

# MELSEC Q Series

## Motion Controllers Programming Manual Common

**Q172HCPU**  
**Q173HCPU**

# ● SAFETY PRECAUTIONS ●

(Read these precautions before using.)

When using this 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 precautions apply only to this equipment. Refer to the Q173HCPU/Q172HCPU Users manual for a description of the Motion controller safety precautions.


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



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



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

Depending on circumstances, procedures indicated by  CAUTION may also be linked to serious results.

In any case, it is important to follow the directions for usage.

Store this manual in a safe place so that you can take it out and read it whenever necessary. Always forward it to the end user.

## For Safe Operations

### 1. Prevention of electric shocks

#### DANGER

- Never open the front case or terminal covers while the power is ON or the unit is running, as this may lead to electric shocks.
- Never run the unit with the front case or terminal cover removed. The high voltage terminal and charged sections will be exposed and may lead to electric shocks.
- Never open the front case or terminal cover at times other than wiring work or periodic inspections even if the power is OFF. The insides of the Motion controller and servo amplifier are charged and may lead to electric shocks.
- When performing wiring work or inspections, turn the power OFF, wait at least ten minutes, and then check the voltage with a tester, etc.. Failing to do so may lead to electric shocks.
- Be sure to ground the Motion controller, servo amplifier and servomotor. (Ground resistance : 100  $\Omega$  or less) Do not ground commonly with other devices.
- The wiring work and inspections must be done by a qualified technician.
- Wire the units after installing the Motion controller, servo amplifier and servomotor. Failing to do so may lead to electric shocks or damage.
- Never operate the switches with wet hands, as this may lead to electric shocks.
- Do not damage, apply excessive stress, place heavy things on or sandwich the cables, as this may lead to electric shocks.
- Do not touch the Motion controller, servo amplifier or servomotor terminal blocks while the power is ON, as this may lead to electric shocks.
- Do not touch the built-in power supply, built-in grounding or signal wires of the Motion controller and servo amplifier, as this may lead to electric shocks.

### 2. For fire prevention

#### CAUTION

- Install the Motion controller, servo amplifier, servomotor and regenerative resistor on inflammable material. Direct installation on flammable material or near flammable material may lead to fire.
- If a fault occurs in the Motion controller or servo amplifier, shut the power OFF at the servo amplifier's power source. If a large current continues to flow, fire may occur.
- When using a regenerative resistor, shut the power OFF with an error signal. The regenerative resistor may abnormally overheat due to a fault in the regenerative transistor, etc., and may lead to fire.
- Always take heat measures such as flame proofing for the inside of the control panel where the servo amplifier or regenerative resistor is installed and for the wires used. Failing to do so may lead to fire.

### 3. For injury prevention

#### CAUTION

- Do not apply a voltage other than that specified in the instruction manual on any terminal. Doing so may lead to destruction or damage.
- Do not mistake the terminal connections, as this may lead to destruction or damage.
- Do not mistake the polarity ( + / - ), as this may lead to destruction or damage.
- Do not touch the servo amplifier's heat radiating fins, regenerative resistor and servomotor, etc., while the power is ON and for a short time after the power is turned OFF. In this timing, these parts become very hot and may lead to burns.
- Always turn the power OFF before touching the servomotor shaft or coupled machines, as these parts may lead to injuries.
- Do not go near the machine during test operations or during operations such as teaching. Doing so may lead to injuries.

### 4. Various precautions

Strictly observe the following precautions.

Mistaken handling of the unit may lead to faults, injuries or electric shocks.

#### (1) System structure

#### CAUTION

- Always install a leakage breaker on the Motion controller and servo amplifier power source.
- If installation of an electromagnetic contactor for power shut off during an error, etc., is specified in the instruction manual for the servo amplifier, etc., always install the electromagnetic contactor.
- Install the emergency stop circuit externally so that the operation can be stopped immediately and the power shut off.
- Use the Motion controller, servo amplifier, servomotor and regenerative resistor with the combinations listed in the instruction manual. Other combinations may lead to fire or faults.
- If safety standards (ex., robot safety rules, etc.,) apply to the system using the Motion controller, servo amplifier and servomotor, make sure that the safety standards are satisfied.
- Construct a safety circuit externally of the Motion controller or servo amplifier if the abnormal operation of the Motion controller or servo amplifier differ from the safety directive operation in the system.
- In systems where coasting of the servomotor will be a problem during the forced stop, emergency stop, servo OFF or power supply OFF, use dynamic brakes.
- Make sure that the system considers the coasting amount even when using dynamic brakes.
- In systems where perpendicular shaft dropping may be a problem during the forced stop, emergency stop, servo OFF or power supply OFF, use both dynamic brakes and electromagnetic brakes.
- The dynamic brakes must be used only on errors that cause the forced stop, emergency stop, or servo OFF. These brakes must not be used for normal braking.

 CAUTION

- The brakes (electromagnetic brakes) assembled into the servomotor are for holding applications, and must not be used for normal braking.
- The system must have a mechanical allowance so that the machine itself can stop even if the stroke limits switch is passed through at the max. speed.
- Use wires and cables that have a wire diameter, heat resistance and bending resistance compatible with the system.
- Use wires and cables within the length of the range described in the instruction manual.
- The ratings and characteristics of the parts (other than Motion controller, servo amplifier and servomotor) used in a system must be compatible with the Motion controller, servo amplifier and servomotor.
- Install a cover on the shaft so that the rotary parts of the servomotor are not touched during operation.
- There may be some cases where holding by the electromagnetic brakes is not possible due to the life or mechanical structure (when the ball screw and servomotor are connected with a timing belt, etc.). Install a stopping device to ensure safety on the machine side.

(2) Parameter settings and programming

 CAUTION

- Set the parameter values to those that are compatible with the Motion controller, servo amplifier, servomotor and regenerative resistor model and the system application. The protective functions may not function if the settings are incorrect.
- The regenerative resistor model and capacity parameters must be set to values that conform to the operation mode, servo amplifier and servo power supply module. The protective functions may not function if the settings are incorrect.
- Set the mechanical brake output and dynamic brake output validity parameters to values that are compatible with the system application. The protective functions may not function if the settings are incorrect.
- Set the stroke limit input validity parameter to a value that is compatible with the system application. The protective functions may not function if the setting is incorrect.
- Set the servomotor encoder type (increment, absolute position type, etc.) parameter to a value that is compatible with the system application. The protective functions may not function if the setting is incorrect.
- Set the servomotor capacity and type (standard, low-inertia, flat, etc.) parameter to values that are compatible with the system application. The protective functions may not function if the settings are incorrect.
- Set the servo amplifier capacity and type parameters to values that are compatible with the system application. The protective functions may not function if the settings are incorrect.
- Use the program commands for the program with the conditions specified in the instruction manual.

 **CAUTION**

- Set the sequence function program capacity setting, device capacity, latch validity range, I/O assignment setting, and validity of continuous operation during error detection to values that are compatible with the system application. The protective functions may not function if the settings are incorrect.
- Some devices used in the program have fixed applications, so use these with the conditions specified in the instruction manual.
- The input devices and data registers assigned to the link will hold the data previous to when communication is terminated by an error, etc. Thus, an error correspondence interlock program specified in the instruction manual must be used.
- Use the interlock program specified in the special function module's instruction manual for the program corresponding to the special function module.

(3) Transportation and installation

 **CAUTION**

- Transport the product with the correct method according to the mass.
- Use the servomotor suspension bolts only for the transportation of the servomotor. Do not transport the servomotor with machine installed on it.
- Do not stack products past the limit.
- When transporting the Motion controller or servo amplifier, never hold the connected wires or cables.
- When transporting the servomotor, never hold the cables, shaft or detector.
- When transporting the Motion controller or servo amplifier, never hold the front case as it may fall off.
- When transporting, installing or removing the Motion controller or servo amplifier, never hold the edges.
- Install the unit according to the instruction manual in a place where the mass can be withstood.
- Do not get on or place heavy objects on the product.
- Always observe the installation direction.
- Keep the designated clearance between the Motion controller or servo amplifier and control panel inner surface or the Motion controller and servo amplifier, Motion controller or servo amplifier and other devices.
- Do not install or operate Motion controller, servo amplifiers or servomotors that are damaged or that have missing parts.
- Do not block the intake/outtake ports of the servomotor with cooling fan.
- Do not allow conductive matter such as screw or cutting chips or combustible matter such as oil enter the Motion controller, servo amplifier or servomotor.
- The Motion controller, servo amplifier and servomotor are precision machines, so do not drop or apply strong impacts on them.

 **CAUTION**

- Securely fix the Motion controller and servo amplifier to the machine according to the instruction manual. If the fixing is insufficient, these may come off during operation.
- Always install the servomotor with reduction gears in the designated direction. Failing to do so may lead to oil leaks.
- Store and use the unit in the following environmental conditions.

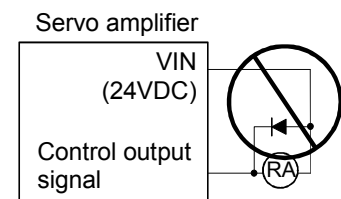
Environment	Conditions	
	Motion controller/Servo amplifier	Servomotor
Ambient temperature	According to each instruction manual.	0°C to +40°C (With no freezing) (32°F to +104°F)
Ambient humidity	According to each instruction manual.	80% RH or less (With no dew condensation)
Storage temperature	According to each instruction manual.	-20°C to +65°C (-4°F to +149°F)
Atmosphere	Indoors (where not subject to direct sunlight). No corrosive gases, flammable gases, oil mist or dust must exist	
Altitude	1000m (3280.84ft.) or less above sea level	
Vibration	According to each instruction manual	

- When coupling with the synchronization encoder or servomotor shaft end, do not apply impact such as by hitting with a hammer. Doing so may lead to detector damage.
- Do not apply a load larger than the tolerable load onto the servomotor shaft. Doing so may lead to shaft breakage.
- When not using the module for a long time, disconnect the power line from the Motion controller or servo amplifier.
- Place the Motion controller and servo amplifier in static electricity preventing vinyl bags and store.
- When storing for a long time, please contact with our sales representative.

#### (4) Wiring

### ⚠ CAUTION

- Correctly and securely wire the wires. Reconfirm the connections for mistakes and the terminal screws for tightness after wiring. Failing to do so may lead to run away of the servomotor.
- After wiring, install the protective covers such as the terminal covers to the original positions.
- Do not install a phase advancing capacitor, surge absorber or radio noise filter (option FR-BIF) on the output side of the servo amplifier.
- Correctly connect the output side (terminals U, V, W). Incorrect connections will lead the servomotor to operate abnormally.
- Do not connect a commercial power supply to the servomotor, as this may lead to trouble.
- Do not mistake the direction of the surge absorbing diode installed on the DC relay for the control signal output of brake signals, etc. Incorrect installation may lead to signals not being output when trouble occurs or the protective functions not functioning.
- Do not connect or disconnect the connection cables between each unit, the encoder cable or PLC expansion cable while the power is ON.
- Securely tighten the cable connector fixing screws and fixing mechanisms. Insufficient fixing may lead to the cables coming off during operation.
- Do not bundle the power line or cables.



#### (5) Trial operation and adjustment

### ⚠ CAUTION

- Confirm and adjust the program and each parameter before operation. Unpredictable movements may occur depending on the machine.
- Extreme adjustments and changes may lead to unstable operation, so never make them.
- When using the absolute position system function, on starting up, and when the Motion controller or absolute value motor has been replaced, always perform a home position return.



(6) Usage methods

**⚠ CAUTION**

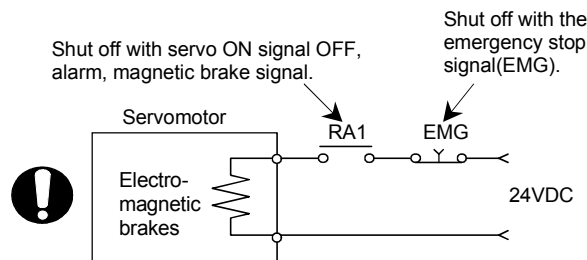
- Immediately turn OFF the power if smoke, abnormal sounds or odors are emitted from the Motion controller, servo amplifier or servomotor.
- Always execute a test operation before starting actual operations after the program or parameters have been changed or after maintenance and inspection.
- The units must be disassembled and repaired by a qualified technician.
- Do not make any modifications to the unit.
- Keep the effect or electromagnetic obstacles to a minimum by installing a noise filter or by using wire shields, etc. Electromagnetic obstacles may affect the electronic devices used near the Motion controller or servo amplifier.
- When using the CE Mark-compliant equipment, refer to the "EMC Installation Guidelines" (data number IB(NA)-67339) for the Motion controllers and refer to the corresponding EMC guideline information for the servo amplifiers, inverters and other equipment.
- Use the units with the following conditions.

Item	Conditions					
	Q61P-A1	Q61P-A2	Q61P	Q62P	Q63P	Q64P
Input power	100 to 120VAC <sup>+10%</sup> <sub>-15%</sub> (85 to 132VAC)	200 to 240VAC <sup>+10%</sup> <sub>-15%</sub> (170 to 264VAC)	100 to 240VAC <sup>+10%</sup> <sub>-15%</sub> (85 to 264VAC)		24VDC <sup>+30%</sup> <sub>-35%</sub> (15.6 to 31.2VDC)	100 to 120VAC <sup>+10%</sup> <sub>-15%</sub> / 200 to 240VAC <sup>+10%</sup> <sub>-15%</sub> (85 to 132VAC/ 170 to 264VAC)
Input frequency	50/60Hz ±5%					
Tolerable momentary power failure	20ms or less					

(7) Corrective actions for errors

**⚠ CAUTION**

- If an error occurs in the self diagnosis of the Motion controller or servo amplifier, confirm the check details according to the instruction manual, and restore the operation.
- If a dangerous state is predicted in case of a power failure or product failure, use a servomotor with electromagnetic brakes or install a brake mechanism externally.
- Use a double circuit construction so that the electromagnetic brake operation circuit can be operated by emergency stop signals set externally.



 **CAUTION**

- If an error occurs, remove the cause, secure the safety and then resume operation after alarm release.
- The unit may suddenly resume operation after a power failure is restored, so do not go near the machine. (Design the machine so that personal safety can be ensured even if the machine restarts suddenly.)

**(8) Maintenance, inspection and part replacement**

 **CAUTION**

- Perform the daily and periodic inspections according to the instruction manual.
- Perform maintenance and inspection after backing up the program and parameters for the Motion controller and servo amplifier.
- Do not place fingers or hands in the clearance when opening or closing any opening.
- Periodically replace consumable parts such as batteries according to the instruction manual.
- Do not touch the lead sections such as ICs or the connector contacts.
- Do not place the Motion controller or servo amplifier on metal that may cause a power leakage or wood, plastic or vinyl that may cause static electricity buildup.
- Do not perform a megger test (insulation resistance measurement) during inspection.
- When replacing the Motion controller or servo amplifier, always set the new module settings correctly.
- When the Motion controller or absolute value motor has been replaced, carry out a home position return operation using one of the following methods, otherwise position displacement could occur.
  - 1) After writing the servo data to the Motion controller using programming software, switch on the power again, then perform a home position return operation.
  - 2) Using the backup function of the programming software, load the data backed up before replacement.
- After maintenance and inspections are completed, confirm that the position detection of the absolute position detector function is correct.
- Do not short circuit, charge, overheat, incinerate or disassemble the batteries.
- The electrolytic capacitor will generate gas during a fault, so do not place your face near the Motion controller or servo amplifier.
- The electrolytic capacitor and fan will deteriorate. Periodically replace these to prevent secondary damage from faults. Replacements can be made by our sales representative.

### (9) About processing of waste

When you discard Motion controller, servo amplifier, a battery (primary battery) and other option articles, please follow the law of each country (area).

#### CAUTION

- This product is not designed or manufactured to be used in equipment or systems in situations that can affect or endanger human life.
- When considering this product for operation in special applications such as machinery or systems used in passenger transportation, medical, aerospace, atomic power, electric power, or submarine repeating applications, please contact your nearest Mitsubishi sales representative.
- Although this product was manufactured under conditions of strict quality control, you are strongly advised to install safety devices to forestall serious accidents when it is used in facilities where a breakdown in the product is likely to cause a serious accident.

### (10) General cautions

#### CAUTION

- All drawings provided in the instruction manual show the state with the covers and safety partitions removed to explain detailed sections. When operating the product, always return the covers and partitions to the designated positions, and operate according to the instruction manual.

REVISIONS

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

Print Date	* Manual Number	Revision
Jun., 2005	IB(NA)-0300111-A	First edition
May., 2006	IB(NA)-0300111-B	[Additional model] Software for SV43 [Additional correction/partial correction] About Manuals
Sep., 2006	IB(NA)-0300111-C	[Additional model] Q61P, MR-J3-□B(Large capacity), MR-J3-□B-RJ006 [Additional correction/partial correction] About Manuals, Servo parameters

Japanese Manual Number IB(NA)-0300091

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## INTRODUCTION

Thank you for choosing the Q173HCPU/Q172HCPU Motion Controller.  
Please read this manual carefully so that equipment is used to its optimum.

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## About Manuals

The following manuals are related to this product.

Referring to this list, please request the necessary manuals.

### Related Manuals

#### (1) Motion controller

Manual Name	Manual Number (Model Code)
<p>Q173HCPU/Q172HCPU Motion controller User's Manual</p> <p>This manual explains specifications of the Motion CPU modules, Q172LX Servo external signal interface module, Q172EX Serial absolute synchronous encoder interface module, Q173PX Manual pulse generator interface module, Teaching units, Power supply modules, Servo amplifiers, SSCNETIII cables, synchronous encoder cables and others.</p> <p>(Optional)</p>	IB-0300110 (1XB910)
<p>Q173HCPU/Q172HCPU Motion controller (SV13/SV22) Programming Manual (Motion SFC)</p> <p>This manual explains the functions, programming, debugging, error codes and others of the Motion SFC.</p> <p>(Optional)</p>	IB-0300112 (1XB912)
<p>Q173HCPU/Q172HCPU Motion controller (SV13/SV22) Programming Manual (REAL MODE)</p> <p>This manual explains the servo parameters, positioning instructions, device list, error list and others.</p> <p>(Optional)</p>	IB-0300113 (1XB913)
<p>Q173HCPU/Q172HCPU Motion controller (SV22) Programming Manual (VIRTUAL MODE)</p> <p>This manual describes the dedicated instructions use to the synchronous control by virtual main shaft, mechanical system program create mechanical module.</p> <p>This manual explains the servo parameters, positioning instructions, device list, error list and others.</p> <p>(Optional)</p>	IB-0300114 (1XB914)
<p>Q173HCPU/Q172HCPU Motion controller (SV43) Programming Manual</p> <p>This manual describes the dedicated instructions to execute the positioning control by Motion program of EIA language (G-code).</p> <p>This manual explains the servo parameters, positioning instructions, device list, error list and others.</p> <p>(Optional)</p>	IB-0300115 (1XB915)



(2) PLC

Manual Name	Manual Number (Model Code)
<p>QCPU User's Manual (Hardware Design, Maintenance and Inspection)</p> <p>This manual explains the specifications of the QCPU modules, power supply modules, base modules, extension cables, memory card battery and others.</p> <p>(Optional)</p>	SH-080483ENG (13JR73)
<p>QCPU User's Manual (Function Explanation, Program Fundamentals)</p> <p>This manual explains the functions, programming methods and devices and others to create programs with the QCPU.</p> <p>(Optional)</p>	SH-080484ENG (13JR74)
<p>QCPU User's Manual (Multiple CPU System)</p> <p>This manual explains the functions, programming methods and cautions and others to construct the Multiple CPU system with the QCPU.</p> <p>(Optional)</p>	SH-080485ENG (13JR75)
<p>QCPU (Q Mode)/QnACPU Programming Manual (Common Instructions)</p> <p>This manual explains how to use the sequence instructions, basic instructions, application instructions and micro computer program.</p> <p>(Optional)</p>	SH-080039 (13JF58)
<p>QCPU (Q Mode)/QnACPU Programming Manual (PID Control Instructions)</p> <p>This manual explains the dedicated instructions used to exercise PID control.</p> <p>(Optional)</p>	SH-080040 (13JF59)
<p>QCPU (Q Mode)/QnACPU Programming Manual (SFC)</p> <p>This manual explains the system configuration, performance specifications, functions, programming, debugging, error codes and others of MELSAP3.</p> <p>(Optional)</p>	SH-080041 (13JF60)
<p>I/O Module Type Building Block User's Manual</p> <p>This manual explains the specifications of the I/O modules, connector, connector/terminal block conversion modules and others.</p> <p>(Optional)</p>	SH-080042 (13JL99)

(3) Servo amplifier

Manual Name	Manual Number (Model Code)
<p>MR-J3-□B Servo amplifier Instruction Manual</p> <p>This manual explains the I/O signals, parts names, parameters, start-up procedure and others for MR-J3-□B Servo amplifier.</p> <p>(Optional)</p>	SH-030051 (1CW202)
<p>Fully Closed Loop Control MR-J3-□B-RJ006 Servo amplifier Instruction Manual</p> <p>This manual explains the I/O signals, parts names, parameters, start-up procedure and others for Fully Closed Loop Control MR-J3-□B-RJ006 Servo amplifier.</p> <p>(Optional)</p>	SH-030056 (1CW304)

# 1. OVERVIEW

## 1.1 Overview

This programming manual describes the common items of each operating system software, such as the Multiple CPU system of the operating system software packages "SW5RN-SV□Q□", "SW6RN-SV□Q□" for Motion CPU module (Q173HCPU/Q172HCPU).

In this manual, the following abbreviations are used.

Generic term/Abbreviation	Description
Q173HCPU/Q172HCPU or Motion CPU (module)	Q173HCPU/Q172HCPU/Q173HCPU-T/Q172HCPU-T Motion CPU module
Q172LX/Q172EX/Q173PX or Motion module	Q172LX Servo external signals interface module/ Q172EX-S2/-S3 Serial absolute synchronous encoder interface module <sup>(Note-1)</sup> / Q173PX(-S1) Manual pulse generator interface module
MR-J3-□B	Servo amplifier model MR-J3-□B
AMP or Servo amplifier	General name for "Servo amplifier model MR-J3-□B"
QCPU, PLC CPU or PLC CPU module	Qn(H)CPU
Multiple CPU system or Motion system	Abbreviation for "Multiple PLC system of the Q series"
CPU <sub>n</sub>	Abbreviation for "CPU No.n (n= 1 to 4) of the CPU module for the Multiple CPU system"
Programming software package	General name for "MT Developer" and "GX Developer"
Operating system software	General name for "SW□RN-SV□Q□"
SV13	Operating system software for conveyor assembly use (Motion SFC) : SW6RN-SV13Q□
SV22	Operating system software for automatic machinery use (Motion SFC) : SW6RN-SV22Q□
SV43	Operating system software for machine tool peripheral use: SW5RN-SV43Q□
MT Developer	Abbreviation for Integrated start-up support software package "MT Developer (Version□ <sup>(Note-2)</sup> or later)"
GX Developer	Abbreviation for MELSEC PLC programming software package "GX Developer (Version 6 or later)"
Manual pulse generator or MR-HDP01	Abbreviation for "Manual pulse generator (MR-HDP01)"
Serial absolute synchronous encoder or Q170ENC	Abbreviation for "Serial absolute synchronous encoder (Q170ENC)"
SSCNET <sup>III</sup> <sup>(Note-3)</sup>	High speed synchronous network between Motion controller and servo amplifier
SSCNET <sup>(Note-3)</sup>	High speed serial communication between Motion controller and servo amplifier
Absolute position system	General name for "System using the servomotor and servo amplifier for absolute position"
Battery holder unit	Battery holder unit (Q170HBATC)
External battery	General name for "Q170HBATC" and "Q6BAT"
A□0BD-PCF	A10BD-PCF/A30BD-PCF SSC I/F board

# 1 OVERVIEW

Generic term/Abbreviation	Description
SSC I/F communication cable	Abbreviation for "Cable for SSC I/F board/card"
Teaching unit or A31TU-D3□/A31TU-DN□	A31TU-D3□/A31TU-DN□ Teaching unit <sup>(Note-4)</sup>
Intelligent function module	Abbreviation for "MELSECNET/H module/Ethernet module/CC-Link module/ Serial communication module"

(Note-1) : Q172EX can be used in SV22.

(Note-2) : Refer to Section "1.3.4 Software packages" for the correspondence version.

(Note-3) : SSCNET: Servo System Controller NETwork

(Note-4) : Teaching unit can be used in SV13.

## REMARK

For information about the each module, design method for program and parameter, refer to the following manuals relevant to each module.

Item	Reference Manual	
Motion CPU module/Motion unit	Q173HCPU/Q172HCPU User's Manual	
PLC CPU, peripheral devices for PLC program design, I/O modules and intelligent function module	Manual relevant to each module	
Operation method for MT Developer	Help of each software	
SV13/SV22	<ul style="list-style-type: none"> <li>• Design method for Motion SFC program</li> <li>• Design method for Motion SFC parameter</li> <li>• Motion dedicated PLC instruction</li> </ul>	Q173HCPU/Q172HCPU Motion controller (SV13/SV22) Programming Manual (Motion SFC)
	<ul style="list-style-type: none"> <li>• Design method for positioning control program in the real mode</li> <li>• Design method for positioning control parameter</li> </ul>	Q173HCPU/Q172HCPU Motion controller (SV13/SV22) Programming Manual (REAL MODE)
SV22 (Virtual mode)	<ul style="list-style-type: none"> <li>• Design method for mechanical system program</li> </ul>	Q173HCPU/Q172HCPU Motion controller (SV22) Programming Manual (VIRTUAL MODE)
SV43	<ul style="list-style-type: none"> <li>• Design method for Motion program</li> <li>• Motion dedicated PLC instruction</li> <li>• Design method for positioning control parameter</li> </ul>	Q173HCPU/Q172HCPU Motion controller (SV43) Programming Manual

## 1.2 Features

The Motion CPU and Multiple CPU system have the following features.

### 1.2.1 Features of Motion CPU

#### (1) Q series PLC Multiple CPU system

(a) The load of control processing for each CPU can be distributed by controlling the complicated servo control with the Motion CPU, and the machine control or information control with the PLC CPU, and flexible system configuration can be realized.

(b) The Motion CPU and PLC CPU are selected flexibly, and the Multiple CPU system up to 4 CPU modules can be realized.

The Motion CPU module for the number of axis to be used can be selected.

Q173HCPU : Up to 32 axes

Q172HCPU : Up to 8 axes

(Note): Combination with Q173CPU(N)/Q172CPU(N) is also possible.

The PLC CPU module for the program capacity to be used can be selected.

(One or more PLC CPU is necessary with the Multiple CPU system.)

Q00CPU : 8k steps

Q01CPU : 14k steps

Q02CPU, Q02HCPU : 28k steps

Q06HCPU : 60k steps

Q12HCPU : 124k steps

Q25HCPU : 252k steps

(c) The device data access of the Motion CPU and the Motion SFC program (SV13/SV22)/Motion program (SV43) start can be executed from PLC CPU by the Motion dedicated PLC instruction.

#### (2) High speed operation processing

(a) The minimum operation cycle of the Motion CPU is made 0.44[ms] (so far, the ratio of 2 times), and it correspond with high frequency operation.

(Note): The minimum operation cycle of Q173CPU(N)/Q172CPU(N) is 0.88[ms].

(b) High speed PLC control is possible by the Q series PLC CPU.

(For LD instruction)

Q02HCPU, Q06HCPU, Q12HCPU, Q25HCPU : 0.034[μs]

Q02CPU : 0.079[μs]

Q00CPU : 0.16[μs]

Q01CPU : 0.10[μs]

- (3) Connection between the Motion controller and servo amplifier with high speed synchronous network by SSCNET III
  - (a) High speed synchronous network by SSCNET III connect between the Motion controller and servo amplifier, and batch control the charge of servo parameter, servo monitor and test operation, etc.  
It is also realised reduce the number of wires.
  - (b) The maximum distance between the Motion CPU and servo amplifier, servo amplifier and servo amplifier of the SSCNET III cable on the same bus was set to 50(164.04)[m(ft.)], and the flexibility improved at the Motion system design.
- (4) The operating system software package for your application needs  
By installing the operating system software for applications in the internal flash memory of the Motion CPU, the Motion controller suitable for the machine can be realized.  
And, it also can correspond with the function improvement of the software package.
  - (a) Conveyor assembly use (SV13)  
Offer liner interpolation, circular interpolation, helical interpolation, constant-speed control, speed control, fixed-pitch feed and etc. by the dedicated servo instruction. Ideal for use in conveyors and assembly machines.
  - (b) Automatic machinery use (SV22)  
Provides synchronous control and offers electronic cam control by mechanical support language. Ideal for use in automatic machinery.
  - (c) Machine tool peripheral use (SV43)  
Offer liner interpolation, circular interpolation, helical interpolation, constant-speed positioning and etc. by the EIA language (G-code). Ideal for use in machine tool peripheral.

# 1 OVERVIEW

## 1.2.2 Basic specifications of Q173HCPU/Q172HCPU

### (1) Module specifications

Item	Q173HCPU	Q173HCPU-T	Q172HCPU	Q172HCPU-T
Teaching unit	—	Usable	—	Usable
Internal current consumption (5VDC) [A]	1.25	1.56 <sup>(Note)</sup>	1.14	1.45 <sup>(Note)</sup>
Mass [kg]	0.23	0.24	0.22	0.23
Exterior dimensions [mm(inch)]	104.6 (4.11)(H) × 27.4 (1.08)(W) × 114.3 (4.50)(D)			

(Note) : Current consumption 0.26[A] of the teaching unit is included.

### (2) SV13/SV22 Motion control specifications/performance specifications

#### (a) Motion control specifications

Item	Q173HCPU	Q173HCPU-T	Q172HCPU	Q172HCPU-T
Number of control axes	Up to 32 axes		Up to 8 axes	
Operation cycle (default)	SV13	0.44ms/ 1 to 3 axes 0.88ms/ 4 to 10 axes 1.77ms/11 to 20 axes 3.55ms/21 to 32 axes		0.44ms/ 1 to 3 axes 0.88ms/ 4 to 8 axes
	SV22	0.88ms/ 1 to 5 axes 1.77ms/ 6 to 14 axes 3.55ms/15 to 28 axes 7.11ms/29 to 32 axes	—	0.88ms/ 1 to 4 axes 1.77ms/ 5 to 8 axes
Interpolation functions	Linear interpolation (Up to 4 axes), Circular interpolation (2 axes), Helical interpolation (3 axes)			
Control modes	PTP(Point to Point) control, Speed control, Speed-position control, Fixed-pitch feed, Constant speed control, Position follow-up control, Speed control with fixed position stop, Speed switching control, High-speed oscillation control, Synchronous control (SV22)			
Acceleration/ deceleration control	Automatic trapezoidal acceleration/deceleration, S-curve acceleration/deceleration			
Compensation	Backlash compensation, Electronic gear, Phase compensation (SV22)			
Programming language	Motion SFC, Dedicated instruction, Mechanical support language (SV22)			
Servo program capacity	14k steps			
Number of positioning points	3200 points (Positioning data can be designated indirectly)			
Programming tool	IBM PC/AT			
Peripheral I/F	USB/SSCNET			
Teaching operation function	None	Provided (SV13 use)	None	Provided (SV13 use)
Home position return function	Proximity dog type (2 types), Count type (3 types), Data set type (2 types), Dog cradle type, Stopper type (2 types), Limit switch combined type (Home position return re-try function provided, home position shift function provided)			
JOG operation function	Provided			

# 1 OVERVIEW

## Motion control specifications (continued)

Item	Q173HCPU	Q173HCPU-T	Q172HCPU	Q172HCPU-T
Manual pulse generator operation function	Possible to connect 3 modules			
Synchronous encoder operation function	Possible to connect 12 modules		Possible to connect 8 modules	
M-code function	M-code output function provided M-code completion wait function provided			
Limit switch output function	Number of output points 32 points Watch data: Motion control data/Word device			
Absolute position system	Made compatible by setting battery to servo amplifier. (Possible to select the absolute data method or incremental method for each axis)			
Number of SSCNET III systems <small>(Note-1)</small>	2 systems		1 system	
Motion related interface module	Q172LX : 4 modules usable Q172EX : 6 modules usable Q173PX : 4 modules usable <small>(Note-2)</small>		Q172LX : 1 module usable Q172EX : 4 modules usable Q173PX : 3 modules usable <small>(Note-2)</small>	

(Note-1) : The servo amplifiers for SSCNET cannot be used.

(Note-2) : When using the incremental synchronous encoder (SV22 use), you can use above number of modules.  
When connecting the manual pulse generator, you can use only 1 module.

(b) Motion SFC Performance Specifications

Item		Q173HCPU/Q172HCPU		
Motion SFC program capacity	Code total (Motion SFC chart+ Operation control+ Transition)	543k bytes		
	Text total (Operation control+ Transition)	484k bytes		
Motion SFC program	Number of Motion SFC programs	256 (No.0 to 255)		
	Motion SFC chart size/program	Up to 64k bytes (Included Motion SFC chart comments)		
	Number of Motion SFC steps/program	Up to 4094 steps		
	Number of selective branches/branch	255		
	Number of parallel branches/branch	255		
	Parallel branch nesting	Up to 4 levels		
Operation control program (F/FS) / Transition program (G)	Number of operation control programs	4096 with F(Once execution type) and FS(Scan execution type) combined. (F/FS0 to F/FS4095)		
	Number of transition programs	4096(G0 to G4095)		
	Code size/program	Up to approx. 64k bytes (32766 steps)		
	Number of blocks(line)/program	Up to 8192 blocks (in the case of 4 steps(min)/blocks)		
	Number of characters/block(line)	Up to 128 (comment included)		
	Number of operand/block ( ) nesting/block	Up to 64 (operand: constants, word device, bit devices) Up to 32 levels		
	Descriptive expression	Operation control program	Calculation expression/bit conditional expression	
		Transition program	Calculation expression/bit conditional expression/ comparison conditional expression	
Execute specification	Number of multi execute programs	Up to 256		
	Number of multi active steps	Up to 256 steps/all programs		
	Executed task	Normal task	Execute in motion main cycle	
		Event task (Execution can be masked.)	Fixed cycle	Execute in fixed cycle (0.88ms, 1.77ms, 3.55ms, 7.11ms, 14.2ms)
			External interrupt	Execute when input ON is set among interrupt module QI60 (16 points).
			PLC interrupt	Execute with interrupt instruction (S(P).GINT) from PLC CPU.
NMI task	Execute when input ON is set among interrupt module QI60 (16 points).			
Number of I/O points (X/Y)	8192 points			
Number of real I/O points (PX/PY)	256 points			
Number of devices (Device In the Motion CPU only) (Included the positioning dedicated device)	Internal relays (M)	Total (M + L) : 8192 points		
	Latch relays (L)			
	Link relays (B)	8192 points		
	Annunciators (F)	2048 points		
	Special relays (M)	256 points		
	Data registers (D)	8192 points		
	Link registers (W)	8192 points		
	Special registers (D)	256 points		
	Motion registers (#)	8192 points		
Coasting timers (FT)	1 point (888μs)			



# 1 OVERVIEW

## (3) SV43 Motion control specifications/performance specifications (a) Motion control specifications

Item	Q173HCPU	Q172HCPU
Number of control axes	Up to 32 axes	Up to 8 axes
Operation cycle (default)	0.88ms/ 1 to 5 axes 1.77ms/ 6 to 14 axes 3.55ms/15 to 28 axes 7.11ms/29 to 32 axes	0.88ms/ 1 to 5 axes 1.77ms/ 6 to 8 axes
Interpolation functions	Linear interpolation (Up to 4 axes), Circular interpolation (2 axes), Helical interpolation (3 axes)	
Control modes	PTP (Point to Point) control, Constant speed positioning, High-speed oscillation control	
Acceleration/ deceleration control	Automatic trapezoidal acceleration/deceleration, S-curve acceleration/deceleration	
Compensation	Backlash compensation, Electronic gear	
Programming language	Dedicated instruction (EIA language)	
Motion program capacity	248k bytes	
Number of programs	1024	
Number of simultaneous start programs	Axis designation program : 32 Control program : 16	Axis designation program : 8 Control program : 16
Number of positioning points	Approx. 10600 points (Positioning data can be designated indirectly)	
Programming tool	IBM PC/AT	
Peripheral I/F	USB/SSCNET	
Teaching operation function	None	
Home position return function	Proximity dog type (2 types), Count type (3 types), Data set type (2 types), Dog cradle type, Stopper type (2 types), Limit switch combined type (Home position return re-try function provided, home position shift function provided)	
JOG operation function	Provided	
Manual pulse generator operation function	Possible to connect 3 modules	
M-code function	M-code output function provided M-code completion wait function provided	
Limit switch output function	Number of output points 32 points Watch data: Motion control data/Word device	
Skip function	Provided	
Override ratio setting function	Override ratio setting : 0 to 100[%]	
Absolute position system	Made compatible by setting battery to servo amplifier. (Possible to select the absolute data method or incremental method for each axis)	
Number of SSCNETⅢ systems <small>(Note-1)</small>	2 systems	1 system
Number of Motion related modules	Q172LX : 4 modules Q173PX : 1 module	Q172LX : 1 module Q173PX : 1 module

(Note-1) : The servo amplifiers for SSCNET cannot be used.

# 1 OVERVIEW

## (b) Motion program performance specifications

Item		Q173HCPU/Q172HCPU
Program capacity	Total of program files	248k bytes
	Number of programs	Up to 1024 (No. 1 to 1024)
Operation controls	Arithmetic operation	Unary operation, Addition and subtraction operation, Multiplication and division operation, Remainder operation
	Comparison operation	Equal to, Not equal to
	Logical operation	Logical shift operation, Logical negation, Logical AND, Logical OR, Exclusive OR
G-codes	Positioning command	G00, G01, G02, G03, G04, G09, G12, G13, G23, G24, G25, G26, G28, G30, G32, G43, G44, G49, G53, G54, G55, G56, G61, G64, G90, G91, G92, G98, G99, G100, G101
M-codes	Output command to data register	M****
Special M-codes	Program control command	M00, M01, M02, M30, M98, M99, M100
Variable	Device variable	X, Y, B, F, D, W, #
Functions	Trigonometric function	SIN, COS, TAN, ASIN, ACOS, ATAN
	Numerical function	ABS, SQR, BIN, LN, EXP, BCD, RND, FIX, FUP, INT, FLT, DFLT, SFLT
Instructions	Start/end	CALL, CLEAR
	Home position return	CHGA
	Speed/torque setting	TL, CHGV, CHGT
	Motion control	WAITON, WAITOFF, EXEON, EXEOFF
	Jump/repetition processing	CALL, GOSUB/GOSUBE, IF...GOTO, IF...THEN...ELSE...END, WHILE...DO...END
	Data operation	BMOV, BDMOV, FMOV, BSET, BRST, SET, RST, MULTW, MULTR, TO, FROM, ON, OFF, IF...THEN...SET/RST/OUT, PB
Number of controls	Number of program calls (GOSUB/GOSUBE)	Up to 8
	Number of program calls (M98)	Up to 8
Number of I/O points (X/Y)	8192 points	
Number of real I/O points (PX/PY)	256 points	
Number of devices (Device In the Motion CPU only) (Included the positioning dedicated device)	Internal relays (M)	Total (M + L) : 8192 points
	Latch relays (L)	
	Link relays (B)	8192 points
	Annunciators (F)	2048 points
	Special relays (M)	256 points
	Data registers (D)	8192 points
	Link registers (W)	8192 points
	Special registers (D)	256 points
	Motion registers (#)	8192 points
Coasting timers (FT)	1 point (888 $\mu$ s)	

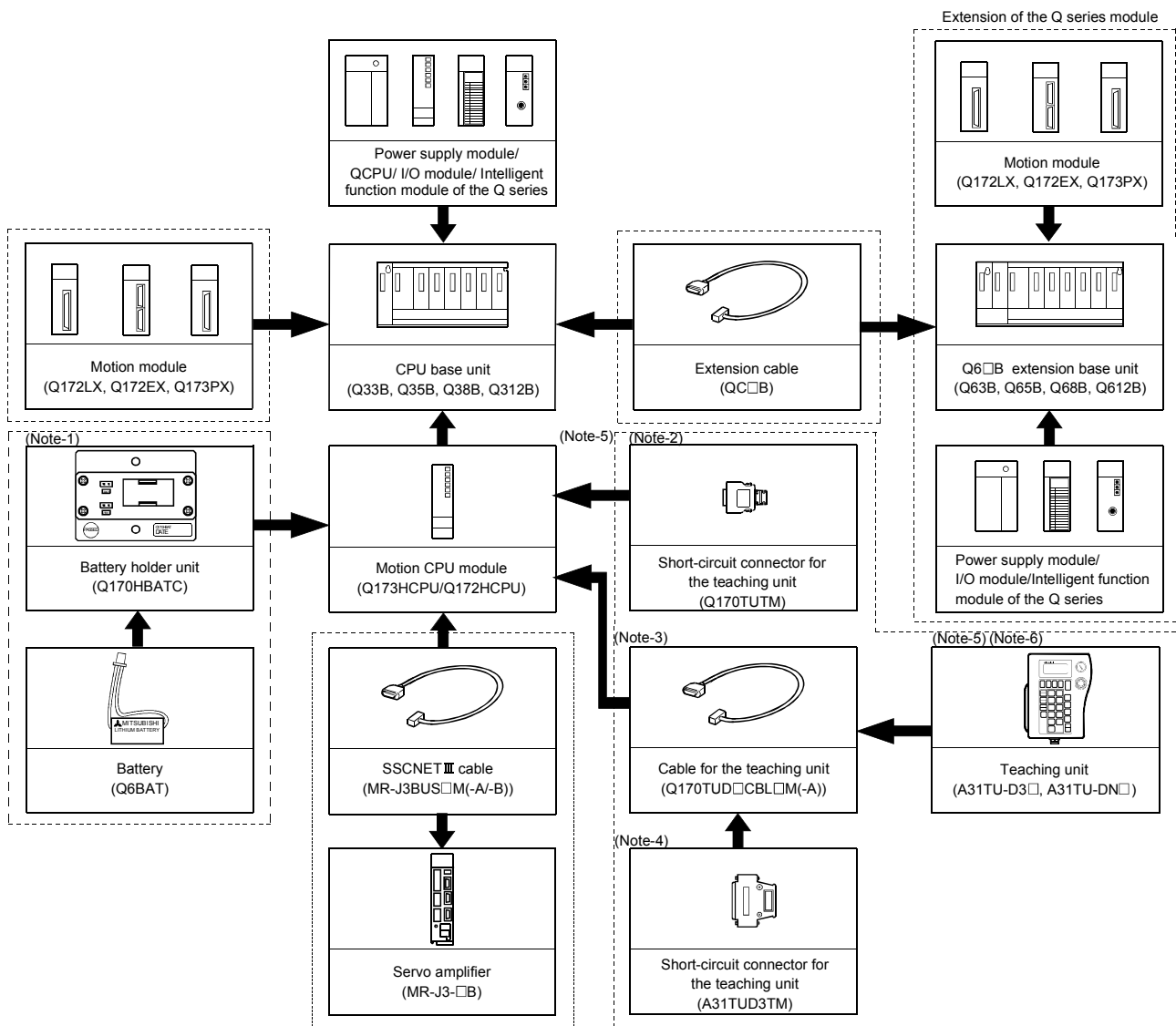
### 1.3 Hardware Configuration

This section describes the Q173HCPU/Q172HCPU system configuration, precautions on use of system, and configured equipments.

#### 1.3.1 Motion system configuration

This section describes the equipment configuration, configuration with peripheral devices and system configuration in the Q173HCPU/Q172HCPU system.

##### (1) Equipment configuration in Q173HCPU/Q172HCPU system



It is possible to select the best according to the system.

(Note-1) : When using the external battery, be sure to connect the Battery holder unit (Q170HBATC). And be sure to set the Battery(Q6BAT) to the Battery holder unit (Q170HBATC). Battery(Q6BAT) is optional.

(Note-2) : It is possible to use only Q173HCPU-T/Q172HCPU-T. It is packed together with Q173HCPU-T/Q172HCPU-T.

(Note-3) : It varies by the connecting teaching unit.

(Note-4) : It is packed together with Q170TUD□CBL□M.

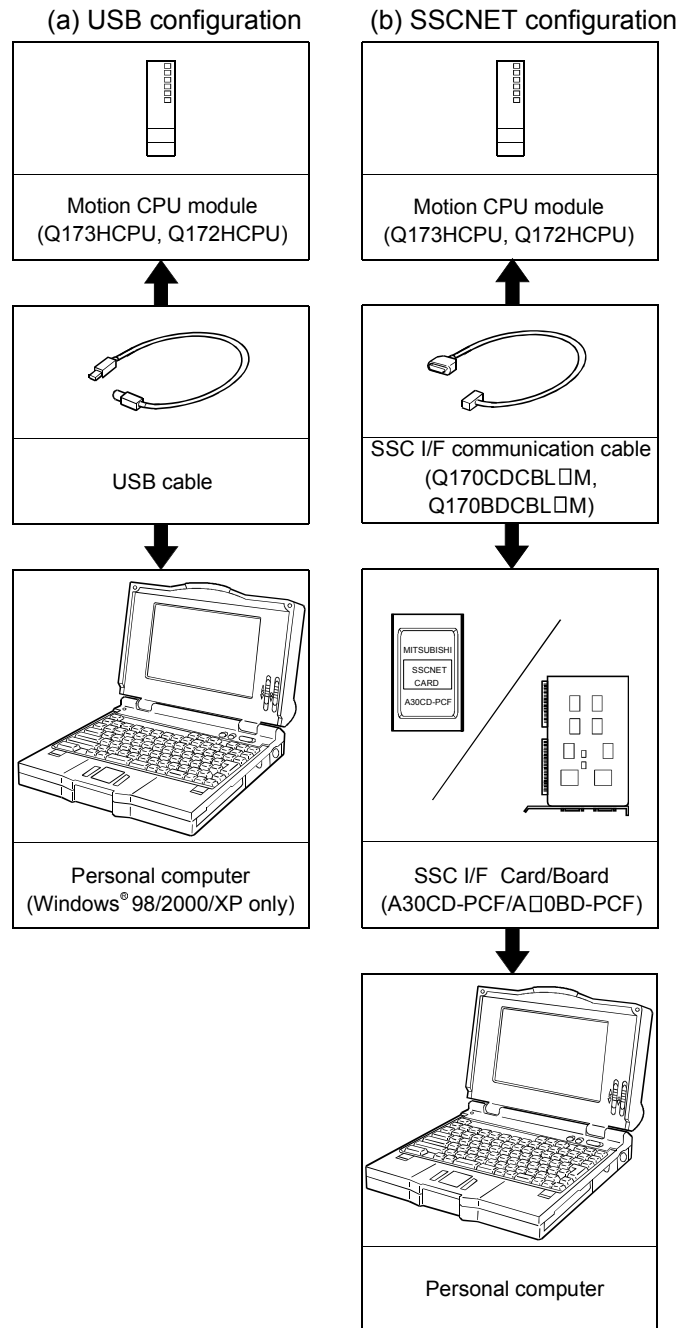
(Note-5) : When using the A31TU-D3□/A31TU-DN□, be sure to use the Q173HCPU-T/Q172HCPU-T.

(Note-6) : A31TU-D3□/A31TU-DN□ corresponds to only Japanese.

It does not correspond to display for English.

(2) Peripheral device configuration for the Q173HCPU/Q172HCPU

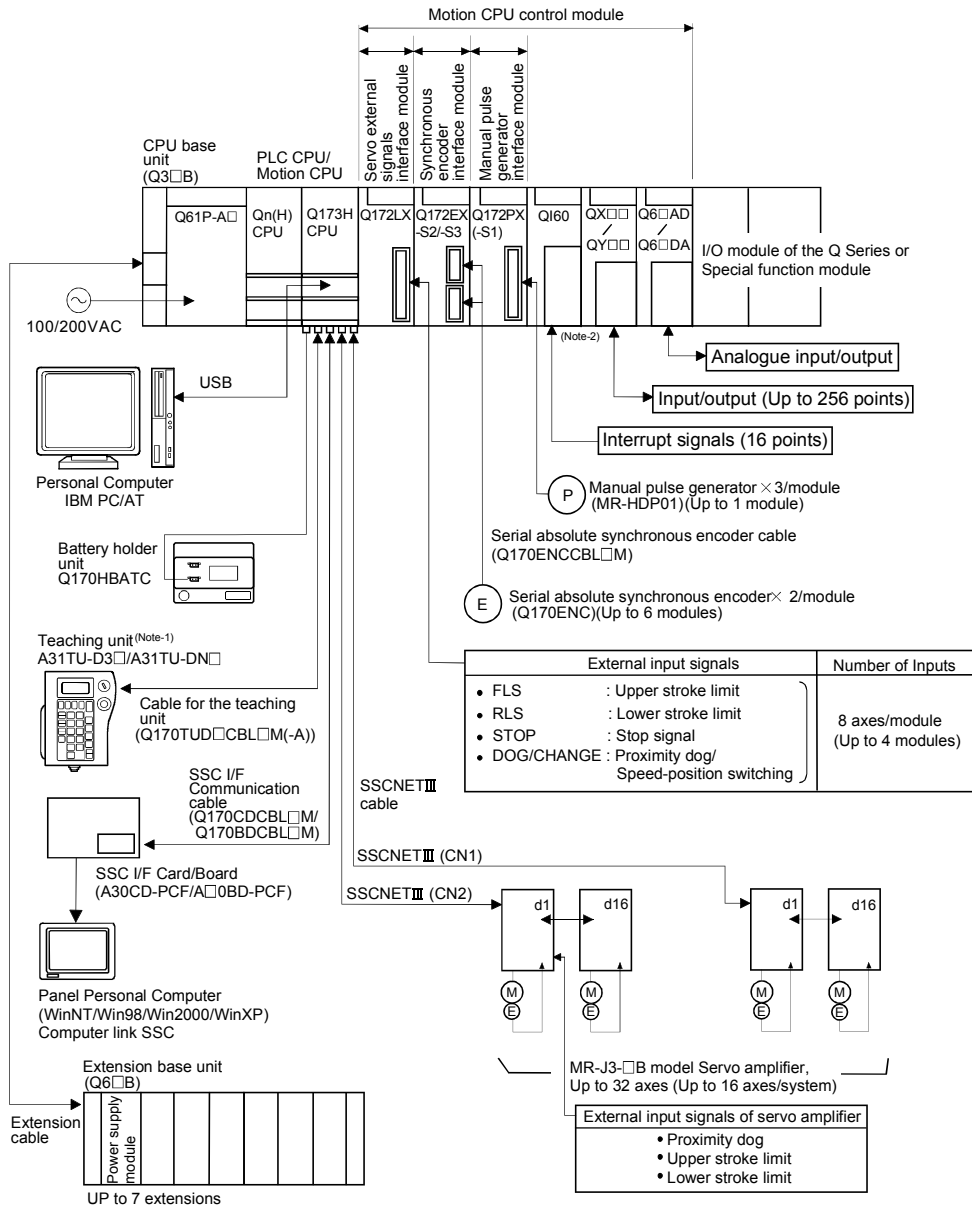
The following (a)(b) can be used.



(Note) : For information about GPP functions of PLC CPU, refer to the operating manual of PLC. Also, refer to the help of each software for information about operation of each programming software package.

# 1 OVERVIEW

## 1.3.2 Q173HCPU System overall configuration

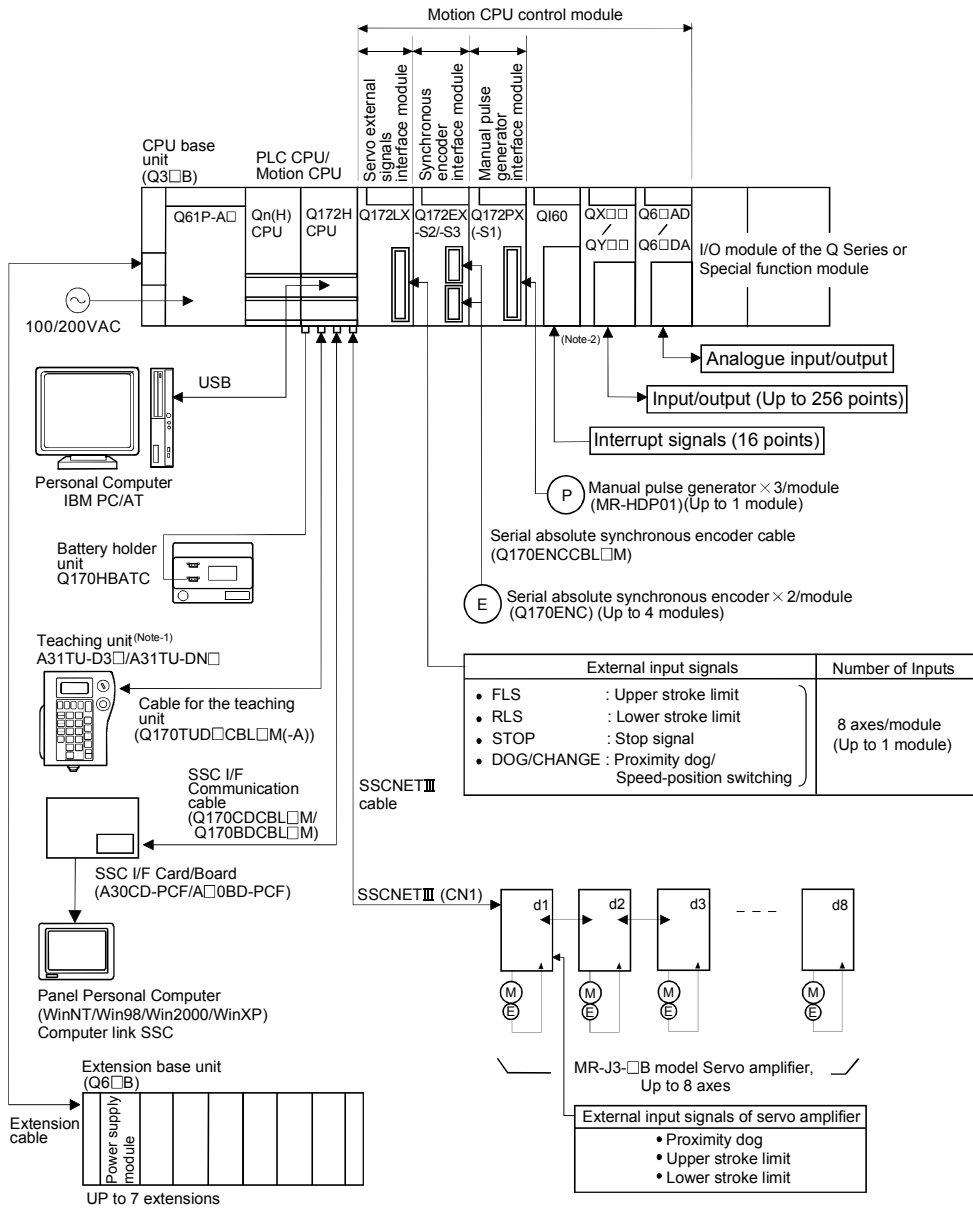


### CAUTION

- Construct a safety circuit externally of the Motion controller or servo amplifier if the abnormal operation of the Motion controller or servo amplifier differ from the safety directive operation in the system.
- The ratings and characteristics of the parts (other than Motion controller, servo amplifier and servomotor) used in a system must be compatible with the Motion controller, servo amplifier and servomotor.
- Set the parameter values to those that are compatible with the Motion controller, servo amplifier, servomotor and regenerative resistor model and the system application. The protective functions may not function if the settings are incorrect.
- When a teaching unit is used, the cable for the teaching unit is necessary between the Motion CPU (Q173HCPU-T/Q172HCPU-T) and teaching unit. And, connect the short-circuit connector for teaching unit, after removing the teaching unit or when not using it.

# 1 OVERVIEW

## 1.3.3 Q172HCPU System overall configuration



(Note-1) : Be sure to use the Q173HCPU-T.  
A31TU-D3□/A31TU-DN□ corresponds to only Japanese.  
It does not correspond to display for English.

(Note-2) : QI60 can be used in SV13/SV22.

### CAUTION

- Construct a safety circuit externally of the Motion controller or servo amplifier if the abnormal operation of the Motion controller or servo amplifier differ from the safety directive operation in the system.
- The ratings and characteristics of the parts (other than Motion controller, servo amplifier and servomotor) used in a system must be compatible with the Motion controller, servo amplifier and servomotor.
- Set the parameter values to those that are compatible with the Motion controller, servo amplifier, servomotor and regenerative resistor model and the system application. The protective functions may not function if the settings are incorrect.
- When a teaching unit is used, the cable for the teaching unit is necessary between the Motion CPU (Q173HCPU-T/Q172HCPU-T) and teaching unit. And, connect the short-circuit connector for teaching unit, after removing the teaching unit or when not using it.



# 1 OVERVIEW

## 1.3.4 Software packages

### (1) Software packages

#### (a) Operating system software packages

Application	Software package	
	Q173HCPU	Q172HCPU
For conveyor assembly <b>SV13</b> (Motion SFC)	SW6RN-SV13QK	SW6RN-SV13QM
For automatic machinery <b>SV22</b> (Motion SFC)	SW6RN-SV22QJ	SW6RN-SV22QL
For machine tool peripheral <b>SV43</b>	SW5RN-SV43QJ	SW5RN-SV43QL

#### (b) Integrated start-up support software package

Part name	Model name	Details	Version		
MT Developer	SW6RNC-GSVPROE	SW6RNC-GSVE (Integrated start-up support software (1 CD-ROM) )	<b>00K</b>	<b>00M</b>	<b>00N</b>
		Conveyor assembly software : SW6RN-GSV13P	00J	00K	00L
		Automatic machinery software : SW6RN-GSV22P	00J	00K	00L
		Machine tool peripheral software : SW6RN-GSV43P	—	00F	00G
		Cam data creation software : SW3RN-CAMP	00M	00M	00M
		Digital oscilloscope software : SW6RN-DOSCP	00G	00H	00H
		Communication system software : SW6RN-SNETP	00J	00K	00L
	Document print software : SW3RN-DOCPRNP, SW20RN-DOCPRNP	00R 00M	00T 00Q	00W 00T	
		SW6RNC-GSVHELPE (Operation manual (1 CD-ROM) )			
		Installation manual			
	SW6RNC-GSVPROE				
	SW6RNC-GSVSETE	A30CD-PCF(SSC I/F card (PCMCIA TYPE II 1CH/card) )			
		Q170CDCBL3M (A30CD-PCF cable 3m (9.84ft.))			

(Note) : Operating environment of the MT Developer is WindowsNT<sup>®</sup> 4.0/Windows<sup>®</sup> 98/Windows<sup>®</sup> 2000/Windows<sup>®</sup> XP English version only.

### (2) Operating environment of personal computer

Operating environment is shown below.

IBM PC/AT with which WindowsNT<sup>®</sup> 4.0/Windows<sup>®</sup> 98/Windows<sup>®</sup> 2000/  
Windows<sup>®</sup> XP English version operates normally.

Item	WindowsNT <sup>®</sup> 4.0 (Service Pack 2 or later) (Note) or Windows <sup>®</sup> 98	Windows <sup>®</sup> 2000	Windows <sup>®</sup> XP
CPU	Pentium <sup>®</sup> 133MHz or more	Pentium <sup>®</sup> II 233MHz or more	Pentium <sup>®</sup> II 450MHz or more
Memory capacity	Recommended 32MB or more	Recommended 64MB or more	Recommended 192MB or more
Hard disk free space	Hard disk free space is as following list.		
Disk drive	3.5inch (1.44MB) floppy disk drive, CD-ROM disk drive		
Display	800×600 pixels, 256 colors or more		

(Note) : Impossible to use USB connection.

# 1 OVERVIEW

It is necessary the following capacity depending on the installed software.

Model name	Size	
	SW6RNC-GSVE	SW6RNC-GSVHELPE
SW6RN-GSV13P	65MB	40MB
SW6RN-GSV22P	66MB	45MB
SW6RN-GSV43P	55MB	32MB
SW3RN-CAMP	5MB	3MB
SW6RN-DOSCP	35MB	10MB
SW6RN-SNETP	Standard	60MB
	Custom (When all selection)	60.5MB
SW3RN-DOCPRNP	45MB	5MB
SW20RN-DOCPRNP	45MB	5MB

(Note-1) : WindowsNT<sup>®</sup> , Windows<sup>®</sup> are either registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries.

(Note-2) : Pentium<sup>®</sup> are trademarks or registered trademarks of Intel Corporation or its subsidiaries in the United States and other countries.

### (3) Operating system(OS) type/version

#### (a) Confirmation method in the operating system(OS)

MITSUBISHI SOFTWARE PACKAGE 3.5inch  
**MOTION CONTROLLER**  
 MODEL [ 1 )  
 [ 2 ) [ 3 )  
 DATE [ 4 ) [ 5 )  
 © MITSUBISHI ELECTRIC CORPORATION ALL RIGHTS RESERVED

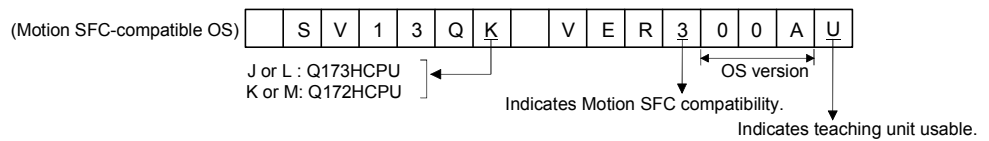
- 1) OS software TYPE
- 2) Software version
- 3) OS software version
- 4) Serial number
- 5) Number of FD

Example) When using the Q173HCPU, SV13 and version A.

- 1) SW6RN-SV13QK
- 2) BCD-B14W311
- 3) A

#### (b) Confirmation method in the SW6RN-GSV□P

The operating system(OS) type/version of the connected CPU is displayed on the installation screen of the SW6RN-GSV□P.



## (4) Relevant software packages

### (a) PLC software package

Model name	Software package
GX Developer	SW□D5C-GPPW-E

(Note) : □=used "6" or later.

### (b) Servo setup software package

Model name	Software package
MR Configurator	MRZJW3-SETUP221E

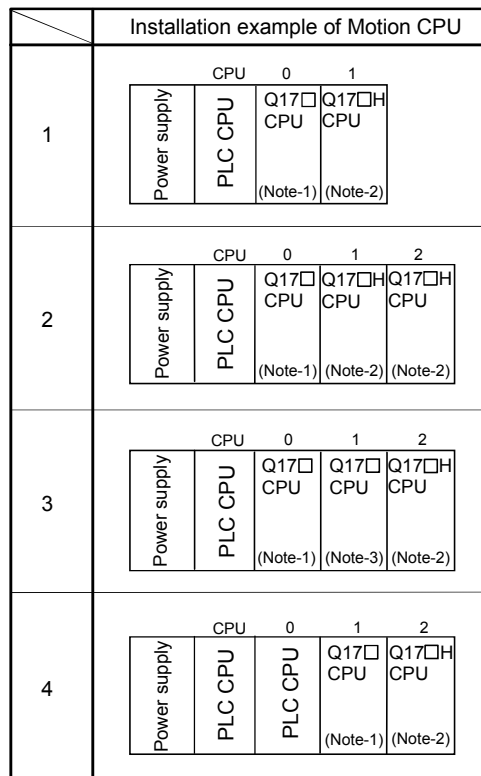
### POINT

- (1) When the operation of Windows is not unclear in the operation of this software, refer to the manual of Windows or guide-book from the other supplier.
- (2) The screen might not be correctly displayed depending on the system font size of WindowsNT<sup>®</sup> 4.0/Windows<sup>®</sup> 98/Windows<sup>®</sup> 2000/Windows<sup>®</sup> XP.  
Be sure to use the small size fonts.

## 1.3.5 Restrictions on motion systems

- (1) It is not allowed to use the Motion CPU as the control CPU of a module installed on the QA1S6□B extension base unit. PLC CPU must be used as the control CPU.
- (2) Motion CPU module cannot be used as standalone module. It must always be used in combination with the PLC CPU module (version that supports Multiple CPU systems). Moreover, it must be installed on the right side of PLC CPU module. PLC CPU module cannot be installed in a position to the right of Motion CPU module.
- (3) Personal computer CPU unit must be installed on the right side of Motion CPU module. Motion CPU module cannot be installed in a position to the right of personal computer CPU unit.
- (4) Make sure to use the PLC CPU module in the "Q mode."
- (5) Motion CPU module cannot be set as the control CPU of intelligent function module or Graphic Operation Terminal (GOT).
- (6) SSCNETⅢ cable which connects the Motion CPU and servo amplifier, and the teaching unit connecting cable which connects the Motion CPU and A31TU-D3□/A31TU-DN□<sup>(Note-1)</sup> are pulled from the bottom part of unit. Make sure to secure sufficient space for pulling out the cable when designing the control panel.
- (7) Motion CPU module is one module element of Q series multiple PLC system. It must be set the parameters of Q series multiple PLC system for each PLC CPU. Motion CPU module must also be set to support the Multiple CPU system in the system settings.
- (8) Make sure to use the Motion CPU as the control CPU of motion modules dedicated for Motion CPU (e.g., Q172LX, Q172EX<sup>(Note-2)</sup>, Q173PX). They will not operate correctly if PLC CPU is set and installed as the control CPU by mistake. Motion CPU is treated as a 32-point intelligent module by PLC CPU of other CPU. It cannot be accessed from other CPU.
- (9) When a Multiple CPU system is configured, make sure to configure the modules so that the total current consumption of individual modules on the CPU base does not exceed the 5VDC output capacity of power supply module.
- (10) Motion modules (Q172LX, Q172EX, Q173PX) is to do selection whether to be necessary referring to the "3. DESIGN" of the "Q173HCPU/Q172HCPU User's Manual" for the system design.

- (11) Installation position of the Q172EX<sup>(Note-2)</sup> is only CPU base unit.
- (12) When combining the Q173HCPU(-T)/Q172HCPU(-T) with Q173CPU(N)/Q172CPU(N)/Q173CPUN-T/Q172CPUN-T, set as following combination. If it is used in combination except for the following, the Q173HCPU(-T)/Q172HCPU(-T) does not operate normally, such as Q173HCPU(-T)/Q172HCPU(-T) does not start or communication error with servo amplifier will occur. However, all the operating system software are SV43, there is no restriction for the combination of Motion CPU.



Abbreviation	Model name
Q17□HCPU	Q17□HCPU(-T)
Q17□CPU	Q17□CPU(N)/Q17□CPUN(-T)

(Note-1) :Be sure to install the following operating system software to the Q17□CPU.

Application	Version
SV13/SV22	00R or later

(Note-2): There is no restriction for the operating system software and version installed to the Q17□HCPU.

(Note-3): There is no restriction for the operating system software and version installed to the Q17□CPU.

- (13) When the operation cycle is 0.4[ms], set the system setting as the axis select switch of servo amplifier "0 to 7". If the axis select switch of servo amplifier "8 to F" is set, the servo amplifiers are not recognized.

(Note-1) : Teaching unit can be used in SV13. It cannot be used in SV22/SV43.

(Note-2) : Q172EX can be used in SV22. It cannot be used in SV13/SV43.

## 2. MULTIPLE CPU SYSTEM

### 2.1 Multiple CPU System

#### 2.1.1 Overview

##### (1) Multiple CPU System

Multiple (up to 4 modules) PLC CPUs and Motion CPUs are installed to the CPU base unit, and each CPU controls the I/O modules and intelligent function modules of the CPU base unit/extension base unit slot by slot in the Multiple CPU system.

Each Motion CPU controls the servo amplifiers connected by SSCNETⅢ cable.

##### (2) Distributed system configuration

(a) By distributing such tasks as servo control, machine control and information control among multiple processors, the flexible system configuration can be realized.

(b) You can increase the number of control axes by using a multiple Motion CPUs. It is possible to control up to 96 axes by using three Q173HCPUs.

(c) You can reduce the PLC scan time of the overall system by using a multiple PLC CPUs and distributing the PLC control load among them.

##### (3) Communication among the CPUs in the Multiple CPU system

(a) Transmission of data among the CPUs in the Multiple CPU system is performed automatically using the multiple CPU automatic refresh function. This makes it possible to use the device data of the other CPUs as the device data of the self CPU.

(b) You can access the device data and start the Motion SFC program (SV13/SV22)/Motion program (SV43) from the PLC CPU to the Motion CPU by Motion dedicated PLC instruction.

## 2 MULTIPLE CPU SYSTEM

### 2.1.2 Installation of PLC CPU and Motion CPU

Up to a total four PLC CPUs and Motion CPUs can be installed in the CPU base unit, in the four slots starting from the CPU slot (the slot located to the immediate right of the power supply module) to slot 2 in series.

There must be no non-installation slot left, between a PLC CPU and a Motion CPU, or between Motion CPUs.

When two or more Motion CPUs are installed, they are installed together in the slots provided to the right of one or more PLC CPUs. (PLC CPU cannot be installed to the right of a Motion CPU.)

#### (1) When the high performance model PLC CPU is used.

Number of CPUs	Installation positions of PLC CPUs/Motion CPUs														
2	<table border="1"> <thead> <tr> <th>Power supply</th> <th>CPU 0</th> <th>1</th> <th>2</th> <th></th> </tr> </thead> <tbody> <tr> <td>PLC CPU</td> <td>Motion CPU</td> <td>I/O, etc.</td> <td>I/O, etc.</td> <td></td> </tr> </tbody> </table>					Power supply	CPU 0	1	2		PLC CPU	Motion CPU	I/O, etc.	I/O, etc.	
	Power supply	CPU 0	1	2											
PLC CPU	Motion CPU	I/O, etc.	I/O, etc.												
3	<table border="1"> <thead> <tr> <th>Power supply</th> <th>CPU 0</th> <th>1</th> <th>2</th> <th></th> </tr> </thead> <tbody> <tr> <td>PLC CPU</td> <td>PLC CPU</td> <td>Motion CPU</td> <td>I/O, etc.</td> <td></td> </tr> </tbody> </table>					Power supply	CPU 0	1	2		PLC CPU	PLC CPU	Motion CPU	I/O, etc.	
	Power supply	CPU 0	1	2											
PLC CPU	PLC CPU	Motion CPU	I/O, etc.												
4	<table border="1"> <thead> <tr> <th>Power supply</th> <th>CPU 0</th> <th>1</th> <th>2</th> <th></th> </tr> </thead> <tbody> <tr> <td>PLC CPU</td> <td>PLC CPU</td> <td>PLC CPU</td> <td>Motion CPU</td> <td></td> </tr> </tbody> </table>					Power supply	CPU 0	1	2		PLC CPU	PLC CPU	PLC CPU	Motion CPU	
	Power supply	CPU 0	1	2											
PLC CPU	PLC CPU	PLC CPU	Motion CPU												
	<table border="1"> <thead> <tr> <th>Power supply</th> <th>CPU 0</th> <th>1</th> <th>2</th> <th></th> </tr> </thead> <tbody> <tr> <td>PLC CPU</td> <td>Motion CPU</td> <td>Motion CPU</td> <td>Motion CPU</td> <td></td> </tr> </tbody> </table>					Power supply	CPU 0	1	2		PLC CPU	Motion CPU	Motion CPU	Motion CPU	
Power supply	CPU 0	1	2												
PLC CPU	Motion CPU	Motion CPU	Motion CPU												

#### (2) When the basic model PLC CPU is used.

Multiple CPU system up to 3 modules (PLC CPU×1, Motion CPU×1, Personal computer CPU×1).

### 2.1.3 Precautions for using Q series I/O modules and intelligent function modules

- (1) **Modules controllable by the Motion CPU**  
I/O modules (QX□, QY□, QH□, QX□Y□, Q6□AD□, Q6□DA□, interrupt module (QI60) and motion modules (Q172LX, Q172EX, Q173PX) can be controlled by the Motion CPU.
- (2) **Compatibility with the Multiple CPU system**
  - (a) All I/O modules (QX□, QY□, QH□, QX□Y□, Q6□AD□, Q6□DA□) support the Multiple CPU system.
  - (b) The interrupt module (QI60), which is currently not subject to function upgrade, supports the Multiple CPU system.
  - (c) The intelligent function modules support the Multiple CPU system only when their function version is B or later. These modules cannot be controlled by the Motion CPU, so be sure to use the PLC CPU as a control CPU.
  - (d) All motion modules (Q172LX, Q172EX, Q173PX) support the Multiple CPU system. These modules cannot be controlled by the PLC CPU, so be sure to use the Motion CPU as a control CPU.
- (3) **Access range from a non-control CPU**
  - (a) The Motion CPU can access only the modules controlled by the self CPU. It cannot access the modules controlled by other CPUs.
  - (b) Access range from a non-control CPU for the modules controlled by the Motion CPU are shown below.

Access target		I/O setting from outside the group (setting from the PLC CPU)	
		Not received	Received
Input (X)		×	○
Output (Y)		×	×
Buffer memory	Read	×	×
	Write	×	×

#### REMARK

- The function version of an intelligent function module can be checked on the rated plate of the intelligent function module or in the GX Developer's system monitor product information list.
- Refer to the "Q173HCPU/Q172HCPU User's Manual" for the model name which can be controlled by the Motion CPU.



## 2 MULTIPLE CPU SYSTEM

### 2.1.4 Modules subject to installation restrictions

- (1) Modules subject to installation restrictions in the Motion CPU are shown below. Use within the restrictions listed below.

(a) SV13/SV22

Description	Model name	Maximum installable modules per CPU	
		Q173HCPU	Q172HCPU
Servo external signals interface module	Q172LX	4 modules	1 module
Serial absolute synchronous interface module	Q172EX (Note-2)	6 modules	4 modules
Manual pulse generator interface module	Q173PX (Note-1)	4 modules <sup>(Note-2)</sup> (Incremental serial encoder use)	3 modules <sup>(Note-2)</sup> (Incremental serial encoder use)
		1 module (Manual pulse generator only use)	1 module (Manual pulse generator only use)
Input module	QX□	Total 256 points	
Output module	QY□		
Input/output composite module	QH□		
	QX□Y□		
Analogue input module	Q6□AD□		
Analogue output module	Q6□DA□		
Interrupt module	QI60	1 module	

(Note-1) : When the Manual pulse generator and the serial encoder are used at the same time with the SV22, the Q173PX installed in the slot of the smallest number is used for manual pulse generator input.

(Note-2) : SV22 only.

(b) SV43

Description	Model name	Maximum installable modules per CPU	
		Q173HCPU	Q172HCPU
Servo external signals interface module	Q172LX	4 modules	1 module
Manual pulse generator interface module	Q173PX	1 module (Manual pulse generator only use)	1 module (Manual pulse generator only use)
Input module	QX□	Total 256 points	
Output module	QY□		
Input/output composite module	QH□		
	QX□Y□		
Analogue input module	Q6□AD□		
Analogue output module	Q6□DA□		

- (2) Modules controlled by a Motion CPU cannot be installed in the extension base unit QA1S6□B. Install them in the CPU base unit Q3□B or extension base unit Q6□B.

## 2 MULTIPLE CPU SYSTEM

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- (3) A total of eight base units including one CPU base unit and seven extension base units can be used. However, the usable slots (number of modules) are limited to 64 per system including vacant slots. If a module is installed in slot 65 or subsequent slot, an error (SP. UNIT LAY ERROR) will occur. Make sure all modules are installed in slots 1 to 64. (Even when the total number of slots provided by the CPU base unit and extension base units exceeds 65 (such as when six 12-slot base units are used), an error does not occur as long as the modules are installed within slots 1 to 64.)

### 2.1.5 Processing time of the Multiple CPU system

#### (1) Processing of the Multiple CPU system

Each CPU module of the Multiple CPU system accesses to the modules controlled by self CPU with which the CPU base unit or extension base unit is installed, and the other CPU through the bus (base unit patterns and extension cables). However, a multiple CPU module cannot use the bus simultaneously. When a multiple CPUs have accessed the bus simultaneously, the CPUs which performed buss access later remain in "waiting state" until the CPU currently using the bus completes its processing. In a Multiple CPU system, the above waiting time (duration while a CPU remains in waiting state) causes an I/O delay or prolonged scan time.

#### (2) When the waiting time becomes the longest

In the Multiple CPU system, the wait time of self CPU becomes the longest in the following conditions:

- When is using a total of four PLC CPUs/Motion CPUs are used in the Multiple CPU system.
- When the extension base units are used.
- When the intelligent function modules handling large volumes of data are installed in the extension base unit(s).
- When a total of four CPUs are used and the four CPUs have simultaneously accessed a module installed in an extension base unit.
- When there are many automatic refresh points between a PLC CPU and a Motion CPU.

#### (3) When shortening the processing time of the Multiple CPU system

The processing time of the Multiple CPU system can be shortened in the following methods:

- Install all modules with many access points such as MELSECNET/10(H) and CC-Link refreshes together in the CPU base unit.
- Control all modules with many access points such as MELSECNET/10(H) and CC-Link refreshes using only one PLC CPU so that they are not accessed by two or more CPUs simultaneously.
- Reduce the number of refresh points of MELSECNET/10(H), CC-Link, etc.
- Reduce the number of automatic refresh points of the PLC CPUs/Motion CPUs.

## 2 MULTIPLE CPU SYSTEM

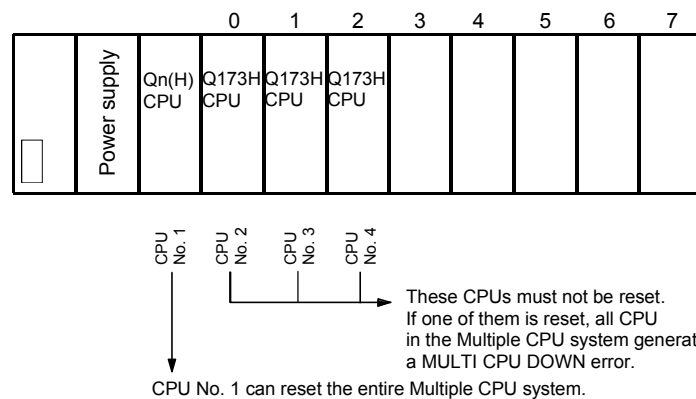
### 2.1.6 How to reset the Multiple CPU system

With the Multiple CPU system, resetting the PLC CPU of CPU No. 1 resets the entire system.

When the PLC CPU of CPU No. 1 is reset, the CPUs, I/O modules and intelligent function modules of all CPUs will be reset.

To recover any of the CPUs in the Multiple CPU system that generated a CPU stop error, reset the PLC CPU of CPU No. 1 or restart the power (i.e., turning the power ON, OFF and then ON).

(If the PLC CPUs or Motion CPUs of CPU Nos. 2 through 4 generated a CPU stop error, they cannot be recovered by resetting the corresponding CPU.)



#### POINT

- (1) In a Multiple CPU system, the PLC CPUs/Motion CPUs of CPU No. 2, 3 or 4 cannot be reset individually.  
When a PLC CPU or Motion CPU of CPU No. 2, 3 or 4 is reset while the Multiple CPU system is operating, the other CPUs generate a MULTI CPU DOWN error (error code: 7000) and the entire system stops.  
Note that depending on the timing at which the PLC CPU or Motion CPU of CPU No. 2, 3 or 4 is reset, the PLC CPU of a the other CPU may stop due to an error other than MULTI CPU DOWN.
- (2) Resetting CPU No. 2, 3 or 4 generates a MULTI CPU DOWN error regardless of the operation mode set in the Multiple CPU Settings tab. (Stop/continue all CPUs upon error in CPU No. 2, 3 or 4.) (Refer to Section 2.1.7 for the setting of operation mode in Multiple CPU Settings.)

## 2 MULTIPLE CPU SYSTEM

### 2.1.7 Processing at a CPU DOWN error occurrence by a PLC CPU or Q173HCPU/ Q172HCPU

In the Multiple CPU system, the system operates differently when CPU No. 1 generated a CPU DOWN error as compared with when CPU No. 2, 3 or 4 did.

#### (1) When CPU No. 1 generated a CPU DOWN error

(a) When the PLC CPU of CPU No. 1 generated a CPU DOWN error, all PLC CPU/Q173HCPU/Q172HCPU of CPU Nos. 2, 3 and 4 generate a MULTI CPU DOWN error (error code: 7000) and the Multiple CPU system stops. (Note-1)

(b) Recover the system using the procedure below:

1) Check the cause of the error that occurred in CPU No. 1 using the PC diagnostic function of GX Developer.

2) Remove the cause of the error.

3) Reset the PLC CPU of CPU No. 1 or restart the power.

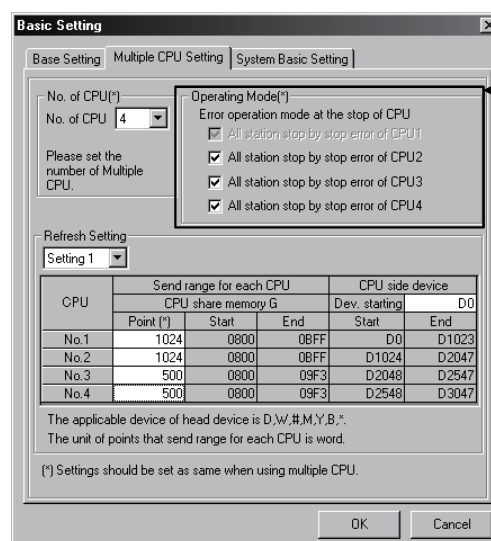
Resetting the PLC CPU of CPU No. 1 or restarting the power resets all CPUs in the Multiple CPU system and the system is recovered.

#### (2) When CPU No. 2, 3 or 4 generated a CPU DOWN error

If the PLC CPU, Q173HCPU or Q172HCPU of CPU No. 2, 3 or 4 generated a CPU DOWN error, the entire system may or may not stop depending on the setting of "Operation Mode" in the Multiple CPU Settings tab.

By default value, all CPUs will stop when any of the CPUs generates a CPU stop error. If you do not wish to stop all CPUs following an error generated in the PLC CPU, Q173HCPU or Q172HCPU of a specific CPU or CPUs, click and uncheck the CPU or CPUs that will not stop all CPUs upon generating an error.

(See arrow A.)



## 2 MULTIPLE CPU SYSTEM

- (a) When a CPU DOWN error occurs in the CPU of the CPU in a checked "Stop all CPUs upon error in CPU No. n" item, all PLC CPU/Q173HCPU/ Q172HCPU of the other CPUs will generate a MULTI CPU DOWN error (error code: 7000) and the Multiple CPU system will stop. (Note-1)
- (b) When a CPU DOWN error occurs in the CPU of the PLC in an unchecked "Stop all CPUs upon error in CPU No. n" item, all CPUs of the other CPUs will generate a MULTI CPU ERROR (error code: 7020) and continue their operation.

### POINT

(Note-1) : When a CPU DOWN error occurs, the CPU detecting the error will generate a MULTI CPU DOWN error.

Therefore, the system may enter a MULTI CPU DOWN mode after detecting the CPU DOWN error in the CPU generating a MULTI CPU DOWN error, instead of the error in the CPU that generated the CPU DOWN error in the first place. In this case, the common error-data area may store a CPU number different from one corresponding to the CPU that generated the CPU DOWN error first.

When recovering the system, remove the cause of the error present in the CPU not stopped by a MULTI CPU DOWN error.

In the screen below, the cause of the error present in CPU No. 2, which does not have a MULTI CPU DOWN error, should be removed.

The screenshot shows the 'PLC diagnostics' window with the following sections:

- PLC status:** Shows PLC operation status for No1, No2, No3, and No4. No1 and No3 are in STOP mode, while No2 and No4 are in RUN mode.
- Present Error:** A table listing errors for PLC1, PLC2, PLC3, and PLC4.
 

PLC Module	No.	Present Error	Year/Month/Day
PLC1	7000	MULTI CPU DOWN	2006-7-10
PLC2	3010	PARAMETER ERROR	2006-7-10
PLC3	10000	CONT.UNIT ERROR	2006-7-10
PLC4	7000	MULTI CPU DOWN	2006-7-10
- Serial communication error:** Includes options for Overrunning error, Parity error, and Framing error, with 'Error Jump' and 'Help' buttons.
- Error log:** A table showing a history of errors.
 

No.	Error message	Year/Month/Day	Time
1500	AC/DC DOWN	2006-7-10	18:45:36
1500	AC/DC DOWN	2006-7-10	18:48:23
1500	AC/DC DOWN	2006-7-10	19:4:19
7000	MULTI CPU DOWN	2006-7-10	20:5:31
1500	AC/DC DOWN	2006-7-11	15:41:15
1500	AC/DC DOWN	2006-7-11	15:51:25

## 2 MULTIPLE CPU SYSTEM

(c) Use the following procedure to recover the system:

- 1) Check the CPU generating the error and cause of the error using the PC diagnostic function of GX Developer.
- 2) If the error occurred in a Q173HCPU/Q172HCPU and the error code is 10000, check the cause of the error using error list of SW6RN-GSV□P.
- 3) Remove the cause of the error.
- 4) Reset the PLC CPU of CPU No. 1 or restart the power.
- 5) Resetting the PLC CPU of CPU No. 1 or restarting the power resets all CPUs in the Multiple CPU system and the system will be recovered.

### (3) Operation at a Motion CPU error

Operations at a Motion CPU error are shown below.

Category	Type of error	Operation	Remark
Operation disable errors	System setting error	Does not operate from the beginning (does not run).	• All actual output PY points turn OFF. No effect on other CPUs.
	WDT error	Varies depending on the error.	• All actual output PY points turn OFF. Other CPUs may also stop depending on the parameter setting.
	Self-diagnosis error	Stops at a CPU DOWN error.	
	Other CPU DOWN error	Operation corresponding to STOP (M2000 OFF). Depends on the "Operation mode upon CPU stop error" setting.	• All actual output PY points turn OFF.
Operation continuous enable errors	Self-diagnosis error	Operation continues when the continuous error occurred.	<ul style="list-style-type: none"> <li>• Only the applicable program stops (the program may continue depending on the type of error).</li> <li>• Actual output PY retains output.</li> <li>• No effect on other CPUs.</li> </ul>
	Motion SFC error <sup>(Note-1)</sup>	Processing stops for each program or axis instead of the Motion CPU stopping all the processing.	
	Minor error		
	Major error		
	Servo error		
	Servo program setting error <sup>(Note-1)</sup>		
Motion program setting error <sup>(Note-2)</sup>			

(Note-1) : SV13/SV22 use

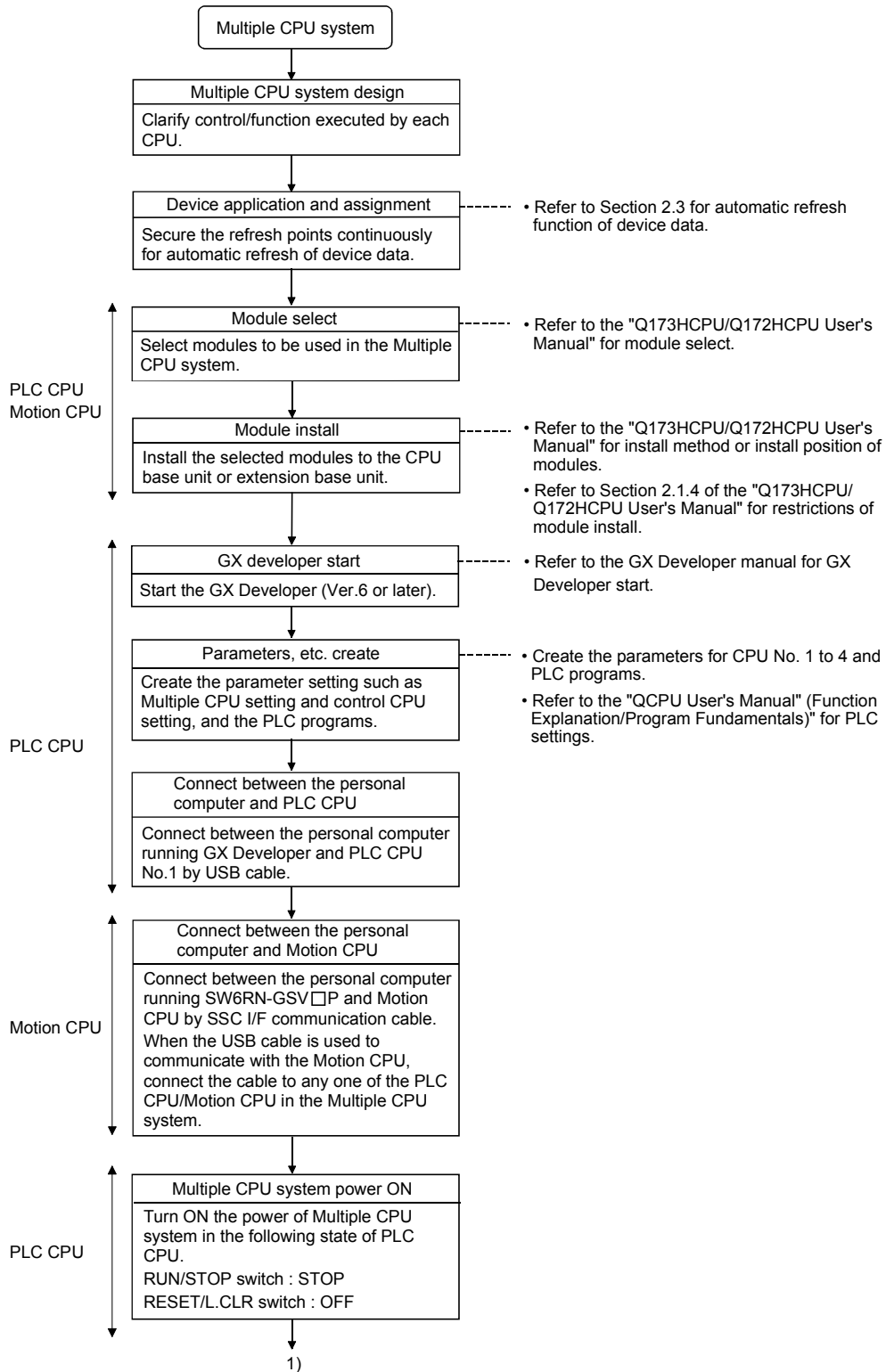
(Note-2) : SV43 use

## 2 MULTIPLE CPU SYSTEM

### 2.2 Starting Up the Multiple CPU System

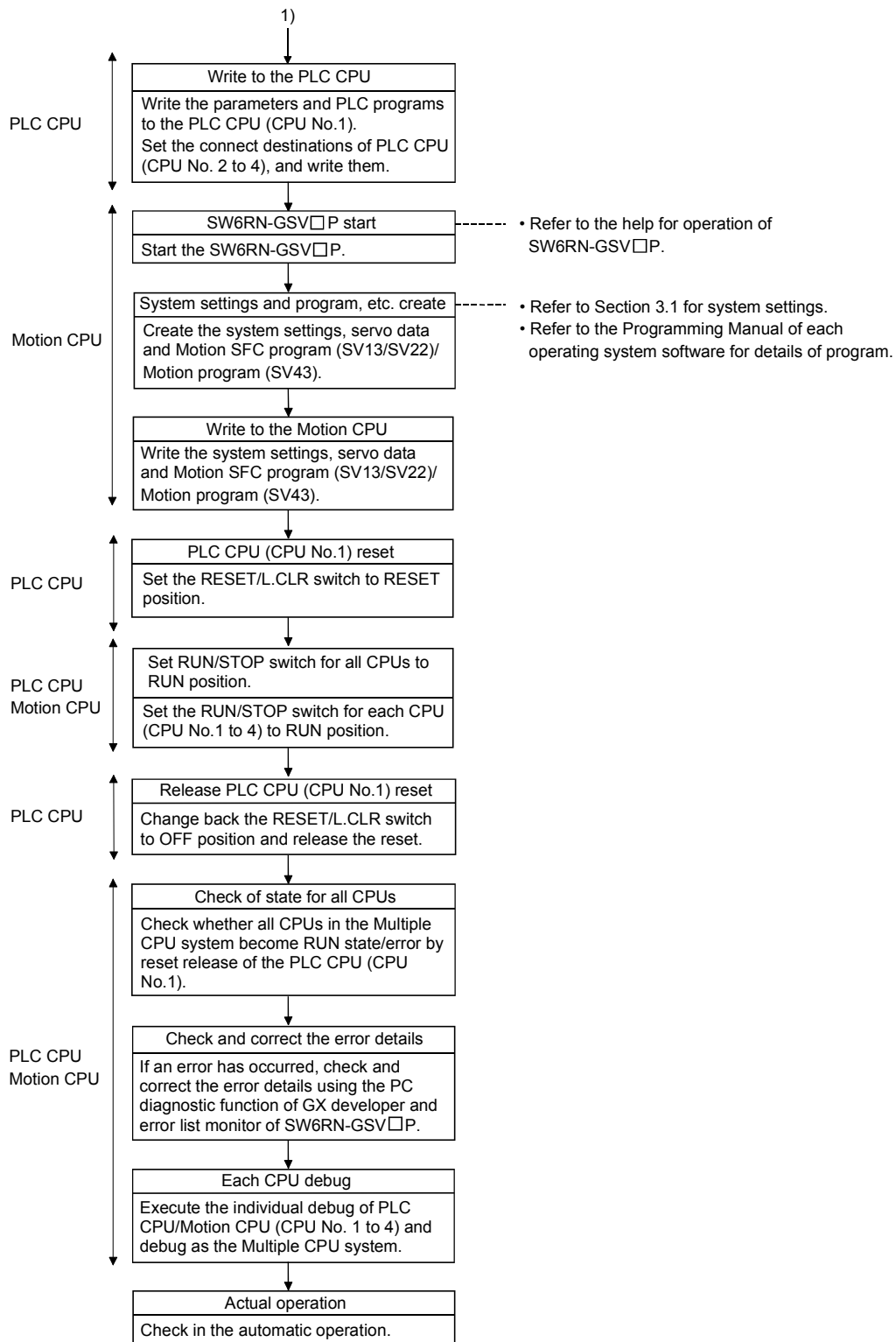
This section describes a standard procedure to start up the Multiple CPU system.

#### 2.2.1 Startup Flow of the Multiple CPU System





## 2 MULTIPLE CPU SYSTEM



(Note) : Installation of the operating system software is required to the Motion CPU module before start of the Multiple CPU system.

Refer to Chapter 5 of the "Q173HCPU/Q172HCPU User's Manual" for installation of the Motion CPU operating system software.

## 2 MULTIPLE CPU SYSTEM

### 2.3 Communication between the PLC CPU and the Motion CPU in the Multiple CPU System

The following tasks can be performed between the PLC CPU and the Motion CPU in the Multiple CPU system.

- Data transfer between CPUs by the automatic refresh function of the shared CPU memory
- Control instruction from the PLC CPU to Motion CPU by the Motion dedicated Instructions
- Reading/writing device data from the PLC CPU to Motion CPU by the dedicated instruction

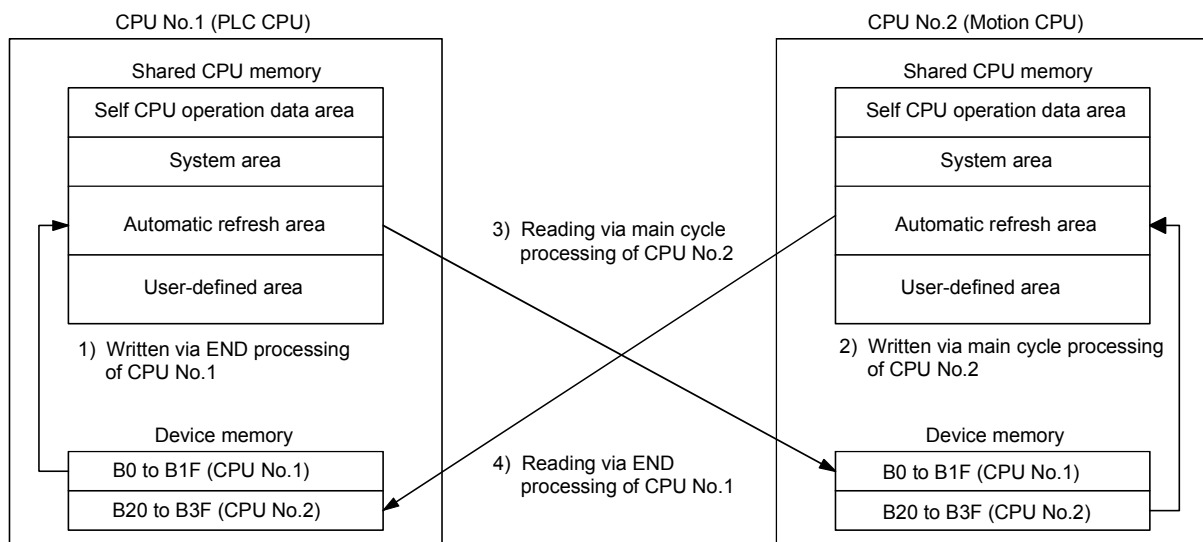
#### 2.3.1 Automatic Refresh Function of The Shared CPU Memory

##### (1) Automatic refresh function of the shared CPU memory

- (a) The automatic refresh function of the shared CPU memory is executed automatically the data transfer between CPUs in the Multiple CPU system during END processing in the PLC CPU or during main cycle processing (free time except motion control) in the Motion CPU.

When the automatic refresh function is used, the data in the device memory of the other CPU is read automatically, so the device data of other CPU can be used as the device data of self CPU.

The diagram below illustrates the automatic refresh operation involving 32 points (B0 to B1F) for the PLC CPU of CPU No.1 and 32 points (B20 to B3F) for the Motion CPU of CPU No.2.



Processing details of CPU No.1 (PLC CPU) at the END processing.

- 1) : Data of transmitting devices B0 to B1F for CPU No.1 is transferred to the automatic refresh area of shared memory in the self CPU.
- 4) : Data in the automatic refresh area of shared memory in CPU No.2 is transferred to B20 to B3F in the self CPU.

## 2 MULTIPLE CPU SYSTEM

Processing details of CPU No.2 (Motion CPU) at main cycle processing.

2) : Data of transmitting devices B20 to B3F for CPU No.2 is transferred to the automatic refresh area of shared memory in the self CPU.

3) : Data in the automatic refresh area of shared memory in CPU No.1 is transferred to B0 to B1F in the self CPU.

By the above operations, the data written to B0 to B1F in CPU No.1 can be read as B0 to B1F of CPU No.2, while the data written to B20 to B3F in CPU No.2 can be read as B20 to B3F of CPU No.1. B0 to B1F of CPU No.1 can be read or written freely using CPU No.1, but B20 to B3F correspond to the refresh area for the data of CPU No.2 and can only be read, not written, by CPU No. 1. Similarly, B20 to B3F of CPU No.2 can be read or written freely using CPU No.2, but B0 to B1F correspond to the refresh area for the data of CPU No.1 and thus can only be read, not written, by CPU No.2.

(b) Executing the automatic refresh function

The automatic refresh function can be executed regardless of whether the applicable PLC CPU and Motion CPU are in the RUN or STOP state. When a CPU DOWN error will occur in the PLC CPU or Motion CPU, the automatic refresh function is not executed.

When one CPU generated a CPU DOWN error, the other CPU free from CPU DOWN error retains the data saved immediately before the CPU DOWN error occurred. For example, if CPU No.2 generated a CPU DOWN error while B20 was ON in the operation block diagram in (a), B0 of CPU No.1 remains ON. If necessary, interlocking is performed using other-CPU DOWN detection signals M9244 to M9247.

(c) To execute the automatic refresh function, for the Motion CPU the number of transmitting points for the CPU and the devices whose data is stored (devices to which the automatic refresh function is executed) must be set in Multiple CPU Settings of System Settings. For the PLC CPU, the applicable parameters must be set identically in Multiple CPU Settings of PC parameters.

Item		Description
Type of refresh device	Bit	Y, M, B (Set the first device No. as a multiple of 16 in modules of 32 bits.)
	Word	D, W, # (Set in modules of 2 words.)
Number of refresh device range settings		4 ranges (Bit and word may be mixed.)
Number of refresh words per CPU		A maximum of 8k words
Number of transmitting words per CPU		A maximum of 2k words (Set in units of 2 words.)

### CAUTION

- If necessary, perform interlocking during the execution of the automatic refresh function using other CPU DOWN detection signals M9244 to M9247.

(2) Automatic refresh settings 1 (Automatic setting)

- (a) When executing the automatic refresh function of shared CPU memory, set the number of each CPU's transmitting points and devices in which data is to be stored using Multiple CPU Settings of System Settings. Refer to the "QCPU User's Manual (Functions Explanation/Program Fundamentals)" about the setting of the PLC CPU.

• Set the transmitting range for each CPU.

• Select the setting No..

• Set the first device No. from which the automatic refresh function is executed. (Number of specified points are continuously used from the device No. to be set.)

(b) Setting number selection/send range (refresh range) for each CPU

- 1) The refresh setting of four ranges can be set by setting selection. For example, ON/OFF data may be refreshed using bit-device setting, while other data may be refreshed using word device setting.
- 2) The number of points in the shared CPU memory set in units of 2 points (2 words) is set in the range for each CPU. (2 points if word device is specified for the CPU-side device, or 32 points if bit device is specified.) Data of the CPUs for which "0" is set as the number of points representing the send range of the CPU will not be refreshed. Assume that 32 points (B0 to B1F) of CPU No.1 and 32 points (B20 to B3F) of CPU No.2 are to be refreshed. Since one point in the shared CPU memory corresponds to 16 bit-device points, the number of transmitting points becomes 2 for CPU No. 1 and also 2 for CPU No. 2.
- 3) The maximum number of transmitting points combining all four ranges is 2k words per CPU (PLC CPU or Motion CPU) or 8k points (8k words) for all CPUs.

• 2k points (2k words) per CPU  
• 8k points (8k words) for all CPUs  
• Set in units of 2 points (2 words).

• Setting two points in shared CPU memory and specifying the bit device for the CPU-side device creates 32 bit-device points.

• Data in CPU No.3 and 4 is not refreshed since the number of points is set to 0.

CPU	Send range for each CPU			CPU 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				

## 2 MULTIPLE CPU SYSTEM

- 4) The shared CPU memory to be occupied during execution of the automatic refresh function covers all areas corresponding to settings 1 to 4.

When the number of transmitting points is set, the first and last addresses of the shared CPU memory to be used are indicated in hexadecimal.

The CPU for which the number of transmitting points is set in settings 1 and 2 use the last address of shared CPU memory in setting 2. (In the example below, CPU No.1 and No.2 are using the area up to 811H, while CPU No.4 is using the area up to 821H.)

The CPU for which the number of transmitting points is set only in setting 1 use the last address of shared CPU memory in setting 1. (In the example below, CPU No.3 is using the last address in setting 1).

CPU	Send range for each CPU			CPU side device	
	CPU 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	32	0802	0821	W20	W3F

The applicable device of head device is D,W,#,M,Y,B,\*.  
The unit of points that send range for each CPU is word.

(\*) Settings should be set as same when using multiple CPU.

- 5) Set the same number of transmitting points for all CPUs in the Multiple CPU system.

If any of the CPUs has a different number of transmitting points, a PARAMETER ERROR will be occurred.

### (c) CPU-side device

The following devices can be used for automatic refresh. (Other devices cannot be set in SW6RN-GSV□P.)

Settable device	Restriction
Data resistor (D) Link resistor (W) Motion resistor (#)	None
Link relay (B) Internal relay (M) Output (Y)	<ul style="list-style-type: none"> <li>Specify 0 or a multiple of 16 as the first No..</li> <li>One transmitting point occupies 16 points.</li> </ul>

- 1) As for the CPU-side devices, the devices corresponding to the total number of transmitting points set for CPU No.1 to 4 in one setting range are used in succession starting from the device No. to be set. Set a device number that ensures enough devices for the set transmitting points.

When bit device is specified for the CPU-side device, the number of transmitting points is multiplied by 16.

## 2 MULTIPLE CPU SYSTEM

2) Set the CPU-side device as follows.

- Settings 1 to 4 may use different devices.

If the device ranges do not overlap, the same device may be used for settings 1 to 4.

Setting 1: Link relay

Refresh Setting						
Setting 1						
CPU	Send range for each CPU			CPU side device		
	Point (*)	Start	End	Dev. starting	Start	End
No.1	2	0800	0801	B0	B0	B1F
No.2	2	0800	0801	B20	B20	B3F
No.3	4	0800	0803	B40	B40	B7F
No.4	2	0800	0801	B80	B80	B9F

The applicable device of head device is D,W,#,M,Y,B,\*.  
The unit of points that send range for each CPU is word.

(\*) Settings should be set as same when using multiple CPU.

Setting 2: Link register

Refresh Setting						
Setting 2						
CPU	Send range for each CPU			CPU side device		
	Point (*)	Start	End	Dev. starting	Start	End
No.1	16	0802	0811	w0	w0	w0F
No.2	16	0802	0811	w10	w10	w1F
No.3	0					
No.4	32	0802	0821	w20	w20	w3F

The applicable device of head device is D,W,#,M,Y,B,\*.  
The unit of points that send range for each CPU is word.

(\*) Settings should be set as same when using multiple CPU.

Setting 3: Link relay

Refresh Setting						
Setting 3						
CPU	Send range for each CPU			CPU side device		
	Point (*)	Start	End	Dev. starting	Start	End
No.1	2	0812	0813	B100	B100	B11F
No.2	2	0812	0813	B120	B120	B13F
No.3	4	0804	0807	B140	B140	B17F
No.4	4	0822	0825	B180	B180	B1BF

The applicable device of head device is D,W,#,M,Y,B,\*.  
The unit of points that send range for each CPU is word.

(\*) Settings should be set as same when using multiple CPU.

• Settings 1 to 4 may use different devices.

• The same device may be used for settings 1 to 4.  
In setting 1 shown to the left, 160 points from B0 to B9F are used. Therefore, setting 3 can use device No. after BA0. Device numbers may not overlap even partially, such as specifying B0 to B9F in setting 1 and B90 to B10F in setting 3.

• The first and last addresses are calculated automatically in SW6RN-GSV□P.

## 2 MULTIPLE CPU SYSTEM

- The devices in settings 1 to 4 can be set individually for each CPU. For example, you may set link relay for CPU No.1 and internal relay for CPU No.2.

Refresh settings of CPU No.1

Refresh Setting  
Setting 1

Refresh Setting  
Setting 2

CPU	Send range for each CPU			CPU side device	
	Point (*)	Start	End	Dev. starting	End
No.1	16	0802	0811	W0	W0F
No.2	16	0802	0811	W10	W1F
No.3	0				
No.4	32	0802	0821	W20	W3F

The applicable device of head device is D,W,#,M,Y,B,\*.  
The unit of points that send range for each CPU is word.

(\*) Settings should be set as same when using multiple CPU.

Head device	End
B0	
B1F	
B3F	
B7F	
B9F	

- When the CPU-side device for CPU No.1 is different from that for CPU No.2.

Refresh settings of CPU No.2

Refresh Setting  
Setting 1

Refresh Setting  
Setting 2

CPU	Send range for each CPU			CPU side device	
	Point (*)	Start	End	Dev. starting	End
No.1	16	0802	0811	W0	W0F
No.2	16	0802	0811	W10	W1F
No.3	0				
No.4	32	0802	0821	W20	W3F

The applicable device of head device is D,W,#,M,Y,B,\*.  
The unit of points that send range for each CPU is word.

(\*) Settings should be set as same when using multiple CPU.

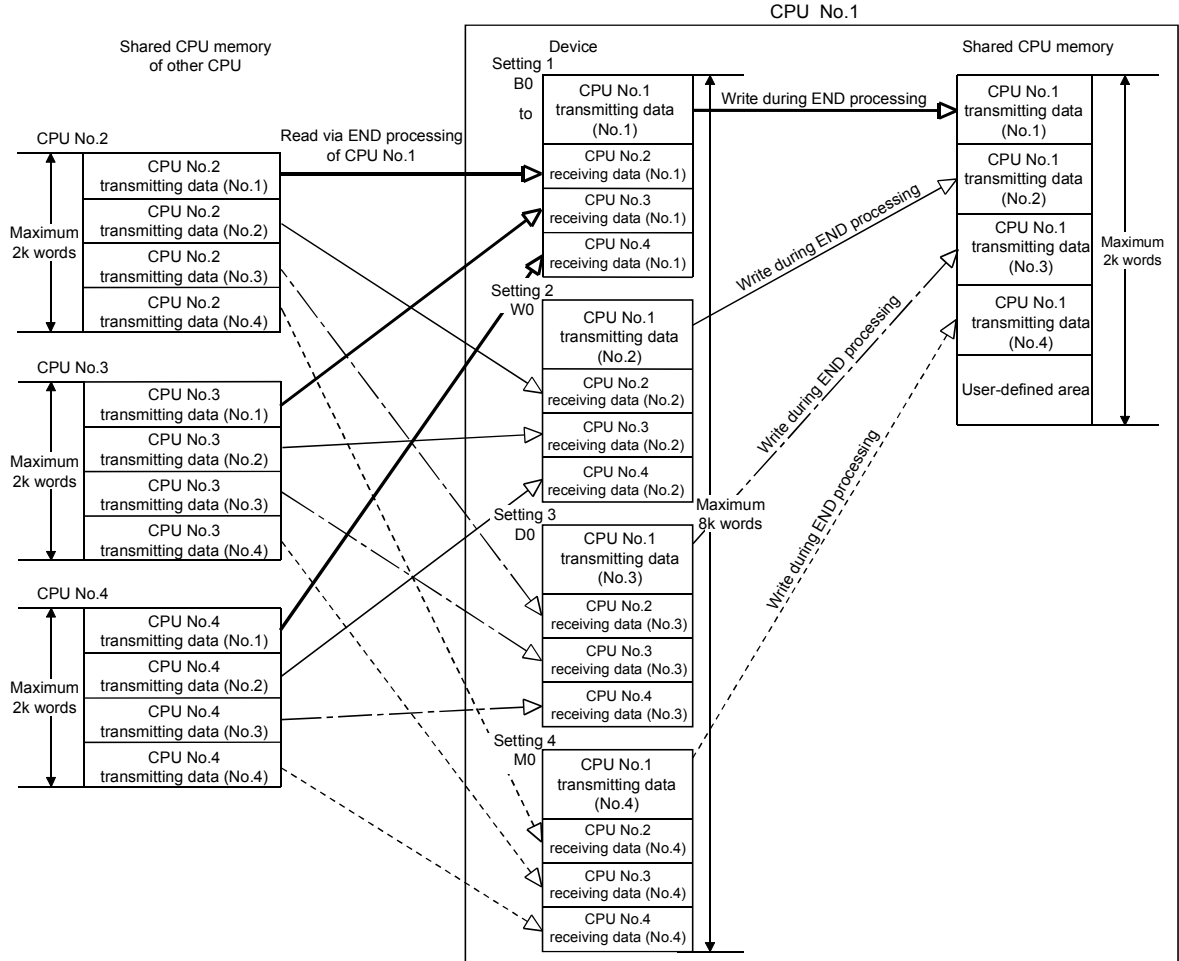
Head device	End
M0	
M31	
M63	
M127	
M159	

- When the CPU-side device for CPU No.1 is the same as that for CPU No.2.

- Set the same number of points for all CPUs.

## 2 MULTIPLE CPU SYSTEM

- 3) The block diagram below illustrates the automatic refresh operation over four ranges of setting 1: link relay (B), setting 2: link register (W), setting 3: data register (D), and setting 4: internal relay (M).



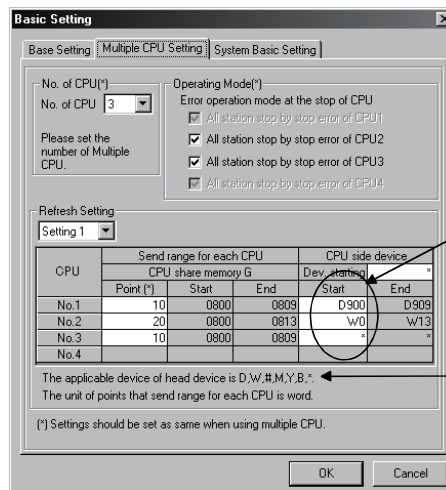


### (3) Automatic refresh settings 2 (Manual setting)

(a) When the automatic refresh setting (Manual setting) of Motion CPU is used, there are the following advantages.

- 1) A device setting which executes the automatic refresh setting between the PLC CPU and Motion CPU can be performed flexibly.
- 2) Because it is made not to execute the automatic refresh setting between the Motion CPU using a dummy setting, it is not necessary to use the user device for the automatic refresh vainly, and a main cycle can also be shortened.
- 3) It is possible to execute the automatic refresh of Motion device (#) to the PLC CPU directly. Similarly, it is possible to execute the automatic refresh for data of the PLC CPU to the Motion device (#) directly.

Refer to the "QCPU User's Manual (Functions Explanation/Program Fundamentals)" about the setting for the PLC CPU.



• The first device can be arbitrarily set up for every CPU. "DUMMY(\*)" can be set to the first device except the self CPU.

• The motion device (#) can be set as a first device.

(b) Setting selection/send range (refresh range) for each CPU

- 1) The refresh setting of four ranges can be set by setting selection. For example, ON/OFF data may be refreshed using bit-device setting, while other data may be refreshed word device setting.
- 2) The number of points in the shared CPU memory is set in units of 2 points (2 words) is set in the send range for each CPU. (2 points if word device is specified for the CPU-side device, or 32 points if bit device is specified.)  
Data of the CPU for which "0" is set as the number of points representing the transmitting range of the CPU may not be refreshed.
- 3) The maximum number of transmitting points combining all four ranges is 2k words per CPU (PLC CPU or Motion CPU) or 8k points (8k words) for all CPUs.
- 4) If "\*" is set as the first device setting column A of each automatic refresh setting, the first device for every CPU can be arbitrarily set up by the user in the column of B.

## 2 MULTIPLE CPU SYSTEM

- 5) "DUMMY" setting can be set to the first device column B of the automatic refresh setting. ("DUMMY" setting cannot be set to the self CPU.) "DUMMY" setting should set "\*" as the first device column B. The self CPU does not execute the automatic refresh to the other CPU which carried out "DUMMY(\*)" setting.

Refresh Setting

Setting 1

CPU	Send range for each CPU			CPU side device	
	CPU share memory G			Dev. starting	*
	Point (*)	Start	End	Start	End
No.1	0				
No.2	0				
No.3	0				
No.4					

The applicable device of head device is D,W,#,M,Y,B,\*.  
The unit of points that send range for each CPU is word.

(\*) Settings should be set as same when using multiple CPU.

• A white portion can be set.

- 6) Set the same number of transmitting points for all CPUs in the Multiple CPU system.  
If any of the CPUs has a different number of transmitting points, a PARAMETER ERROR will be occurred.

## 2 MULTIPLE CPU SYSTEM

### (c) CPU-side device

The following devices can be used for automatic refresh. (Other devices cannot be set in SW6RN-GSV□□.)

Settable device	Restriction
Data resistor (D) Link resistor (W) Motion resistor (#)	None
Link relay (B) Internal relay (M) Output (Y)	<ul style="list-style-type: none"> <li>Specify 0 or a multiple of 16 as the first No..</li> <li>One transmitting point occupies 16 points.</li> </ul>

#### • Self CPU (CPU No.2)

##### Refresh setting 1

Refresh Setting

Setting 1

CPU	Send range for each CPU			CPU side device	
	CPU share memory G			Dev. starting	
	Point (*)	Start	End	Start	End
No.1	20	0800	0813	D200	D219
No.2	30	0800	081D	D100	D129
No.3	10	0800	0809	W0	W9
No.4	50	0800	0831	*	*

The applicable device of head device is D,W,#,M,Y,B,\*.  
The unit of points that send range for each CPU is word.

(\*) Settings should be set as same when using multiple CPU.

• If the device No. does not overlap, it is right.

• The device of CPU No.4 at setting 1 is not refreshed by the CPU No.2.

#### • Self CPU (CPU No.2)

##### Refresh setting 2

Refresh Setting

Setting 2

CPU	Send range for each CPU			CPU side device	
	CPU share memory G			Dev. starting	
	Point (*)	Start	End	Start	End
No.1	20	0814	0827	M480	M799
No.2	30	081E	083B	M0	M479
No.3	10	080A	0813	B0	B9F
No.4	50	0832	0863	*	*

The applicable device of head device is D,W,#,M,Y,B,\*.  
The unit of points that send range for each CPU is word.

(\*) Settings should be set as same when using multiple CPU.

• If the device No. does not overlap, it is right.

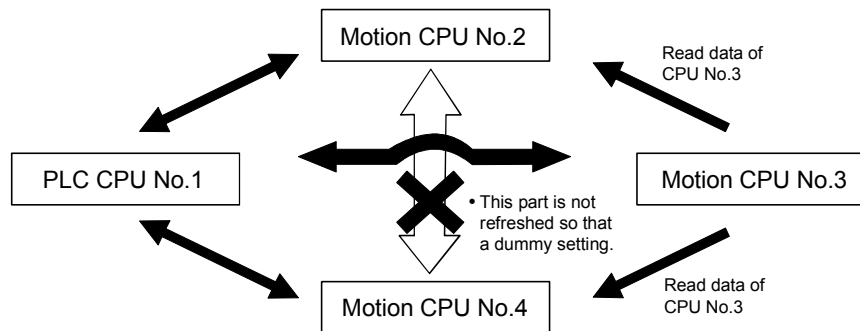
• The device of CPU No.4 at setting 2 is not refreshed by the CPU No.2.

## 2 MULTIPLE CPU SYSTEM

### [Dummy setting]

Usually, the automatic refresh setting is executed between PLC CPU and Motion CPU for the instructions to each Motion CPU and the monitor of a state by the PLC CPU at the time of operation. However, the automatic refresh is not necessary between each Motion CPU. In this case, because it is made not to execute the automatic refresh setting between the Motion CPU using a dummy setting, it is not necessary to use the user device for the automatic refresh vainly, and a main cycle can also be shortened.

Example of the automatic refresh setting using the "Dummy setting" is as follows.



- PLC CPU (CPU No.1)  
Automatic refresh setting 1

CPU	Send range for each CPU			CPU side device	
	CPU share memory G			Dev. starting	M0
	Point (*)	Start	End	Start	End
No.1	10	0800	0809	M0	M159
No.2	20	0800	0813	M160	M479
No.3	30	0800	081D	M480	M959
No.4	40	0800	0827	M960	M1599

The applicable device of head device is D,W,#,M,Y,B.\*.  
The unit of points that send range for each CPU is word.

(\*) Settings should be set as same when using multiple CPU.

- Motion CPU (CPU No.3)  
Automatic refresh setting 1

CPU	Send range for each CPU			CPU side device	
	CPU share memory G			Dev. starting	*
	Point (*)	Start	End	Start	End
No.1	10	0800	0809	M1024	M1183
No.2	20	0800	0813	*	*
No.3	30	0800	081D	B0	B1DF
No.4	40	0800	0827	*	*

The applicable device of head device is D,W,#,M,Y,B.\*.  
The unit of points that send range for each CPU is word.

(\*) Settings should be set as same when using multiple CPU.

- The device of CPU No.2 and No.4 are not refreshed by the CPU No.3.

- Motion CPU (CPU No.2)  
Automatic refresh setting 1

CPU	Send range for each CPU			CPU side device	
	CPU share memory G			Dev. starting	*
	Point (*)	Start	End	Start	End
No.1	10	0800	0809	M1024	M1183
No.2	20	0800	0813	M0	M319
No.3	30	0800	081D	B0	B1DF
No.4	40	0800	0827	*	*

The applicable device of head device is D,W,#,M,Y,B.\*.  
The unit of points that send range for each CPU is word.

(\*) Settings should be set as same when using multiple CPU.

- The device of CPU No.4 is not refreshed by the CPU No.2.

- Motion CPU (CPU No.4)  
Automatic refresh setting 1

CPU	Send range for each CPU			CPU side device	
	CPU share memory G			Dev. starting	*
	Point (*)	Start	End	Start	End
No.1	10	0800	0809	M1024	M1183
No.2	20	0800	0813	*	*
No.3	30	0800	081D	B0	B1DF
No.4	40	0800	0827	M0	M639

The applicable device of head device is D,W,#,M,Y,B.\*.  
The unit of points that send range for each CPU is word.

(\*) Settings should be set as same when using multiple CPU.

- The device of CPU No.2 is not refreshed by the CPU No.4.

Although the example of a setting is the case of the automatic refresh setting 1, the automatic refresh setting 2 - 4 can be also set similarly.

## 2 MULTIPLE CPU SYSTEM

### (4) The layout example of automatic refresh setting

The layout example of automatic refresh when Read/Write does a Motion dedicated device in the Motion CPU with PLC CPU is shown below.

#### (a) SV13

- Overall configuration

Table of the internal relays

Device No.	Application
M0 to	User device (2000 points)
M2000 to	Common device (320 points)
M2320 to	Special relay allocated device (Status) (80 points)
M2400 to	Axis status (20 points × 32 axes)
M3040 to	Unusable
M3072 to	Common device (Command signal) (64 points)
M3136 to	Special relay allocated device (Command signal) (64 points)
M3200 to	Axis command signal (20 points × 32 axes)
M3840  to	User device (4352 points)
M8191	

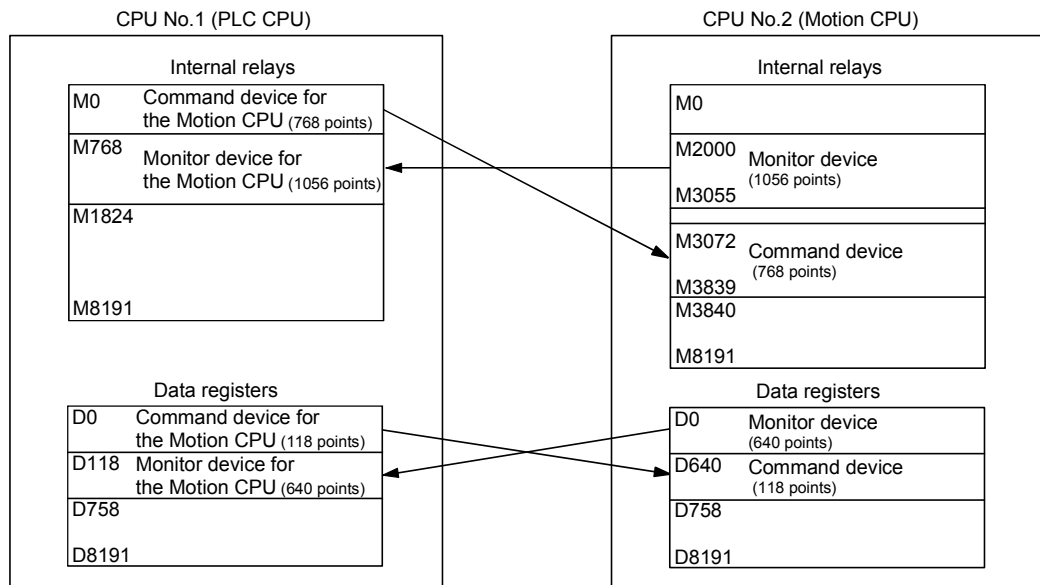
Table of the data registers

Device No.	Application
D0 to	Axis monitor device (20 points × 32 axes)
D640 to	Control change register (2 points × 32 axes)
D704 to	Common device (Common signal) (54 points)
D758 to	Common device (Monitor) (42 points)
D800  to	User device (7392 points)
D8191	

## 2 MULTIPLE CPU SYSTEM

### 1) PLC CPU (1 module) + Motion CPU (1 module)

The outline operation and the automatic refresh setting are as follows.



#### • Automatic refresh setting 1

PLC CPU (CPU No.1)

CPU	Send range for each CPU			CPU side device	
	CPU share memory G			Dev. starting	M0
	Point	Start	End	Start	End
No.1	48			M0	M767
No.2	66			M768	M1823
No.3					
No.4					

Motion CPU (CPU No.2)

CPU	Send range for each CPU			CPU side device	
	CPU share memory G			Dev. starting	*
	Point	Start	End	Start	End
No.1	48			M3072	M3839
No.2	66			M2000	M3055
No.3					
No.4					

#### • Automatic refresh setting 2

PLC CPU (CPU No.1)

CPU	Send range for each CPU			CPU side device	
	CPU share memory G			Dev. starting	D0
	Point	Start	End	Start	End
No.1	118			D0	D117
No.2	640			D118	D757
No.3					
No.4					

Motion CPU (CPU No.2)

CPU	Send range for each CPU			CPU side device	
	CPU share memory G			Dev. starting	*
	Point	Start	End	Start	End
No.1	118			D640	D757
No.2	640			D0	D639
No.3					
No.4					

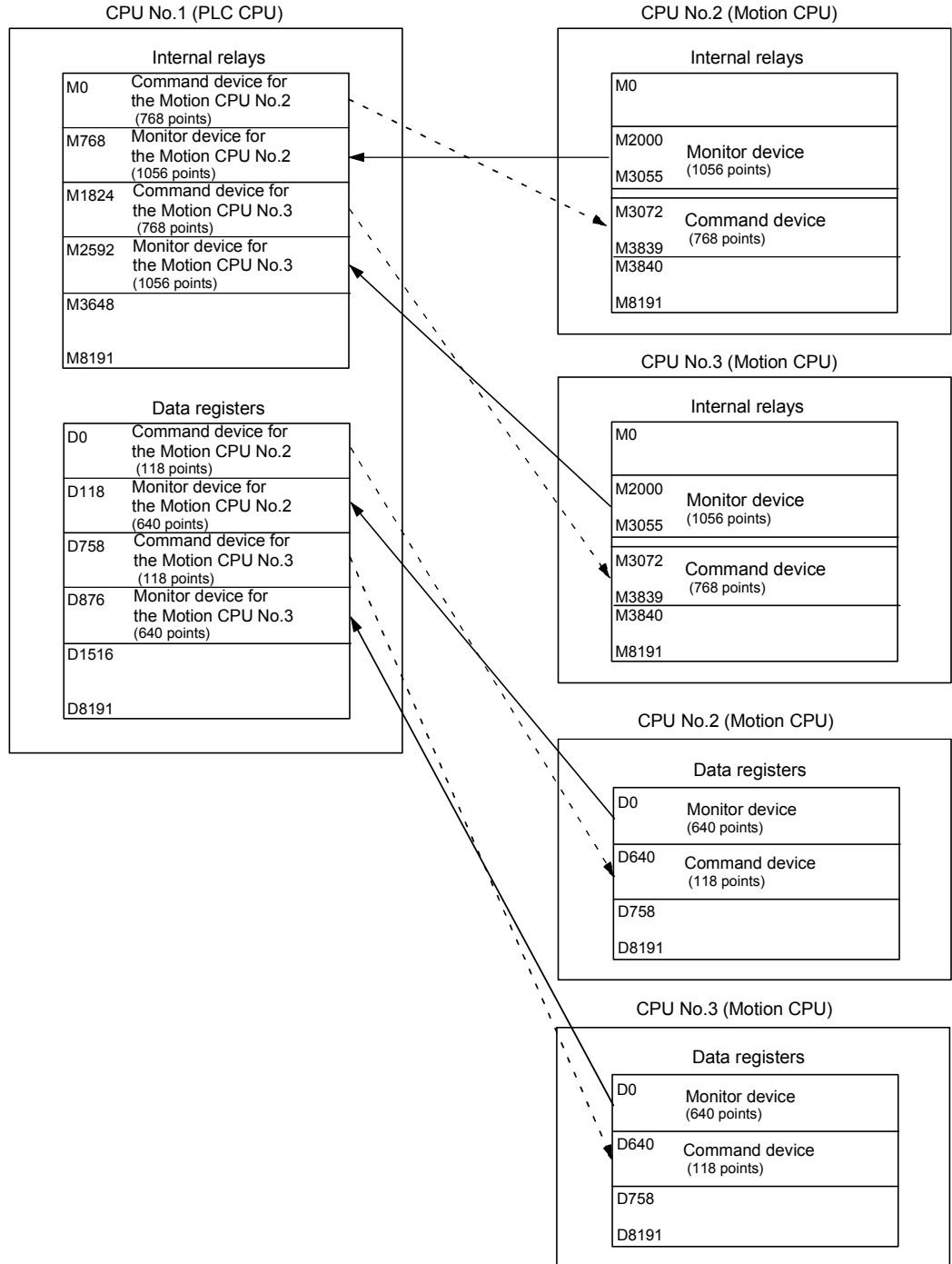
#### POINT

Although it has set up so that 32 axes may be assigned in the above assignment example, reduce the number of assignment automatic refresh points a part for the number of axes to be used.

## 2 MULTIPLE CPU SYSTEM

### 2) PLC CPU (1 module) + Motion CPU (2 modules)

The outline operation and the automatic refresh setting are shown below.



## 2 MULTIPLE CPU SYSTEM

### • Automatic refresh setting 1

PLC CPU (CPU No.1)

CPU	Send range for each CPU			CPU side device	
	CPU share memory G			Dev. starting	M0
	Point	Start	End	Start	End
No.1	48			M0	M767
No.2	66			M768	M1823
No.3	0				
No.4					

Motion CPU (CPU No.2)

CPU	Send range for each CPU			CPU side device	
	CPU share memory G			Dev. starting	*
	Point	Start	End	Start	End
No.1	48			M3072	M3839
No.2	66			M2000	M3055
No.3	0				
No.4					

### • Automatic refresh setting 2

PLC CPU (CPU No.1)

CPU	Send range for each CPU			CPU side device	
	CPU share memory G			Dev. Starting	D0
	Point	Start	End	Start	End
No.1	118			D0	D117
No.2	640			D118	D757
No.3	0				
No.4					

Motion CPU (CPU No.2)

CPU	Send range for each CPU			CPU side device	
	CPU share memory G			Dev. starting	*
	Point	Start	End	Start	End
No.1	118			D640	D757
No.2	640			D0	D639
No.3	0				
No.4					

### • Automatic refresh setting 3

PLC CPU (CPU No.1)

CPU	Send range for each CPU			CPU side device	
	CPU share memory G			Dev. Starting	M1824
	Point	Start	End	Start	End
No.1	48			M1824	M2591
No.2	0				
No.3	66			M2592	M3647
No.4					

Motion CPU (CPU No.2)

CPU	Send range for each CPU			CPU side device	
	CPU share memory G			Dev. starting	*
	Point	Start	End	Start	End
No.1	48			*	*
No.2	0				
No.3	66			*	*
No.4					

(Note) : A dummy setting is made so that an excessive device may not be refreshed in the Motion CPU No.2.

### • Automatic refresh setting 4

PLC CPU (CPU No.1)

CPU	Send range for each CPU			CPU side device	
	CPU share memory G			Dev. starting	D758
	Point	Start	End	Start	End
No.1	118			D758	D875
No.2	0				
No.3	640			D876	D1515
No.4					

Motion CPU (CPU No.2)

CPU	Send range for each CPU			CPU side device	
	CPU share memory G			Dev. starting	*
	Point	Start	End	Start	End
No.1	118			*	*
No.2	0				
No.3	640			*	*
No.4					

(Note) : A dummy setting is made so that an excessive device may not be refreshed in the Motion CPU No.2.



## 2 MULTIPLE CPU SYSTEM

- Automatic refresh setting 1

Motion CPU (CPU No.3)

CPU	Send range for each CPU			CPU side device	
	CPU share memory G			Dev. starting	*
	Point	Start	End	Start	End
No.1	48			*	*
No.2	66			*	*
No.3	0				
No.4					

(Note) : A dummy setting is made so that an excessive device may not be refreshed in the Motion CPU No.3.

- Automatic refresh setting 2

Motion CPU (CPU No.3)

CPU	Send range for each CPU			CPU side device	
	CPU share memory G			Dev. starting	*
	Point	Start	End	Start	End
No.1	118			*	*
No.2	640			*	*
No.3	0				
No.4					

(Note) : A dummy setting is made so that an excessive device may not be refreshed in the Motion CPU No.3.

- Automatic refresh setting 3

Motion CPU (CPU No.3)

CPU	Send range for each CPU			CPU side device	
	CPU share memory G			Dev. starting	*
	Point	Start	End	Start	End
No.1	48			M3072	M3839
No.2	0				
No.3	66			M2000	M3055
No.4					

- Automatic refresh setting 4

Motion CPU (CPU No.3)

CPU	Send range for each CPU			CPU side device	
	CPU share memory G			Dev. starting	*
	Point	Start	End	Start	End
No.1	118			D640	D757
No.2	0				
No.3	640			D0	D639
No.4					

### POINT

In the case of the combination "PLC CPU (1 module) + Motion CPU (3 modules)" with SV13, make all the devices of all the CPUs refresh as mentioned above because the setting that Read/Write is made of the PLC CPU cannot be executed.

## 2 MULTIPLE CPU SYSTEM

### (b) SV22 • Overall configuration

Table of the internal relays

Device No.	Application
M0 to	User device (2000 points)
M2000 to	Common device (320 points)
M2320 to	Special relay allocated device (Status) (64 points)
M2400 to	Axis status (20 points × 32 axes)
M3040 to	Unusable
M3072 to	Common device (Command signal) (64 points)
M3136 to	Special relay allocated device (Command signal) (64 points)
M3200 to	Axis command signal (20 points × 32 axes)
M3840 to	Unusable
M4000 to	Virtual servomotor axis status (20 points × 32 axes) (Mechanical system setting axis only)
M4640 to	Synchronous encoder axis status (4 points × 12 axes)
M4688 to	Unusable
M4800 to	Virtual servomotor axis command signal (20 points × 32 axes) (Mechanical system setting axis only)
M5440 to	Synchronous encoder axis command signal (4 points × 12 axes)
M5488 to	Cam axis command signal (1 points × 32 axes) (Mechanical system setting axis only)
M5520 to	Smoothing clutch complete signal (2 points × 32 axes)
M5584 to	Unusable
M5600 to M8191	User device) (2592 points)

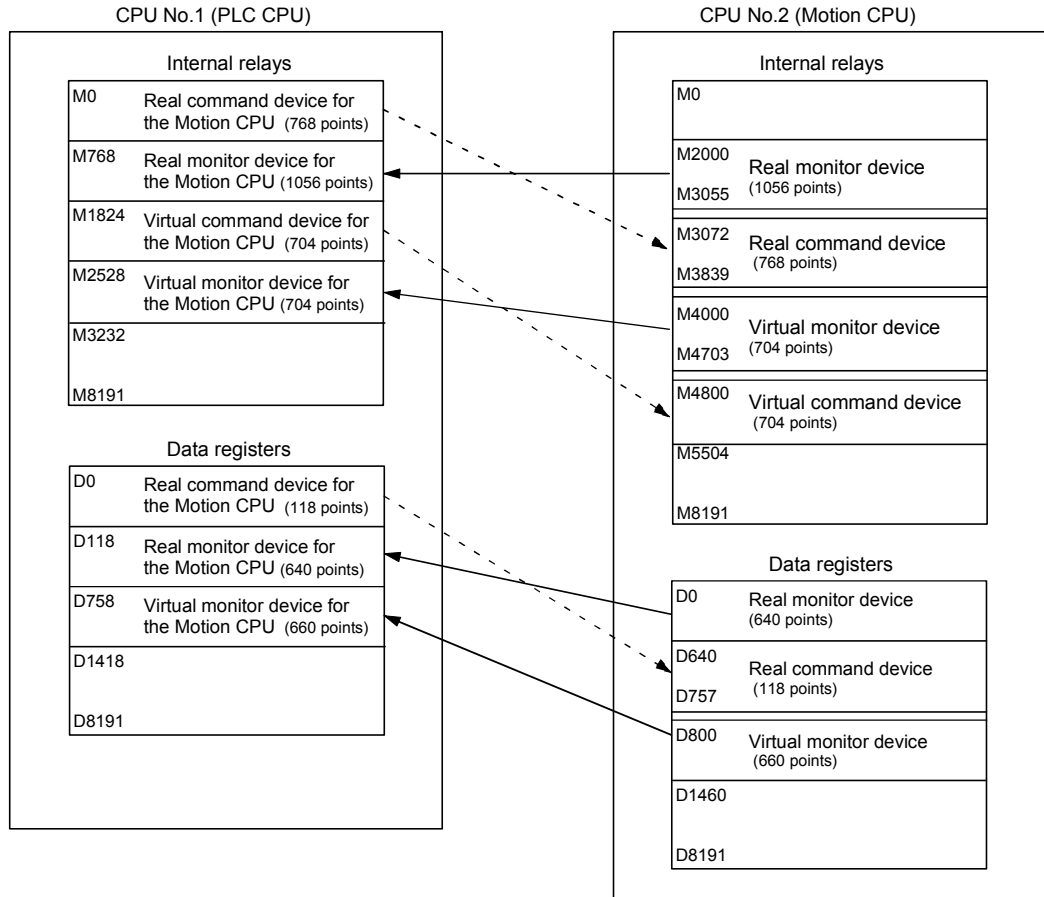
Table of the data registers

Device No.	Application
D0 to	Axis monitor device (20 points × 32 axes)
D640 to	Control change register (2 points × 32 axes)
D704 to	Common device (Command signal) (54 points)
D758 to	Common device (Monitor) (42 points)
D800 to	Virtual servomotor axis monitor device (10 points × 32 axes) (Mechanical system setting axis only)
D1120 to	Synchronous encoder axis monitor device (10 points × 12 axes)
D1240 to	Cam axis monitor device (10 points × 32 axes)
D1560 to D8191	User device (6632 points)

## 2 MULTIPLE CPU SYSTEM

### 1) PLC CPU (1 module) + Motion CPU (1 module)

The outline operation and the automatic refresh setting are as follows.



## 2 MULTIPLE CPU SYSTEM

### • Automatic refresh setting 1

PLC CPU (CPU No.1)

CPU	Send range for each CPU			CPU side device	
	CPU share memory G			Dev. starting	M0
	Point	Start	End	Start	End
No.1	48			M0	M767
No.2	66			M768	M1823
No.3					
No.4					

Motion CPU (CPU No.2)

CPU	Send range for each CPU			CPU side device	
	CPU share memory G			Dev. starting	*
	Point	Start	End	Start	End
No.1	48			M3072	M3839
No.2	66			M2000	M3055
No.3					
No.4					

### • Automatic refresh setting 2

PLC CPU (CPU No.1)

CPU	Send range for each CPU			CPU side device	
	CPU share memory G			Dev. Starting	D0
	Point	Start	End	Start	End
No.1	118			D0	D117
No.2	640			D118	D757
No.3					
No.4					

Motion CPU (CPU No.2)

CPU	Send range for each CPU			CPU side device	
	CPU share memory G			Dev. starting	*
	Point	Start	End	Start	End
No.1	118			D640	D757
No.2	640			D0	D639
No.3					
No.4					

### • Automatic refresh setting 3

PLC CPU (CPU No.1)

CPU	Send range for each CPU			CPU side device	
	CPU share memory G			Dev. Starting	M1824
	Point	Start	End	Start	End
No.1	44			M1824	M2527
No.2	44			M2528	M3231
No.3					
No.4					

Motion CPU (CPU No.2)

CPU	Send range for each CPU			CPU side device	
	CPU share memory G			Dev. starting	*
	Point	Start	End	Start	End
No.1	44			M4800	M5503
No.2	44			M4000	M4703
No.3					
No.4					

### • Automatic refresh setting 4

PLC CPU (CPU No.1)

CPU	Send range for each CPU			CPU side device	
	CPU share memory G			Dev. starting	D758
	Point	Start	End	Start	End
No.1	0				
No.2	660			D758	D1417
No.3					
No.4					

Motion CPU (CPU No.2)

CPU	Send range for each CPU			CPU side device	
	CPU share memory G			Dev. starting	*
	Point	Start	End	Start	End
No.1	0				
No.2	660			D800	D1459
No.3					
No.4					

#### POINT

In the case of the combination "PLC CPU (1 module) + Motion CPU (2 modules)" with SV22, make all the devices of all the CPUs refresh as mentioned above because the setting that Read/Write is made of the PLC CPU cannot be executed.

## 2 MULTIPLE CPU SYSTEM

### (c) SV43 • Overall configuration

Table of the internal relays

Device No.	Application
M0 to	User device (2000 points)
M2000 to	Common device (Status) (320 points)
M2320 to	Special relay allocated device (Status) (80 points)
M2400 to	Axis status (20 points × 32 axes)
M3040 to	Unusable (32 points)
M3072 to	Common device (Command signal) (64 points)
M3136 to	Special relay allocated device (Command signal) (64 points)
M3200 to	Axis command signal (20 points × 32 axes)
M3840 to	User device (160 points)
M4000 to	Axis I/O signal (Axis status 2) (10 points × 32 axes)
M4320 to	Unusable (80 points)
M4400 to	Axis I/O signal (Axis command signal 2) (10 points × 32 axes)
M4720 to M8191	User device (3472 points)

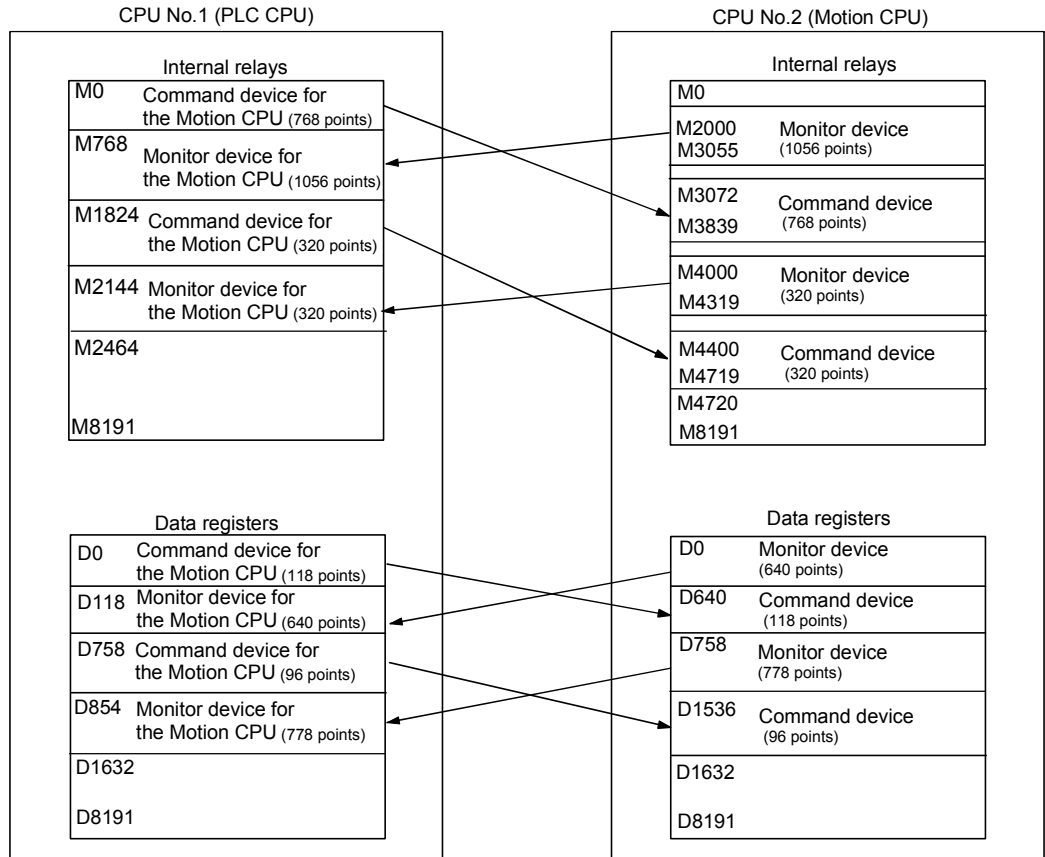
Table of the Data registers

Device No.	Application
D0 to	Axis monitor device (20 points × 32 axes)
D640 to	Control change register (2 points × 32 axes)
D704 to	Common device (Common signal) (54 points)
D758 to	Common device (Monitor) (42 points)
D800 to	Axis monitor device 2 (20 points × 32 axes)
D1440 to	Control program monitor device (6 points × 16 programs)
D1536 to	Control change register 2 (Override ratio) (3 points × 32 axes)
D1632 to	User device (18 points)
D1650 to	Tool length offset data setting register (2 points × 20)
D1690 to D8191	User device (6502 points)

## 2 MULTIPLE CPU SYSTEM

### 1) PLC CPU (1 module) + Motion CPU (1 module)

The outline operation and the automatic refresh setting are shown below.



#### • Automatic refresh setting 1

PLC CPU (CPU No.1)

CPU	Send range for each CPU			CPU side device	
	CPU share memory G			Dev. starting	M0
	Point	Start	End	Start	End
No.1	48			M0	M767
No.2	66			M768	M1823
No.3					
No.4					

Motion CPU (CPU No.2)

CPU	Send range for each CPU			CPU side device	
	CPU share memory G			Dev. starting	*
	Point	Start	End	Start	End
No.1	48			M3072	M3839
No.2	66			M2000	M3055
No.3					
No.4					

#### • Automatic refresh setting 2

PLC CPU (CPU No.1)

CPU	Send range for each CPU			CPU side device	
	CPU share memory G			Dev. starting	D0
	Point	Start	End	Start	End
No.1	118			D0	D117
No.2	640			D118	D757
No.3					
No.4					

Motion CPU (CPU No.2)

CPU	Send range for each CPU			CPU side device	
	CPU share memory G			Dev. starting	*
	Point	Start	End	Start	End
No.1	118			D640	D757
No.2	640			D0	D639
No.3					
No.4					

## 2 MULTIPLE CPU SYSTEM

### • Automatic refresh setting 3

PLC CPU (CPU No.1)

CPU	Send range for each CPU			CPU side device	
	CPU share memory G			Dev. starting	M0
	Point	Start	End	Start	End
No.1	20			M1824	M2143
No.2	20			M2144	M2463
No.3					
No.4					

Motion CPU (CPU No.2)

CPU	Send range for each CPU			CPU side device	
	CPU share memory G			Dev. starting	*
	Point	Start	End	Start	End
No.1	20			M4400	M4719
No.2	20			M4000	M4319
No.3					
No.4					

### • Automatic refresh setting 4

PLC CPU (CPU No.1)

CPU	Send range for each CPU			CPU side device	
	CPU share memory G			Dev. starting	D0
	Point	Start	End	Start	End
No.1	96			D758	D853
No.2	778			D854	D1631
No.3					
No.4					

Motion CPU (CPU No.2)

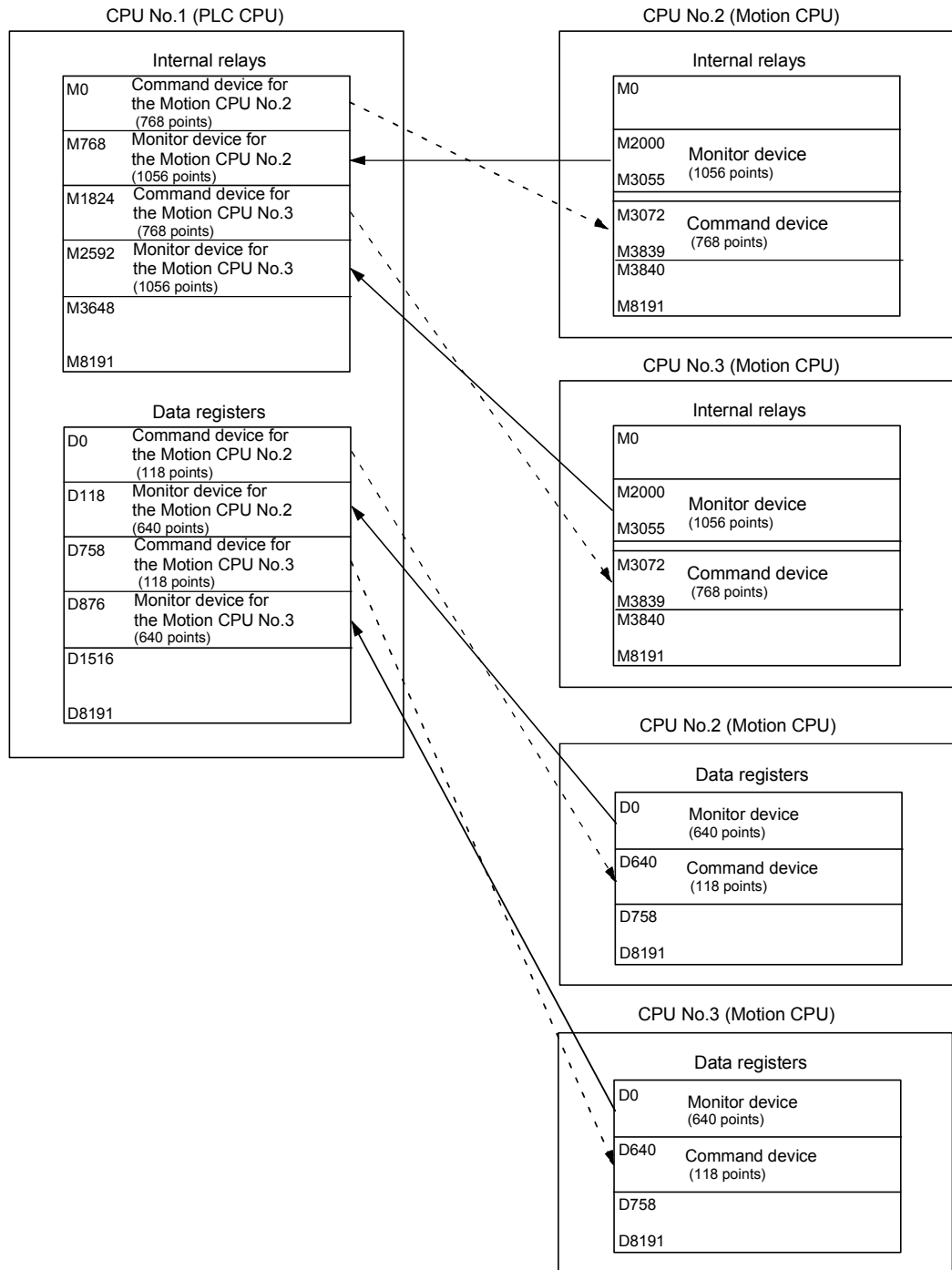
CPU	Send range for each CPU			CPU side device	
	CPU share memory G			Dev. starting	*
	Point	Start	End	Start	End
No.1	96			D1536	D1631
No.2	778			D758	D1535
No.3					
No.4					

#### POINT

Although it has set up so that 32 axes may be assigned in the above assignment example, reduce the number of assignment automatic refresh points a part for the number of axes to be used.

2) PLC CPU (1 module) + Motion CPU (2 modules)

The outline operation and the automatic refresh setting are as follows.





## 2 MULTIPLE CPU SYSTEM

### • Automatic refresh setting 1

PLC CPU (CPU No.1)

CPU	Send range for each CPU			CPU side device	
	CPU share memory G			Dev. starting	M0
	Point	Start	End	Start	End
No.1	48			M0	M767
No.2	66			M768	M1823
No.3	0				
No.4					

Motion CPU (CPU No.2)

CPU	Send range for each CPU			CPU side device	
	CPU share memory G			Dev. starting	*
	Point	Start	End	Start	End
No.1	48			M3072	M3839
No.2	66			M2000	M3055
No.3	0				
No.4					

### • Automatic refresh setting 2

PLC CPU (CPU No.1)

CPU	Send range for each CPU			CPU side device	
	CPU share memory G			Dev. Starting	D0
	Point	Start	End	Start	End
No.1	118			D0	D117
No.2	640			D118	D757
No.3	0				
No.4					

Motion CPU (CPU No.2)

CPU	Send range for each CPU			CPU side device	
	CPU share memory G			Dev. starting	*
	Point	Start	End	Start	End
No.1	118			D640	D757
No.2	640			D0	D639
No.3	0				
No.4					

### • Automatic refresh setting 3

PLC CPU (CPU No.1)

CPU	Send range for each CPU			CPU side device	
	CPU share memory G			Dev. Starting	M1824
	Point	Start	End	Start	End
No.1	48			M1824	M2591
No.2	0				
No.3	66			M2592	M3647
No.4					

Motion CPU (CPU No.2)

CPU	Send range for each CPU			CPU side device	
	CPU share memory G			Dev. starting	*
	Point	Start	End	Start	End
No.1	48			*	*
No.2	0				
No.3	66			*	*
No.4					

(Note): A dummy setting (\*) is made so that an excessive device may not be refreshed in the Motion CPU No.2.

### • Automatic refresh setting 4

PLC CPU (CPU No.1)

CPU	Send range for each CPU			CPU side device	
	CPU share memory G			Dev. starting	D758
	Point	Start	End	Start	End
No.1	118			D758	D875
No.2	0				
No.3	640			D876	D1515
No.4					

Motion CPU (CPU No.2)

CPU	Send range for each CPU			CPU side device	
	CPU share memory G			Dev. starting	*
	Point	Start	End	Start	End
No.1	118			*	*
No.2	0				
No.3	640			*	*
No.4					

(Note): A dummy setting (\*) is made so that an excessive device may not be refreshed in the Motion CPU No.2.

## 2 MULTIPLE CPU SYSTEM

- Automatic refresh setting 1

Motion CPU (CPU No.3)

CPU	Send range for each CPU			CPU side device	
	CPU share memory G			Dev. starting	*
	Point	Start	End	Start	End
No.1	48			*	*
No.2	66			*	*
No.3	0				
No.4					

(Note): A dummy setting (\*) is made so that an excessive device may not be refreshed in the Motion CPU No.2.

- Automatic refresh setting 2

Motion CPU (CPU No.3)

CPU	Send range for each CPU			CPU side device	
	CPU share memory G			Dev. starting	*
	Point	Start	End	Start	End
No.1	118			*	*
No.2	640			*	*
No.3	0				
No.4					

(Note): A dummy setting (\*) is made so that an excessive device may not be refreshed in the Motion CPU No.2.

- Automatic refresh setting 3

Motion CPU (CPU No.3)

CPU	Send range for each CPU			CPU side device	
	CPU share memory G			Dev. starting	*
	Point	Start	End	Start	End
No.1	48			M3072	M3839
No.2	0				
No.3	66			M2000	M3055
No.4					

- Automatic refresh setting 4

Motion CPU (CPU No.3)

CPU	Send range for each CPU			CPU side device	
	CPU share memory G			Dev. starting	*
	Point	Start	End	Start	End
No.1	118			D640	D757
No.2	0				
No.3	640			D0	D639
No.4					

## 2 MULTIPLE CPU SYSTEM

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POINT
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<p>In the case of the combination "PLC CPU (1 module) + Motion CPU (3 modules)" with SV43, make all the devices of all the CPUs refresh as mentioned above because the setting that Read/Write is made of the PLC CPU can not be executed.</p>
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## 2 MULTIPLE CPU SYSTEM

### 2.3.2 Control Instruction from the PLC CPU to The Motion CPU (Motion dedicated instructions)

Control can be instructed from the PLC CPU to the Motion CPU using the Motion dedicated PLC instructions listed in the table below.

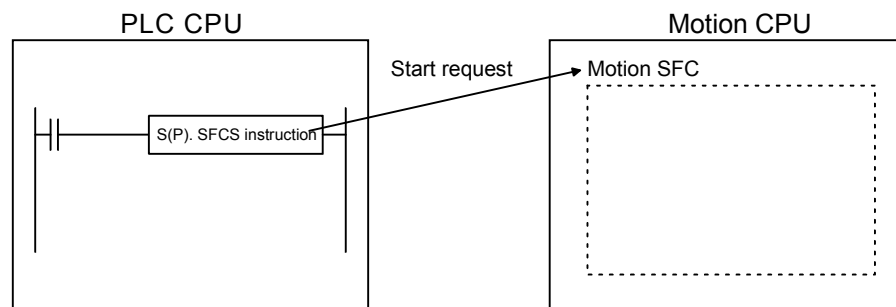
Refer to the "Q173HCPU/Q172HCPU Motion controller (SV13/SV22) Programming Manual (Motion SFC)" or "Q173HCPU/Q172HCPU Motion controller (SV43) Programming Manual" for the details of each instruction.

(Control may not be instructed from the Motion CPU to another Motion CPU.)

Instruction name	Description	
	SV13/SV22	SV43
S(P).SFCS	Start request of the Motion SFC program (Program No. may be specified.)	Start request of the specified Motion program (Control program)
S(P).SVST	Start request of the specified servo program	Start request of the specified Motion program (Axis designation program)
S(P).CHGA	Current value change request of the specified axis	Home position return request of the specified axis
S(P).CHGV	Speed change request of the specified axis	
S(P).CHGT	Torque control value change request of the specified axis	
S(P).GINT	Execute request of an event task to the other CPU (Motion CPU)	Unusable

By using the S(P).SFCS instruction of the Motion dedicated instruction, the Motion SFC of the Motion CPU from the PLC CPU can be started.

<Example>



#### POINT

One PLC CPU can execute a total of up to 32 "Motion dedicated instructions" and "dedicated instructions excluding the S(P).GINT" simultaneously.

When Motion dedicated instructions and dedicated instructions excluding the "S(P).GINT" are executed simultaneously, the instructions will be processed in the order received.

If the command which has not completed processing becomes 33 or more, an OPERATION ERROR (error code: 4107) will be occurred.

### 2.3.3 Reading/Writing Device Data

Device data can be written or read to/from the Motion CPU by the PLC CPU using the dedicated instructions listed in the table below.

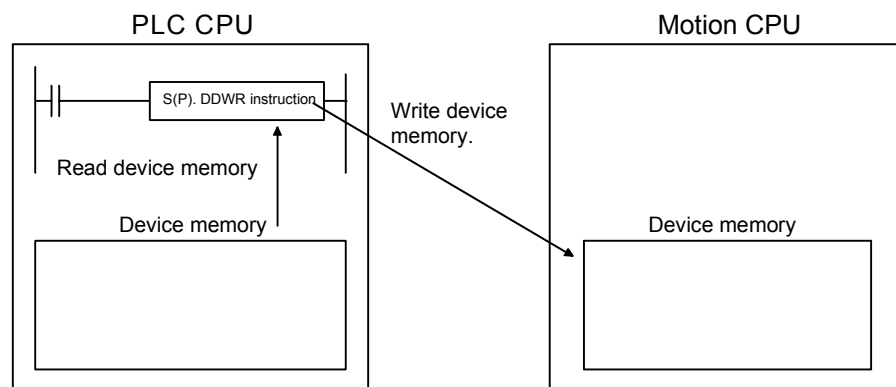
Refer to the "Q173HCPU/Q172HCPU Motion controller (SV13/SV22) Programming Manual (Motion SFC)" or "Q173HCPU/Q172HCPU Motion controller (SV43) Programming Manual for the details of each instruction.

(Data cannot be written or read to/from the PLC CPU by another PLC CPU, to/from the PLC CPU by the Motion CPU, or to/from a Motion CPU by another Motion CPU.)

Instruction name	Description
S(P).DDWR	Write a device data of the self CPU (PLC CPU) to a device of the other CPU (Motion CPU).
S(P).DDRD	Read a device data of other CPU (Motion CPU) to a device of the self CPU (PLC CPU).

For example, by using the S(P). DDWR dedicated instruction, the device data of the PLC CPU can be written to the device data of the Motion CPU.

<Example>



#### POINT

(1) One PLC CPU can execute a total of up to 32 "Motion dedicated instructions" and "dedicated instructions excluding the S(P).GINT" simultaneously.

When Motion dedicated instructions and dedicated instructions excluding the S(P).GINT are executed simultaneously, the instructions will be processed in the order received.

If the command which has not completed processing becomes 33 or more, an OPERATION ERROR (error code: 4107) will be occurred.

(2) Data refresh via the S(P).DDRD/S(P).DDWR is not synchronized with data refresh via the automatic refresh function of shared CPU memory.

Do not issue S(P).DDRD/S(P).DDWR instructions to the devices whose data in shared CPU memory is being refreshed.

## 2 MULTIPLE CPU SYSTEM

### 2.3.4 Shared CPU Memory

Shared CPU memory is used to transfer data between the CPUs in the Multiple CPU system and has a capacity of 4096 words from 0H to FFFH.

Shared CPU memory has four areas: "self CPU operation data area", "system area", "automatic refresh area" and "user-defined area".

When the automatic refresh function of shared CPU memory is set, the area corresponding to the number of automatic refresh points starting from 800H is used as the automatic refresh area.

The user-defined area begins from the address immediately next to the last address of the automatic refresh area.

If the number of automatic refresh points is 18 (12H points), the area from 800H to 811H becomes the automatic refresh area and the area after 812H becomes the user-defined area.

The diagram below shows the structure of shared CPU memory and accessibility from a PLC program.

Shared CPU memory		Self CPU		Other CPU	
		Write <sup>(Note-1)</sup>	Read	Write	Read <sup>(Note-2)</sup>
0H	Self CPU operation data area	Not allowed	Not allowed	Not allowed	Allowed
to					
1FFH	System area	Not allowed	Not allowed	Not allowed	Allowed
to					
200H	Automatic refresh area	Not allowed	Not allowed	Not allowed	Not allowed
to					
7FFH	User-defined area	Allowed	Not allowed	Not allowed	Allowed
to					
FFFH					

#### REMARK

(Note-1) : Use the S. TO instruction to write to the user-defined area of the self CPU in the PLC CPU.

Use the MULTW instruction to write to the user-defined area of the self CPU in the PLC CPU.

(Note-2) : Use the FROM instruction/intelligent function module device (U□\G□) to read the shared memory of the Motion CPU from the PLC CPU.

Use the MULTR instruction to read the shared memory of other CPU in the Motion CPU.

## 2 MULTIPLE CPU SYSTEM

### (1) Self CPU operation data area (0H to 1FFH)

(a) The following data of the self CPU are stored in the Multiple CPU system,

Table 2.1 Table of Contents Stored in the Self CPU Operation Data Area

Shared memory address	Name	Description	Detailed explanation (Note)	Corresponding special register
0H	Data available/not available	"Data available/not available" flag	This area is used to check whether data is stored or not in the self CPU operation data area (1H to 1FH) of the self CPU. • 0: Data is not stored in the self CPU operation data area. • 1: Data is stored in the self CPU operation data area.	—
1H	Diagnosis error	Diagnosis error number	The error number of an error generated during diagnosis is stored as a BIN code.	D9008
2H	Diagnosis-error occurrence time	Diagnosis-error occurrence time	The year and month when the error number was stored in address 1H of shared CPU memory is stored in 2-digit BCD code.	D9010
3H			The date and hour when the error number was stored in address 1H of shared CPU memory is stored in 2-digit BCD code.	D9011
4H			The minutes and seconds when the error number was stored in address 1H of shared CPU memory is stored in 2-digit BCD code.	D9012
5H	Error-data category code	Error-data category code	Category codes indicating the nature of the stored common error data and individual error data are stored.	D9013
6H	Error data	Error data	Common data corresponding to the error number of an error generated during diagnosis is stored.	D9014
7H to 1CH	Not used	—	Not used	—
1DH	Switch status	CPU switch status	The switch status of the CPU is stored.	D9200
1EH	LED status	CPU-LED status	The bit pattern of the CPU LED is stored	D9201
1FH	CPU operation status	CPU operation status	The operation status of the CPU is stored.	D9015

(Note) : Refer to the corresponding special register for details.

- (b) The self CPU operation data area is refreshed every time the applicable register has been changed.  
However, the refresh timing may be delayed by up to the main cycle time.  
(It updates using idle time during motion control. The maximum main cycle time: several milliseconds to several hundred milliseconds).
- (c) The data of the self CPU operation data area can be read from the PLC CPU of the other CPU by the FROM instruction.  
However, since there is a delay in data update, use the data that has been read as an object for monitoring only.
- (d) Self CPU operation data area used by Motion dedicated PLC instruction (30H to 33H)  
The complete status of the to self CPU high speed interrupt accept flag from CPU<sub>n</sub> is stored in the following address.

Table 2.2 Self CPU Operation data Area used by the Motion Dedicated PLC Instruction

Shared memory address	Name	Description
30H(48)	To self CPU high speed interrupt accept flag from CPU1	This area is used to check whether to self CPU high speed interrupt accept flag from CPU <sub>n</sub> can be accepted or not. 0: To self CPU high speed interrupt accept flag from CPU <sub>n</sub> accept usable. 1: To self CPU high speed interrupt accept flag from CPU <sub>n</sub> accept disable.
31H(49)	To self CPU high speed interrupt accept flag from CPU2	
32H(50)	To self CPU high speed interrupt accept flag from CPU3	
33H(51)	To self CPU high speed interrupt accept flag from CPU4	

## 2 MULTIPLE CPU SYSTEM

### (2) System area (200H to 7FFH)

This area is used by the operating systems (OS) of the PLC CPU/Motion CPU. OS uses this area when executing dedicated Multiple CPU communication instructions.

- System area used by Motion dedicated PLC instruction (204H to 20DH)  
The complete status is stored in the following.

Table 2.3 Table of System Area used by the Motion Dedicated PLC Instruction

Shared memory address	Name	Description												
204H(516)	Start accept flag (Axis1 to 16)	The start accept flag is stored by the 1 to 32 axis, each bit. (As for a bit's actually being set Q173HCPU : J1 to J32/ Q172HCPU : J1 to J8.) OFF : Start accept flag usable ON : Start accept flag disable												
205H(517)	Start accept flag (Axis17 to 32)	<table border="1"> <tr> <td colspan="2" style="text-align: center;">b15</td> <td style="text-align: center;">b1</td> <td style="text-align: center;">b0</td> </tr> <tr> <td>204H(516) address</td> <td>J16</td> <td>••••••••</td> <td>J2 J1</td> </tr> <tr> <td>205H(517) address</td> <td>J32</td> <td>••••••••</td> <td>J17</td> </tr> </table>	b15		b1	b0	204H(516) address	J16	••••••••	J2 J1	205H(517) address	J32	••••••••	J17
b15		b1	b0											
204H(516) address	J16	••••••••	J2 J1											
205H(517) address	J32	••••••••	J17											
206H(518)	Speed changing flag (Axis1 to 16)	The speed changing flag is stored by the 1 to 32 axis, each bit. (As for a bit's actually being set Q173HCPU : J1 to J32/ Q172HCPU : J1 to J8.) OFF : Start accept usable ON : Start accept disable												
207H(519)	Speed changing flag (Axis17 to 32)	<table border="1"> <tr> <td colspan="2" style="text-align: center;">b15</td> <td style="text-align: center;">b1</td> <td style="text-align: center;">b0</td> </tr> <tr> <td>206H(518) address</td> <td>J16</td> <td>••••••••</td> <td>J2 J1</td> </tr> <tr> <td>207H(519) address</td> <td>J32</td> <td>••••~••••</td> <td>J17</td> </tr> </table>	b15		b1	b0	206H(518) address	J16	••••••••	J2 J1	207H(519) address	J32	••••~••••	J17
b15		b1	b0											
206H(518) address	J16	••••••••	J2 J1											
207H(519) address	J32	••••~••••	J17											
208H(520)	Synchronous encoder current value changing flag (Axis1 to 12) <sup>(Note-1)</sup>	The synchronous encoder current value change flag is stored by the 1 to 16 axis, each bit. (As for a bit's actually being set Q173HCPU : E1 to E12/ Q172HCPU : E1 to E8.) OFF : Start accept usable ON : Start accept disable												
20CH(524)	Cam shaft within-one-revolution current value changing flag (Axis1 to 16) <sup>(Note-1)</sup>	The cam shaft within-one-revolution current value changing flag is stored by the 1 to 32 axis, each bit. (As for a bit's actually being set Q173HCPU : C1 to C32/ Q172HCPU : C1 to C8.) OFF : Start accept usable ON : Start accept disable												
20DH(525)	Cam shaft within-one-revolution current value changing flag (Axis17 to 32) <sup>(Note-1)</sup>	<table border="1"> <tr> <td colspan="2" style="text-align: center;">b15</td> <td style="text-align: center;">b1</td> <td style="text-align: center;">b0</td> </tr> <tr> <td>20CH(524) address</td> <td>C16</td> <td>••••••••</td> <td>C2 C1</td> </tr> <tr> <td>20DH(525) address</td> <td>C32</td> <td>••••~••••</td> <td>C17</td> </tr> </table>	b15		b1	b0	20CH(524) address	C16	••••••••	C2 C1	20DH(525) address	C32	••••~••••	C17
b15		b1	b0											
20CH(524) address	C16	••••••••	C2 C1											
20DH(525) address	C32	••••~••••	C17											

(Note-1): Usable in SV22.



(3) Automatic refresh area

This area is used at the automatic refresh of the Multiple CPU system.

This area cannot be written using S. TO instruction/read using FROM instruction of the PLC CPU and written using MULTW instruction/read using MULTR instruction of the Motion CPU.

(4) User-defined area

This area is used for the communication among each CPU in the Multiple CPU system using FROM/S. TO instructions and the intelligent function module devices of the PLC CPU. (Among each CPU communicates using the MULTR/MULTW instruction of the operating control program (SV13/SV22)/Motion program (SV43) in the Motion CPU.)

Refer to the Programming Manual of each operating system software for MULTR instruction or MULTW instruction.

After point set in the automatic refresh area is used.

(If the automatic refresh function is not executed, the area from 800H to FFFH can be used as a user-defined area.)

## 2 MULTIPLE CPU SYSTEM

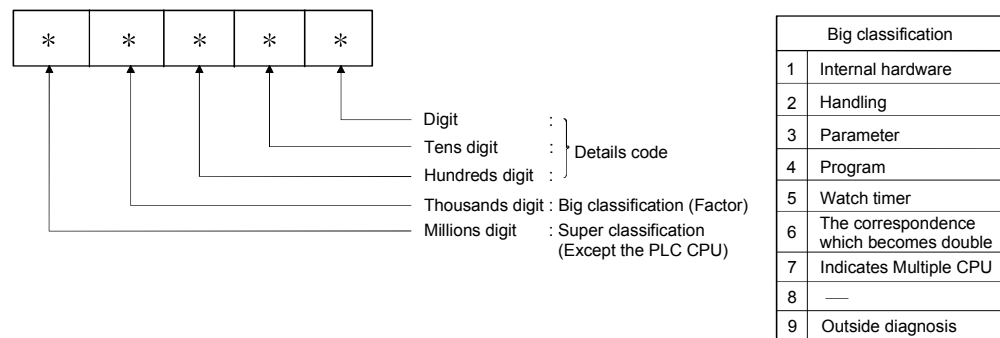
### 2.4 Multiple CPU Error Codes

#### 2.4.1 Self-diagnosis error code

This section explains the self-diagnosis error code. A self-diagnosis error code is stored in D9008.

And, it can be confirmed with device monitor of the PC diagnosis/SW6RN-GSV□P of GX Developer.

Each digit is defined as the error code as follows.



The characteristic error of Motion CPU is 10000 (the error code which occurs except the PLC CPU).

## 2 MULTIPLE CPU SYSTEM

Table 2.4 Multiple CPU errors which occurs in the Motion CPU (1000 to 10000)

Middle classification	Error messages	Error code	Error information Classification code	Occurs CPU		LED status		Operating status of CPU	Diagnostic timing		
				Single composition	Multiple composition	RUN	ERROR				
CPU (hard) error	MAIN CPU DOWN	1000	—	—	—	OFF	Flickers	Stop	Always		
		1001									
		1002									
		1003									
		1004									
		1005									
		1006									
		1007									
		1008									
		1009									
	In the CPU, RAM error (RAM ERROR)	1105	—	—	○	○	OFF	Flickers	Stop	At power supply ON/at reset	
	FUSE BREAK OFF	1300	—	—	—	—	OFF/ON	Flickers/ON	Stop/Continue (Note-7)	Always	
Module error (hard)	SP. UNIT DOWN	1401	Module No.	○	○	OFF	Flickers	Stop	At power supply ON/at reset		
Base	Q bus error (CONTROL-BUS ERROR)	1413	Module No.	○	○	OFF	Flickers	Stop	Always		
		1414	Module No.	○	○	OFF	Flickers	Stop	Always		
		1415	Base No. (Note-2)	○	⊙	OFF	Flickers	Stop	Always		
		1416	Module No. (Note-1)	—	⊙	OFF	Flickers	Stop	At power supply ON/at reset		
Power supply	Detection of AC/DC DOWN (AC/DC DOWN)	1500	—	○	○	ON	OFF	Continue	Always		
Battery	(BATTERY ERROR)	1600	Drive name	○	○	ON	OFF	Continue	Always		
		1601				BAT. ALM LED ON					
Handling the intelligent function module/ Multiple CPU module	Intelligent function module installation error (SP. UNIT LAY ERROR)	2121	Module No.	—	—	○	○	OFF	Flickers	Stop	At power supply ON/at reset
		2124									
		2125									
		2126									
		2126	Module No. (Note-1)								

(Note-1) : CPU No. is stored in slot No. of the common information classification.

(Note-2) : Base No. in "common information classification code" of "error information classification code" is 0 : CPU base, 1 to 7 : Number of extension bases.

(Note-3) : Because a stop error or CPU No. except CPU No. that it was reset becomes MULTI CPU DOWN simultaneously, a stop error or CPU No. except CPU No. that it was reset may store in the classification of error information depending on timing.

(Note-4) : When an error occurs in the Motion CPU and so on except PLC CPU, if a PC diagnosis is made in the CPU except PLC CPU from GX Developer via PLC CPU, the error code "10000" is indicated.

(Note-5) : The Motion SFC error detection signal (M2039) turned on at the error detection (SV13/SV22). A self-diagnosis error flag (M9008) and a diagnosis error flag (M9010) do not turn on at the error detection. The error code "10000" being set in D9008 is reset in the Motion SFC error detection signal (M2039) ON → OFF (SV13/SV22).

(Note-6) : MOTION RUN LED turns off at the stop error occurrence. (The condition of RUN LED does not change.)

(Note-7) : Operating status of CPU at the error occurrence can be set in the parameter. (LED display also changes continuously.)

## 2 MULTIPLE CPU SYSTEM

Error code	Error contents and cause	Corrective action	Remark
1000	Run-away or failure of main CPU (1) Malfunctioning due to noise or other reason (2) Hardware fault	(1) Measure noise level. (2) Reset and establish the RUN status again. If the same error is displayed again, this suggests a CPU hardware error. Explain the error symptom and get advice from our sales representative.	
1001			
1002			
1003			
1004			
1005			
1006			
1007			
1008			
1009			
1105	Shared CPU memory fault in the CPU.	(1) Measure noise level. (2) Reset and establish the RUN status again. If the same error is displayed again, this suggests a CPU hardware error. Explain the error symptom and get advice from our sales representative.	
1300	There is an output module with a blown fuse.	Check ERR. LED of the output modules and replace the module whose LED is lit.	
1401	There was no response from the motion module or intelligent function module during initial communications.	The Motion dedicated module, the intelligent function module, the CPU module or the base unit has hardware error. Explain the error symptom and get advice from our sales representative.	
1413	An error is detected on the Q bus.	A special function module, the CPU module, or the base unit has hardware error. Explain the error symptom and get advice from our sales representative.	
1414			
1415			
1416	Fault of the CPU or extension base unit was detected.		
1416	Bus fault was detected at power-on or reset.		
1500	A momentary power interruption of the power supply occurred. The power supply went off.	Check the power supply.	
1600	(1) Voltage of the CPU has dropped below stipulated level. (2) The lead connector of CPU battery has not been installed.	(1) Replace the battery. (2) If the battery is for internal RAM or for the back-up power function, install a lead connector.	
1601	Battery voltage has dropped below stipulated level.	Replace the battery.	
2121	A CPU module is installed in a slot except CPU slot, 0 to 2 slot.	A CPU module is installed to a CPU slot or 0 to 2 slot.	
2124	(1) A module is installed in slot 65 or subsequent slot. (2) A module is installed in a base for which "None" is set in the base settings.	(1) Remove a module of slot 65 or subsequent slot. (2) Remove a module of base for which "None" is set in the base settings.	
2125	(1) A module which the PLC CPU cannot recognize has been installed. (2) There was no response from the intelligent function module.	(1) Install a usable module in the PLC CPU. (2) The intelligent function module has hardware error. Explain the error symptom and get advice from our sales representative.	
2126	CPU module locations in a Multiple CPU system is either of the following. (1) There are non-installation slots between the CPU modules. (2) The modules except the PLC CPU are installed between the PLC CPU modules.	(1) There must be non-installation slots between the CPU modules in the Multiple CPU system. (When the non-installation slots are reserved, cancel the reservation.) (2) Remove the modules except the PLC CPU installed between the PLC CPU modules, and shift over to the slots with the PLC CPU modules in the Multiple CPU system.	

- : It occurs in the CPU (CPU No.) which detected a error.  
 ◎ : It occurs in all CPU No. at the time of the Multiple CPU composition.  
 — : It does not occur.

## 2 MULTIPLE CPU SYSTEM

Table 2.4 Multiple CPU errors which occurs in the Motion CPU (1000 to 10000) (continued)

Middle classification	Error messages	Error code	Error information Classification code	Occurs CPU		LED status		Operating status of CPU	Diagnostic timing	
				Single composition	Multiple composition	RUN	ERROR			
Parameter	PARAMETER ERROR	3001	File name	○	○	OFF	Flickers	Stop	At power supply ON/ at reset/ at Stop → Run	
		3010		—	◎					
		3012		—	○					
		3013		—	◎					
Multiple CPU	Other issue opportunity CPU weight occasion error (MULTI CPU DOWN)	7000	Module No. (Note-1) (Note-3)	—	○	OFF	Flickers	Stop	Always	
		7002	Module No. (Note-1)	—	○				At power supply ON/ at reset	
		7003		—	○					
	Multiple CPU start error (MULTI EXE. ERROR)	7010	Module No. (Note-1)	—	○	OFF	Flickers	Stop	At power supply ON/ at reset	
	Multiple CPU start error (MULTI CPU ERROR)	7020	Module No. (Note-1)	—	○	ON	ON	Continue	Always	
CPU error except for PLC CPU	CPU error except for PLC CPU (CONT. UNIT ERROR) (Note-4) (Note-5)	10000	—	Except for PLC CPU		ON	ON : System setting error/ servo error OFF : other error	Stop : System setting error Continue : other error	At power supply ON/ at reset/ at Stop → Run	

(Note-1) : CPU No. is stored in slot No. of the common information classification.

(Note-2) : Base No. in "common information classification code" of "error information classification code" is 0 : CPU base, 1 to 7 : Number of extension bases.

(Note-3) : Because a stop error or CPU No. except CPU No. that it was reset becomes MULTI CPU DOWN simultaneously, a stop error or CPU No. except CPU No. that it was reset may store in the classification of error information depending on timing.

(Note-4) : When an error occurs in the Motion CPU and so on except PLC CPU, if a PC diagnosis is made in the CPU except PLC CPU from GX Developer via PLC CPU, the error code "10000" is indicated.

(Note-5) : The Motion SFC error detection signal (M2039) turned on at the error detection (SV13/SV22). A self-diagnosis error flag (M9008) and a diagnosis error flag (M9010) do not turn on at the error detection. The error code "10000" being set in D9008 is reset in the Motion SFC error detection signal (M2039) ON → OFF (SV13/SV22).

(Note-6) : MOTION RUN LED turns off at the stop error occurrence. (The condition of RUN LED does not change.)

## 2 MULTIPLE CPU SYSTEM

Error code	Error contents and cause	Corrective action	Remark
3001	Parameter contents have been destroyed.	(1) Read the error detailed information at the peripheral device, check and correct the parameter items corresponding to the numerical values (parameter No.). (2) If the error still occurred after correcting of the parameter settings, it may be an error for internal RAM of CPU or memory. Explain the error symptom and get advice from our sales representative.	
3010	The number of CPU modules set in the parameter differ from the real installation in a Multiple CPU system.	Match (preset count of Multiple CPU setting) – (CPU (empty) setting in I/O assignment) with the real installation of CPUs.	
3012	The reference CPU No. set in the parameter differ from the setting in a Multiple CPU system.	Match the setting in the parameter with that of the reference CPU No. (CPU No.1).	
3013	Multiple CPU automatic refresh setting is any of the followings in a Multiple CPU system. (1) When a bit device is used as a refresh device, a number except a multiple of 16 is set as the refresh first device. (2) A non-specifiable device is specified. (3) The number of transmitting points is an odd number.	Check the following in the Multiple CPU automatic refresh parameters and make correction. (1) When specifying the bit device, specify a multiple of 16 for the refresh first device. (2) Specify the device that may be specified for the refresh device. (3) Set the number of transmitting points to an even number.	
7000	In a Multiple CPU system, a CPU fault occurred at the CPU where "all station stop by stop error of CPU was selected" in the operating mode. (It occurs in the CPU except for the CPU that suspension of a system is chosen.) In a Multiple CPU system, CPU No.1 resulted in stop error at power-on and the other CPU cannot start. (This error occurred at CPU No.2 to 4)	Read the individual information of the error at the peripheral device, check the error of the CPU resulting in CPU fault, and remove the error.	
7002	At initial communication in a Multiple CPU system, no response is given back from the target CPU of initial communication.	Reset the PLC CPU and run it again. If the same error is displayed again, it is a hardware fault of any CPU. Explain the error symptom and get advice from our sales representative.	
7003			
7010	(1) A fault CPU is installed in a Multiple CPU system. (2) CPUs of unmatched versions are installed in a Multiple CPU system. (This error is detected at the PLC CPU of function version B.) (3) Any CPU No. among CPU No.2 to 4 was reset, after power supply on a Multiple CPU system. (This error occurs by the reset CPU No..)	The CPU No. of the function version A or the break down module is exchanged for the CPU module of the function version B, after it began to read the individual information of the error at the peripheral devices.	
7020	In a Multiple CPU system, a CPU fault occurred at the CPU where "all station stop by stop error of CPU was not selected" in the operation mode. (The error is detected at the PLC CPU of other than the CPU No. where the CPU fault occurred.)	Read the individual information of the error at the peripheral device, check the error of the CPU resulting in CPU fault, and remove the error.	
10000	The error which a Motion CPU was characteristic of occurred. It is set when an error all to set with the system setting error, the Motion CPU is detected. (Minor error, major error, servo error and various errors)	Use the software package of the applicable CPU module to check the details of the error that occurred.	

- : It occurs in the CPU (CPU No.) which detected a error.  
 ◎ : It occurs in all CPU No. at the time of the Multiple CPU composition.  
 — : It does not occur.

### 2.4.2 Release of self-diagnosis error

The CPU can perform the release operation for errors only when the errors allow the CPU to continue its operation.

To release the errors, follow the steps shown below.

- (1) Eliminate the error cause.
- (2) Store the error code to be released in the special register D9060.
- (3) Turn the special relay M9060 off to on.
- (4) The target error is released.

After the CPU is reset by the release of error, the special relays, special registers and LEDs for the error are returned to the states under which the error occurred.

If the same error occurs again after the release of the error, it will be registered again.

### 3. COMMON PARAMETERS

#### 3.1 System Settings

In the Multiple CPU system, the common system parameters and individual parameters are set for each CPU and written to each CPU.

- (1) The base settings, Multiple CPU settings and Motion slot settings are set in the common system parameter setting.
- (2) The basic system settings, self CPU installation position setting, servo amplifier/motor setting, high-speed read setting and battery setting are set in the individual parameter setting.
- (3) The data setting and correction can be performed in dialog form using a peripheral device.



### 3 COMMON PARAMETERS

#### 3.1.1 System data settings

The table below lists the system data items to be set.

	Item	Setting range	Initial value	Remark	
Common system parameters	Base setting	CPU base	2/3/5/8/10/12 slots	CPU base: 2 slots	Set the number of slots in the CPU base or extension base.
		Extension base	None/2/3/5/8/10/12 slots	None	
	Multiple CPU setting	Number of Multiple CPUs	2/3/4 modules	2 modules	Set the total number of Multiple CPUs including PLC CPU(s).
		Automatic refresh setting	Up to 2k words of devices (D/W/#/M/Y/B) can be set per CPU for settings 1 to 4.	None	Set the automatic refresh between CPUs using Multiple CPU shared memory.
		Error operation mode at the stop of CPU	Stop/do not stop all CPUs upon an error in CPU Nos. 1/2/3/4. (The setting range varies depending on the number of Multiple CPUs installed.)	Stop all CPUs upon error in CPU Nos. 1/2/3/4	Set whether or not to stop the entire system when a CPU stop error occurs in each CPU.
	Motion slot setting	Module arrangement	Within the CPU base and extension base slots	None	Install the modules controlled by the self CPU in the CPU base and/or extension base(s).
		Individual module	Varies depending on the module.	Varies depending on the module.	Set detailed items for each module controlled by the self CPU.
Individual parameters	Basic system setting	Operation cycle	0.4ms/0.8ms/1.7ms/3.5ms /7.1 ms/14.2ms/Auto	Auto	Set the operation cycle of motion control.
		Operation at STOP to RUN	M2000 is turned on with switch (STOP to RUN). /M2000 becomes a switch set (STOP to RUN) + register by single-unit with turning on.	M2000 is turned on with switch (STOP to RUN).	Set the condition in which the PLC ready flag (M2000) turns on.
		Forced stop(Note)	None/X(PX) (0 to 1FFF)/M (0 to 8191)	None	Set the bit device used for forced stop.
		Latch range	M (0 to 8191)/B (0 to 1FFF)/F (0 to 2047)/D (0 to 8191)/W (0 to 1FFF)	None	Set the latch range of device memory.
	Self CPU installation position setting	Set self CPU/another CPU/ CPU (empty) for slots 0/1/2. (The setting range varies depending on the number of Multiple CPUs installed.)	None (When two CPUs are installed, slot 0 is fixed as the self CPU.)	Set the installation position of the self CPU in the CPU base.	
	Amplifier setting	Q173HCPU: Up to 2 systems, 32 axes. Q172HCPU: Up to 1 system, 8 axes	None	Set the model name, axis No. and other details for the servo amplifiers.	
		External signal input setting Amplifier input invalid/ Amplifier input valid	Amplifier input invalid		
		Input filter setting None/0.8ms/1.7ms/2.6ms /3.5ms	3.5ms		
	High-speed data read setting	One Q172EX/Q173PX module and one input module.	None	Set the high-speed read data. Refer to Section 4.3 for the high-speed read function.	
	Battery setting	External battery unused/ External battery used	External battery unused	Set whether or not to use an external battery. If the power supply is down for one month or longer, data must be backed up with an external battery. Refer to "Q173HCPU/Q172HCPU User's Manual" for external battery.	

(Note) : The forced stop can also be executed by the forced stop terminal of servo amplifier besides the forced stop input setting.

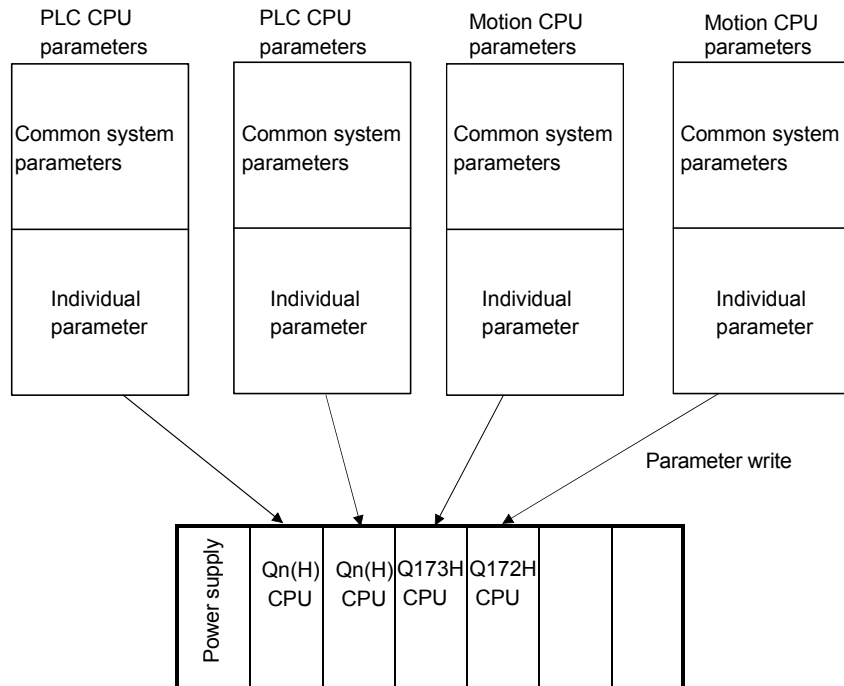
### 3 COMMON PARAMETERS

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#### 3.1.2 Common system parameters

(1) Parameters for operating the Multiple CPU system

In the Multiple CPU system, the common system parameters and individual parameter for each CPU are set and written into each CPU. Regarding the Motion CPU, the items in System Settings related to the entire Multiple CPU system must be identical to the parameter settings in the PLC CPU.



### 3 COMMON PARAMETERS

#### (2) Parameters common throughout the Multiple CPU system

In the Motion CPU, during initialization the parameters in the table below are verified against the parameters in the PLC CPU of CPU No. 1. Unmatched parameters generate a PARAMETER ERROR (error code: 3012), so the parameters show below must be set identically between Motion CPUs and the PLC CPU of CPU No.1. (If the system settings are changed in a Motion CPU, it is necessary to reset. Therefore, the parameters are checked only during initialization.)

PLC CPUs can use the parameters of the other CPUs via "Multiple CPU parameter utilization" in GX Developer. Since Motion CPUs don't have this function, however, the common parameters must be set for each Motion CPU.

Table of Parameters common throughout the Multiple CPU system

Type of parameter		Verification item	Remark
Name in Motion CPU	Name in PLC CPU		
Multiple CPU settings	Number of Multiple CPUs	Number of CPU modules	
	Operation mode	Operation mode when a CPU stop error occurred	
	Automatic refresh setting	Number of automatic refresh points	
Motion slot settings	I/O assignment	Control CPU	Control CPU No.
Base settings		Basic settings	Total number of bases
		Base	Base No.
			Number of base slots
			<ul style="list-style-type: none"> <li>• Only the module numbers set in System Settings on the Motion CPU side are verified.</li> <li>• Not verified if base settings are omitted on the PLC CPU side.</li> </ul>

### 3 COMMON PARAMETERS

#### (a) Multiple CPU settings

Set the following items identically in Multiple CPU Settings (Motion CPU setting) in SW6RN-GSV□P and in Multiple CPU Settings (PLC CPU setting) in GX Developer.

- Number of CPU modules
- Operation mode when a CPU stop error occurred
- Number of automatic refresh points (Settings 1 to 4 must be the same for all CPUs)

#### • Multiple CPU Settings (Motion CPU setting) in SW6RN-GSV□P

**Basic Setting**

Base Setting | **Multiple CPU Setting** | System Basic Setting

No. of CPU(\*)  
No. of CPU: 2  
Please set the number of Multiple CPU.

Operating Mode(\*)  
Error operation mode at the stop of CPU  
 All station stop by stop error of CPU1  
 All station stop by stop error of CPU2  
 All station stop by stop error of CPU3  
 All station stop by stop error of CPU4

Refresh Setting  
Setting 1

CPU	Send range for each CPU			CPU side device	
	Point (*)	Start	End	Dev. starting	W0
No.1	256	0800	08FF	w0	w0FF
No.2	256	0800	08FF	w100	w1FF
No.3					
No.4					

The applicable device of head device is D,W,#,M,Y,B,\*.  
The unit of points that send range for each CPU is word.  
(\* ) Settings should be set as same when using multiple CPU.

OK Cancel

Number of CPU modules

Error operation made at the stop of CPU

Number of automatic refresh points

#### • Multiple PLC Setting (PLC CPU setting) in GX Developer

**Multiple CPU settings**

No. of PLC(\*)  
No. of PLC: 2

Online module change(\*)  
 Enable online module change with another PLC.  
 When the online module change is enabled with another PLC, I/O status outside the group cannot be taken.

I/O sharing when using Multiple CPUs (\*)  
 All CPUs can read all inputs  
 All CPUs can read all outputs

Operating mode (\*)  
Error operation mode at the stop of PLC  
 All station stop by stop error of PLC1  
 All station stop by stop error of PLC2  
 All station stop by stop error of PLC3  
 All station stop by stop error of PLC4

Refresh settings  
Change screens: Setting 1  
 Set starting devices for each PLC

PLC	Send range for each PLC			PLC side device	
	The auto refresh area (Caution) Point (*)	Start	End	Dev. starting	W100
No.1	256	0000	00FF	w100	w1FF
No.2	256	0000	00FF	w200	w2FF
No.3					
No.4					

Caution) Offset (HEX) from starting address of the auto refresh area. Refer to the user's manual of the each PLC about the starting address.  
The applicable device of head device is B,M,Y,D,W,R,ZR.  
The unit of points that send range for each PLC is word.  
(\* ) Settings should be set as same when using multiple CPU.

Import Multiple CPU Parameter Check End Cancel

Number of CPU modules

Error operation made at the stop of CPU

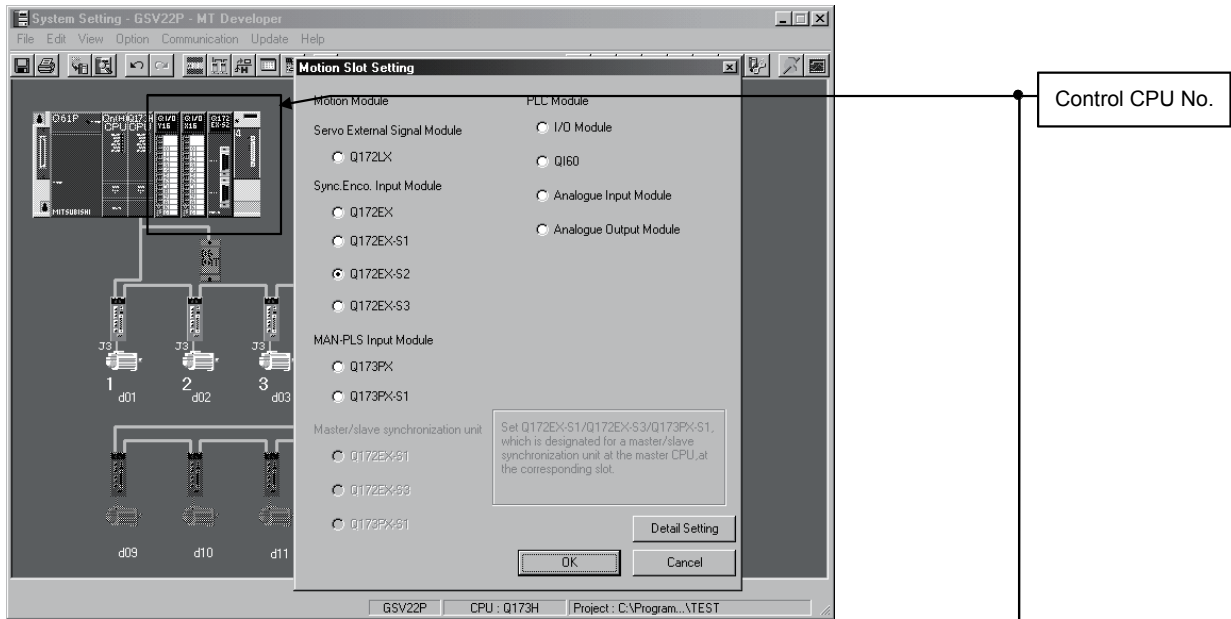
Number of automatic refresh points

### 3 COMMON PARAMETERS

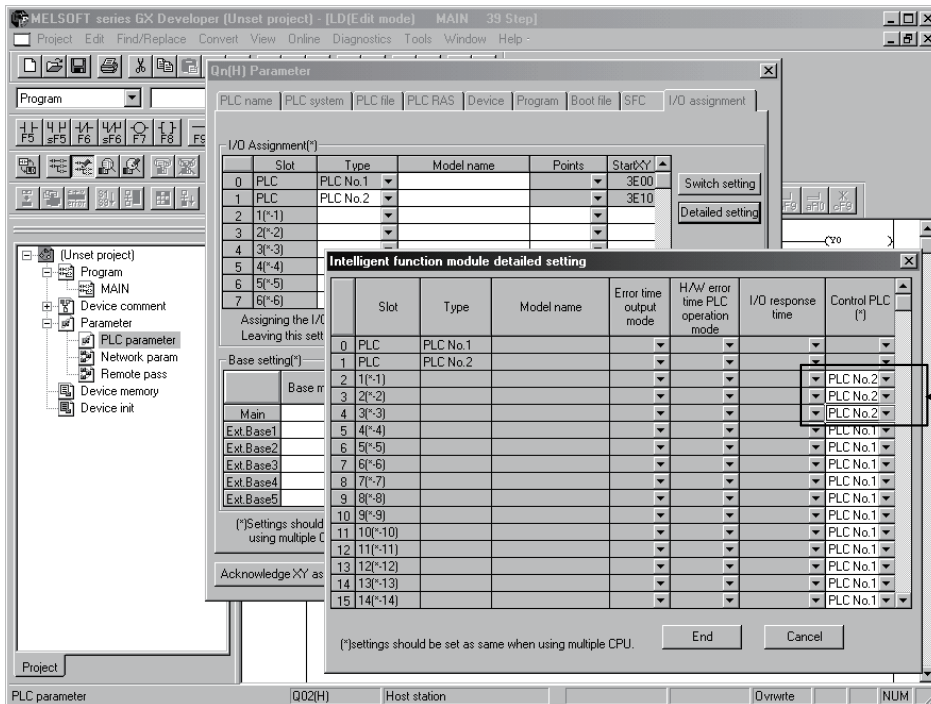
(b) Motion slot settings

Set the modules controlled by the self CPU by the Motion Slot Settings (Motion CPU setting) in SW6RN-GSV□P. In GX Developer, set the slot for Motion CPU control as the CPU number of the Motion CPU in I/O Assignment Settings (PLC CPU setting).

• Motion Slot Setting (Motion CPU setting) in SW6RN-GSV□P



• I/O Assignment Setting (PLC CPU setting) in GX Developer



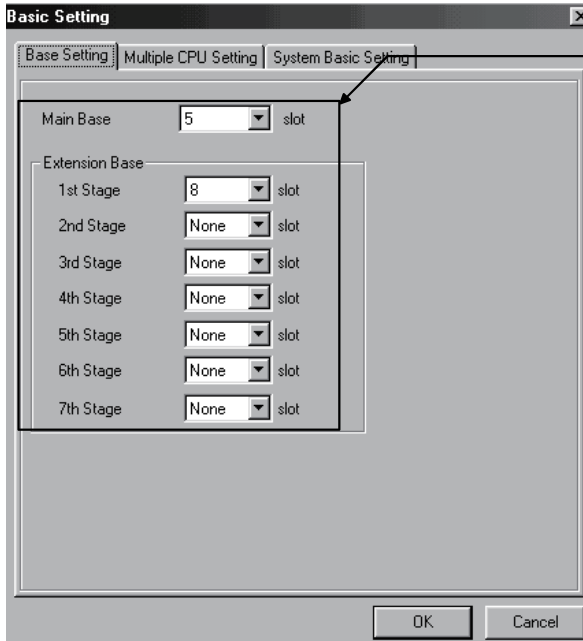
(Note): Motion slot setting items are different depending on the operating system software.

### 3 COMMON PARAMETERS

(c) Base settings

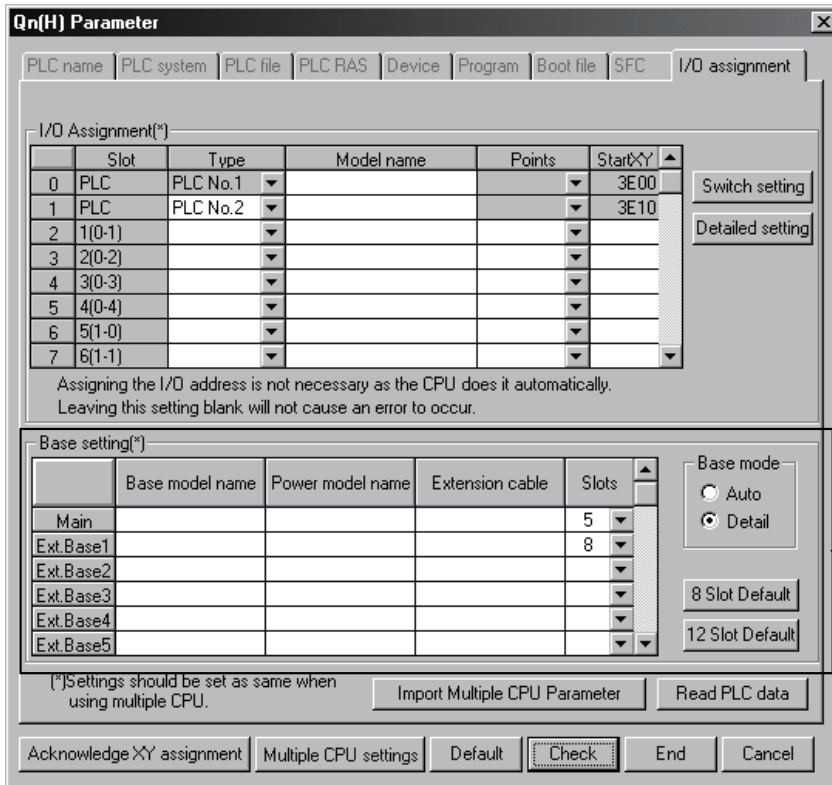
Set the total number of bases and number of slots in each base identically between Base Settings (Motion CPU setting) in SW6RN-GSV□□ and I/O Assignment Settings (PLC CPU setting) in GX Developer. In GX Developer, the detailed settings may be omitted by setting the base mode "Automatic".

• Base Settings (Motion CPU setting) in SW6RN-GSV□□



Total number of bases and number of slots in each base

• I/O Assignment Settings (PLC CPU setting) in GX Developer



(Note) : Only the Motion CPU may be set without setting the PLC CPU.

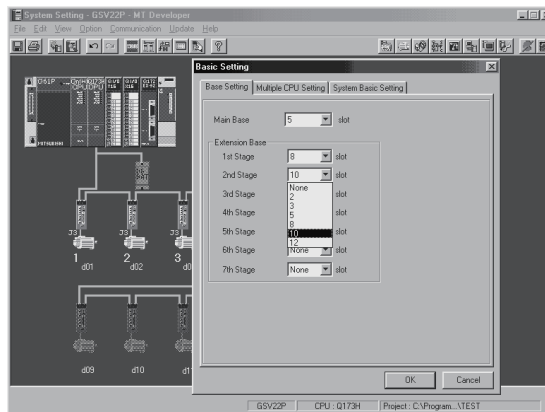
#### POINT

GOT is recognized as an intelligent function modules "16 points×10 slots" on the base (number of extension bases and slot No. are set in the GOT parameter.) for bus connection with GOT.

Set the one extension base (16 points×10 slots) for connection with GOT, then set "10 slots" as number of extension bases for connection with GOT in the system setting (base setting).

<Example>

When the "2nd stage" of extension base is set as connection with GOT.  
(Set "10" slot as "2nd stage" of extension base in the base setting.)



If the bus connection with GOT is executed without above settings in the base setting of system setting, "SP.UNIT LAY ERROR" (error code: 2124) will occur.

#### 3.1.3 Individual parameters

##### (1) Basic system settings

The following explains each item to be set in Basic System Settings.

##### (a) Operation cycle setting

- 1) Set the of motion operation cycle (cycles at which a position command is computed and sent to the servo amplifier).

The setting range is 0.4ms/0.8ms/1.7ms/3.5ms/7.1ms/14.2ms/Automatic setting. The actual operation cycle corresponding to 0.4ms is 0.444...ms. Similarly, 0.8ms corresponds to 0.888...ms, 1.7ms to 1.777...ms, 3.5ms to 3.555...ms, 7.1ms to 7.111...ms, and 14.2ms to 14.222...ms, respectively.

- 2) The default value is "Automatic setting". When "Automatic setting" is selected, the operation cycle is set according to the table below based on the number of axes for servo amplifier set in the System Settings.

Operating system	Number of axes	Operation cycle setting
SV13	1 to 3 axes	0.4 ms
	4 to 10 axes	0.8 ms
	11 to 20 axes	1.7 ms
	21 to 32 axes	3.5 ms
SV22/SV43	1 to 5 axes	0.8 ms
	6 to 14 axes	1.7 ms
	15 to 28 axes	3.5 ms
	29 to 32 axes	7.1 ms

- 3) If the duration of motion operation has exceeded the operation cycle, the operation cycle over flag (M2054) turns ON. Even when "Automatic setting" is selected, the duration of motion operation may exceed the operation cycle depending on the control conditions. The actual duration of motion operation (unit:μs) is stored in the D9188, and the current setting of operation cycle (unit:μs) is stored in the D9197. Monitor these special registers and adjust the set value of operation cycle so that the actual duration of motion operation will not exceed the set operation cycle. (A WDT or other error may occur in the Motion CPU.)

##### (b) Operation setting upon STOP → RUN

Set the condition in which the "PLC ready" flag (M2000) turns ON. Select one of the following:

- 1) M2000 ON upon switching (STOP → RUN) (default)

Condition in which the M2000 turns from OFF to ON

- Change the RUN/STOP switch from the STOP side to the RUN side.
- With the RUN/STOP switch set to the RUN side, turn ON the power or cancel the reset.



Condition in which the M2000 turns from ON to OFF

- Change the RUN/STOP switch from the RUN side to the STOP side.

- 2) M2000 ON upon switching (STOP → RUN) + 1 set in setting register  
(The M2000 turns ON when the switch is set to the RUN side and 1 is set in the setting register.)

Condition in which the M2000 turns from OFF to ON

- With the RUN/STOP switch set to the RUN side, set 1 in the setting register for "PLC ready" flag (D704). (The Motion CPU detects a change from 0 to 1 in the lowest bit in the D704).

Condition in which the M2000 turns from ON to OFF

- With the RUN/STOP switch set to the RUN side, set 0 in the setting register for "PLC ready" flag (D704). (The Motion CPU detects a change from 1 to 0 in the lowest bit in the D704).
- Change the RUN/STOP switch from the RUN side to the STOP side.

- (c) Forced stop input setting

Specify the bit device used for executing a forced stop in which all servo-amplifier axes are stopped immediately.

Either X (PX) or M can be specified. No default value has been set. The set bit device is designated as contact B and performs the following control in response to ON/OFF of the device.

- Bit device is turned OFF ... Forced stop input is ON (forced stop)
- Bit device is turned ON ... Forced stop input is OFF (forced stop is released.)

- (d) Latching range setting

Set the following latching ranges for M, B, F, D and W, respectively.

- Range in which the latch can be cleared with the latch clear key (Latch (1))
- Range in which the latch cannot be cleared with the latch clear key (Latch (2))

### 3 COMMON PARAMETERS

#### (2) Individual module settings

The setting items for each module are shown below.

#### Setting items for each module

Module name		Item	Setting range	Initial value	Number of usable modules	
					Q173HCPU	Q172HCPU
Q172LX	Servo external signals input module	External signal setting	Set the number of axes for which the 8 axes input is used.	Unused	4	1
		DOG/CHANGE turning OFF to ON/ON to OFF	DOG/CHANGE input turning OFF to ON or turning ON to OFF	Turning OFF to ON		
		Input response time	0.4/0.6/1 ms (DOG/CHANGE response time)	0.4 ms		
Q172EX	Serial encoder input module	Serial encoder setting	Used/Unused	Unused	6 (SV22)	4 (SV22)
		Serial encoder selection	Q170ENC/MR-HENC	Q170ENC		
		Input response time	0.4/0.6/1 ms (TREN response time)	0.4 ms		
		High-speed read setting	Used/Unused	Unused		
Q173PX	Manual pulse generator input module	Manual pulse generator setting (SV13/SV43)	Used only	Used	1 (SV13/SV43) 4 (SV22)	1 (SV13/SV43) 3 (SV22)
		Manual pulse generator/Serial encoder setting (SV22)	Used/Unused	P <input type="checkbox"/> Used		
		Input response time	0.4/0.6/1 ms (TREN response time)	0.4 ms		
		High-speed read setting	Used/Unused	Unused		
QI60	Interrupt module	Input response time	0.1/0.2/0.4/0.6/1 ms	0.2 ms	1 (SV13/SV22)	1 (SV13/SV22)

### 3 COMMON PARAMETERS

Setting items for each module (Continued)

Module name		Item	Setting range	Initial value	Number of usable modules	
					Q173HCPU	Q172HCPU
QX□	Input module	First I/O No.	00 to FF0 (in units of 16 points)	0	Total 256 points or less	Total 256 points or less
		Number of I/O points	0/16/32/64/128/256	16		
		High-speed read setting	Used/Unused	Unused		
		Input response time setting (setting for high-speed input module in parentheses)	1/5/10/20/70 ms (0.1/0.2/0.4/0.6/1 ms)	10 ms (0.2 ms)		
QY□	Output module	First I/O No.	00 to FF0 (in units of 16 points)	0		
		Number of I/O points	0/16/32/64/128/256	16		
QH□/QX□Y□	Input/Output composite module	First I/O No.	00 to FF0 (in units of 16 points)	0		
		Number of I/O points	0/16/32/64/128/256	16		
		Input response time setting	1/5/10/20/70 ms	10 ms		
		High-speed read setting	Used/Unused	Unused		
Q6□AD□	Analogue input module	First I/O No.	00 to FF0 (in units of 16 points)	0		
		Input range setting	4 to 20mA/0 to 20mA/1 to 5V/0 to 5V/-10 to 10V/0 to 10V/User range	4 to 20mA		
		Temperature drift compensation	Used/None	Used		
		Resolution mode	Normal/High	Normal		
		Operation mode	Normal (A/D conversion)/Offset gain setting	Normal (A/D conversion)		
Q6□DA□	Analogue output module	First I/O No.	00 to FF0 (in units of 16 points)	0		
		Output range setting	4 to 20mA/0 to 20mA/1 to 5V/0 to 5V/-10 to 10V/User range	4 to 20mA		
		HOLD/CLEAR function setting	CLEAR only	CLEAR		
		Output mode	Normal (Asynchronous)/Synchronous output	Normal (Asynchronous)		
		Resolution mode	Normal/High	Normal		
		Operation mode	Normal (D/A conversion)/Offset gain setting	Normal (D/A conversion)		

#### (3) External signal input

Servo external signal (Upper stroke limit/Lower stroke limit/Stop signal/Proximity DOG) can be selected for every axis from the following two methods.

- (a) Q172LX Servo external signals interface module use  
Set the servo external signals interface module, and set axis No. as the "External signal setting" in the system setting.
- (b) Servo amplifier input device use (MR-J3-□B use only)  
Set "Amplifier input valid" as the external signal input setting in the "Amplifier setting" of system setting.  
There are following restrictions to use.
  - Count type home position return cannot be used.
  - Speed/position switching control cannot be executed.
  - Stop signal (STOP) cannot be used.

The correspondence of external signal and input device is shown below.

External signals	Input device (CN3) <sup>(Note)</sup>
Upper stroke limit (FLS)	D11
Lower stroke limit (RLS)	D12
Proximity DOG (DOG)	D13

(Note): Refer to the "MR-J3-□B Servo Amplifier Instruction Manual" for pin configurations.

Set the external signal setting in the "Input Filter Setting".

Refer to the Programming Manual of the operating system software for the software and correspondence version compatible with the external signal setting.

### 3 COMMON PARAMETERS

#### (4) System setting errors

Motion CPUs generate a system configuration error under the following conditions:

Error name	Error code (Note-1)	Error cause	Check timing	Operation at error occurrence
LAY ERROR (SL * *)	10000 (Note-2)	• The slot set in system settings is vacant or a different module is installed.	When the power is turned ON/ the key is reset	Cannot be started. (Motion CPU system setting error)
AXIS No. MULTIDEF		• Duplicate axis No. is set in system settings.		
AMP No. SETTING		• Not a single axis is set in system settings.		
AXIS No. ERROR		• System setting data is not written.		
I/O POINTS OVER		• The number of actual I/O points set in system settings exceeds 256.		
ROM ERROR1		• Type of the operating system software of data written to ROM is different.		
ROM ERROR2		• Data is not written to ROM.		
ROM ERROR3 (* *)		• Data size of ROM is abnormal. <ul style="list-style-type: none"> <li>• Execute the ROM writing again.</li> <li>• Check the adjustment for the version of Motion CPU, programming system software and operating system software.</li> </ul>		
ROM ERROR4 (* *)	• Data of ROM is abnormal. <ul style="list-style-type: none"> <li>• Execute the ROM writing again.</li> <li>• Check the adjustment for the version of Motion CPU, programming system software and operating system software.</li> </ul>			
SP. UNIT LAY ERROR	2121	• A CPU module is installed in a slot except for a CPU slot or slot 0 to 2.	When the power is turned ON/ the key is reset	Cannot be started. (Multiple CPU system CPU DOWN error)
SP. UNIT LAY ERROR	2124 (Note-3)	• A module is installed in slot 65 or subsequent slot. • A module is installed in a base for which "None" is set in base settings.		
SP. UNIT LAY ERROR	2126	• There are non-installation slots between the CPU modules. • The modules except for the PLC CPU are installed between the PLC CPU modules.		
PARAMETER ERROR	3010	• The number of CPU modules set in the parameter differ from the real installation in a Multiple CPU system.		
PARAMETER ERROR	3012	• The reference CPU No. set in the parameter differ from the setting in a Multiple CPU system.		
PARAMETER ERROR	3013	Multiple CPU automatic refresh setting is any of the followings in a Multiple CPU system. <ul style="list-style-type: none"> <li>• When a bit device is set as a refreshed, a number except for a multiple of 16 is set as the refresh first device.</li> <li>• A non-specifiable device is specified.</li> <li>• The number of transmitting points is an odd number.</li> </ul>		
MULTI EXE. ERROR	7010	• A fault CPU is installed in a Multiple CPU system. • CPUs of unmatched versions are installed in a Multiple CPU system. (An error is detected at the PLC CPU of function version B.) • Any CPU No. among CPU No.2 to 4 was reset, after power on a Multiple CPU system. (This error occurs by the reset CPU No..)		

(Note-1) : The error code stored in the diagnosis error area of the self operation information area in the Multiple CPU shared memory.

(Note-2) : When an error code 10000 is displayed, the M2041 ("System setting error" flag) turns ON and an applicable error name shown above is displayed on the error list monitor of the programming software package.

(Note-3) : Base settings must be performed in System Settings of the Motion CPU even for those bases in which the modules controlled by the self CPU are not installed.

#### 3.2 Assignment of I/O No.

I/O No.s used in the Multiple CPU system include those used by the Motion CPU to communicate with I/O modules/intelligent function modules and those used in the communication between the PLC CPU and the Motion CPU. The following explains each I/O No. and assignment of I/O No..

##### 3.2.1 I/O No. for I/O modules and intelligent function modules

In the Multiple CPU system, the "0H" position(slot) of I/O No. which seen from the PLC CPU is different from the position in the case of a standalone CPU. However, I/O No. of the control module may be assigned independently for each CPU in the Motion CPU.

###### (1) "0H" position of I/O No.

- (a) In the Multiple CPU system, the slots corresponding to the number of units set by a multiple CPU parameter are occupied by the PLC CPU/Motion CPU.
- (b) I/O modules and intelligent function modules are installed in slots available to the right of those occupied by the PLC CPU/Motion CPU.
- (c) I/O No. of the control module may be assigned independently for each CPU in the Motion CPU. I/O No. of the PLC CPU control modules are assigned sequentially toward the right, starting from "0H" being the I/O module or intelligent function module installed to the immediate right of the slots occupied by the PLC CPU/Motion CPU.
- (d) Notation of I/O No.
  - Receiving of ON/OFF data by the Motion CPU is deemed input (PX), while outputting of ON/OFF data from the Motion CPU is deemed output (PY).
  - I/O No. is expressed in hexadecimal.

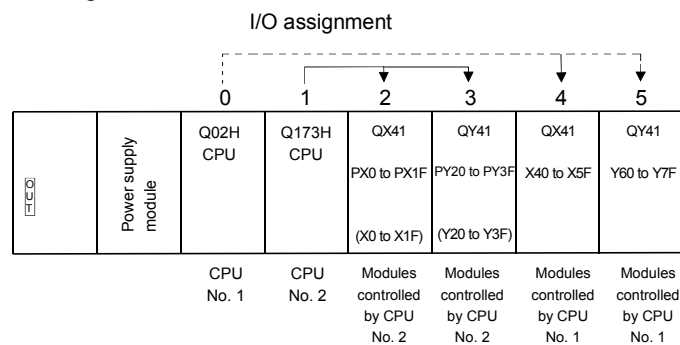
###### (2) Assignment of I/O No. to the Motion CPU control module

Mitsubishi recommends that I/O No. assignment be set as common consecutive No. throughout all CPUs.

However, the I/O No. of the Motion CPUs control input modules, output modules and input/output composite modules may also be set independently of the I/O No. of the PLC CPU control modules.

(The I/O No. of the Motion CPU control modules are indicated with a PX/PY.)

The I/O No. of the Motion CPU control modules are invalid during I/O Assignment Settings of the PLC CPU.



### 3 COMMON PARAMETERS

#### (3) Setting of the Motion CPU control modules by the PLC CPU

Follow the table below when Motion CPU control modules are set in I/O Assignment Settings of the PLC CPU. (The PLC CPU handles the Q172LX, Q172EX and Q173PX as intelligent function modules having 32 occupied points.) Type and number of points may be left unset.

Module name	Type	Number of points	Remarks
Input module	Input	Selected according to the module.	<ul style="list-style-type: none"> <li>For the control CPU, set the CPU that corresponds to the Motion CPU (required).</li> <li>Type and number of points may be left unset.</li> </ul>
Output module	Output		
Input/Output composite module	Composite I/O		
Analogue input module	Analogue input	16 points	
Analogue output module	Analogue output		
Interrupt module (QI60)	Interrupt		
Q172LX	Intelligent	32 points	
Q172EX		32 points	
Q173PX		32 points	

#### POINT

- (1) Set the I/O device of the Motion CPU within the range from PX/PY000 to PX/PYFFF. Set the number of real I/O points within 256 points. (I/O No. may not be consecutive.)
- (2) As for the Motion CPU, the Q172LX, Q172EX, Q173PX and QI60 are not included in the number of real I/O points.

### 3 COMMON PARAMETERS

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#### 3.2.2 I/O No. of PLC CPU and Q173HCPU/Q172HCPU

In the Multiple CPU system, I/O No. is assigned to the PLC CPU/Motion CPU to enable communication between the PLC CPU and Motion CPU using the following instructions:

- The Multiple CPU dedicated instructions
- The Motion CPU dedicated instructions
- The Multiple CPU communication dedicated instructions

The I/O No. of the PLC CPU/Motion CPU are fixed based on the installed slots and cannot be changed.

The table below lists the I/O No. of the PLC CPU/Motion CPU installed in the CPU base unit of the Multiple CPU system.

CPU installation position	QCPU slot	Slot 0	Slot 1	Slot 2
Head I/O number	3E00H	3E10H	3E20H	3E30H

The I/O No. of the PLC CPU/Motion CPU are used in the following cases:

- When writing data to the shared CPU memory of the self CPU using the S. TO instruction.
- When reading data from the shared CPU memory of the other CPU using the FROM instruction.
- When reading data from the shared CPU memory of the other CPU using an intelligent function module device (U□\G□)
- When reading device data directly from the Motion CPU from the PLC CPU using the "S(P).DDRD" instruction.
- When writing device data directly to the Motion CPU from the PLC CPU using the "S(P).DDWR" instruction.

#### REMARK

- Refer to Section "2.3 Communication between the PLC CPU and the Motion CPU in the Multiple CPU System" for communication between the PLC CPU and the Motion CPU.



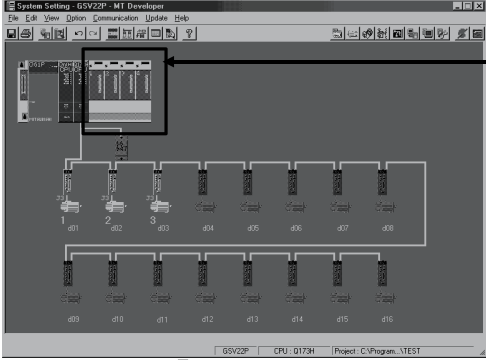
### 3 COMMON PARAMETERS

#### 3.2.3 Setting I/O No.

The procedure for the I/O No. setting for the Motion CPU in System Settings of SW6RN-GSV□P is shown below. In the Motion CPU, by setting a module used in each CPU base or extension base slot in System Settings, the control CPU of the applicable slot is assigned as the self CPU. Input modules, output modules and composite I/O modules require an I/O No. to be set.

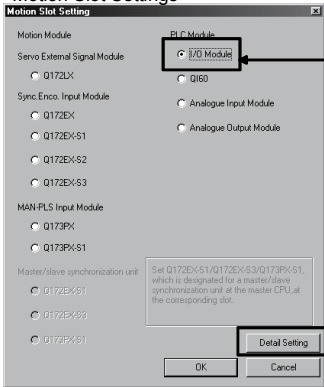
Refer to the help of SW6RN-GSV□P for the detailed operating procedure on the System Settings screen.

<System Settings>



1) Double-click the slot position, display the Motion Slot Settings dialog box.

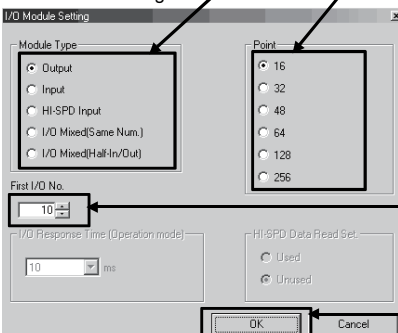
<Motion Slot Settings>



2) Select the I/O module.

3) Click [Detail Setting].

<I/O Module Settings>



4) Select applicable module type and number of points for the I/O module to be used.

5) Set the first I/O No. (PX No., PY No.).

6) Click [OK].

(Note): Display of system setting and motion slot setting are different depending on the operating system software.

#### POINT

I/O No.s cannot be assigned automatically, unlike a PLC CPU for which I/O No. are assigned automatically if such setting is omitted in the Motion CPU. In the Motion CPU, be sure to set the first I/O No. in System Settings for each module used.

### 3 COMMON PARAMETERS

#### 3.3 Servo Parameters

- (1) The servo parameters control the data fixed by the specifications of the servo amplifier and servomotor controlled in the parameter set for each axis and the control of the servomotor.
- (2) The servo parameters are set by the Setup software (MR Configurator).

##### 3.3.1 Servo parameters of servo amplifier

The servo parameters to be set are shown in Tables 3.1 to 3.4.

Refer to the "Servo amplifier Instruction Manual" for details of the servo parameters. Instruction Manual list is shown below.

Refer to the help for handling of the Setup software (MR Configurator).

Servo amplifier type	Instruction manual name
MR-J3-□B	MR-J3-□B Servo Amplifier Instruction Manual (SH-030051)
MR-J3-□B-RJ006	Fully closed loop control MR-J3-□B-RJ006 Servo Amplifier Instruction Manual (SH-030056)



##### (1) Basic setting parameters

Table 3.1 Servo parameter (Basic setting parameters) list

LED display	Symbol	Item	Setting details	Setting value/setting range (Setting by setup software)	Section			
	—	Servo series	• Set automatically in the system settings.		—			
PA02	REG *	Regenerative brake option	• Set the presence/absence of regenerative brake option.	00: Regenerative brake option is not used. • MR-J3-10B: Regenerative brake resistor is not used. • MR-J3-20B or more and -700B or less: Built-in regenerative brake resistor is used. • Supplied regenerative brake resistors or regenerative brake option is used with the MR-J3-11KB(4) or more servo amplifier. 01: FR-BU(-H) • FR-RC(-H) • FR-CV(-H) 02: MR-RB032 03: MR-RB12 04: MR-RB32 05: MR-RB30 06: MR-RB50 08: MR-RB31 09: MR-RB51 FA: When regenerative brake resistors or regenerative brake option supplied to MR-J3-11KB(4) or more are cooled by fans to increase capability.	3.3.2			
PA03	ABS *	Absolute position detection system	• Set the presence/absence of absolute position detection system. Set "0: Invalid (Used in incremental system)" for used in incremental system, and set "1: Valid" for used in absolute (absolute position) system.	0: Invalid (Used in incremental system) 1: Valid (Used in absolute system)	3.3.3			
PA04	AOP1 *	Function selection A-1	• Set the presence/absence of forced stop input (EM1) of servo amplifier.	<table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td style="padding: 2px;">0</td> <td style="padding: 2px;">0</td> <td style="padding: 2px;">0</td> </tr> </table> Selection of servo forced stop 0: Valid (Forced stop (EM1) is used.) 1: Invalid (Forced stop (EM1) is not used.)	0	0	0	3.3.4
0	0	0						

### 3 COMMON PARAMETERS

Table 3.1 Servo parameter (Basic setting parameters) list (Continued)

LED display	Symbol	Item	Setting details	Setting value/setting range (Setting by setup software)	Section																																																																																																
PA08	ATU	Auto tuning mode	<ul style="list-style-type: none"> <li>Select the gain adjustment mode.</li> </ul> <table border="1"> <thead> <tr> <th>Name</th> <th>Automatically set parameter</th> </tr> </thead> <tbody> <tr> <td>0: Interpolation mode</td> <td>PB06, PB08, PB09, PB10</td> </tr> <tr> <td>1: Auto tuning mode 1</td> <td>PB06, PB07, PB08, PB09, PB10</td> </tr> <tr> <td>2: Auto tuning mode 2</td> <td>PB07, PB08, PB09, PB10</td> </tr> <tr> <td>3: Manual mode</td> <td>—</td> </tr> </tbody> </table>	Name	Automatically set parameter	0: Interpolation mode	PB06, PB08, PB09, PB10	1: Auto tuning mode 1	PB06, PB07, PB08, PB09, PB10	2: Auto tuning mode 2	PB07, PB08, PB09, PB10	3: Manual mode	—	0: Interpolation mode 1: Auto tuning mode 1 2: Auto tuning mode 2 3: Manual mode	3.3.5																																																																																						
Name	Automatically set parameter																																																																																																				
0: Interpolation mode	PB06, PB08, PB09, PB10																																																																																																				
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2: Auto tuning mode 2	PB07, PB08, PB09, PB10																																																																																																				
3: Manual mode	—																																																																																																				
PA09	RSP	Auto tuning response	<ul style="list-style-type: none"> <li>Set to increase the response of servo amplifier. (At the automatic tuning valid.)</li> <li>Optimum response can be selected according to the rigidity of machine.</li> <li>As machine rigidity is higher, faster response can be set to improve tracking performance in response to a command and to reduce setting time.</li> </ul>	<table border="1"> <tbody> <tr><td>1 :</td><td>Low response</td><td>(10.0Hz)</td></tr> <tr><td>2 :</td><td></td><td>(11.3Hz)</td></tr> <tr><td>3 :</td><td></td><td>(12.7Hz)</td></tr> <tr><td>4 :</td><td></td><td>(14.3Hz)</td></tr> <tr><td>5 :</td><td></td><td>(16.1Hz)</td></tr> <tr><td>6 :</td><td></td><td>(18.1Hz)</td></tr> <tr><td>7 :</td><td></td><td>(20.4Hz)</td></tr> <tr><td>8 :</td><td></td><td>(23.0Hz)</td></tr> <tr><td>9 :</td><td></td><td>(25.9Hz)</td></tr> <tr><td>10 :</td><td></td><td>(29.2Hz)</td></tr> <tr><td>11 :</td><td></td><td>(32.9Hz)</td></tr> <tr><td>12 :</td><td></td><td>(37.0Hz)</td></tr> <tr><td>13 :</td><td></td><td>(41.7Hz)</td></tr> <tr><td>14 :</td><td></td><td>(47.0Hz)</td></tr> <tr><td>15 :</td><td></td><td>(59.2Hz)</td></tr> <tr><td>16 :</td><td>Middle response</td><td>(59.6Hz)</td></tr> <tr><td>17 :</td><td></td><td>(67.1Hz)</td></tr> <tr><td>18 :</td><td></td><td>(75.6Hz)</td></tr> <tr><td>19 :</td><td></td><td>(85.2Hz)</td></tr> <tr><td>20 :</td><td></td><td>(95.9Hz)</td></tr> <tr><td>21 :</td><td></td><td>(108.0Hz)</td></tr> <tr><td>22 :</td><td></td><td>(121.7Hz)</td></tr> <tr><td>23 :</td><td></td><td>(137.1Hz)</td></tr> <tr><td>24 :</td><td></td><td>(154.4Hz)</td></tr> <tr><td>25 :</td><td></td><td>(173.9Hz)</td></tr> <tr><td>26 :</td><td></td><td>(195.9Hz)</td></tr> <tr><td>27 :</td><td></td><td>(220.6Hz)</td></tr> <tr><td>28 :</td><td></td><td>(248.5Hz)</td></tr> <tr><td>29 :</td><td></td><td>(279.9Hz)</td></tr> <tr><td>30 :</td><td></td><td>(315.3Hz)</td></tr> <tr><td>31 :</td><td></td><td>(355.1Hz)</td></tr> <tr><td>32 :</td><td>High response</td><td>(400.0Hz)</td></tr> </tbody> </table>	1 :	Low response	(10.0Hz)	2 :		(11.3Hz)	3 :		(12.7Hz)	4 :		(14.3Hz)	5 :		(16.1Hz)	6 :		(18.1Hz)	7 :		(20.4Hz)	8 :		(23.0Hz)	9 :		(25.9Hz)	10 :		(29.2Hz)	11 :		(32.9Hz)	12 :		(37.0Hz)	13 :		(41.7Hz)	14 :		(47.0Hz)	15 :		(59.2Hz)	16 :	Middle response	(59.6Hz)	17 :		(67.1Hz)	18 :		(75.6Hz)	19 :		(85.2Hz)	20 :		(95.9Hz)	21 :		(108.0Hz)	22 :		(121.7Hz)	23 :		(137.1Hz)	24 :		(154.4Hz)	25 :		(173.9Hz)	26 :		(195.9Hz)	27 :		(220.6Hz)	28 :		(248.5Hz)	29 :		(279.9Hz)	30 :		(315.3Hz)	31 :		(355.1Hz)	32 :	High response	(400.0Hz)	3.3.6
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31 :		(355.1Hz)																																																																																																			
32 :	High response	(400.0Hz)																																																																																																			
PA10	INP	In-position range	<ul style="list-style-type: none"> <li>Set the range which outputs the positioning completion in the command pulse unit.</li> </ul>	0 to 50000[PLS]	3.3.7																																																																																																
PA14	POL *	Rotation direction selection	<ul style="list-style-type: none"> <li>Set the rotation direction at load side of the servomotor.</li> </ul>	0: Forward rotation (CCW) with positioning address increase  1: Reverse rotation (CW) with positioning address increase 	3.3.8																																																																																																

### 3 COMMON PARAMETERS

Table 3.1 Servo parameter (Basic setting parameters) list (Continued)

LED display	Symbol	Item	Setting details	Setting value/setting range (Setting by setup software)	Section
PA15	ENR *	Encoder output pulse	<ul style="list-style-type: none"> <li>• Set the encoder pulses (A-phase, B-phase) output by the servo amplifier by the number of output pulses per servomotor revolution or output division ratio. (after multiplication by 4)</li> <li>• Select the number of output pulses per servomotor revolution or output division ratio by "PC03 Encoder output pulses selection".</li> <li>• The number of A/B-phase pulses actually output is 1/4 times greater than the preset value. The maximum output frequency is 4.6[Mpps] (after multiplication by 4). Use this parameter within this range.</li> </ul>	1 to 65535[PLS/rev]	3.3.9

#### POINTS

(1) When the items marked "\*" in the above table has changed, make the Multiple CPU system reset or power supply OFF to ON. And, once turn OFF the servo amplifier power supply and then turn ON it again.

### 3 COMMON PARAMETERS

#### (2) Gain/filter parameters

Table 3.2 Servo parameter (Gain/filter parameters) list

LED display	Symbol	Item	Setting details	Setting value/setting range (Setting by setup software)	Section
PB01	FILT	Adaptive tuning mode (Adaptive filter II)	<ul style="list-style-type: none"> <li>• Set the adaptive filter tuning.</li> <li>• Selecting of "1: Filter tuning mode" automatically sets "PB13: Machine resonance suppression filter 1" and "PB14 Notch form selection 1".</li> <li>• When "1: Filter tuning mode" is selected, the tuning is completed after positioning is done the predetermined number or times for the predetermined period of time, and "2: Manual mode" is set automatically.</li> <li>• When the filter tuning is not necessary, "0: Filter OFF" is set.</li> <li>• When "0: Filter OFF" is selected, "PB13: Machine resonance suppression filter 1" and "PB14 Notch form selection 1" are set to initial value at shipped from the factory. However, this does not occur when the servo off.</li> </ul>	0: Filter OFF 1: Filter tuning mode (Adaptive filter) 2: Manual mode	3.3.10
PB02	VRFT	Vibration suppression control tuning mode (Advanced vibration suppression control)	<ul style="list-style-type: none"> <li>• Set the vibration suppression control tuning mode.</li> <li>• Selecting of "1: Vibration suppression control tuning mode" automatically sets "PB19: Vibration suppression control vibration frequency setting" and "PB20 Vibration suppression control resonance frequency setting".</li> <li>• When "1: Vibration suppression control tuning mode" is selected, "2: Manual mode" is set automatically after positioning is done the predetermined number or times for the predetermined period of time.</li> <li>• When "0: Vibration suppression control OFF" is selected, the vibration suppression control is set to OFF, and "PB19: Vibration suppression control vibration frequency setting" and "PB20 Vibration suppression control resonance frequency setting" are set to initial value at shipped from the factory.</li> </ul>	0: Vibration suppression control OFF 1: Vibration suppression control tuning mode 2: Manual mode	3.3.11
PB04	FFC	Feed forward gain	<ul style="list-style-type: none"> <li>• Set the feed forward gain at the position control. When 100[%] is set during operation at constant speed, the droop pulses do not occur. However, sudden acceleration/deceleration will increase the overshoot. (When the feed forward gain setting is 100[%], a guideline of acceleration/deceleration time is 1[s] or more.)</li> </ul>	0 to 100[%]	3.3.12
PB06	GD2	Ratio of load inertia moment to servomotor inertia moment	<ul style="list-style-type: none"> <li>• Set the ratio of load inertia moment to servomotor.</li> <li>• When the auto tuning mode 1 and interpolation mode is selected, the result of auto tuning is automatically used. When "PA08 Auto tuning mode" is set to "2: Auto tuning mode 2" or "3: Manual mode", the manual setting can be executed.</li> </ul>	0 to 300.0[times]	—

### 3 COMMON PARAMETERS

Table 3.2 Servo parameter (Gain/filter parameters) list (Continued)

LED display	Symbol	Item	Setting details	Setting value/setting range (Setting by setup software)	Section
PB07	PG1	Model loop gain	<ul style="list-style-type: none"> <li>Set the response gain up to the target position.</li> <li>Increase the gain to improve trackability in response to the position command.</li> <li>When the auto tuning mode 1 or 2 is selected, the result of auto tuning is automatically used. When "PA08 Auto tuning mode" is set to "1: Auto tuning mode 1" or "3: Manual mode", the manual setting can be executed.</li> </ul>	1 to 2000[rad/s]	—
PB08	PG2	Position loop gain	<ul style="list-style-type: none"> <li>Set the gain of the position loop.</li> <li>Set this parameter to increase the position response to level load disturbance. Higher setting increases the response level but is liable to generate vibration and/or noise.</li> <li>When the auto tuning mode 1 or 2, manual mode and interpolation mode is selected, the result of auto tuning is automatically used. When "PA08 Auto tuning mode" is set to "3: Manual mode", the manual setting can be executed.</li> </ul>	1 to 1000[rad/s]	—
PB09	VG2	Speed loop gain	<ul style="list-style-type: none"> <li>Set the gain of the speed loop.</li> <li>Set this parameter when vibration occurs on machines of low rigidity or large backlash. Higher setting increases the response level but is liable to generate vibration and/or noise.</li> <li>When the auto tuning mode 1 or 2 and interpolation mode is selected, the result of auto tuning is automatically used. When "PA08 Auto tuning mode" is set to "3: Manual mode", the manual setting can be executed.</li> </ul>	20 to 50000[rad/s]	—
PB10	VIC	Speed integral compensation	<ul style="list-style-type: none"> <li>Set the integral time constant of the speed loop.</li> <li>Lower setting increases the response level but is liable to generate vibration and/or noise.</li> <li>When the auto tuning mode 1 or 2 and interpolation mode is selected, the result of auto tuning is automatically used. When "PA08 Auto tuning mode" is set to "3: Manual mode", the manual setting can be executed.</li> </ul>	0.1 to 1000.0[ms]	—
PB11	VDC	Speed differential compensation	<ul style="list-style-type: none"> <li>Set the differential compensation.</li> <li>It becomes valid when PID is set in the PI-PID switching.</li> </ul>	0 to 1000	—
PB13	NH1	Machine resonance suppression filter 1	<ul style="list-style-type: none"> <li>Set the notch frequency of the machine resonance suppression filter 1. (Set the frequency to match the response frequency of the mechanical system.)</li> <li>Setting of "PB01 Adaptive tuning mode" to "1: Filter tuning mode" automatically sets this parameter.</li> <li>Setting of "PB01 Adaptive tuning mode" to "0: Filter OFF" invalidates this parameter.</li> </ul>	100 to 4500[Hz]	—

### 3 COMMON PARAMETERS

Table 3.2 Servo parameter (Gain/filter parameters) list (Continued)

LED display	Symbol	Item	Setting details	Setting value/setting range (Setting by setup software)	Section
PB14	NHQ1	Notch shape selection 1	<ul style="list-style-type: none"> <li>Set the machine resonance suppression filter 1 (Notch shape selection 1).</li> <li>Setting of "PB01 Adaptive tuning mode" to "1: Filter tuning mode" automatically sets this parameter.</li> <li>Setting of "PB01 Adaptive tuning mode" to "0: Filter OFF" invalidates this parameter.</li> </ul>	Notch depth selection 0: Deep (-40db) 1: ↑ (-14db) 2: ↓ (-8db) 3: Shallow (-4db) Notch width selection 0: Standard ( $\alpha=2$ ) 1: ↑ ( $\alpha=3$ ) 2: ↓ ( $\alpha=4$ ) 3: Wide ( $\alpha=5$ )	3.3.13
PB15	NH2	Machine resonance suppression filter 2	<ul style="list-style-type: none"> <li>Set the notch frequency of the machine resonance suppression filter 2. (Set the frequency to match the response frequency of the mechanical system.)</li> <li>Setting of "PB16 Notch shape selection 2" to "0□□1: Machine resonance suppression filter selection is valid" validates this parameter.</li> </ul>	100 to 4500[Hz]	—
PB16	NHQ2	Notch shape selection 2	<ul style="list-style-type: none"> <li>Set the machine resonance suppression filter 2 (Notch shape selection 2).</li> </ul>	Machine resonance suppression filter 2 selection 0: Invalid 1: Valid Notch depth selection 0: Deep (-40db) 1: ↑ (-14db) 2: ↓ (-8db) 3: Shallow (-4db) Notch width selection 0: Standard ( $\alpha=2$ ) 1: ↑ ( $\alpha=3$ ) 2: ↓ ( $\alpha=4$ ) 3: Wide ( $\alpha=5$ )	3.3.14
PB18	LPF	Low pass filter setting	<ul style="list-style-type: none"> <li>Set the low pass filter.</li> <li>Setting of "PB23: Low pass filter selection" to "0: Automatic setting" automatically changes this parameter.</li> <li>When "PB23: Low pass filter selection" is set to "1: Manual setting", the manual setting can be executed.</li> </ul>	100 to 18000[rad/s]	—
PB19	VRF1	Vibration suppression control - vibration frequency setting	<ul style="list-style-type: none"> <li>Set the vibration frequency for vibration suppression control to suppress low-frequency machine vibration, such as enclosure vibration.</li> <li>Setting of "PB02: Vibration suppression control tuning mode" to "1: Vibration suppression control tuning mode" automatically changes this parameter.</li> <li>When "PB02: Vibration suppression control tuning mode" is set to "2: Manual setting", the manual setting can be executed.</li> <li>Setting of "PB02: Vibration suppression control tuning mode" to "0: Vibration suppression control OFF" invalidates this parameter.</li> </ul>	0.1 to 100.0[Hz]	—

### 3 COMMON PARAMETERS

Table 3.2 Servo parameter (Gain/filter parameters) list (Continued)

LED display	Symbol	Item	Setting details	Setting value/setting range (Setting by setup software)	Section
PB20	VRF2	Vibration suppression control - resonance frequency setting	<ul style="list-style-type: none"> <li>Set the resonance frequency for vibration suppression control to suppress low-frequency machine vibration, such as enclosure vibration.</li> <li>Setting of "PB02: Vibration suppression control tuning mode" to "1: Vibration suppression control tuning mode" automatically changes this parameter.</li> <li>When "PB02: Vibration suppression control tuning mode" is set to "2: Manual setting", the manual mode can be executed.</li> <li>Setting of "PB02: Vibration suppression control tuning mode" to "0: Vibration suppression control OFF" invalidates this parameter.</li> </ul>	0.1 to 100.0[Hz]	—
PB23	VFBF	Low pass filter selection	<ul style="list-style-type: none"> <li>Select the setting method of low pass filter.</li> </ul>	0: Automatic setting 1: Manual mode (Setting value of "PB18: Low pass filter setting".)	3.3.15
PB24	MVS *	Slight vibration suppression control selection	<ul style="list-style-type: none"> <li>Select the slight vibration suppression control and PI-PID switching.</li> <li>Setting of "PA08: Auto tuning mode" to "3: Manual mode" validates this parameter.</li> </ul>	Slight vibration suppression control selection 0: Invalid 1: Valid PI-PID control switch over selection 0: PI control is valid 3: PID control is always valid	3.3.16
PB26	CDP *	Gain changing selection	<ul style="list-style-type: none"> <li>Select the gain changing selection/condition.</li> </ul>	Gain changing selection 0: Invalid 1: Control instructions from Motion CPU 2: Command frequency (Setting value of "PB27: Gain changing condition".) 3: Droop pulse value (Setting value of "PB27: Gain changing condition".) 4: Servomotor speed (Setting value of "PB27: Gain changing condition".) Gain changing condition 0: Valid at more than condition (For control instructions from Motion CPU, valid with gain changing command ON.) 1: Valid at less than condition (For control instructions from Motion CPU, valid with gain changing command OFF.)	3.3.17
PB27	CDL	Gain changing condition	<ul style="list-style-type: none"> <li>Set the value of gain changing condition (command frequency, droop pulses, servomotor speed) selected in "PB26: Gain changing selection".</li> <li>The set value unit changes with the changing condition.</li> </ul>	0 to 9999[Kpps, PLS, r/min]	—
PB28	CDT	Gain changing time constant	<ul style="list-style-type: none"> <li>Set the time constant at which the gains will change in response to the conditions set in "PB26: Gain changing selection" and "PB27: Gain changing condition".</li> </ul>	0 to 100[ms]	—
PB29	GD2B	Gain changing - ratio of load inertia moment to servo motor inertia moment	<ul style="list-style-type: none"> <li>Set the ratio of load inertia moment to servomotor inertia moment when gain changing is valid.</li> <li>Setting of "PA08: Auto tuning mode" to "3: Manual mode" validates this parameter.</li> </ul>	0.0 to 300.0[times]	—
PB30	PG2B	Gain changing - position loop gain	<ul style="list-style-type: none"> <li>Set the position loop gain when the gain changing is valid.</li> <li>Setting of "PA08: Auto tuning mode" to "3: Manual mode" validates this parameter.</li> </ul>	1 to 2000[rad/s]	—



### 3 COMMON PARAMETERS

Table 3.2 Servo parameter (Gain/filter parameters) list (Continued)

LED display	Symbol	Item	Setting details	Setting value/setting range (Setting by setup software)	Section
PB31	VG2B	Gain changing - speed loop gain	<ul style="list-style-type: none"> <li>Set the speed loop gain when the gain changing is valid.</li> <li>Setting of "PA08: Auto tuning mode" to "3: Manual mode" validates this parameter.</li> </ul>	20 to 50000[rad/s]	—
PB32	VICB	Gain changing - speed integral compensation	<ul style="list-style-type: none"> <li>Set the speed integral compensation when the gain changing is valid.</li> <li>Setting of "PA08: Auto tuning mode" to "3: Manual mode" validates this parameter.</li> </ul>	0.1 to 5000.0[ms]	—
PB33	VRF1B	Gain changing - vibration suppression control - vibration frequency setting	<ul style="list-style-type: none"> <li>Set the vibration frequency for vibration suppression control when the gain changing is valid.</li> <li>Setting of "PB02: Vibration suppression control filter tuning mode" to "2: Manual mode" and "PB26: Gain changing selection" to "1: Control instructions from Motion CPU" validates this parameter.</li> </ul> <p>(Note): Always execute the gain changing after the servomotor has stopped.</p>	0.1 to 100.0[Hz]	—
PB34	VRF2B	Gain changing - vibration suppression control - resonance frequency setting	<ul style="list-style-type: none"> <li>Set the resonance frequency for vibration suppression control when the gain changing is valid.</li> <li>Setting of "PB02: Vibration suppression control filter tuning mode" to "2: Manual mode" and "PB26: Gain changing selection" to "1: Control instructions from Motion CPU" validates this parameter.</li> </ul> <p>(Note): Always execute the gain changing after the servomotor has stopped.</p>	0.1 to 100.0[Hz]	—

#### POINTS

(1) When the items marked "\*" in the above table has changed, make the Multiple CPU system reset or power supply OFF to ON. And, once turn OFF the servo amplifier power supply and then turn ON it again.

### 3 COMMON PARAMETERS

#### (3) Extension setting parameters

Table 3.3 Servo parameter (Extension setting parameters) list

LED display	Symbol	Item	Setting details	Setting value/setting range (Setting by setup software)	Section
PC01	ERZ *	Error excessive alarm level	• Set the error excessive alarm level with rotation amount of servomotor.	1 to 200[rev]	—
PC02	MBR	Electromagnetic brake sequence output	• Set the delay time between electronic brake interlock signal (MBR) and the base drive circuit is shut-off.	0 to 1000[ms]	—
PC03	ENRS *	Encoder output pulse selection	• Select the encoder output pulse direction and encoder pulse output setting.	Encoder output pulse direction 0: A-phase increase 90° by CCW motor turning 1: A-phase increase 90° by CW motor turning Encoder pulse output setting 0: Output pulse designation 1: Division ration setting	3.3.18
PC04	COP1 *	Function selection C-1	• Select the serial encoder cable. • The following encoder cables are 4-wire type. • MR-EKCBL30M-L • MR-EKCBL30M-H • MR-EKCBL40M-H • MR-EKCBL50M-H	0: 2-wire type 1: 4-wire type	3.3.19
PC05	COP2 *	Function selection C-2	• Select the motor-less operation.	0: Invalid 1: Valid	3.3.20
PC07	ZSP	Zero speed	• Set the output range of the zero speed (ZSP). • Zero speed signal detection has hysteresis width of 20[r/min].	0 to 10000[r/min]	—
PC09	MOD1	Analog monitor 1 output	• Select the signal provided to the analog monitor 1 output. (Note-1): Encoder pulse unit (Note-2): 8[V] is output at the maximum torque. (Note-3): It can be used by the absolute (absolute position) system.	0: Servomotor speed ( $\pm 8V/\text{max. speed}$ ) 1: Torque ( $\pm 8V/\text{max. torque}$ ) <sup>(Note-2)</sup> 2: Servomotor speed (+8V/max. speed) 3: Torque (+8V/max. torque) <sup>(Note-2)</sup> 4: Current command ( $\pm 8V/\text{max. current command}$ ) 5: Speed command ( $\pm 8V/\text{max. speed command}$ ) 6: Droop pulses ( $\pm 10V/1 \times 10^2$ [PLS]) <sup>(Note-1)</sup> 7: Droop pulses ( $\pm 10V/1 \times 10^3$ [PLS]) <sup>(Note-1)</sup> 8: Droop pulses ( $\pm 10V/1 \times 10^4$ [PLS]) <sup>(Note-1)</sup> 9: Droop pulses ( $\pm 10V/1 \times 10^5$ [PLS]) <sup>(Note-1)</sup> A: Feedback position ( $\pm 10V/1 \times 10^6$ [PLS]) <sup>(Note-1,3)</sup> B: Feedback position ( $\pm 10V/1 \times 10^7$ [PLS]) <sup>(Note-1,3)</sup> C: Feedback position ( $\pm 10V/1 \times 10^8$ [PLS]) <sup>(Note-1,3)</sup> D: Bus voltage ( $\pm 8V/400V$ )	3.3.21
PC10	MOD2	Analog monitor 2 output	• Select the signal provided to the analog monitor 2 output. (Note-1): Encoder pulse unit (Note-2): 8[V] is output at the maximum torque. (Note-3): It can be used by the absolute (absolute position) system.	0: Servomotor speed ( $\pm 8V/\text{max. speed}$ ) 1: Torque ( $\pm 8V/\text{max. torque}$ ) <sup>(Note-2)</sup> 2: Servomotor speed (+8V/max. speed) 3: Torque (+8V/max. torque) <sup>(Note-2)</sup> 4: Current command ( $\pm 8V/\text{max. current command}$ ) 5: Speed command ( $\pm 8V/\text{max. speed command}$ ) 6: Droop pulses ( $\pm 10V/1 \times 10^2$ [PLS]) <sup>(Note-1)</sup> 7: Droop pulses ( $\pm 10V/1 \times 10^3$ [PLS]) <sup>(Note-1)</sup> 8: Droop pulses ( $\pm 10V/1 \times 10^4$ [PLS]) <sup>(Note-1)</sup> 9: Droop pulses ( $\pm 10V/1 \times 10^5$ [PLS]) <sup>(Note-1)</sup> A: Feedback position ( $\pm 10V/1 \times 10^6$ [PLS]) <sup>(Note-1,3)</sup> B: Feedback position ( $\pm 10V/1 \times 10^7$ [PLS]) <sup>(Note-1,3)</sup> C: Feedback position ( $\pm 10V/1 \times 10^8$ [PLS]) <sup>(Note-1,3)</sup> D: Bus voltage ( $\pm 8V/400V$ )	3.3.22
PC11	MO1	Analog monitor 1 offset	• Set the offset voltage of the analog monitor 1 output.	-999 to 999[mV]	—
PC12	MO2	Analog monitor 2 offset	• Set the offset voltage of the analog monitor 2 output.	-999 to 999[mV]	—

### 3 COMMON PARAMETERS

Table 3.3 Servo parameter (Extension setting parameters) list (Continued)

LED display	Symbol	Item	Setting details	Setting value/setting range (Setting by setup software)	Section
PC17	COP4 *	Function Selection C-4	<ul style="list-style-type: none"> <li>Set the home position setting condition.</li> <li>Set this parameter when using the absolute position encoder.</li> </ul>	0: Need to pass motor Z phase after the power supply is switched on 1: Not need to pass motor Z phase after the power supply is switched on	3.3.23
PC21	BPS *	Alarm history clear	<ul style="list-style-type: none"> <li>Clear the alarm history.</li> </ul>	0: Invalid 1: Valid (When alarm history clear is made valid, the alarm history is cleared at next power-on. After the alarm history is cleared, the setting is automatically made invalid (reset to 0).)	3.3.24

#### POINTS

(1) When the items marked "\*" in the above table has changed, make the Multiple CPU system reset or power supply OFF to ON. And, once turn OFF the servo amplifier power supply and then turn ON it again.

(4) I/O Setting Parameters

Table 3.4 Servo parameter (I/O Setting Parameters) list

LED display	Symbol	Item	Setting details	Setting value/setting range (Setting by setup software)	Section
PD07	DO1 *	Output signal device selection 1 (CN3-13)	<ul style="list-style-type: none"> <li>Set the signal output to the connector (CN3-13 pin) of servo amplifier.</li> <li>(Note-1): It becomes always OFF in speed control mode.</li> <li>(Note-2): It becomes SA (Speed reached) in speed control mode.</li> <li>(Note-3): Never change this setting for manufacturer setting.</li> </ul>	00: Always OFF 01: For manufacturer setting <sup>(Note-3)</sup> 02: RD (Servo ON) 03: ALM (Trouble) 04: INP (In-position) <sup>(Note-1)</sup> 05: MBR (Electromagnetic brake interlock) 06: DB (External dynamic brake) 07: TLC (Limiting torque) 08: WNG (Warning) 09: RWNG (Battery warning) 0A: Always OFF <sup>(Note-2)</sup> 0B: For manufacturer setting <sup>(Note-3)</sup> 0C: ZSP (Zero speed) 0D: For manufacturer setting <sup>(Note-3)</sup> 0E: For manufacturer setting <sup>(Note-3)</sup> 0F: CDPS (Variable gain selection) 10: For manufacturer setting <sup>(Note-3)</sup> 11: ABSV (Absolute position erasing) <sup>(Note-1)</sup> 12 to 1F, 20 to 3F: For manufacturer setting <sup>(Note-3)</sup>	3.3.25
PD08	DO2 *	Output signal device selection 2 (CN3-9)	<ul style="list-style-type: none"> <li>Set the signal output to the connector (CN3-9 pin) of servo amplifier.</li> <li>(Note-1): It becomes always OFF in speed control mode.</li> <li>(Note-2): It becomes SA (Speed reached) in speed control mode.</li> <li>(Note-3): Never change this setting for manufacturer setting.</li> </ul>	00: Always OFF 01: For manufacturer setting <sup>(Note-3)</sup> 02: RD (Servo ON) 03: ALM (Trouble) 04: INP (In-position) <sup>(Note-1)</sup> 05: MBR (Electromagnetic brake interlock) 06: DB (External dynamic brake) 07: TLC (Limiting torque) 08: WNG (Warning) 09: RWNG (Battery warning) 0A: Always OFF <sup>(Note-2)</sup> 0B: For manufacturer setting <sup>(Note-3)</sup> 0C: ZSP (Zero speed) 0D: For manufacturer setting <sup>(Note-3)</sup> 0E: For manufacturer setting <sup>(Note-3)</sup> 0F: CDPS (Variable gain selection) 10: For manufacturer setting <sup>(Note-3)</sup> 11: ABSV (Absolute position erasing) <sup>(Note-1)</sup> 12 to 1F, 20 to 3F: For manufacturer setting <sup>(Note-3)</sup>	3.3.26
PD09	DO3 *	Output signal device selection 3 (CN3-15)	<ul style="list-style-type: none"> <li>Set the signal output to the connector (CN3-15 pin) of servo amplifier.</li> <li>(Note-1): It becomes always OFF in speed control mode.</li> <li>(Note-2): It becomes SA (Speed reached) in speed control mode.</li> <li>(Note-3): Never change this setting for manufacturer setting.</li> </ul>	00: Always OFF 01: For manufacturer setting <sup>(Note-3)</sup> 02: RD (Servo ON) 03: ALM (Trouble) 04: INP (In-position) <sup>(Note-1)</sup> 05: MBR (Electromagnetic brake interlock) 06: DB (External dynamic brake) 07: TLC (Limiting torque) 08: WNG (Warning) 09: RWNG (Battery warning) 0A: Always OFF <sup>(Note-2)</sup> 0B: For manufacturer setting <sup>(Note-3)</sup> 0C: ZSP (Zero speed) 0D: For manufacturer setting <sup>(Note-3)</sup> 0E: For manufacturer setting <sup>(Note-3)</sup> 0F: CDPS (Variable gain selection) 10: For manufacturer setting <sup>(Note-3)</sup> 11: ABSV (Absolute position erasing) <sup>(Note-1)</sup> 12 to 1F, 20 to 3F: For manufacturer setting <sup>(Note-3)</sup>	3.3.27

### 3 COMMON PARAMETERS

Table 3.4 Servo parameter (I/O Setting Parameters) list (Continued)

LED display	Symbol	Item	Setting details	Setting value/setting range (Setting by setup software)	Section
PD14	DOP3 *	Function Selection D-3	• Set the ALM output signal at warning occurrence.	0: When the warning occurs; WNG (Warning): OFF to ON ALM (Trouble): ON 1: When the warning occurs; WNG (Warning): OFF to ON ALM (Trouble): ON to OFF	3.3.28

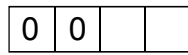
#### POINTS

(1) When the items marked "\*" in the above table has changed, make the Multiple CPU system reset or power supply OFF to ON. And, once turn OFF the servo amplifier power supply and then turn ON it again.

### 3 COMMON PARAMETERS

#### 3.3.2 Regenerative brake option

This parameter is set to use the regenerative brake option.



Selection of regenerative brake option

00 : Regenerative brake option is not used.

·EMR-J3-10B: Regenerative brake resistor is not used.

·EMR-J3-20B or more and -700B or less: Built-in regenerative brake resistor is used.

·ESupplied regenerative brake resistors or regenerative brake option is used with the MR-J3-11KB(4) or more servo amplifier.

01 : FR-BU(-H)·FR-RC(-H)·FR-CV(-H)

02 : MR-RB032

03 : MR-RB12

04 : MR-RB32

05 : MR-RB30

06 : MR-RB50

08 : MR-RB31

09 : MR-RB51

FA : When regenerative brake resistors or regenerative brake option supplied to MR-J3-11KB(4) or more are cooled by fans to increase capability.

#### 3.3.3 Absolute position detection system

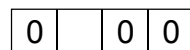
This parameter is set to use the absolute (absolute position) system in the position control mode.

0: Invalid (Used in incremental system)

1: Valid (Used in absolute system)

#### 3.3.4 Function selection A-1

This parameter is set to use the forced stop input of servo amplifier.



Selection of servo forced stop

0: Valid (Forced stop (EM1) is used.)

1: Invalid (Forced stop (EM1) is not used.)

When not using the forced stop of servo amplifier, set the selection of servo forced stop to "1: Invalid".

The forced stop automatically turns on inside the servo amplifier.

#### 3.3.5 Auto tuning mode

This parameter is used to select the gain adjustment mode.

Setting value	Name	Automatically set parameter
0	Interpolation mode	PB06, PB08, PB09, PB10
1	Auto tuning mode 1	PB06, PB08, PB08, PB09, PB10
2	Auto tuning mode 2	PB07, PB08, PB09, PB10
3	Manual mode	—

### 3 COMMON PARAMETERS

#### 3.3.6 Auto tuning response

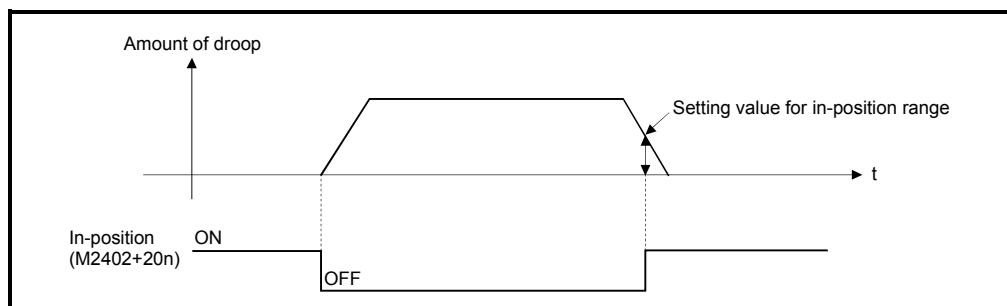
- (1) This parameter is used to increase the response of servo amplifier. The response of servo amplifier increases by changing (as 1, 2, ... 5) the setting value of auto tuning response.

Setting value	Response	Guideline for machine resonance frequency [Hz]	Setting value	Response	Guideline for machine resonance frequency [Hz]
1	Low response ↑	10.0	17	Middle response ↑	67.1
2		11.3	18		75.6
3		12.7	19		85.2
4		14.3	20		95.9
5		16.1	21		108.0
6		18.1	22		121.7
7		20.4	23		137.1
8		23.0	24		154.4
9		25.9	25		173.9
10		29.2	26		195.9
11		32.9	27		220.6
12		37.0	28		248.5
13		41.7	29		279.9
14		47.0	30		315.3
15		52.9	31		355.1
16	Middle response	59.6	32		High response

- (2) It is increased in order from the low response setting side while checking the vibration and stop setting time immediately before stopping motor or machine. If a machine resonance will occur at this time, decrease the setting value.
- (3) Change the auto tuning response setting while stopping motor.

#### 3.3.7 In-position range

- (1) "In-position" is the droop pulses in the deviation counter.
- (2) If an in-position value is set, the in-position signal (M2402+20n) turns on when the difference between the position command and position feedback from the servomotor becomes within the setting range.



- (3) Setting range is 0 to 50000[PLS].

### 3 COMMON PARAMETERS

#### 3.3.8 Rotation direction selection

This parameter is used to set the rotation direction at load side of the servomotor.

Setting value	Servomotor rotation direction	
	When positioning address increases	When positioning address decreases
0	CCW	CW
1	CW	CCW

#### 3.3.9 Encoder output pulse

This parameter is used to set the encoder pulses (A-phase, B-phase) output by the servo amplifier. Set the value 4 times greater than the A-phase or B-phase pulses. Setting range is 1 to 65535[PLS/rev].

"PC03: Encoder output pulse selection" can be used to select the output pulse setting or output division ratio setting. The number of A/B-phase pulses actually output is 1/4 times greater than the preset value. The maximum output frequency is 4.6[Mpps] (after multiplication by 4). Use this parameter within this range.

(1) For output pulse designation

Set "0000h" (initial value) to "PC03: Encoder output pulse selection".

Set the number of pulses per servomotor revolution.

Output pulse = Setting value [PLS/rev]

For example, set "5600h" to "PA15: Encoder output pulse", the actually output A/B-phase pulses are shown below.

$$\text{A/B-phase output pulses} = \frac{5600}{4} = 1400[\text{PLS}]$$

(2) For output division ratio setting

Set "001□h" (initial value) to "PC03: Encoder output pulse selection".

The number of pulses per servomotor revolution is divided by the setting value.

$$\text{Output pulse} = \frac{\text{Resolution per servomotor revolution}}{\text{Setting value}} [\text{PLS/rev}]$$

For example, set "8h" to "PA15: Encoder output pulse", the actually output A/B-phase pulses are shown below:

$$\text{A/B-phase output pulses} = \frac{262144}{8} \times \frac{1}{4} = 8192[\text{PLS}]$$



### 3 COMMON PARAMETERS

#### 3.3.10 Adaptive tuning mode

(1) This parameter is used to set the adaptive filter tuning.

Setting value	Name	Automatically set parameter
0	Filter OFF	PB13, PB14 (Fixed to the initial value)
1	Filter tuning mode	PB13, PB14
2	Manual mode	—

(2) Selecting of "1: Filter tuning mode" automatically sets "PB13: Machine resonance suppression filter 1" and "PB14 Notch form selection 1".

#### 3.3.11 Vibration suppression control tuning mode

This parameter is used to set the vibration suppression control tuning mode.

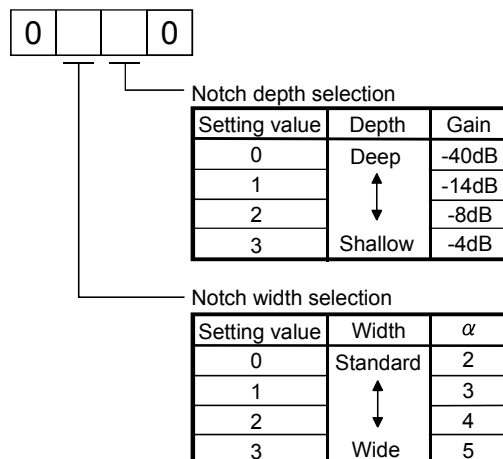
Setting value	Name	Automatically set parameter
0	Vibration suppression control OFF	PB19, PB20 (Fixed to the initial value)
1	Vibration suppression control tuning mode	PB19, PB20
2	Manual mode	—

#### 3.3.12 Feed forward gain

This parameter is used to improve the trackability in response of servo amplifier. Setting range is 0 to 100[%]. (Servo amplifier use)

#### 3.3.13 Notch shape selection 1

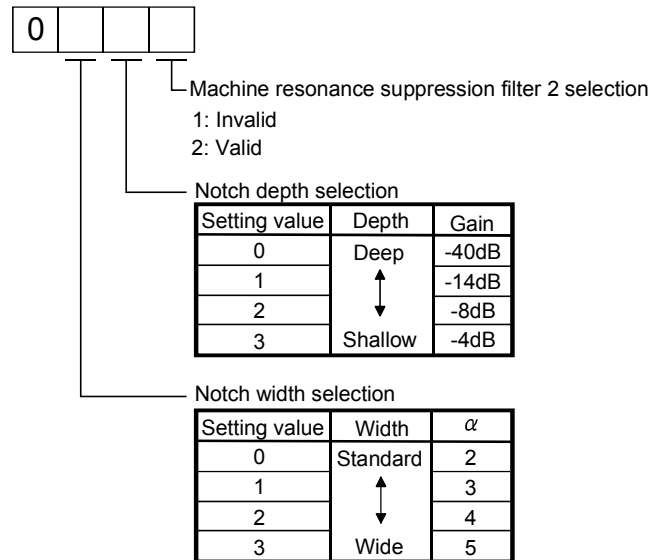
This parameter is used to select the machine resonance suppression filter 1 (Notch shape selection 1).



### 3 COMMON PARAMETERS

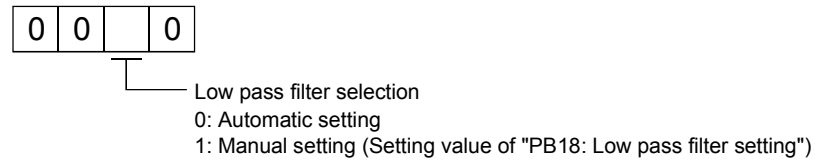
#### 3.3.14 Notch shape selection 2

This parameter is used to select the machine resonance suppression filter 2 (Notch shape selection 2).



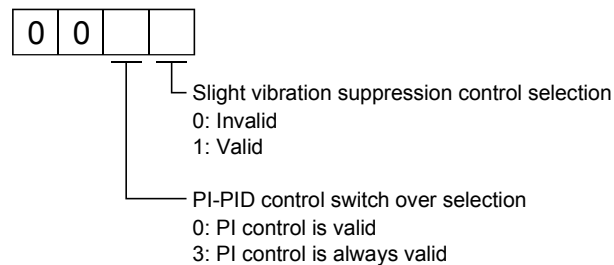
#### 3.3.15 Low pass filter selection

This parameter is used to select the low pass filter.



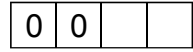
#### 3.3.16 Slight vibration suppression control selection

This parameter is used to select the slight vibration suppression control and PI-PID switching.



#### 3.3.17 Gain changing selection

This parameter is used to select the gain changing condition.



Gain changing selection

Under any of the following conditions, the gains change based on the setting value of servo parameter PB29 to PB32.

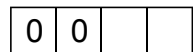
- 0: Invalid
- 1: Control instructions from Motion CPU
- 2: Command frequency (Setting value of "PB27: Gain changing condition")
- 3: Droop pulse value (Setting value of "PB27: Gain changing condition")
- 4: Servomotor speed (Setting value of "PB27: Gain changing condition")

Gain changing condition

- 0: Valid at more than condition  
(For control instructions from Motion CPU, valid with gain changing command ON)
- 1: Valid at less than condition  
(For control instructions from Motion CPU, valid with gain changing command OFF)

#### 3.3.18 Encoder output pulse selection

This parameter is used to select the encoder output pulse direction and encoder pulse output setting.



Encoder pulse output phase changing

Changing the phases of a, B-phase encoder pulses output.

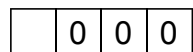
Setting value	Servomotor rotation direction	
	CCW	CW
0	A-phase B-phase	A-phase B-phase
1	A-phase B-phase	A-phase B-phase

Encoder output pulse setting selection

- 0: Output pulse designation
- 1: Division ratio setting

#### 3.3.19 Function selection C-1

This parameter is used to select the serial encoder cable.



Serial encoder cable communication system selection

- 0: 2-wire type
- 1: 4-wire type

The following serial encoder cables are 4-wire type.

- MR-EKCBL30M-L
- MR-EKCBL30M-H
- MR-EKCBL40M-H
- MR-EKCBL50M-H

The other all serial encoder cables are 2-wire type.

Incorrect setting will result in an encoder error 1 (Error code: 2016) or encoder error 2 (Error code: 2020).

### 3 COMMON PARAMETERS

#### 3.3.20 Function selection C-2

This parameter is used to select the motor-less operation.

0	0	0	
---	---	---	--

Motor-less operation selection  
 0: Valid  
 1: Invalid

If motor-less operation is set to valid, the output signal can be output and status display is possible as well as the case in which the motor operates actually without connecting the servomotor.

It can be checked the Motion SFC program (SV13/SV22)/Motion program (SV43) of Multiple CPU system without connecting a motor.

POINT
Function selection C-2 (Motor-less operation selection) Motor-less operation differs from operation in which an actual motor is run in that, in response to signals input in motor-less operation, motor operation is simulated and output signals and state display data are created under the condition that the load torque zero and moment of load inertia are the same as the motor's moment of inertia. Accordingly, the acceleration/deceleration time and effective torque or the peak load display value and the regenerative load ratio is always "0", which is not the case when the real motor is operated.

#### 3.3.21 Analog monitor 1 output

This parameter is used to output the operating status of servo amplifier to analog monitor in real time. The operating status can be checked by analog output.

This function is used to monitor the status of servo amplifier using an ammeter or synchronize the torque/speed with the other servo amplifiers.

Set the signal provided to the analog monitor 1 output.

0	0	0	
---	---	---	--

Analog monitor 1 output

Setting value	Setting details
0	Servomotor speed ( $\pm 8V/\text{max. speed}$ )
1	Torque ( $\pm 8V/\text{max. torque}$ ) <sup>(Note-2)</sup>
2	Servomotor speed ( $+8V/\text{max. speed}$ )
3	Torque ( $+8V/\text{max. torque}$ ) <sup>(Note-2)</sup>
4	Current command ( $\pm 8V/\text{max. current command}$ )
5	Speed command ( $\pm 8V/\text{max. speed command}$ )
6	Droop pulses ( $\pm 10V/1 \times 10^2[\text{PLS}]$ ) <sup>(Note-1)</sup>
7	Droop pulses ( $\pm 10V/1 \times 10^3[\text{PLS}]$ ) <sup>(Note-1)</sup>
8	Droop pulses ( $\pm 10V/1 \times 10^4[\text{PLS}]$ ) <sup>(Note-1)</sup>
9	Droop pulses ( $\pm 10V/1 \times 10^5[\text{PLS}]$ ) <sup>(Note-1)</sup>
A	Feedback position ( $\pm 10V/1 \times 10^6[\text{PLS}]$ ) <sup>(Note-1,3)</sup>
B	Feedback position ( $\pm 10V/1 \times 10^7[\text{PLS}]$ ) <sup>(Note-1,3)</sup>
C	Feedback position ( $\pm 10V/1 \times 10^8[\text{PLS}]$ ) <sup>(Note-1,3)</sup>
D	Bus voltage ( $\pm 8V/400V$ )

(Note-1): Encoder pulse unit

(Note-2): 8[V] is output at the maximum torque.

(Note-3): It can be used by the absolute (absolute position) system.

### 3 COMMON PARAMETERS

#### 3.3.22 Analog monitor 2 output

This parameter is used to output the operating status of servo amplifier to analog monitor in real time. The operating status can be checked by analog output. This function is used to monitor the status of servo amplifier using an ammeter or synchronize the torque/speed with the other servo amplifiers. Set the signal provided to the analog monitor 1 output.

0 0 0

Analog monitor 2 output

Setting value	Setting details
0	Servomotor speed ( $\pm 8V/\text{max. speed}$ )
1	Torque ( $\pm 8V/\text{max. torque}$ ) <sup>(Note-2)</sup>
2	Servomotor speed ( $+8V/\text{max. speed}$ )
3	Torque ( $+8V/\text{max. torque}$ ) <sup>(Note-2)</sup>
4	Current command ( $\pm 8V/\text{max. current command}$ )
5	Speed command ( $\pm 8V/\text{max. speed command}$ )
6	Droop pulses ( $\pm 10V/1 \times 10^2[\text{PLS}]$ ) <sup>(Note-1)</sup>
7	Droop pulses ( $\pm 10V/1 \times 10^3[\text{PLS}]$ ) <sup>(Note-1)</sup>
8	Droop pulses ( $\pm 10V/1 \times 10^4[\text{PLS}]$ ) <sup>(Note-1)</sup>
9	Droop pulses ( $\pm 10V/1 \times 10^5[\text{PLS}]$ ) <sup>(Note-1)</sup>
A	Feedback position ( $\pm 10V/1 \times 10^6[\text{PLS}]$ ) <sup>(Note-1,3)</sup>
B	Feedback position ( $\pm 10V/1 \times 10^7[\text{PLS}]$ ) <sup>(Note-1,3)</sup>
C	Feedback position ( $\pm 10V/1 \times 10^8[\text{PLS}]$ ) <sup>(Note-1,3)</sup>
D	Bus voltage ( $\pm 8V/400V$ )

(Note-1): Encoder pulse unit

(Note-2): 8[V] is output at the maximum torque.

(Note-3): It can be used by the absolute (absolute position) system.

#### 3.3.23 Function Selection C-4

This parameter is used to set the home position setting condition. It is set when using the absolute position encoder.

0 0 0

Selection of home position setting condition

0: Need to pass motor Z phase after the power supply is switched on.

1: Not need to pass motor Z phase after the power supply is switched on.

#### 3.3.24 Alarm history clear

This parameter is used to clear the alarm history.

0 0 0

Alarm history clear

0: Invalid

1: Valid

When alarm history clear is made valid, the alarm history is cleared at next power-on. After the alarm history is cleared, the setting is automatically made invalid (reset to 0).

### 3 COMMON PARAMETERS

#### 3.3.25 Output signal device selection 1

This parameter is used to set the signal output to the connector (CN3-13 pin) of servo amplifier. The device that can be assigned changes depending on the control mode.

0	0	0	
---	---	---	--

└ Select the output device of the CN3-13 pin.

The devices that can be assigned in each control mode are shown below.  
If any other device is set, it is invalid.

Setting value	Position control mode	Speed control mode
00	Always OFF	Always OFF
01	For manufacturer setting <sup>(Note)</sup>	For manufacturer setting <sup>(Note)</sup>
02	RD (Servo ON)	RD (Servo ON)
03	ALM (Trouble)	ALM (Trouble)
04	INP (In-position)	Always OFF
05	MBR (Electromagnetic brake interlock)	MBR (Electromagnetic brake interlock)
06	DB (External dynamic brake)	DB (External dynamic brake)
07	TLC (Limiting torque)	TLC (Limiting torque)
08	WNG (Warning)	WNG (Warning)
09	RWNG (Battery warning)	RWNG (Battery warning)
0A	Always OFF	SA (Speed reached)
0B	For manufacturer setting <sup>(Note)</sup>	For manufacturer setting <sup>(Note)</sup>
0C	ZSP (Zero speed)	ZSP (Zero speed)
0D	For manufacturer setting <sup>(Note)</sup>	For manufacturer setting <sup>(Note)</sup>
0E	For manufacturer setting <sup>(Note)</sup>	For manufacturer setting <sup>(Note)</sup>
0F	CDPS (Variable gain selection)	CDPS (Variable gain selection)
10	For manufacturer setting <sup>(Note)</sup>	For manufacturer setting <sup>(Note)</sup>
11	ABSV (Absolute position erasing)	Always OFF
12 to 1F	For manufacturer setting <sup>(Note)</sup>	For manufacturer setting <sup>(Note)</sup>
20 to 3F	For manufacturer setting <sup>(Note)</sup>	For manufacturer setting <sup>(Note)</sup>

(Note): Encoder pulse unit For manufacturer setting. Never change this setting.

#### 3.3.26 Output signal device selection 2

This parameter is used to set the signal output to the connector (CN3-9 pin) of servo amplifier. The device that can be assigned changes depending on the control mode. Refer to the table of Section 3.3.25 for the devices that can be assigned.

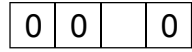
#### 3.3.27 Output signal device selection 3

This parameter is used to set the signal output to the connector (CN3-15 pin) of servo amplifier. The device that can be assigned changes depending on the control mode. Refer to the table of Section 3.3.25 for the devices that can be assigned.

### 3 COMMON PARAMETERS

#### 3.3.28 Function selection D-3

This parameter is used to set the ALM output signal at warning occurrence.



Selection of output device at warning occurrence  
 Select the warning (WNG) and trouble (ALM) output status at warning occurrence.

Output of servo amplifier

Setting value	(Note) Device status
0	<p>WNG 1 0 ALM 1 0 Warning occurrence</p>
1	<p>WNG 1 0 ALM 1 0 Warning occurrence</p>

(Note) 0: OFF  
 1: ON

4. AUXILIARY AND APPLIED FUNCTIONS

4.1 Limit Switch Output Function

This function is used to output the ON/OFF signal corresponding to the data range of the watch data set per output device.

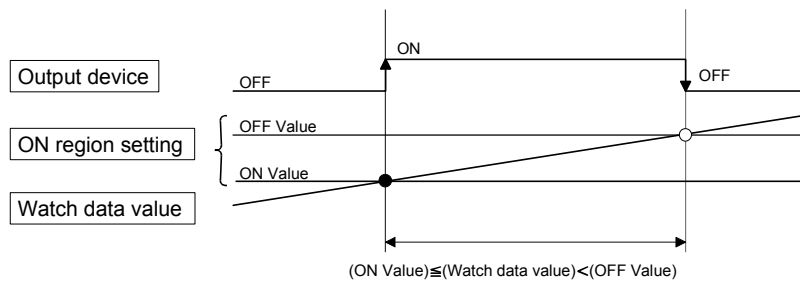
Motion control data or optional word data can be used as watch data. (Refer to Section "4.1.2 Limit output setting data" for details.) A maximum output device for 32 points can be set regardless of the number of axes.

4.1.1 Operations

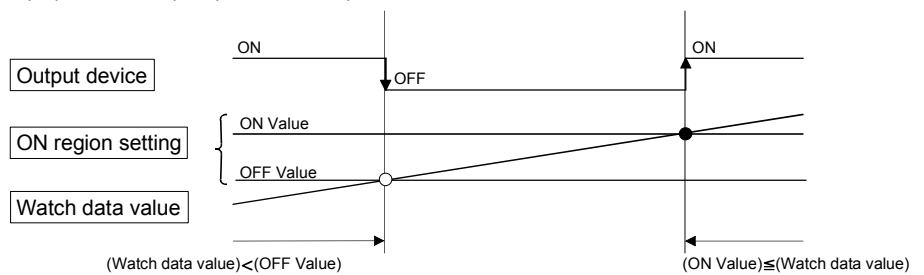
- (1) ON output to an output device is made while the watch data value is in the ON output region set with (ON Value) and (OFF Value) in this function.
  - (a) (ON Value), (OFF Value) and watch data value are handled as signed data. ON output region where an ON output is made to the output device is governed by the magnitude relationship between (ON Value) and (OFF Value) as indicated below.

Relationship between (ON Value) and (OFF Value)	ON output region
$(ON\ Value) < (OFF\ Value)$	$(ON\ Value) \leq (watch\ data\ value) < (OFF\ Value)$
$(ON\ Value) > (OFF\ Value)$	$(ON\ Value) \leq (watch\ data\ value)$ $(Watch\ data\ value) < (OFF\ Value)$
$(ON\ Value) = (OFF\ Value)$	Output OFF in whole region

1)  $(ON\ Value) < (OFF\ Value)$



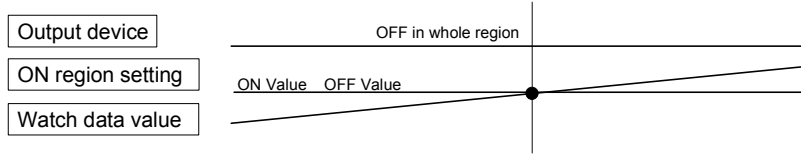
2)  $(ON\ Value) > (OFF\ Value)$





## 4 AUXILIARY AND APPLIED FUNCTIONS

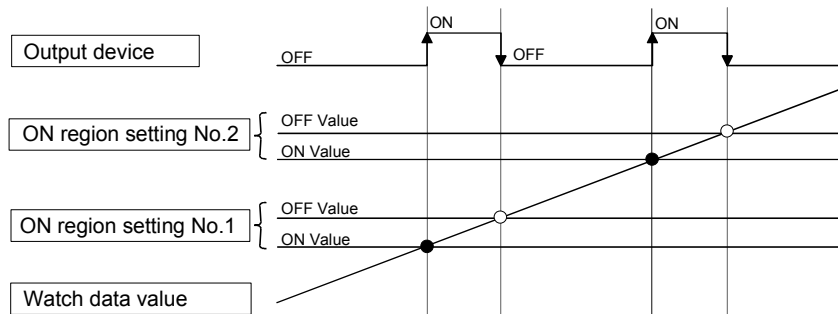
### 3) (ON Value) = (OFF Value)



- (b) The limit switch outputs are controlled based on the each watch data during the PCPU ready status (M9074: ON) by the PLC ready flag (M2000) from OFF to ON.

When the PCPU ready flag (M9074) turns OFF by turning the PLC ready flag (M2000) from ON to OFF, all points turn OFF. When (ON Value) and (OFF Value) are specified with word devices, the word device contents are input to the internal area when the PLC ready flag (M2000) turns from OFF to ON. After that, the word device contents are input per motion operation cycle, and limit switch outputs are controlled.

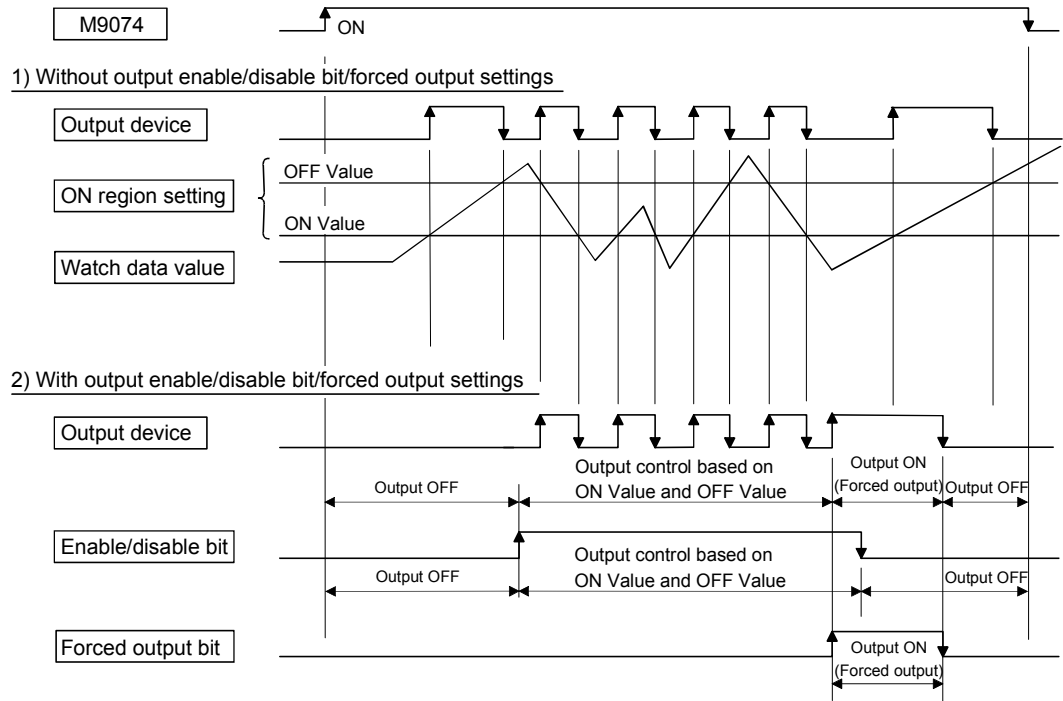
- (c) Multiple outputs (Up to 32 points) can be also set to one watch data. In each setting, the output device may be the same. If multiple ON region settings have been made to the same output device, the logical add of the output results in the regions is output.



- (2) Output enable/disable bit can be set and executed enable/disable of the limit switch outputs point-by-point. Limit switch output control is executed when the output enable/disable bit is ON, and the output is OFF when it is OFF. If there is no setting, the outputs are always enabled.
- (3) Forced output bit can be set and turned the forcibly output of the limit switch outputs point-by-point ON. The output is ON when the forced output bit is ON. Priority is given to control of this setting over off (disable) of the "output enable/disable bit". If there is no setting, no forced outputs are not always made.

## 4 AUXILIARY AND APPLIED FUNCTIONS

- (4) When the multiple watch data, ON region, output enable/disable bit and forced output bit are set to the same output device, the logical add of output results of the settings is output.



## 4 AUXILIARY AND APPLIED FUNCTIONS

### 4.1.2 Limit output setting data

Limit output data list are shown below.

Up to 32 points of output devices can be set.

(The following items of No.1 to No.5 are set together as one point.)

No.	Item		Setting range	Fetch cycle	Refresh cycle	Remarks	
1	Output device		Bit device (X, Y, M, L, B)	—	Operation cycle		
2	Watch data		Motion control data/ word device (D, W, #, absolute address) (16-bit integer type/32-bit integer type/ 64-bit floating-point type)	Operation cycle	—		
3	ON region setting	ON Value	Word device (D, W, #)/constant (K, H)				
		OFF Value	Word device (D, W, #)/constant (K, H)				
4	Output enable/disable bit		Bit device (X, Y, M, L, B, F, special relay)/ none (default)				ON : Enable OFF : Disable None : Always enable
5	Forced output bit		Bit device (X, Y, M, L, B, F, special relay)/ none (default)				None : No forced outputs are always made (OFF status)

#### (1) Output device

- (a) Set the bit device which outputs the ON/OFF signal toward the preset watch data.
- (b) As the output device, the following devices can be used.

Item	Device No. setting range
Input relay <sup>(Note-1)</sup>	X0 to X1FFF
Output relay <sup>(Note-2)</sup>	Y0 to Y1FFF
Internal relay <sup>(Note-3)</sup>	M0 to M8191
Latch relay	L0 to L8191
Link relay	B0 to B1FFF

(Note-1) : PX is write-disabled and it cannot be used as the output device.

For X, only the free No. of the input card non-loading can be used.

(Note-2) : The real output device range (PY) is also included.

(Note-3) : M2001 to M2032 cannot be used to the output device.

Be careful because it affect a positioning operation, when the positioning dedicated devices are set.

## 4 AUXILIARY AND APPLIED FUNCTIONS

### (2) Watch data

(a) This data is used to perform the limit switch output function. This data is comparison data to output the ON/OFF signal. The output device is ON/OFF-controlled according to the ON region setting.

(b) As the watch data, motion control data or optional word device data can be used.

#### 1) Motion control data

##### a) SV13/SV22

Item	Unit	Data type	Axis No. setting range	
			Q173HCPU	Q172HCPU
Feed current value	Position command	32-bit integer type	1 to 32	1 to 8
Real current value				
Deviation counter value	PLS			
Motor current	0.1%	16-bit integer type		
Motor speed	0.1r/min	32-bit integer type	1 to 12	1 to 8
Cam shaft within-one-revolution current value	PLS			
Feed current value (Virtual)				
After-differential current value (Virtual)				
After-differential encoder current value				
Encoder current value				

##### b) SV43

Item	Unit	Data type	Axis No. setting range	
			Q173HCPU	Q172HCPU
Machine value	Position command	32-bit integer type	1 to 32	1 to 8
Real machine value				
Deviation counter value	PLS			
Motor current	0.1%	16-bit integer type		
Motor speed	0.1r/min	32-bit integer type		
Current value	Position command			

#### 2) Word device data

Item	Device No. setting range
Data register	D0 to D8191
Link register	W0 to W1FFF
Motion register	#0 to #8191

## 4 AUXILIARY AND APPLIED FUNCTIONS

- 3) When the optional device data is set, the following data type is set as the data type to be compared.

Data type	Device No. setting range
16-bit integer type	Set the device No. as an even No..
32-bit integer type	
64-bit floating-point type	

### (3) ON region setting

- (a) The data range which makes the output device turn ON/OFF toward the watch data.
- (b) The following devices can be used as the ON Value and OFF Value of the data range.  
The data type of device/constant to be set is the same as the type of watch data.

Item	Device No. setting range
Data register	D0 to D8191
Link register	W0 to W1FFF
Motion register	#0 to #8191
Constant	Hn/Kn

### (4) Output enable/disable bit

- (a) Set the status of output enable/disable bit when the limit switch output is forbidden during operation.
- 1) The following control is exercised.

Output enable/disable bit	Control description
Without setting (always enable)	Limit switch output is turned ON/OFF based on the ON region setting (ON Value, OFF Value).
With setting	
ON (enable)	Limit switch output is turned OFF.
OFF (disable)	

- (b) Usable devices

Item	Device No. setting range
Input relay <sup>(Note-1)</sup>	X0 to X1FFF
Output relay <sup>(Note-2)</sup>	Y0 to Y1FFF
Internal relay	M0 to M8191
Latch relay	L0 to L8191
Link relay	B0 to B1FFF
Annunciator	F0 to F2047
Special relay	M9000 to M9255

(Note-1) : The real input range(PX) is included.

(Note-2) : The real input range(PY) is included.

## 4 AUXILIARY AND APPLIED FUNCTIONS

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### (5) Forced output bit

- (a) Set the "forced output bit" when you want to forcibly provide the limit switch outputs during operation.

1) The following control is exercised.

Forced output bit		Control description
Without setting		Limit switch outputs are turned ON/OFF on the basis of the "output enable/disable bit" and ON region setting (ON Value, OFF Value).
With setting	OFF	
	ON	

(b) Usable devices

Item	Device No. setting range
Input relay	X0 to X1FFF
Output relay	Y0 to Y1FFF
Internal relay	M0 to M8191
Latch relay	L0 to L8191
Link relay	B0 to B1FFF
Annunciator	F0 to F2047
Special relay	M9000 to M9255

### 4.2 Absolute Position System

The positioning control for absolute position system can be performed using the absolute-position-compatible servomotors and servo amplifiers.

If the machine position is set at the system starting, home position return is not necessary because the absolute position is detected at the power on.

The machine position is set with the home position return using the Motion SFC program (SV13/SV22)/Motion program (SV43) or a peripheral device.

(1) Conditions of the absolute position system start

Perform a home position return after machine adjustment at the absolute position system start.

(2) In the absolute positioning system, the absolute position may be lost in the following cases:

Set the absolute position with a home position return.

(a) The battery unit is removed or replaced.

(b) The battery error of the servo amplifier occurs. (It is detected at the servo amplifier power on).

(c) The machine system is disturbed by a shock.

(d) The cable between servo amplifier and encoder is removed, or the servo amplifier or encoder is replaced.

(3) The current value history can be monitored using of the "System setting mode-allowable travel during power off" or "Monitor mode" using a peripheral device. (Refer to the help of SW6RN-GSV□P to be used "Allowable travel during power off" and "Monitor mode".)

#### CAUTION

- After removing or replacing the battery unit, correctly install the new unit and set the absolute position.
- After a servo battery error occurs, eliminate the cause of the error and ensure operation is safe before setting the absolute position.
- After the mechanical system is disturbed by a shock, make the necessary checks and repairs, and ensure operation is safe before setting the absolute position.

POINT
-------

- |  |
|--|
| <p>(1) The address setting range of absolute position system is 2147483648 to 2147483647.<br/>It is not possible to restore position commands that exceed this limit, or current values after a power interruption.<br/>Correspond by the [degree] setting for an infinite feed operation.</p> <p>(2) Even when the current value address is changed by a current value change instruction, the restored data for the current value after a power interruption is the value based on the status prior to execution of the current value change instruction.</p> <p>(3) When home position return has not been completed (home position return request is ON), restoration of the current value after a power interruption is not possible.</p> |
|--|



## 4 AUXILIARY AND APPLIED FUNCTIONS

### 4.2.1 Current value control

The current value when using the ABS encoder is controlled by following functions.

- (1) The validity of an encoder data during operation is checked.
  - (a) Checks that the amount of change of the encoder in a 3.5[ms] is within 180 degrees at the motor axis. (An error is displayed at the abnormal.)
  - (b) Checks that adjustment of the encoder data and feed-back positions controlled with the servo amplifier. (An error is displayed at the abnormal.)

- (2) The following values can be monitored by the current value history using the peripheral devices.

Monitor conditions	Monitor value
Multiple CPU system power ON/OFF	Encoder current value, Servo command value, Monitor current value
Home position return completion	

- (a) Current value history monitor

Month/day/hour/minute

The time such as at the completion of home position return and servo amplifier power supply ON/OFF is indicated.

In order to indicate the time correctly, turn on M9028 (clock data read request) in the Motion SFC program (SV13/SV22)/Motion program (SV43) after setting the clock data of special register.

- (b) Encoder current value

When using the MR-J3-□B, the multiple revolution data and within-one-revolution data read from the encoder is indicated.

(Note) : For the encoder current value in the home position data area, the encoder current value when the motor is within the in-position range at the completion of home position return is displayed (not encoder value of home position).

- (c) Servo command value

The command value issued to the servo amplifier is indicated.

- (d) Monitor current value

The current value controlled in the Motion CPU is indicated.

(Note) : A value near the feed current value/machine value is indicated.

However, because the monitor current value and feed current value/machine value are different data, it is not abnormal even if a different value is indicated.

- (e) Alarms

When an error for current value restoration occurs at the servo amplifier power on, an error code is indicated.

- (3) By setting of the "Allowable travel during power off", if the encoder data changes exceeding the setting range during power-off, it checks at servo amplifier power-on. (An error is displayed at the abnormal.)

"Allowable travel during power off" cannot be set for the Linear servo amplifier.

## 4 AUXILIARY AND APPLIED FUNCTIONS

### 4.3 High-Speed Reading of Specified Data

This function is used to store the specified positioning data in the specified device (D, W). The signal from input module controlled in the Motion CPU is used as a trigger. It can be set in the system setting of SW6RN-GSV□P.

#### (1) Positioning data that can be set

##### (a) SV13/SV22

Setting data	Word No.	Unit	Remarks
Position command (Feed current value)	2	$10^{-1}$ [ $\mu$ m], $10^{-5}$ [inch], $10^{-5}$ [degree], [PLS]	
Actual current value	2	$10^{-1}$ [ $\mu$ m], $10^{-5}$ [inch], $10^{-5}$ [degree], [PLS]	
Position droop (Deviation counter value)	2	[PLS]	
M-code	1	—	
Torque limit value	1	[%]	
Motor current	1	[%]	
Motor speed	2	[r/min]	
Servo command value	2	[PLS]	
Virtual servomotor feed current value	2	[PLS]	
Synchronous encoder current value	2	[PLS]	
Virtual servo M-code	1	—	
Current value after main shaft differential gear	2	[PLS]	
Current value within one revolution of cam axis	2	[PLS]	
Execute cam No.	1	—	
Execute stroke amount	2	$10^{-1}$ [ $\mu$ m], $10^{-5}$ [inch] [PLS]	
Optional address (Fixed to 4 bytes)	2	—	Valid in SV22 virtual mode only

##### (b) SV43

Set data	Word No.	Unit	Remarks
Position command (Machine value)	2	$10^{-4}$ [mm], $10^{-5}$ [inch], $10^{-5}$ [degree]	
Real machine value	2	$10^{-4}$ [mm], $10^{-5}$ [inch], $10^{-5}$ [degree]	
Position droop (Deviation counter value)	2	[PLS]	
M-codes	1	—	
Torque limit value	1	[%]	
Motor current	1	[%]	
Motor speed	2	[r/min]	
Servo command value	2	[PLS]	
Optional address (Fixed to 4 bytes)	2	—	

#### (2) Modules and signals to be used

Input module	Signal	Read timing	Number of settable points
Q172EX	TREN	0.8[ms]	2
Q173PX			3
PLC input module <sup>(Note)</sup>	PX device		8

(Note) : Only one PLC input module can be used.

## 4 AUXILIARY AND APPLIED FUNCTIONS

---

### 4.4 ROM Operation Function

This function is used to store beforehand the user programs and parameters in the internal FLASH ROM memory built-in the Motion CPU module, and operate it based on the data of internal FLASH ROM memory.

#### 4.4.1 About the ROM operation function

The outline procedure of ROM operation function is shown below.

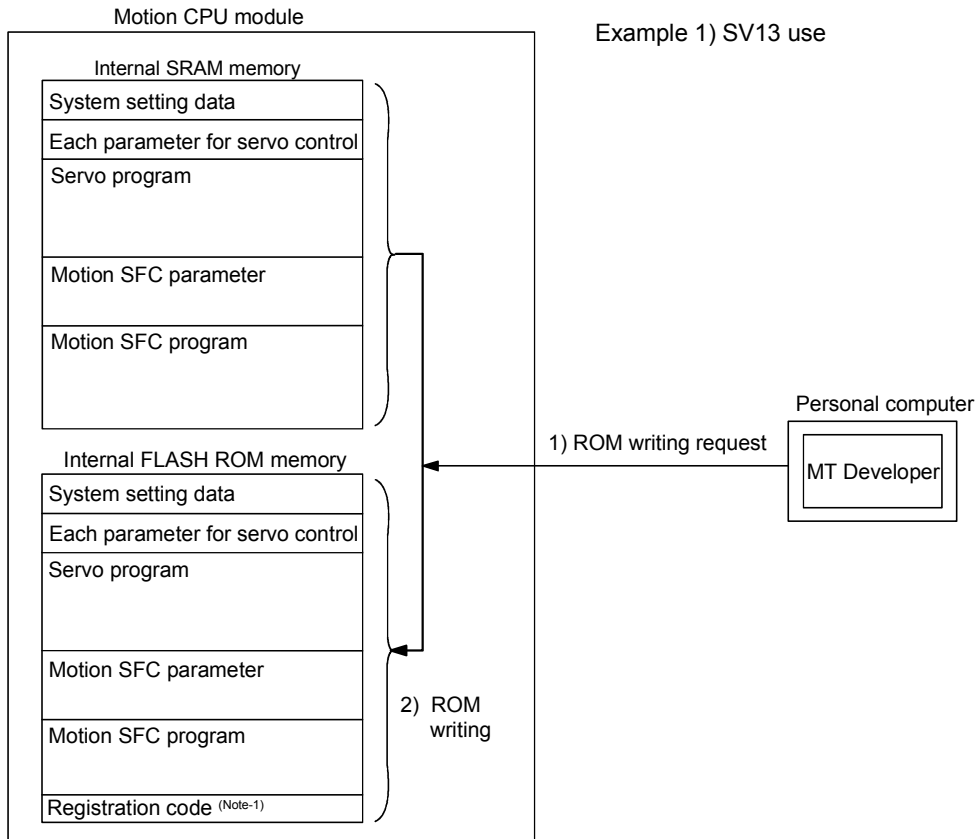
- (1) Turn on or reset the power supply of Multiple CPU system in the "Mode operated by RAM".
- (2) Execute a trial run and adjustment by creating the system setting, programs and parameters using SW6RN-GSV□P.
- (3) Turn on or reset the power supply of Multiple CPU system in the "Installation mode • mode written in ROM".
- (4) Write the system setting, programs and parameters of SRAM built-in the Motion CPU module to the internal FLASH ROM by performing the ROM writing request using SW6RN-GSV□P.
- (5) Start a normal operation by starting the Motion CPU in the "Mode operated by ROM" after reading the system setting, programs and parameters written in the internal FLASH ROM to the internal SRAM.

POINT
(1) Switch the operation mode using a DIP switches of Motion CPU module.
(2) Confirm the operation mode with "Mode LED" and "BOOT LED" of Motion CPU module.

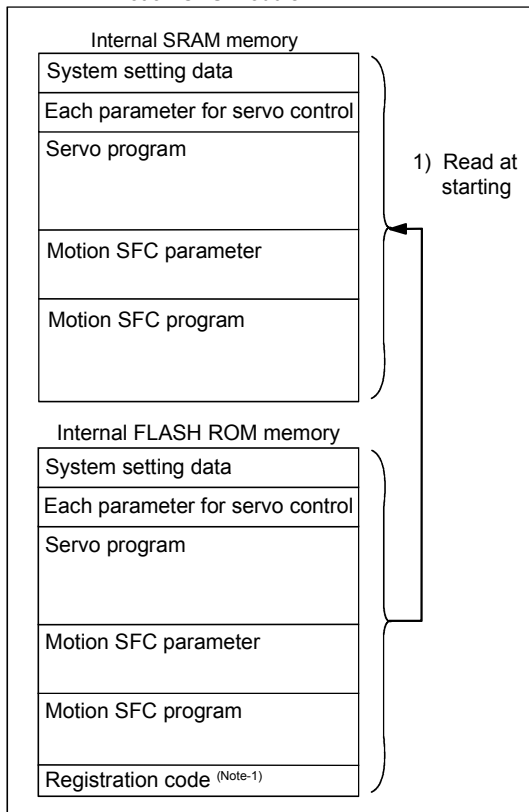
Outline of processing is shown next page.

## 4 AUXILIARY AND APPLIED FUNCTIONS

- Installation mode - mode written in ROM



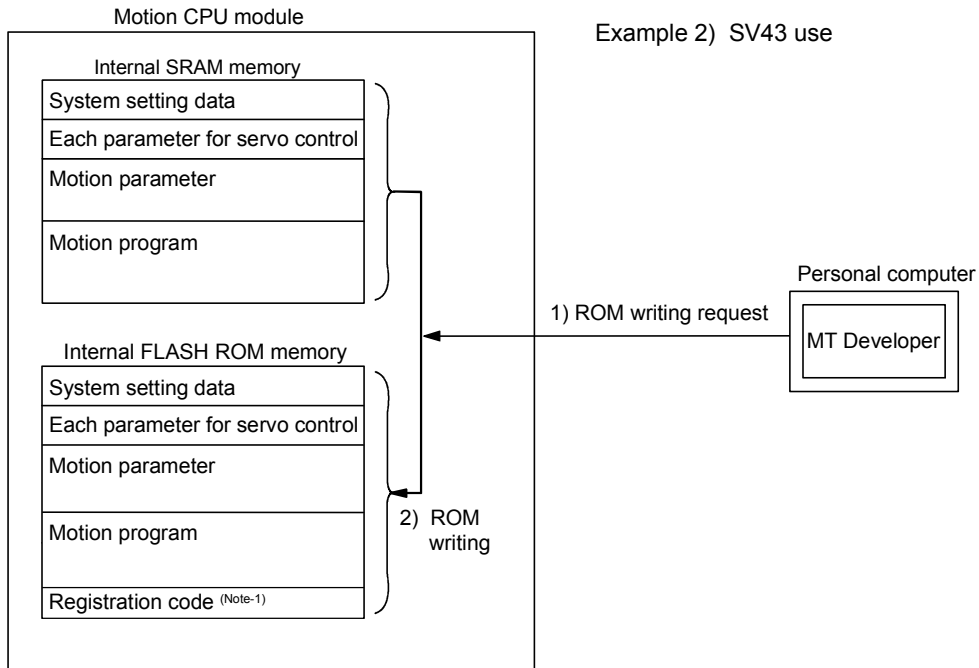
- Mode operated by ROM
- Motion CPU module



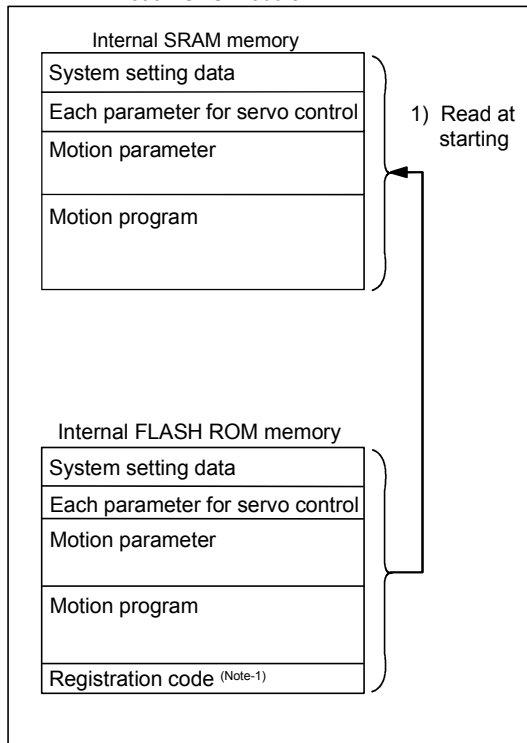
(Note-1) : "Registration code" is used to judge whether the programs and parameters written in the internal FLASH ROM are normal or not.

## 4 AUXILIARY AND APPLIED FUNCTIONS

- Installation mode • mode written in ROM



- Mode operated by ROM
- Motion CPU module

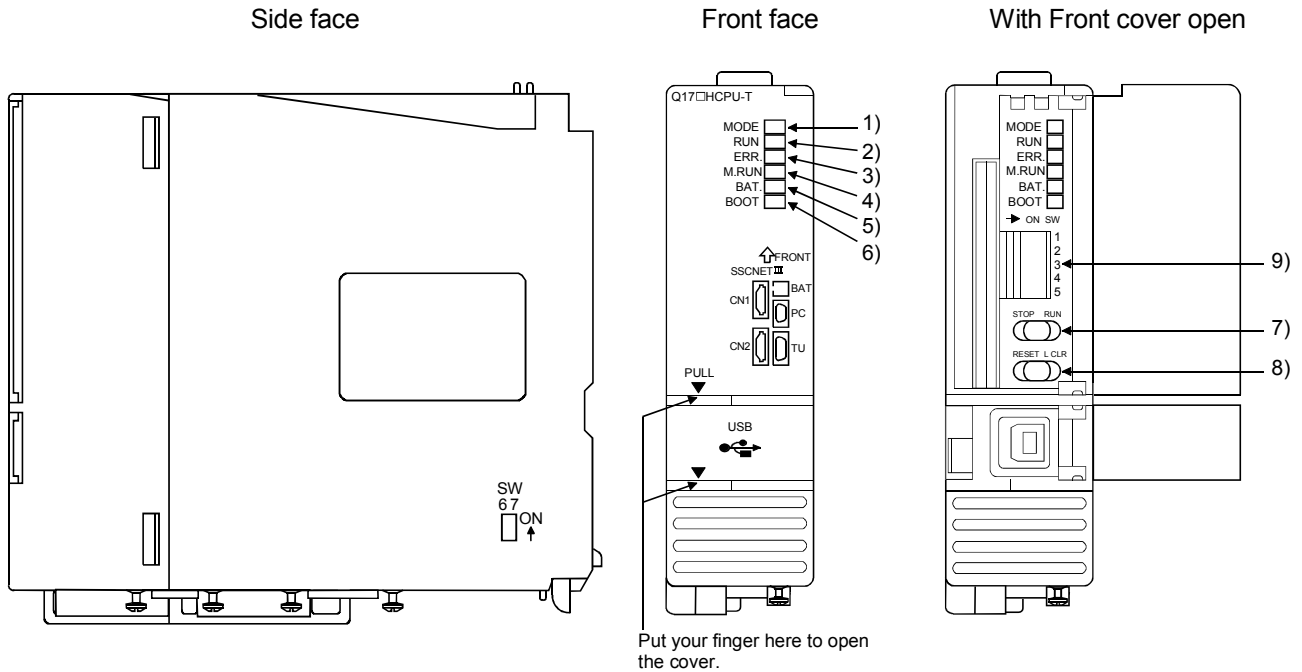


(Note-1) : "Registration code" is used to judge whether the programs and parameters written in the internal FLASH ROM are normal or not.

## 4 AUXILIARY AND APPLIED FUNCTIONS

### 4.4.2 Specifications of LED • switch

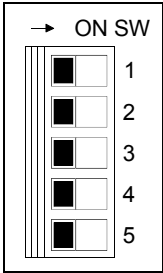
#### (1) Name of parts



No.	Name	Application
1)	MODE LED (Mode judging)	<ul style="list-style-type: none"> <li>• Lit (green) : Normal mode</li> <li>• Lit (orange) : Installation mode • mode written in ROM</li> </ul>
2)	RUN LED	<ul style="list-style-type: none"> <li>• Lit : Motion CPU normal start</li> <li>• Not lit : Motion CPU fault</li> </ul> <p>LED turns off when the trouble occurred at Motion CPU start or WDT error occurred.</p>
3)	ERR. LED	<ul style="list-style-type: none"> <li>• Lit : LED turns on at following errors occurrence.                             <ol style="list-style-type: none"> <li>1) WDT error</li> <li>2) System setting error</li> <li>3) Servo error</li> <li>4) Self diagnostic error which will not stop the operation (except battery error).</li> <li>5) Operating system software is not installed.</li> </ol> </li> <li>• Flickers : Detection of self diagnostic error which will stop the operation.</li> <li>• Not lit : Normal</li> </ul>
4)	M.RUN LED	<ul style="list-style-type: none"> <li>• Lit : During motion control</li> <li>• Flickers : Latch clear start</li> <li>• Not lit : Not during motion control or detection of self diagnostic error which will stop the operation.</li> </ul>
5)	BAT. LED	<ul style="list-style-type: none"> <li>• Lit : Battery error occurrence (External battery use)</li> </ul>
6)	BOOT LED	<ul style="list-style-type: none"> <li>• Lit : Mode operated by ROM</li> <li>• Not lit : Mode operated by RAM/Installation mode • mode written in ROM</li> </ul>

## 4 AUXILIARY AND APPLIED FUNCTIONS

### (2) Applications of switches

No.	Name	Application																
7)	RUN/STOP switch	<ul style="list-style-type: none"> <li>• Move to RUN/STOP.</li> <li>RUN : Motion SFC program (SV13/SV22)/Motion program (SV43) is started.</li> <li>STOP : Stops Motion SFC program (SV13/SV22)/Motion program (SV43) is stopped.</li> </ul>																
8)	RESET/L.CLR switch (Note-1) (Momentary switch)	<p>RESET : Set the switch to the "RESET" position once to reset the hardware. Applies a reset after an operation error and initialized the operation.</p> <p>L.CLR : Clear the latch area all data which set with the parameters. (LATCH CLEAR also clears data outside the latch area at this time.)</p> <ul style="list-style-type: none"> <li>• Latch clear operating method               <ol style="list-style-type: none"> <li>1) Set the "RUN/STOP" switch to "STOP".</li> <li>2) Move the "RESET/L.CLR" switch to "L.CLR" several times until the "M.RUN LED" flickers. ( "M.RUN LED" flickers : Latch clear completed. )</li> <li>3) Move the "RESET/L.CLR" switch to "L.CLR" once more. ( "M.RUN LED" turn off. )</li> </ol> </li> </ul>																
9)	Dip switches 	Dip switch 1	Must not be used. (Shipped from the factory in OFF position)															
		Dip switch 2	ROM operating setting (Shipped from the factory in OFF position)															
		Dip switch 3	<table border="0"> <tr> <td>SW2</td> <td>SW3</td> <td></td> </tr> <tr> <td>OFF</td> <td>OFF</td> <td>→ Mode operated by RAM</td> </tr> <tr> <td>ON</td> <td>OFF</td> <td>→ Must not be set</td> </tr> <tr> <td>OFF</td> <td>ON</td> <td>→ Must not be set</td> </tr> <tr> <td>ON</td> <td>ON</td> <td>→ Mode operated by ROM</td> </tr> </table>	SW2	SW3		OFF	OFF	→ Mode operated by RAM	ON	OFF	→ Must not be set	OFF	ON	→ Must not be set	ON	ON	→ Mode operated by ROM
		SW2	SW3															
		OFF	OFF	→ Mode operated by RAM														
ON	OFF	→ Must not be set																
OFF	ON	→ Must not be set																
ON	ON	→ Mode operated by ROM																
Dip switch 4	Must not be used. (Shipped from the factory in OFF position)																	
Dip switch 5 (Installation • ROM writing switch)	<p>ON : Installation mode • mode written in ROM</p> <p>OFF : Normal mode (Mode operated by RAM / Mode operated by ROM)</p> <p>Turn ON dip switch 5 when installed the operating system software into the Motion CPU module from the peripheral device. After completing the installation, move to switch and re-start.</p>																	

(Note-1) : It is not possible to reset the Multiple CPU system by each of the PLC CPU/Motion CPU No.2 to 4.

If it is reset, other CPU occurred to stop of the overall Multiple CPU system where "MULTI CPU DOWN" (Error code: 7000).

The overall Multiple CPU system reset is resetting the CPU No.1 of PLC CPU.

## 4 AUXILIARY AND APPLIED FUNCTIONS

### 4.4.3 ROM operation function details

(1) Operation mode

"Operation mode" of CPU is set by the state of DIP switch 2, 3, 5 of Motion CPU module at the power supply on or reset of Multiple CPU system.  
DIP switch setting, operation mode and operation mode overview are shown below.

(a) DIP switch setting and operation mode

Dip switch setting			Operation mode
SW2	SW3	SW5	
OFF	OFF	ON	Installation mode • mode written in ROM
OFF	ON	ON	Must not be set (Note-1)
ON	OFF	ON	Must not be set (Note-1)
ON	ON	ON	Installation mode • mode written in ROM
OFF	OFF	OFF	Mode operated by RAM
OFF	ON	OFF	Must not be set (Note-2)
ON	OFF	OFF	Must not be set (Note-2)
ON	ON	OFF	Mode operated by ROM

(Note-1) : It operates in the "Installation mode • mode written in ROM" for wrong setting.

(Note-2) : It operates in the "Mode operated by RAM" for wrong setting.

(b) Operation mode overview

Operation mode	Operation overview
Installation mode • mode written in ROM	<ul style="list-style-type: none"> <li>• MODE LED turns on in orange.</li> <li>• BOOT LED turns off.</li> <li>• The operating system software can be installed.</li> <li>• The user programs and parameters for ROM operation can be written to the FLASH ROM built-in Motion CPU module.</li> <li>• ROM writing is executed at ROM operating after operation check in the RAM operating mode. The user programs and parameters stored in the SRAM built-in Motion CPU module are batch written to the FLASH ROM built-in Motion CPU module.</li> <li>• It becomes STOP state regardless of the RUN/STOP switch in front of Motion CPU module.</li> <li>• The digital oscilloscope function cannot be used.</li> </ul>
Mode operated by RAM	<ul style="list-style-type: none"> <li>• MODE LED turns on in green.</li> <li>• BOOT LED turns off.</li> <li>• Operation is executed based on the user programs and parameters stored in the SRAM built-in Motion CPU module.</li> </ul>
Mode operated by ROM	<ul style="list-style-type: none"> <li>• MODE LED turns on in green.</li> <li>• BOOT LED turns on.</li> <li>• Operation starts after reading the user programs and parameters stored in the internal FLASH ROM to the internal SRAM at power supply on or reset of Multiple CPU system. Even if the user programs and parameters are changed by SW6RN-GSV□P during ROM operating mode, it returns to the contents of internal FLASH ROM at next power supply on or system reset.</li> <li>Also, even if the auto tuning data are reflected on the servo parameter of Motion CPU by operating the servo amplifier with auto-tuning setting, it returns to the contents of internal FLASH ROM at next power supply on or reset release.</li> </ul>



## 4 AUXILIARY AND APPLIED FUNCTIONS

<b>POINT</b>	<p>Do not change the DIP switch setting during operation. Be sure to turn off the power supply of the Multiple CPU system to change the DIP switch setting.</p>
--------------	---

(2) Applicable data into ROM

The data contents batch written to the internal FLASH ROM by ROM writing are shown below. Backup data except the followings (current position of servomotor in absolute position system, home position and latch device, etc.) cannot be written to the internal FLASH ROM.

(a) Content of applicable data into ROM

SV13	SV22	SV43
System setting data		
Each parameter for servo control		
Servo program		—
Motion SFC parameter		Motion parameter
Motion SFC program		Motion program
—	Mechanical system program <sup>(Note-1)</sup>	—
—	Cam data <sup>(Note-1)</sup>	—

(Note-1) : Mechanical system program and cam data are "applicable data into ROM", when using the SV22.

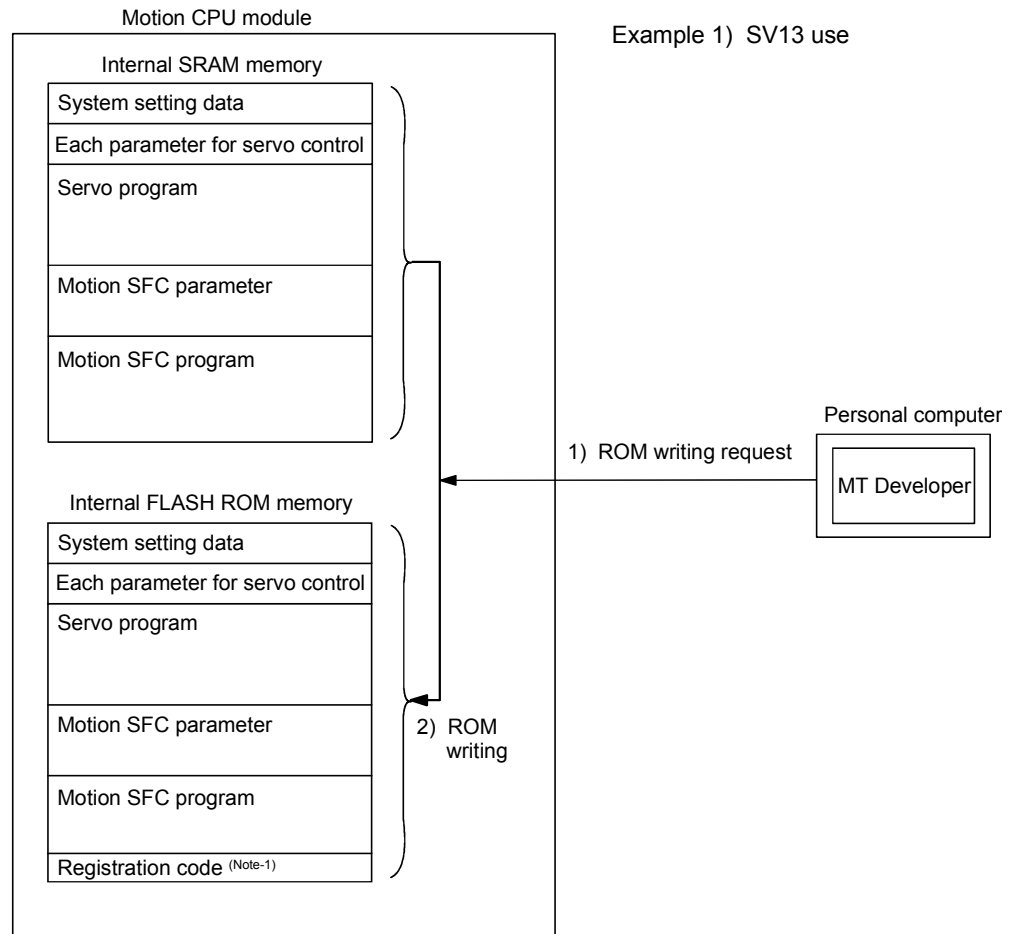
## 4 AUXILIARY AND APPLIED FUNCTIONS

### (b) Operation at applicable data into ROM

When the ROM writing is requested to the Motion CPU module using "Communication" menu of SW6RN-GSV□P, the applicable data into ROM stored in the internal SRAM are batch-written to the internal FLASH ROM after erase of an user memory area of FLASH ROM built-in Motion CPU module.

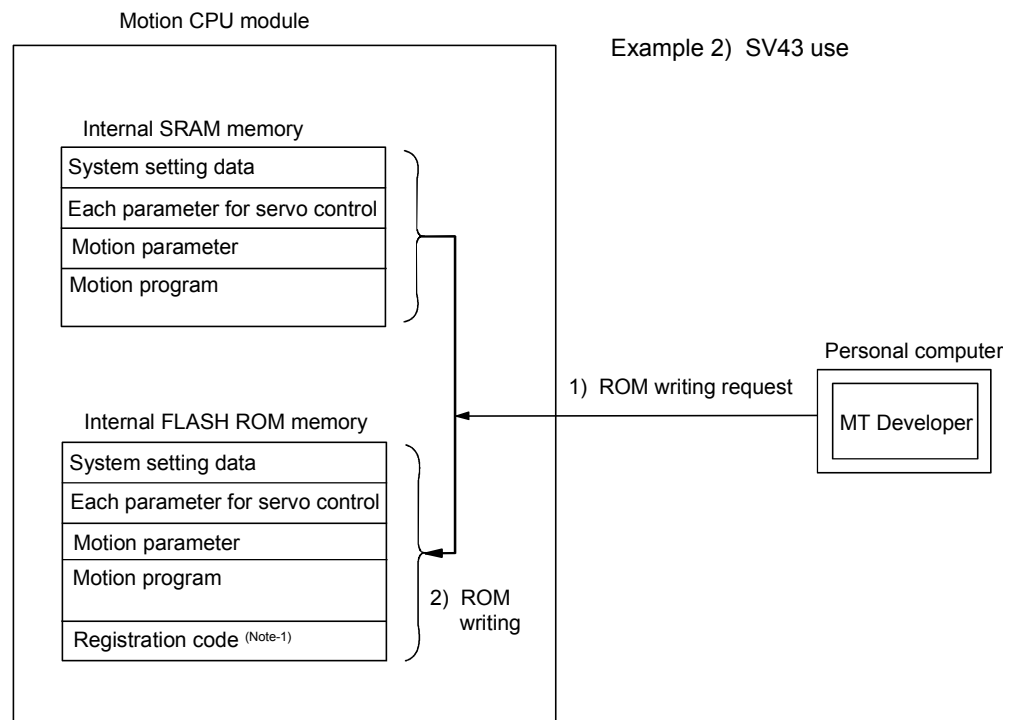
When the writing completes normally, the registration code <sup>(Note-1)</sup> is written and ROM writing ends.

The process overview is shown below.



(Note-1) : "Registration code" is used to judge whether the programs and parameters written in the internal FLASH ROM are normal or not.

## 4 AUXILIARY AND APPLIED FUNCTIONS

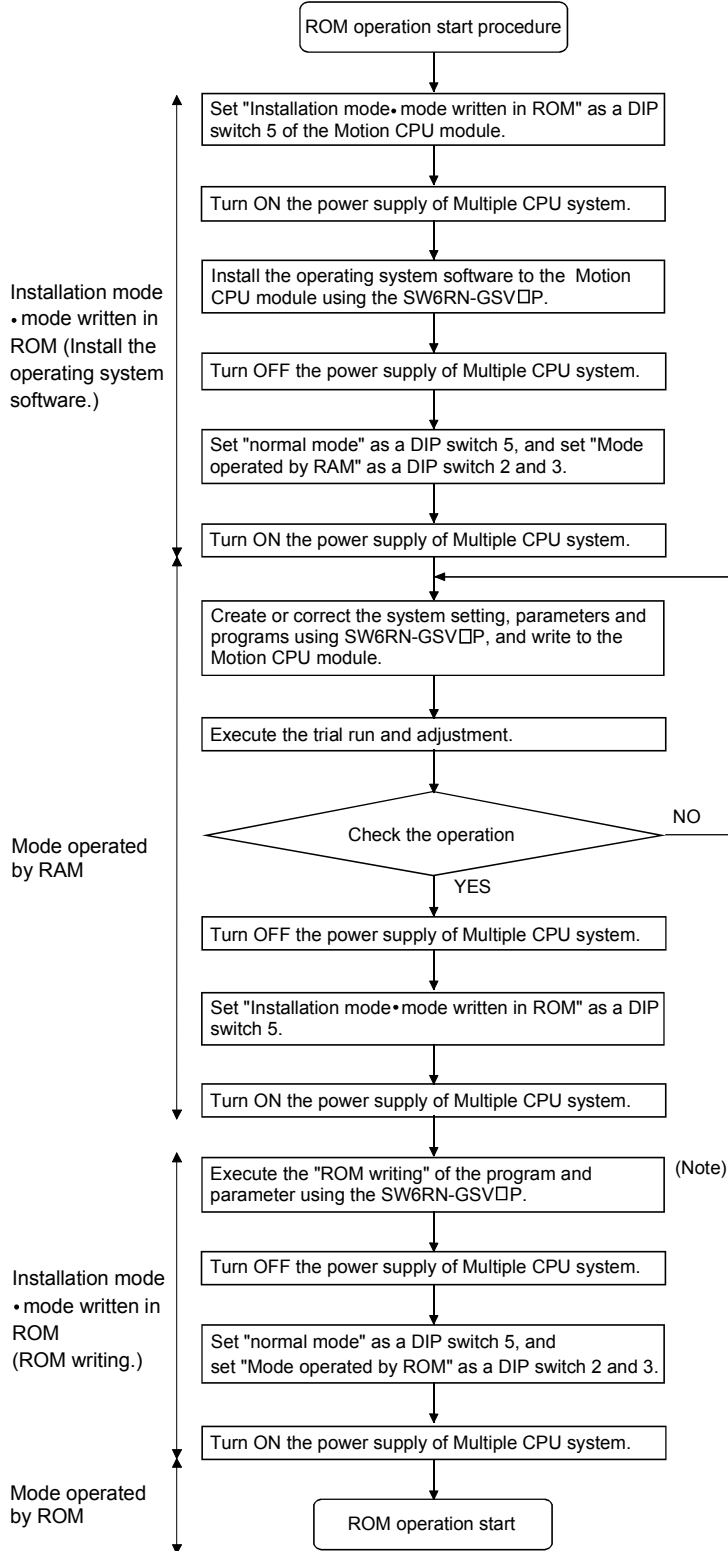


(Note-1) : "Registration code" is used to judge whether the programs and parameters written in the internal FLASH ROM are normal or not.

POINT	
(1)	When the RAM is selected with "Communication" - "Transfer" menu of SW6RN-GSV□P, the SRAM memory built-in Motion CPU module is targeted at the "Installation mode • mode written in ROM" and "Mode operated by ROM".
(2)	The SRAM memory built-in Motion CPU module is targeted at the "Backup • load" operation of SW6RN-GSV□P. Set the "Mode operated by ROM" after "ROM writing" for the ROM operation after "Backup • load" at the CPU module replacement.
(3)	The internal FLASH ROM serves as a life in 100000 times writing. If it passes over a life, "writing error" will occur. After that, replace a module at the ROM operation.
(4)	The online change of Motion SFC program at the mode operated by ROM executes the Motion SFC program performed the online change from the next scanning. After that, it returns to the contents of Motion SFC program written in the internal FLASH ROM at the power supply on or system reset.

(3) ROM operation procedure

The flowchart to start the ROM operation is shown below.

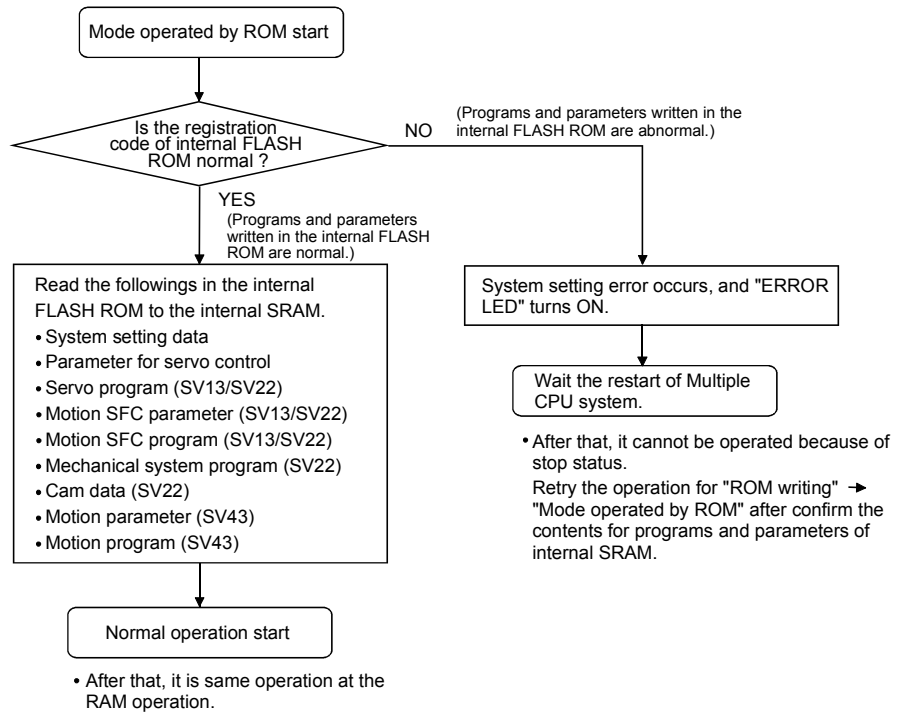


(Note) : Do not execute the ROM writing for program and parameter while installing the operating system software.

## 4 AUXILIARY AND APPLIED FUNCTIONS

### (4) Operation at the "Mode operated by ROM"

Operation at the "Mode operated by ROM" is shown below.

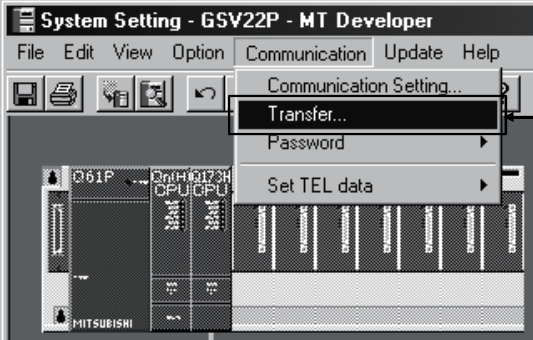


## 4 AUXILIARY AND APPLIED FUNCTIONS

### 4.4.4 Operating procedure of "ROM writing"

The operating procedure of ROM writing using the SW6RN-GSV□P is shown below.  
 (1) SV13/SV22

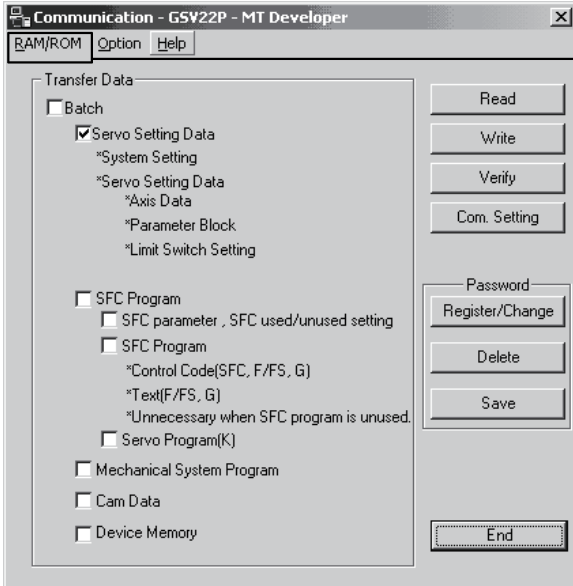
- System setting screen



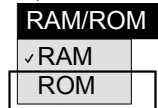
Operating procedure

- 1) Display "ROM/RAM" communication dialog screen after clicking on "Communication" - "Transfer" of the system setting menu screen.  
 (Note) : Select "Transfer" at the ROM writing.

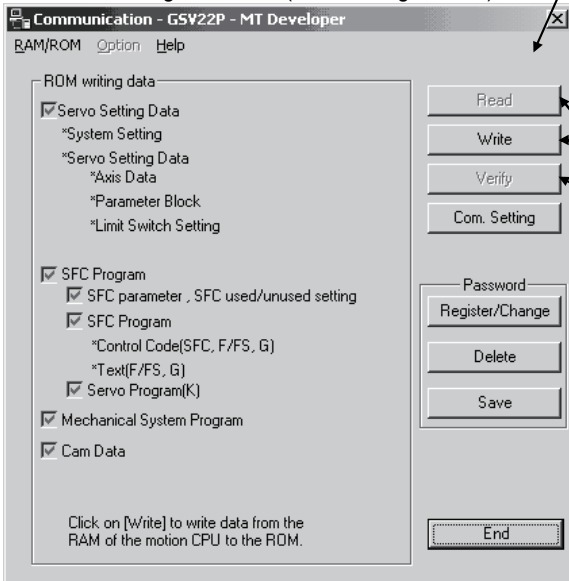
- "When selecting the RAM." (Default screen at "Transfer" selecting.)



- 2) Click on "ROM" of "RAM/ROM" menu screen.  
 Write the programs and data in the RAM of Motion CPU to the ROM.  
 (Note) : At "RAM" clicking on  
 Communication dialog is left screen (When selecting the RAM).  
 Read, write and verify to the RAM of Motion CPU.  
 Write the all data to Motion CPU after clicking on "RAM" at the ROM writing.



- "When selecting the ROM." (ROM writing window)



- 3) "RAM/ROM" communication dialog is left screen (When selecting the ROM.).
- 4) Select "Write" of "When selecting the ROM" screen.  
 (Note) : ALL data are batch-written at the ROM writing.

Not select these items.

- Mechanical system program and cam data cannot be written to the ROM when using the SW6RN-GSV13P.  
 The above items are not displayed on the window.

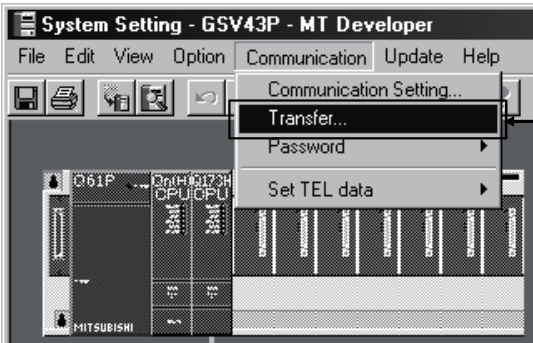
POINT

Be sure to write the all data beforehand to the RAM of Motion CPU at the ROM writing.

## 4 AUXILIARY AND APPLIED FUNCTIONS

### (2) SV43

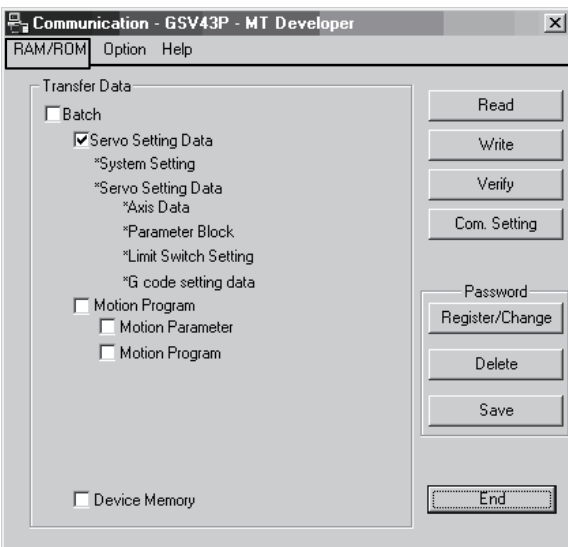
- System setting screen



#### Operating procedure

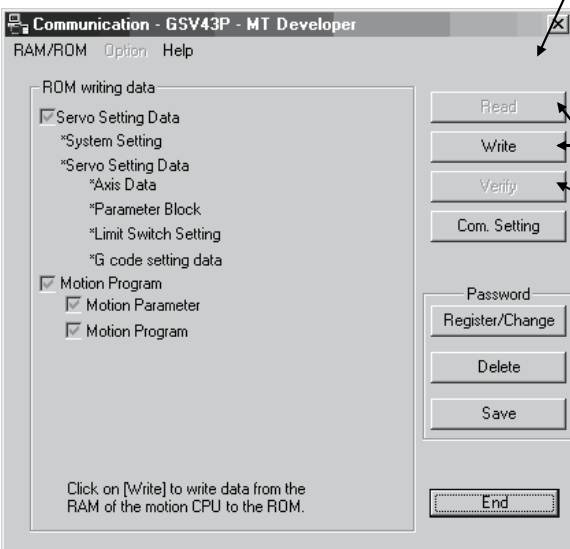
- 1) Display "ROM/RAM" communication dialog screen after clicking on "Communication" - "Transfer" of the system setting menu screen.  
(Note) : Select "Transfer" at the ROM writing.

- "When selecting the RAM." (Default screen at "Transfer" selecting.)



- 2) Click on "ROM" of "RAM/ROM" menu screen.  
Write the programs and data in the RAM of Motion CPU to the ROM.  
(Note) : At "RAM" clicking on  
Communication dialog is left screen (When selecting the RAM).  
Read, write and verify to the RAM of Motion CPU.  
Write the all data to Motion CPU after clicking on "RAM" at the ROM writing.

- "When selecting the ROM." (ROM writing window)



- 3) "RAM/ROM" communication dialog is left screen (When selecting the ROM.).

- 4) Select "Write" of "When selecting the ROM" screen.  
(Note) : ALL data are batch-written at the ROM writing.

Not select these items.

#### POINT

Be sure to write the all data beforehand to the RAM of Motion CPU at the ROM writing.

## 4 AUXILIARY AND APPLIED FUNCTIONS

### 4.5 Security Function

This function is used to protect the user data of Motion CPU by registering a password. The following user data can be protected in this function.

"Write Protection" or "Read/Write Protection" can be set every user data.

Operating system software	User data	Details
SV13/SV22	SFC program	Motion SFC programs (Control code, text) are protected.
	Servo program	Servo programs and program allocation are protected.
SV22	Mechanical system program	Mechanical system programs are protected.
	Cam data	Cam data are protected.
SV43	Motion program	Motion program and Motion parameter are protected.
	Motion parameter	

#### 4.5.1 Password registration/change

There are two following methods to register/change a password.

- [Communication] → [Password] → [Register/Change]
- Password [Register/Change] key of the communication setting screen displayed by "[Communication] → [Transfer]".

<SV13/SV22>

The password content is set for the motion controller and the data in GSV.  
Execute [Save] to save in the project.

	Type	Registration	Password	Registration Condition
1	SFC Program	*	*****	Write Protection
2	Servo Program	*		Read/Write Protection
3	Mechanical System Program		****	Read/Write Protection
4	Cam Data			Write Protection

Buttons: Batch Settings..., Refresh, Execute, Save, Close

<SV43>

The password content is set for the motion controller and the data in GSV.  
Execute [Save] to save in the project.

	Type	Registration	Password	Registration Condition
1	Motion Program	*	*****	Read/Write Protection

Buttons: Refresh, Execute, Save, Close



## 4 AUXILIARY AND APPLIED FUNCTIONS

Items	Details
Type	• Type of user data
Registration	• "*" is displayed when a password is registered in the Motion CPU.
Password	<ul style="list-style-type: none"> <li>• Enter new password.</li> <li>• Set a password by the alphanumeric character (ASCII) of 6 or less characters.</li> <li>• Match case (Full-size character cannot be used.)</li> </ul>
Registration condition	<ul style="list-style-type: none"> <li>• A registration condition set in the Motion CPU is displayed. <ul style="list-style-type: none"> <li>Write Protection: Not writing operation</li> <li>Read/Write Protection: Not reading/writing operation</li> </ul> </li> <li>• New registration condition can be selected by a password input.</li> </ul>

- (1) Procedure for password registration/change
  - (a) A password and registration condition set in the Motion CPU are displayed.
  - (b) Enter new password in the password column, and select a registration condition (Write Protection, Read/Write Protection). It leaves in a blank for the user data that does not register/change a password.
  - (c) Push [Execute] key to register a password in the Motion CPU at the password registration.
  - (d) Push [Execute] key to display a screen which checks old password at the password change. Enter old password, and push [Execute] key. New password will be registered in the Motion CPU by success of old password check. When the new password is the same as old password (change for only registration condition), [Password check] screen is not displayed.

POINT
(1) If an user has forgotten a registration password, clear a password (include user data) of Motion CPU by [Clear All]. However, if [Clear All] is executed, since all password data and user data will be cleared re-write user data in the Motion CPU.
(2) ROM operation can be executed by user data registered a password. The password setting is also included in the ROM writing/reading data.
(3) When a password is registered or changed, the password data in the project is also registered or changed. Be sure to save a password.
(4) When an operation is stopped while a registration/change of password by reset or power OFF of Motion CPU, the data may not be registered. In this case, register or change a password again to restore the user data.

## 4 AUXILIARY AND APPLIED FUNCTIONS

### 4.5.2 Password clearance

There are two following methods to delete a password.

- [Communication] → [Password] → [Delete]
- Password [Delete] key of the communication setting screen displayed by "[Communication] → [Transfer]".

<SV13/SV22>

	Type	Registration	Password
1	SFC Program	*	*****
2	Servo Program	*	
3	Mechanical System Program		
4	Cam Data		

<SV43>

	Type	Registration	Password
1	Motion Program	*	*****

Items	Details
Type	• Type of user data
Registration	• "*" is displayed when a password is registered in the Motion CPU.
Password	• Enter old password.

- (1) Procedure for password clearance
  - (a) The password data set in the Motion CPU are displayed.
  - (b) Enter old password in the password column, and push [Execute] key.
  - (c) A password set in the Motion CPU will be deleted by success of password check. (A blank is displayed in the registration column.)

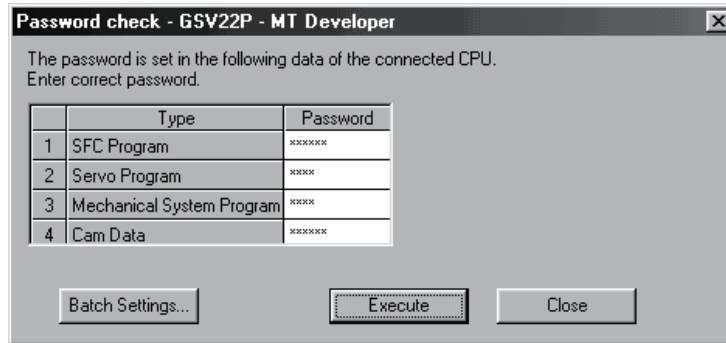
POINT
(1) When a password is deleted, the password data in the project is also deleted. Be sure to save a password.
(2) When an operation is stopped while a clearance of password by reset or power OFF of Motion CPU, the data may not be deleted. In this case, delete a password again to restore the user data.

## 4 AUXILIARY AND APPLIED FUNCTIONS

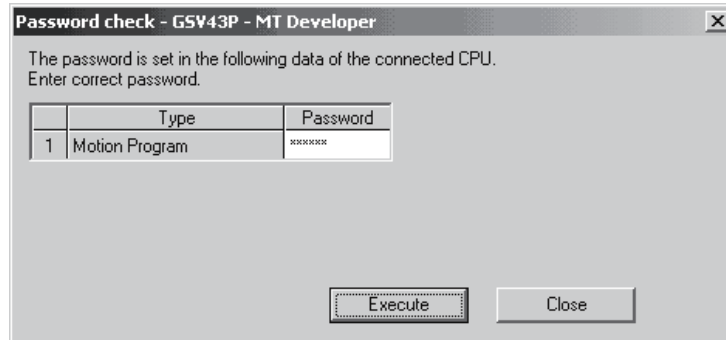
### 4.5.3 Password check

When the user data program set in a password is corrected, the password check screen is displayed automatically.

<SV13/SV22>



<SV43>



Items	Details
Type	• Type of user data
Password	• Enter old password.

- (1) Procedure for password check
  - (a) Enter old password in the password column, and push [Execute] key.
  - (b) A password protection set in the Motion CPU will be released temporarily by success of password check, and the user data program can be corrected.
  - (c) A password is memorized until SW6RN-GSV□P ends. (Since a password is released automatically at the user data correction, a password check screen is not displayed.)

#### POINT

A password memorized by success of password check is valid even if the project change is executed while SW6RN-GSV□P is running. (A password check screen is not displayed.)

## 4 AUXILIARY AND APPLIED FUNCTIONS

### 4.5.4 Password save

There are two following methods to save a password in the project data.

- Registration/change or clearance password
- A password read with user data by [Transfer] → [Read].

A password saved in the project data can be registered with user data, when the user data are written in the Motion CPU that does not set password by [Transfer] → [Write].

The updated password data is saved in the project data by the following operations.

- Password [Save] key of communication setting screen displayed by "[Communication] → [Transfer]".
- Password [Save] key of password registration/change/clearance screen.
- When the password registration/change/clearance screen ends, if there is non-saved password data, select "Yes" of save check screen.

#### (1) A password and registration conditions for each operation

Operation	Password and registration conditions
Read	When a password is set in the call source Motion CPU, the password contents are called and the password data in the project are written.
Write	When a password data is set in the project, if a password is not set in the write designation Motion CPU, the password contents are also written.
Verification	Password data in the project are not updated.
ROM writing	Password contents registered in the write designation Motion CPU are written in ROM.
Online change (SV13/SV22)	Password contents of write designation Motion CPU are not updated.
Backup	It is saved in backup data including also the password contents registered in the call source Motion CPU. The password data in the project is not updated.
Load	Password contents in backup data are written in the write designation Motion CPU.
Password registration/change	New password contents are written in the write designation Motion CPU. Password data in the project is also updated to new password contents.
Password clearance	A password is deleted from the write designation Motion CPU. A password is deleted also from the password data in the project.
Project diversion ([Project management]) - [File diversion])	The password data in diverting source project is not diverted.

The password data in the project is not saved in the project before password save.

POINT
Save a password after delete of password to delete the password data in the project. Or, create new project and divert user data from the project with password data to create the project without password data.

## 4 AUXILIARY AND APPLIED FUNCTIONS

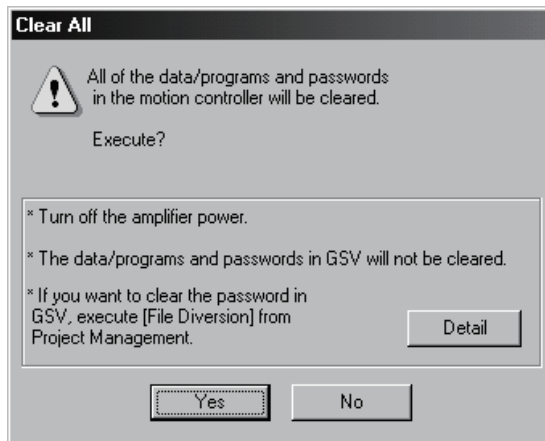
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### 4.6 Clear All

This function is used to clear the all user data, password setting, and backup area in Motion CPU.

Clear all can be executed in the following operation.

- Select "[Option] → [Clear All]" of the communication screen displayed by "[Communication] → [Transfer]".



#### POINT

- (1) Turn off the PLC ready flag (M2000) and test mode ON flag (M9075) to execute "Clear All".
- (2) Turn off the power supply of servo amplifier.
- (3) All user data and password setting are cleared at the "Clear All". Backup of user data and password setting data is recommended before clearance.

### 4.7 Communication via Network

The communication between the personal computer and the Motion CPU is possible via Q series Network module (MELSECNET/10(H), Ethernet, CC-Link and etc.) in the Motion CPU (Q173HCPU/Q172HCPU).

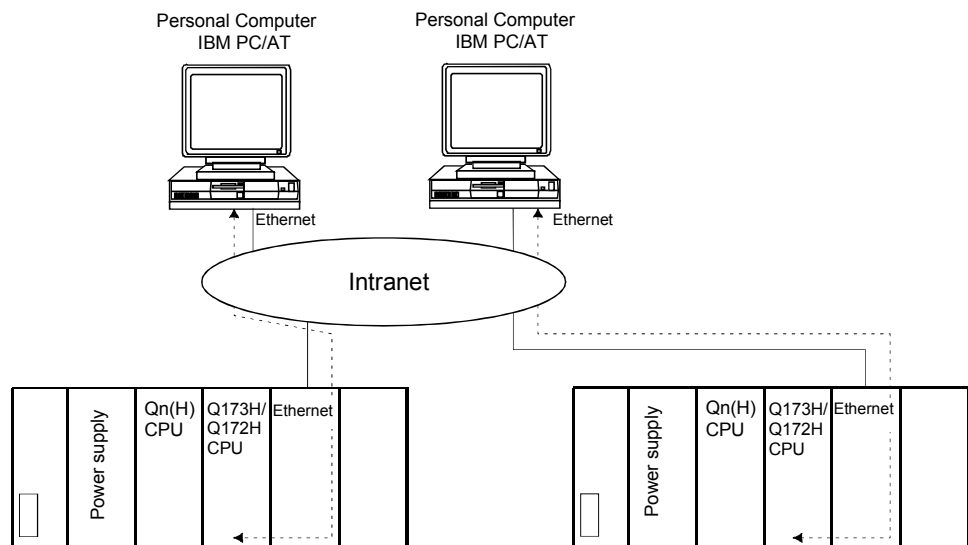
Refer to the following manuals for the specifications of each network modules of MELSECNET/10(H), Ethernet, CC-Link and Serial communication, the handling method.

- (1) MELSECNET/10(H) module : QJ71LP21-25, QJ71LP21G, QJ71BR11, QJ72LP25-25, QJ72LP25G, QJ72BR15
  - QCPU User's Manual(Hardware Design, Maintenance and Inspection)
  - Q Corresponding MELSECNET/H Network System Reference Manual(PLC to PLC network)
  - Q Corresponding MELSECNET/H Network System Reference Manual(Remote I/O network)
  
- (2) Ethernet interface module : QJ71E71, QJ71E71-B2, QJ71E71-100
  - Q Corresponding Ethernet Interface Module User's Manual(Hardware)
  - Q Corresponding Ethernet Interface Module User's Manual(Basic)
  - Q Corresponding Ethernet Interface Module User's Manual(Application)
  - Q Corresponding Ethernet Interface Module User's Manual(Web function)
  - Q Corresponding MELSEC Communication Protocol Reference Manual
  
- (3) CC-Link module : QJ61BT11
  - QJ61BT11 Control & Communication Link System Master/Local Module User's Manual (Hardware)
  - GX Configurator-CC Version 1 Operating Manual
  - CC-Link System Master/Local Module User's Manual
  
- (4) Serial communication module : QJ71C24, QJ71C24-R2
  - Serial Communication Module User's Manual(Hardware)
  - Q Corresponding Serial Communication Module User's Manual(Basic)
  - Q Corresponding Serial Communication Module User's Manual(Application)
  - Q Corresponding MELSEC Communication Protocol Reference Manual

## 4 AUXILIARY AND APPLIED FUNCTIONS

### 4.7.1 Specifications of the communications via network

- (1) Communications via network of the Motion CPU is possible by SW6RN-GSV□P.
- (2) Access range of the communications via network of the Motion CPU is an access range equivalent to Qn(H)CPU. (Refer to Section "4.7.2 Access range of the communications via network".)
- (3) By setting the routing parameter to the control CPU of the network module and the CPU which connected the peripheral devices in the network by MELSECNET/10(H) and Ethernet, it is possible to relay to 8 network points and communicate.
- (4) Because the Motion CPU cannot become the control CPU of the network module, there is not setting item of the network module and network parameter. However, when connecting with the CPU on the other network from the peripheral device which connected the Motion CPU, it needs to the setting of the routing parameter.
- (5) It can operate by remote control the monitor or program editing of the Motion CPU via the intranet using the Ethernet module.

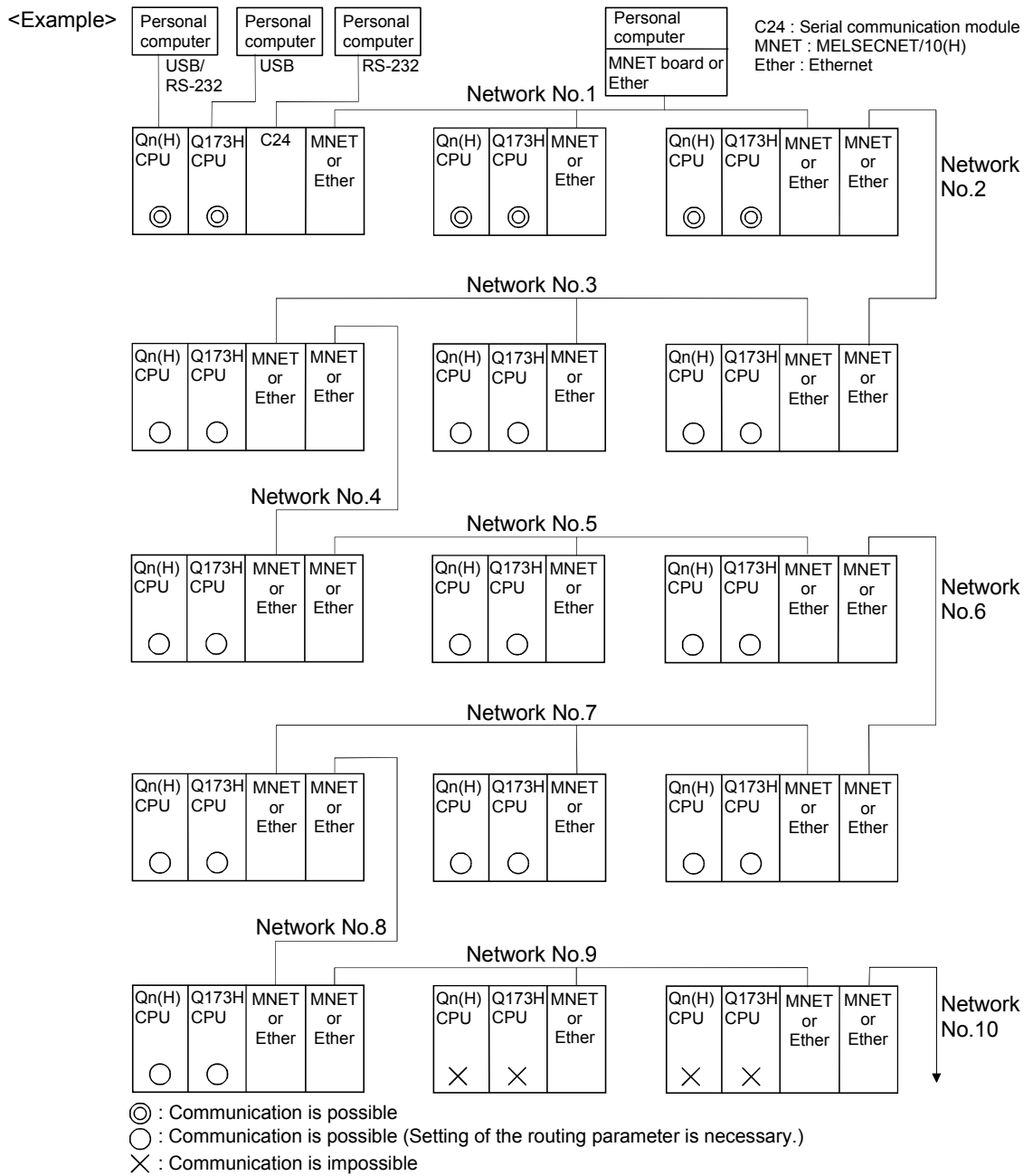


### 4.7.2 Access range of the communications via network

- (1) Network configuration via the MELSECNET/10(H) or the Ethernet
  - (a) It can access the other CPU via the network from the programming software (GX Developer, SW6RN-GSV□P, etc.) of the personal computer connected with the CPU or serial communication module in USB/RS-232.
  - (b) It can access the other CPU via the network from the programming software in the personal computer by connecting the personal computer equipped with Ethernet to MELSECNET/10(H) or Ethernet board to the Ethernet to MELSECNET/10(H) or Ethernet.
  - (c) The access range of above (1) and (2) can be accessed to 8 network points by setting the routing parameter to the control CPU of the network module and the CPU which connected the personal computer.



# 4 AUXILIARY AND APPLIED FUNCTIONS



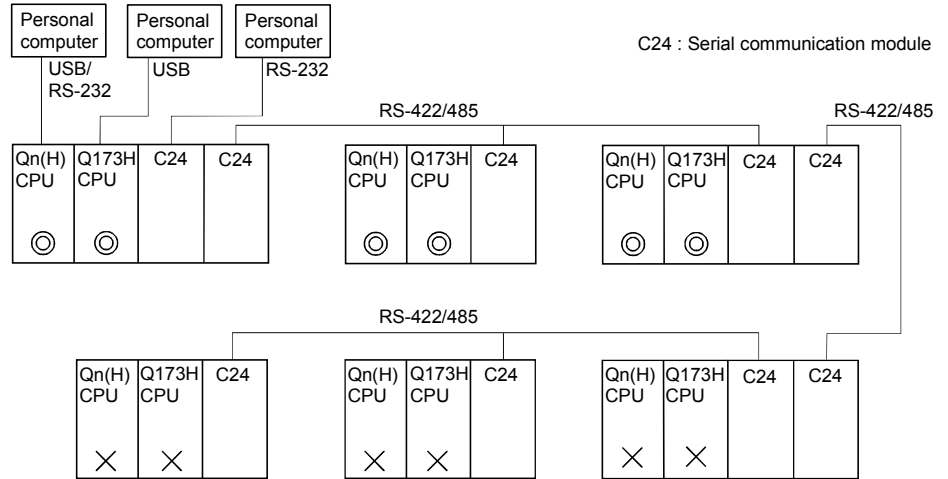


## 4 AUXILIARY AND APPLIED FUNCTIONS

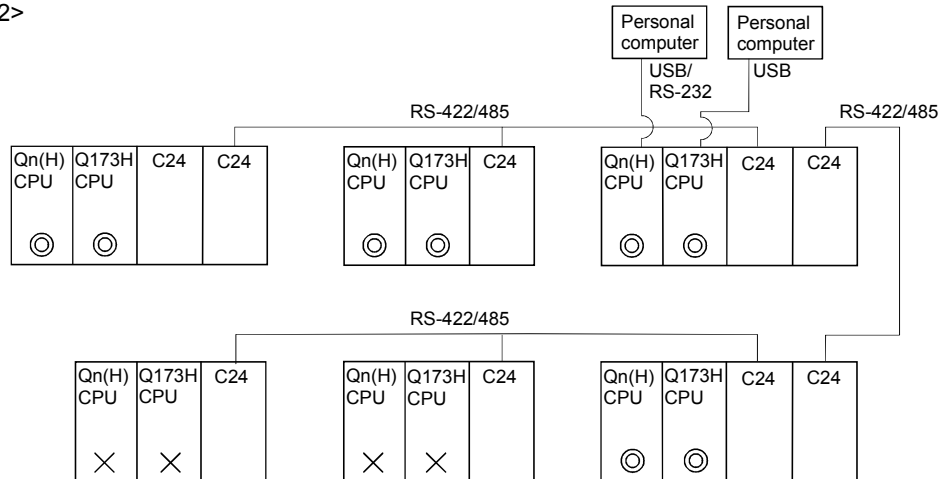
### (3) Network configuration via the RS422/485

- (a) It can access the other CPU via the RS-422/485 from the programming software (GX Developer, SW6RN-GSV□P, etc.) of the personal computer connected with the CPU or serial communication module in USB/RS-232.
- (b) The access range of above (1) is only the CPU on the RS-422/485 which a system connects it to, and it can select RS-422/485 network to connect by specifying the I/O No. of the C24 module.

<Example 1>



<Example 2>



- ◎ : Communication is possible
- : Communication is possible (Setting of the routing parameter is necessary.)
- × : Communication is impossible

## 4 AUXILIARY AND APPLIED FUNCTIONS

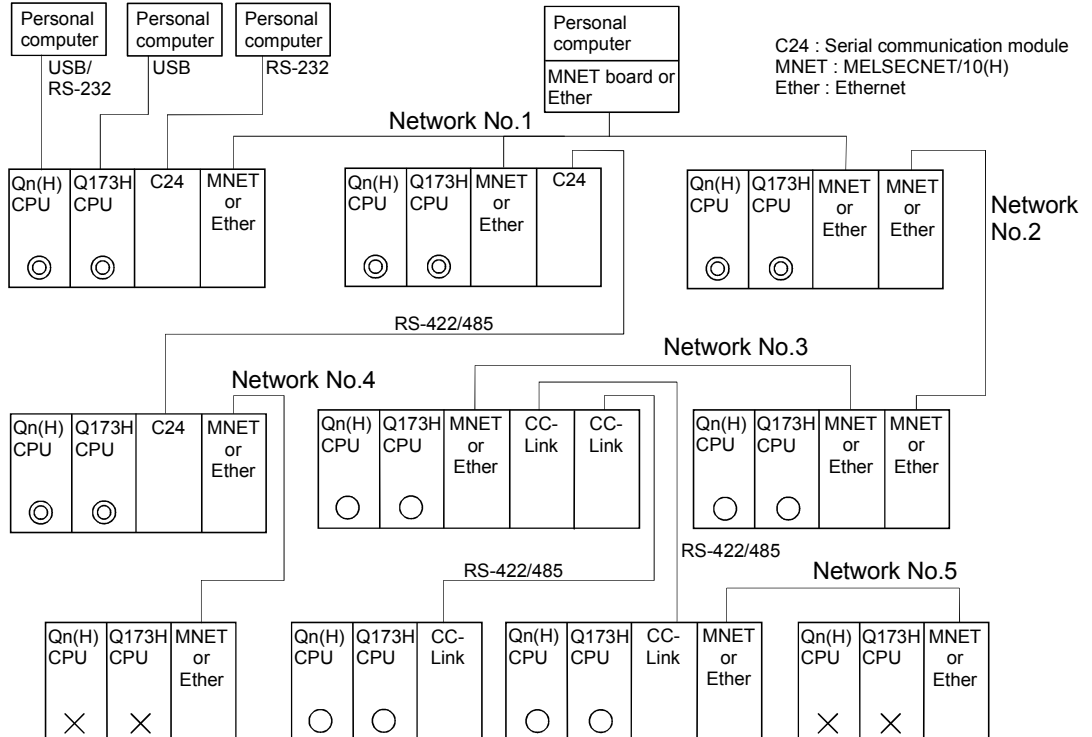
- (4) Network configuration which MELSECNET/10(H), Ethernet, CC-Link, RS-422/485 were mixed
- (a) When the MELSECNET/10(H) or Ethernet is defined as "Network" and CC-Link or RS-422/485 is defined as "Link", combination of whether to be able to access from the programming software (GX Developer, SW6RN-GSV□P, etc.) is shown below.

Network communications	Usable/ unusable
Programming software → CPU (C24) → Network → Link → CPU	○
Programming software → CPU (C24) → Link → Network → CPU	○
Programming software → Network → Link → CPU	○
Programming software → Link → Network → CPU	○
Programming software → CPU (C24) → Network → Link → Network → CPU	×
Programming software → CPU (C24) → Link → Network → Link → CPU	×
Programming software → Network → Link → Network → CPU	×
Programming software → Link → Network → Link → CPU	×

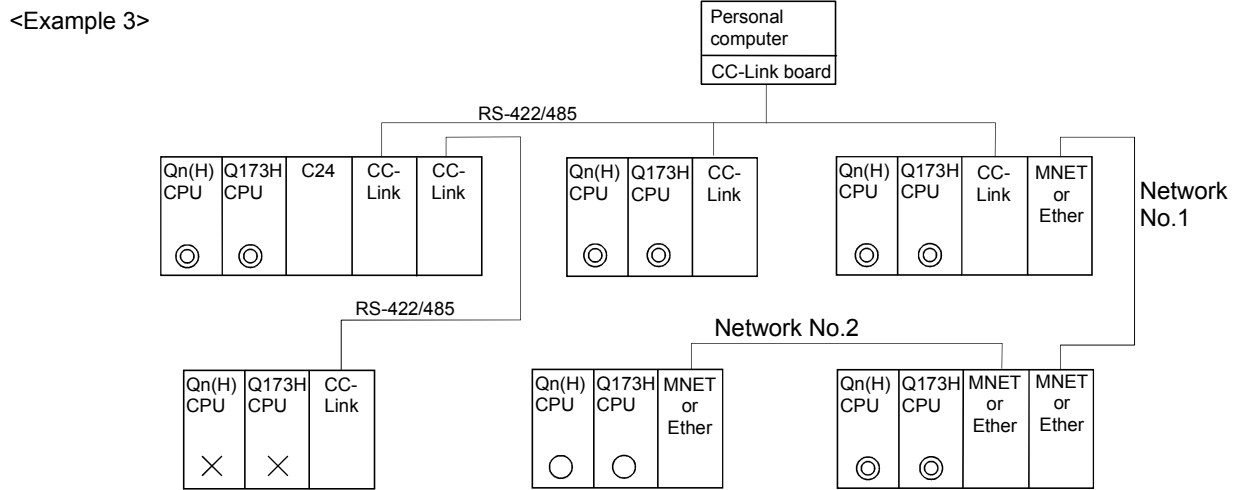
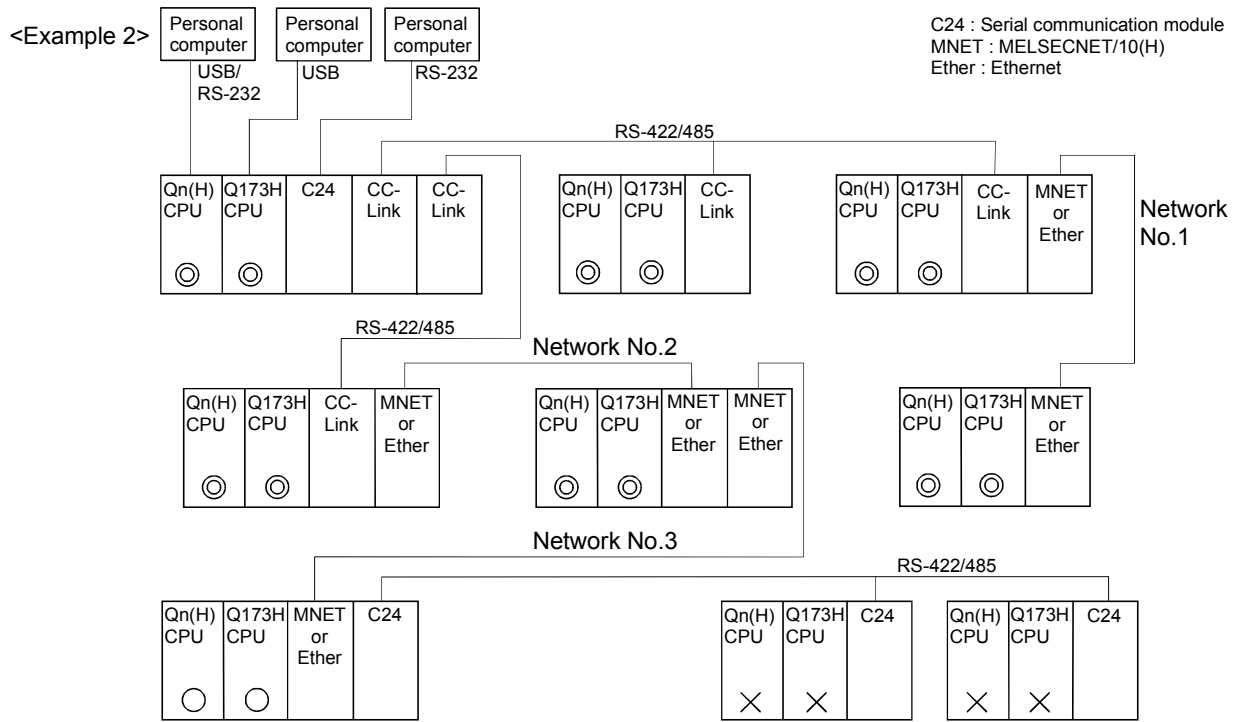
○ : Usable × : Unusable

- (b) It can be accessed to 8 network points by setting the routing parameter in the "Network".
- (c) Because routing cannot access, it can access only the connected network. The connected network can be selected by specifying the I/O No. of the module.

<Example 1>



# 4 AUXILIARY AND APPLIED FUNCTIONS



- ⊙ : Communication is possible
- : Communication is possible (Setting of the routing parameter is necessary.)
- ✕ : Communication is impossible

## 4 AUXILIARY AND APPLIED FUNCTIONS

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### 4.8 Monitor Function of the Main Cycle

- (1) Information for main cycle of the Motion CPU processing (process cycle executed at free time except for motion control) is stored to the special register.
- (2) Since the automatic refresh of shared CPU memory and normal task of Motion SFC program (SV13/SV22)/Motion program (SV43) are executed in the main cycle, make it reference for process time, etc. to program.
- (3) There are following methods to shorten a main cycle.
  - (a) Lengthen an operation cycle setting.
  - (b) Reduce the number of event task programs to execute in the Motion SFC program. (SV13/SV22)
  - (c) Reduce the number of normal task programs to execute simultaneously in the Motion SFC program. (SV13/SV22)
  - (d) Reduce the number of automatic refresh points of shared CPU memory. (SV43)
- (4) When a main cycle is lengthened (more than 1.6[s]), a WDT error may occur in the Motion CPU.
- (5) Details of main cycle monitor register is shown below.

No.	Name	Meaning	Details
D9017	Scan time	Current scan time (1ms units)	<ul style="list-style-type: none"><li>• Current scan time is stored in the unit 1[ms].</li><li>• Setting range (0 to 65535[ms])</li></ul>
D9019	Maximum scan time	Maximum scan time (1ms units)	<ul style="list-style-type: none"><li>• Maximum main cycle is stored in the unit 1[ms].</li><li>• Setting range (0 to 65535[ms])</li></ul>

### 4.9 Servo Parameter Reading Function

- (1) When the servo parameters are changed, the Motion CPU will be automatically read the servo parameters and reflected them to the servo parameter storage area in the Motion CPU. Therefore, an operation to read servo parameters is unnecessary in the following cases.
  - (a) The parameters are changed by auto tuning.
  - (b) The parameters are changed by connecting directly MR Configurator to the servo amplifier.

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

If the power supply of Motion CPU is turned off/reset or the power supply of servo amplifier is turned off immediately after change, it may not be reflected.
---

- (2) After executing the servo parameter reading function, when it needs to reflect the servo parameters changed to the SW6RN-GSV□P, read the servo parameters from the Motion CPU and save data.

## 4 AUXILIARY AND APPLIED FUNCTIONS

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### 4.10 Optional Data Monitor Function

This function is used to store the data (refer to following table) up to three points per axis to the specified devices (D, W, #) and monitor them.

It can be set by the system setting of SW6RN-GSV□P.

(1) Data that can be set

Data type	Unit	Number of words
Effective load ratio	[%]	1
Regenerative load ratio	[%]	1
Peak load ratio	[%]	1
Position feed back	[PLS]	2
Absolute position encoder within one-revolution position	[PLS]	2
Load inertia ratio	[ $\times 0.1$ ]	1
Position loop gain 1	[rad/s]	1
Bus voltage	[V]	1

(2) Devices that can be set

Word device	Device that can be set
D	0 to 8191
W	0 to 1FFF
#	0 to 7999

#### POINT

- (1) The updating cycle of data is every operation cycle.
- (2) Set an even number as device setting in the two word data.



## 4 AUXILIARY AND APPLIED FUNCTIONS

### 4.11 Connect/Disconnect Function

This function is used to connect/disconnect the SSCNET communication temporarily, when the servo amplifier or SSCNETⅢ cable on the SSCNET system are exchanged during the power supply ON of Motion CPU. An user side requires connect/disconnect to a system, and a system side stores the states of command accept waiting or execute waiting for connect/disconnect. Moreover, also use this device to re-connect the servo amplifier shut off by the connect/disconnect device. When the power supply for axis 1 is turned OFF/ON on the SSCNET system, a connect/disconnect processing is unnecessary.

(1) Setting value/monitor value of connect/disconnect device are shown below

Device No.	Setting value/ monitor value	Overview	Setting
D9112 (Note-1)	0 (Normal)	<p>Connect/disconnect command accept waiting</p> <ul style="list-style-type: none"> <li>State of connect/disconnect command accept waiting</li> </ul> <p>In this state, when "1 to 32" (Note-2) is set, disconnect execute waiting "-1" is set, and when "-10" is set, re-connect execute waiting "-1" is set.</p>	System side
	-1	<p>Connect/disconnect execute waiting</p> <ul style="list-style-type: none"> <li>State where it is standing by to execute connect/disconnect processing. (State after "1 to 32" (Note-2): Disconnect command" and "-10: Re-connect command" are set by user side.)</li> </ul> <p>After this state, when "-2: Connect/disconnect execute command" is set by user side, connect/disconnect processing is executed.</p>	
	1 to 32 (Note-2)	<p>Disconnect command (Axis No. of servo amplifier to disconnect)</p> <ul style="list-style-type: none"> <li>Set axis No. "1 to 32" (Note-2) of servo amplifier to be disconnected.</li> </ul> <p>If this axis number is set by user side, it only becomes "-1: Disconnect execute waiting". Set "-2: Disconnect execute command" by user side to actually disconnect.</p>	User side
	-10	<p>Re-connect command</p> <ul style="list-style-type: none"> <li>Set to re-connect the disconnecting servo amplifier.</li> </ul> <p>The disconnecting servo amplifiers for all SSCNET systems are re-connected. If this setting value is set by user side, it only becomes "-1: Re-connect execute waiting". Set "-2: Re-connect execute command" by user side to actually re-connect.</p>	
	-2	<p>Connect/disconnect execute command</p> <ul style="list-style-type: none"> <li>Set to execute connect/disconnect processing.</li> </ul> <p>This setting value is set in the state of "-1: Connect/disconnect execute waiting". Connect/disconnect device is set to "0" after completion of connect/disconnect.</p> <p>(LED display of servo amplifier will be "AA" after completion of disconnection. Then, turn the power supply of servo amplifier ON. In addition, connect the SSCNETⅢ cable to servo amplifier and turn the power supply of servo amplifier ON before re-connect processing.)</p>	

(Note-1) If values except setting value/monitor value are stored, it is set to "0" without processing.

(Note-2) The range of axis No.1 to 8 is valid in the Q172HCPU.

## 4 AUXILIARY AND APPLIED FUNCTIONS

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(2) Procedure for connect/disconnect function to exchange the servo amplifier or SSCNET III cable are shown below.

(a) Operation procedure to disconnect

1) Set the axis No. of servo amplifier to disconnect in D9112. (1 to 32)

↓

2) Check that D9112 is "-1: Disconnect execute waiting".  
(Disconnect execute waiting)

↓

3) Set "-2: Disconnect execute command" in D9112.

↓

4) Check that D9112 is "0: Disconnect command accept waiting".  
(Completion of disconnection)

↓

5) After checking the LED display "AA" of servo amplifier to be disconnected, turn the power supply of servo amplifier OFF.

(b) Operation procedure to re-connect

1) Turn the power supply of servo amplifier ON.

↓

2) Set "-10: Re-connect command" in D9112.

↓

3) Check that D9112 is "-1: Re-connect execute waiting".  
(Re-connect execute waiting)

↓

4) Set "-2: Re-connect execute command" in D9112.

↓

5) Check that D9112 is "0: Re-connect command accept waiting".  
(Completion of re-connection)

↓

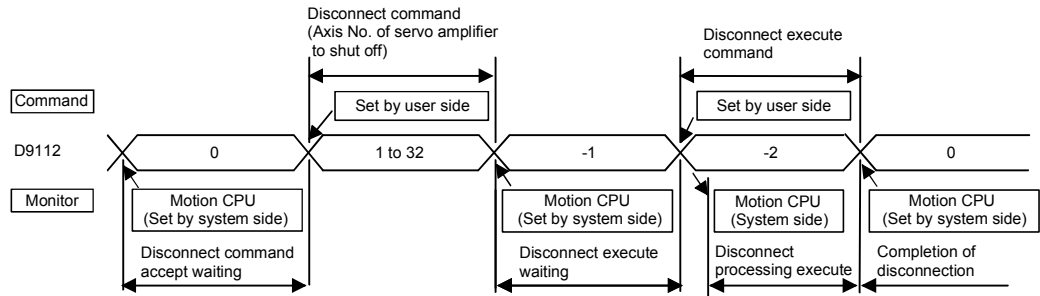
6) After checking the servo ready (M2415+20n) of servo amplifier to re-connect, resume operation of servo amplifier.

POINT
(1) After completion of SSCNET communication disconnect processing, check the LED display of servo amplifier is "AA", and then turn the power supply of servo amplifier OFF.
(2) When the power supply for axis 1 is turned OFF/ON on the SSCNET system, a connect/disconnect processing is unnecessary.
(3) If the power supply of servo amplifier connected after axis 2 of SSCNET system is turned OFF, operation failure may occur in the other axes. Be sure to use a disconnect function to turn OFF the power supply of servo amplifier.

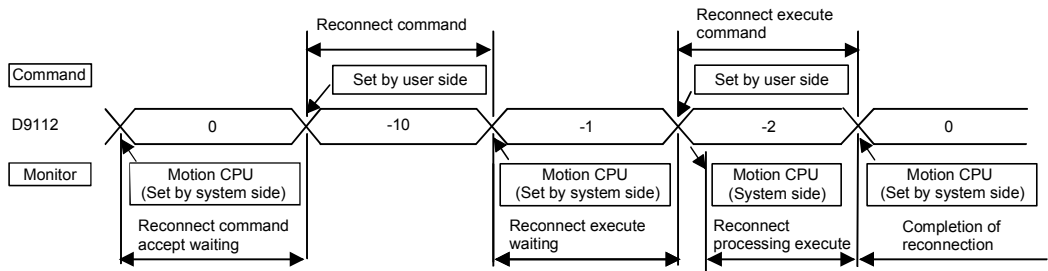
## 4 AUXILIARY AND APPLIED FUNCTIONS

(3) Flow of device value for connect/disconnect operation are shown below.

### (a) Disconnect operation



### (b) Re-connect operation



#### POINT

When the power supply of non-setting axis is turned OFF in the system setting, execute the disconnect processing toward system setting axis near a terminus from the axis. If a following axis is disconnected, non-setting axis is disconnected automatically.

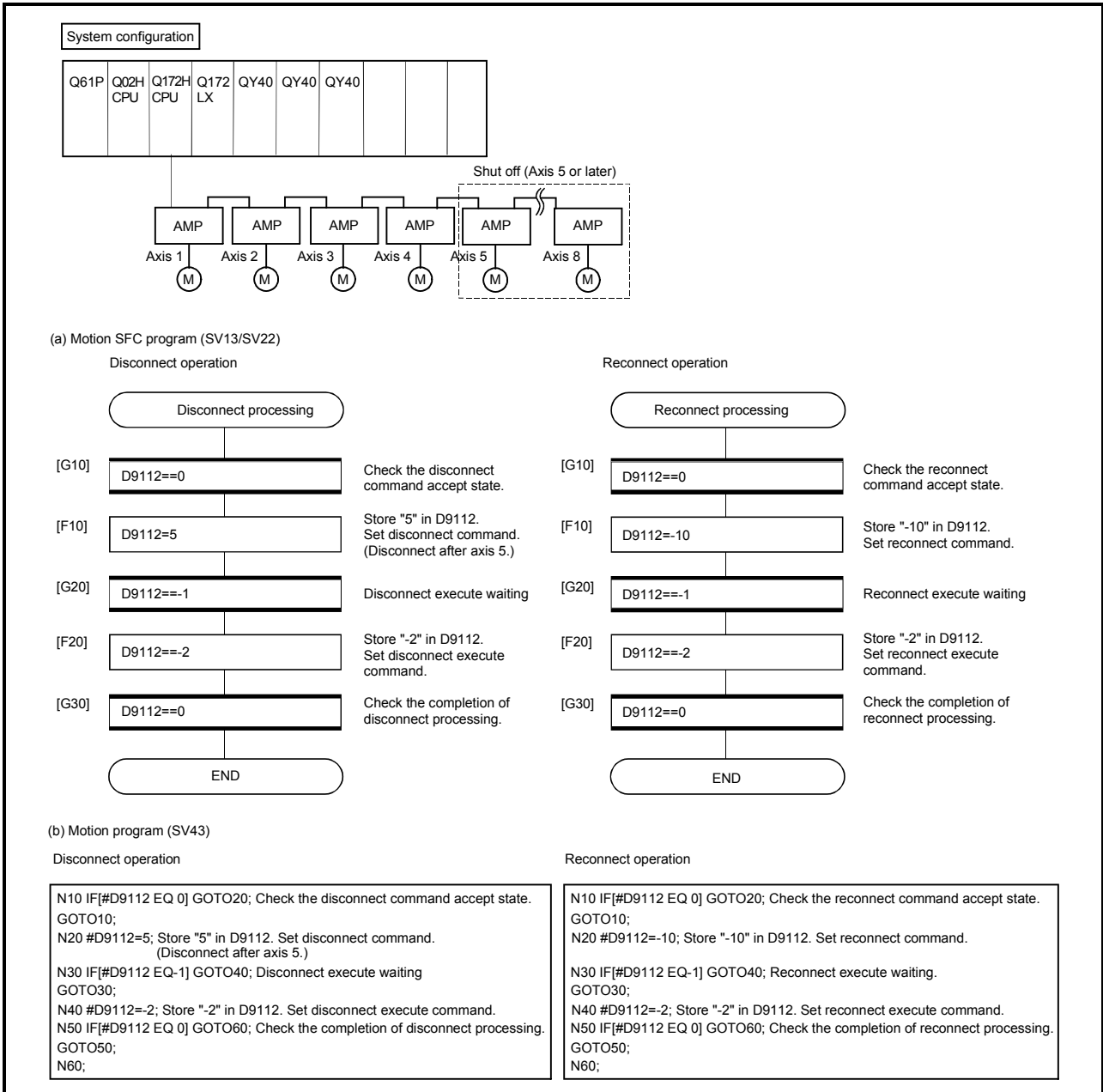
## 4 AUXILIARY AND APPLIED FUNCTIONS

<Program example>

(1) Connect/disconnect program for servo amplifier after axis 5 of self CPU

**Disconnect procedure:** After checking the LED display "AA" of servo amplifier, turn the power supply of servo amplifier OFF.

**Reconnect procedure:** After checking the servo ready (M2415+20n) of re-connected servo amplifier, resume operation of servo amplifier.

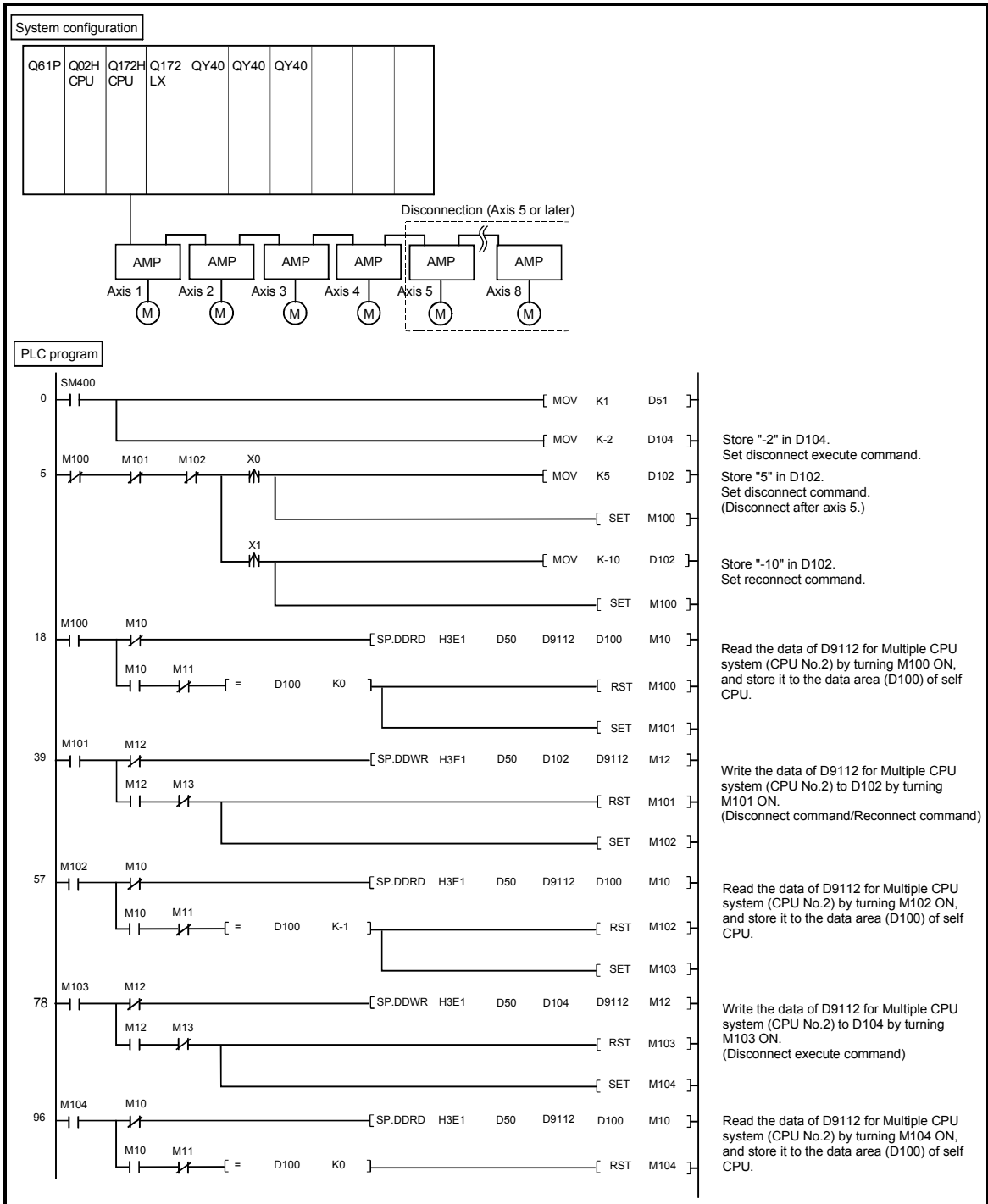


## 4 AUXILIARY AND APPLIED FUNCTIONS

(2) Connect/disconnect program for servo amplifier after axis 5 connected to the Motion CPU (CPU No.2) from PLC CPU (CPU No.1).

**Disconnect procedure:** After turning X0 OFF to ON, check the LED display "AA" of servo amplifier and then turn the power supply of servo amplifier OFF.

**Reconnect procedure:** After turning X1 OFF to ON, check the servo ready (M2415+20n) of re-connected servo amplifier and then resume operation of servo amplifier.





## **WARRANTY**

Please confirm the following product warranty details before using this product.

### **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 sales representative or Mitsubishi Service Company.

However, if repairs are required onsite at domestic or overseas location, expenses to send an engineer will be solely at the customer's discretion. Mitsubishi shall not be held responsible for any re-commissioning, maintenance, or testing on-site that involves replacement of the failed module.

#### **[Gratis Warranty Term]**

Note that an installation period of less than one year after installation in your company or your customer's premises or a period of less than 18 months (counted from the date of production) after shipment from our company, whichever is shorter, is selected.

#### **[Gratis Warranty Range]**

##### **(1) Diagnosis of failure**

As a general rule, diagnosis of failure is done on site by the customer.

However, Mitsubishi or Mitsubishi service network can perform this service for an agreed upon fee upon the customer's request.

There will be no charges if the cause of the breakdown is found to be the fault of Mitsubishi.

##### **(2) Breakdown repairs**

There will be a charge for breakdown repairs, exchange replacements and on site visits for the following four conditions, otherwise there will be a charge.

1) Breakdowns due to improper storage, handling, careless accident, software or hardware design by the customer

2) Breakdowns due to modifications of the product without the consent of the manufacturer

3) Breakdowns resulting from using the product outside the specified specifications of the product

4) Breakdowns that are outside the terms of warranty

Since the above services are limited to Japan, diagnosis of failures, etc. are not performed abroad.

If you desire the after service abroad, please register with Mitsubishi. For details, consult us in advance.

### **2. Exclusion of Loss in Opportunity and Secondary Loss from Warranty Liability**

Mitsubishi will not be held liable for damage caused by factors found not to be the cause of Mitsubishi; opportunity loss or lost profits caused by faults in the Mitsubishi products; damage, secondary damage, accident compensation caused by special factors unpredictable by Mitsubishi; damages to products other than Mitsubishi products; and to other duties.

### **3. Onerous Repair Term after Discontinuation of Production**

Mitsubishi shall accept onerous product repairs for seven years after production of the product is discontinued.

### **4. Delivery Term**

In regard to the standard product, Mitsubishi shall deliver the standard product without application settings or adjustments to the customer and Mitsubishi is not liable for on site adjustment or test run of the product.

### **5. Precautions for Choosing the Products**

(1) These products have been manufactured as a general-purpose part for general industries, and have not been designed or manufactured to be incorporated in a device or system used in purposes related to human life.

(2) Before using the products for special purposes such as nuclear power, electric power, aerospace, medicine, passenger movement vehicles or under water relays, contact Mitsubishi.

(3) These products have been manufactured under strict quality control. However, when installing the product where major accidents or losses could occur if the product fails, install appropriate backup or failsafe functions in the system.

(4) When exporting any of the products or related technologies described in this catalogue, you must obtain an export license if it is subject to Japanese Export Control Law.

MOTION CONTROLLER Qseries  
Programming Manual (COMMON)  
(Q173HCPU/Q172HCPU)



HEAD OFFICE : TOKYO BUILDING, 2-7-3 MARUNOUCHI, CHIYODA-KU, TOKYO 100-8310, JAPAN

MODEL	Q173H-P-COM-E
MODEL CODE	1XB911
IB(NA)-0300111-C(0609)MEE	

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