU system.

See Section 11.1 for details of the scan time concept.

This chapter provides explanations on the factors to be added to the scan time calculated as explained in Section 11.1 and the method of calculating processing time when configuring multiple PLC systems.

#### (1) I/O refresh time

Input refresh time is calculated in accordance with the equation explained in Section 11.1.

The I/O refresh time for the following values only are prolonged when bus access overlaps with other PLCs.

(Prolonged time) =  $\frac{(\text{input points} + \text{output points})}{16} \times N3 \times (\text{number of other PLCs}) (\mu s)$

Use the following values for N3

CPU type	N3	
	Systems with only a main base unit	Systems that include additional base units
Q12PHCPU, Q25PHCPU	8.7 $\mu s$	21 $\mu s$

#### (2) Total value of command execution time

Refer to the following manual for details on the processing time of special multiple PLC commands, and the processing time for commands that have different processing times with multiple PLC systems.

- QCPU (Q mode)/QnACPU Programming Manual (Common Instructions)

#### (3) END process

The following tables shows the END processing time.

CPU type	END processing time
Q12PHCPU, Q25PHCPU	0.19 ms

18.2 Factor to Prolong the Scan Time

The processing time for multiple PLC systems is prolonged in comparison with single CPU systems when the following functions are used.

Add the following values to the values calculated in Sections 11.1 and 18.a to acquire the amount of time used by these functions.

- Multiple PLC system automatic refresh
- MELSECNET/H refreshing
- CC-Link automatic refresh

(1) Automatic refresh of CPU shared memory

- (a) The amount of time required to perform the refresh function set up with the multiple PLC settings.  
 This value is the total amount of time required for writing into the host PLC's CPU shared memory, and the amount of time required to read from other PLCs' CPU shared memories.  
 These values are added when setting up the refresh settings with the PLC parameter multiple PLC settings.
- (b) The automatic refresh period of the CPU shared memory is calculated in the following equation.

(Automatic refresh time) =  $(N1 + (\text{received word points}) \times N2) \times (\text{number of other PLCs}) + (N3 + (\text{transmitted word points}) \times N4) (\mu s)$

- The received word points must equal the word points transmitted by other PLCs.  
 For example, if the host PLC is the PLC No.1, then this value must equal the number of points transmitted for the PLC No.2 to PLC No.4.
- Use the following values for N1 to N4.

CPU type	N1	N2	N3	N4
Q12PHCPU, Q25PHCPU	27 $\mu s$	0.44 $\mu s$	27 $\mu s$	0.08 $\mu s$

- (c) The amount of time required for the automatic refresh process will be prolonged by the following amount of time when processing is duplicated with the automatic refresh function on other PLCs.

(Prolonged time) =  $(\text{transmitted/received word point}) \times N5 \times (\text{number of other PLCs}) (\mu s)$

Use the following values for N5

CPU type	N5	
	Systems with only a main base unit	Systems that include additional base units
Q12PHCPU, Q25PHCPU	0.54 $\mu s$	1.3 $\mu s$

(2) MELSECNET/H refresh

- (a) The amount of time required for performing the refresh process between Process CPU and MELSECNET/H network modules.  
Refer to the following manual for details on the refresh time for MELSECNET/H.
  - Q Corresponding MELSECNET/H Network System Refresh Manual
- (b) The amount of time required for the automatic refresh process will be prolonged only by the following amount of time when requests for refreshing are issued by other MELSECNET/H modules at the same time on a multiple PLC system.

(Prolonged time) = (transmitted/received word point) × N5  
 × (number of other PLCs) (μs)

The number of words transmitted/received is the total value of the following transferal data.

- Link refresh data :  $\frac{(LB + LX + LY + SB)}{16} + LW$
- Data transferred to the memory card's file register :  $\frac{(LB + LX + LY + SB)}{16} + LW$
- Transferal between data links :  $(\frac{LB}{16} + LW) \times 2$

Refer to the following table for N5

CPU type	N5	
	Systems with only a main base unit	Systems that include additional base units
Q12PHCPU, Q25PHCPU	0.54 μs	1.30 μs

(3) CC-Link automatic refresh

- (a) The amount of time required for performing the refresh process between Process CPU and CC-Link master local modules.  
Refer to the following manual for details on the automatic refresh time for CC-Link.
  - QJ61BT11 CC-Link System Master Local Module User's Manual
- (c) The amount of time required for the automatic refresh process will be prolonged only by the following amount of time when requests for refreshing are issued by other CC-Link modules at the same time on a multiple PLC system.

(Prolonged time) = (transmitted/received word point) × N5  
 × (number of other PLCs) (μs)

The amount of data transmitted/received is the following transferal data.

- Link refresh data :  $\frac{(RX + RY + SB)}{16} + SW$

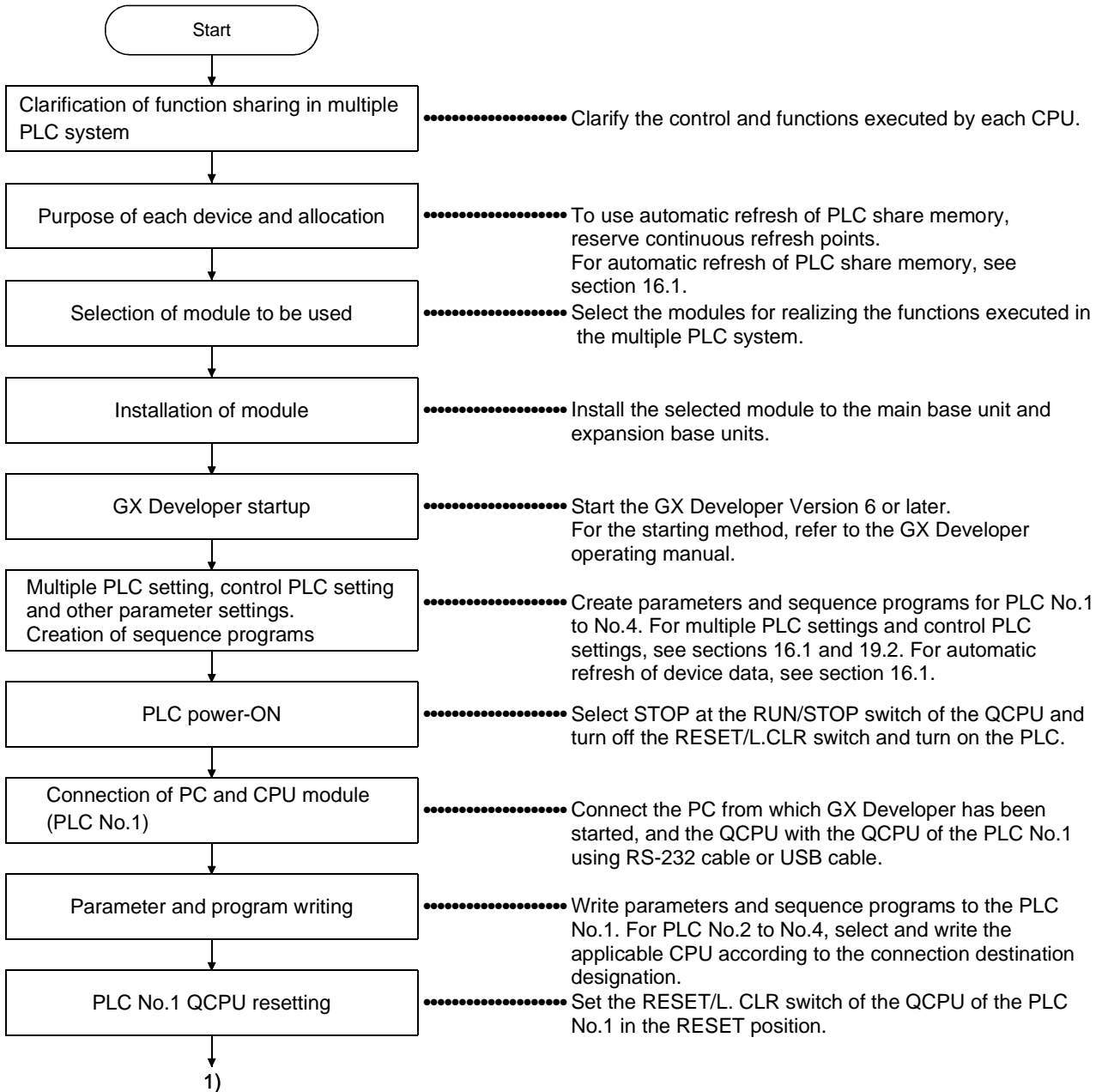
Refer to the following table for N5

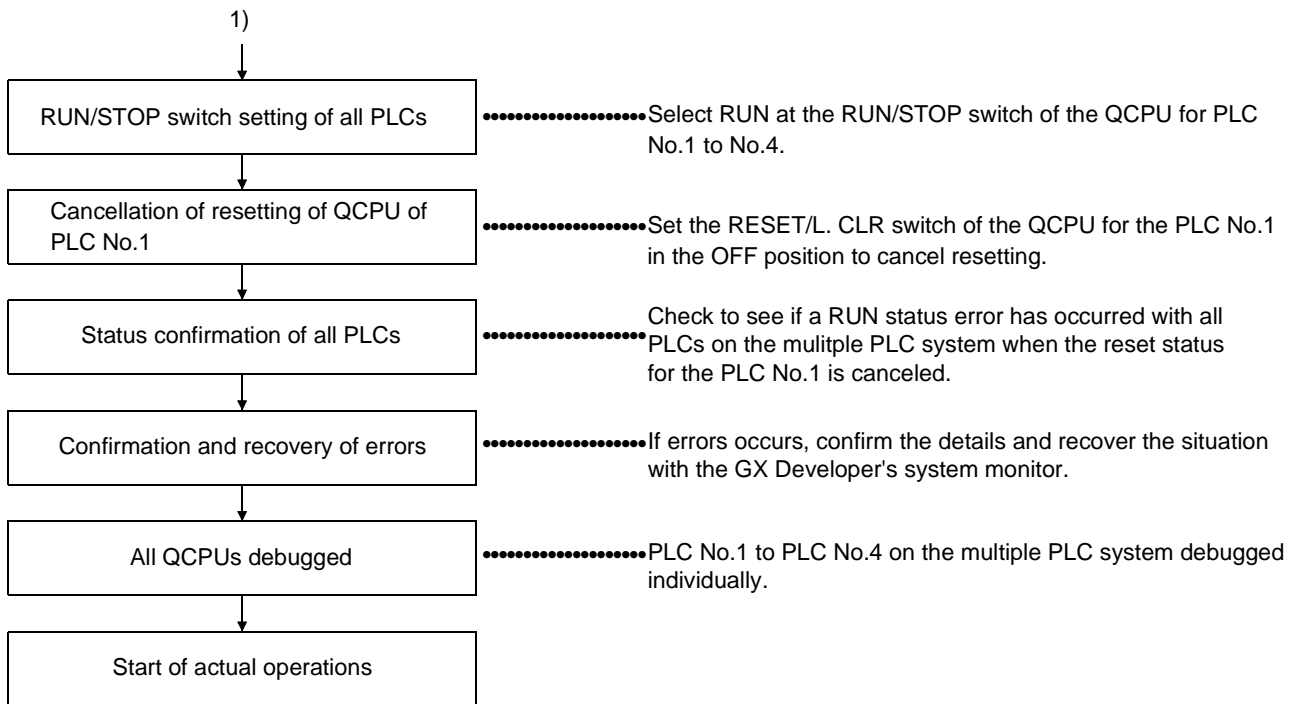
CPU type	N5	
	Systems with only a main base unit	Systems that include additional base units
Q12PHCPU, Q25PHCPU	0.54 μs	1.30 μs

## 19 STARTING UP THE MULTIPLE PLC SYSTEM

This Chapter explains the standard procedures for starting up the multiple PLC system.

### 19.1 Flow-chart for Starting Up the Multiple PLC System



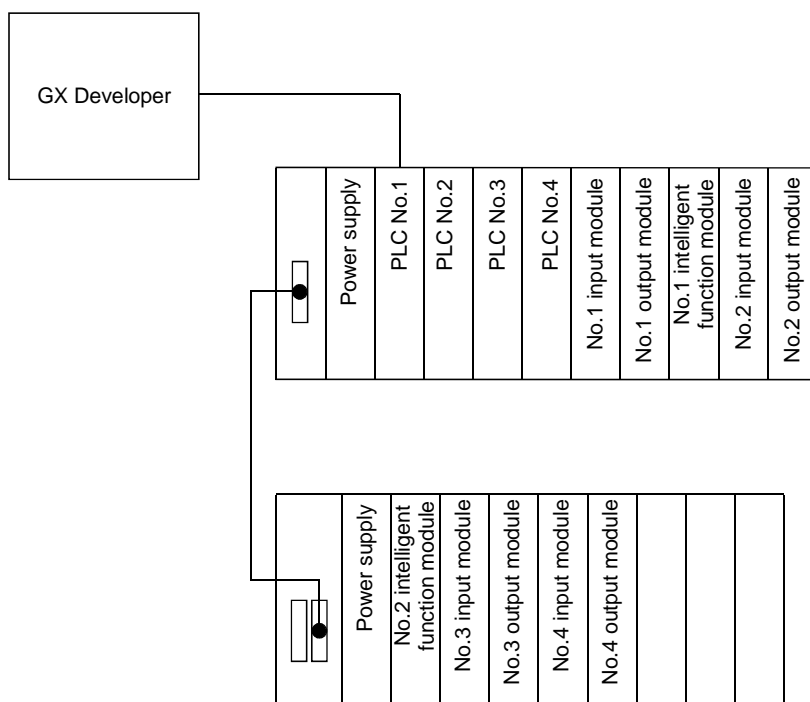


### 19.2 Setting Up the Multiple PLC System Parameters (Multiple PLC Settings, Control PLC Settings)

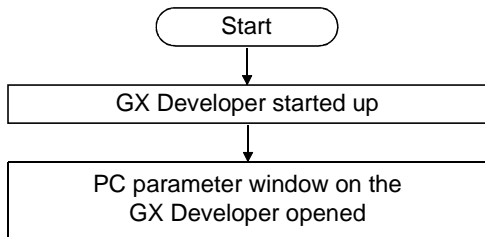
This section explains the procedures for setting up the multiple PLC system parameters with GX Developer.  
 Refer to the GX Developer's operation manual for details on setting up all other parameters.

#### 19.2.1 System configuration

The following shows an example procedures for setting up the multiple PLC system parameters.

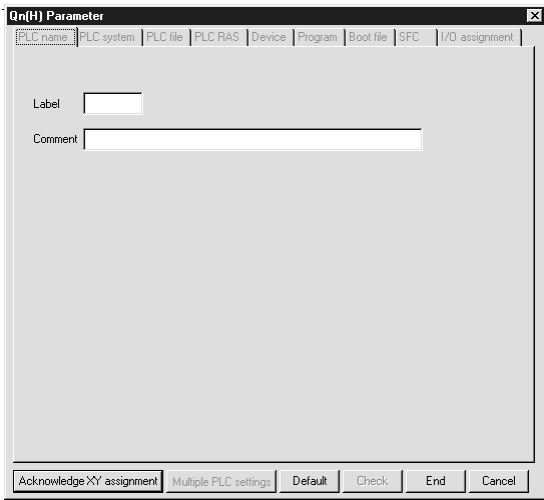


19.2.2 Creating new systems

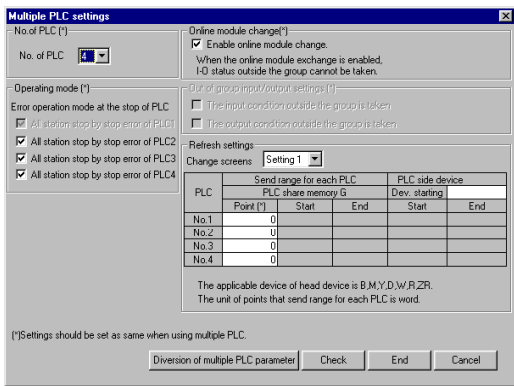


Refer to GX Developer operating manual

Refer to GX Developer operating manual



Select "Multiple PLC Settings" to display the multiple PLC setup window.



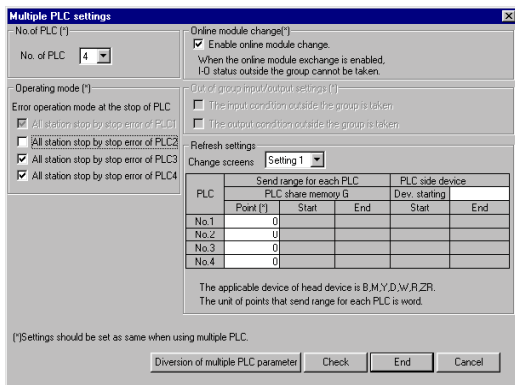
Setting the number of CPUs (required item)

- Sets the number of CPU modules to be mounted onto the main base unit with the multiple PLC system.

1)



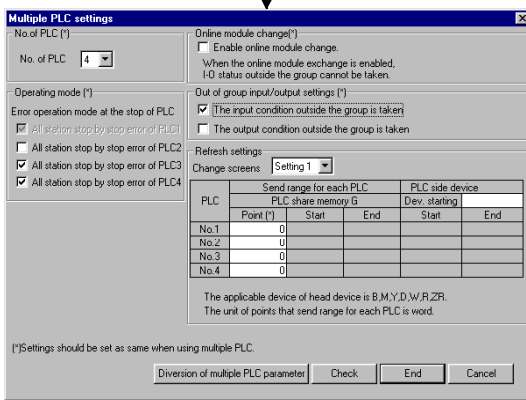
1)



Setting the operating mode (optional)

- Selects whether to halt operations for all PLCs or continue with operations when a stop error occurs.  
Default: Stop all PLCs upon a stopping error at PLC No.2, No.3 or No.4. (No check).
- For example, if the tick beside the "All station stop by stop error of PLC2" is removed, the operations for all other PLCs will continue even when an error occurs in the PLC No.2.
- The operation mode for the PLC No.1 cannot be changed.

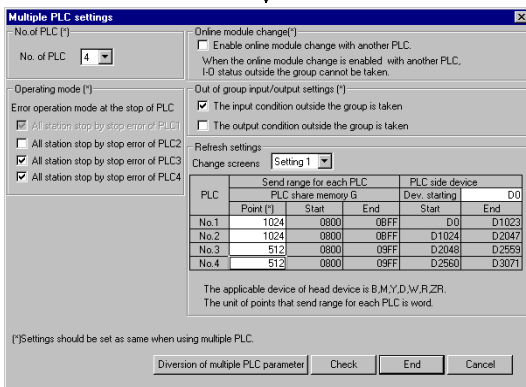
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Out of the group input/output settings (optional)

- Sets whether or not the I/O status of non-control PLCs are acquired.  
Default: Do not acquire. (No check)

↓



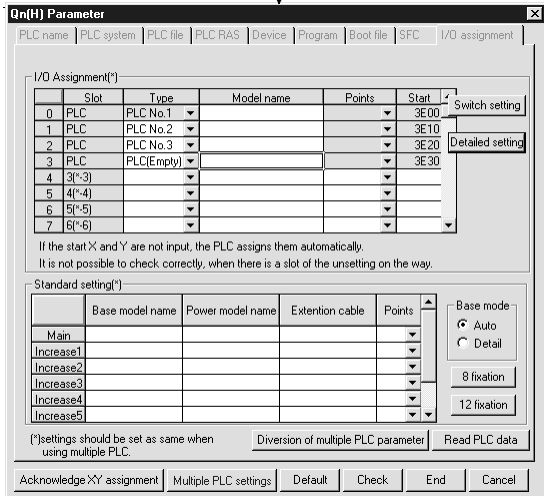
Multiple PLC system (optional)

- Sets the device and number of PLC share memory G points to perform data communications with the automatic refresh process between CPU modules.
- This is linked from the device number set with the first device to the number of PLC share memory G points and used. The 1st PLC share memory G point occupies the points shown in the table below.

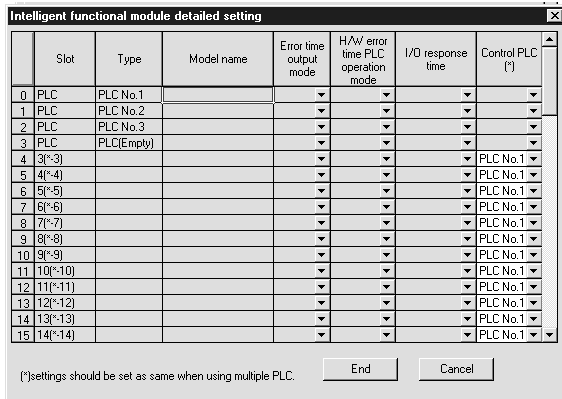
Device	Points occupied
B, M, Y	16 points
D, R, ZR	1 point

2)

2)

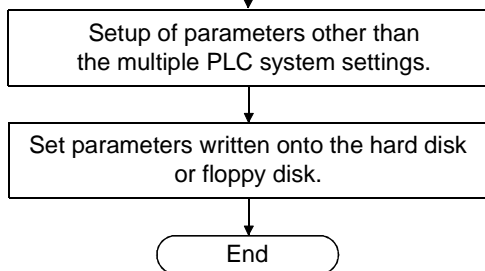


Selects "CPU (Empty)" for the slots on which CPU modules are not to be mounted by type. Select "Detailed Settings" on the I/O assignment window to display the detail settings window.



Control PLC settings (required item)

- Selects the control PLCs (PLC No.1 to No.4) for each slot.
- Function version A intelligent function modules set the control PLC No.1.
- Output modules and special function modules that support the AnS series set a single PLC in all slots.

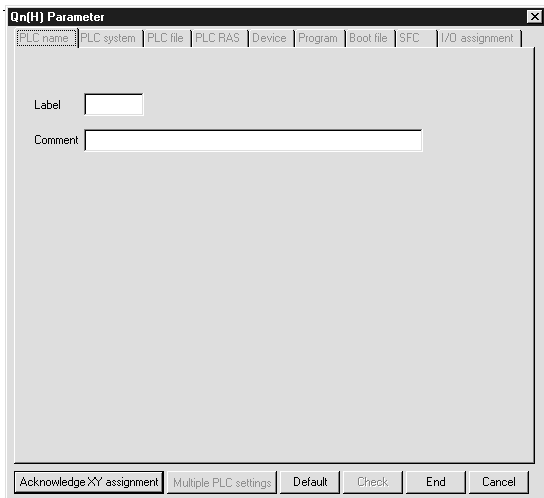


19.2.3 Using existing preset multiple PLC settings and I/O allocations

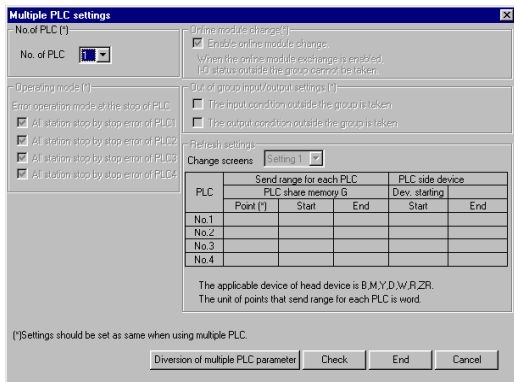
Start

GX Developer started up

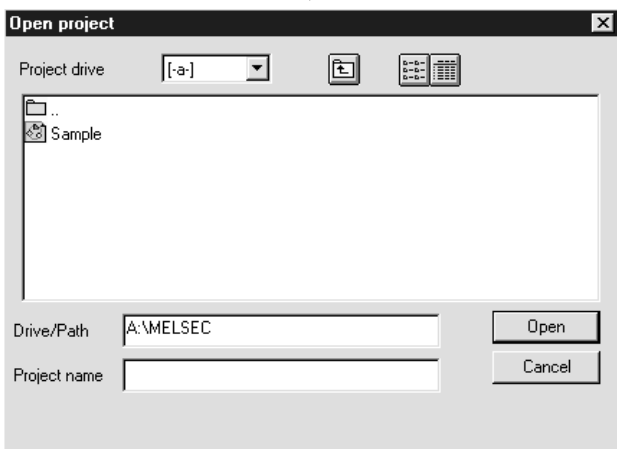
Refer to the GX Developer's operation manual



Opens the GX Developer's PC parameter setup window. Select "Multiple PLC settings" to display the multiple PLC setup window.



Transferring multiple PLC settings  
Click on "Diversion multiple PLC parameters."

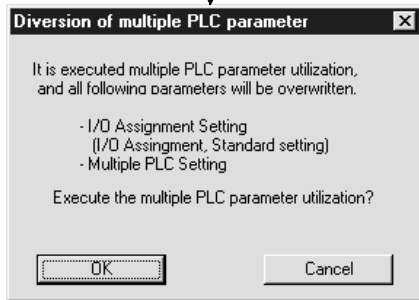


Setting up transferred projects

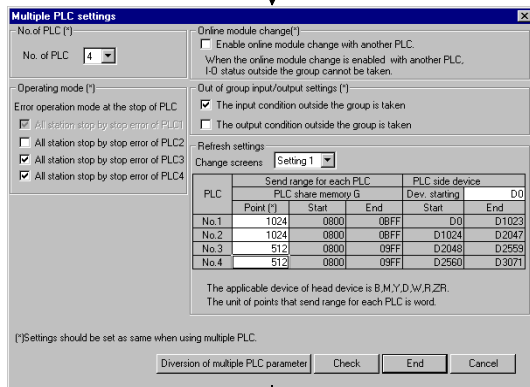
- Select the project into which existing multiple PLC settings and I/O allocations are to be transferred.
- Click on "Open."

1)

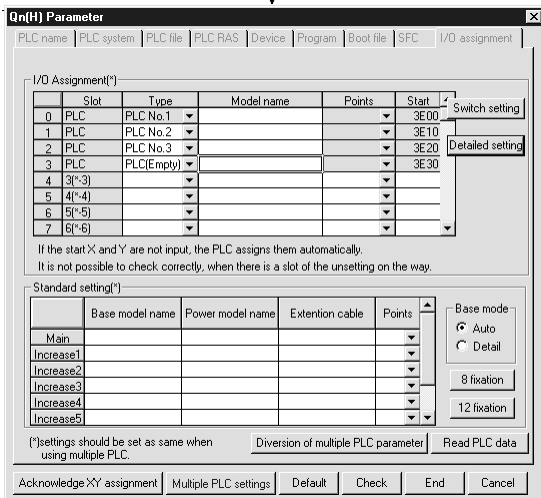
1)



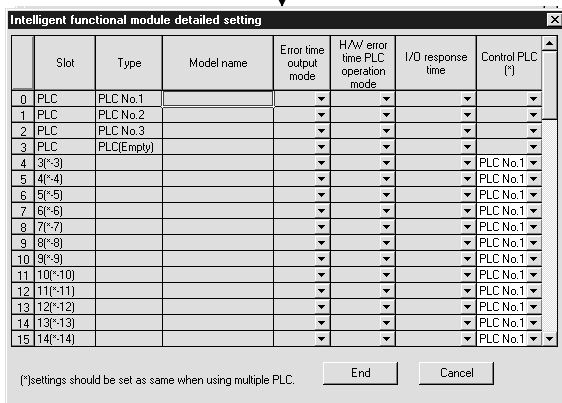
The multiple PLC settings and I/O Assignment Setting data are read and written into the specified project when "OK" is selected.



Confirming the multiple PLC settings  
When changing the CPU devices in the "Refresh settings", enter the device number after it has been changed. ("\*" indicates the item can be changed.)

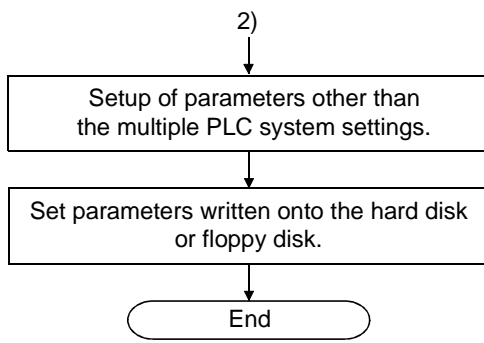


Confirm the I/O Assignment and standard settings on the I/O Allocation Window.  
Select "Detailed Settings" to display the detailed setting window.



Confirm the control PLC settings.

2)





## APPENDIX

## APPENDIX 1 Special Relay List

Special relays, SM, are internal relays whose applications are fixed in the PLC.

For this reason, they cannot be used by sequence programs in the same way as the normal internal relays.

However, they can be turned ON or OFF as needed in order to control the CPU module and remote I/O modules.

The headings in the table that follows have the following meanings.

Item	Function of Item
Number	• Indicates the number of the special relay.
Name	• Indicates the name of the special relay.
Meaning	• Indicates the nature of the special relay.
Explanation	• Contains detailed information about the nature of the special relay.
Set by (When set)	<ul style="list-style-type: none"> <li>• Indicates whether the relay is set by the system or user, and, if it is set by the system, when setting is performed.</li> <li>&lt;Set by&gt; <ul style="list-style-type: none"> <li>S : Set by system</li> <li>U : Set by user (in sequence program or test operation at a GX Developer)</li> <li>S/U : Set by both system and user</li> </ul> </li> <li>&lt;When set&gt; → indicated only if setting is done by system. <ul style="list-style-type: none"> <li>Each END : Set during each END processing</li> <li>Initial : Set only during initial processing (when power supply is turned ON, or when going from STOP to RUN)</li> <li>Status change : Set only when there is a change in status</li> <li>Error : Set when error is generated</li> <li>Instruction execution : Set when instruction is executed</li> <li>Request : Set only when there is a user request (through SM, etc.)</li> </ul> </li> </ul>
Corresponding ACPU M9 □ □ □	<ul style="list-style-type: none"> <li>• Indicates special relay M9 □ □ □ corresponding to the ACPU. (Change and notation when there has been a change in contents)</li> <li>• Items indicated as "New" have been newly added for Process CPU.</li> </ul>
Corresponding CPU	<ul style="list-style-type: none"> <li>• Indicates the corresponding CPU type name.</li> <li>○+Rem: Can be applied to Process CPU and MELSECNET/H remote I/O modules.</li> <li>○: Can be applied to Process CPU</li> <li>Remote: Can be applied to the MELSECNET/H remote I/O modules.</li> </ul>

For details on the following items, refer to the following:

- Networks → • For Q Corresponding MELSECNET/H Network System Reference Manual (PLC to PLC network)
  - For Q Corresponding MELSECNET/H Network System Reference Manual (Remote I/O network)
- SFC → QCPU(Q Mode)/QnACPU Programming Manual (SFC)

Special Relay List

(1) Diagnostic Information

Number	Name	Meaning	Explanation	Set by (When Set)	Corresponding ACPU M9 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Applicable CPU	
SM0	Diagnostic errors	OFF: No error ON : Error	<ul style="list-style-type: none"> <li>ON if diagnosis results show error occurrence (Includes when an annunciator is ON, and when an error is detected with CHK instruction)</li> <li>Stays ON subsequently even if normal operations restored</li> </ul>	S (Error)	New	○+Rem	
SM1	Self-diagnosis error	OFF: No self-diagnosis errors ON : Self-diagnosis	<ul style="list-style-type: none"> <li>Comes ON when an error occurs as a result of self-diagnosis.</li> <li>Stays ON subsequently even if normal operations restored</li> </ul>	S (Error)	M9008		
SM5	Error common information	OFF: No error common information ON : Error common information	<ul style="list-style-type: none"> <li>When SM0 is ON, ON if there is error common information</li> </ul>	S (Error)	New		
SM16	Error individual information	OFF: No error common information ON : Error common information	<ul style="list-style-type: none"> <li>When SM0 is ON, ON if there is error individual information</li> </ul>	S (Error)	New		
SM50	Error reset	OFF →ON : Error reset	<ul style="list-style-type: none"> <li>Conducts error reset operation</li> <li>See section 11.3 for further information</li> </ul>	U	New		
SM51	Battery low latch	OFF: Normal ON : Battery low	<ul style="list-style-type: none"> <li>ON if battery voltage at CPU module or memory card drops below rated value. Stays ON subsequently even after normal operation is restored</li> <li>Synchronous with BAT. ALARM LED</li> </ul>	S (Error)	M9007	○	
SM52	Battery low	OFF: Normal ON : Battery low	<ul style="list-style-type: none"> <li>Same as SM51, but goes OFF subsequently when battery voltage returns to normal.</li> </ul>	S (Error)	M9006		
SM53	AC/DC DOWN detection	OFF: AC/DC DOWN not detected ON : AC/DC DOWN detected	<ul style="list-style-type: none"> <li>Comes ON it a momentary power interruption of less than 20ms occurred during use of the AC power supply module, and reset by turning the power OFF, then ON.</li> <li>Comes ON if a momentary power interruption of less than 10ms occurred during use of the DC power supply module, and reset by turning power OFF, then ON.</li> </ul>	S (Error)	M9005		
SM56	Operation Errors	OFF: Normal ON : Operation error	<ul style="list-style-type: none"> <li>ON when operation error is generated</li> <li>Stays ON subsequently even if normal operations restored</li> </ul>	S (Error)	M9011	○	
SM60	Blown fuse detection	OFF: Normal ON : Module with blown fuse	<ul style="list-style-type: none"> <li>Comes ON even if there is only one output module with a blown fuse, and remains ON even after return to normal</li> <li>Blown fuse status is checked even for remote I/O station output modules.</li> </ul>	S (Error)	M9000	○+Rem	
SM61	I/O module verification error	OFF: Normal ON : Error	<ul style="list-style-type: none"> <li>Comes ON if there is a discrepancy between the actual I/O modules and the registered information when the power is turned on</li> <li>I/O module verification is also conducted for remote I/O station modules.</li> </ul>	S (Error)	M9002		
SM62	Annunciator detection	OFF: Not detected ON : Detected	<ul style="list-style-type: none"> <li>Goes ON if even one annunciator F goes ON.</li> </ul>	S (Instruction execution)	M9009	○	
SM80	CHK detection	OFF: Not detected ON : Detected	<ul style="list-style-type: none"> <li>Goes ON if error is detected by CHK instruction.</li> <li>Stays ON subsequently even after normal operation is restored.</li> </ul>	S (Instruction execution)	New		
SM90	Startup of watchdog timer for step transition (Enabled only when SFC program exists)	OFF: Not started (watchdog timer reset) ON : Started (watchdog timer started)	Corresponds to SD90	<ul style="list-style-type: none"> <li>Goes ON when measurement of step transition watchdog timer is commenced.</li> <li>Resets watchdog timer when it goes OFF.</li> </ul>	U	M9108	○
SM91			Corresponds to SD91			M9109	
SM92			Corresponds to SD92			M9110	
SM93			Corresponds to SD93			M9111	
SM94			Corresponds to SD94			M9112	
SM95			Corresponds to SD95			M9113	
SM96			Corresponds to SD96			M9114	
SM97			Corresponds to SD97			New	
SM98			Corresponds to SD98			New	
SM99			Corresponds to SD99			New	





Special Relay List

(2) System information

Number	Name	Meaning	Explanation	Set by (When Set)	Corresponding ACPU M9 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Applicable CPU
SM202	LED off command	OFF →ON : LED off	• When this relay goes from OFF to ON, the LEDs corresponding to the individual bits at SD202 go off	U	New	○
SM203	STOP contact	STOP status	• Goes ON at STOP status	S (Status change)	M9042	
SM204	PAUSE contact	PAUSE status	• Goes ON at PAUSE status	S (Status change)	M9041	
SM206	PAUSE enable coil	OFF: PAUSE disabled ON : PAUSE enabled	• PAUSE status is entered if this relay is ON when the remote PAUSE contact goes ON	U	M9040	Remote
	Device test request acceptance status	OFF: Device test not yet executed ON : Device test executed	• Comes ON when the device test mode is executed on GX Developer.	S (Request)	New	
SM210	Clock data set request	OFF: Ignored ON : Set request	• When this relay goes from OFF to ON, clock data being stored from SD210 to SD213 after execution of END instruction for changed scan is written to the clock device.	U	M9025	○
SM211	Clock data error	OFF: No error ON : Error	• ON when error is generated in clock data (SD210 to SD213) value, and OFF if no error is detected.	S (Request)	M9026	
SM213	Clock data read request	OFF: Ignored ON : Read request	• When this relay is ON, clock data is read to SD210 to SD213 as BCD values.	U	M9028	○+Rem
SM235	Online module change flag	OFF:Online module change is not in progress ON: Online module change in progress	• Turns on during online module change.	S (During online module change)	New	
SM236	Online module change complete flag	OFF:Online module change incomplete ON: Online module change complete	• Turns ON for one scan after online module change is complete. • This contact point can only be used by the scan program.(for local unit)	S (When online module change is complete)	New	
SM240	No. 1 CPU reset flag	OFF: PLC No. 1 reset cancel ON : PLC No. 1 resetting	• Goes OFF when reset of the PLC No. 1 is canceled. • Comes ON when the PLC No. 1 is resetting (including the case where the PLC is removed from the base). The other PLCs are also put in reset status.	S (Status change)	New	○
SM241	No. 2 CPU reset flag	OFF: PLC No. 2 reset cancel ON : PLC No. 2 resetting	• Goes OFF when reset of the PLC No. 2 is canceled. • Comes ON when the PLC No. 2 is resetting (including the case where the PLC is removed from the base). The other PLCs result in "MULTI CPU DOWN" (error code: 7000).			
SM242	No. 3 CPU reset flag	OFF: PLC No. 3 reset cancel ON : PLC No. 3 resetting	• Goes OFF when reset of the PLC No. 3 is canceled. • Comes ON when the PLC No. 3 is resetting (including the case where the PLC is removed from the base). The other PLCs result in "MULTI CPU DOWN" (error code: 7000).			
SM243	No. 4 CPU reset flag	OFF: PLC No. 4 reset cancel ON : PLC No. 4 resetting	• Goes OFF when reset of the PLC No. 4 is canceled. • Comes ON when the PLC No. 4 is resetting (including the case where the PLC is removed from the base). The other PLCs result in "MULTI CPU DOWN" (error code: 7000).			
SM244	No. 1 CPU error flag	OFF: PLC No. 1 normal ON : PLC No. 1 during stop error	• Goes OFF when the PLC No. 1 is normal (including a continuation error). • Comes ON when the PLC No. 1 is during a stop error.			
SM245	No. 2 CPU error flag	OFF: PLC No. 2 normal ON : PLC No. 2 during stop error	• Goes OFF when the PLC No. 2 is normal (including a continuation error). • Comes ON when the PLC No. 2 is during a stop error.			
SM246	No. 3 CPU error flag	OFF: PLC No. 3 normal ON : PLC No. 3 during stop error	• Goes OFF when the PLC No. 3 is normal (including a continuation error). • Comes ON when the PLC No. 3 is during a stop error.			
SM247	No. 4 CPU error flag	OFF: PLC No. 4 normal ON : PLC No. 4 during stop error	• Goes OFF when the PLC No. 4 is normal (including a continuation error). • Comes ON when the PLC No. 4 is during a stop error.			
SM250	Max. loaded I/O read	OFF: Ignored ON : Read	• When this relay goes from OFF to ON, maximum loaded I/O number is read to SD250.	U	New	○+Rem
SM254	All stations refresh command	OFF: Refresh arrival station ON : Refresh all stations	• Effective for the batch refresh (also effective for the low speed cyclic) • Designate whether to receive arrival stations only or to receive all slave stations.	U (Every END)	New	○

## Special Relay List (Continued)

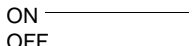
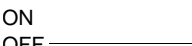

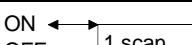
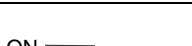
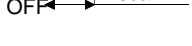



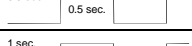
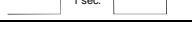

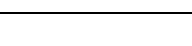
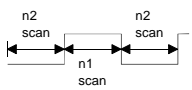
Number	Name	Meaning	Explanation	Set by (When Set)	Corresponding ACPU M9 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Applicable CPU
SM255	MELSECNET/H module 1 information	OFF: Operative network ON : Standby network	• Goes ON for standby network (If no designation has been made concerning active or standby, active is assumed.)	S (Initial)	New	○
SM256		OFF: Reads ON : Does not read	• For refresh from link to CPU (B, W, etc.) indicate whether to read from the link module.	U	New	
SM257		OFF: Writes ON : Does not write	• For refresh from CPU to link (B, W, etc.), designate whether to write to the link module.	U	New	
SM260	MELSECNET/H module 2 information	OFF: Operative network ON : Standby network	• Goes ON for standby network (If no designation has been made concerning active or standby, active is assumed.)	S (Initial)	New	
SM261		OFF: Reads ON : Does not read	• For refresh from link to CPU (B, W, etc.) indicate whether to read from the link module.	U	New	
SM262		OFF: Writes ON : Does not write	• For refresh from CPU to link (B, W, etc.), designate whether to write to the link module.	U	New	
SM265	MELSECNET/H module 3 information	OFF: Operative network ON : Standby network	• Goes ON for standby network (If no designation has been made concerning active or standby, active is assumed.)	S (Initial)	New	
SM266		OFF: Reads ON : Does not read	• For refresh from link to CPU (B, W, etc.) indicate whether to read from the link module.	U	New	
SM267		OFF: Writes ON : Does not write	• For refresh from CPU to link (B, W, etc.), designate whether to write to the link module.	U	New	
SM270	MELSECNET/H module 4 information	OFF: Operative network ON : Standby network	• Goes ON for standby network (If no designation has been made concerning active or standby, active is assumed.)	S (Initial)	New	
SM271		OFF: Reads ON : Does not read	• For refresh from link to CPU (B, W, etc.) indicate whether to read from the link module.	U	New	
SM272		OFF: Writes ON : Does not write	• For refresh from CPU to link (B, W, etc.), designate whether to write to the link module.	U	New	
SM280	CC-Link error	OFF: Normal ON : Error	• Goes ON when a CC-Link error is detected in any of the installed QJ61QBT11. Goes OFF when normal operation is restored.	S (Status change)	New	○+Rem
SM320	Presence/absence of SFC program	OFF: SFC program absent ON : SFC program present	• ON if SFC program is correctly registered, and OFF if not registered. • Goes OFF if SFC dedicated instruction is not correct.	S (Initial)	M9100	
SM321	Start/stop SFC program	OFF: SFC program stop ON : SFC program start	• Initial value is set at the same value as SM320. (Goes ON automatically if SFC program is present.) • SFC program will not execute if this goes OFF prior to SFC program processing • Starts the SFC program when this relay goes from OFF to ON. • Stops the SFC program when this relay goes from ON to OFF.	S (Initial) U	M9101 format change	
SM322	SFC program start status	OFF: Initial start ON : Restart	• Initial value is set at ON or OFF depending on parameters. • When this relay is OFF, all execution statuses at stop of SFC program are cleared and execution starts from the initial step of the block where the start request is made. • When this relay is ON, execution starts from the execution block and execution step that were active at stop of SFC program. (ON is enabled only when resumptive start has been designated at parameters.) • SM902 is not automatically designated for latch.	S (Initial) U	M9102 format change	○
SM323	Presence/absence of continuous transition for entire block	OFF: Continuous transition not effective ON : Continuous transition effective	• When this relay is OFF, transition to one scan/one step occurs in all blocks. • When this relay is ON, transition to one continuous scan occurs in all blocks. • In designation of individual blocks, priority is given to the continuous transition bit of the block. (Designation is checked when block starts.)	U	M9103	
SM324	Continuous transition prevention flag	OFF: When transition is executed ON : When no transition	• When continuous transition is effective, goes ON when continuous transition is not being executed; goes OFF when continuous transition is being executed. • Normally ON when continuous transition is not effective.	S (Instruction execution)	M9104	
SM325	Output mode at block stop	OFF: OFF ON : Preserves	When block stops, selects active step operation output. • When this relay is OFF, all coil outputs are set to OFF. • When this relay is ON, coil outputs are maintained.	S (Initial) U	M9196	

Special Relay List (Continued)

Number	Name	Meaning	Explanation	Set by (When Set)	Corresponding ACPU M9 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Applicable CPU
SM326	SFC device clear mode	OFF: Clear device ON : Preserves device	Selects the device status when the stopped CPU module is run after the sequence program or SFC program has been modified when the SFC program exists.	U	New	○
SM327	Output during end step execution	OFF: OFF ON : Preserves	Selects the output action of the step being held when a block is ended by executing the end step. • When this relay is OFF, all coil outputs are set to OFF. • When this relay is ON, coil outputs are maintained.	S (Initial) U	New	
SM330	Operation mode for low speed execution type program	OFF: Asynchronous mode ON : Synchronous mode	• Select whether low speed execution type programs are executed in asynchronous or synchronous mode. • Asynchronous mode Mode where the operations for the low speed execution type program are continued during the excess time. • Synchronous mode Mode where the operations for the low speed execution type program are started from the next scan even when there is the excess time.	U	New	
SM390	Access execution flag	When ON, access to the intelligent function module is completed	• Stores the status of the intelligent function module access instruction executed immediately before. (This information will be overwritten when the intelligent function module access instruction is executed again.) • This flag is used by the user in a program as the completion bit.	S (Status change)	New	

Special Relay List

(3) System clocks/counters

Number	Name	Meaning	Explanation	Set by (When Set)	Corresponding ACPU M9 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Applicable CPU	
SM400	Always ON	ON  OFF	• Normally is ON	S (Every END processing)	M9036		
SM401	Always OFF	ON  OFF	• Normally is OFF	S (Every END processing)	M9037		
SM402	ON for 1 scan only after RUN	ON  OFF	• After RUN, ON for 1 scan only. • This contact can be used for scan execution type programs only.	S (Every END processing)	M9038		
SM403	After RUN, OFF for 1 scan only	ON  OFF	• After RUN, OFF for 1 scan only. • This contact can be used for scan execution type programs only.	S (Every END processing)	M9039		
SM404	Low speed execution type program ON for 1 scan only after RUN	ON  OFF	• After RUN, ON for 1 scan only. • This contact can be used for low speed execution type programs only.	S (Every END processing)	New		
SM405	Low speed execution type program After RUN, OFF for 1 scan only	ON  OFF	• After RUN, OFF for 1 scan only. • This contact can be used for low speed execution type programs only.	S (Every END processing)	New		
SM409	0.01 second clock		• This relay repeats ON/OFF at every 5 ms. • Starts from OFF when the PLC power is turned ON or the CPU module is reset. • Note that the ON-OFF status changes when the designated time has elapsed during the execution of the program.	S (Status change)	New		○
SM410	0.1 second clock		• This relay repeats ON/OFF at every predefined constant time. • Starts from OFF when the PLC power is turned ON or the CPU module is reset. • Note that the ON-OFF status changes when the designated time has elapsed during the execution of the program.	S (Status change)	M9030		
SM411	0.2 second clock				M9031		
SM412	1 second clock				M9032		
SM413	2 second clock				M9033		
SM414	2n second clock		• This relay repeats ON/OFF in accordance with the number of seconds designated by SD414. • Starts from OFF when the PLC power is turned ON or the CPU module is reset. • Note that the ON-OFF status changes when the designated time has elapsed during the execution of the program.	S (Status change)	M9034 format change		
SM415	2n (ms) clock		• This relay repeats ON/OFF in accordance with the number of milliseconds designated by SD415. • Starts from OFF when the PLC power is turned ON or the CPU module is reset. • Note that the ON-OFF status changes when the designated time has elapsed during the execution of the program.	S (Status change)	New		
SM420	User timing clock No.0		• This relay repeats ON/OFF at designated scan intervals. • Starts from OFF when the PLC power is turned ON or the CPU module is reset. • The ON/OFF scan intervals are set by the DUTY instruction.  <div style="border: 1px solid black; padding: 2px; display: inline-block;">                     DUTY n1 n2 SM420                 </div> n1: Scan interval of ON n2: Scan interval of OFF	S (Every END processing)	M9020	○	
SM421	User timing clock No.1				M9021		
SM422	User timing clock No.2				M9022		
SM423	User timing clock No.3				M9023		
SM424	User timing clock No.4				M9024		
SM430	User timing clock No.5		• For low speed execution type programs of SM420 to SM424	S (Every END processing)	New		
SM431	User timing clock No.6						
SM432	User timing clock No.7						
SM433	User timing clock No.8						
SM434	User timing clock No.9						

Special Relay List

(4) Scan information

Number	Name	Meaning	Explanation	Set by (When Set)	Corresponding ACPU M9 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Applicable CPU
SM510	Low speed execution type program execution flag	OFF: Completed or not executed ON : Execution under way.	• Goes ON when low speed execution type program is executed.	S (Every END processing)	New	○
SM551	Reads module service interval	OFF: Ignored ON : Read	• Reads the module service interval designated by SD550 to SD551 and SD552 when this relay switches from OFF to ON.	U	New	○+Rem

(5) Memory cards

Number	Name	Meaning	Explanation	Set by (When Set)	Corresponding ACPU M9 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Applicable CPU
SM600	Memory card A usable flags	OFF: Unusable ON : Use enabled	• ON when memory card A is ready for use by user	S (Initial)	New	○
SM601	Memory card A protect flag	OFF: No protect ON : Protect	• Goes ON when memory card A protect switch is ON	S (Initial)	New	
SM602	Drive 1 flag	OFF: No drive 1 ON : Drive 1 present	• Goes ON when drive 1 (card 1 RAM area) is present	S (Initial)	New	
SM603	Drive 2 flag	OFF: No drive 2 ON : Drive 2 present	• Goes ON when drive 2 (card 1 ROM area) is present	S (Initial)	New	
SM604	Memory card A in-use flag	OFF: Not in use ON : In use	• Goes ON when memory card A is in use	S (Initial)	New	
SM605	Memory card A remove/insert prohibit flag	OFF: Remove/insert enabled ON : Remove/insert prohibited	• Goes ON when memory card A cannot be inserted or removed	U	New	
SM609	Memory card remove/insert enable flag	OFF: Remove/insert prohibited ON : Remove/insert enabled	• Turned ON by user to enable the removal/insertion of memory card. • Turned OFF by the system after the memory card is removed.	U/S	New	
SM620	Memory card B usable flags	OFF: Unusable ON : Use enabled	• Always ON	S (Initial)	New	
SM621	Memory card B protect flag	OFF: No protect ON : Protect	• Always ON	S (Initial)	New	
SM622	Drive 3 flag	OFF: No drive 3 ON : Drive 3 present	• Always ON	S (Initial)	New	
SM623	Drive 4 flag	OFF: No drive 4 ON : Drive 4 present	• Always ON	S (Initial)	New	QCPU
SM640	File register use	OFF: File register not in use ON : File register in use	• Goes ON when file register is in use	S (Status change)	New	○
SM650	Comment use	OFF: File register not in use ON : File register in use	• Goes ON when comment file is in use	S (Status change)	New	
SM660	Boot operation	OFF: Internal memory execution ON : Boot operation in progress	• Goes ON while boot operation is in process • Goes OFF if boot designation switch is OFF	S (Status change)	New	
SM672	Memory card A file register access range flag	OFF: Within access range ON : Outside access range	• Goes ON when access is made to area outside the range of file register R of memory card A (Set within END processing.) • Reset at user program	S/U	New	

(6) Instruction-Related Special Relays

Number	Name	Meaning	Explanation	Set by (When Set)	Corresponding ACPU M9 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Applicable CPU
SM700	Carry flag	OFF: Carry OFF ON : Carry ON	• Carry flag used in application instruction	S (Instruction execution)	M9012	○
SM701	Number of output characters selection	OFF: 16 characters output ON : Outputs until NUL	• Outputs up to NUL (00h) ASCII code when SM701 is OFF. • Outputs ASCII code of 16 characters when SM701 is ON.	U	M9049	
SM702	Search method	OFF: Search next ON : 2-part search	• Designates method to be used by search instruction. • Data must be arranged for 2-part search.	U	New	
SM703	Sort order	OFF: Ascending order ON : Descending order	• The sort instruction is used to designate whether data should be sorted in ascending order or in descending order.	U	New	
SM704	Block comparison	OFF: Non-match found ON : All match	• Goes ON when all data conditions have been met for the BKCMP instruction.	S (Instruction execution)	New	
SM710	CHK instruction priority ranking flag	OFF: Conditions priority ON : Pattern priority	• Remains as originally set when OFF. • CHK priorities updated when ON.	S (Instruction execution)	New	○
SM715	EI flag	OFF: During DI ON : During EI	• ON when EI instruction is being executed.	S (Instruction execution)	New	○
SM720	Comment read completion flag	OFF: Comment read not completed ON : Comment read completed	• Switches ON for only one scan when COMRD or PRC instruction is completed.	S (Status change)	New	QCPU
SM721	File being accessed	OFF: File not accessed ON : File being accessed	• Switches ON while a file is being accessed by the S.FWRITE, S.FREAD, COMRD, PRC, or LEDC instruction.	S (Status change)	New	
SM722	BIN/DBIN instruction error disabling flag	OFF: Error detection performed ON : Error detection not performed	• Turned ON when "OPERATION ERROR" is suppressed for BIN or DBIN instruction.	U	New	
SM736	PKEY instruction execution in progress flag	OFF: Instruction not executed ON : Instruction execution	• ON when PKEY instruction is being executed. Goes OFF when CR is input, or when input character string reaches 32 characters.	S (Instruction execution)	New	○
SM737	Keyboard input reception flag for PKEY instruction	OFF: Keyboard input reception enabled ON : Keyboard input reception disabled	• Goes ON when keyboard input is being conducted. Goes when keyboard input has been stored at the CPU module.	S (Instruction execution)	New	
SM738	MSG instruction reception flag	OFF: Instruction not executed ON : Instruction execution	• Goes ON when MSG instruction is executed.	S (Instruction execution)	New	
SM775	Selection of link refresh processing during COM instruction execution	OFF: Performs link refresh ON : No link refresh performed	• Selects whether only the general data process is performed for the execution of the COM instruction or the link refresh process is also performed.	U	New	
SM776	Enable/disable local device at CALL	OFF: Local device disabled ON : Local device enabled	• Determines whether to enable/disable the local device in the program CALLED at CALL.	U (Status change)	New	
SM777	Enable/disable local device in interrupt program	OFF: Local device disabled ON : Local device enabled	• Determines whether to enable/disable the local device at the execution of interrupt programs.	U (Status change)	New	

(7) Debug

Number	Name	Meaning	Explanation	Set by (When Set)	Corresponding ACPU M9 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Applicable CPU
SM800	Trace preparation	OFF: Not ready ON : Ready	• Switches ON when the trace preparation is completed.	S (Status change)	New	QCPU
SM801	Trace start	OFF: Suspend ON : Start	• Trace is started when this relay switches ON. • Trace is suspended when this relay switches OFF. (All related special Ms switches OFF.)	U	M9047	QCPU
SM802	Trace execution in progress	OFF: Suspend ON : Start	• Switches ON during execution of trace.	S (Status change)	M9046	QCPU
SM803	Trace trigger	OFF →ON: Start	• Trace is triggered when this relay switches from OFF to ON. (Identical to TRACE instruction execution status)	U	M9044	QCPU
SM804	After trace trigger	OFF: Not after trigger ON : After trigger	• Switches ON after trace is triggered.	S (Status change)	New	QCPU
SM805	Trace completed	OFF: Not completed ON : End	• Switches ON at completion of trace.	S (Status change)	9043	QCPU
SM820	Step trace preparation	OFF: Not ready ON : Ready	• Goes ON after program trace registration, at ready.	U	New	○
SM821	Step trace starts	OFF: Suspend ON : Start	• When this goes ON, step trace is started • Suspended when OFF (Related special M all OFF)	S (Status change)	M9182 format change	
SM822	Step trace execution underway	OFF: Suspend ON : Start	• Goes ON when step trace execution is underway • Goes OFF at completion or suspension	S (Status change)	M9181	
SM823	After step trace trigger	OFF: Not after trigger ON : Is after first trigger	• Goes ON if even 1 block within the step trace being executed is triggered. • Goes OFF when step trace is commenced.	S (Status change)	New	
SM824	After Step trace trigger	OFF: Is not after all triggers ON : Is after all triggers	• Goes ON if all blocks within the step trace being executed are triggered. • Goes OFF when step trace is commenced.	S (Status change)	New	
SM825	Step trace completed	OFF: Not completed ON : End	• Goes ON at step trace completion. • Goes OFF when step trace is commenced.	S (Status change)	M9180	
SM826	Trace error	OFF: Normal ON : Errors	• Switches ON if error occurs during execution of trace.	S (Status change)	New	

(8) Latch area

Number	Name	Meaning	Explanation	Set by (When Set)	Corresponding ACPU M9 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Applicable CPU
SM910	RKEY registration flag	OFF: Keyboard input notregistered ON : Keyboard input registered	• Goes ON at registration of keyboard input. OFF if keyboard input is not registered.	S (Instruction execution)	New	QnA

(9) A to Q/QnA conversion correspondences

Special relays SM1000 to SM1255 are the relays which correspond to ACPU special relays M9000 to M9255 after A to Q/QnA conversion.

All of these special relays are controlled by the system so that users cannot turn them ON/OFF in the program.

If users want to turn these relays ON/OFF, the program should be modified to use QCPU/QnACPU special relays.

For SM1084 and SM1200 through SM1255, however, if a user can turn ON/OFF some of special relays M9084 and M9200 through M9255 before conversion, the user can also turn ON/OFF the corresponding relays among SM1084 and SM1200 through SM1255 after the conversion.

For details on the ACPU special relays, see the user's manuals for the individual CPUs, and MELSECNET or MELSECNET/B Data Link System Reference Manuals.

**POINT**

The processing time may be longer when converted special relays are used with QCPU. Uncheck "A-series CPU compatibility setting" within the PC system setting in GPPW parameters when converted special relays are not used.

**REMARK**

The following are additional explanations about the Special Relay for Modification column.

- ① When a special relay for modification is provided, the device number should be changed to the provided QCPU/QnACPU special relay.
- ② When  is provided, the converted special relay can be used for the device number.
- ③ When  is provided, the device number does not work with QCPU/QnACPU.

Special Relay List

ACPU Special Relay	Special Relay after Conversion	Special Relay for Modification	Name	Meaning	Details	Applicable CPU
M9000	SM1000	—	Fuse blown	OFF: Normal ON : Fuse blown module with blown fuse present	• Turned on when there is one or more output units of which fuse has been blown. Remains on if normal status is restored. Output modules of remote I/O stations are also checked fore fuse condition.	○
M9002	SM1002	—	I/O module verification error	OFF: Normal ON : Error	• Turned on if the states of I/O module is different form entered states when power is turned on. Remains on if normal states is restored. I/O module verification is done also to remote I/O station modules. (Reset is enabled only when special registers SD1116 to SD1123 are reset.)	
M9004	SM1004	—	NIMI link error	OFF: Normal ON : Error	• Turned on when the MINI(S3) link error is detected on even one of the AJ71PT32(S3) modules being loaded. Remains on if normal status is restored.	QnA
M9005	SM1005	—	AC DOWN detection	OFF: AC DOWN not detected ON : AC DOWN detected	• Comes ON it a momentary power interruption of less than 20ms occurred during use of the AC power supply module, and reset by turning power OFF, then ON.	○
					• Comes ON if a momentary power interruption of less than 10ms occurred during use of the DC power supply module, and reset by turning power OFF, then ON.	
					• Comes ON if a momentary power interruption of less than 1ms occurred during use of the DC power supply module, and reset by turning power OFF, then ON.	QnA

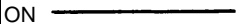

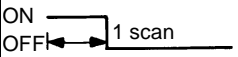
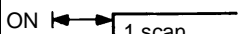


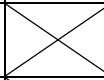

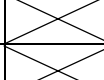
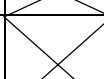



Special Relay List (Continued)

ACPU Special Relay	Special Relay after Conversion	Special Relay for Modification	Name	Meaning	Details	Applicable CPU
M9006	SM1006	—	Battery low	OFF: Normal ON : Battery low	• Turned on when battery voltage reduces to less than specified. Turned off when battery voltage becomes normal.	○
M9007	SM1007	—	Battery low latch	OFF: Normal ON : Battery low	• Turned on when battery voltage reduces to less than specified. Remains on if battery voltage becomes normal.	
M9008	SM1008	SM1	Self-diagnosis error	OFF: No error ON : Error	• Turned on when error is found as a result of self-diagnosis.	
M9009	SM1009	SM62	Annunciator detection	OFF: No F number detected ON : F number detected	• Turned on when [OUT] F of [SET] F instruction is executed. Switched off when SD1124 data is zeroed.	○
M9011	SM1011	SM56	Operation error flag	OFF: No error ON : Error	• Turned on when operation error occurs during execution of application instruction. Remains on if normal status is restored.	
M9012	SM1012	SM700	Carry flag	OFF: Carry OFF ON : Carry ON	• Carry flag used in application instruction.	
M9016	SM1016		Data memory clear flag	OFF: Ignored ON : Output cleared	• Clears the data memory including the latch range (other than special relays and special registers) in remote run mode from computer, etc. when SM1016 is on.	
M9017	SM1017		Data memory clear flag	OFF: Ignored ON : Output cleared	• Clears the unlatched data memory (other than special relays and registers) in remote run mode from computer, etc. when SM1017 is on.	
M9020	SM1020	—	User timing clock No.0		<ul style="list-style-type: none"> <li>• This relay repeats ON/OFF at designated scan intervals.</li> <li>• Starts from OFF when the PLC power is turned ON or the CPU module is reset.</li> <li>• The ON/OFF scan intervals are set by the [DUTY] instruction.</li> </ul> <p>n1: Scan interval of ON n2: Scan interval of OFF</p>	
M9021	SM1021	—	User timing clock No.1			
M9022	SM1022	—	User timing clock No.2			
M9023	SM1023	—	User timing clock No.3			
M9024	SM1024	—	User timing clock No.4			
M9025	SM1025	—	Clock data set request	OFF: Ignored ON : Set request present used	• Writes clock data from SD1025 to SD1028 to the clock element after the [END] instruction is executed during the scan in which SM1025 has changed from off to on.	
M9026	SM1026	—	Clock data error	OFF: No error ON : Error	• Switched on by clock data (SD1025 to SD1028) error	
M9027	SM1027	—	Clock data display	OFF: Ignored ON : Display	• Clock data is read from SD1025 to SD1028 and month, day, hour, minute and minute are indicated on the CPU front LED display.	○
M9028	SM1028	—	Clock data read request	OFF: Ignored ON : Read request	• Reads clock data to SD1025 to SD1028 in BCD when SD1028 is on.	
M9029	SM1029		Batch processing of data communications requests	OFF: Batch processing not conducted ON : Batch processing conducted	<ul style="list-style-type: none"> <li>• The SM1029 relay is turned on using a sequence program to process all data communication requests accepted during one scan in the END processing of that scan.</li> <li>• The batch processing of the data communication requests can be turned on and off during running.</li> <li>• The default is OFF (processed one at a time for each END processing in the order in which data communication requests are accepted).</li> </ul>	
M9030	SM1030	—	0.1 second clock		<ul style="list-style-type: none"> <li>• Generates each of 0.1 sec, 0.2 sec, 1 sec and 2 sec clocks.</li> <li>• This relay does not turn ON/OFF for each scan; it turns ON/OFF when the predefined time elapses even during scanning.</li> <li>• Starts from OFF when the PLC power is turned ON or the CPU module is reset.</li> </ul>	
M9031	SM1031	—	0.2 second clock			
M9032	SM1032	—	1 second clock			
M9033	SM1033	—	2 second clock			
M9034	SM1034	—	2n minute clock (1 minute clock) *			

\*: 1 minute clock indicates the name of the special relay (M9034) of the ACPU.

Special Relay List (Continued)

ACPU Special Relay	Special Relay after Conversion	Special Relay for Modification	Name	Meaning	Details	Applicable CPU	
M9036	SM1036	—	Always ON	ON  OFF	• Used as dummy contacts of initialization and application instruction in sequence program.		
M9037	SM1037	—	Always OFF	ON  OFF	• SM1038 and SM1037 are turned on and off without regard to position of key switch on CPU front. SM1038 and SM1039 are under the same condition as RUN status except when the key switch is at STOP position, and turned off and on. Switched off if the key switch is in STOP position. SM1038 is on for one scan only and SM1039 is off for one scan only if the key switch is not in STOP position.		
M9038	SM1038	—	ON for 1 scan only after RUN	ON  OFF			
M9039	SM1039	—	RUN flag(After RUN, OFF for 1 scan only)	ON  OFF			
M9040	SM1040	SM206	PAUSE enable coil	OFF: PAUSE disabled ON : PAUSE enabled	• When remote pause contact has turned on and SM204 is on, PAUSE mode is set and SM206 is turned on.		
M9041	SM1041	SM204	USE statuscontact	OFF: PAUSE not in effect ON : PAUSE in effect			
M9042	SM1042	SM203	STOP status contact	OFF: STOP not in effect ON : STOP in effect	• Switched on when the RUN key switch is in STOP position.		
M9043	SM1043	SM805	SamplingTrace completed	OFF: Sampling trace in progress ON : Sampling trace completed	• Turned on upon completion of sampling trace performed the number of times preset by parameter after [STRA] instruction is executed. Reset when [STRAR] instruction is executed.		
M9044	SM1044	SM803	Sampling trace	OFF → ON [STRA] Same as execution ON → OFF [STRAR] Same as execution	• Turning on/off SM803 can execute [STRA] / [STRAR] instruction. (SM803 is forcibly turned on/off by a peripheral device.) When switched from OFF to ON: [STRA] instruction When switched from ON to OFF: [STRAR] instruction The value stored in SD1044 is used as the condition for the sampling trace. At scanning, at time → Time (10 msec unit)		○
M9045	SM1045		Watchdog timer (WDT) reset	OFF: Does not reset WDT ON : Resets WDT	• The SM1015 relay is turned on to reset the WDT when the ZCOM instruction and data communication request batch processing are executed (used when the scan time exceeds 200 ms).		
M9046	SM1046	SM802	Sampling trace	OFF: Trace not in progress ON : Trace in progress	• Switched on during sampling trace.		
M9047	SM1047	SM801	Sampling trace preparations	OFF: Sampling trace suspended ON : Sampling trace started	• Sampling trace is not executed unless SM801 is turned ON. • Sampling trace is suspended when SM801 goes OFF.		
M9049	SM1049	SM701	Selection of number of characters output	OFF: Output until NULL code encountered ON : 16 characters output	• When SM701 is OFF, characters up to NUL (00H) code are output. • When SM701 is ON, ASCII codes of 16 characters are output.		
M9051	SM1051		CHG instruction execution disable	OFF: Enabled ON : Disable	• Switched ON to disable the CHG instruction. • Switched ON when program transfer is requested. Automatically switched OFF when transfer is complete.		
M9052	SM1052		SEG instruction switch	OFF: 7SEG segment display ON : I/O partial refresh	• When SM1052 is ON, the SEG instruction is executed as an I/O partial refresh instruction. • When SM1052 is OFF, the SEG instruction is executed as a 7-SEG display instruction.		
M9054	SM1054	SM205	STEP RUN flag	OFF: STEP RUN not in effect ON : STEP RUN in effect	• Switched on when the RUN key switch is in STEP RUN position.	QnA	
M9055	SM1055	SM808	Status latch completion flag	OFF: Not completed ON : Completed	• Turned on when status latch is completed. Turned off by reset instruction.		
M9056	SM1056		Main side P, I set request	OFF: Other than when P, I set being requested ON : P, I set being requested	• Provides P, I set request after transfer of the other program (for example subprogram when main program is being run) is complete during run. Automatically switched off when P, I setting is complete.	○	
M9057	SM1057		Sub side P, I set request	OFF: Other than when P, I set being requested ON : P, I set being requested			
M9058	SM1058		Main program P, I set completion	Momentarily ON at P, I set completion			
M9059	SM1059		Sub program P, I set completion	Momentarily ON at P, I set completion			
M9060	SM1060		Sub program 2 P, I set request	OFF: Other than when P, I set being requested ON : P, I set being requested			
				• Provides P, I set request after transfer of the other program (for example subprogram when main program is being run) is complete during run. Automatically switched off when P, I setting is complete.			

Special Relay List (Continued)

ACPU Special Relay	Special Relay after Conversion	Special Relay for Modification	Name	Meaning	Details	Applicable CPU
M9061	SM1061	X	Sub program 3 P, I set request	OFF: Other than when P, I set being requested ON : P, I set being requested	• Provides P, I set request after transfer of the other program (for example subprogram when main program is being run) is complete during run. Automatically switched off when P, I setting is complete.	○
M9065	SM1065	SM711	Divided processing execution detection	OFF: Divided processing not underway ON : During divided processing	• Turned on when canvas screen transfer to AD57(S1)/AD58 is done by divided processing, and turned off at completion of divided processing.	QnA
M9066	SM1066	SM712	Divided processing request flag	OFF: Batch processing ON : Divided processing	• Turned on when canvas screen transfer to AD57(S1)/AD58 is done by divided processing.	
M9070	SM1070	X	A8UPU/A8PUJ required search time	OFF: Read time not shortened ON : Read time shortened	• Turned ON to shorten the search time in the A8UPU/A8PUJ. (In this case, the scan time is extended by 10 %.) * The A8UPU/A8PUJ cannot be used in the QCPU/QnACPU special relays.	○
M9081	SM1081	SM714	Communication request registration area BUSY signal	OFF: Empty spaces in communication request registration area ON : No empty spaces in communication request registration area	• Indication of communication enable/disable to remote terminal modules connected to the AJ71PT32-S3, A2C or A52G.	QnA
M9084	SM1084	X	Error check	OFF: Error check executed ON : No error check	• It is set whether the error checks below are performed or not when the END instruction is processed (to set the END instruction processing time). • Check for breakage of fuse. • Collation check of I/O unit • Check of battery	○
M9091	SM1091	X	Instruction error flag	OFF: No error ON : Error	• Set when an operation error detail factor is stored at SD1091, and remains set after normal status is restored. • Set when an error occurred at execution of the microcomputer program package, and remains set after normal status is restored.	
M9094	SM1094	SM251	I/O change flag	OFF: Replacement ON : No replacement	• After the head address of the required I/O module is set to SD251, switching SM251 on allows the I/O module to be changed in online mode. (One module is only allowed to be changed by one setting.) • To be switched on in the program or peripheral device test mode to change the module during CPU RUN. To be switched on in peripheral device test mode to change the module during CPU STOP. • RUN/STOP mode must not be changed until I/O module change is complete.	QnA
M9100	SM1100	SM320	Presence/absence of SFC program	OFF: SFC programs not used ON : SFC programs used	• Turned on if the SFC program is registered, and turned off if it is not.	
M9101	SM1101	SM321	Start/stop SFC program	OFF: SFC programs stop ON : SFC programs start	• Should be turned on by the program if the SFC program is to be started. If turned off, operation output of the execution step is turned off and the SFC program is stopped.	
M9102	SM1102	SM322	SFC program start status	OFF: Initial Start ON : Continue	• Selects the starting step when the SFC program is restarted using SM322. ON: All execution conditions when the SFC program stopped are cleared, and the program is started with the initial step of block 0. OFF: Started with the step of the block being executed when the program stopped. • Once turned on, the program is latched in the system and remains on even if the power is turned off. Should be turned off by the sequence program when turning on the power, or when starting with the initial step of block 0.	○
M9103	SM1103	SM323	Presence/absence of continuous transition	OFF: Continuous transition not effective ON : Continuous transition effective	• Selects consecutive or step-by-step transfer of steps of which transfer conditions are established when all of the transfer conditions of consecutive steps are established. ON: Consecutive transfer is executed. OFF: One step per one scan is transferred.	

Special Relay List (Continued)

ACPU Special Relay	Special Relay after Conversion	Special Relay for Modification	Name	Meaning	Details	Applicable CPU		
M9104	SM1104	SM324	Continuous transition suspension flag	OFF: When transition is completed ON : When no transition	<ul style="list-style-type: none"> <li>Set when consecutive transfer is not executed with consecutive transfer enabled. Reset when transfer of one step is completed. Consecutive transfer of a step can be prevented by writing an AND condition to corresponding M9104.</li> </ul>			
M9108	SM1108	SM90	Step transition watchdog timer start (equivalent of D9108)	OFF: Watchdog timer reset ON : Watchdog timer reset start	<ul style="list-style-type: none"> <li>Turned on when the step transfer monitoring timer is started. Turned off when the monitoring timer is reset.</li> </ul>			
M9109	SM1109	SM91	Step transition watchdog timer start (equivalent of D9109)					
M9110	SM1110	SM92	Step transition watchdog timer start (equivalent of D9110)					
M9111	SM1111	SM93	Step transition watchdog timer start (equivalent of D9111)					
M9112	SM1112	SM94	Step transition watchdog timer start (equivalent of D9112)					
M9113	SM1113	SM95	Step transition watchdog timer start (equivalent of D9113)					
M9114	SM1114	SM96	Step transition watchdog timer start (equivalent of D9114)					
M9180	SM1180	SM825	Active step sampling trace completion flag				OFF: Trace started ON : Trace completed	<ul style="list-style-type: none"> <li>Set when sampling trace of all specified blocks is completed. Reset when sampling trace is started.</li> </ul>
M9181	SM1181	SM822	Active step sampling trace execution flag	OFF: Trace not being executed ON : Trace execution under way	<ul style="list-style-type: none"> <li>Set when sampling trace is being executed. Reset when sampling trace is completed or suspended.</li> </ul>			
M9182	SM1182	SM821	Active step sampling trace permission	OFF: Trace disable/suspend ON : Trace enable	<ul style="list-style-type: none"> <li>Selects sampling trace execution enable/disable. ON: Sampling trace execution is enabled. OFF: Sampling trace execution is disabled. If turned off during sampling trace execution, trace is suspended.</li> </ul>			
M9196	SM1196	SM325	Operation output at block stop	OFF: Coil output OFF ON : Coil output ON	<ul style="list-style-type: none"> <li>Selects the operation output when block stop is executed. ON: Retains the ON/OFF status of the coil being used by using operation output of the step being executed at block stop. OFF: All coil outputs are turned off. (Operation output by the SET instruction is retained regardless of the ON/OFF status of M9196.)</li> </ul>			
M9197	SM1197	X	Switch between blown fuse and I/O verification error display	SM9197	SM1198		I/O numbers to be displayed	Switches I/O numbers in the fuse blow module storage registers (SD1100 to SD1107) and I/O module verify error storage registers (SD1116 to SD1123) according to the combination of ON/OFF of the SM1197 and SM1198.
				OFF	OFF		X/Y 0 to 7F0	
ON	OFF	X/Y 800 to FF0						
M9198	SM1198	X		OFF	ON	X/Y 1000 to 17F0		
			ON	ON	X/Y 1800 to 1FF0			
M9199	SM1199	X	Data recovery of online sampling trace/status latch	OFF: Data recovery disabled ON : Data recovery enabled	<ul style="list-style-type: none"> <li>Recovers the setting data stored in the CPU at restart when sampling trace/status latch is executed.</li> <li>SM1199 should be ON to execute again. (Unnecessary when writing the data again from peripheral devices.)</li> </ul>			

Special Relay List (Continued)

ACPU Special Relay	Special Relay after Conversion	Special Relay for Modification	Name	Meaning	Details	Applicable CPU
M9200	SM1200	—	$\overline{\text{ZNRD}}$ instruction (LRDP instruction for ACPU) reception (for master station)	OFF: Not accepted ON : Accepted	<ul style="list-style-type: none"> <li>Depends on whether or not the <math>\overline{\text{ZNRD}}</math> (word device read) instruction has been received.</li> <li>Used in the program as an interlock for the <math>\overline{\text{ZNRD}}</math> instruction.</li> <li>Use the <math>\overline{\text{RST}}</math> instruction to reset.</li> </ul>	QnA
M9201	SM1201	—	$\overline{\text{ZNRD}}$ instruction (LRDP instruction for ACPU) completion (for master station)	OFF: Not completed ON : End	<ul style="list-style-type: none"> <li>Depends on whether or not the <math>\overline{\text{ZNRD}}</math> (word device read) instruction execution is complete.</li> <li>Used as a condition contact for resetting M9200 and M9201 after the <math>\overline{\text{ZNRD}}</math> instruction is complete.</li> <li>Use the <math>\overline{\text{RST}}</math> instruction to reset.</li> </ul>	
M9202	SM1202	—	$\overline{\text{ZNWR}}$ instruction (LWTP instruction for ACPU) reception (for master station)	OFF: Not accepted ON : Accepted	<ul style="list-style-type: none"> <li>Depends on whether or not the <math>\overline{\text{ZNWR}}</math> (word device write) instruction has been received.</li> <li>Used in the program as an interlock for the <math>\overline{\text{ZNWR}}</math> instruction.</li> <li>Use the <math>\overline{\text{RST}}</math> instruction to reset.</li> </ul>	
M9203	SM1203	—	$\overline{\text{ZNWR}}$ instruction (LWTP instruction for ACPU) completion (for master station)	OFF: Not completed ON : End	<ul style="list-style-type: none"> <li>Depends on whether or not the <math>\overline{\text{ZNWR}}</math> (word device write) instruction execution is complete.</li> <li>Used as a condition contact to reset M9202 and M9203 after the <math>\overline{\text{ZNWR}}</math> instruction is complete.</li> <li>Use the <math>\overline{\text{RST}}</math> instruction to reset.</li> </ul>	
M9204	SM1204	—	$\overline{\text{ZNRD}}$ instruction (LWTP instruction for ACPU) reception (for local station)	OFF: Not completed ON : End	On indicates that the $\overline{\text{ZNRD}}$ instruction is complete at the local station.	
M9205	SM1205	—	$\overline{\text{ZNWR}}$ instruction (LRDP instruction for ACPU) reception (for local station)	OFF: Not completed ON : End	On indicates that the $\overline{\text{ZNWR}}$ instruction is complete at the local station.	
M9206	SM1206	—	Host station link parameter error	OFF: Normal ON : Abnormal	Depends on whether or not the link parameter setting of the host is valid.	
M9207	SM1207	—	Link parameter check results	OFF: YES ON : NO	Depends on whether or not the link parameter setting of the master station in tier two matches that of the master station in tier three in a three-tier system. (Valid only for the master stations in a three-tier system.)	
M9208	SM1208	—	Sets master station B and W transmission range (for lower link master stations only)	OFF: Transmits to tier2 and tier 3 ON : Transmits to tier2 only	<ul style="list-style-type: none"> <li>Depends on whether or not the B and W data controlled by higher-link master station (host station) is sent to lower-link local stations (tertiary stations).</li> <li>When SM1208 is OFF.....B and W of host station is sent to tertiary stations.</li> <li>When SM1208 is ON.....B and W of host station is not sent to tertiary stations.</li> </ul>	
M9209	SM1209	—	Link parameter check command (for lower link master stations only)	OFF: Executing the check function ON : Check non-execution	<ul style="list-style-type: none"> <li>Set to ON not to match B and W of the higher and lower links. (When SM1209 is ON, the link parameters of the higher and lower links are not checked.)</li> <li>When SM1209 is OFF, the link parameters of the higher and lower links are checked.</li> </ul>	
M9210	SM1210	—	Link card error (for master station)	OFF: Normal ON : Abnormal	Depends on presence or absence of the link card hardware error. Judged by the CPU.	
M9211	SM1211	—	Link module error (for local station use)	OFF: Normal ON : Abnormal	Depends on presence or absence of the link card hardware error. Judged by the CPU.	
M9224	SM1224	—	Link status	OFF: Online ON : Offline, station-to-station test, or self-loopback test	Depends on whether the master station is online or offline or is in station-to-station test or self-loopback test mode.	
M9225	SM1225	—	Forward loop error	OFF: Normal ON : Abnormal	Depends on the error condition of the forward loop line.	
M9226	SM1226	—	Reverse loop error	OFF: Normal ON : Abnormal	Depends on the error condition of the reverse loop line.	
M9227	SM1227	—	Loop test status	OFF: Not being executed ON : Forward or reverse loop test execution underway	Depends on whether or not the master station is executing a forward or a reverse loop test.	
M9232	SM1232	—	Local station operation status	OFF: RUN or STEP RUN status ON : STOP or PAUSE status	Depends on whether or not a local station is in STOP or PAUSE mode.	

Special Relay List (Continued)

ACPU Special Relay	Special Relay after Conversion	Special Relay for Modification	Name	Meaning	Details	Applicable CPU
M9233	SM1233	—	Local station error detect status	OFF: No errors ON : Error detection	Depends on whether or not a local station has detected an error in another station.	QnA
M9235	SM1235	—	Local station, remote I/O station parameter error detect status	OFF: No errors ON : Error detection	Depends on whether or not a local or a remote I/O station has detected any link parameter error in the master station	
M9236	SM1236	—	Local station, remote I/O station initial communications status	OFF: No communications ON : Communications underway	Depends on the results of initial communication between a local or remote I/O station and the master station. (Parameter communication, etc.)	
M9237	SM1237	—	Local station, remote I/O station error	OFF: Normal ON : Abnormal	Depends on the error condition of a local or remote I/O station.	
M9238	SM1238	—	Local station, remote I/O station forward or reverse loop error	OFF: Normal ON : Abnormal	Depends on the error condition of the forward and reverse loop lines of a local or a remote I/O station.	
M9240	SM1240	—	Link status	OFF: Online ON : Offline, station-to-station test, or self-loopback test	Depends on whether the local station is online or offline, or is in station-to-station test or self-loopback test mode.	
M9241	SM1241	—	Forward loop line error	OFF: Normal ON : Abnormal	Depends on the error condition of the forward loop line.	
M9242	SM1242	—	Reverse loop line error	OFF: Normal ON : Abnormal	Depends on the error condition of the reverse loop line.	
M9243	SM1243	—	Loopback implementation	OFF: Loopback not being conducted ON : Loopback implementation	Depends on whether or not loopback is occurring at the local station.	
M9246	SM1246	—	Data not received	OFF: Reception ON : No reception	Depends on whether or not data has been received from the master station.	
M9247	SM1247	—	Data not received	OFF: Reception ON : No reception	Depends on whether or not a tier three station has received data from its master station in a three-tier system.	
M9250	SM1250	—	Parameters not received	OFF: Reception ON : No reception	Depends on whether or not link parameters have been received from the master station.	
M9251	SM1251	—	Link relay	OFF: Normal ON : Abnormal	Depends on the data link condition at the local station.	
M9252	SM1252	—	Loop test status	OFF: Not being executed ON : Forward or reverse loop test execution underway	Depends on whether or not the local station is executing a forward or a reverse loop test.	
M9253	SM1253	—	Master station operation status	OFF: RUN or STEP RUN status ON : STOP or PAUSE status	Depends on whether or not the master station is in STOP or PAUSE mode.	
M9254	SM1254	—	Local station other than host station operation status	OFF: RUN or STEP RUN status ON : STOP or PAUSE status	Depends on whether or not a local station other than the host is in STOP or PAUSE mode.	
M9255	SM1255	—	Local station other than host station error	OFF: Normal ON : Abnormal	Depends on whether or not a local station other than the host is in error.	

(10) Process control instructions

Number	Name	Meaning	Explanation	Set by (When Set)	ACPU M9 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Applicable CPU
SM1500	Hold mode	OFF: No-hold ON : Hold	• Specifies whether or not to hold the output value when a range over occurs for the S.IN instruction range check.	U	New	○
SM1501	Hold mode	OFF: No-hold ON : Hold	• Specifies whether or not the output value is held when a range over occurs for the S.OUT instruction range check.	U	New	

## APPENDIX 2 Special Register List

The special registers, SD, are internal registers with fixed applications in the PLC.

For this reason, it is not possible to use these registers in sequence programs in the same way that normal registers are used.

However, data can be written as needed in order to control the CPU modules and remote I/O modules.

Data stored in the special registers are stored as BIN values if no special designation has been made to the contrary.

The headings in the table that follows have the following meanings.

Item	Function of Item
Number	• Indicates special register number
Name	• Indicates name of special register
Meaning	• Indicates contents of special register
Explanation	• Discusses contents of special register in more detail
Set by (When set)	<ul style="list-style-type: none"> <li>• Indicates whether the relay is set by the system or user, and, if it is set by the system, when setting is performed.</li> <li>&lt;Set by&gt; <ul style="list-style-type: none"> <li>S : Set by system</li> <li>U : Set by user (sequence programs or test operations from GX Developer)</li> <li>S/U : Set by both system and user</li> </ul> </li> <li>&lt;When set&gt; → Indicated only for registers set by system <ul style="list-style-type: none"> <li>Each END : Set during each END processing</li> <li>Initial : Set only during initial processing (when power supply is turned ON, or when going from STOP to RUN)</li> <li>Status change : Set only when there is a change in status</li> <li>Error : Set when error occurs</li> <li>Instruction execution : Set when instruction is executed</li> <li>Request : Set only when there is a user request (through SM, etc.)</li> </ul> </li> </ul>
Corresponding ACPU M9 □ □ □	<ul style="list-style-type: none"> <li>• Indicates corresponding special register in ACPU (D9 □ □ □)(Change and notation when there has been a change in contents)</li> <li>• Items indicated as "New" have been newly added for Process CPU</li> </ul>
Corresponding CPU	<ul style="list-style-type: none"> <li>• Indicates the corresponding CPU type name.</li> <li>○+Rem: Can be applied to Process CPU and MELSECNET/H remote I/O modules.</li> <li>○: Can be applied to all types of CPU</li> <li>Remote: Can be applied to the MELSECNET/H remote I/O modules.</li> </ul>

For details on the following items, see these manuals:

- Networks → • For Q Corresponding MELSECNET/H Network System Reference Manual (PLC to PLC network)
  - For Q Corresponding MELSECNET/H Network System Reference Manual (Remote I/O network)
- SFC → QCPU(Q mode)/QnACPU Programming Manual (SFC)

Special Register List

(1) Diagnostic Information

Number	Name	Meaning	Explanation	Set by (When set)	Corresponding ACPU D9□□□	Corresponding CPU						
SD0	Diagnostic errors	Diagnosis error code	<ul style="list-style-type: none"> <li>Error codes for errors found by diagnosis are stored as BIN data.</li> <li>Contents identical to latest fault history information.</li> </ul>	S (Error)	D9008 format change							
SD1	Clock time for diagnosis error occurrence	Clock time for diagnosis error occurrence	<ul style="list-style-type: none"> <li>Year (last two digits) and month that SD0 data was updated is stored as BCD 2-digit code. (Example)  <table border="1" style="margin-left: 20px;"> <tr> <td>B15 to B8</td> <td>B7 to B0</td> <td></td> </tr> <tr> <td>Year (0 to 99)</td> <td>Month (1 to 12)</td> <td>: October, 1995 H9510</td> </tr> </table> </li> </ul>	B15 to B8	B7 to B0		Year (0 to 99)	Month (1 to 12)	: October, 1995 H9510	S (Error)	New	
B15 to B8			B7 to B0									
Year (0 to 99)			Month (1 to 12)	: October, 1995 H9510								
SD2	<ul style="list-style-type: none"> <li>The day and hour that SD0 was updated is stored as BCD 2-digit code. (Example)  <table border="1" style="margin-left: 20px;"> <tr> <td>B15 to B8</td> <td>B7 to B0</td> <td></td> </tr> <tr> <td>Day (1 to 31)</td> <td>Hour (0 to 23)</td> <td>: 10 p.m. on 25th H2510</td> </tr> </table> </li> </ul>	B15 to B8	B7 to B0		Day (1 to 31)	Hour (0 to 23)	: 10 p.m. on 25th H2510					
B15 to B8	B7 to B0											
Day (1 to 31)	Hour (0 to 23)	: 10 p.m. on 25th H2510										
SD3	<ul style="list-style-type: none"> <li>The minute and second that SD0 data was updated is stored as BCD 2-digit code. (Example)  <table border="1" style="margin-left: 20px;"> <tr> <td>B15 to B8</td> <td>B7 to B0</td> <td></td> </tr> <tr> <td>Minutes (0 to 59)</td> <td>Seconds (0 to 59)</td> <td>: 35 min. 48 sec. (past the hour) H3548</td> </tr> </table> </li> </ul>	B15 to B8	B7 to B0		Minutes (0 to 59)	Seconds (0 to 59)	: 35 min. 48 sec. (past the hour) H3548					
B15 to B8	B7 to B0											
Minutes (0 to 59)	Seconds (0 to 59)	: 35 min. 48 sec. (past the hour) H3548										
SD4	Error information categories	Error information category code	<ul style="list-style-type: none"> <li>Category codes which help indicate what type of information is being stored in the common information areas (SD5 through SD15) and the individual information areas (SD16 through SD26) are stored here.  <table border="1" style="margin-left: 20px;"> <tr> <td>B15 to B8</td> <td>B7 to B0</td> <td></td> </tr> <tr> <td>Individual information category codes</td> <td>Common information category codes</td> <td></td> </tr> </table> </li> <li>The common information category codes store the following codes:                      0 : No error                      1 : Unit/module No./ PLC No./Base No. *                      2 : File name/Drive name                      3 : Time (value set)                      4 : Program error location                      5 : Switch cause (for Q4AR only)                      * : For a multiple PLC system, the module number or PLC number is stored depending on the error that occurred.                      (Refer to the corresponding error code for which number has been stored.)                      PLC No. 1: 1, PLC No. 2: 2, PLC No. 3: 3, PLC No. 4: 4                 </li> <li>The individual information category codes store the following codes:                      0 : No error                      1 : (Open)                      2 : File name/Drive name                      3 : Time (value actually measured)                      4 : Program error location                      5 : Parameter number                      6 : Annunciator number                      7 : Check instruction malfunction number                 </li> </ul>	B15 to B8	B7 to B0		Individual information category codes	Common information category codes		S (Error)	New	Q+Rem
B15 to B8	B7 to B0											
Individual information category codes	Common information category codes											



Special Register List (Continued)

Number	Name	Meaning	Explanation	Set by (When set)	Corresponding ACPU D9 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Corresponding CPU																																		
SD5 SD6 SD7 SD8 SD9 SD10 SD11 SD12 SD13 SD14 SD15	Error common information	Error common information	<ul style="list-style-type: none"> <li>Common information corresponding to the error codes (SD0) is stored here.</li> <li>The following four types of information are stored here:                             <ul style="list-style-type: none"> <li>① Slot No.                                     <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Number</th> <th>Meaning</th> </tr> </thead> <tbody> <tr> <td>SD5</td> <td>Slot No./PLC No./Base No. *1 *2</td> </tr> <tr> <td>SD6</td> <td>I/O No. (Not used for base No.)</td> </tr> <tr> <td>SD7</td> <td rowspan="8" style="text-align: center;">(Vacant)</td> </tr> <tr><td>SD8</td></tr> <tr><td>SD9</td></tr> <tr><td>SD10</td></tr> <tr><td>SD11</td></tr> <tr><td>SD12</td></tr> <tr><td>SD13</td></tr> <tr><td>SD14</td></tr> <tr><td>SD15</td></tr> </tbody> </table> </li> <li>*1: For a multiple PLC system, the slot number or PLC number is stored depending on the error that occurred. Slot 0 in the multiple PLC system is the one on the slot on the right of the rightmost CPU module. (Refer to the corresponding error code for which number has been stored.) PLC No. 1: 1, PLC No. 2: 2, PLC No. 3: 3, PLC No. 4: 4</li> <li>*2: If a fuse blown or I/O verify error occurred in the module loaded in the MELSECNET/H remote I/O station, the network number is stored into the upper 8 bits and the station number into the lower 8 bits. Use the I/O No. to check the module where the fuse blown or I/O verify error occurred.</li> <li>② File name/Drive name                                     <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Number</th> <th>Meaning</th> </tr> </thead> <tbody> <tr> <td>SD5</td> <td>Drive</td> </tr> <tr> <td>SD6</td> <td rowspan="4" style="text-align: center;">File name (ASCII code: 8 characters)</td> </tr> <tr> <td>SD7</td> </tr> <tr> <td>SD8</td> </tr> <tr> <td>SD9</td> </tr> <tr> <td>SD10</td> <td>Extension*3 2EH(.)</td> </tr> <tr> <td>SD11</td> <td>(ASCII code: 3 characters)</td> </tr> <tr> <td>SD12</td> <td rowspan="4" style="text-align: center;">(Vacant)</td> </tr> <tr><td>SD13</td></tr> <tr><td>SD14</td></tr> <tr><td>SD15</td></tr> </tbody> </table> </li> </ul> </li> </ul>	Number	Meaning	SD5	Slot No./PLC No./Base No. *1 *2	SD6	I/O No. (Not used for base No.)	SD7	(Vacant)	SD8	SD9	SD10	SD11	SD12	SD13	SD14	SD15	Number	Meaning	SD5	Drive	SD6	File name (ASCII code: 8 characters)	SD7	SD8	SD9	SD10	Extension*3 2EH(.)	SD11	(ASCII code: 3 characters)	SD12	(Vacant)	SD13	SD14	SD15	S (Error)	New	○+Rem
Number			Meaning																																					
SD5			Slot No./PLC No./Base No. *1 *2																																					
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SD12	(Vacant)																																							
SD13																																								
SD14																																								
SD15																																								

\* 3: Refer to REMARK.

**REMARK**

1) Extensions are shown below.

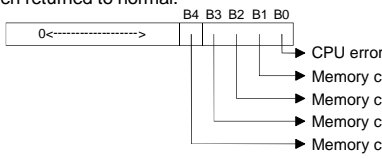
SD10		SD11		Extension name	File type
Higher8 bits	Lower8 bits	Higher8 bits	Higher8 bits		
51H	50H	41H	41H	QPA	Parameters
51H	50H	47H	47H	QPG	Sequence program/SFC program
51H	43H	44H	44H	QCD	Device comment
51H	44H	49H	49H	QDI	Device initial value
51H	44H	52H	52H	QDR	File register
51H	44H	53H	53H	QDS	Simulation data
51H	44H	4CH	4CH	QDL	Local device
51H	46H	44H	44H	QFD	Trouble history data

Special Register List (Continued)

Number	Name	Meaning	Explanation	Set by (When set)	Corresponding ACPU D9 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Corresponding CPU																																																								
SD5	Error common information	Error common information	<p>③ Time (value set)</p> <table border="1"> <thead> <tr> <th>Number</th> <th>Meaning</th> </tr> </thead> <tbody> <tr> <td>SD5</td> <td>Time : 1 μs units (0 to 999 μs)</td> </tr> <tr> <td>SD6</td> <td>Time : 1 ms units (0 to 65535 ms)</td> </tr> <tr> <td>SD7</td> <td rowspan="8">(Vacant)</td> </tr> <tr> <td>SD8</td> </tr> <tr> <td>SD9</td> </tr> <tr> <td>SD10</td> </tr> <tr> <td>SD11</td> </tr> <tr> <td>SD12</td> </tr> <tr> <td>SD13</td> </tr> <tr> <td>SD14</td> </tr> <tr> <td>SD15</td> <td></td> </tr> </tbody> </table> <p>④ Program error location</p> <table border="1"> <thead> <tr> <th>Number</th> <th>Meaning</th> </tr> </thead> <tbody> <tr> <td>SD5</td> <td rowspan="4">File name (ASCII code: 8 characters)</td> </tr> <tr> <td>SD6</td> </tr> <tr> <td>SD7</td> </tr> <tr> <td>SD8</td> </tr> <tr> <td>SD9</td> <td>Extension <input type="text"/> 2EH(.)</td> </tr> <tr> <td>SD10</td> <td>(ASCII code: 3 characters)</td> </tr> <tr> <td>SD11</td> <td>Pattern*4</td> </tr> <tr> <td>SD12</td> <td>Block No.</td> </tr> <tr> <td>SD13</td> <td>Step No./transition No.</td> </tr> <tr> <td>SD14</td> <td>Sequence step No. (L)</td> </tr> <tr> <td>SD15</td> <td>Sequence step No. (H)</td> </tr> </tbody> </table> <p>* 4 Contents of pattern data</p> <table border="1"> <tr> <td>15</td><td>14</td><td>to</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td><td>←(Bit number)</td> </tr> <tr> <td>0</td><td>0</td><td>to</td><td>0</td><td>0</td><td>*</td><td>*</td><td>*</td><td>*</td> </tr> </table> <p>(Not used)</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> SFC block designation present (1)/absent (0)</li> <li><input type="checkbox"/> SFC step designation present (1)/absent (0)</li> <li><input type="checkbox"/> SFC transition designation present (1)/absent (0)</li> </ul>	Number	Meaning	SD5	Time : 1 μs units (0 to 999 μs)	SD6	Time : 1 ms units (0 to 65535 ms)	SD7	(Vacant)	SD8	SD9	SD10	SD11	SD12	SD13	SD14	SD15		Number	Meaning	SD5	File name (ASCII code: 8 characters)	SD6	SD7	SD8	SD9	Extension <input type="text"/> 2EH(.)	SD10	(ASCII code: 3 characters)	SD11	Pattern*4	SD12	Block No.	SD13	Step No./transition No.	SD14	Sequence step No. (L)	SD15	Sequence step No. (H)	15	14	to	4	3	2	1	0	←(Bit number)	0	0	to	0	0	*	*	*	*	S (Error)	New	○+Rem
Number				Meaning																																																										
SD5				Time : 1 μs units (0 to 999 μs)																																																										
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SD12																																																														
SD13																																																														
SD14																																																														
SD15																																																														



Special Register List (Continued)

Number	Name	Meaning	Explanation	Set by (When set)	Corresponding ACPU D9□□□	Corresponding CPU
SD50	Error reset	Error number that performs error reset	<ul style="list-style-type: none"> <li>Stores error number that performs error reset</li> </ul>	U	New	○+Rem
SD51	Battery low latch	Bit pattern indicating where battery voltage drop occurred	<ul style="list-style-type: none"> <li>All corresponding bits go ON when battery voltage drops.</li> <li>Subsequently, these remain ON even after battery voltage has been returned to normal.</li> </ul>  <ul style="list-style-type: none"> <li>When High Performance model QCPU is used, this flag is always OFF because memory card B is used as standard memory.</li> </ul>	S (Error)	New	○
SD52	Battery low	Bit pattern indicating where battery voltage drop occurred	<ul style="list-style-type: none"> <li>Same configuration as SD51 above</li> <li>Subsequently, goes OFF when battery voltage is restored to normal.</li> <li>When QCPU is used, this flag is always OFF because memory card B is used as standard memory.</li> </ul>	S (Error)	New	
SD53	AC DOWN detection	Number of times for AC DOWN	<ul style="list-style-type: none"> <li>Every time the input voltage falls to or below 85% (AC power)/65% (DC power) of the rating during calculation of the CPU module, the value is incremented by 1 and stored in BIN code.</li> </ul>	S (Error)	D9005	○+Rem
SD60	Blown fuse number	Number of module with blown fuse	<ul style="list-style-type: none"> <li>Value stored here is the lowest station I/O number of the module with the blown fuse.</li> </ul>	S (Error)	D9000	○+Rem
SD61	I/O module verification error number	I/O module verification error module number	<ul style="list-style-type: none"> <li>The lowest I/O number of the module where the I/O module verification number took place.</li> </ul>	S (Error)	D9002	
SD62	Annunciator number	Annunciator number	<ul style="list-style-type: none"> <li>The first annunciator number to be detected is stored here.</li> </ul>	S (Instruction execution)	D9009	○
SD63	Number of annunciators	Number of annunciators	<ul style="list-style-type: none"> <li>Stores the number of annunciators searched.</li> </ul>	S (Instruction execution)	D9124	

Special Register List (Continued)

Number	Name	Meaning	Explanation	Set by (When set)	Corresponding ACPU D9□□□	Corresponding CPU
SD64	Table of detected annunciator numbers	Annunciator detection number	When F goes ON due to [OUT F] or [SET F], the F numbers which go progressively ON from SD64 through SD79 are registered.	S (Instruction execution)	D9125	○
SD65			F numbers turned OFF by [RST F] are deleted from SD64 to SD79, and are shifted to the data register following the data register where the deleted F numbers had been stored.		D9126	
SD66			Execution of the [LEDR] instruction shifts the contents of SD64 to SD79 up by one.		D9127	
SD67			(This can also be done by using the INDICATOR RESET switch on the front of the Q3A/Q4ACPU.)		D9128	
SD68			After 16 annunciators have been detected, detection of the 17th will not be stored from SD64 through SD79.		D9129	
SD69					D9130	
SD70					D9131	
SD71					D9132	
SD72					New	
SD73					New	
SD74					New	
SD75					New	
SD76					New	
SD77		New				
SD78		New				
SD79		New				
SD80	CHK number	CHK number	• Error codes detected by the CHK instruction are stored as BCD code.	S (Instruction execution)	New	
SD90	Step transition watchdog timer setting value (Enabled only when SFC program exists)	F number for timer set value and time over error	Corresponds to SM90	U	D9108	
SD91			Corresponds to SM91		D9109	
SD92			Corresponds to SM92		D9110	
SD93			Corresponds to SM93		D9111	
SD94			Corresponds to SM94		D9112	
SD95			Corresponds to SM95		D9113	
SD96			Corresponds to SM96		D9114	
SD97			Corresponds to SM97		New	
SD98			Corresponds to SM98		New	
SD99			Corresponds to SM99		New	
SD105	CH1 transmission speed setting (RS232)	Stores the preset transmission speed when GX Developer is used.	3 : 300bps, 6 : 600bps, 24 : 2400bps, 48 : 4800bps 96 : 9600bps, 192 : 19.2kbps, 384 : 38.4kbps 576 : 57.6kbps, 1152 : 115.2kbps	S	New	○+Rem

Special Register List

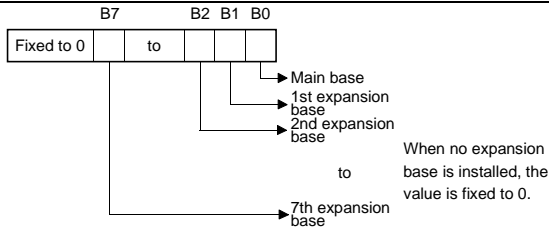
(2) System information

Number	Name	Meaning	Explanation	Set by (When set)	Corresponding ACPU D9 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Corresponding CPU
SD200	Status of switch	Status of CPU switch	<p>• The switch status of the remote I/O module is stored in the following format.</p> <p>① Remote I/O module switch status Always 1: STOP</p>	S (Always)	New	Remote
			<p>• The CPU module switch status is stored in the following format:</p> <p>①: CPU switch status 0: RUN 1: STOP 2: L.CLR</p> <p>②: Memory card switch Always OFF</p> <p>③: DIP switch B8 through BC correspond to SW1 through SW5 of system setting switch 1. 0: OFF, 1: ON BD through BF are vacant.</p>	S (Every END processing)	New	○
SD201	LED status	Status of CPU-LED	<p>• The following bit patterns are used to store the statuses of the LEDs on the CPU:</p> <p>①: RUN ⑤: BOOT ②: ERROR ⑥: Vacant ③: USER ⑦: Vacant ④: BAT.ALARM ⑧: MODE</p> <p>Bit patterns for MODE 0: OFF, 1: Green, 2: Orange</p>	S (Status change)	New	QCPU
SD203	Operating status of CPU	Operating status of CPU	<p>• The operating status of the remote I/O module is stored in the following format.</p> <p>① Remote I/O module operating status Always 2: STOP</p>	S (Always)	New	Rem
			<p>• The CPU module operating status is stored as indicated in the following figure:</p> <p>①: Operating status of CPU 0: RUN 1: STEP-RUN 2: STOP 3: PAUSE</p> <p>②: STOP/PAUSE cause 0: Switch 1: Remote contact 2: Remote operation from the GX Developer or Serial Communication. 3: Internal program instruction 4: Errors</p> <p>Note: Priority is earliest first</p>	S (Every END processing)	D9015 format change	○

Special Register List (Continued)

Number	Name	Meaning	Explanation	Set by (When set)	Corresponding ACPU D9□□□	Corresponding CPU																																
SD206	Device test execution type	0: Test not yet executed 1: During X device test 2: During Y device test 3: During X/Y device test	<ul style="list-style-type: none"> <li>Set when the device test mode is executed on GX Developer.</li> </ul>	S (Request)	New	Rem																																
SD207	LED display priority ranking	Priorities 1 to 4	<ul style="list-style-type: none"> <li>When error is generated, the LED display (flicker) is made according to the error number setting priorities.</li> <li>The setting areas for priorities are as follows:  <table border="1" style="margin-left: 20px;"> <tr> <td>B15</td><td>B12</td><td>B11</td><td>B8</td><td>B7</td><td>B4</td><td>B3</td><td>B0</td> </tr> <tr> <td>SD207</td><td>Priority 4</td><td>Priority 3</td><td>Priority 2</td><td>Priority 1</td><td></td><td></td><td></td> </tr> <tr> <td>SD208</td><td>Priority 8</td><td>Priority 7</td><td>Priority 6</td><td>Priority 5</td><td></td><td></td><td></td> </tr> <tr> <td>SD209</td><td></td><td></td><td>Priority 10</td><td>Priority 9</td><td></td><td></td><td></td> </tr> </table> </li> <li>Default Value SD207=H4321 SD208=H8765 SD209=H00A9</li> <li>No display is made if "0" is set. However, even if "0" has been set, information concerning CPU operation stop (including parameter settings) errors will be indicated by the LEDs without conditions. See Section 7.9.5 REMARK for the priority order.</li> </ul>	B15	B12	B11	B8	B7	B4	B3	B0	SD207	Priority 4	Priority 3	Priority 2	Priority 1				SD208	Priority 8	Priority 7	Priority 6	Priority 5				SD209			Priority 10	Priority 9				U	D9038	○
B15		B12		B11	B8	B7	B4	B3	B0																													
SD207		Priority 4		Priority 3	Priority 2	Priority 1																																
SD208	Priority 8	Priority 7	Priority 6	Priority 5																																		
SD209			Priority 10	Priority 9																																		
SD208	Priorities 5 to 8	D3039 format change																																				
SD209	Priorities 9 to 10	New																																				
SD210	Clock data	Clock data (year, month)	<ul style="list-style-type: none"> <li>The year (last two digits) and month are stored as BCD code at SD210 as shown below:  <table border="1" style="margin-left: 20px;"> <tr> <td>B15 to B12</td><td>B11 to B8</td><td>B7 to B4</td><td>B3 to B0</td> </tr> <tr> <td>Year</td><td>Month</td><td></td><td></td> </tr> </table> </li> <li>Example : July 1993 H9307</li> </ul>	B15 to B12	B11 to B8	B7 to B4	B3 to B0	Year	Month			S/U (Request)	D9025	○+Rem																								
B15 to B12	B11 to B8	B7 to B4	B3 to B0																																			
Year	Month																																					
SD211	Clock data	Clock data (day, hour)	<ul style="list-style-type: none"> <li>The day and hour are stored as BCD code at SD211 as shown below:  <table border="1" style="margin-left: 20px;"> <tr> <td>B15 to B12</td><td>B11 to B8</td><td>B7 to B4</td><td>B3 to B0</td> </tr> <tr> <td>Day</td><td>Hour</td><td></td><td></td> </tr> </table> </li> <li>Example : 31st, 10 a.m. H3110</li> </ul>	B15 to B12	B11 to B8	B7 to B4	B3 to B0	Day	Hour			D9026																										
B15 to B12	B11 to B8	B7 to B4	B3 to B0																																			
Day	Hour																																					
SD212	Clock data	Clock data (minute, second)	<ul style="list-style-type: none"> <li>The minutes and seconds (after the hour) are stored as BCD code at SD212 as shown below:  <table border="1" style="margin-left: 20px;"> <tr> <td>B15 to B12</td><td>B11 to B8</td><td>B7 to B4</td><td>B3 to B0</td> </tr> <tr> <td>Minute</td><td>Second</td><td></td><td></td> </tr> </table> </li> <li>Example : 35 min., 48 sec. (after the hour) H3548</li> </ul>	B15 to B12	B11 to B8	B7 to B4	B3 to B0	Minute	Second			D9027																										
B15 to B12	B11 to B8	B7 to B4	B3 to B0																																			
Minute	Second																																					
SD213	Clock data	Clock data (day of week)	<ul style="list-style-type: none"> <li>Stores the year (two digits) and the day of the week in SD213 in the BCD code format as shown below.  <table border="1" style="margin-left: 20px;"> <tr> <td>B15 to B12</td><td>B11 to B8</td><td>B7 to B4</td><td>B3 to B0</td> </tr> <tr> <td>Higher digits of year (0 to 99)</td><td>Day of week</td><td></td><td></td> </tr> </table> </li> <li>Example : Friday H0005</li> </ul> <table border="1" style="margin-left: 20px;"> <tr><th>Day of week</th></tr> <tr><td>0</td><td>Sunday</td></tr> <tr><td>1</td><td>Monday</td></tr> <tr><td>2</td><td>Tuesday</td></tr> <tr><td>3</td><td>Wednesday</td></tr> <tr><td>4</td><td>Thursday</td></tr> <tr><td>5</td><td>Friday</td></tr> <tr><td>6</td><td>Saturday</td></tr> </table>	B15 to B12	B11 to B8	B7 to B4	B3 to B0	Higher digits of year (0 to 99)	Day of week			Day of week	0	Sunday	1	Monday	2	Tuesday	3	Wednesday	4	Thursday	5	Friday	6	Saturday	S/U (Request)	D9028	○+Rem									
B15 to B12	B11 to B8	B7 to B4	B3 to B0																																			
Higher digits of year (0 to 99)	Day of week																																					
Day of week																																						
0	Sunday																																					
1	Monday																																					
2	Tuesday																																					
3	Wednesday																																					
4	Thursday																																					
5	Friday																																					
6	Saturday																																					

Special Register List (Continued)

Number	Name	Meaning	Explanation	Set by (When set)	Corresponding ACPU D9	Corresponding CPU																																																						
SD220	LED display data	Display indicator data	<ul style="list-style-type: none"> <li>LED display ASCII data (16 characters) stored here.</li> </ul>	S (When changed)	New	○																																																						
SD221			<table border="1"> <tr> <td>B15</td> <td>to</td> <td>B8</td> <td>B7</td> <td>to</td> <td>B0</td> </tr> <tr> <td>SD220</td> <td>15th character from the right</td> <td></td> <td></td> <td></td> <td>16th character from the right</td> </tr> <tr> <td>SD221</td> <td>13th character from the right</td> <td></td> <td></td> <td></td> <td>14th character from the right</td> </tr> <tr> <td>SD222</td> <td>11th character from the right</td> <td></td> <td></td> <td></td> <td>12th character from the right</td> </tr> <tr> <td>SD223</td> <td>9th character from the right</td> <td></td> <td></td> <td></td> <td>10th character from the right</td> </tr> <tr> <td>SD224</td> <td>7th character from the right</td> <td></td> <td></td> <td></td> <td>8th character from the right</td> </tr> <tr> <td>SD225</td> <td>5th character from the right</td> <td></td> <td></td> <td></td> <td>6th character from the right</td> </tr> <tr> <td>SD226</td> <td>3rd character from the right</td> <td></td> <td></td> <td></td> <td>4th character from the right</td> </tr> <tr> <td>SD227</td> <td>1st character from the right</td> <td></td> <td></td> <td></td> <td>2nd character from the right</td> </tr> </table>				B15	to	B8	B7	to	B0	SD220	15th character from the right				16th character from the right	SD221	13th character from the right				14th character from the right	SD222	11th character from the right				12th character from the right	SD223	9th character from the right				10th character from the right	SD224	7th character from the right				8th character from the right	SD225	5th character from the right				6th character from the right	SD226	3rd character from the right				4th character from the right	SD227	1st character from the right				2nd character from the right
B15			to				B8	B7	to	B0																																																		
SD220			15th character from the right							16th character from the right																																																		
SD221			13th character from the right							14th character from the right																																																		
SD222			11th character from the right							12th character from the right																																																		
SD223			9th character from the right							10th character from the right																																																		
SD224			7th character from the right							8th character from the right																																																		
SD225	5th character from the right				6th character from the right																																																							
SD226	3rd character from the right				4th character from the right																																																							
SD227	1st character from the right				2nd character from the right																																																							
SD235	Unit to which Online module change is being performed	The header I/O number of the unit to which Online module exchange is being performed + 10H	<ul style="list-style-type: none"> <li>10H is added to the value of the header I/O number of which the Online module change is being performed.</li> </ul>	S (During Online module Exchange)	New																																																							
SD240	Base mode	0: Automatic mode 1: Detail mode	<ul style="list-style-type: none"> <li>Stores the base mode.</li> </ul>	S (Initial)	New																																																							
SD241	No. of extension bases	0: Main base only 1 to 7: No. of extension bases	<ul style="list-style-type: none"> <li>Stores the maximum number of the extension bases being installed.</li> </ul>	S (Initial)	New																																																							
SD242	A/Q base differentiation	Base type differentiation 0: QA * * B is installed (A mode) 1: Q * * B is installed (Q mode)		S (Initial)	New	○+Rem																																																						
SD243	No. of base slots	No. of base slots	<table border="1"> <tr> <td>B15</td> <td>B12</td> <td>B11</td> <td>B8</td> <td>B7</td> <td>B4</td> <td>B3</td> <td>B0</td> </tr> <tr> <td>SD243</td> <td>Expansion 3</td> <td>Expansion 2</td> <td>Expansion 1</td> <td></td> <td>Main</td> <td></td> <td></td> </tr> <tr> <td>SD244</td> <td>Expansion 7</td> <td>Expansion 6</td> <td>Expansion 5</td> <td>Expansion 4</td> <td></td> <td></td> <td></td> </tr> </table>	B15	B12	B11	B8	B7	B4	B3	B0	SD243	Expansion 3	Expansion 2	Expansion 1		Main			SD244	Expansion 7	Expansion 6	Expansion 5	Expansion 4				S (Initial)	New																															
B15			B12	B11	B8	B7	B4	B3	B0																																																			
SD243	Expansion 3	Expansion 2	Expansion 1		Main																																																							
SD244	Expansion 7	Expansion 6	Expansion 5	Expansion 4																																																								
SD244	<ul style="list-style-type: none"> <li>As shown above, each area stores the number of slots being installed.</li> </ul>																																																											
SD250	Loaded maximum I/O	Loaded maximum I/O No.	<ul style="list-style-type: none"> <li>When SM250 goes from OFF to ON, the upper 2 digits of the final I/O number plus 1 of the modules loaded are stored as BIN values.</li> </ul>	S (Request END)	New	○+Rem																																																						
SD254	MELSECNET/10 (H) information	Number of modules installed	<ul style="list-style-type: none"> <li>Indicates the number of modules installed on MELSECNET/10 (H)</li> </ul>	S (Initial)	New	○																																																						
SD255		I/O No.	<ul style="list-style-type: none"> <li>MELSECNET/10 (H) I/O number of first module installed</li> </ul>																																																									
SD256		Network No.	<ul style="list-style-type: none"> <li>MELSECNET/10 (H) network number of first module installed</li> </ul>																																																									
SD257		Group number	<ul style="list-style-type: none"> <li>MELSECNET/10 (H) group number of first module installed</li> </ul>																																																									
SD258		Station No.	<ul style="list-style-type: none"> <li>MELSECNET/10 (H) station number of first module installed</li> </ul>																																																									
SD259		Standby information	<ul style="list-style-type: none"> <li>In the case of standby stations, the module number of the standby station is stored. (1 to 4)</li> </ul>																																																									
SD260 to SD264		Information from 2nd module	<ul style="list-style-type: none"> <li>Configuration is identical to that for the 2nd module.</li> </ul>																																																									
SD265 to SD269	Information from 3rd module	<ul style="list-style-type: none"> <li>Configuration is identical to that for the 3rd module.</li> </ul>																																																										
SD270 to SD274	Information from 4th module	<ul style="list-style-type: none"> <li>Configuration is identical to that for the 4th module.</li> </ul>																																																										



Special Register List (Continued)

Number	Name	Meaning	Explanation	Set by (When set)	Corresponding ACPU D9 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Corresponding CPU
SD280	CC-Link error	Error detection status	<p>① When Xn0 of the installed CC-Link goes ON, the bit corresponding to the station switches ON.</p> <p>② When either Xn1 or XnF of the installed CC-Link switch OFF, the bit corresponding to the station switches ON.</p> <p>③ Switches ON when the CPU cannot communicate with the installed CC-Link.</p>	S (Error)	New	QCPU Remote
SD290	Device allocation (Same as parameter contents)	Number of points allocated for X	• Stores the number of points currently set for X devices	S (Initial)	New	○+Rem
SD291		Number of points allocated for Y	• Stores the number of points currently set for Y devices			
SD292		Number of points allocated for M	• Stores the number of points currently set for M devices			
SD293		Number of points allocated for L	• Stores the number of points currently set for L devices			○
SD294		Number of points allocated for B	• Stores the number of points currently set for B devices			○+Rem
SD295		Number of points allocated for F	• Stores the number of points currently set for F devices			○
SD296		Number of points allocated for SB	• Stores the number of points currently set for SB devices			○+Rem
SD297		Number of points allocated for V	• Stores the number of points currently set for V devices			○
SD298		Number of points allocated for S	• Stores the number of points currently set for S devices			
SD299		Number of points allocated for T	• Stores the number of points currently set for T device			
SD300		Number of points allocated for ST	• Stores the number of points currently set for ST devices			
SD301	Number of points allocated for C	• Stores the number of points currently set for C devices	S (Initial)	New	○+Rem	
SD302	Number of points allocated for D	• Stores the number of points currently set for D devices				
SD303	Number of points allocated for W	• Stores the number of points currently set for W devices				
SD304	Number of points allocated for SW	• Stores the number of points currently set for SW devices				
SD315	Time reserved for communication processing	Time reserved for communication processing	Reserves the designated time for communication processing with GX Developer or other units. The greater the value is designated, the shorter the response time for communication with other devices (GX Developer, serial communication units) becomes. The scan time becomes longer by the designated time. Setting range: 1 to 100 ms If the designated value is out of the range above, it is assumed to no setting.	END processing	New	○

Special Register List (Continued)

Number	Name	Meaning	Explanation	Set by (When set)	Corresponding ACPU D9□□□	Corresponding CPU
SD340	Ethernet information	No. of modules installed	• Indicates the number of modules installed on Ethernet.	S (Initial)	New	○+Rem
SD341		I/O No.	• Ethernet I/O No. of the 1st module installed.			
SD342		Network No.	• Ethernet network No. of the 1st module installed.			
SD343		Group No.	• Ethernet group No. of the 1st module installed.			
SD344		Station No.	• Ethernet station No. of the 1st module installed.			
SD345 to SD346		Empty	• Empty (The Ethernet IP address of the 1st module is stored in buffer memory.)			
SD347		Empty	• Empty (The Ethernet error code of the 1st module is read with the ERRORRD instruction.)			
SD348 to SD354		Information from 2nd module	• Configuration is identical to that for the first module.	S (Initial)	New	
SD355 to SD361		Information from 3rd module	• Configuration is identical to that for the first module.			
SD362 to SD368		Information from 4th module	• Configuration is identical to that for the first module.			
SD395	Multiple PLC number	Multiple PLC number	• In a multiple PLC system configuration, the PLC number of the host CPU is stored. PLC No. 1: 1, PLC No. 2: 2, PLC No. 3: 3, PLC No. 4: 4	S (Initial)	New	○

(3) System clocks/counters

Number	Name	Meaning	Explanation	Set by (When set)	Corresponding ACPU D9□□□	Corresponding CPU
SD412	1 second counter	Number of counts in 1-second units	<ul style="list-style-type: none"> <li>Following programmable controller CPU module RUN, 1 is added each second</li> <li>Count repeats from 0 to 32767 to -32768 to 0</li> </ul>	S (Status change)	D9022	○
SD414	2n second clock setting	2n second clock units	<ul style="list-style-type: none"> <li>Stores value n of 2n second clock (Default is 30)</li> <li>Setting can be made between 1 and 32767</li> </ul>	U	New	
SD415	2nms clock setting	2nms clock units	<ul style="list-style-type: none"> <li>Stores value n of 2nms clock (Default is 30)</li> <li>Setting can be made between 1 and 32767</li> </ul>	U	New	
SD420	Scan counter	Number of counts in each scan	<ul style="list-style-type: none"> <li>This counter increases by 1 for each scan of the scan execution type program after RUN of the CPU module. *</li> <li>Count repeats from 0 to 32767 to -32768 to 0</li> </ul>	S(Every END processing)	New	
SD430	Low speed scan counter	Number of counts in each scan	<ul style="list-style-type: none"> <li>This counter increases by 1 for each scan of the low speed execution type program after RUN of the CPU module.</li> <li>Count repeats from 0 to 32767 to -32768 to 0</li> <li>Used only for low speed execution type programs</li> </ul>	S(Every END processing)	New	

\* : Not counted by the scan in an initial execution type program.

Special Register List

(4) Scan information

Number	Name	Meaning	Explanation	Set by (When set)	Corresponding ACPU D9□□□	Corresponding CPU
SD500	Execution program No.	Execution type of program being executed	<ul style="list-style-type: none"> <li>Program number of program currently being executed is stored as BIN value.</li> </ul>	S (Status change)	New	
SD510	Low speed program No.	File name of low speed execution in progress	<ul style="list-style-type: none"> <li>Program number of low speed program currently being executed is stored as BIN value.</li> <li>Enabled only when SM510 is ON.</li> </ul>	S (Every END processing)	New	
SD520	Current scan time	Current scan time (in 1 ms units)	<ul style="list-style-type: none"> <li>Stores current scan time (in 1 ms units)</li> <li>Range from 0 to 65535</li> </ul>	S (Every END processing)	D9017 format change	
SD521		Current scan time (in 100 μs units)	<ul style="list-style-type: none"> <li>Stores current scan time (in 100 μs units)</li> <li>Range from 00000 to 900</li> <li>(Example) A current scan of 23.6 ms would be stored as follows: D520=23 D521=600</li> </ul>	S (Every END processing)	New	
SD522	Initial scan time	Initial scan time (in 1 ms units)	<ul style="list-style-type: none"> <li>Stores scan time for initially execution type program. (in 1 ms units)</li> <li>Range from 0 to 65535</li> </ul>	S (First END processing)	New	
SD523		Initial scan time (in 100 μs units)	<ul style="list-style-type: none"> <li>Stores scan time for initially execution type program. (in 100 μs units)</li> <li>Range of 000 to 900</li> </ul>			
SD524	Minimum scan time	Minimum scan time (in 1 ms units)	<ul style="list-style-type: none"> <li>Stores minimum value of scan time (in 1 ms units)</li> <li>Range from 0 to 65535</li> </ul>	S (Every END processing)	D9018 format change	
SD525		Minimum scan time (in 100 μs units)	<ul style="list-style-type: none"> <li>Stores minimum value of scan time (in 100 μs units)</li> <li>Range of 000 to 900</li> </ul>	S (Every END processing)	New	
SD526	Maximum scan time	Maximum scan time (in 1 ms units)	<ul style="list-style-type: none"> <li>Stores maximum value of scan time, excepting the first scan. (in 1 ms units)</li> <li>Range from 0 to 65535</li> </ul>	S (Every END processing)	D9019 format change	○
SD527		Maximum scan time (in 100 μs units)	<ul style="list-style-type: none"> <li>Stores maximum value of scan time, excepting the first scan. (in 100 μs units)</li> <li>Range of 000 to 900</li> </ul>		New	
SD528	Current scan time for low speed execution type programs	Current scan time (in 1 ms units)	<ul style="list-style-type: none"> <li>Stores current scan time for low speed execution type program (in 1 ms units)</li> </ul>	S (Every END processing)	New	
SD529		Current scan time (in 100 μs units)	<ul style="list-style-type: none"> <li>Stores current scan time for low speed execution type program (in 100 μs units)</li> <li>Range of 000 to 900</li> </ul>			
SD532	Minimum scan time for low speed execution type programs	Minimum scan time (in 1 ms units)	<ul style="list-style-type: none"> <li>Stores minimum value of scan time for low speed execution type program (in 1 ms units)</li> <li>Range from 0 to 65535</li> </ul>	S (Every END processing)	New	
SD533		Minimum scan time (in 100 μs units)	<ul style="list-style-type: none"> <li>Stores minimum value of scan time for low speed execution type program (in 100 μs units)</li> <li>Range of 000 to 900</li> </ul>			
SD534	Maximum scan time for low speed execution type programs	Maximum scan time (in 1 ms units)	<ul style="list-style-type: none"> <li>Stores the maximum scan time for all except low speed execution type program's first scan. (in 1 ms units)</li> <li>Range from 0 to 65535</li> </ul>	S (Every END processing)	New	
SD535		Maximum scan time (in 100 μs units)	<ul style="list-style-type: none"> <li>Stores the maximum scan time for all except low speed execution type program's first scan. (in 100 μs units)</li> <li>Range of 000 to 900</li> </ul>			
SD540	END processing time	END processing time (in 1 ms units)	<ul style="list-style-type: none"> <li>Stores time from completion of scan program to start of next scan. (in 1 ms units)</li> <li>Range from 0 to 65535</li> </ul>	S (Every END processing)	New	
SD541		END processing time (in 100 μs units)	<ul style="list-style-type: none"> <li>Stores time from completion of scan program to start of next scan. (in 100 μs units)</li> <li>Range of 000 to 900</li> </ul>			

Special Register List (Continued)

Number	Name	Meaning	Explanation	Set by (When set)	Corresponding ACPU D9□□□	Corresponding CPU
SD542	Constant scan wait time	Constant scan wait time (in 1 ms units)	<ul style="list-style-type: none"> <li>Stores wait time when constant scan time has been set. (in 1 ms units)</li> <li>Range from 0 to 65535</li> </ul>	S (First END processing)	New	
SD543		Constant scan wait time (in 100 μs units)	<ul style="list-style-type: none"> <li>Stores wait time when constant scan time has been set. (in 100 μs units)</li> <li>Range of 000 to 900</li> </ul>			
SD544	Cumulative execution time for low speed execution type programs	Cumulative execution time for low speed execution type programs (in 1 ms units)	<ul style="list-style-type: none"> <li>Stores cumulative execution time for low speed execution type programs. (in 1 ms units)</li> <li>Range from 0 to 65535</li> <li>Cleared to 0 following 1 low speed scan</li> </ul>	S (Every END processing)	New	○
SD545		Cumulative execution time for low speed execution type programs (in 100 μs units)	<ul style="list-style-type: none"> <li>Stores cumulative execution time for low speed execution type programs. (in 100 μs units)</li> <li>Range of 000 to 900</li> <li>Cleared to 0 following 1 low speed scan</li> </ul>			
SD546	Execution time for low speed execution type programs	Execution time for low speed execution type programs (in 1 ms units)	<ul style="list-style-type: none"> <li>Stores low speed program execution time during 1 scan (in 1 ms units)</li> <li>Range from 0 to 65535</li> <li>Stores each scan</li> </ul>	S (Every END processing)	New	○
SD547		Execution time for low speed execution type programs (in 100 μs units)	<ul style="list-style-type: none"> <li>Stores low speed program execution time during 1 scan (in 100 μs units)</li> <li>Range of 000 to 900</li> <li>Stores each scan</li> </ul>			
SD548	Scan program execution time	Scan program execution time (in 1 ms units)	<ul style="list-style-type: none"> <li>Stores execution time for scan execution type program during 1 scan (in 1 ms units)</li> <li>Range from 0 to 65535</li> <li>Stores each scan</li> </ul>	S (Every END processing)	New	
SD549		Scan program execution time (in 100 μs units)	<ul style="list-style-type: none"> <li>Stores execution time for scan execution type program during 1 scan (in 100 μs units)</li> <li>Range of 000 to 900</li> <li>Stores each scan</li> </ul>			
SD550	Service interval measurement module	Unit/module No.	<ul style="list-style-type: none"> <li>Sets I/O number for module that measures service interval</li> </ul>	U	New	
SD551	Service interval time	Module service interval (in 1 ms units)	<ul style="list-style-type: none"> <li>When SM551 is ON, stores service interval for module designated by SD550. (in 1 ms units)</li> <li>Range from 0 to 65535</li> </ul>	S (Request)	New	○+Rem
SD552		Module service interval (in 100 μs units)	<ul style="list-style-type: none"> <li>When SM551 is ON, stores service interval for module designated by SD550. (in 100 μs units)</li> <li>Range from 000 to 900</li> </ul>			

Special Register List

(5) Memory card

Number	Name	Meaning	Explanation	Set by (When set)	Corresponding ACPU D9 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Corresponding CPU																
SD600	Memory card A models	Memory card A models	<ul style="list-style-type: none"> <li>Indicates memory card A model installed</li> </ul>	S (Initial and card removal)	New	○																
SD602	Drive 1 (RAM) capacity	Drive 1 capacity	<ul style="list-style-type: none"> <li>Drive 1 capacity is stored in 1 kbyte units</li> </ul>	S (Initial and card removal)	New	○																
SD603	Drive 2 (ROM) capacity	Drive 2 capacity	<ul style="list-style-type: none"> <li>Drive 2 capacity is stored in 1 kbyte units</li> </ul>	S (Initial and card removal)	New	○																
SD604	Memory card A use conditions	Memory card A use conditions	<ul style="list-style-type: none"> <li>The use conditions for memory card A are stored as bit patterns (In use when ON)</li> <li>The significance of these bit patterns is indicated below:</li> </ul> <table border="1"> <tr> <td>B0: Boot operation (QBT)</td> <td>B8: Not used</td> </tr> <tr> <td>B1: Parameters (QPA)</td> <td>B9: CPU fault history (QFD)</td> </tr> <tr> <td>B2: Device comments (QCD)</td> <td>BA: Not used</td> </tr> <tr> <td>B3: Device initial value (QDI)</td> <td>BB: Local device (QDL)</td> </tr> <tr> <td>B4: File register R (QDR)</td> <td>BC: Not used</td> </tr> <tr> <td>B5: Trace (QTS)</td> <td>BD: Not used</td> </tr> <tr> <td>B6: Not used</td> <td>BE: Not used</td> </tr> <tr> <td>B7: Not used</td> <td>BF: Not used</td> </tr> </table>	B0: Boot operation (QBT)	B8: Not used	B1: Parameters (QPA)	B9: CPU fault history (QFD)	B2: Device comments (QCD)	BA: Not used	B3: Device initial value (QDI)	BB: Local device (QDL)	B4: File register R (QDR)	BC: Not used	B5: Trace (QTS)	BD: Not used	B6: Not used	BE: Not used	B7: Not used	BF: Not used	S (Status change)	New	○
B0: Boot operation (QBT)	B8: Not used																					
B1: Parameters (QPA)	B9: CPU fault history (QFD)																					
B2: Device comments (QCD)	BA: Not used																					
B3: Device initial value (QDI)	BB: Local device (QDL)																					
B4: File register R (QDR)	BC: Not used																					
B5: Trace (QTS)	BD: Not used																					
B6: Not used	BE: Not used																					
B7: Not used	BF: Not used																					
SD620	Memory card B models	Memory card B models	<ul style="list-style-type: none"> <li>Indicates memory card B models installed</li> </ul>	S (Initial)	New	○																
SD622	Drive 3 (RAM) capacity	Drive 3 capacity	<ul style="list-style-type: none"> <li>Drive 3 capacity is stored in 1 kbyte units.</li> </ul>	S (Initial)	New	○																
SD623	Drive 4 (ROM) capacity	Drive 4 capacity	<ul style="list-style-type: none"> <li>Drive 4 capacity is stored in 1 kbyte units.</li> </ul>	S (Initial)	New	○																
SD624	Drive 3/4 use conditions	Drive 3/4 use conditions	<ul style="list-style-type: none"> <li>The conditions for usage for drive 3/4 are stored as bit patterns. (In use when ON)</li> <li>The significance of these bit patterns is indicated below:</li> </ul> <table border="1"> <tr> <td>B0: Boot operation (QBT)</td> <td>B8: Not used</td> </tr> <tr> <td>B1: Parameters (QPA)</td> <td>B9: CPU fault history (QFD)</td> </tr> <tr> <td>B2: Device comments (QCD)</td> <td>B10: Not used</td> </tr> <tr> <td>B3: Device initial value (QDI)</td> <td>B11: Local device (QDL)</td> </tr> <tr> <td>B4: File R (QDR)</td> <td>B12: Not used</td> </tr> <tr> <td>B5: Trace (QTS)</td> <td>B13: Not used</td> </tr> <tr> <td>B6: Not used</td> <td>B14: Not used</td> </tr> <tr> <td>B7: Not used</td> <td>B15: Not used</td> </tr> </table>	B0: Boot operation (QBT)	B8: Not used	B1: Parameters (QPA)	B9: CPU fault history (QFD)	B2: Device comments (QCD)	B10: Not used	B3: Device initial value (QDI)	B11: Local device (QDL)	B4: File R (QDR)	B12: Not used	B5: Trace (QTS)	B13: Not used	B6: Not used	B14: Not used	B7: Not used	B15: Not used	S (Status change)	New	○
B0: Boot operation (QBT)	B8: Not used																					
B1: Parameters (QPA)	B9: CPU fault history (QFD)																					
B2: Device comments (QCD)	B10: Not used																					
B3: Device initial value (QDI)	B11: Local device (QDL)																					
B4: File R (QDR)	B12: Not used																					
B5: Trace (QTS)	B13: Not used																					
B6: Not used	B14: Not used																					
B7: Not used	B15: Not used																					

Special Register List (Continued)

Number	Name	Meaning	Explanation	Set by (When set)	Corresponding ACPU D9□□□	Corresponding CPU
SD640	File register drive	Drive number:	• Stores drive number being used by file register	S (Initial)	New	○
SD641	File register file name	File register file name	• Stores file register file name (with extension) selected at parameters or by use of QDRSET instruction as ASCII code. B15 to B8 B7 to B0 SD641 Second character First character SD642 Fourth character Third character SD643 Sixth character Fifth character SD644 Eighth character Seventh character SD645 First character of extension 2EH(.) SD646 Third character of extension Second character of extension	S (Initial)	New	
SD642						
SD643						
SD644						
SD645						
SD646						
SD647						
SD648	File register block number	File register block number	• Stores the currently selected file register block number.	S (Status change)	D9035	
SD650	Comment drive	Comment drive number	• Stores the comment drive number selected at the parameters or by the QCDSET instruction.	S (Status change)	New	
SD651	Comment file name	Comment file name	• Stores the comment file name (with extension) selected at the parameters or by the QCDSET instruction in ASCII code. B15 to B8 B7 to B0 SD651 Second character First character SD652 Fourth character Third character SD653 Sixth character Fifth character SD654 Eighth character Seventh character SD655 First character of extension 2EH(.) SD656 Third character of extension Second character of extension	S (Status change)	New	
SD652						
SD653						
SD654						
SD655						
SD656						
SD660						Boot operation designation file
SD661	File name of boot designation file	• Stores the file name of the boot designation file (* .QBT). B15 to B8 B7 to B0 SD661 Second character First character SD662 Fourth character Third character SD663 Sixth character Fifth character SD664 Eighth character Seventh character SD665 First character of extension 2EH(.) SD666 Third character of extension Second character of extension	S (Initial)	New		
SD662						
SD663						
SD664						
SD665						
SD666						

(6) Instruction-Related Registers

Number	Name	Meaning	Explanation	Set by (When set)	Corresponding ACPU D9□□□	Corresponding CPU																																																																																																																																																																																																																																							
SD705	Mask pattern	Mask pattern	<ul style="list-style-type: none"> <li>During block operations, turning SM705 ON makes it possible to use the mask pattern being stored at SD705 (or at SD705 and SD706 if double words are being used) to operate on all data in the block with the masked values.</li> </ul>	U	New	○																																																																																																																																																																																																																																							
SD706																																																																																																																																																																																																																																													
SD715	IMASK instruction mask pattern	Mask pattern	<ul style="list-style-type: none"> <li>Patterns masked by use of the IMASK instruction are stored in the following manner:</li> </ul> <table border="1" style="margin-left: 40px;"> <tr> <td></td> <td style="text-align: center;">B15</td> <td></td> <td style="text-align: center;">B1</td> <td style="text-align: center;">B0</td> </tr> <tr> <td>SD715</td> <td style="text-align: center;">I15</td> <td style="text-align: center;">to</td> <td style="text-align: center;">I1</td> <td style="text-align: center;">I0</td> </tr> <tr> <td>SD716</td> <td style="text-align: center;">I31</td> <td style="text-align: center;">to</td> <td style="text-align: center;">I17</td> <td style="text-align: center;">I16</td> </tr> <tr> <td>SD717</td> <td style="text-align: center;">I47</td> <td style="text-align: center;">to</td> <td style="text-align: center;">I33</td> <td style="text-align: center;">I32</td> </tr> </table>		B15		B1	B0	SD715	I15	to	I1	I0	SD716	I31	to	I17	I16	SD717	I47	to	I33	I32	S (During execution)	New	○																																																																																																																																																																																																																			
				B15		B1	B0																																																																																																																																																																																																																																						
SD715				I15	to	I1	I0																																																																																																																																																																																																																																						
SD716	I31	to	I17	I16																																																																																																																																																																																																																																									
SD717	I47	to	I33	I32																																																																																																																																																																																																																																									
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SD718	Accumulator	Accumulator	<ul style="list-style-type: none"> <li>For use as replacement for accumulators used in A-series programs.</li> </ul>	S/U	New																																																																																																																																																																																																																																								
SD719																																																																																																																																																																																																																																													
SD720	Program No. designation for PLOAD instruction	Program No. designation for PLOAD instruction	<ul style="list-style-type: none"> <li>Stores the program number of the program to be loaded by the PLOAD instruction when designated.</li> <li>Designation range: 1 to 124</li> </ul>	U	New	○																																																																																																																																																																																																																																							
SD736	PKEY input	PKEY input	<ul style="list-style-type: none"> <li>SD that temporarily stores keyboard data input by means of the PKEY instruction.</li> </ul>	S (During execution)	New	○																																																																																																																																																																																																																																							
SD738	Message storage	Message storage	<ul style="list-style-type: none"> <li>Stores the message designated by the MSG instruction.</li> </ul> <table border="1" style="margin-left: 40px;"> <tr> <td></td> <td style="text-align: center;">B15</td> <td style="text-align: center;">to</td> <td style="text-align: center;">B8</td> <td style="text-align: center;">B7</td> <td style="text-align: center;">to</td> <td style="text-align: center;">B0</td> </tr> <tr> <td>SD738</td> <td style="text-align: center;">2nd character</td> <td></td> <td style="text-align: center;">1st character</td> <td></td> <td></td> <td></td> </tr> <tr> <td>SD739</td> <td style="text-align: center;">4th character</td> <td></td> <td style="text-align: center;">3rd character</td> <td></td> <td></td> <td></td> </tr> <tr> <td>SD740</td> <td style="text-align: center;">6th character</td> <td></td> <td style="text-align: center;">5th character</td> <td></td> <td></td> <td></td> </tr> <tr> <td>SD741</td> <td style="text-align: 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style="text-align: center;">20th character</td> <td></td> <td style="text-align: center;">19th character</td> <td></td> <td></td> <td></td> </tr> <tr> <td>SD748</td> <td style="text-align: center;">22nd character</td> <td></td> <td style="text-align: center;">21st character</td> <td></td> <td></td> <td></td> </tr> <tr> <td>SD749</td> <td style="text-align: center;">24th character</td> <td></td> <td style="text-align: center;">23rd character</td> <td></td> <td></td> <td></td> </tr> <tr> <td>SD750</td> <td style="text-align: center;">26th character</td> <td></td> <td style="text-align: center;">25th character</td> <td></td> <td></td> <td></td> </tr> <tr> <td>SD751</td> <td style="text-align: center;">28th character</td> <td></td> <td style="text-align: center;">27th character</td> <td></td> <td></td> <td></td> </tr> <tr> <td>SD752</td> <td style="text-align: center;">30th character</td> <td></td> <td style="text-align: center;">29th character</td> <td></td> <td></td> <td></td> </tr> <tr> <td>SD753</td> <td style="text-align: center;">32nd character</td> <td></td> <td style="text-align: center;">31st character</td> <td></td> <td></td> <td></td> </tr> <tr> <td>SD754</td> <td style="text-align: center;">34th character</td> <td></td> <td style="text-align: center;">33rd character</td> <td></td> <td></td> <td></td> </tr> <tr> <td>SD755</td> <td style="text-align: center;">36th character</td> <td></td> <td style="text-align: center;">35th character</td> <td></td> <td></td> <td></td> </tr> <tr> <td>SD756</td> <td style="text-align: center;">38th character</td> <td></td> <td style="text-align: center;">37th character</td> <td></td> <td></td> <td></td> </tr> <tr> <td>SD757</td> <td style="text-align: center;">40th character</td> <td></td> <td style="text-align: center;">39th character</td> <td></td> <td></td> <td></td> </tr> <tr> <td>SD758</td> <td style="text-align: center;">42nd character</td> <td></td> <td style="text-align: center;">41st character</td> <td></td> <td></td> <td></td> </tr> <tr> <td>SD759</td> <td style="text-align: center;">44th character</td> <td></td> <td style="text-align: center;">43rd character</td> <td></td> <td></td> <td></td> </tr> <tr> <td>SD760</td> <td style="text-align: center;">46th character</td> <td></td> <td style="text-align: center;">45th character</td> <td></td> <td></td> <td></td> </tr> <tr> <td>SD761</td> <td style="text-align: center;">48th character</td> <td></td> <td style="text-align: center;">47th character</td> <td></td> <td></td> <td></td> </tr> <tr> <td>SD762</td> <td style="text-align: center;">50th character</td> <td></td> <td style="text-align: center;">49th character</td> <td></td> <td></td> <td></td> </tr> <tr> <td>SD763</td> <td style="text-align: center;">52nd character</td> <td></td> <td style="text-align: center;">51st character</td> <td></td> <td></td> <td></td> </tr> <tr> <td>SD764</td> <td style="text-align: center;">54th character</td> <td></td> <td style="text-align: center;">53rd character</td> 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character		5th character				SD741	8th character		7th character				SD742	10th character		9th character				SD743	12th character		11th character				SD744	14th character		13th character				SD745	16th character		15th character				SD746	18th character		17th character				SD747	20th character		19th character				SD748	22nd character		21st character				SD749	24th character		23rd character				SD750	26th character		25th character				SD751	28th character		27th character				SD752	30th character		29th character				SD753	32nd character		31st character				SD754	34th character		33rd character				SD755	36th character		35th character				SD756	38th character		37th character				SD757	40th character		39th character				SD758	42nd character		41st character				SD759	44th character		43rd character				SD760	46th character		45th character				SD761	48th character		47th character				SD762	50th character		49th character				SD763	52nd character		51st character				SD764	54th character		53rd character				SD765	56th character		55th character				SD766	58th character		57th character				SD767	60th character		59th character				SD768	62nd character		61st character				SD769	64th character		63rd character				S (During execution)	New	○
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SD774 TO SD775	PID limit setting	0: Limit set 1: Limit not set	<ul style="list-style-type: none"> <li>Designate the limit for each PID loop as follows:</li> </ul> <table border="1" style="margin-left: 40px;"> <tr> <td></td> <td style="text-align: center;">B15</td> <td></td> <td style="text-align: center;">B1</td> <td style="text-align: center;">B0</td> </tr> <tr> <td>SD774</td> <td style="text-align: center;">Loop16</td> <td style="text-align: center;">to</td> <td style="text-align: center;">Loop2</td> <td style="text-align: center;">Loop1</td> </tr> <tr> <td>SD775</td> <td style="text-align: center;">Loop32</td> <td style="text-align: center;">to</td> <td style="text-align: center;">Loop18</td> <td style="text-align: center;">Loop17</td> </tr> </table>		B15		B1	B0	SD774	Loop16	to	Loop2	Loop1	SD775	Loop32	to	Loop18	Loop17	U	New	○																																																																																																																																																																																																																								
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Special Register List (Continued)

Number	Name	Meaning	Explanation	Set by (When set)	Corresponding ACPU D9□□□	Corresponding CPU																									
SD781 TO SD793	Mask pattern of IMASK instruction	Mask pattern	<ul style="list-style-type: none"> <li>Stores the mask patterns masked by the IMASK instruction as follows:</li> </ul> <table border="1" style="margin-left: 40px;"> <tr> <td></td> <td style="text-align: center;">B15</td> <td></td> <td style="text-align: center;">B1</td> <td style="text-align: center;">B0</td> </tr> <tr> <td>SD781</td> <td style="text-align: center;"> 63</td> <td style="text-align: center;">to</td> <td style="text-align: center;"> 49</td> <td style="text-align: center;"> 48</td> </tr> <tr> <td>SD782</td> <td style="text-align: center;"> 79</td> <td style="text-align: center;">to</td> <td style="text-align: center;"> 65</td> <td style="text-align: center;"> 64</td> </tr> <tr> <td></td> <td colspan="4" style="text-align: center;">to</td> </tr> <tr> <td>SD793</td> <td style="text-align: center;"> 255</td> <td style="text-align: center;">to</td> <td style="text-align: center;"> 241</td> <td style="text-align: center;"> 240</td> </tr> </table>		B15		B1	B0	SD781	63	to	49	48	SD782	79	to	65	64		to				SD793	255	to	241	240	S (During execution)	New	○
	B15		B1	B0																											
SD781	63	to	49	48																											
SD782	79	to	65	64																											
	to																														
SD793	255	to	241	240																											

(7) A to Q/QnA conversion correspondences

ACPU special registers D9000 to D9255 correspond to the special registers SD1000 to SD1255 after A-series to the Q/QnA-series conversion.

These special registers are all set by the system, and users cannot use them to set program data.

Users who need to set data with these registers should edit the special registers for the Q/QnA.

However, before conversion users could set data at special registers D9200 to D9255 only, and after conversion users can also set data at registers 1200 to 1255.

For more detailed information concerning the contents of the ACPU special registers, see the individual CPU User's Manual, and the MELSECNET and MELSECNET/B data link system reference manual.

**REMARK**

Supplemental explanation on "Special Register for Modification" column

- ① For the device numbers for which a special register for modification is specified, modify it to the special register for QCPU/QnACPU.
- ② For the device numbers for which  is specified, special register after conversion can be used.
- ③ Device numbers for which  is specified do not function for QCPU/QnACPU.

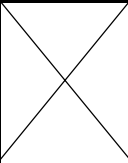
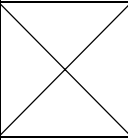
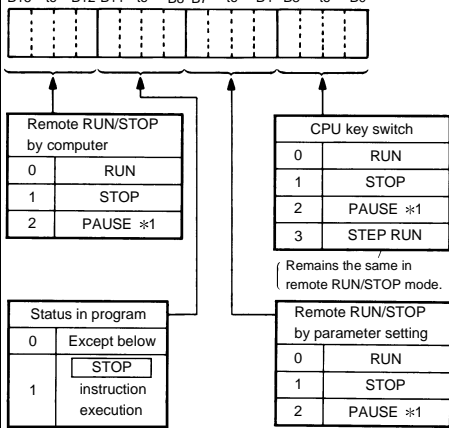
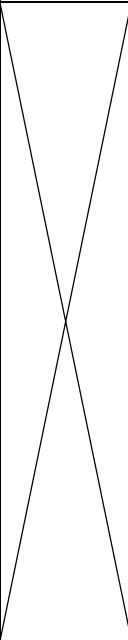
Special Register List

ACPU Special Conversion	Special Register after Conversion	Special Register for Modification	Name	Meaning	Details	Corresponding CPU																																								
D9000	SD1000	—	Fuse blown	Number of module with blown fuse	<ul style="list-style-type: none"> <li>• When fuse blown modules are detected, the lowest number of detected units is stored in hexadecimal. (Example: When fuses of Y50 to 6F output modules have blown, "50" is stored in hexadecimal) To monitor the number by peripheral devices, perform monitor operation given in hexadecimal. (Cleared when all contents of SD1100 to SD1107 are reset to 0.)</li> <li>• Fuse blow check is executed also to the output modules of remote I/O stations.</li> </ul>																																									
D9001	SD1001	—	Fuse blown	Number of module with blown fuse	<ul style="list-style-type: none"> <li>• Stores the module numbers corresponding to setting switch numbers or base slot numbers when fuse blow occurred.</li> </ul> <table border="1" style="margin-left: 20px;"> <thead> <tr> <th colspan="2">I/O module for A0J2</th> <th colspan="2">Extension base unit</th> </tr> <tr> <th>Setting switch</th> <th>Stored data</th> <th>Base unit slot No.</th> <th>Stored data</th> </tr> </thead> <tbody> <tr><td>0</td><td>1</td><td>0</td><td>5</td></tr> <tr><td>1</td><td>2</td><td>1</td><td>6</td></tr> <tr><td>2</td><td>3</td><td>2</td><td>7</td></tr> <tr><td>3</td><td>4</td><td>3</td><td>8</td></tr> <tr><td>4</td><td>5</td><td></td><td></td></tr> <tr><td>5</td><td>6</td><td></td><td></td></tr> <tr><td>6</td><td>7</td><td></td><td></td></tr> <tr><td>7</td><td>8</td><td></td><td></td></tr> </tbody> </table>	I/O module for A0J2		Extension base unit		Setting switch	Stored data	Base unit slot No.	Stored data	0	1	0	5	1	2	1	6	2	3	2	7	3	4	3	8	4	5			5	6			6	7			7	8			○
I/O module for A0J2		Extension base unit																																												
Setting switch	Stored data	Base unit slot No.	Stored data																																											
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Special Register List (Continued)

ACPU Special Conversion	Special Register after Conversion	Special Register for Modification	Name	Meaning	Details	Corresponding CPU																																	
D9002	SD1002	—	I/O module verification error	I/O module verification error module number	<ul style="list-style-type: none"> <li>If I/O modules, of which data are different from data entered, are detected when the power is turned on, the first I/O number of the lowest number unit among the detected units is stored in hexadecimal. (Storing method is the same as that of SD1000.) To monitor the number by peripheral devices, perform monitor operation given in hexadecimal. (Cleared when all contents of SD1116 to SD1123 are reset to 0.)</li> <li>I/O module verify check is executed also to the modules of remote I/O terminals.</li> </ul>	○																																	
D9004	SD1004	—	MINI link errors	Stores setting status made at parameters (modules 1 to 8)	<ul style="list-style-type: none"> <li>Error status of the MINI(S3) link detected on loaded AJ71PT32(S3) is stored.</li> </ul> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;">B15</td><td colspan="7" style="text-align: center;">to</td><td style="text-align: center;">B8</td><td colspan="7" style="text-align: center;">to</td><td style="text-align: center;">B0</td> </tr> <tr> <td style="text-align: center;">8</td><td style="text-align: center;">7</td><td style="text-align: center;">6</td><td style="text-align: center;">5</td><td style="text-align: center;">4</td><td style="text-align: center;">3</td><td style="text-align: center;">2</td><td style="text-align: center;">1</td> <td style="text-align: center;">8</td><td style="text-align: center;">7</td><td style="text-align: center;">6</td><td style="text-align: center;">5</td><td style="text-align: center;">4</td><td style="text-align: center;">3</td><td style="text-align: center;">2</td><td style="text-align: center;">1</td> </tr> </table> <div style="display: flex; justify-content: space-around; margin-top: 5px;"> <div style="border: 1px solid black; padding: 2px; font-size: small;">Bits which correspond to faulty AJ71PT32(S3) are turned on.</div> <div style="border: 1px solid black; padding: 2px; font-size: small;">Bits which correspond to the signals of AJ71PT32(S3), shown below, are turned on as the signals are turned on.  <ul style="list-style-type: none"> <li>• Hardware error (X0/X20)</li> <li>• MINI(S3) link error detection (X6/X26)</li> <li>• MINI(S3) link communication error (X7/X27)</li> </ul> </div> </div>	B15	to							B8	to							B0	8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1	QnA
B15	to							B8	to							B0																							
8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1																								
D9005	SD1005	—	AC DOWN counter	Number of times for AC DOWN	When the AC power supply module is used, 1 is added at occurrence of an instantaneous power failure of within 20ms. (The value is stored in BIN code.)It is reset when power is switched from OFF to ON.	○																																	
					When the DC power supply module is used, 1 is added at occurrence of an instantaneous power failure of within 10ms. (The value is stored in BIN code.)It is reset when power is switched from OFF to ON.																																		
					When the DC power supply module is used, 1 is added at occurrence of an instantaneous power failure of within 1ms. (The value is stored in BIN code.)It is reset when power is switched from OFF to ON.	QnA																																	
D9008	SD1008	SD0	Self-diagnosis error	Self-diagnosis error number	<ul style="list-style-type: none"> <li>When error is found as a result of self-diagnosis, error number is stored in BIN code.</li> </ul>																																		
D9009	SD1009	SD62	Annunciator detection	F number at which external failure has occurred	<ul style="list-style-type: none"> <li>When one of F0 to 255 is turned on by <b>[OUT F]</b> or <b>[SET F]</b>, the F number, which has been detected earliest among the F numbers which have turned on, is stored in BIN code.</li> <li>SD62 can be cleared by <b>[RST F]</b> or <b>[LEDR]</b> instruction. If another F number has been detected, the clearing of SD62 causes the next number to be stored in SD62.</li> </ul>	○																																	
					<ul style="list-style-type: none"> <li>When one of F0 to 255 is turned on by <b>[OUT F]</b> or <b>[SET F]</b>, the F number, which has been detected earliest among the F numbers which have turned on, is stored in BIN code.</li> <li>SD62 can be cleared by executing <b>[RST F]</b> or <b>[LEDR]</b> instruction or moving INDICATOR RESET switch on CPU front to ON position. If another F number has been detected, the clearing of SD62 causes the nest number to be stored in SD62.</li> </ul>																																		
D9010	SD1010	X	Error step	Step number at which operation error has occurred.	<ul style="list-style-type: none"> <li>When operation error has occurred during execution of application instruction, the step number, at which the error has occurred, is stored in BIN code. Thereafter, each time operation error occurs, the contents of SD1010 are renewed.</li> </ul>																																		

Special Register List (Continued)

ACPU Special Conversion	Special Register after Conversion	Special Register for Modification	Name	Meaning	Details	Corresponding CPU
D9011	SD1011		Error step	Step number at which operation error has occurred.	<ul style="list-style-type: none"> <li>When operation error has occurred during execution of application instruction, the step number, at which the error has occurred, is stored in BIN code. Since storage into SD1011 is made when SM1011 changes from off to on, the contents of SD1011 cannot be renewed unless SM1011 is cleared by user program.</li> </ul>	○
D9014	SD1014		I/O control mode	I/O control mode number	<ul style="list-style-type: none"> <li>The I/O control mode set is returned in any of the following numbers:                             <ol style="list-style-type: none"> <li>Both input and output in direct mode</li> <li>Input in refresh mode, output in direct mode</li> <li>Both input and output in refresh mode</li> </ol> </li> </ul>	
D9015	SD1015	SD203	Operating status of CPU	Operating status of CPU	<ul style="list-style-type: none"> <li>The operation status of CPU as shown below are stored in SD203.</li> </ul>  <p style="font-size: small;">* 1 When the CPU is in RUN mode and SM1040 is off, the CPU remains in RUN mode if changed to PAUSE mode.</p>	
D9016	SD1016		Program number	0: Main program (ROM) 1: Main program (RAM) 2: Subprogram 1 (RAM) 3: Subprogram 2 (RAM) 4: Subprogram 3 (RAM) 5: Subprogram 1 (ROM) 6: Subprogram 2 (ROM) 7: Subprogram 3 (ROM) 8: Main program (E <sup>2</sup> PROM) 9: Subprogram 1 (E <sup>2</sup> PROM) A: Subprogram 2 (E <sup>2</sup> PROM) B: Subprogram 3 (E <sup>2</sup> PROM)	<ul style="list-style-type: none"> <li>Indicates which sequence program is run presently. One value of 0 to B is stored in BIN code.</li> </ul>	
D9017	SD1017	SD520	Scan time	Minimum scan time (10 ms units)	<ul style="list-style-type: none"> <li>If scan time is smaller than the content of SD520, the value is newly stored at each END. Namely, the minimum value of scan time is stored into SD520 in BIN code.</li> </ul>	
D9018	SD1018	SD524	Scan time	Scan time (10 ms units)	<ul style="list-style-type: none"> <li>Scan time is stored in BIN code at each END and always rewritten.</li> </ul>	

Special Register List (Continued)

ACPU Special Conversion	Special Register after Conversion	Special Register for Modification	Name	Meaning	Details	Corresponding CPU																
D9019	SD1019	SD526	Scan time	Maximum scan time (10 ms units)	<ul style="list-style-type: none"> <li>If scan time is larger than the content of SD526, the value is newly stored at each END. Namely, the maximum value of scan time is stored into SD526 in BIN code.</li> </ul>																	
D9020	SD1020	X	Constant scan	Constant scan time (User sets in 10 ms units)	<ul style="list-style-type: none"> <li>Sets the interval between consecutive program starts in multiples of 10 ms. 0: No setting 1 to 200: Set. Program is executed at intervals of (set value) × 10 ms.</li> </ul>																	
D9021	SD1021	—	Scan time	Scan time (1 ms units)	<ul style="list-style-type: none"> <li>Scan time is stored and updated in BIN code after every END.</li> </ul>																	
D9022	SD1022	SD412	1 second counter	Count in units of 1ms.	<ul style="list-style-type: none"> <li>When the PC CPU starts running, it starts counting 1 every second.</li> <li>It starts counting up from 0 to 32767, then down to -32768 and then again up to 0. Counting repeats this routine.</li> </ul>																	
D9025	SD1025	SD210	Clock data	Clock data (year, month)	<ul style="list-style-type: none"> <li>Stores the year (2 lower digits) and month in BCD. B15 to B12 B11 to B8 B7 to B4 B3 to B0 Example: 1987, July H8707</li> </ul>																	
D9026	SD1026	SD211	Clock data	Clock data (day, hour)	<ul style="list-style-type: none"> <li>Stores the day and hour in BCD. B15 to B12 B11 to B8 B7 to B4 B3 to B0 Example: 31th, 10 o'clock H3110</li> </ul>																	
D9027	SD1027	SD212	Clock data	Clock data (minute, second)	<ul style="list-style-type: none"> <li>Stores the Minute and second in BCD. B15 to B12 B11 to B8 B7 to B4 B3 to B0 Example: 35 minutes, 48 seconds H3548</li> </ul>																	
D9028	SD1028	SD213	Clock data	Clock data (day of week)	<ul style="list-style-type: none"> <li>Stores the day of the week in BCD. B15 to B12 B11 to B8 B7 to B4 B3 to B0 Example: Friday H0005</li> </ul> <p>0 must be set.</p> <table border="1"> <tr><th colspan="2">Day of the week</th></tr> <tr><td>0</td><td>Sunday</td></tr> <tr><td>1</td><td>Monday</td></tr> <tr><td>2</td><td>Tuesday</td></tr> <tr><td>3</td><td>Wednesday</td></tr> <tr><td>4</td><td>Thursday</td></tr> <tr><td>5</td><td>Friday</td></tr> <tr><td>6</td><td>Saturday</td></tr> </table>	Day of the week		0	Sunday	1	Monday	2	Tuesday	3	Wednesday	4	Thursday	5	Friday	6	Saturday	
Day of the week																						
0	Sunday																					
1	Monday																					
2	Tuesday																					
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4	Thursday																					
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6	Saturday																					
D9035	SD1035	SD648	Extension file register	Use block No.	<ul style="list-style-type: none"> <li>Stores the block No. of the extension file register being used in BCD code.</li> </ul>																	
D9036	SD1036	X	Extension file register for designation of device number	Device number when individual devices from extension file register are directly accessed	<ul style="list-style-type: none"> <li>Designate the device number for the extension file register for direct read and write in 2 words at SD1036 and SD1037 in BIN data. Use consecutive numbers beginning with R0 of block No. 1 to designate device numbers.</li> </ul>																	
D9037	SD1037	X																				
D9038	SD1038	SD207	LED display priority ranking	Priorities 1 to 4	<ul style="list-style-type: none"> <li>Sets priority of ERROR LEDs which illuminate (or flicker) to indicate errors with error code numbers.</li> <li>Configuration of the priority setting areas is as shown below.</li> </ul>																	
D9039	SD1039	SD208		Priorities 5 to 7																		

Special Register List (Continued)

ACPU Special Conversion	Special Register after Conversion	Special Register for Modification	Name	Meaning	Details	Corresponding CPU				
D9044	SD1044	X	For sampling trace	Step or time during sampling trace	<ul style="list-style-type: none"> <li>Turned on/off with a peripheral device.</li> <li>At scanning-----0</li> <li>At time -----Time (10 msec unit)</li> <li>Stores the value in BIN code.</li> </ul>	○				
D9049	SD1049	X	Work area for SFC	Block number of extension file register	<ul style="list-style-type: none"> <li>Stores the block number of the expansion file register which is used as the work area for the execution of a SFC program in a binary value.</li> <li>Stores "0" if an empty area of 16K bytes or smaller, which cannot be expansion file register No. 1, is used or if SM320 is OFF.</li> </ul>					
D9050	SD1050	X	SFC program error number	Error code generated by SFC program	<ul style="list-style-type: none"> <li>Stores code numbers of errors occurred in the SFC program in BIN code.</li> <li>0: No error</li> <li>80: SFC program parameter error</li> <li>81: SFC code error</li> <li>82: Number of steps of simultaneous execution exceeded</li> <li>83: Block start error</li> <li>84: SFC program operation error</li> </ul>					
D9051	SD1051	X	Error block	Block number where error occurred	<ul style="list-style-type: none"> <li>Stores the block number in which an error occurred in the SFC program in BIN code.</li> <li>In the case of error 83 the starting block number is stored.</li> </ul>					
D9052	SD1052	X		Step number where error occurred	<ul style="list-style-type: none"> <li>Stores the step number in which error 84 occurred in the SFC program in BIN code.</li> <li>Stores "0" when errors 80, 81 and 82 occurred.</li> <li>Stored the block starting step number when error 83 occurred.</li> </ul>					
D9053	SD1053	X	Error transition	Transition condition number where error occurred	<ul style="list-style-type: none"> <li>Stores the transfer condition number in which error 84 occurred in the SFC program in BIN code.</li> <li>Stored "0" when errors 80, 81, 82 and 83 occurred.</li> </ul>					
D9054	SD1054	X	Error sequence step	Sequence step number where error occurred	<ul style="list-style-type: none"> <li>Stores the sequence step number of transfer condition and operation output in which error 84 occurred in the SFC program in BIN code.</li> </ul>					
D9055	SD1055	SD812	Status latch	Status latch step	<ul style="list-style-type: none"> <li>Stores the step number when status latch is executed.</li> <li>Stores the step number in a binary value if status latch is executed in a main sequence program.</li> <li>Stores the block number and the step number if status latch is executed in a SFC program.</li> </ul> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;">Block No. (BIN)</td> <td style="text-align: center;">Step No. (BIN)</td> </tr> <tr> <td style="text-align: center;">← Higher 8 bits →</td> <td style="text-align: center;">← Lower 8 bits →</td> </tr> </table>	Block No. (BIN)	Step No. (BIN)	← Higher 8 bits →	← Lower 8 bits →	
Block No. (BIN)	Step No. (BIN)									
← Higher 8 bits →	← Lower 8 bits →									
D9060	SD1060	SD392	Software version	Software version of internal software	<ul style="list-style-type: none"> <li>Stores the software version of the internal system in ASCII code.</li> </ul> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;">Higher byte</td> <td style="text-align: center;">Lower byte</td> </tr> </table> <p style="text-align: center;">↑ The data in the lower byte position is indefinite. The software version is stored in the higher byte position.</p> <p>For version "A", for example, "41H" is stored.</p> <p>Note: The software version of the initial system may differ from the version indicated by the version information printed on the rear of the case.</p>	Higher byte	Lower byte	QnA		
Higher byte	Lower byte									
D9072	SD1072	X	PLC communications check	Computer link data check	<ul style="list-style-type: none"> <li>In the self-loopback test of the serial communication module, the serial communication module writes/reads data automatically to make communication checks.</li> </ul>	○				
D9081	SD1081	SD714	Number of empty blocks in communications request registration area	Number of empty blocks in communications request registration area	<ul style="list-style-type: none"> <li>Stores the number of empty blocks in the communication request registration area to the remote terminal module connected to the MELSECNET/MINI-S3 master unit, A2C or A52G.</li> </ul>	QnA				

Special Register List (Continued)

ACPU Special Conversion	Special Register after Conversion	Special Register for Modification	Name	Meaning	Details	Corresponding CPU																																																																				
D9085	SD1085	X	Register for setting time check value	Default value 10s	<ul style="list-style-type: none"> <li>• Sets the time check time of the data link instructions (ZNRD, ZNWR) for the MELSECNET/10.</li> <li>• Setting range: 1 s to 65535 s (1 to 65535)</li> <li>• Setting unit: 1 s</li> <li>• Default value: 10 s (If 0 has been set, default 10 s is applied)</li> </ul>																																																																					
D9090	SD1090	X	Number of special functions modules over	Number of special functions modules over	<ul style="list-style-type: none"> <li>• For details, refer to the manual of each microcomputer program package.</li> </ul>																																																																					
D9091	SD1091	X	Detailed error code	Self-diagnosis detailed error code	<ul style="list-style-type: none"> <li>• Stores the detail code of cause of an instruction error.</li> </ul>																																																																					
D9094	SD1094	X	Head I/O number for replacement	Head I/O number for replacement	<ul style="list-style-type: none"> <li>• Stores upper 2 digits of the head I/O address of I/O modules to be loaded or unloaded during online mode in BIN code.</li> </ul> <p>Example) Input module X2F0 → H2F</p>																																																																					
D9100	SD1100	—	Fuse blown module	Bit pattern in units of 16 points, indicating the modules whose fuses have blown	<ul style="list-style-type: none"> <li>• Output module numbers (in units of 16 points), of which fuses have blown, are entered in bit pattern. (Preset output unit numbers when parameter setting has been performed.)</li> </ul> <table border="1" style="font-size: small;"> <tr> <td></td> <td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td> </tr> <tr> <td>SD1100</td> <td>0</td><td>0</td><td>0</td><td>1 (r1C0)</td><td>0</td><td>0</td><td>0</td><td>1 (r1B0)</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td> </tr> <tr> <td>SD1101</td> <td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td> </tr> <tr> <td>SD1107</td> <td>0</td><td>0</td><td>0</td><td>0</td><td>1 (r7B0)</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1 (r7C0)</td><td>0</td><td>0</td> </tr> </table> <p style="text-align: center;">↑ Indicates fuse blow.</p>		15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	SD1100	0	0	0	1 (r1C0)	0	0	0	1 (r1B0)	0	0	0	0	0	0	0	0	SD1101	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	SD1107	0	0	0	0	1 (r7B0)	0	0	0	0	0	0	0	0	1 (r7C0)	0	0	
	15					14	13	12	11	10	9	8	7	6	5	4	3	2	1	0																																																						
SD1100	0					0	0	1 (r1C0)	0	0	0	1 (r1B0)	0	0	0	0	0	0	0	0																																																						
SD1101	0					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0																																																						
SD1107	0					0	0	0	1 (r7B0)	0	0	0	0	0	0	0	0	1 (r7C0)	0	0																																																						
D9101	SD1101																																																																									
D9102	SD1102																																																																									
D9103	SD1103																																																																									
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D9105	SD1105																																																																									
D9106	SD1106																																																																									
D9107	SD1107																																																																									
D9108	SD1108	—	Step transfer monitoring timer setting	Timer setting valve and the f number at time out	<ul style="list-style-type: none"> <li>• Sets value for the step transfer monitoring timer and the number of F which turns on when the monitoring timer timed out.</li> </ul> <table border="1" style="font-size: small; margin: 0 auto;"> <tr> <td style="border: none;">b15 to b8</td> <td style="border: none;">b7</td> <td style="border: none;">to</td> <td style="border: none;">b0</td> </tr> <tr> <td style="border: none;">┌───┐</td> <td style="border: none;">┌───┐</td> <td style="border: none;">┌───┐</td> <td style="border: none;">┌───┐</td> </tr> <tr> <td style="border: none;">↑</td> <td style="border: none;">↑</td> <td style="border: none;">↑</td> <td style="border: none;">↑</td> </tr> <tr> <td style="border: none;">Timer setting</td> <td style="border: none;">Timer setting</td> <td style="border: none;">(1 to 255 s in seconds)</td> <td style="border: none;">F number setting</td> </tr> </table> <p>(By turning on any of MSM708 to SM1114, the monitoring timer starts. If the transfer condition following a step which corresponds to the timer is not established within set time, set annunciator (F) is tuned on.)</p>	b15 to b8	b7	to	b0	┌───┐	┌───┐	┌───┐	┌───┐	↑	↑	↑	↑	Timer setting	Timer setting	(1 to 255 s in seconds)	F number setting																																																					
b15 to b8	b7					to	b0																																																																			
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Timer setting	Timer setting					(1 to 255 s in seconds)	F number setting																																																																			
D9109	SD1109																																																																									
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D9111	SD1111																																																																									
D9112	SD1112																																																																									
D9113	SD1113																																																																									
D9114	SD1114																																																																									
D9116	SD1116	—	I/O module verification error	Bit pattern, in units of 16 points, indicating the modules with verification errors.	<ul style="list-style-type: none"> <li>• When I/O modules, of which data are different from those entered at power-on, have been detected, the I/O unit numbers (in units of 16 points) are entered in bit pattern. (Preset I/O unit numbers when parameter setting has been performed.)</li> </ul> <table border="1" style="font-size: small;"> <tr> <td></td> <td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td> </tr> <tr> <td>SD1116</td> <td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1 (r1C)</td> </tr> <tr> <td>SD1117</td> <td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1 (r7C)</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td> </tr> <tr> <td>SD1123</td> <td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1 (r7B)</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td> </tr> </table> <p style="text-align: center;">↑ Indicates I/O module verify error.</p>		15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	SD1116	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1 (r1C)	SD1117	0	0	0	0	0	0	0	1 (r7C)	0	0	0	0	0	0	0	0	SD1123	0	0	0	0	0	1 (r7B)	0	0	0	0	0	0	0	0	0	0	
	15					14	13	12	11	10	9	8	7	6	5	4	3	2	1	0																																																						
SD1116	0					0	0	0	0	0	0	0	0	0	0	0	0	0	0	1 (r1C)																																																						
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SD1123	0					0	0	0	0	1 (r7B)	0	0	0	0	0	0	0	0	0	0																																																						
D9117	SD1117																																																																									
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D9121	SD1121																																																																									
D9122	SD1122																																																																									
D9123	SD1123																																																																									





(8) Fuse blown module

Number	Name	Meaning	Explanation	Set by (When set)	Corresponding ACPU D9□□□	Corresponding CPU																																																																				
SD1300	Fuse blown module	Bit pattern in units of 16 points, indicating the modules whose fuses have blown 0: No blown fuse 1: Blown fuse present	<ul style="list-style-type: none"> <li>The numbers of output modules whose fuses have blown are input as a bit pattern (in units of 16 points). (If the module numbers are set by parameter, the parameter-set numbers are stored.)</li> <li>Also detects blown fuse condition at remote station output modules</li> </ul> <div style="text-align: center;"> <table border="1" style="margin: auto;"> <tr> <td></td><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td> </tr> <tr> <td>SD1300</td><td>0</td><td>0</td><td>0</td><td>1<sub>(YCO)</sub></td><td>0</td><td>0</td><td>0</td><td>1<sub>(YBO)</sub></td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td> </tr> <tr> <td>SD1301</td><td>1<sub>(YFO)</sub></td><td>0</td><td>0</td><td>0</td><td>0</td><td>1<sub>(Y1A)</sub></td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td> </tr> <tr> <td>SD1331</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1<sub>(Y1F B0)</sub></td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1<sub>(Y1F 30)</sub></td><td>0</td><td>0</td><td>0</td> </tr> </table> <p style="text-align: center;">↑ Indicates a blown fuse</p> </div> <ul style="list-style-type: none"> <li>Not cleared even if the blown fuse is replaced with a new one. This flag is cleared by error resetting operation (refer to 11.3.).</li> </ul>		15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	SD1300	0	0	0	1 <sub>(YCO)</sub>	0	0	0	1 <sub>(YBO)</sub>	0	0	0	0	0	0	0	0	SD1301	1 <sub>(YFO)</sub>	0	0	0	0	1 <sub>(Y1A)</sub>	0	0	0	0	0	0	0	0	0	0	SD1331	0	0	0	0	1 <sub>(Y1F B0)</sub>	0	0	0	0	0	0	0	1 <sub>(Y1F 30)</sub>	0	0	0	S (Error)	D9100	○+Rem
				15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0																																																							
SD1300				0	0	0	1 <sub>(YCO)</sub>	0	0	0	1 <sub>(YBO)</sub>	0	0	0	0	0	0	0	0																																																							
SD1301				1 <sub>(YFO)</sub>	0	0	0	0	1 <sub>(Y1A)</sub>	0	0	0	0	0	0	0	0	0	0																																																							
SD1331				0	0	0	0	1 <sub>(Y1F B0)</sub>	0	0	0	0	0	0	0	1 <sub>(Y1F 30)</sub>	0	0	0																																																							
SD1301				D9101																																																																						
SD1302				D9102																																																																						
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SD1306	D9106																																																																									
SD1307	D9107																																																																									
SD1308	New																																																																									
SD1309 to SD1330	New to New																																																																									
SD1331	New																																																																									
SD1350 to SD1381	External power supply disconnected module (For future expansion)	Bit pattern in units of 16 points, indicating the modules whose external power supply has been disconnected 0: External power supply disconnected 1: External power supply is not disconnected	<ul style="list-style-type: none"> <li>The module number (in units of 16 points) whose external power supply has been disconnected is input as a bit pattern. (If the module numbers are set by parameter, the parameter-set numbers are used.)</li> </ul> <div style="text-align: center;"> <table border="1" style="margin: auto;"> <tr> <td></td><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td> </tr> <tr> <td>SD1350</td><td>0</td><td>0</td><td>0</td><td>1</td><td>0</td><td>0</td><td>0</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td> </tr> <tr> <td>SD1351</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td> </tr> <tr> <td>SD1381</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td><td>0</td><td>0</td><td>0</td> </tr> </table> <p style="text-align: center;">↑ Indicates a blown fuse</p> </div>		15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	SD1350	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	SD1351	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	SD1381	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	S (Error)	New	
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0																																																										
SD1350	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0																																																										
SD1351	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0																																																										
SD1381	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0																																																										

Special Register List (Continue)

(9) I/O module verification

Number	Name	Meaning	Explanation	Set by (When set)	Corresponding ACPU D9□□□	Corresponding CPU																																																																				
SD1400 SD1401 SD1402 SD1403 SD1404 SD1405 SD1406 SD1407 SD1408 SD1409 to SD1430 SD1431	I/O module verification error	Bit pattern, in units of 16 points, indicating the modules with verification errors. 0: No I/O verification errors 1: I/O verification error present	<ul style="list-style-type: none"> <li>When the power is turned on, the module numbers of the I/O modules whose information differs from the registered I/O module information are set in this register (in units of 16 points). (If the I/O numbers are set by parameter, the parameter-set numbers are stored.)</li> <li>Also detects I/O module information</li> </ul> <table border="1" style="margin-left: 20px;"> <tr> <td></td> <td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td> </tr> <tr> <td>D9116</td> <td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1 (FF)</td> </tr> <tr> <td>D9117</td> <td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1 (FF)</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td> </tr> <tr> <td>D9123</td> <td>0</td><td>1 (FF)</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td> </tr> </table> <p style="margin-left: 20px;">↑ Indicates an I/O module verification error</p> <ul style="list-style-type: none"> <li>Not cleared even if the blown fuse is replaced with a new one. This flag is cleared by error resetting operation (refer to 11.3.).</li> </ul>		15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	D9116	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1 (FF)	D9117	0	0	0	0	0	0	1 (FF)	0	0	0	0	0	0	0	0	0	D9123	0	1 (FF)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	S (Error)	D9116 D9117 D9118 D9119 D9120 D9121 D9122 D9123 New New to New New	○+Rem
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0																																																										
D9116	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1 (FF)																																																										
D9117	0	0	0	0	0	0	1 (FF)	0	0	0	0	0	0	0	0	0																																																										
D9123	0	1 (FF)	0	0	0	0	0	0	0	0	0	0	0	0	0	0																																																										

(10) Process control instructions

Number	Name	Meaning	Explanation	Set by (When set)	Corresponding ACPU D9□□□	Corresponding CPU
SD1500 SD1501	Basic period	Basic period tome	<ul style="list-style-type: none"> <li>Set the basic period (1 second units) use for the process control instruction using floating point data.</li> </ul> <p>Floating points data = <input type="text" value="SD1501"/> <input type="text" value="SD1500"/></p>	U	New	Q4AR
SD1502	Process control instruction detail error code	Process control instruction detail error code	<ul style="list-style-type: none"> <li>Shows the detailed error contents for the error that occurred in the process control instruction</li> </ul>	S (Error occurrence)	New	
SD1503	Process control instruction generated error location	Process control instruction generated error location	<ul style="list-style-type: none"> <li>Shows the error process block that occurred in the process control instruction.</li> </ul>	S (Error occurrence)	New	
SD1506 SD1507	Dummy device	Dummy device	<ul style="list-style-type: none"> <li>Used to specify dummy devices by a process control instruction</li> </ul>	U	New	

APPENDIX 3 List of Interrupt Pointer Nos. and Interrupt Factors

I No.	Interrupt Factors	Priority Ranking	I No.	Interrupt factors	Priority Ranking		
I0	QI60 interrupt module factor	1st point	237	I32 * 2	Errors that stop operation	1	
I1		2nd point	238	I33	Empty	—	
I2		3rd point	239	I34	UNIT VERIFY ERR. FUSE BREAK OFF SP. UNIT ERROR	2	
I3		4th point	240				
I4		5th point	241	I35	OPERATION ERROR SFCP OPE. ERROR SFCP ECE. ERROR EX. POWER OFF	3	
I5		6th point	242				
I6		7th point	243				
I7		8th point	244				
I8		9th point	245	I36	ICM. OPE ERROR FILE OPE. ERROR	4	
I9		10th point	246				
I10		11th point	247	I37	Empty	—	
I11		12th point	248	I38	PRG. TIME OVER	5	
I12		13th point	249				
I13		14th point	250	I39	CHK instruction execution Anunciator detection	6	
I14		15th point	251				
I15		16th point	252	I40 to I49	—	Empty	
I16	—	Empty	—				
I17							
I18							
I19							
I20							
I21							
I22							
I23							
I24							
I25							
I26							
I27							
I28	Internal timer factor * 1	100ms	256	I50 to I255	Intelligent function module factor * 4	Specifies which intelligent function module is used with parameters.	18 to 223
I29		40ms	255				
I30		20ms	254				
I31		10ms	253				

**REMARK**

- \*1 : The internal times shown are the default setting times.  
These times can be designated in 0.5 ms units through a 0.5 to 1000 ms range set at the "PLC system" tab screen in the "(PLC) Parameter" dialog box.
- \*2 : When an error interruption with "I32 (error that stops operation)" occurs, the Process CPU is not stopped until I32 processing is completed.
- \*3 : Execution of error interruptions is prohibited for the interrupt pointer Nos. I32 to I39 when the power is turned on and during a Process CPU reset. When using interrupt pointer Nos. I32 to I39, set the interruption permitted status by using the IMASK instruction.
- \*4 : To use the intelligent function module interrupt, the intelligent function module setting (interrupt points setting) is required at the "PLC system" tab screen in the "(PLC) Parameter" dialog box.  
(For the interrupts from the intelligent function module, see Section 8.2.1.)



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# WARRANTY

Please confirm the following product warranty details before starting use.

## 1. Gratis Warranty Term and Gratis Warranty Range

If any faults or defects (hereinafter "Failure") found to be the responsibility of Mitsubishi occurs during use of the product within the gratis warranty term, the product shall be repaired at no cost via the dealer or Mitsubishi Service Company. Note that if repairs are required at a site overseas, on a detached island or remote place, expenses to dispatch an engineer shall be charged for.

### [Gratis Warranty Term]

The gratis warranty term of the product shall be for one year after the date of purchase or delivery to a designated place.

Note that after manufacture and shipment from Mitsubishi, the maximum distribution period shall be six (6) months, and the longest gratis warranty term after manufacturing shall be eighteen (18) months. The gratis warranty term of repair parts shall not exceed the gratis warranty term before repairs.

### [Gratis Warranty Range]

- (1) The range shall be limited to normal use within the usage state, usage methods and usage environment, etc., which follow the conditions and precautions, etc., given in the instruction manual, user's manual and caution labels on the product.
- (2) Even within the gratis warranty term, repairs shall be charged for in the following cases.
  1. Failure occurring from inappropriate storage or handling, carelessness or negligence by the user. Failure caused by the user's hardware or software design.
  2. Failure caused by unapproved modifications, etc., to the product by the user.
  3. When the Mitsubishi product is assembled into a user's device, Failure that could have been avoided if functions or structures, judged as necessary in the legal safety measures the user's device is subject to or as necessary by industry standards, had been provided.
  4. Failure that could have been avoided if consumable parts (battery, backlight, fuse, etc.) designated in the instruction manual had been correctly serviced or replaced.
  5. Failure caused by external irresistible forces such as fires or abnormal voltages, and Failure caused by force majeure such as earthquakes, lightning, wind and water damage.
  6. Failure caused by reasons unpredictable by scientific technology standards at time of shipment from Mitsubishi.
  7. Any other failure found not to be the responsibility of Mitsubishi or the user.

## 2. Onerous repair term after discontinuation of production

- (1) Mitsubishi shall accept onerous product repairs for seven (7) years after production of the product is discontinued. Discontinuation of production shall be notified with Mitsubishi Technical Bulletins, etc.
- (2) Product supply (including repair parts) is not possible after production is discontinued.

## 3. Overseas service

Overseas, repairs shall be accepted by Mitsubishi's local overseas FA Center. Note that the repair conditions at each FA Center may differ.

## 4. Exclusion of chance loss and secondary loss from warranty liability

Regardless of the gratis warranty term, Mitsubishi shall not be liable for compensation to damages caused by any cause found not to be the responsibility of Mitsubishi, chance losses, lost profits incurred to the user by Failures of Mitsubishi products, damages and secondary damages caused from special reasons regardless of Mitsubishi's expectations, compensation for accidents, and compensation for damages to products other than Mitsubishi products and other duties.

## 5. Changes in product specifications

The specifications given in the catalogs, manuals or technical documents are subject to change without prior notice.

## 6. Product application

- (1) In using the Mitsubishi MELSEC programmable logic controller, the usage conditions shall be that the application will not lead to a major accident even if any problem or fault should occur in the programmable logic controller device, and that backup and fail-safe functions are systematically provided outside of the device for any problem or fault.
- (2) The Mitsubishi general-purpose programmable logic controller has been designed and manufactured for applications in general industries, etc. Thus, applications in which the public could be affected such as in nuclear power plants and other power plants operated by respective power companies, and applications in which a special quality assurance system is required, such as for Railway companies or National Defense purposes shall be excluded from the programmable logic controller applications.

Note that even with these applications, if the user approves that the application is to be limited and a special quality is not required, application shall be possible.

When considering use in aircraft, medical applications, railways, incineration and fuel devices, manned transport devices, equipment for recreation and amusement, and safety devices, in which human life or assets could be greatly affected and for which a particularly high reliability is required in terms of safety and control system, please consult with Mitsubishi and discuss the required specifications.



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