

MOTION CONTROLLER

 Q series

COMMON

Q173DCPU

Q172DCPU

Programming Manual

● SAFETY PRECAUTIONS ●

(Please read these instructions before using this equipment.)

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

These precautions apply only to this product. Refer to the Q173DCPU/Q172DCPU Users manual for a description of the Motion controller safety precautions.


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

 **DANGER**

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

 **CAUTION**

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

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.

Please save this manual to make it accessible when required and 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.
- Completely turn off the externally supplied power used in the system before mounting or removing the module, performing wiring work, or inspections. Failing to do so 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 Ω 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 incombustible. Installing them directly or close to combustibles will 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.
- Do not damage, apply excessive stress, place heavy things on or sandwich the cables, as this 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 heat radiating fins of controller or servo amplifier, 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 correct combinations listed in the instruction manual. Other combinations may lead to fire or faults.
- Use the CPU module, base unit and motion module with the correct combinations listed in the instruction manual. Other combinations may lead to 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.

CAUTION

- 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.
- 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.

CAUTION

- Use the program commands for the program with the conditions specified in the instruction manual.
- 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 intelligent function module's instruction manual for the program corresponding to the intelligent 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 Motion controller, servo amplifier and 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.

⚠ CAUTION

- The Motion controller, servo amplifier and servomotor are precision machines, so do not drop or apply strong impacts on them.
- Securely fix the Motion controller, servo amplifier and servomotor 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.

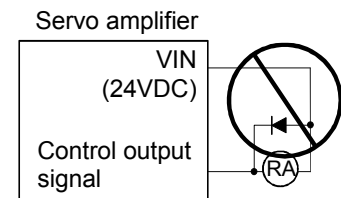
Environment	Conditions	
	Motion controller/Servo amplifier	Servomotor
Ambient temperature	According to each instruction manual.	0°C to +40°C (With no freezing) (32°F to +104°F)
Ambient humidity	According to each instruction manual.	80% RH or less (With no dew condensation)
Storage temperature	According 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 synchronous 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 synchronous encoder and 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.
Also, execute a trial operation.

(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 (terminal 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 combing 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

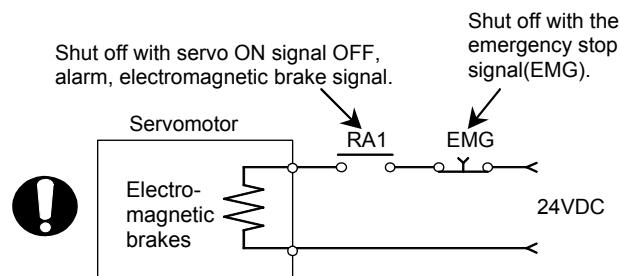
- Immediately turn OFF the power if smoke, abnormal sounds or odors are emitted from the Motion controller, servo amplifier or servomotor.
- Always execute a test operation before starting actual operations after the program or parameters have been changed or after maintenance and inspection.
- Do not attempt to disassemble and repair the units excluding a qualified technician whom our company recognized.
- 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 ^{+10%} _{-15%} (85 to 132VAC)	200 to 240VAC ^{+10%} _{-15%} (170 to 264VAC)	100 to 240VAC ^{+10%} _{-15%} (85 to 264VAC)		24VDC ^{+30%} _{-35%} (15.6 to 31.2VDC)	100 to 120VAC ^{+10%} / _{-15%} 200 to 240VAC ^{+10%} _{-15%} (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.



- 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.
- Before touching the module, always touch grounded metal, etc. to discharge static electricity from human body. Failure to do so may cause the module to fail or malfunction.
- Do not directly touch the module's conductive parts and electronic components. Touching them could cause an operation failure or give damage to the module.
- 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.

CAUTION

- 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 drop or impact the battery installed to the module.
Doing so may damage the battery, causing battery liquid to leak in the battery. Do not use the dropped or impacted battery, but dispose of it.
- 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
Jan., 2008	IB(NA)-0300134-A	First edition

Japanese Manual Number IB(NA)-0300126

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INTRODUCTION

Thank you for choosing the Mitsubishi Motion controller Q173DCPU/Q172DCPU.
Before using the equipment, please read this manual carefully to develop full familiarity with the functions and performance of the Motion controller you have purchased, so as to ensure correct use.

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About Manuals

The following manuals are also related to this product.

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

Related Manuals

(1) Motion controller

Manual Name	Manual Number (Model Code)
Q173DCPU/Q172DCPU Motion controller User's Manual This manual explains specifications of the Motion CPU modules, Q172DLX Servo external signal interface module, Q172DEX Synchronous encoder interface module, Q173DPX Manual pulse generator interface module, Power supply modules, Servo amplifiers, SSCNETIII cables, Synchronous encoder cables and others. (Optional)	IB-0300133 (1XB927)
Q173DCPU/Q172DCPU Motion controller (SV13/SV22) Programming Manual (Motion SFC) This manual explains the functions, programming, debugging, error lists and others for Motion SFC. (Optional)	IB-0300135 (1XB929)
Q173DCPU/Q172DCPU Motion controller (SV13/SV22) Programming Manual (REAL MODE) This manual explains the servo parameters, positioning instructions, device lists, error lists and others. (Optional)	IB-0300136 (1XB930)
Q173DCPU/Q172DCPU Motion controller (SV22) Programming Manual (VIRTUAL MODE) This manual explains the dedicated instructions to use the synchronous control by virtual main shaft, mechanical system program create mechanical module, servo parameters, positioning instructions, device lists, error lists and others. (Optional)	IB-0300137 (1XB931)

(2) PLC

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

(3) Servo amplifier

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

MEMO

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 "SW8DNC-SV□Q□" for Motion CPU module (Q173DCPU/Q172DCPU).

In this manual, the following abbreviations are used.

Generic term/Abbreviation	Description
Q173DCPU/Q172DCPU or Motion CPU (module)	Q173DCPU/Q172DCPU Motion CPU module
Q172DLX/Q172DEX/Q173DPX or Motion module	Q172DLX Servo external signals interface module/ Q172DEX Serial Synchronous encoder interface module ^(Note-1) / Q173DPX 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	QnUD(H)CPU
Multiple CPU system or Motion system	Abbreviation for "Multiple PLC system of the Q series"
CPU _n	Abbreviation for "CPU No.n (n= 1 to 4) of the CPU module for the Multiple CPU system"
Self CPU	Motion CPU being programmed by the currently open MT Developer project
Programming software package	General name for MT Developer/GX Developer/MR Configurator
Operating system software	General name for "SW8DNC-SV□Q□"
SV13	Operating system software for conveyor assembly use (Motion SFC) : SW8DNC -SV13Q□
SV22	Operating system software for automatic machinery use (Motion SFC) : SW8DNC -SV22Q□
MT Developer	Abbreviation for "Motion controller programming software MT Developer2 (Version 1.00A or later)"
GX Developer	Abbreviation for "MELSEC PLC programming software package GX Developer (Version 8.48A or later)"
MR Configurator	Abbreviation for "Servo setup software package MR Configurator (Version C0 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 ^{III} ^(Note-2)	High speed synchronous network 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 (Q170DBATC)
External battery	General name for "Q170DBATC" and "Q6BAT"
Intelligent function module	Abbreviation for "MELSECNET/H module/Ethernet module/CC-Link module/ Serial communication module"

(Note-1) : Q172DEX can be used in SV22.

(Note-2) : SSCNET: Servo System Controller NETwork

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		Q173DCPU/Q172DCPU 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"> • Design method for Motion SFC program • Design method for Motion SFC parameter • Motion dedicated PLC instruction 	Q173DCPU/Q172DCPU Motion controller (SV13/SV22) Programming Manual (Motion SFC)
	<ul style="list-style-type: none"> • Design method for positioning control program in the real mode • Design method for positioning control parameter 	Q173DCPU/Q172DCPU Motion controller (SV13/SV22) Programming Manual (REAL MODE)
SV22 (Virtual mode)	<ul style="list-style-type: none"> • Design method for mechanical system program 	Q173DCPU/Q172DCPU Motion controller (SV22) Programming Manual (VIRTUAL MODE)

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) Load distribution of processing can be performed by controlling the complicated servo control with Motion CPU and the machine control or information control with PLC CPU. Therefore, the 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.

Q173DCPU : Up to 32 axes

Q172DCPU : Up to 8 axes

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.)

Q03UDCPU : 30k steps

Q04UDHCPU : 40k steps

Q06UDHCPU : 60k steps

(c) The device data access of the Motion CPU and the Motion SFC program 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], and it correspond with high frequency operation.

(b) High speed PLC control is possible by the universal model QCPU.

(For LD instruction)

Q03UDCPU : 20[ns]

Q04UDHCPU : 9.5[ns]

Q06UDHCPU : 9.5[ns]

- (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.

1 OVERVIEW

1.2.2 Basic specifications of Q173DCPU/Q172DCPU

(1) Module specifications

Item	Q173DCPU	Q172DCPU
Internal current consumption (5VDC) [A]	1.25	1.14
Mass [kg]	0.33	0.33
Exterior dimensions [mm(inch)]	98 (3.85)(H) × 27.4 (1.08)(W) × 119.3 (4.69)(D)	

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

(a) Motion control specifications

Item	Q173DCPU	Q172DCPU
Number of control axes	Up to 32 axes	Up to 8 axes
Operation cycle (default)	SV13 0.44ms/ 1 to 6 axes 0.88ms/ 7 to 18 axes 1.77ms/19 to 32 axes	0.44ms/ 1 to 6 axes 0.88ms/ 7 to 8 axes
	SV22 0.44ms/ 1 to 4 axes 0.88ms/ 5 to 12 axes 1.77ms/13 to 28 axes 3.55ms/29 to 32 axes	0.44ms/ 1 to 4 axes 0.88ms/ 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)	
Peripheral I/F	Via PLC CPU (USB/RS-232)	
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	
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	

1 OVERVIEW

Motion control specifications (continued)

Item	Q173DCPU	Q172DCPU
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	Q172DLX : 4 modules usable Q172DEX : 6 modules usable Q173DPX : 4 modules usable <small>(Note-2)</small>	Q172DLX : 1 module usable Q172DEX : 4 modules usable Q173DPX : 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		Q173DCPU/Q172DCPU		
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	Up to 128 (comment included)		
	Number of operand/block	Up to 64 (operand: constants, word device, bit devices)		
	() nesting/block	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 main cycle of Motion CPU	
		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 (D(P).GINT) from PLC CPU.
NMI task	Execute when input ON is set among interrupt module QI60 (16 points).			
Number of devices (Device In the Motion CPU only) (Included the positioning dedicated device)	Internal relays (M)	8192 points		
	Link relays (B)	8192 points		
	Annunciators (F)	2048 points		
	Special relays (SM)	2256 points		
	Data registers (D)	8192 points		
	Link registers (W)	8192 points		
	Special registers (SD)	2256 points		
	Motion registers (#)	8736 points		
	Coasting timers (FT)	1 point (888μs)		
Multiple CPU area devices (U□\G)	Up to 14336 points usable ^(Note)			

(Note): Usable number of points changes according to the system settings.

1 OVERVIEW

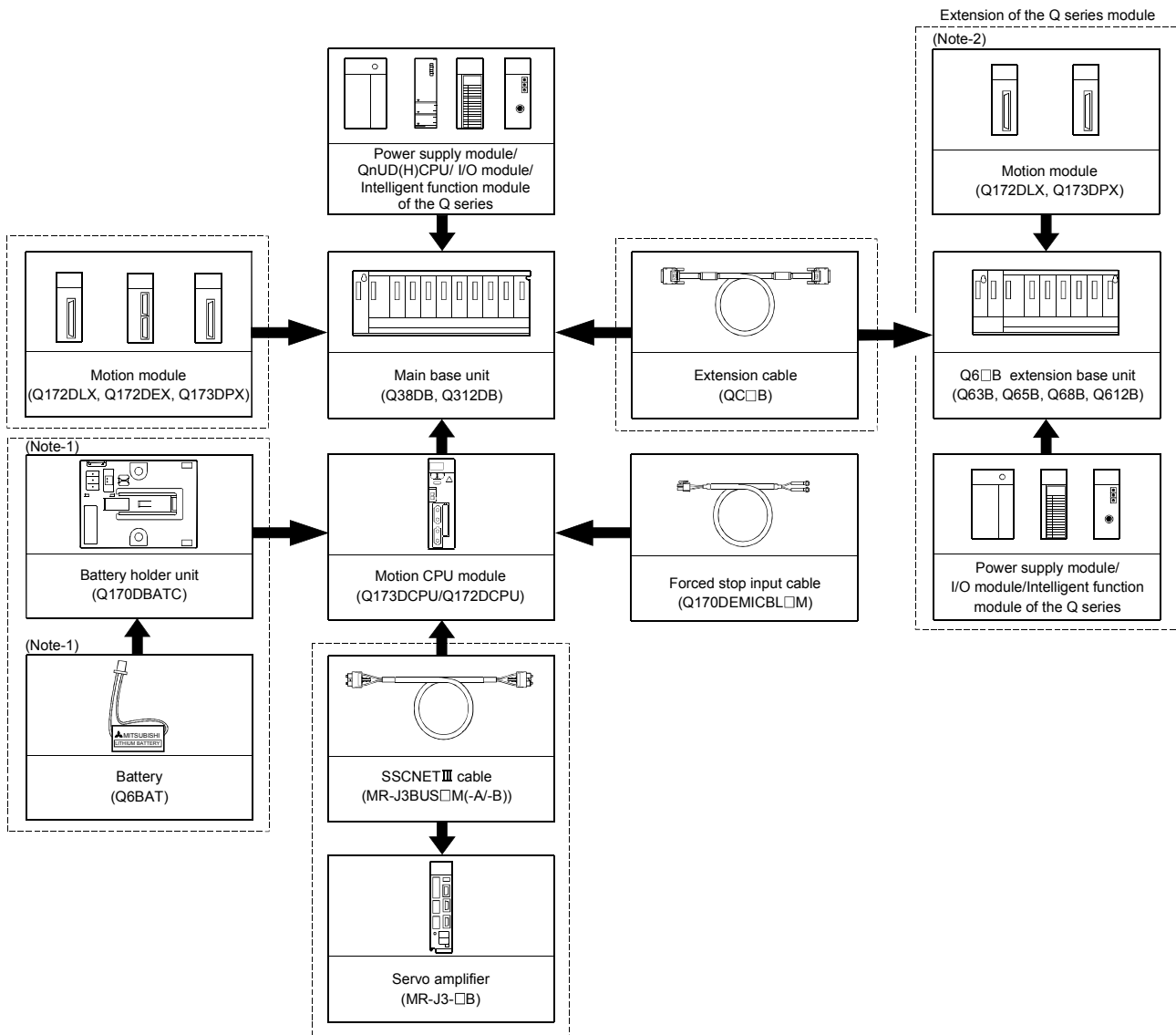
1.3 Hardware Configuration

This section describes the Q173DCPU/Q172DCPU system configuration, precautions on use of system, and configured equipments.

1.3.1 Motion system configuration

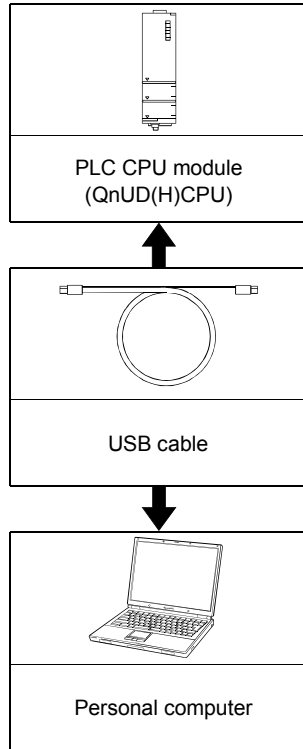
This section describes the equipment configuration, configuration with peripheral devices and system configuration in the Q173DCPU/Q172DCPU system.

(1) Equipment configuration in Q173DCPU/Q172DCPU system

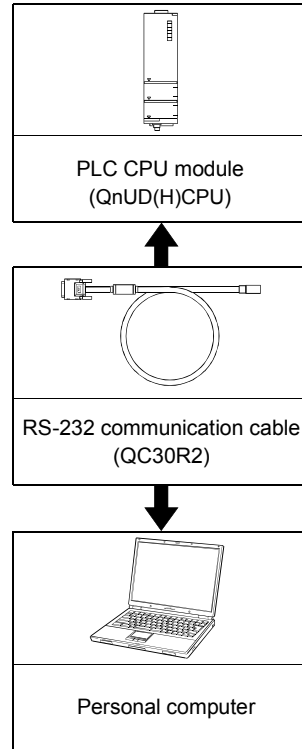


(2) Peripheral device configuration for the Q173DCPU/Q172DCPU
The following (a)(b) can be used.

(a) USB configuration

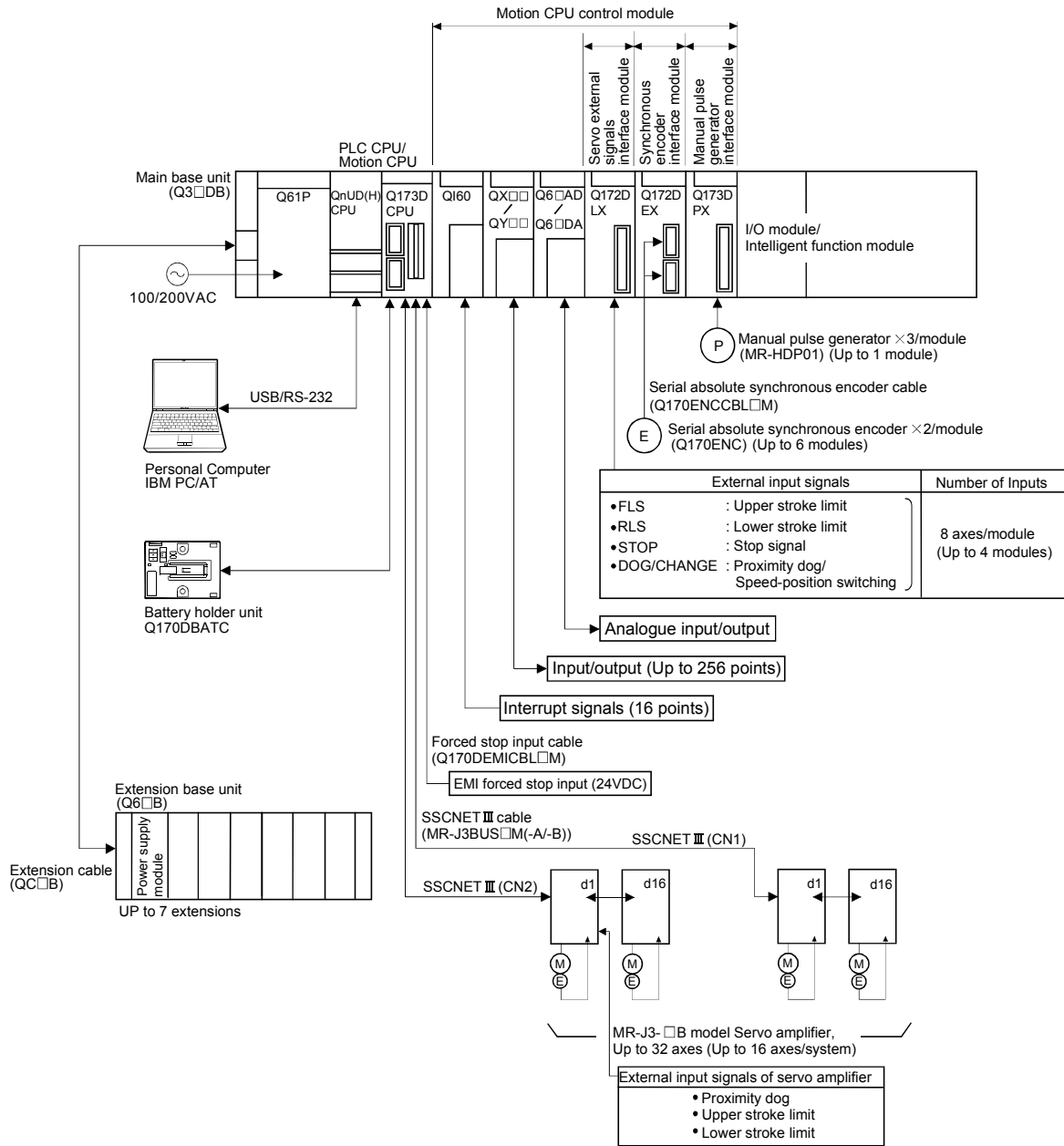


(b) RS-232 configuration



1 OVERVIEW

1.3.2 Q173DCPU System overall configuration

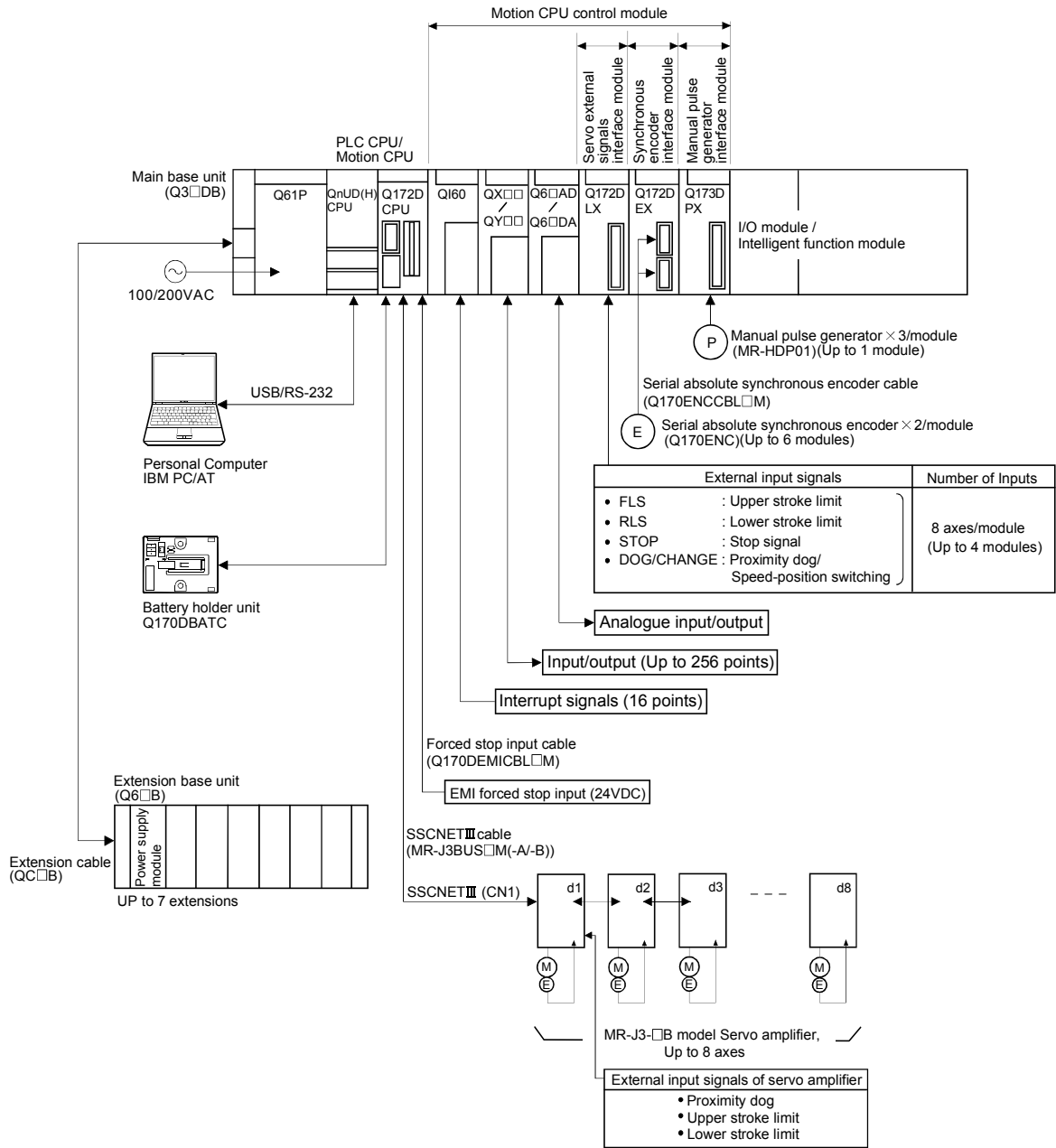


CAUTION

- 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.

1 OVERVIEW

1.3.3 Q172DCPU 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.

1 OVERVIEW

1.3.4 Software packages

(1) Software packages

(a) Operating system software

Application	Software package	
	Q173DCPU	Q172DCPU
For conveyor assembly SV13	SW8DNC-SV13QB	SW8DNC-SV13QD
For automatic machinery SV22	SW8DNC-SV22QA	SW8DNC-SV22QC

(b) Motion controller programming software

Part name	Model name	Details
MT Developer2	SW1DNC-MTW2-E (1 CD-ROM disk)	Conveyor Assembly Software Automatic Machinery Software Cam Data Creation Software Digital Oscilloscope Software Communication System Software Document Print Software Operation Manual (Help) Installation manual (PDF)

(Note) : Operating environment to use MT Developer is Windows[®] Vista/Windows[®] XP/Windows[®] 2000 English version only.

(2) Operating environment of personal computer

Operating environment is shown below.

IBM PC/AT with which Windows[®] Vista/Windows[®] XP/Windows[®]2000 English version operates normally.

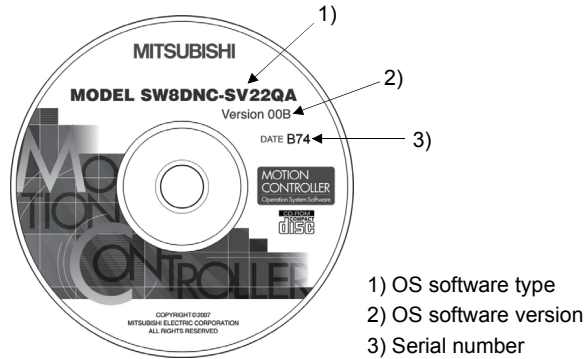
Item	Operating environment
OS	Microsoft [®] Windows [®] Vista Home Basic Microsoft [®] Windows [®] Vista Home Premium Microsoft [®] Windows [®] Vista Business Microsoft [®] Windows [®] Vista Ultimate Microsoft [®] Windows [®] Vista Enterprise Microsoft [®] Windows [®] XP Professional (Service Pack 2 or later) Microsoft [®] Windows [®] XP Home Edition (Service Pack 2 or later) Microsoft [®] Windows [®] 2000 Professional (Service Pack 4 or later)
CPU	Desktop PC: Recommended Intel [®] Celeron [®] Processor 2.8GHz or more Laptop PC: Recommended Intel [®] Pentium [®] Processor M 1.7GHz or more
Memory capacity	Recommended 512MB or more
Video card	Card compatible with Microsoft [®] DirectX [®] 9.0c or later
Available hard disk capacity	Installation: HD 1GB or more Operation: Virtual memory 50MB or more
Disk drive	CD-ROM disk drive
Display	Resolution 1024 × 768 pixels or higher

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

(Note-2) : Intel, Celeron and Pentium are trademarks of Intel Corporation in the U.S. and other countries.

(3) Operating system type/version

(a) Confirmation method in the operating system (CD)

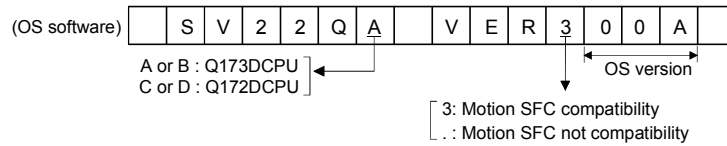


Example) When using Q173DCPU, SV22 and version 00A.

- 1) SW8DNC-SV22QA
- 2) 00A

(b) Confirmation method in MT Developer

The operating system(OS) type/version of connected CPU is displayed on the installation screen of MT Developer.



(4) Relevant software packages

(a) PLC software package

Model name	Software package
GX Developer	SW8D5C-GPPW-E

(b) Servo set up software package

Model name	Software package
MR Configurator	MRZJW3-SETUP221E

POINTS

- (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 following functions cannot be used when the computer is running under Windows® Vista, Windows® XP or Windows® 2000.
This product may not perform properly, when these functions are used.
< Windows® Vista/Windows® XP >
 - Activating the application with Windows® compatibility mode
 - Fast user switching
 - Remote desktop
 - Large size
 - x64 Edition (64 bit Windows®)< Windows® 2000 >
 - Large fonts

1.3.5 Restrictions on motion systems

(1) Combination of Multiple CPU system

- (a) Motion CPU module cannot be used as standalone module.
Be sure to install the universal model PLC CPU module (Q03UDCPU/Q04UDHCPU/Q06UDHCPU) to CPU No.1.
For Universal model PLC CPU module, "Multiple CPU high speed transmission function" must be set in the Multiple CPU settings.
- (b) Only Multiple CPU high speed main base unit (Q38DB/Q312DB) can be used.
- (c) The combination of Q173DCPU/Q172DCPU and Q173HCPU(-T)/Q172HCPU(-T)/Q173CPUN(-T)/Q172CPUN(-T) cannot be used.
- (d) Up to four modules of PLC CPU modules (Q03UDCPU/Q04UDHCPU/Q06UDHCPU/Motion CPU modules) can be installed from the CPU slot (the slot on the right side of power supply module) to slot 2 of the main base unit. CPU modules called as CPU No.1 to CPU No.4 from the left sequentially. There is no restriction on the installation order of CPU No.2 to No.4. For CPU module except CPU No.1, an empty slot can be reserved for addition of CPU module. An empty slot can be set between CPU modules. However, the mounting condition when combining with the High performance PLC CPU module/Process CPU module/PC CPU module/C controller module is different depending on the specification of CPU modules, refer to the Manuals of each CPU modules.
- (e) It takes about 10 seconds to startup (state that can be controlled) of Motion CPU. Make a Multiple CPU synchronous startup setting suitable for the system.
- (f) Execute the automatic refresh of the Motion CPU modules and PLC CPU modules (Q03UDCPU/Q04UDHCPU/Q06UDHCPU) by using the automatic refresh of Multiple CPU high speed transmission area setting. When the High performance PLC CPU module/Process CPU module/PC CPU module/C controller module is mounted in the combination of Multiple CPU system, the Motion CPU module cannot be execute the automatic refresh with these modules.
- (g) Use the Motion dedicated PLC instructions that starts by "D(P)". The Motion dedicated PLC instructions that starts by "S(P)." cannot be used. When the High performance PLC CPU module/Process CPU module/PC CPU module/C controller module is mounted in the combination of Multiple CPU system, the Motion dedicated PLC instruction from these modules cannot be executed.

(2) Motion modules

- (a) Installation position of Q172DEX^(Note-1) is only the main base unit. It cannot be used on the extension base unit.
- (b) Q172DLX/Q173DPX can be installed on any of the main base unit/extension base unit.
- (c) Q172DLX/Q172DEX^(Note-1)/Q173DPX cannot be installed in CPU slot and I/O slot 0 to 2 of the main base unit. Wrong installation might damage the main base unit.
- (d) Q172EX(-S1/-S2/-S3)/Q172LX/Q173PX(-S1) for Q173HCPU(-T)/Q172HCPU(-T)/Q173CPUN(-T)/Q172CPUN(-T)/Q173CPU/Q172CPU cannot be used.
- (e) Be sure to use the Motion CPU as the control CPU of Motion modules (Q172DLX, Q172DEX^(Note-1), Q173DPX, etc.) for Motion CPU. 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.

(Note-1) : Q172DEX can be used in SV22. It cannot be used in SV13.

(3) Other restrictions

- (a) Motion CPU module cannot be set as the control CPU of intelligent function module (except some modules) or Graphic Operation Terminal(GOT).
- (b) Be sure to use the external battery.
- (c) There are following methods to execute the forced stop input.
 - Use a EMI terminal of Motion CPU module
 - Use a device set in the forced stop input setting of system setting
- (d) Forced stop input for EMI terminal of Motion CPU module cannot be invalidated by the parameter.
 When the device set in the forced stop input setting is used without use of EMI terminal of Motion CPU module, apply 24VDC voltage on EMI terminal and invalidate the forced stop input of EMI terminal.
- (e) Be sure to use the cable for forced stop input (sold separately). The forced stop cannot be released without using it.
- (f) 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.
- (g) It is impossible to mount the main base unit by DIN rail when using the Motion CPU module.
 Doing so could result in vibration that may cause erroneous operation.
- (h) The module name displayed by "System monitor" - "Product information list" of GX Developer is different depending on the function version of Motion modules (Q172DLX, Q172DEX, Q173DPX).
 (Note): Even if the function version "C" is displayed, it does not correspond to the online module change.

Module name	Model display	
	Function version "B"	Function version "C"
Q172DLX	Q172LX	Q172DLX
Q172DEX	MOTION-UNIT	Q172DEX
Q173DPX	MOTION-UNIT	Q173DPX

MEMO

2. MULTIPLE CPU SYSTEM

2.1 Multiple CPU System

2.1.1 Overview

(1) What is Multiple CPU system ?

A Multiple CPU system is a system in which more than one PLC CPU module and Motion CPU module (up to 4 modules) are mounted on several main base unit in order to control the I/O modules and intelligent function modules. Each Motion CPU controls the servo amplifiers connected by SSCNETⅢ cable.

(2) System configuration based on load distribution

(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 CPU modules.

It is possible to control up to 96 axes by using the three CPU modules (Q173DCPU).

(c) By distributing the high-load processing performed on a single PLC CPU over several CPU modules, it is possible to reduce the overall system PLC scan time.

(3) Communication between CPUs in the Multiple CPU system

(a) Since device data of other CPUs can be automatically read by the automatic refresh function, the self CPU can also use them as those of self CPU.

(Note): When the High performance PLC CPU module/Process CPU module/PC CPU module/C controller module is mounted in the combination of Multiple CPU system, the Motion dedicated PLC instruction from these modules cannot be executed.

(b) Motion dedicated PLC instructions can be used to access device data from the PLC CPU to Motion CPU and start Motion SFC program.

2 MULTIPLE CPU SYSTEM

2.1.2 Installation position of CPU module

Up to four PLC CPUs and Motion CPUs can be installed from the CPU slot (the right side slot of the power supply module) to slots 2 of the main base unit.

The Motion CPU module cannot be installed in the CPU slot.

The PLC CPU module must be installed in the CPU slot (CPU No.1) in the Multiple CPU system.

There is no restriction on the installation order for CPU modules (CPU No.2 to 4).

(Note): Refer to the manual for each CPU module when the High performance PLC CPU module, Process CPU module, PC CPU module and C controller module is mounted in the combination of Multiple CPU.

Table 2.1 Example for CPU module installation

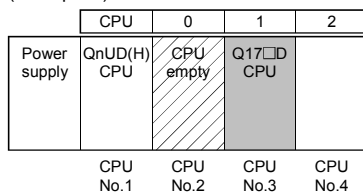
Number of CPUs	Installation position of CPU module												
	Power supply	CPU No.1	CPU No.2	CPU No.3	CPU No.4								
2	<table border="1"> <tr><th>CPU</th><th>0</th><th>1</th><th>2</th></tr> <tr><td>QnUD(H) CPU</td><td>Q17□□D CPU</td><td></td><td></td></tr> </table>	CPU	0	1	2	QnUD(H) CPU	Q17□□D CPU						
	CPU	0	1	2									
QnUD(H) CPU	Q17□□D CPU												
3	<table border="1"> <tr><th>CPU</th><th>0</th><th>1</th><th>2</th></tr> <tr><td>QnUD(H) CPU</td><td>Q17□□D CPU</td><td>QnUD(H) CPU</td><td></td></tr> </table>	CPU	0	1	2	QnUD(H) CPU	Q17□□D CPU	QnUD(H) CPU					
	CPU	0	1	2									
QnUD(H) CPU	Q17□□D CPU	QnUD(H) CPU											
4	<table border="1"> <tr><th>CPU</th><th>0</th><th>1</th><th>2</th></tr> <tr><td>QnUD(H) CPU</td><td>Q17□□D CPU</td><td>QnUD(H) CPU</td><td>CPU empty</td></tr> </table>	CPU	0	1	2	QnUD(H) CPU	Q17□□D CPU	QnUD(H) CPU	CPU empty				
	CPU	0	1	2									
QnUD(H) CPU	Q17□□D CPU	QnUD(H) CPU	CPU empty										

CPU 0 1 2 : Slot number

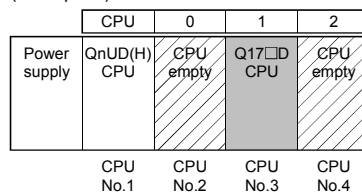
An empty slot can be reserved for future addition of a CPU module.

Set the number of CPU modules including empty slots in the Multiple CPU setting, and set the type of the slots to be emptied to "PLC (Empty)" in the CPU setting.

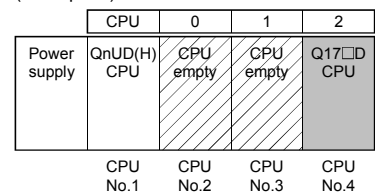
(Example 1)



(Example 2)



(Example 3)



2.1.3 Precautions for using I/O modules and intelligent function modules

(1) Modules controllable by the Motion CPU

Modules controllable by the Motion CPU are shown below.

- Motion modules (Q172DLX, Q172DEX, Q173DPX)
- I/O modules (QX□, QY□, QH□, QX□Y□)
- Analogue modules (Q6□AD□, Q6□AD-□, Q6□DA□, Q6□DA-□)
- Interrupt module (QI60)

(2) Compatibility with the Multiple CPU system

The intelligent function modules of function version "B" or later support the Multiple CPU system. Be sure to use the PLC CPU as a control CPU because of the intelligent function modules cannot be controlled by the Motion CPU.

(3) Access range from non-controlled 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 non-controlled PLC CPU for the modules controlled by the Motion CPU are shown below.

Table 2.2 Access range to non-controlled module

Access target		I/O setting outside of the group (Set by PLC CPU)	
		Disabled (Not checked)	Enabled (Checked)
Input (X)		×	○
Output (Y)		×	×
Buffer memory	Read	×	×
	Write	×	×

○ : Accessible × : Inaccessible

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 "Q173DCPU/Q172DCPU 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 install restrictions for the Motion CPU are shown below. Use within the restrictions listed below.

Description	Model name	Maximum installable modules per CPU	
		Q173DCPU	Q172DCPU
Servo external signals interface module	Q172DLX	4 modules	1 module
Serial absolute synchronous interface module	Q172DEX (Note-2)	6 modules	4 modules
Manual pulse generator interface module	Q173DPX (Note-1)	4 modules ^(Note-2) (Incremental serial encoder use)	3 modules ^(Note-2) (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□ Q6□AD-□		
Analogue output module	Q6□DA□ Q6□DA-□		
Interrupt module	QI60		

(Note-1) : When the Manual pulse generator and the serial encoder are used at the same time with the SV22, the Q173DPX installed in the slot of the smallest number is used for manual pulse generator input.

(Note-2) : SV22 only.

- (2) A total of eight base units including one main base unit and seven extension base units can be used. However, the usable slots (number of modules) are limited to 64 per system including empty 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 main 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.)

POINT
(1) Q172DLX/Q172DEX/Q173DPX cannot be installed in CPU slot and I/O slot 0 to 2 of the main base unit. Wrong installation might damage the main base unit.
(2) Q172DEX can be installed in the main base unit only. It cannot be used in the extension base unit.

2 MULTIPLE CPU SYSTEM

2.1.5 How to reset the Multiple CPU system

The entire Multiple CPU system can be reset by resetting CPU No.1.

The CPU modules of No.2 to No.4, I/O modules and intelligent function modules will be reset when PLC CPU No.1 is reset.

If a stop error occurs in any of the CPUs on the Multiple CPU system, either reset CPU No.1 or restart the Multiple CPU system (power supply ON → OFF → ON) for recovery.

(Recovery is not allowed by resetting the error-stopped CPU modules other than CPU No.1.)

POINT
(1) It is not possible to reset the CPU modules of No.2 to No.4 individually in the Multiple CPU system. If an attempt to reset any of those PLC CPU modules during operation of the Multiple CPU system, a "MULTI CPU DOWN (error code: 7000)" error will occur for the other CPUs, and the entire Multiple CPU system will be halted. However, depending on the timing in which any of PLC CPU modules other than No.1 has been reset, an error other than the "MULTI CPU DOWN" may halt the other PLC CPUs/Motion CPUs.
(2) A "MULTI CPU DOWN (error code: 7000)" error will occur regardless of the operation mode(All stop by stop error of CPU "n"/continue) set at the "Multiple CPU setting" screen when any of PLC CPU modules of No.2 to No.4 is reset. (Refer to Section 2.1.6.)

2 MULTIPLE CPU SYSTEM

2.1.6 Operation for CPU module stop error

The entire system will behave differently depending whether a stop error occurs in CPU No.1 or any of CPU No.2 to No.4 in the Multiple CPU system.

(1) When a stop error occurs at CPU No.1

- (a) A "MULTI CPU DOWN (error code: 7000)" error occurs at the other CPUs and the Multiple CPU system will be halted when a stop error occurs at the PLC CPU No.1. ^(Note-1)
- (b) The following procedure to restore the system is shown below.
 - 1) Confirm the error cause with the PLC diagnostics on GX Developer.
 - 2) Remove the error cause.
 - 3) Either reset the PLC CPU No.1 or restart the power to the Multiple CPU system (power ON → OFF → ON).

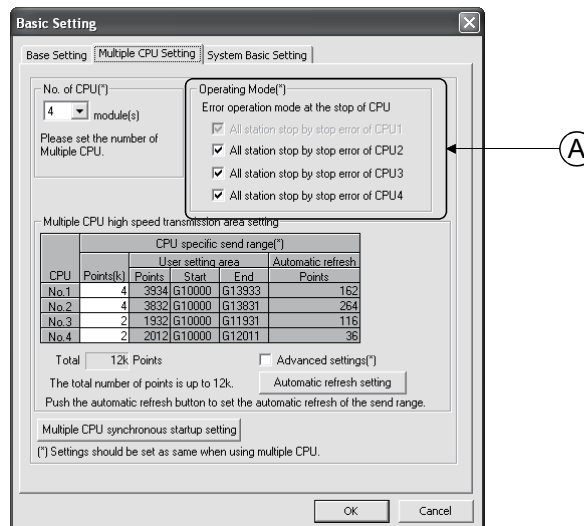
All CPUs on the entire Multiple CPU system will be reset and the system will be restored when PLC CPU No. 1 is reset or the Multiple CPU system is reapplied.

(2) When a stop error occurs at CPU other than No.1

Whether the entire system is halted or not is determined by the Multiple CPU setting's "Operating Mode" setting when a stop error occurs in a PLC CPU module/Motion CPU module other than CPU No.1.

The default is set for all CPUs to be stopped with a stop error.

When you do not want to stop all CPUs at occurrence of a stop error in a PLC CPU module/Motion CPU module, remove the check mark that corresponds to the CPU No. so that its error will not stop all CPUs. (See arrow A.)

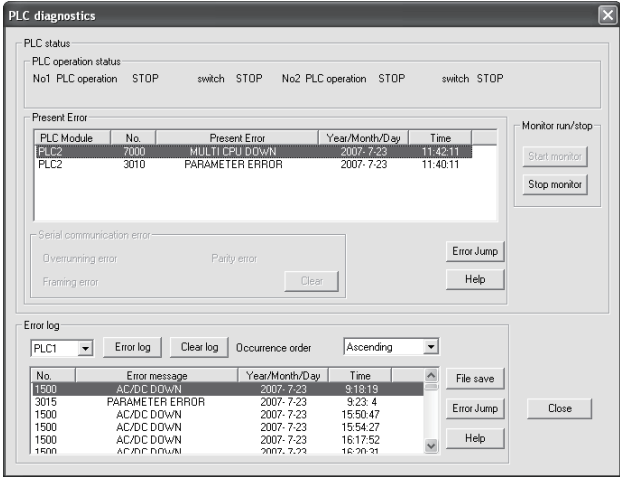


- (a) When a stop error occurs in the CPU module for which "All station stop by stop error of CPU 'n' " has been set, a "MULTI CPU DOWN (error code: 7000)" error occurs for the other PLC CPU module/Motion CPU modules and the Multiple CPU system will be halted. ^(Note-1)

- (b) When a stop error occurs in the CPU module for which " All station stop by stop error of CPU 'n' " has not been set, a "MULTI EXE. ERROR (error code: 7010)" error occurs in all other CPUs but operations will continue.

POINT

(Note-1) : When a stop error occurs, a "MULTI CPU DOWN (error code : 7000)" stop error will occur at the CPU on which the error was detected. Depending on the timing of error detection, a "MULTI CPU DOWN" error may be detected in a CPU of "MULTI CPU DOWN" status, not the first CPU on which a stop error occurs. Because of this, CPU No. different from the one of initial error CPU may be stored in the error data's common information category. To restore the system, remove the error cause on the CPU that is stopped by an error other than "MULTI CPU DOWN". In the screen below, the cause of the CPU No.2 error that did not cause the "MULTI CPU DOWN" error is to be removed.



The screenshot shows the 'PLC diagnostics' window. At the top, 'PLC status' indicates 'No1 PLC operation STOP' and 'No2 PLC operation STOP'. The 'Present Error' table is as follows:

PLC Module	No.	Present Error	Year/Month/Day	Time
PLC2	7000	MULTI CPU DOWN	2007-7-23	11:43:11
PLC2	3010	PARAMETER ERROR	2007-7-23	11:40:11

The 'Error log' section is set to 'PLC1' and shows the following table:

No.	Error message	Year/Month/Day	Time
1500	AC/DC DOWN	2007-7-23	9:18:19
3015	PARAMETER ERROR	2007-7-23	9:23:4
1500	AC/DC DOWN	2007-7-23	15:50:47
1500	AC/DC DOWN	2007-7-23	15:54:27
1500	AC/DC DOWN	2007-7-23	18:17:52
1500	AC/DC DOWN	2007-7-23	18:20:31

- (c) Observe the following procedures to restore the system.
 - 1) Confirm the error-detected CPU No. and error cause with the PLC diagnostics on GX Developer.
 - 2) If the error code occurred in Motion CPU 10000 to 10999, confirm the error cause with Motion CPU error batch monitor of MT Developer.
 - 3) Remove the error cause.
 - 4) Either reset the PLC CPU No.1 or restart the power to the Multiple CPU system (power ON → OFF → ON).

All CPUs on the entire Multiple CPU system will be reset and the system will be restored when PLC CPU No.1 is reset or the power to the Multiple CPU system is reapplied.

2 MULTIPLE CPU SYSTEM

(3) Operation at a Motion CPU error

Operations at a Motion CPU error are shown below.

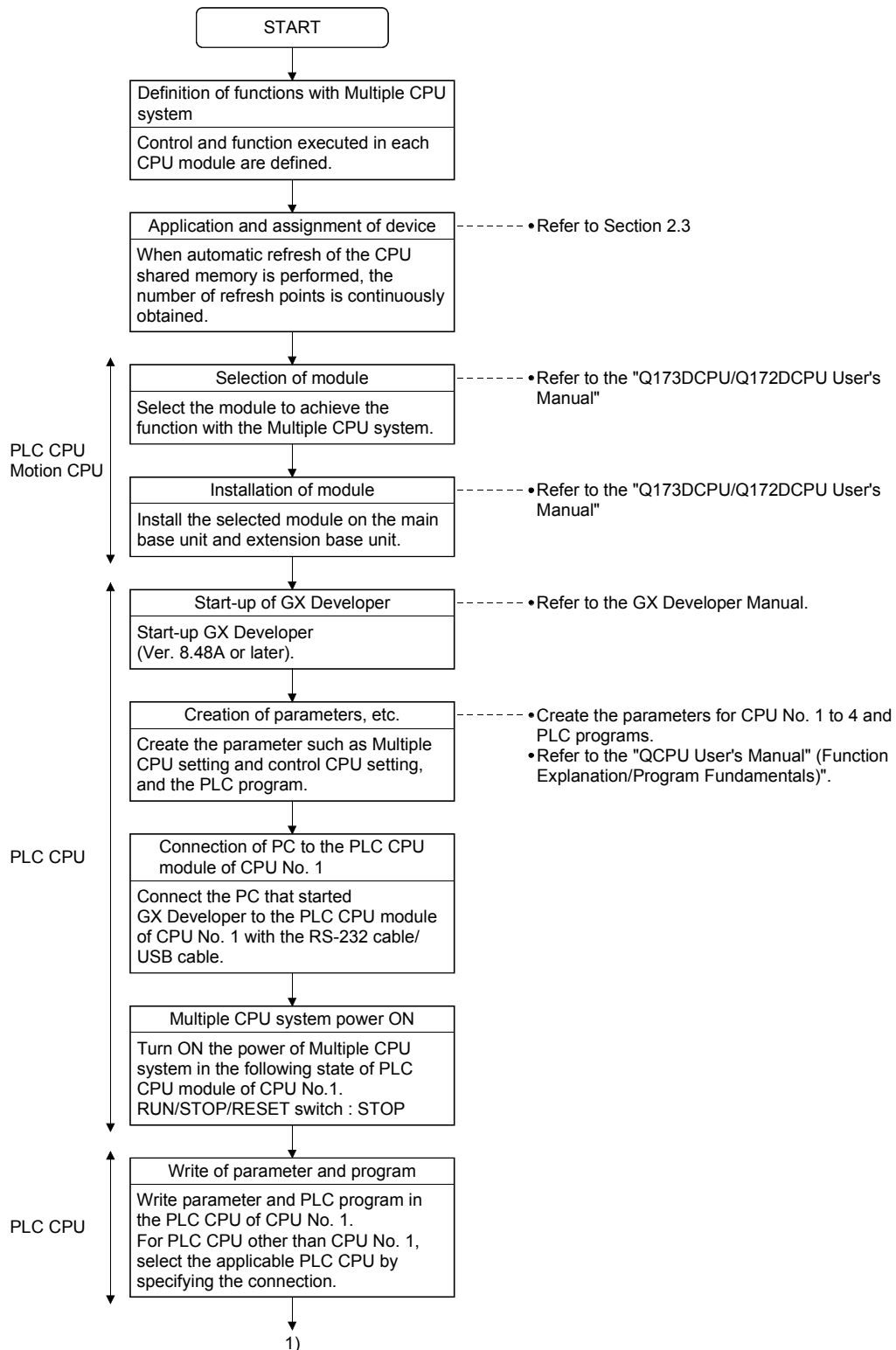
Category	Type of error	Operation	Remark
Operation disable errors	System setting error	Does not operate from the beginning (does not run).	• All actual output PY points turn OFF. No effect on other CPUs.
	WDT error	Varies depending on the error.	• All actual output PY points turn OFF. Other CPUs may also 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.	
	Motion SFC error	Processing stops for each program or axis instead of the Motion CPU stopping all the processing.	<ul style="list-style-type: none"> • Only the applicable program stops (the program may continue depending on the type of error). • Actual output PY retains output. • No effect on other CPUs.
	Minor error		
	Major error		
	Servo error		
Servo program setting error			

2 MULTIPLE CPU SYSTEM

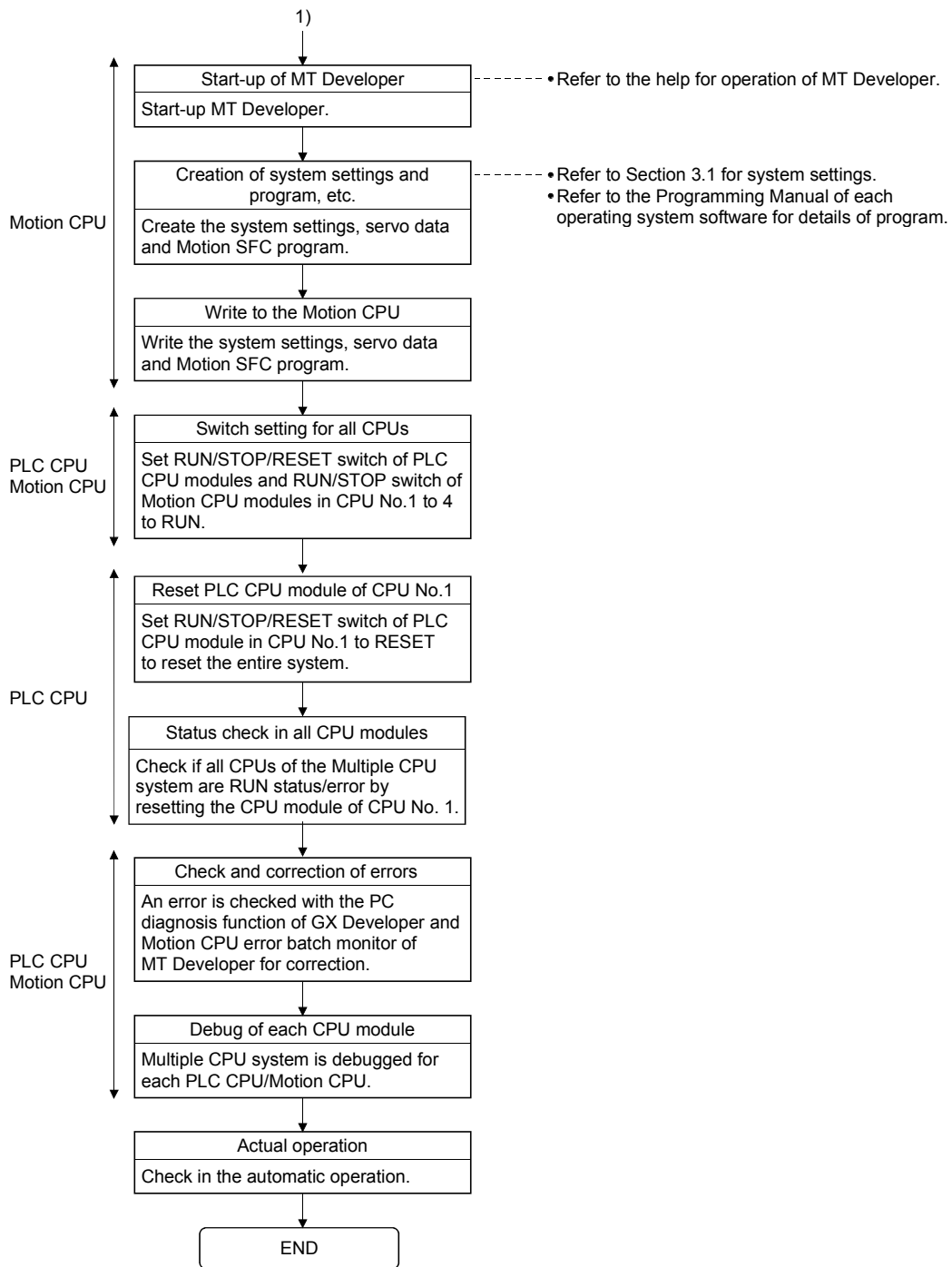
2.2 Starting Up the Multiple CPU System

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 "Q173DCPU/Q172DCPU 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

2.3.1 CPU shared Memory

(1) Structure of CPU shared memory

The CPU shared memory is memory provided for each CPU module by which data is written or read between CPU modules of a Multiple CPU system.

The CPU shared memory consists of four areas.

- Self CPU operation information area
- System area
- User setting area
- Multiple CPU high speed transmission area

The CPU shared memory configuration and the availability of the communication from the self CPU using the CPU shared memory by program are shown below.

CPU shared memory		Self CPU		Other CPU		
		Write	Read	Write	Read	
(0H) 0 to (1FFH) 511	to (200H) 512	Self CPU operation information area	×	○ ^(Note-2)	×	○ ^(Note-2)
(7FFH) 2047 (800H) 2048		System area	×	×	×	○ ^(Note-2)
	to (FFFH) 4095	User setting area	○ ^(Note-1)	○ ^(Note-2)	×	○ ^(Note-2)
(1000H) 4096 (270FH) 9999 (2710H) 10000		Unusable	×	×	×	×
	to (5F0FH) 24335	Multiple CPU high speed transmission area (Variable size in 0 to 14k[points]: 1k words in unit)	○ ^(Note-3)	○ ^(Note-3)	×	○ ^(Note-3)

} Multiple CPU high speed bus

○ : Communication allowed × : Communication not allowed

REMARK

(Note-1) : Use the MULTW instruction to write to the user setting area of the self CPU in the Motion CPU.

Use the S. TO instruction to write to the user setting area of the self CPU in the PLC CPU.

(Note-2) : Use the MULTR instruction to read the shared memory of self CPU and other CPU in the Motion CPU.

Use the FROM instruction/Multiple CPU area device (U□\G□) to read the shared memory of the Motion CPU from the PLC CPU.

(Note-3) : Refer to Section 2.3.2(1) for the access method of Multiple CPU high speed transmission area.

2 MULTIPLE CPU SYSTEM

(a) Self CPU operation information area (0H to 1FFH)

- 1) The following information of self CPU is stored as the Multiple CPU system

Table 2.3 Table of self CPU operation information areas

CPU shared memory address	Name	Detail	Description (Note)	Corresponding special register
0H	Information availability	Information availability flag	The area to confirm if information is stored in the self CPU's operation information area (1H to 1FH) or not. <ul style="list-style-type: none"> • 0: Information not stored in the self CPU's operation information area. • 1: Information stored in the self CPU's operation information area. 	—
1H	Diagnostic error	Diagnostic error number	An error No. identified during diagnosis is stored in BIN.	SD0
2H	Time the diagnostic error occurred	Time the diagnostic error occurred	The year and month that the error number was stored in the CPU shared memory's 1H address is stored with two digits of the BCD code.	SD1
3H			The date and time that the error number was stored in the CPU shared memory's 1H address is stored with two digits of the BCD code.	SD2
4H			The minutes and seconds that the error number was stored in the CPU shared memory's 1H address is stored with two digits of the BCD code.	SD3
5H	Error information identification code	Error information identification code	Stores an identification code to determine what error information has been stored in the common error information and individual error information.	SD4
6H to 10H	Common error information	Common error information	The common information corresponding to the error number identified during diagnosis is stored.	SD5 to SD15
11H to 1BH	Individual error information	Individual error information	The individual information corresponding to the error number identified during diagnostic is stored.	SD16 to SD26
1CH	Empty	—	Cannot be used	—
1DH	Switch status	CPU switch status	Stores the CPU module switch status.	SD200
1EH	Empty	—	Cannot be used	—
1FH	CPU operation status	CPU operation status	Stores the CPU module's operation status.	SD203

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

- 2) The self CPU operation information area is refreshed every time the applicable register has been changed in the main cycle.
- 3) Other PLC CPU can use FROM instruction to read data from the self CPU operation information area.
However, because there is a delay in data updating, use the read data for monitoring purposes only.

(b) System area

The area used by the operating systems (OS) of the PLC CPU/Motion CPU.

(c) User setting area

The area for communication between CPU modules in the Multiple CPU system by MULTR/MULTW instruction of Motion CPU.

(PLC CPU use FROM/S.TO instruction or Multiple CPU area devices to communicate between CPU modules.)

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

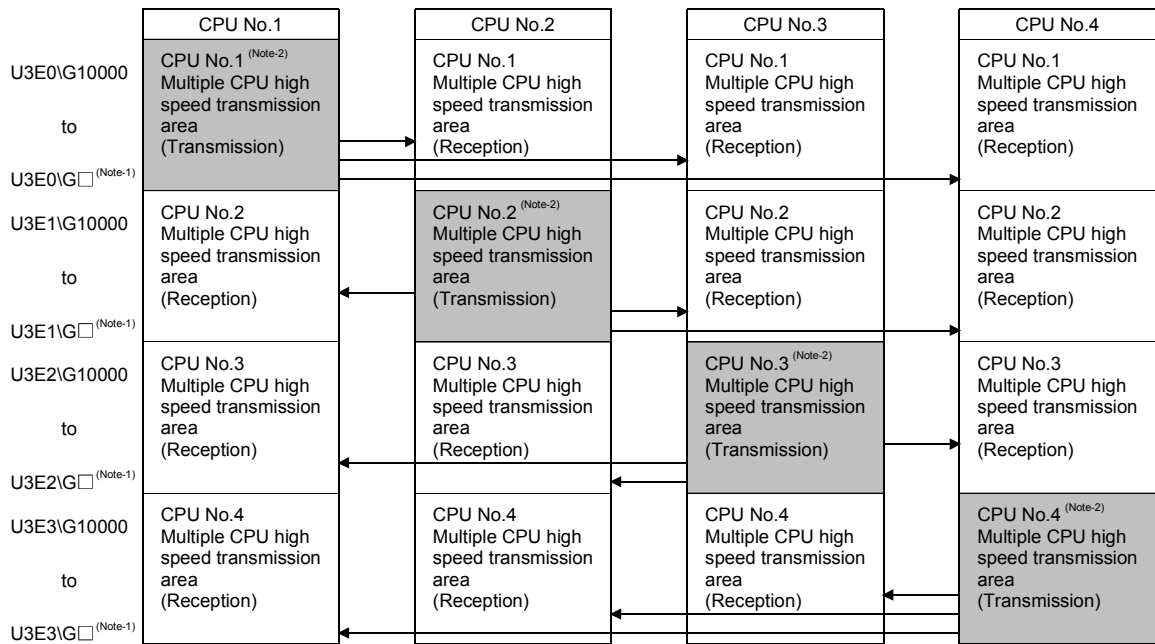
2 MULTIPLE CPU SYSTEM

(d) Multiple CPU high speed transmission area

The area corresponding to the Multiple CPU high speed main base unit (Q3□DB) and Multiple CPU high speed transmission that uses the drive system controllers including QnUD(H)CPU and Motion CPU.

The image chart of Multiple CPU high speed transmission area is shown below.

Refer to Section 2.3.2(1) for access to the Multiple CPU high speed transmission area of self CPU and other CPU.



(Note-1) : The final device is "10000+(A*1024-B-1)".

A : Data transmission size of each CPU (1k words in unit)

B : Size used in the automatic refresh of each CPU.

Refer to Section "2.3.2 Multiple CPU high speed transmission" for the size setting of A and B.

(Note-2) : Transmission area to write/read in the self CPU.

Reception area from the other CPU can be read only.

It is updated every 0.88ms.

2.3.2 Multiple CPU high speed transmission

(1) Multiple CPU high speed transmission

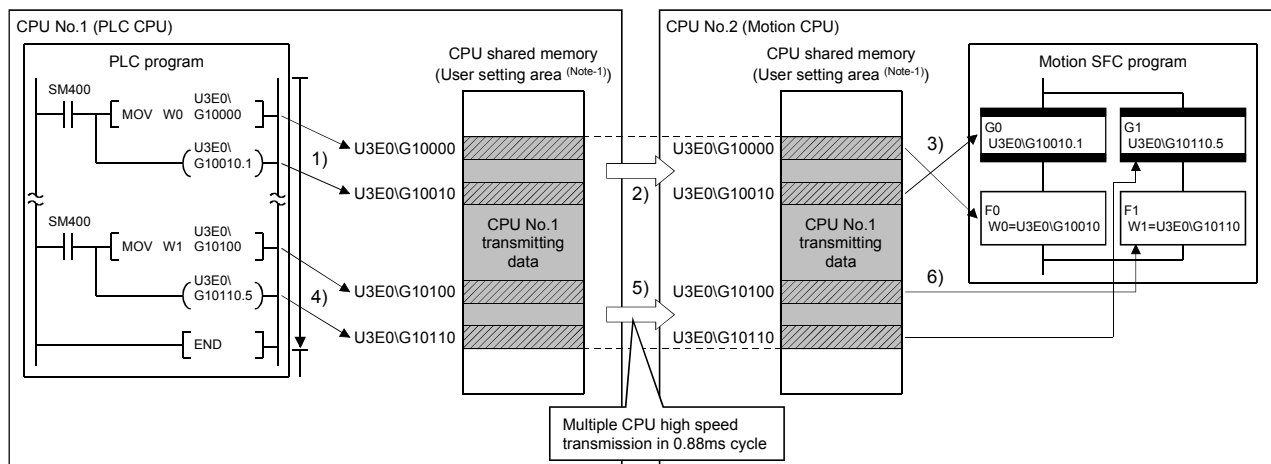
Multiple CPU high speed transmission is a function for fixed cycle data transmission between Multiple CPUs (Multiple CPU high speed transmission cycle is 0.88ms.).

Secure data transmission is possible without effecting the PLC CPU scan time or Motion CPU main cycle because the data transmission and execution of PLC program and Motion SFC program can be executed with parallel processing. High speed response between multiple CPUs is realized by synchronizing the Multiple CPU high speed transmission cycle with Motion CPU operation cycle.

The following methods of data transmission exist between Multiple CPUs for Multiple CPU high speed transmission.

- Multiple CPU area device method
Directly set the Multiple CPU high speed transmission area by Multiple CPU area device (U□\G□) in the program.
- Automatic refresh method
Refresh the internal devices of each CPU by automatic refresh via "Multiple CPU high speed transmission area".

(a) Multiple CPU area device method



- 1), 4) : Write data in the user setting area ^(Note-1) by the instruction that uses the Multiple CPU area device.
- 3), 6) : Read data from the user setting area ^(Note-1) by the instruction that uses the Multiple CPU area device.
- 2), 5) : Transmit the contents of user setting area ^(Note-1) to the other CPU with by Multiple CPU high speed transmission in 0.88ms cycle.

Note-1: The area composed in the Multiple CPU high speed transmission area.
(Refer to Section "(3) Memory configuration of Multiple CPU high speed transmission area".)

2 MULTIPLE CPU SYSTEM

1) Access to Multiple CPU high speed transmission area

a) Description of Multiple CPU area device

Word device : U \ G

→ CPU shared memory address (decimal) (10000 to up to 24335)
 → First I/O number of CPU module

CPU No.	CPU No.1	CPU No.2	CPU No.3	CPU No.4
First I/O number	3E0(H)	3E1(H)	3E2(H)	3E3(H)

Bit device : U \ G .

→ Bit specification (0 to F : Hexadecimal)
 → CPU shared memory address (decimal) (10000 to up to 24335)
 → First I/O number CPU module

CPU No.	CPU No.1	CPU No.2	CPU No.3	CPU No.4
First I/O number	3E0(H)	3E1(H)	3E2(H)	3E3(H)

(Example)

- Multiple CPU high speed transmission memory address of CPU No. 2:
10002
U3E1\G10002
- Bit 14 of CPU No. 3 Multiple CPU high speed transmission memory
address 10200
U3E2\G10200.E

b) Example of access in the program

<Motion SFC program>

- Store K12345678 to the Multiple CPU high speed transmission
memory 10200,10201 of self CPU (CPU No.2).
U3E1\G10200L = K12345678
- Turn on bit 12 of the Multiple CPU high speed transmission
memory 10301 of self CPU (CPU No.3)
SET U3E2\G10301.C

<Servo program>

- Program which executes the positioning for Axis 1 to position set
in the Multiple CPU high speed transmission memory 10400,
10401 of CPU No.1 at the speed set in the 10402, 10403 of CPU
No.1, and uses bit 1 of CPU No.1 Multiple CPU high speed
transmission memory 10404 of CPU No.1 as a cancel signal.

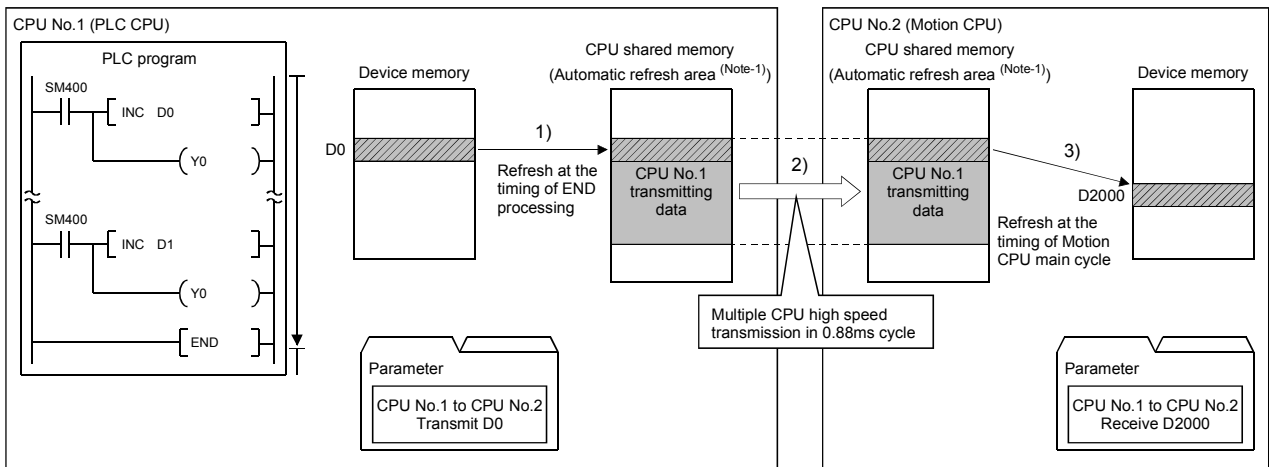
ABS-1		
Axis	1,	U3E0\G10400
Speed		U3E0\G10402
Cancel		U3E0\G10404.1

POINT

This method can be used to access only the Multiple CPU high speed transmission area of CPU shared memory. It cannot be used to access the CPU shared memory (0 to 4095).

2 MULTIPLE CPU SYSTEM

(b) Example of using automatic refresh method



- 1) Transmit the content of D0 to the automatic refresh area ^(Note-1) at the time of END processing by parameter setting.
 - 2) Transmit the content of automatic refresh area ^(Note-1) to the other CPU by Multiple CPU high speed transmission at 0.88ms cycle.
 - 3) Read the content of automatic refresh area ^(Note-1) at the time of Motion CPU main cycle and transmit it to D2000 by parameter setting.
- Note-1: The area composed in the Multiple CPU high speed transmission area.
(Refer to Section "(3) Memory configuration of Multiple CPU high speed transmission area".)

(2) System configuration

Multiple CPU high speed transmission can be used only between CPU modules for the Multiple CPU high speed transmission installed in the Multiple CPU high speed main base unit (Q3□DB).

The system configuration specification is shown in Table 2.4.

Table 2.4 System configuration to use Multiple CPU high speed transmission

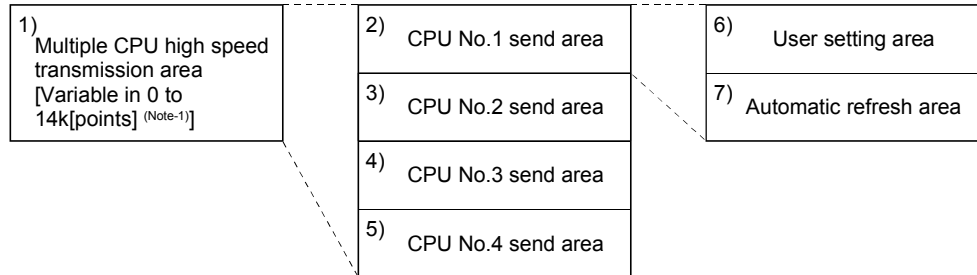
Object	Restrictions
Base unit	Multiple CPU high speed main base unit (Q3□DB) is used.
CPU module	QnUD(H)CPU is used for CPU No. 1.
	Q173DCPU/Q172DCPU and QnUD(H)CPU are used for CPU No. 2 to CPU No. 4

"MULTI EXE. ERROR (error code: 7011) will occur if the power supply of Multiple CPU system is turned on without matching the system configuration shown in Table 2.4.

2 MULTIPLE CPU SYSTEM

(3) Memory configuration of Multiple CPU high speed transmission area

Memory configuration of Multiple CPU high speed transmission area is shown below.



(Note-1): Multiple CPU high speed transmission area;
 14k[points]: Maximum value when constituted with two CPUs
 13k[points]: Maximum value when constituted with three CPUs
 12k[points]: Maximum value when constituted with four CPUs

Table 2.5 Description of area

No.	Name	Description	Size	
			Setting range	Setting unit
1)	Multiple CPU high speed transmission area	<ul style="list-style-type: none"> Area for data transmission between each CPU module in the Multiple CPU system. The area up to 14k [points] is divided between each CPU module that constitutes the Multiple CPU system. 	0 to 14k	1k
2)	CPU No. n send area (n=1 to 4)	<ul style="list-style-type: none"> Area to store the send data of the each CPU module. Sends the data stored in the send area of self CPU to the other CPUs. Other CPU send area stores the data received from the other CPUs. 	0 to 14k	1k
3)				
4)				
5)				
6)	User setting area	<ul style="list-style-type: none"> Area for data communication with other CPUs using the Multiple CPU area device. Can be accessed by the user program using the Multiple CPU area device. Refer to Section 2.3.2 (1) for details of this area. 	0 to 14k	2
7)	Automatic refresh area	<ul style="list-style-type: none"> Area for communicating device data with other CPUs by the communication using the automatic refresh. Access by user program is disabled. Refer to Section "(4)(b) Automatic refresh setting" for details of this area. 	0 to 14k	2

(4) Parameter setting

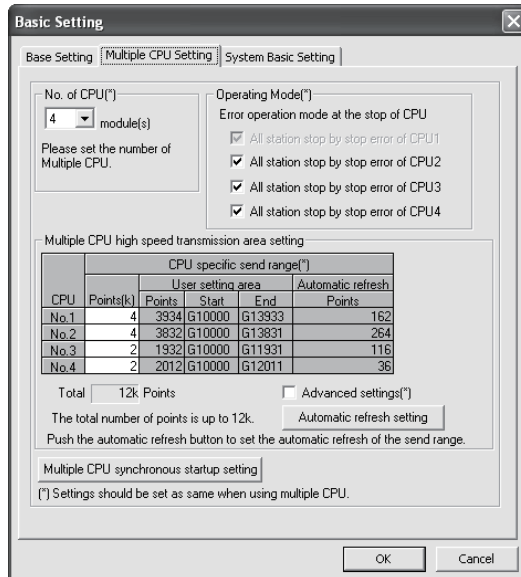
The parameter setting list for use with the Multiple CPU high speed transmission is shown in Table 2.6.

Table 2.6 Multiple CPU high speed transmission parameter list

Name	Description	Target CPU
Multiple CPU high speed transmission area setting	Set the size of the Multiple CPU high speed transmission area allocated in each CPU module which composes the Multiple CPU system.	All CPUs
Automatic refresh setting	Set the range to execute the data transmission by the automatic refresh function among the user area in the Multiple CPU high speed transmission area.	

(a) Multiple CPU high speed transmission area setting

Multiple CPU high speed transmission area setting screen and setting range are shown below.



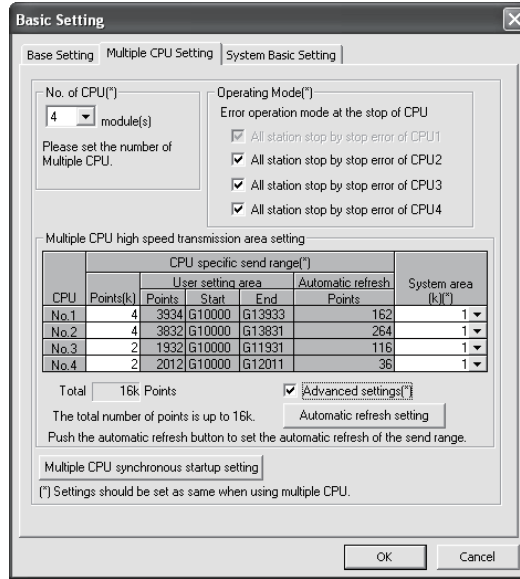
2 MULTIPLE CPU SYSTEM

Table 2.7 Parameter setting items of Multiple CPU high speed transmission area setting

Item	Setting description	Setting/display value	Restriction	Consistency check																								
CPU	CPU No. corresponding to displayed parameters.	CPU No.1 to No.4	—	—																								
CPU specific send range	<p>Set the number of points of data that each CPU module sends. Default value assigned to each CPU is shown below.</p> <table border="1"> <thead> <tr> <th rowspan="2">Number of CPUs</th> <th colspan="4">Default value of CPU specific send range [points]</th> </tr> <tr> <th>CPU No.1</th> <th>CPU No.2</th> <th>CPU No.3</th> <th>CPU No.4</th> </tr> </thead> <tbody> <tr> <td>2</td> <td>7k</td> <td>7k</td> <td>—</td> <td>—</td> </tr> <tr> <td>3</td> <td>7k</td> <td>3k</td> <td>3k</td> <td>—</td> </tr> <tr> <td>4</td> <td>3k</td> <td>3k</td> <td>3k</td> <td>3k</td> </tr> </tbody> </table>	Number of CPUs	Default value of CPU specific send range [points]				CPU No.1	CPU No.2	CPU No.3	CPU No.4	2	7k	7k	—	—	3	7k	3k	3k	—	4	3k	3k	3k	3k	<p>Range: 0 to 14k [points] Unit: 1k [point] (Points: Word in units)</p>	<ul style="list-style-type: none"> Set the total of all CPUs to be the following points or lower. When constituted with two CPUs: 14k [points] When constituted with three CPUs: 13k [points] When constituted with four CPUs: 12k [points] 	Provided
Number of CPUs	Default value of CPU specific send range [points]																											
	CPU No.1	CPU No.2	CPU No.3	CPU No.4																								
2	7k	7k	—	—																								
3	7k	3k	3k	—																								
4	3k	3k	3k	3k																								
Automatic refresh	<p>Number of points used in the automatic refresh function is displayed. Number of points that is set by the "automatic refresh setting" is displayed.</p>	<p>Range: 0 to 14336 [points] Unit: 2 [points]</p>	Do not exceed the CPU specific send range [points].	—																								
User setting area	<p>Area size specified directly by program is displayed. The value where the "number of points set in the automatic refresh" is subtracted from the "CPU specific send range setting" is displayed.</p>	<p>Range: 0 to 14336 [points] Unit: 2 [points]</p>	—	—																								

POINT

Selecting "Advanced setting" enables the ability to change the number of points from 1k to 2k in the system area used for Motion dedicated PLC instructions. Changing the number of points in the system area to 2k increases the number of Motion dedicated PLC instructions that can be executed concurrently in a scan. The screen where "Advanced setting" is selected is shown below. Refer to the "Q173DCPU/Q172DCPU Motion controller (SV13/SV22) Programming Manual (Motion SFC) " for the Motion dedicated PLC instruction.



Item	Setting description	Setting/display value (Points: Word in units)	Restriction	Data size consistency check
CPU specific send range	Set the number of points of data that each CPU module sends.	Range: 0 to 14k [points] Unit: 1k [points]	<ul style="list-style-type: none"> Set the total of all CPUs to be the following points or lower. When constituted with two CPUs: 14k [points] When constituted with three CPUs: 13k [points] When constituted with four CPUs: 12k [points] 	Provided
System area	Set the number of points for a system area to be assigned for each CPU module. (Default value of system area size is 1k [point].)	Range: 1k/2k [points]	—	Provided
Total	Display the total of number of points of the self CPU send area and the system area that are assigned to the each CPU module.	Range: 1 to 16k [points] Unit: 1k [points]	Set the total of all CPUs to 16.0k points or lower.	—

2 MULTIPLE CPU SYSTEM

(b) Automatic refresh setting

Setting for use of the automatic refresh function in the Multiple CPU high speed transmission area.

Up to 32 setting ranges can be set for each CPU module.

Automatic refresh setting screen and setting range are shown below.

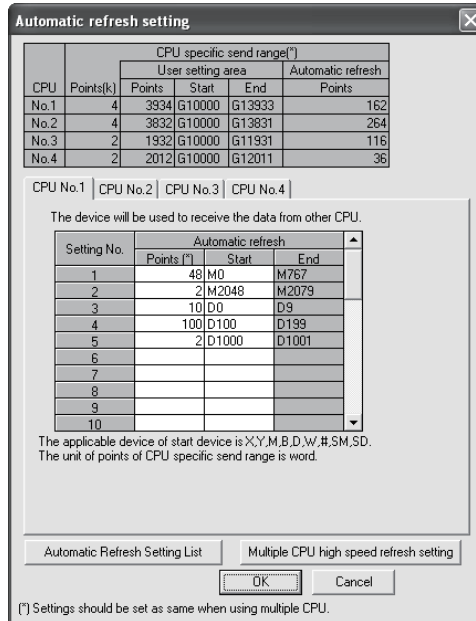


Table 2.8 Parameter setting items of automatic refresh setting

Item	Setting description	Setting range	Restriction	Data size consistency check
CPU selection	Select the CPU module for editing of the CPU specific send range setting.	CPU No. 1 to No. 4	<ul style="list-style-type: none"> CPU No. which exceeds the number of CPU modules cannot be selected. 	—
Setting No.	The setting No. for transmission of each CPU module is displayed. Automatic refresh is executed between devices set to the same setting No. for all CPUs that constitute the Multiple CPU system.	1 to 32	—	—
Points	Set the number of points for data communication.	Range: 2 to 14336 [points] Unit: 2 [points]	<ul style="list-style-type: none"> Setting which exceeds the number of points of the self CPU send area allocated to the each CPU module (CPU specific send range) cannot be set. Bit device can be specified in units of 32 points (2 words) only. 	Provided
Start	Specifies the device which performs the data communication (automatic refresh). Specifies the device sent by the self CPU when the "Send source CPU selection" is the self CPU, and specifies the device received by the self CPU when the CPU specific send range setting is the other CPU.	Usable device (X, Y, M, B, D, W, #, SM, SD) Note) Set "blank" when automatic refresh is not executed.	<ul style="list-style-type: none"> Bit device can be specified in units of 16 points (1 word) only. Device number cannot be duplicated. 	None

2 MULTIPLE CPU SYSTEM

POINT

The processing performance of automatic refresh improves when devices are transmitted in 2 word sets. Therefore, it is recommended to set the start device as 2 word unit by inputting an even device number.

1) Operation example of automatic refresh

a) Parameter setting

The example of setting automatic refresh is shown below.

• CPU No.1 (PLC CPU) (GX Developer)

Set the device transmitted to CPU No.2.

PLC	point(k)	I/O No.	User setting area				Auto refresh			
			point	Start	End	point	Start	End		
No.1	7	U3E0	7128	G10000	G17127	40	G17128	G17167		
No.2	7	U3E1	6488	G10000	G16487	680	G16488	G17167		
No.3										
No.4										

No.	point(k)	Auto refresh		CPU specific send range (U3E0)	
		Start	End	Start	End
1	40	M3200	M3039	G17128	G17167
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					

• CPU No.2 (Motion CPU) (MT Developer)

Set the device received from CPU No.1.

CPU	Point(s)	User setting area				Automatic refresh	
		Points	Start	End	Points		
No.1	7	7128	G10000	G17127	40		
No.2	7	6488	G10000	G16487	680		
No.3							
No.4							

Setting No.	Points (k)	Automatic refresh	
		Start	End
1	40	M3200	M3039
2			
3			
4			
5			
6			
7			
8			
9			
10			

Set the device received from CPU No.2.

PLC	point(k)	I/O No.	User setting area				Auto refresh			
			point	Start	End	point	Start	End		
No.1	7	U3E0	7128	G10000	G17127	40	G17128	G17167		
No.2	7	U3E1	6488	G10000	G16487	680	G16488	G17167		
No.3										
No.4										

No.	point(k)	Auto refresh		CPU specific send range (U3E1)	
		Start	End	Start	End
1	40	D0	D639	G16488	G17127
2	40	M2400	M3039	G17128	G17167
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					

Set the device transmitted to CPU No.1.

CPU	Point(s)	User setting area				Automatic refresh	
		Points	Start	End	Points		
No.1	7	7128	G10000	G17127	40		
No.2	7	6488	G10000	G16487	680		
No.3							
No.4							

Setting No.	Points (k)	Automatic refresh	
		Start	End
1	40	D0	D639
2	40	M2400	M3039
3			
4			
5			
6			
7			
8			
9			
10			

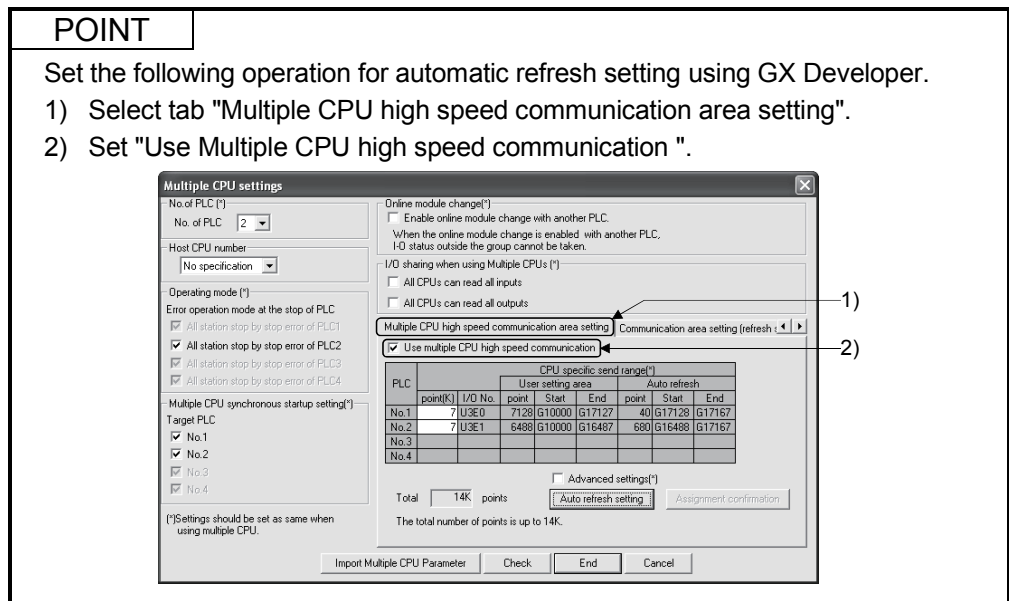
(Note) : The operation example of automatic refresh is shown on the next page.

2 MULTIPLE CPU SYSTEM

POINT

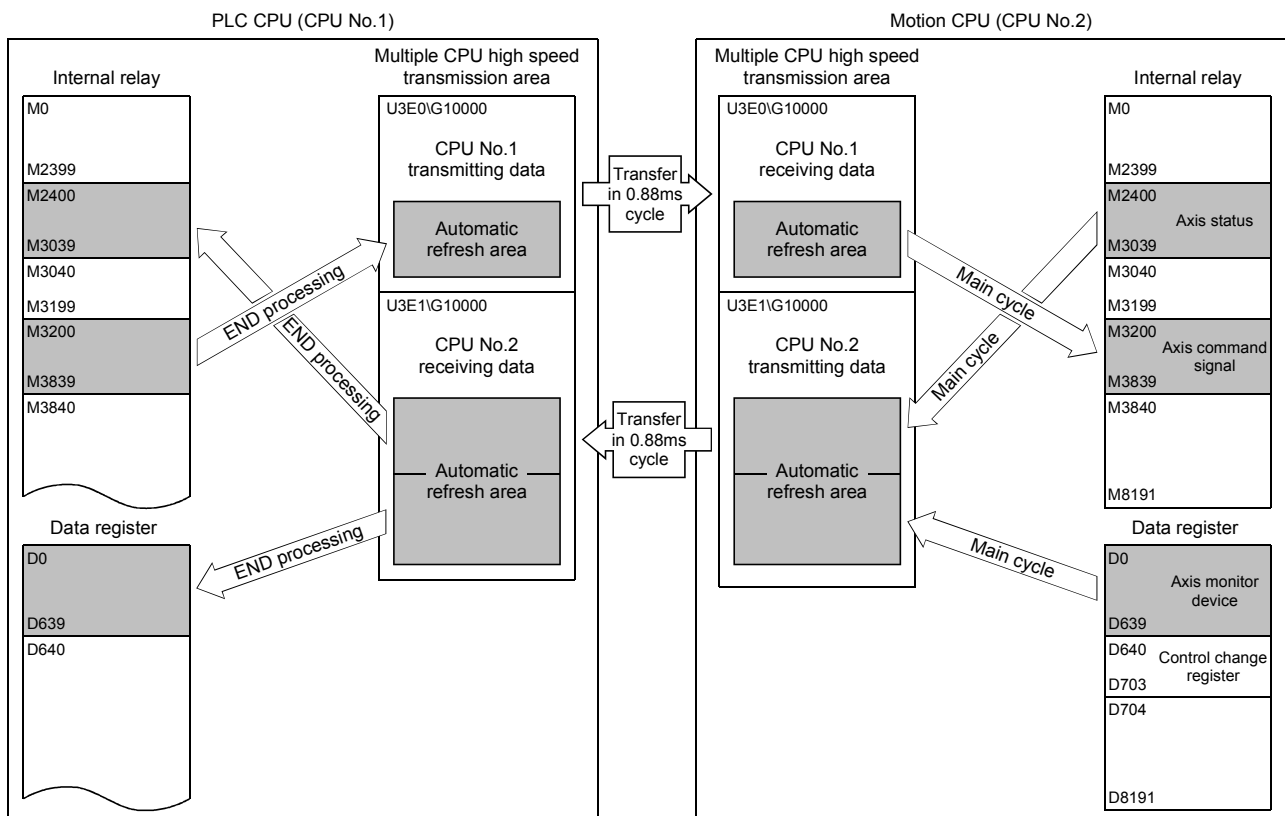
Set the following operation for automatic refresh setting using GX Developer.

- 1) Select tab "Multiple CPU high speed communication area setting".
- 2) Set "Use Multiple CPU high speed communication".



b) Operation example

The example of operating automatic refresh is shown below.



(c) Data size consistency check

Whether the Multiple CPU setting parameters are the same for all CPUs or not is automatically checked. A "PARAMETER ERROR (error code: 3012, 3015)" will occur if they do not match.

(5) Precautions

(a) Assurance of data sent between CPUs

Due to the timing of data sent from the self CPU and automatic refresh in any of the other CPUs, old data and new data may become mixed (data separation).

The following shows the methods for avoiding data separation at communications by automatic refresh.

1) Data consistency for 32 bit data

Transfer data with automatic refresh method is in units of 32 bits. Since automatic refresh is set in units of 32 bits, 32-bit data does not separate.

- For word data

2 words data can be prevented from separating by using an even number to set the first number of each device in automatic refresh setting.

2) Data consistency for data exceeding 32 bits

In automatic refresh method, data is read in descending order of the setting number in automatic refresh setting parameter.

Transfer data separation can be avoided by using a transfer number lower than the transfer data as an interlock device.

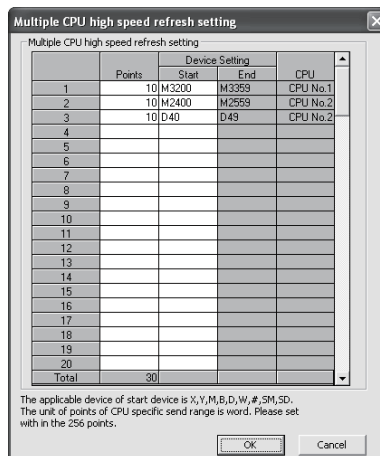
2 MULTIPLE CPU SYSTEM

2.3.3 Multiple CPU high speed refresh function

This function is used to update the data between internal devices of Motion CPU and the Multiple CPU high speed transmission area. This occurs every operation cycle as defined in the device setting of automatic refresh in the self CPU.

Classification	Item	Description	Setting/display value	Restriction
Display	Setting No.	Setting No. which executes high speed refresh is displayed.	1 to 128 (Up to 128)	
	CPU	CPU No. set in the automatic refresh setting is automatically displayed by setting devices. Self CPU : Refresh from the internal device of Motion CPU to Multiple CPU high speed transmission area. Other CPU : Refresh from the Multiple CPU high speed transmission area to internal device of Motion CPU.	CPU No. 1 to No.4	
User setting	Device setting	Set the device No. of Motion CPU to execute the high speed refreshes.	Usable device : D, W, #, SD, M, X, Y, B, SM	<ul style="list-style-type: none"> The start device number must be a multiple of 16 for the bit device. Do not set a device not setting also set in the automatic refresh. No. of "start device + number of points" cannot exceed setting range of each setting No. in automatic refresh setting. Do not overlap the device No. between setting No..
	Points	Set the number of points to refresh data of each data in word unit. (Note) Refresh is not executed when not set.	Range: 2 to 256 [points] Unit: 2 points (Note-1)	<ul style="list-style-type: none"> Sets the total of all CPUs to 256 points or lower.
	Refresh cycle	Operation cycle (fixed)	—	—

(Note-1) : Point in word unit.



(1) Application example of Multiple CPU high speed refresh function

Multiple CPU high speed refresh function is used as in the following applications.

- 1) Read the data such as the real current value and synchronous encoder current value with PLC CPU at high speed.
- 2) Exchange the FIN waiting signal at high speed.

2 MULTIPLE CPU SYSTEM

(2) Operation example of Multiple CPU high speed refresh function

(a) Parameter setting

The automatic refresh setting of Multiple CPU high speed refresh is shown below.

• CPU No.1 (PLC CPU) (GX Developer)
Set the device transmitted to CPU No.2.

Available start devices are X,Y,M,L,B,D, W,R,ZR,SM,SD,SB,SW.
Word is used for points. Every 2 points are counted as a set.
[*]Settings should be set as same when using multiple CPU.

• CPU No.2 (Motion CPU) (MT Developer)
Set the device received from CPU No.1.

The applicable device of start device is X,Y,M,B,D,W,#,SM,SD.
The unit of points of CPU specific send range is word.

Set the device received from CPU No.2.

Available start devices are X,Y,M,L,B,D, W,R,ZR,SM,SD,SB,SW.
Word is used for points. Every 2 points are counted as a set.
[*]Settings should be set as same when using multiple CPU.

Set the device transmitted to CPU No.1.

The applicable device of start device is X,Y,M,B,D,W,#,SM,SD.
The unit of points of CPU specific send range is word.

Set the device to executed the Multiple CPU high speed refresh.

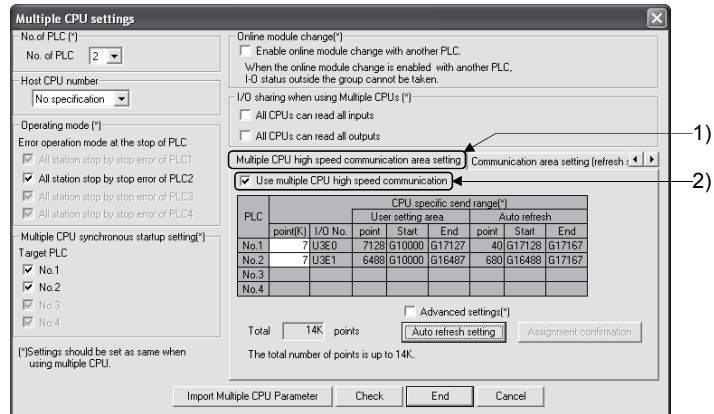
The applicable device of start device is X,Y,M,B,D,W,#,SM,SD.
The unit of points of CPU specific send range is word. Please set with in the 256 points.

(Note) : The operating example of Multiple CPU high speed refresh function is shown in "(b) Operation example".

POINT

Set the following operation for automatic refresh setting using GX Developer.

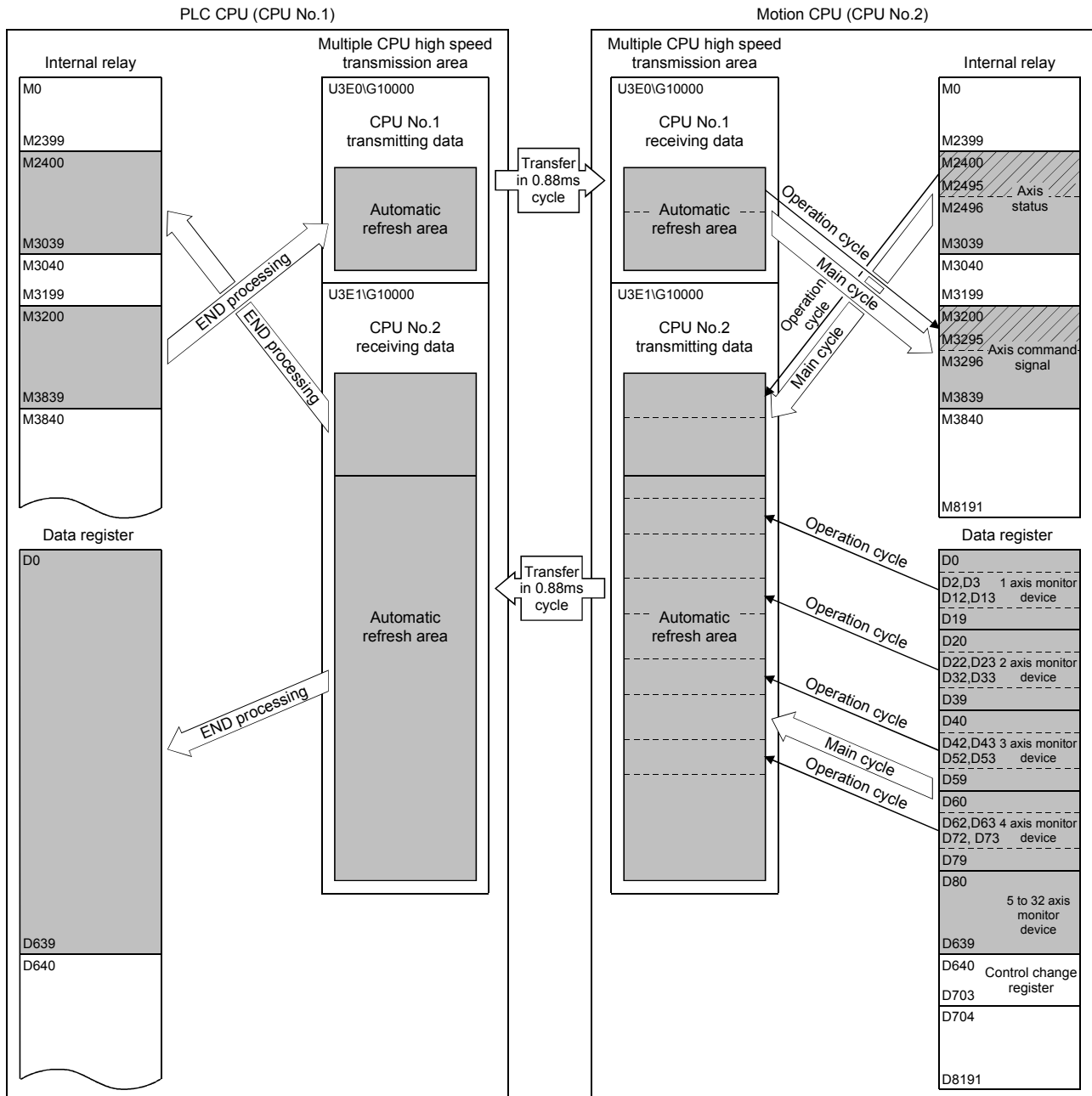
- 1) Select tab "Multiple CPU high speed communication area setting".
- 2) Set "Use Multiple CPU high speed communication".



2 MULTIPLE CPU SYSTEM

(b) Operation example

The example of operating Multiple CPU high speed refresh function is shown below.



- Axis 1 to 4 status information (M2400 to M2495) is transferred to the automatic refresh area one every operation cycle of the Motion CPU.
- Axis 1 to axis 4 command signals are received from the automatic refresh area one every operation cycle of the Motion CPU.
- Real current values of Axis 1 to axis 4 and M-code is updated by setting D0 to D639 of the Motion CPU to the automatic refresh area.
- Every 0.88ms, data in the automatic refresh area of all CPUs are transferred allowing each CPU to update its data upon its next independent operation cycle.

2.3.4 Clock synchronization between Multiple CPU

The clock of each CPU is synchronized with the clock of CPU No. 1.

The clock data used for synchronization in a Multiple CPU system can be edited.

(1) Setting of clock data

Set the clock of CPU No.1. The Motion CPU module operates automatically by the clock of CPU No.1.

POINT

The clock data of CPU No.1 is automatically set even if the clocks of CPU No. 2 to 4 are set independently.

(2) Synchronization of clock data

All clocks are synchronized with CPU No.1 immediately after turning ON/resetting power and every 1-second interval thereafter.

(3) Information of clock

The clock data that CPU No. 1 transmits is year, month, day, day of week, hour, minute and second.

(4) Error

Since CPU No.1 sets the clock data at 1-second intervals, an error of up to 1 second may occur to the clock of CPU No.2 to 4.

2.3.5 Multiple CPU synchronous startup

Multiple CPU synchronous startup function synchronizes the startups of CPU No.1 to CPU No.4. (It takes about ten seconds to startup for Motion CPU.)

Since this function monitors the startup of each CPU module, when other CPU is accessed by a user program, an interlock program which checks the CPU module startup is unnecessary.

With the Multiple CPU synchronous startup function, the startup is synchronized with the slowest CPU module to startup; therefore, the system startup may be slow.

POINT

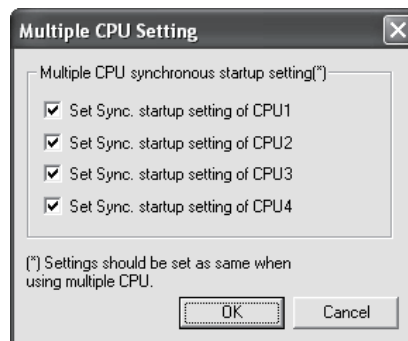
Multiple CPU synchronous startup function is for accessing each CPU module in a Multiple CPU system without needing an interlock.

This function is not for starting an operation simultaneously among CPU modules after startup.

(1) Multiple CPU synchronous startup setting

To use the Multiple CPU synchronous startup function, check No.1 to No.4 of target CPU in Multiple CPU settings in system setting of MT Developer. (Set it in the Multiple CPU setting of PLC parameter setting of GX Developer for QnUD(H)CPU.)

"Set Sync. startup setting of CPU□" is set for No.1 to 4 at default.



Set the same Multiple CPU synchronous startup for all CPUs that constitute the Multiple CPU system.

The self-diagnosis error "PARAMETER ERROR (error code: 3015)" will occur if all CPU modules that constitute the Multiple CPU system do not have the same setting.

When this function is not used (each CPU startup without synchronization), startup of each CPU module can be confirmed by using special relays SM220 to SM223 (CPU No.1 to 4 READY complete flag).

2 MULTIPLE CPU SYSTEM

2.3.6 Control Instruction from PLC CPU to Motion CPU

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

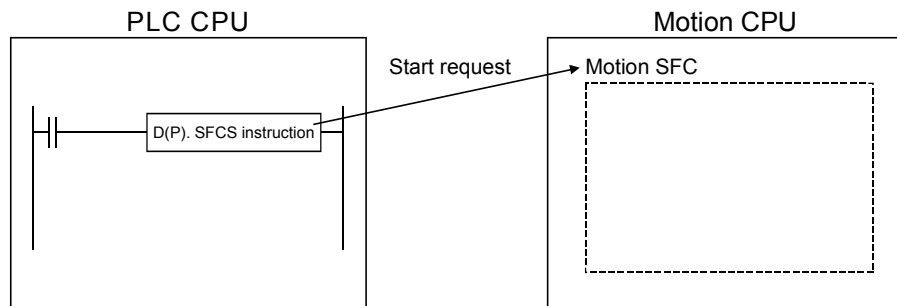
Refer to the "Q173DCPU/Q172DCPU Motion controller (SV13/SV22) Programming Manual (Motion SFC)" for the details of each instruction.

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

Instruction name	Description
D(P).SFCS	Start request of the Motion SFC program (Program No. may be specified.)
D(P).SVST	Start request of the specified servo program
D(P).CHGA	Current value change request of the specified axis
D(P).CHGV	Speed change request of the specified axis
D(P).CHGT	Torque control value change request of the specified axis
D(P).GINT	Execute request of an event task to the other CPU (Motion CPU)
D(P).DDWR	Write device data of the self CPU (PLC CPU) to the device of other CPU (Motion CPU)
D(P).DDRDR	Read device data of other CPU (Motion CPU) to the device of self CPU (PLC CPU)

For example, by using the D(P).SFCS instruction of Motion dedicated PLC instruction, the Motion SFC of the Motion CPU can be started from the PLC CPU.

<Example>



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 system basic setting, self CPU installation position setting, servo amplifier setting, high-speed read setting and optional data monitor setting are set in the individual parameter setting.
- (3) The data setting and correction can be performed in dialog form using MT Developer.

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	Main base	8/12 slots	Main base: 8 slots	Set the number of slots in the main base or extension base.	
		Extension base	None/2/3/5/8/10/12 slots	None		
	Multiple CPU setting	No. of CPU		2/3/4 modules	2 modules	Set the total number of Multiple CPUs including PLC CPU(s).
		Error operation mode at the stop of CPU		Stop/do not stop all CPUs upon an error in CPU No. 1 to 4. (The setting range varies depending on the number of Multiple CPUs.)	Stop all CPUs upon error in CPU Nos. 1 to 4	Set whether or not to stop the entire system when a CPU stop error occurs in each CPU.
		Multiple CPU high speed transmission area setting	CPU specific send range	0 to 14k points	Varies depending on the number of CPUs.	
			System area	1 to 2k points	1	
			Automatic refresh setting	Point : 2 to 14336 points Start : Set target device for automatic refresh.	None	
	Multiple CPU synchronous startup setting		Set/do not set CPU No. 1 to 4 as the synchronized startup. (The setting range varies depending on the number of Multiple CPUs.)	Set CPU No. 1 to 4 as the synchronized startup.	Refer to Section 2.3.5.	
	Motion slot setting	Module arrangement		Within the main base and extension base slots	None	Install the modules controlled by the self CPU in the main 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	System basic 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 by switching from STOP to RUN./M2000 is turned on by switching from STOP to RUN and setting 1 in the set register.	M2000 is turned on by switching from STOP to RUN.	Set the condition in which the PLC ready flag (M2000) turns on.
		Forced stop (Note-1)		None/X(PX) (0 to 1FFF)/M (0 to 8191)	None	Set the bit device to use forced stop in the program. However, the forced stop input by EMI terminal of Motion CPU module cannot be invalidated using parameter setting.
		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/other CPU/CPU (empty) for slots 0/1/2. (The setting range varies depending on the number of Multiple CPUs installed.)	None	Set the installation position of the self CPU in the main base.	

3 COMMON PARAMETERS

	Item	Setting range	Initial value	Remark
Individual parameters	Amplifier setting	Q173DCPU: Up to 2 systems, 32 axes Q172DCPU: 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 Q172DEX/Q173DPX module and one input module.	None	Set the high-speed read data. Refer to Section 4.3.
	Optional data monitor setting	Set 1 to 3 for each axis. Q173DCPU: Up to 32 axes Q172DCPU: Up to 8 axes	None	Set the optional data monitor. Refer to Section 4.10.

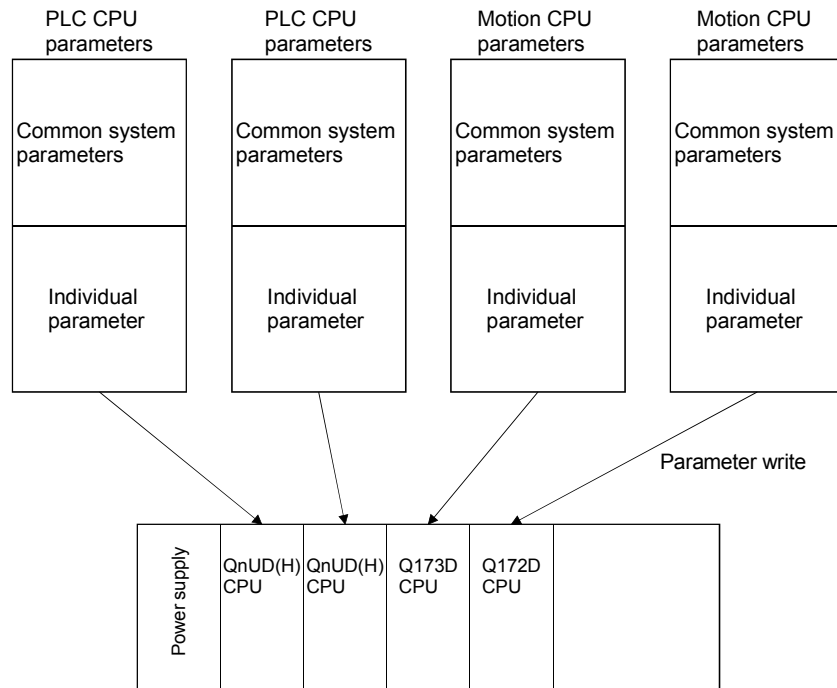
(Note-1) : The forced stop can also be executed by the EMI forced stop terminal of Motion CPU module or forced stop terminal of servo amplifier besides the forced stop input setting.

3 COMMON PARAMETERS

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, 3015), 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.)

The parameter No. of unmatched parameter is set in the error individual information (SD16) by this error occurrence.

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

Table of Parameters cross-Multiple CPU system

Type of parameter				Verification item	Parameter number	Remark	
Name in Motion CPU		Name in PLC CPU					
Multiple CPU setting	No. of CPU		No. of PLC		Number of CPUs	0E00H	
	Operating mode		Operating mode		Operation mode for CPU stop error	0E01H	
	Multiple CPU high speed transmission area setting	CPU specific send range	Multiple CPU settings	CPU specific send range	Points of CPU specific send range	E008H	Refer to Section 2.3.2.
		System area		System area	System area size	E008H	Refer to Section 2.3.2. This parameter can be set when "Advanced setting" is selected.
		Automatic refresh setting		Automatic refresh setting	Points of automatic refresh	E009H	Refer to Section 2.3.2. (Automatic refresh using Multiple CPU high speed transmission area)
	Multiple CPU synchronous startup setting		Multiple CPU synchronous startup setting		Synchronize Multiple CPU startup or not	E00BH	Refer to Section 2.3.5.
Motion slot setting		I/O assignment	Detailed settings	Control PLC	Control CPU No.	0406H	Verify module only set in the system settings in the Motion CPU side.
Base setting			Basic setting	Slots	Total number of bases	0401H	Not verified if base settings are omitted in the PLC CPU side.
				Base	Base No. Number of base slots		

3 COMMON PARAMETERS

(a) Multiple CPU settings

Set the following items identically in Multiple CPU Settings (Motion CPU) in MT Developer and in Multiple CPU Settings (PLC CPU) in GX Developer.

- Number of CPU modules (Included CPU empty slots)
- Operation mode when a CPU stop error occurred
- Multiple CPU high speed transmission area setting (Must be set the same for all CPUs)
- Multiple CPU synchronous startup setting

Multiple CPU Settings (Motion CPU) in MT Developer

The screenshot shows the 'Basic Setting' dialog box in MT Developer. The 'Multiple CPU Setting' tab is active. Callouts point to the following settings:

- Number of CPU modules:** Set to 2 in the 'No. of CPU(*)' dropdown.
- Error operation mode at the stop of CPU:** Checked for 'All station stop by stop error of CPU1', 'All station stop by stop error of CPU2', 'All station stop by stop error of CPU3', and 'All station stop by stop error of CPU4'.
- Multiple CPU high speed transmission area setting:** A table showing CPU specific send ranges for No.1 and No.2.
- Multiple CPU synchronous startup setting:** Checked for 'Set Sync. startup setting of CPU1', 'Set Sync. startup setting of CPU2', 'Set Sync. startup setting of CPU3', and 'Set Sync. startup setting of CPU4'.

CPU	Points(k)	User setting area			Automatic refresh
		Points	Start	End	
No.1	7	7006	G10000	G17005	162
No.2	7	6904	G10000	G16903	264
No.3					
No.4					

Multiple PLC Setting (PLC CPU setting) in GX Developer

The screenshot shows the 'Multiple PLC settings' dialog box in GX Developer. Callouts point to the following settings:

- Select tab "Multiple CPU high speed communication area setting":** The 'Multiple CPU high speed communication area setting' tab is selected.
- Set "Use multiple CPU high speed communication":** Checked in the 'Multiple CPU high speed communication area setting' section.
- Operating mode (*):** Checked for 'All station stop by stop error of PLC1', 'All station stop by stop error of PLC2', 'All station stop by stop error of PLC3', and 'All station stop by stop error of PLC4'.
- Multiple CPU synchronous startup setting (*):** Checked for 'No.1', 'No.2', 'No.3', and 'No.4'.

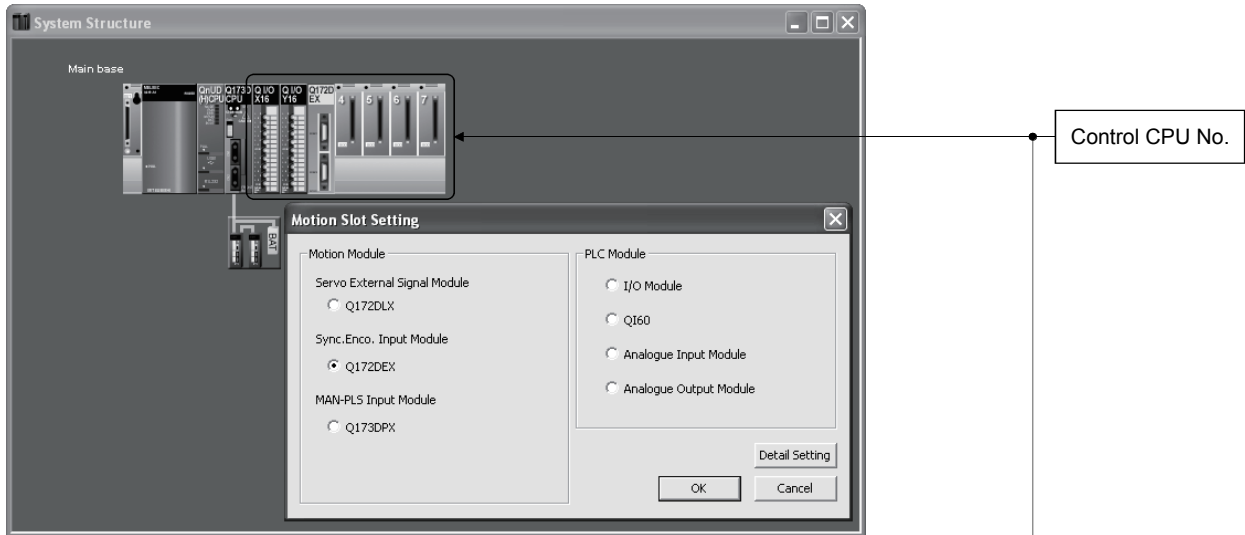
PLC	point(K)	I/O No.	User setting area			Auto refresh		
			point	Start	End	point	Start	End
No.1	7	U3E0	7006	G10000	G17005	162	G17006	G17167
No.2	7	U3E1	6904	G10000	G16903	264	G16904	G17167
No.3								
No.4								

3 COMMON PARAMETERS

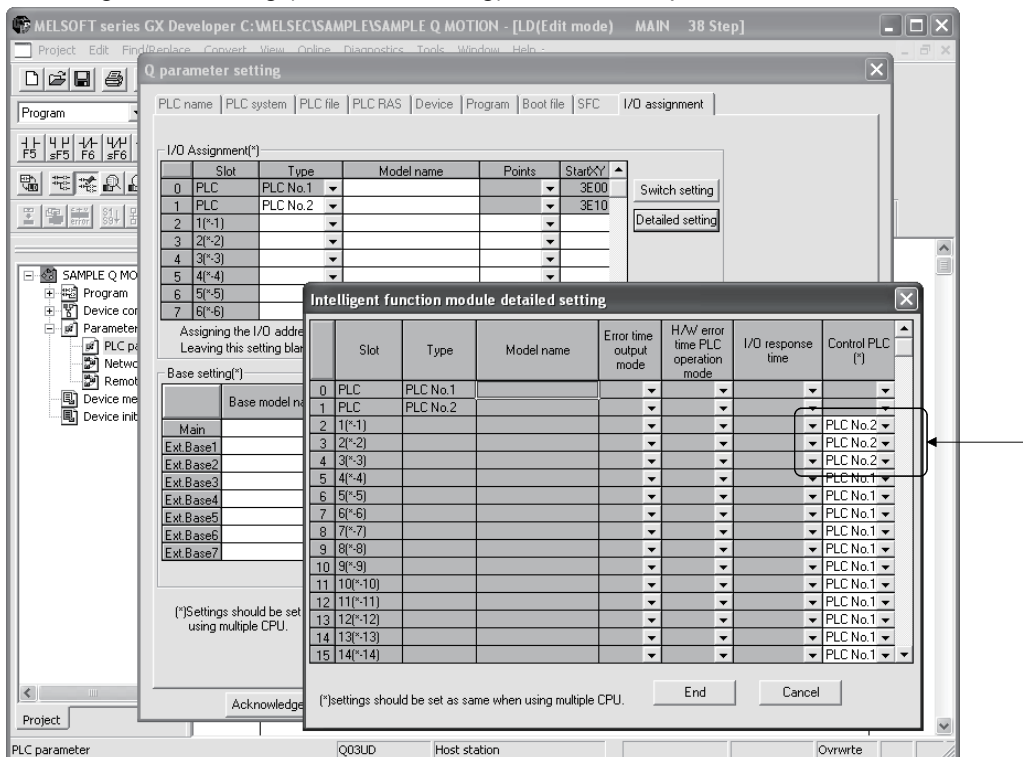
(b) Motion slot settings

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

Motion Slot Setting (Motion CPU) in MT Developer



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



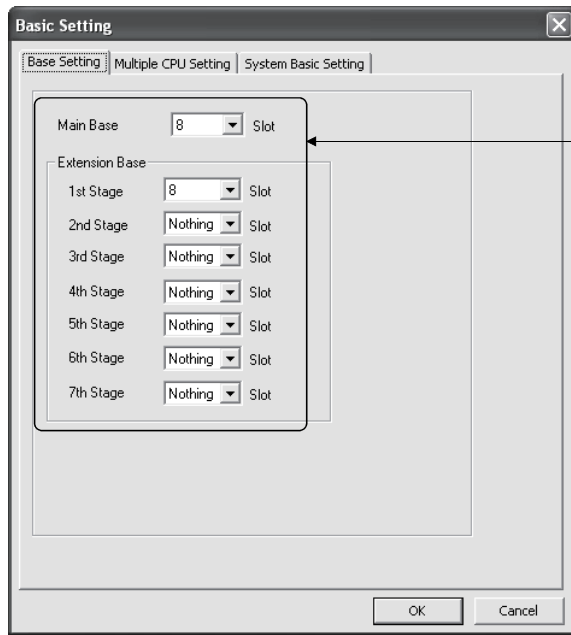
(Note): Motion slot setting items are different depending on the operating system software.

3 COMMON PARAMETERS

(c) Base settings

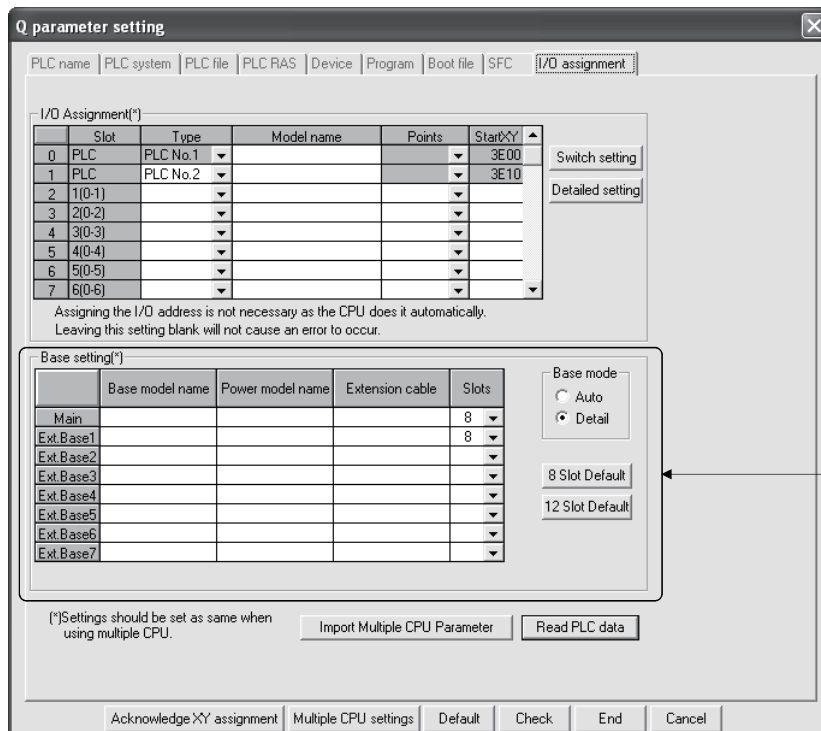
Set the total number of bases and number of slots in each base identically between Base Settings (Motion CPU) in MT Developer and I/O Assignment Settings (PLC CPU) in GX Developer. In GX Developer, the detailed settings may be omitted by setting the base mode "Automatic".

Base Settings (Motion CPU) in MT Developer



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.

3 COMMON PARAMETERS

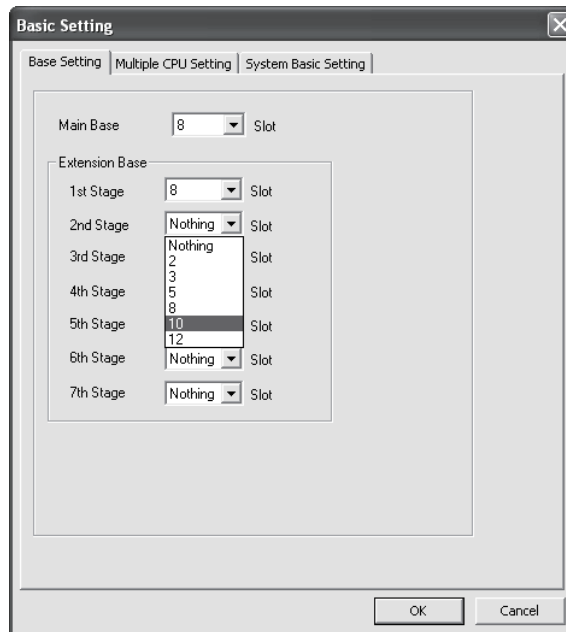
POINT

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.)

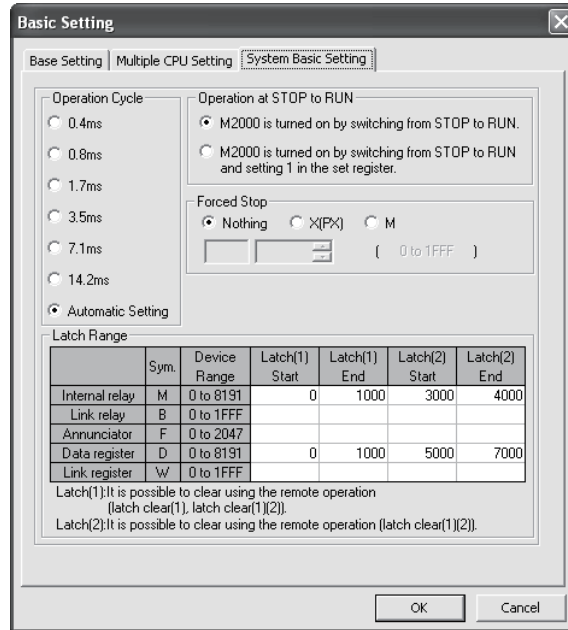


3 COMMON PARAMETERS

3.1.3 Individual parameters

(1) System basic setting

The following explains each item to be set in system basic setting.



(a) Operation cycle

- 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 6 axes	0.4 ms
	7 to 18 axes	0.8 ms
	19 to 32 axes	1.7 ms
SV22	1 to 4 axes	0.4 ms
	5 to 12 axes	0.8 ms
	13 to 28 axes	1.7 ms
	29 to 32 axes	3.5 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: μ s) is stored in SD522, and the current setting of operation cycle (unit: μ s) is stored in SD523. 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 at STOP to RUN
Set the condition in which the "PLC ready" flag (M2000) turns ON. Select any one of the followings.
- 1) M2000 is turned on by switching from STOP to RUN.
Condition in which the M2000 turns from OFF to ON
- Change the RUN/STOP switch from STOP to RUN.
 - Turn ON the power supply with the RUN/STOP switch set to RUN.
- Condition in which the M2000 turns from ON to OFF
- Change the RUN/STOP switch from RUN to STOP.
- 2) M2000 is turned on by switching from STOP to RUN and setting 1 in the set register.
(M2000 turns ON when the switch is set to RUN 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 RUN, 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 RUN, 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 RUN to STOP.
- (c) Forced stop
Set the bit device used for executing a forced stop in which all servo-amplifier axes are stopped immediately in the program.
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.)
- The forced stop input by EMI terminal of Motion CPU module cannot be invalidated using parameter setting.

3 COMMON PARAMETERS

(d) Latch range

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

- Latch (1) : It is possible clear using the remote operation (Latch clear(1), Latch clear (1)(2)).
- Latch (2) : It is possible clear using the remote operation (Latch clear (1)(2)).

(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	
					Q173DCPU	Q172DCPU
Q172DLX	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	Valid on leading edge/ Valid on trailing edge	Valid on leading edge		
		I/O response time (Operation mode)	0.4/0.6/1 ms (DOG/CHANGE response time)	0.4 ms		
Q172DEX	Synchronous encoder input module	Synchronous encoder setting	Used/Unused	Unused	6 (SV22)	4 (SV22)
		Synchronous encoder selection	Q170ENC/MR-HENC	Q170ENC		
		I/O response time (Operation mode)	0.4/0.6/1 ms (TREN response time)	0.4 ms		
		High-speed data read setting	Used/Unused	Unused		
Q173DPX	Manual pulse generator input module	Manual pulse generator setting (SV13)	Used only	Used	1 (SV13) 4 (SV22)	1 (SV13) 3 (SV22)
		Manual pulse generator/ Synchronous encoder setting (SV22)	Used/Unused	P□ Used		
		I/O response time (Operation mode)	0.4/0.6/1 ms (TREN response time)	0.4 ms		
		High-speed data read setting	Used/Unused	Unused		
Q160	Interrupt module	Input response time	0.1/0.2/0.4/0.6/1 ms	0.2 ms	1	1

3 COMMON PARAMETERS

Setting items for each module (Continued)

Module name		Item	Setting range	Initial value	Number of usable modules	
					Q173DCPU	Q172DCPU
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
		Point	0/16/32/64/128/256	16		
		High-speed data read setting	Used/Unused	Unused		
		I/O response time (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		
		Point	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		
		Point	0/16/32/64/128/256	16		
		I/O response time	1/5/10/20/70 ms	10 ms		
		High-speed data read setting	Used/Unused	Unused		
Q6□AD□/ Q6□AD-□	Analogue input module	First I/O No.	00 to FF0 (in units of 16 points)	0		
		Input range	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□/ Q6□DA-□	Analogue output module	First I/O No.	00 to FF0 (in units of 16 points)	0		
		Output range	4 to 20mA/0 to 20mA/1 to 5V/0 to 5V/-10 to 10V/User range	4 to 20mA		
		HOLD/CLEAR function	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) Q172DLX 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) ^(Note)
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".

3 COMMON PARAMETERS

3.2 I/O number assignment

In the Multiple CPU system, I/O numbers are used for interactive transmission between the Motion CPU and I/O modules and intelligent function modules, or between PLC CPU and Motion CPU.

3.2.1 I/O number assignment of each module

The Multiple CPU system is different from the Single CPU system in the position (slot) of I/O number "0H" for PLC CPU.

However, I/O number of control module can be assigned independently for each CPU for Motion CPU.

(1) Position of I/O number "0H"

- (a) The number of slots set with the Multiple CPU settings are occupied by the PLC CPU/Motion CPU on the Multiple CPU system.
- (b) I/O modules and intelligent function modules are installed from the right of the slots occupied by PLC CPU/Motion CPU.
- (c) I/O number of Motion CPU control module can be assigned independently for each CPU.

The I/O number of PLC CPU control module for an I/O module or intelligent function module mounted to the next slot to those occupied by CPU modules is set as "0H" and consecutive numbers are then allocated sequentially to the right.

(d) Notation of I/O number

- Receiving of ON/OFF data by Motion CPU is deemed input (PX), while outputting of ON/OFF data from Motion CPU is deemed output (PY).
- I/O number is expressed in hexadecimal.

REMARK

- 1) If the number of CPU modules installed on the main base unit is less than the number set at the "Multiple CPU setting", set the open slot(s) to "PLC (Empty)". Refer to Section 2.1.2 for the "PLC (Empty)" setting.
- 2) The I/O numbers for the Multiple CPU system can be confirmed with the system monitor of GX Developer.

3 COMMON PARAMETERS

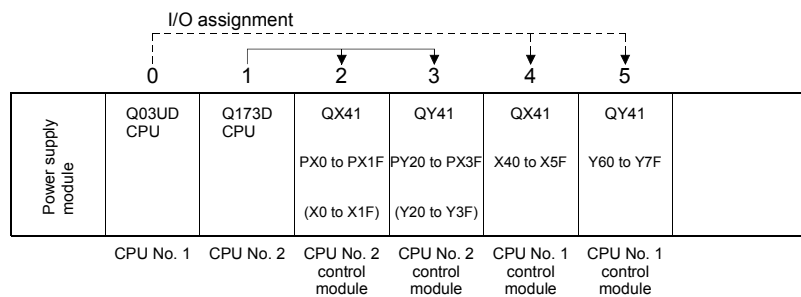
(2) I/O number assignment of Motion CPU control module

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

However, the I/O number of the input modules, output modules and input/output composite modules controlled with the Motion CPU can also be set regardless as the I/O number of PLC CPU.

(I/O number of the Motion CPU control modules is indicated as PX/PY.)

I/O number of the Motion CPU control modules cannot be assigned by I/O assignment settings of PLC CPU.



(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 Q172DLX, Q172DEX and Q173DPX 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"> For the control CPU, set the CPU that corresponds to the Motion CPU (required). Type and number of points may be left unset.
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		
Q172DLX	Intelligent	32 points	
Q172DEX		32 points	
Q173DPX		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 Q172DLX, Q172DEX, Q173DPX and QI60 are not included in the number of real I/O points.

3 COMMON PARAMETERS

3.2.2 I/O number of each CPU modules

In the Multiple CPU system, I/O numbers are assigned to each CPU module to specify installed CPU modules.

The I/O number for each CPU module is fixed to the corresponding slot and cannot be changed.

The I/O number allocated to each CPU module in the Multiple CPU system is shown below.

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

The I/O number of PLC CPU/Motion CPU are used in the following cases.

- When writing data to the CPU shared memory of self CPU using the S. TO instruction.
- When reading data from the CPU shared memory of other CPU using the FROM instruction.
- When reading data from the CPU shared memory of 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 "D(P).DDR" instruction.
- When writing device data directly to the Motion CPU from the PLC CPU using the "D(P).DDWR" instruction.

Refer to Section 2.3.6 or the "Q173DCPU/Q172DCPU Motion controller (SV13/SV22) Programming Manual (Motion SFC)" for the Motion dedicated PLC instruction.

3 COMMON PARAMETERS

3.2.3 I/O number setting

Set the modules installed in the each slot of the main base or extension base and assign the control CPU of applicable slot as the self CPU in the system setting for Motion CPU.

The following modules must be set the I/O No..

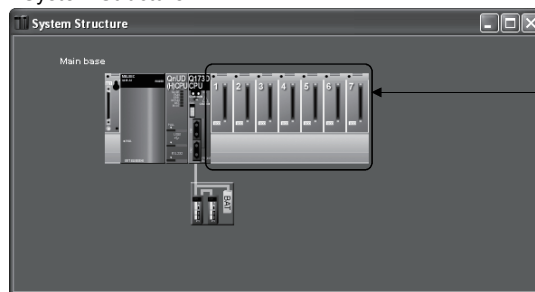
- Input module
- Output module
- Input/Output composite module
- Analogue input module
- Analogue output module

Refer to the help of MT Developer for the detailed operating procedure on the system settings screen.

Set the I/O No. of modules controlled with the Motion CPU module set in the system structure screen of MT Developer. The setting procedure of I/O No. is shown below.

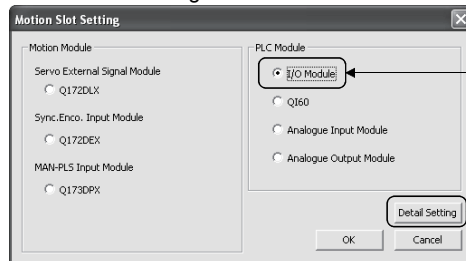
(Example) For set the output module

<System Structure>



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

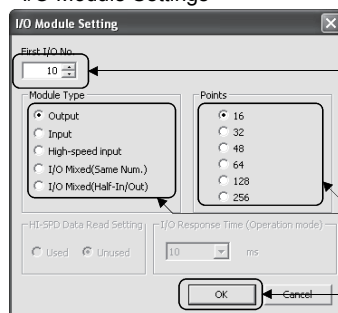
<Motion Slot Settings>



2) Select the I/O module.

3) Click [Detail Setting].

<I/O Module Settings>



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

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

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

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.

The servo parameters are set by the Setup software (MR Configurator).

Refer to the "Servo amplifier Instruction Manual" for details of the servo parameters.
Refer to the help for handling of MR Configurator.

Instruction Manual list is shown below.

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

No.	Symbol	Name	Initial value	Unit
PA01	—	For manufacturer setting	0000h	—
PA02	REG *	Regenerative brake option	0000h	—
PA03	ABS *	Absolute position detection system	0000h	—
PA04	AOP1 *	Function selection A-1	0000h	—
PA05	—	For manufacturer setting	0	—
PA06			1	
PA07			1	
PA08	ATU	Auto tuning mode	0001h	—
PA09	RSP	Auto tuning response	12	—
PA10	INP	In-position range	100	PLS
PA11	—	For manufacturer setting	1000.0	—
PA12			1000.0	
PA13			0000h	
PA14	POL *	Rotation direction selection	0	—
PA15	ENR *	Encoder output pulse	4000	PLS/rev
PA16	—	For manufacturer setting	0	—
PA17			0000h	
PA18			0000h	
PA19			000Bh	

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

No.	Symbol	Name	Initial value	Unit
PB01	FILT	Adaptive tuning mode (Adaptive filter I)	0000h	—
PB02	VRFT	Vibration suppression control tuning mode (Advanced vibration suppression control)	0000h	—
PB03	—	For manufacturer setting	0	—
PB04	FFC	Feed forward gain	0	%
PB05	—	For manufacturer setting	500	—
PB06	GD2	Ratio of load inertia moment to servomotor inertia moment	7.0	times
PB07	PG1	Model loop gain	24	rad/s
PB08	PG2	Position loop gain	37	rad/s
PB09	VG2	Speed loop gain	823	rad/s
PB10	VIC	Speed integral compensation	33.7	ms
PB11	VDC	Speed differential compensation	980	—
PB12	—	For manufacturer setting	0	—
PB13	NH1	Machine resonance suppression filter 1	4500	Hz
PB14	NHQ1	Notch shape selection 1	0000h	—
PB15	NH2	Machine resonance suppression filter 2	4500	Hz
PB16	NHQ2	Notch shape selection 2	0000h	—
PB17	—	Automatic setting parameter	—	—
PB18	LPF	Low pass filter setting	3141	rad/s
PB19	VRF1	Vibration suppression control - vibration frequency setting	100.0	Hz
PB20	VRF2	Vibration suppression control - resonance frequency setting	100.0	Hz
PB21	—	For manufacturer setting	0.00	—
PB22			0.00	
PB23	VFBF	Low pass filter selection	0000h	—
PB24	MVS *	Slight vibration suppression control selection	0000h	—
PB25	—	For manufacturer setting	0000h	—
PB26	CDP *	Gain changing selection	0000h	—
PB27	CDL	Gain changing condition	10	—
PB28	CDT	Gain changing time constant	1	ms
PB29	GD2B	Gain changing - ratio of load inertia moment to servo motor inertia moment	7.0	times
PB30	PG2B	Gain changing - position loop gain	37	rad/s
PB31	VG2B	Gain changing - speed loop gain	823	rad/s
PB32	VICB	Gain changing - speed integral compensation	33.7	ms
PB33	VRF1B	Gain changing - vibration suppression control - vibration frequency setting	100.0	Hz
PB34	VRF2B	Gain changing - vibration suppression control - resonance frequency setting	100.0	Hz
PB35	—	For manufacturer setting	0.00	—
PB36			0.00	
PB37			100	
PB38			0.0	
PB39			0.0	
PB40			0.0	
PB41			1125	
PB42			1125	
PB43			0004h	
PB44			0.0	
PB45			0000h	

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

No.	Symbol	Name	Initial value	Unit
PC01	ERZ *	Error excessive alarm level	3	rev
PC02	MBR	Electromagnetic brake sequence output	0	ms
PC03	ENRS *	Encoder output pulse selection	0000h	—
PC04	COP1 *	Function selection C-1	0000h	—
PC05	COP2 *	Function selection C-2	0000h	—
PC06	COP3 *	Function selection C-3	0000h	—
PC07	ZSP	Zero speed	50	r/min
PC08	—	For manufacturer setting	0	—
PC09	MOD1	Analog monitor 1 output	0000h	—
PC10	MOD2	Analog monitor 2 output	0001h	—
PC11	MO1	Analog monitor 1 offset	0	mV
PC12	MO2	Analog monitor 2 offset	0	mV
PC13	MOSDL	Analog monitor feedback position output standard data Low	0	PLS
PC14	MOSDH	Analog monitor feedback position output standard data High	0	10000PLS
PC15	—	For manufacturer setting	0	—
PC16	—		0000h	
PC17	COP4 *	Function selection C-4	0000h	—
PC18	—	For manufacturer setting	0000h	—
PC19			0000h	
PC20			0000h	
PC21			BPS *	
PC22	—	For manufacturer setting	0000h	—
PC23			0000h	
PC24			0000h	
PC25			0000h	
PC26			0000h	
PC27			0000h	
PC28			0000h	
PC29			0000h	
PC30			0000h	
PC31			0000h	
PC32			0000h	

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

(4) I/O Setting Parameters

No.	Symbol	Name	Initial value	Unit
PD01	—	For manufacturer setting	0000h	—
PD02			0000h	
PD03			0000h	
PD04			0000h	
PD05			0000h	
PD06			0000h	
PD07	DO1 *	Output signal device selection 1 (CN3-13)	0005h	—
PD08	DO2 *	Output signal device selection 2 (CN3-9)	0004h	—
PD09	DO3 *	Output signal device selection 3 (CN3-15)	0003h	—
PD10	—	For manufacturer setting	0000h	—
PD11			0004h	
PD12			0000h	
PD13			0000h	
PD14	DOP3 *	Function Selection D-3	0000h	—
PD15	—	For manufacturer setting	0000h	—
PD16			0000h	
PD17			0000h	
PD18			0000h	
PD19			0000h	
PD20			0000h	
PD21			0000h	
PD22			0000h	
PD23			0000h	
PD24			0000h	
PD25			0000h	
PD26			0000h	
PD27			0000h	
PD28			0000h	
PD29			0000h	
PD30			0000h	
PD31			0000h	
PD32			0000h	

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. 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.

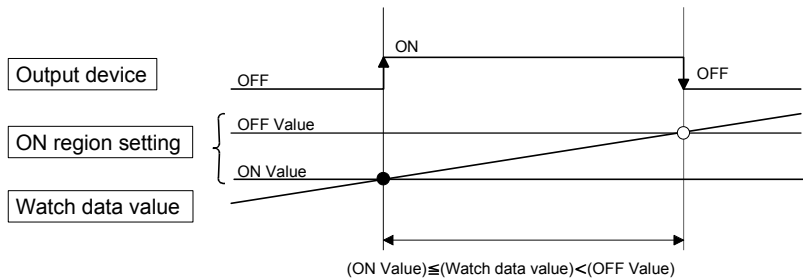
Motion control data or optional word data can be used as watch data. (Refer to Section "4.1.2 Limit output setting data" for details.) A maximum output device for 32 points can be set regardless of the number of axes.

4.1.1 Operations

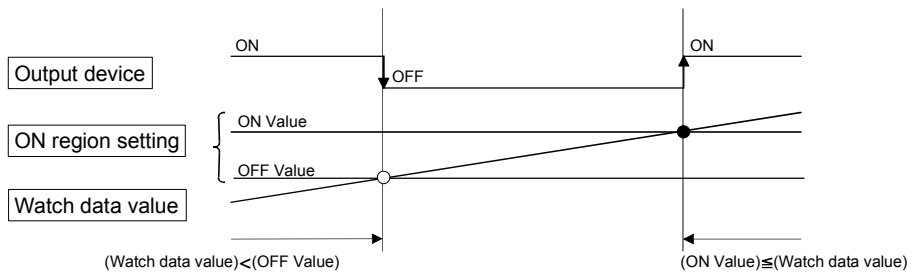
- (1) ON output to an output device is made while the watch data value is in the ON output region set with (ON Value) and (OFF Value) in this function.
 - (a) (ON Value), (OFF Value) and watch data value are handled as signed data. ON output region where an ON output is made to the output device is governed 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) $(ON\ Value) < (OFF\ Value)$

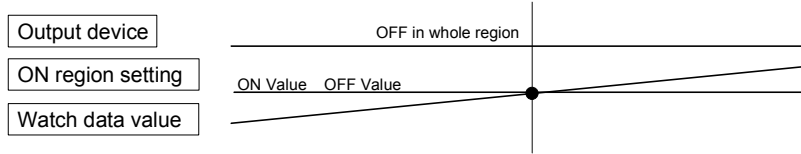


2) $(ON\ Value) > (OFF\ Value)$



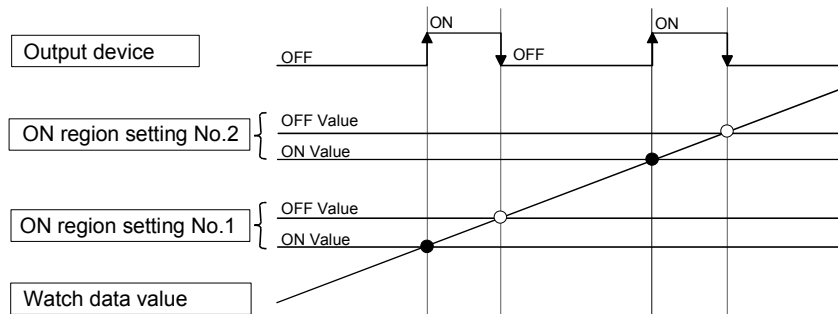
4 AUXILIARY AND APPLIED FUNCTIONS

3) (ON Value) = (OFF Value)



- (b) The limit switch outputs are controlled based on the each watch data during the PCPU ready status (SM500: ON) by the PLC ready flag (M2000) from OFF to ON.
 When the PCPU ready flag (SM500) 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.

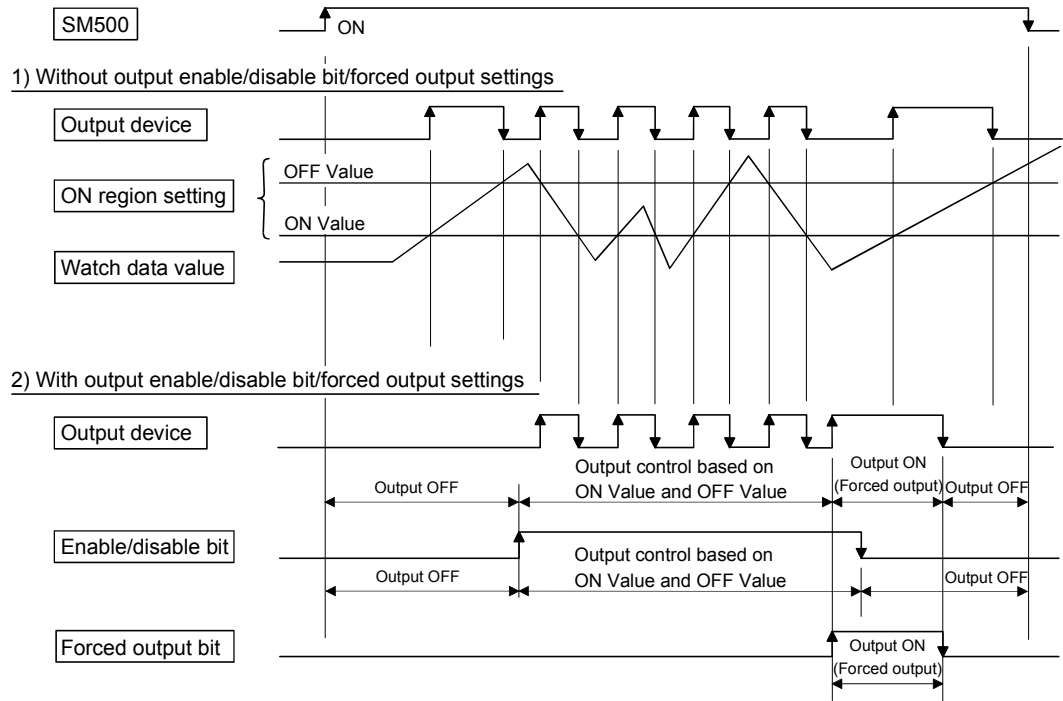
- (c) Multiple outputs (Up to 32 points) can be also set to one watch data. In each setting, the output device may be the same.
 If multiple ON region settings have been made to the same output device, the logical add of the output results in the regions is output.



- (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, B, U□\G)	—	Operation cycle		
2	Watch data	Motion control data/ word device (D, W, #, U□\G, 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, #, U□\G)/constant (K, H)	
		OFF Value			Word device (D, W, #, U□\G)/constant (K, H)	
4	Output enable/disable bit	Bit device (X, Y, M, B, F, SM, U□\G)/ none (default)			ON : Enable OFF : Disable None : Always enable	
5	Forced output bit	Bit device (X, Y, M, B, F, SM, U□\G)/ 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 ^(Note-1)	X0 to X1FFF
Output relay ^(Note-2)	Y0 to Y1FFF
Internal relay ^(Note-3)	M0 to M8191
Link relay	B0 to B1FFF
Multiple CPU area device	U□\G10000.0 to U□\G (10000+p-1).F ^{(Note-4), (Note-5)}

(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.

(Note-4) : "p" indicates the user setting area points of the Multiple CPU high speed transmission area for the each CPU.

(Note-5) : Only device of the self CPU can be used.

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

Item	Unit	Data type	Axis No. setting range	
			Q173DCPU	Q172DCPU
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				

2) Word device data

Item	Device No. setting range
Data register	D0 to D8191
Link register	W0 to W1FFF
Motion register	#0 to #7999
Multiple CPU area device	U□\G10000 to U□\G (10000+p-1) ^(Note-1)

(Note-1) : "p" indicates the user setting area points of the Multiple CPU high speed transmission area for the each CPU.

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

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

4 AUXILIARY AND APPLIED FUNCTIONS

(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 #7999
Multiple CPU area device	U□\G10000 to U□\G (10000+p-1) ^(Note-1)
Constant	Hn/Kn

(Note-1) : "p" indicates the user setting area points of the Multiple CPU high speed transmission area for the each CPU.

(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 ^(Note-1)	X0 to X1FFF
Output relay ^(Note-2)	Y0 to Y1FFF
Internal relay	M0 to M8191
Link relay	B0 to B1FFF
Annunciator	F0 to F2047
Special relay	SM0 to SM1999
Multiple CPU area device	U□\G10000.0 to U□\G (10000+p-1).F ^(Note-3)

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

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

(Note-3) : "p" indicates the user setting area points of the Multiple CPU high speed transmission area for the each CPU.

4 AUXILIARY AND APPLIED FUNCTIONS

(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.

Output enable/disable 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	Limit switch outputs are turned ON.

(b) Usable devices

Item	Device No. setting range
Input relay	X0 to X1FFF
Output relay	Y0 to Y1FFF
Internal relay	M0 to M8191
Link relay	B0 to B1FFF
Annunciator	F0 to F2047
Special relay	SM0 to SM1999
Multiple CPU area device	U□\G10000.0 to U□\G (10000+p-1).F ^(Note-1)

(Note-1) : "p" indicates the user setting area points of the Multiple CPU high speed transmission area for the each CPU.

POINT

Refer to Chapter 2 for the user setting area points of the Multiple CPU high speed transmission area.

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 or MT Developer.

(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 MT Developer.

(Refer to the help of MT Developer 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.
It is not possible to restore position commands that exceed this limit, or current values after a power interruption.
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 monitor of MT Developer.

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

- (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 SM801 (clock data read request) in the Motion SFC program 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 is indicated. However, because the monitor current value and feed current 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, U□\G). The signal from input module controlled in the Motion CPU is used as a trigger.

It can be set in the system setting of MT Developer.

(1) Positioning data that can be set

Setting data	Word No.	Unit	Remarks
Position command (Feed current value)	2	10 ⁻¹ [μm], 10 ⁻⁵ [inch], 10 ⁻⁵ [degree], [PLS]	
Actual current value	2	10 ⁻¹ [μm], 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 [μm], 10 ⁻⁵ [inch] [PLS]	
Optional address (Fixed to 4 bytes)	2	—	Valid in SV22 virtual mode only

(2) Modules and signals to be used

Input module	Signal	Read timing	Number of settable points
Q172DEX	TREN	0.8[ms]	2
Q173DPX			3
PLC input module ^(Note)	PX device		8

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

(3) Usable devices

Word devices	Usable devices
D	0 to 8191
W	0 to 1FFF
U□\G	10000 to (10000 + p-1) ^{(Note-1), (Note-2)}

(Note-1): "p" indicates the user setting area points of the Multiple CPU high speed transmission area for the each CPU.

(Note-2): Only device of the self CPU can be used.

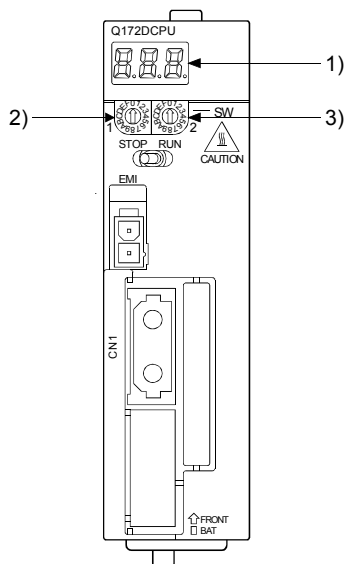
POINT
(1) Set an even number as device setting in the two word data.
(2) Refer to Chapter 2 for the user setting area points of the Multiple CPU high speed transmission area.

4 AUXILIARY AND APPLIED FUNCTIONS

4.4 ROM Operation Function

This function is used to operate based on the data in the FLASH ROM built-in Motion CPU module that the user programs and parameters have been stored.

4.4.1 Specifications of 7-segment LED/Switches



No.	Items	Functions
1)	7-segment LED	• Indicate the operation state and error information.
2)	Rotary switch 1 (SW1)	• Set the operation mode (Normal mode, Installation mode and mode operated by ROM, etc.)
3)	Rotary switch 2 (SW2)	• Each switch setting is 0 to F.

(1) Operation mode

"Operation mode" of the Motion CPU is set by the rotary switch setting of Motion CPU module at the power supply ON of the Multiple CPU system.

The rotary switch setting, operation mode and operation mode overview are shown below.

(a) Rotary switch setting and operation mode



Rotary switch setting ^(Note-1)		Operation mode
SW1	SW2	
A	Any setting (Except C)	Installation mode
0	0	Mode operated by RAM
0	6	Mode operated by ROM
Any setting	C	SRAM clear ^(Note-2)

(Note-1) : Do not set except the above setting.

(Note-2) : The programs, parameters, absolute position data, and latch data in the SRAM built-in Motion CPU module are cleared.

4 AUXILIARY AND APPLIED FUNCTIONS

(b) Operation mode overview

Operation mode	7-segment LED	Operation overview
Mode operated by RAM		<ul style="list-style-type: none"> • " . " remains flashing in the first digit of 7-segment LED. • It operates based on the user programs and parameters stored in the SRAM built-in Motion CPU module. • The user programs and parameters for the ROM operation can be written to the FLASH ROM built-in Motion CPU module.
Mode operated by ROM		<ul style="list-style-type: none"> • " . " remains flashing in the first digit and steady " . " display in the second digit of 7-segment LED. • Operation starts after the user programs and parameters stored in the FLASH ROM built-in Motion CPU module are read to the SRAM built-in Motion CPU module at power supply on or reset of the Multiple CPU system. <p>If the ROM writing is not executed, even if the user programs and parameters are changed using the MT Developer during mode operated by ROM, operation starts with the contents of the FLASH ROM at next power supply on or reset.</p> <p>Also, If the ROM writing is not executed, even if the auto tuning data are reflected on the servo parameter of Motion CPU by operation in the auto-tuning setting, operation starts with the contents of the FLASH ROM at next power supply on or reset.</p>

POINT

Do not change the rotary switch setting during operation.

Be sure to turn OFF the power supply before the rotary switch setting change.

4 AUXILIARY AND APPLIED FUNCTIONS

4.4.2 Outline of ROM operation

When the ROM writing is requested to the Motion CPU module using the MT Developer, the programs and parameters stored in the SRAM built-in Motion CPU module are batch-written to the FLASH ROM, after the data of FLASH ROM built-in Motion CPU are erased.

When the Motion CPU starts in the "Mode operated by ROM", a normal operation starts, after the data written in the FLASH ROM is read to the SRAM.

The programs and parameters created by the MT Developer must be written beforehand to the FLASH ROM built-in Motion CPU module at the ROM operation. The following methods for ROM writing are shown below.

- Write the programs and parameters written in the SRAM built-in Motion CPU module to the FLASH ROM built-in Motion CPU module.
- Write the programs and parameters of the MT Developer to the SRAM built-in Motion CPU module, and then write them to the FLASH ROM built-in Motion CPU module.

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

SV13	SV22
System setting data	
Each parameter for servo control	
Servo program	
Motion SFC parameter	
Motion SFC program	
—	Mechanical system program
—	Cam data

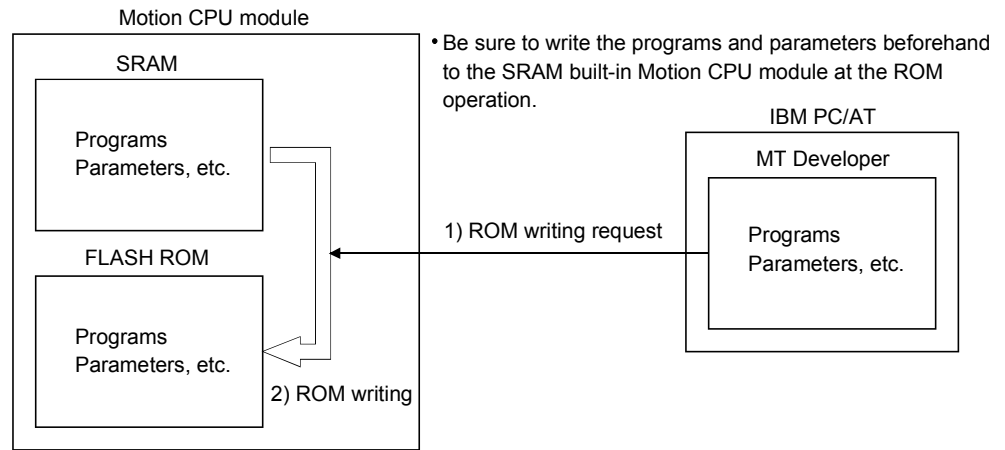
POINT
<p>(1) "Backup • load" operation of the MT Developer targets the SRAM built-in Motion CPU module. (The FLASH ROM built-in Motion CPU module is not targeted.) Set to "Mode operated by ROM" after ROM writing to execute the ROM operation after "Backup • load" operation at the Motion CPU module exchange.</p> <p>(2) The FLASH ROM built-in Motion CPU module serves as a life in 100000 times writing. Make the ROM writing within 100000 times. If it passes over a life, "writing error" will occur, replace the Motion CPU module.</p> <p>(3) The online change of Motion SFC program executes the Motion SFC program performed the online change from the next scanning at the mode operated by ROM. Operation starts with the contents of the Motion SFC program written in the FLASH ROM built-in Motion CPU module at next power supply on or reset.</p> <p>(4) It needs to meet the following conditions for the ROM writing. (a) PLC ready flag (M2000) OFF (b) Not installation mode</p>

4 AUXILIARY AND APPLIED FUNCTIONS

- (1) Write the programs and parameters written in the SRAM built-in Motion CPU module to the FLASH ROM built-in Motion CPU module for the ROM operation.

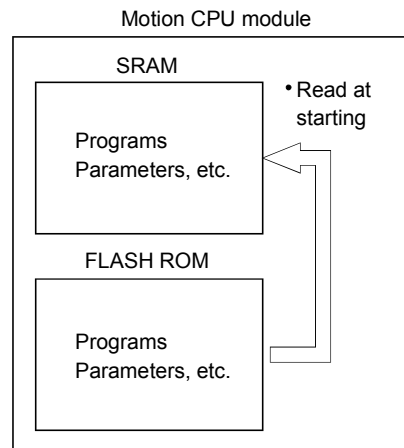
<ROM writing>

- Mode operated by RAM/Mode operated by ROM



<ROM operation>

- Mode operated by RAM/Mode operated by ROM

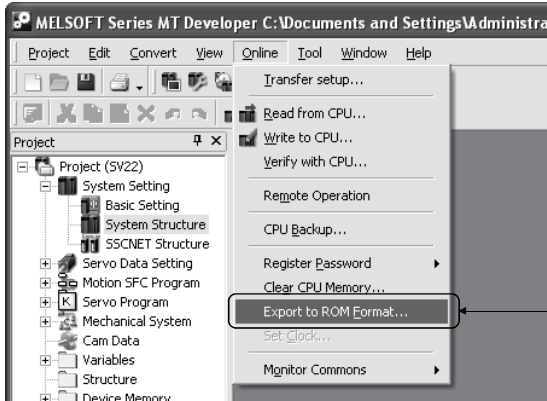


4 AUXILIARY AND APPLIED FUNCTIONS

<Operating procedure for ROM writing> Write the data of SRAM built-in Motion CPU module to the ROM.

The operating procedure for ROM writing using the MT Developer is shown below.

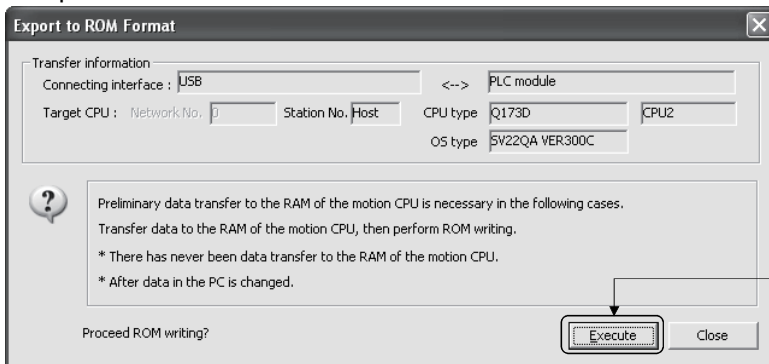
•Main Frame screen



Operating procedure

1) Select menu "Online" -"Export to ROM Format" to display "Export to ROM Format" screen.

• Export to ROM Format screen



2) Select "Execute" button.
ROM writing is executed to FLASH ROM built-in Motion CPU module.

POINT

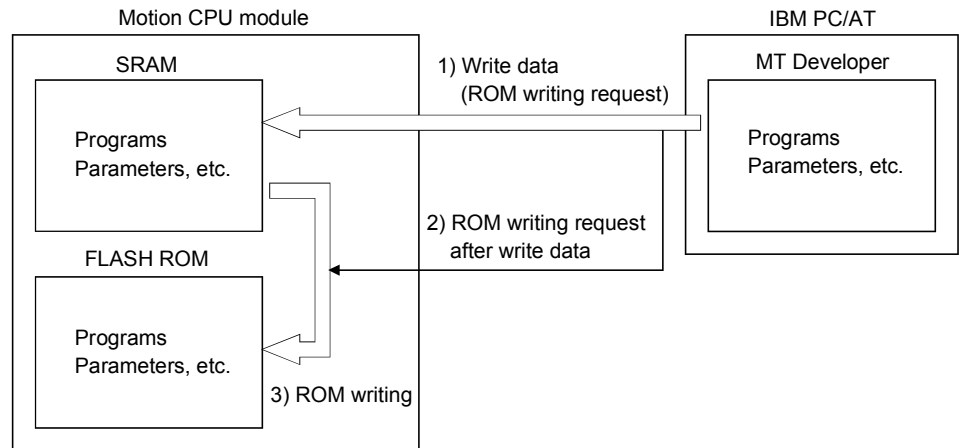
- Be sure to write the all data beforehand to SRAM built-in Motion CPU module at the ROM writing.

4 AUXILIARY AND APPLIED FUNCTIONS

- (2) Write the programs and parameters of the MT Developer to the SRAM built-in Motion CPU module, and then write them to the FLASH ROM built-in Motion CPU module for the ROM operation.

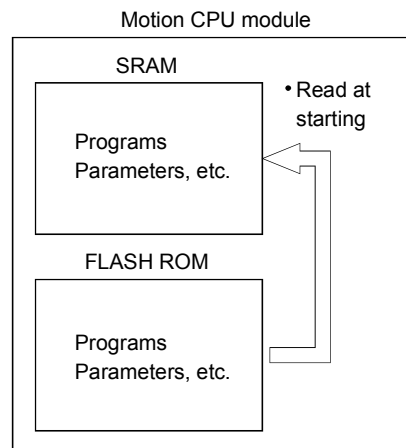
<Data writing + ROM writing>

- Mode operated by RAM/Mode operated by ROM



<ROM operation>

- Mode operated by RAM/Mode operated by ROM

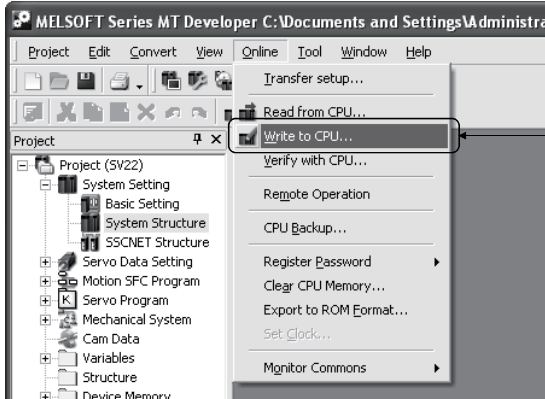


4 AUXILIARY AND APPLIED FUNCTIONS

<Operating procedure for ROM writing> Write the data of MT Developer to the ROM.

The operating procedure for ROM writing using the MT Developer is shown below.

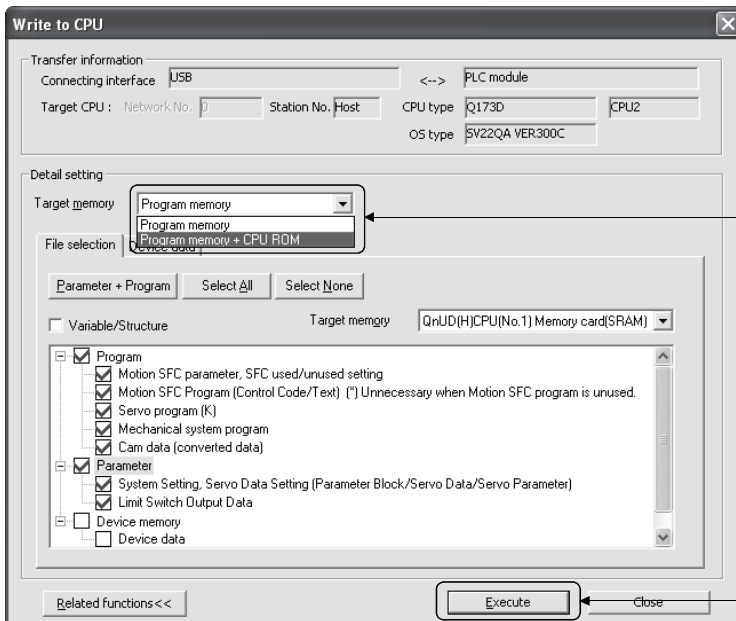
• Main Frame screen



Operating procedure

1) Select menu "Online" -"Write to CPU" to display "Write to CPU" screen.

•Write to CPU screen



2) Check data of MT Developer written in the Motion CPU.

3) Select "Program memory + CPU ROM" in target memory.

4) Select "Execute" button.
SRAM data built in Motion CPU module is written to ROM after writing data of MT developer to SRAM built-in Motion CPU module.

(Note): Mechanical system program and cam data (converted data) cannot be displayed when using OS type "SW8DNC-SV13".

POINT

- Be sure to write the all data beforehand to SRAM built-in Motion CPU module at the ROM writing.

4 AUXILIARY AND APPLIED FUNCTIONS

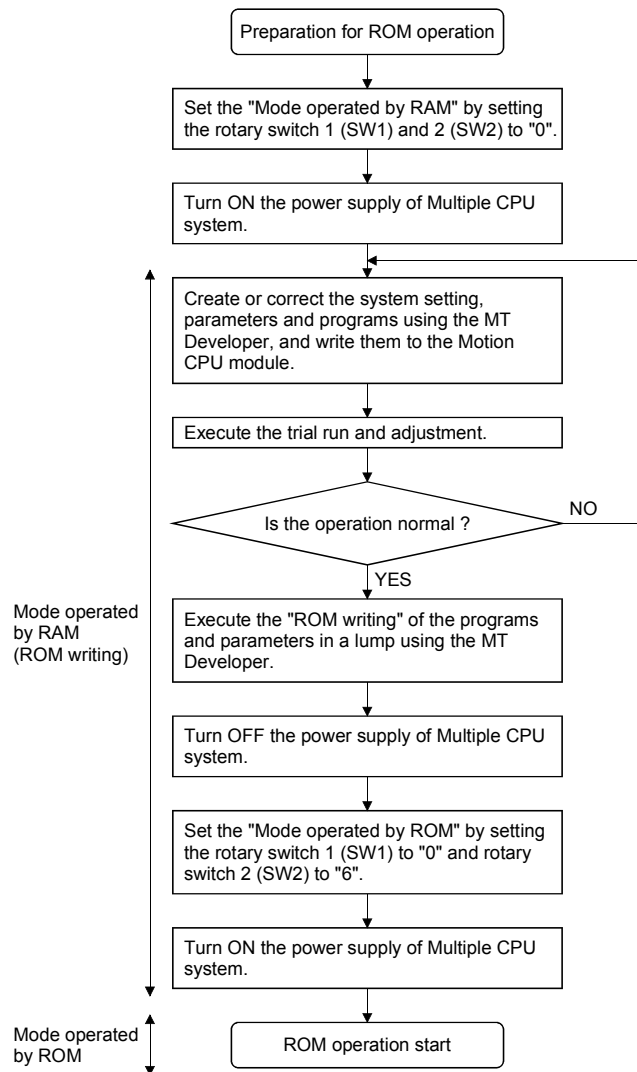
4.4.3 Operating procedure of the ROM operation function

The outline procedure of ROM operation function is shown below.

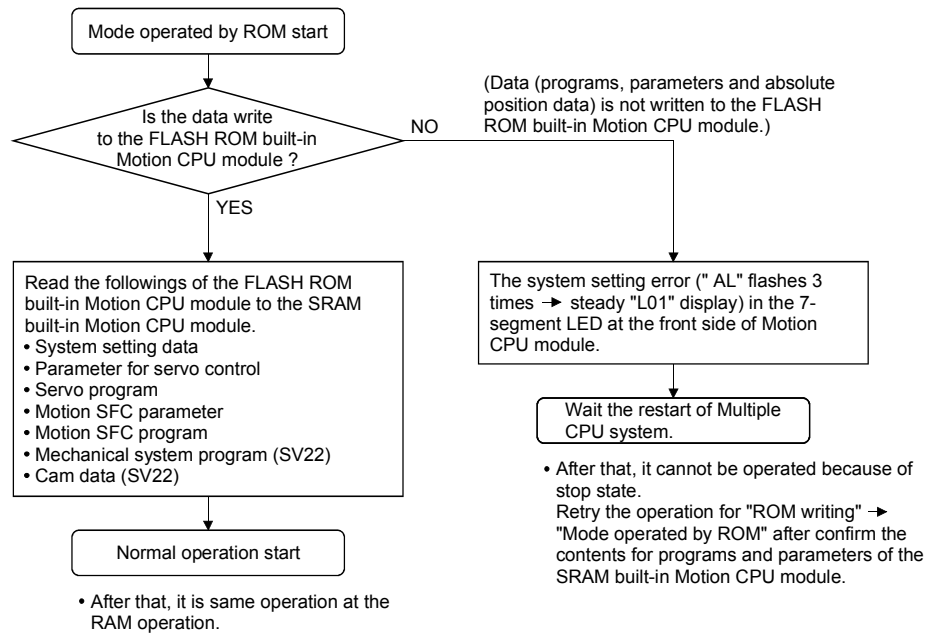
- 1) Turn on or reset the power supply of Multiple CPU system in the "Mode operated by RAM".
- 2) Create the system setting, programs and parameters using the MT Developer, and execute a trial run and adjustment.
- 3) Write the system setting, programs and parameters of SRAM built-in Motion CPU module to the FLASH ROM built-in Motion CPU module by the ROM writing request using the MT Developer.
- 4) By starting the Motion CPU in the "Mode operated by ROM", a normal operation starts after the system setting, programs and parameters written in the FLASH ROM built-in Motion CPU module are read to the SRAM built-in Motion CPU module.

(1) ROM operation procedure

The ROM operation procedure is shown below.



(2) Operation at the "Mode operated by ROM"

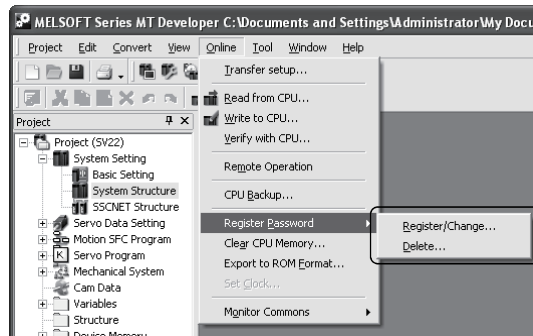


POINT
(1) Change the operation mode using the rotary switch of Motion CPU module.
(2) Confirm the operation mode by the 7-segment LED of Motion CPU module.

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 illegal reading or writing of the user data are prevented by setting a password. Registered password can be changed and deleted. [Register/Change Password] or [Delete Password] screen is used to register/change/delete a password. Select from a menu bar to display these screen.



The user data protected in this function are shown below.

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

Operating system software	User data	Protected contents
SV13/SV22	Motion SFC program	Motion SFC programs (Control code, text)
	Servo program	Servo programs and program allocation
SV22	Mechanical system program	Mechanical system programs
	Cam data	Cam data

4.5.1 Password registration/change

Select menu [Online] → [Register Password] → [Register/Change] to register/change a password.

(1) Procedure for password registration

- (a) Enter initial registration password in password column, and select registration condition (Write Protection, Read/Write Protection). It leaves in blank for the user data that does not register a password.
- (b) Click on [Execute] button to register a password in the Motion CPU.
- (c) Select menu [Project] → [Save] to save a password after registration in a project.
Refer to Section 4.5.4 for password save.

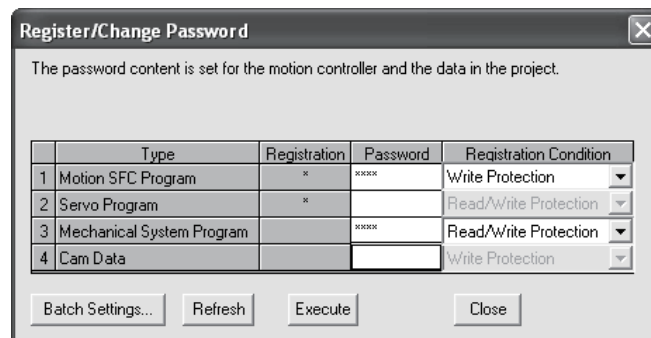
(2) Procedure for password change

- (a) Status of password registered in the Motion CPU are displayed.

4 AUXILIARY AND APPLIED FUNCTIONS

- (b) Enter new password in password column, and select registration condition (Write Protection, Read/Write Protection). It leaves in blank for the user data that does not change a password.
- (c) Click on [Execute] button to display [Check Password] screen for old password confirmation. Click on [Execute] button after old password input. 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), [Check Password] screen is not displayed.
- (d) Select menu [Project] → [Save] to save a password after change in a project. Refer to Section 4.5.4 for password save.

POINT
(1) If an user has forgotten a registration password, clear a password of Motion CPU by the all clear function. However, the all password data and user data are cleared by the all clear function. Re-write the user data to the Motion CPU. (Refer to Section 4.6 for details.)
(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) The password data is not save in a project without password save. Therefore, be sure to save a password.
(4) If an operation stops by reset or power OFF of the Multiple CPU system while a password registration/change, the user data may not be registered. Register/change a password again to restore the user data.



Items	Details
Type	Type of user data
Registration	"*" is displayed when a password is registered in the Motion CPU.
Password	Enter initial registration/change password. Alphanumeric character (ASCII) of 6 or less Match case (Not full-size character)
Registration condition	A registration condition set in the Motion CPU is displayed. <ul style="list-style-type: none"> • Write Protection • Read/Write Protection New registration condition can be selected by password input.

4 AUXILIARY AND APPLIED FUNCTIONS

4.5.2 Password delete

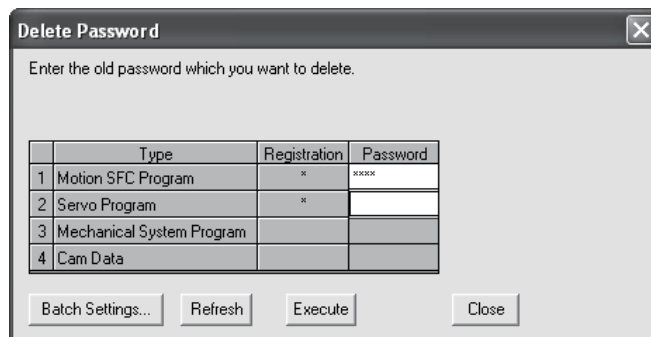
Select menu [Online] → [Register Password] → [Delete] to delete a password.

(1) Procedure for password delete

- (a) Status of password registered in the Motion CPU are displayed.
- (b) Enter old password and click on [Execute] button to delete password. It leaves in blank for the user data that does not delete a password.
- (c) A password will be deleted by success of password check. ("*" displayed in registration column disappears.)
- (d) Select menu [Project] → [Save] to save a password after delete in a project. Refer to Section 4.5.4 for password save.

POINT

- (1) The password data is not save in a project without password save. Therefore, be sure to save a password.
- (2) If an operation stops by reset or power OFF of the Multiple CPU system while delete of password, the data may not be deleted. Delete a password again to restore the user data.



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

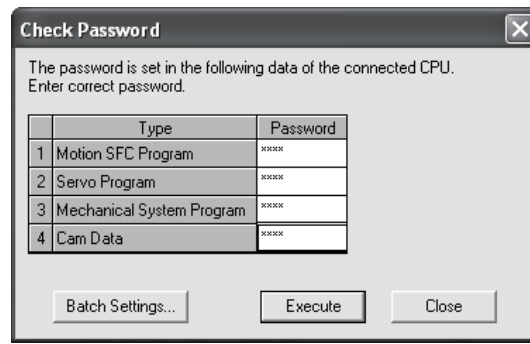
4 AUXILIARY AND APPLIED FUNCTIONS

4.5.3 Password check

When operating the user data that sets password, the check password screen is displayed automatically.

(1) Procedure for password check

- (a) Enter old password in password column, and click on [Execute] button.
- (b) Protection by the password temporarily released by success of password check. After that it can be operated the user data.
- (c) A password is memorized until MT Developer ends. (Since protection by password is automatically released temporarily at the user data operation, a check password screen is not displayed.)



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

4 AUXILIARY AND APPLIED FUNCTIONS

4.5.4 Password save

Registered/changed/deleted password or password read with user data from "Read from CPU" screen displayed by menu [Online] → [Read from CPU] can be saved in a project data.

A password saved in a project data can be registered with user data, when the user data are written in the Motion CPU that does not set password from "Write to CPU" screen displayed by menu [Online] → [Write to CPU].

Select menu [Project] → [Save] to save the updated password data in a project.

(1) Status of password data for each operation

Operation	Status of password data
Read	When a password is set in the call source Motion CPU, the password contents are called and the password data in a project are updated.
Write	When a password data is set in a project, if a password is not set in the write designation Motion CPU, the password contents are also written.
Verification	Password data in a project are not updated.
ROM writing	Password contents registered in the write designation Motion CPU are written in ROM.
Online change	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 a project is not updated.
Load	Password contents in backup data are written in the write designation Motion CPU.
Register/change password	New password contents are written in the write designation Motion CPU. Password data in a project is also updated to new password contents.
Delete password	A password is deleted from the write designation Motion CPU. A password is deleted also from the password data in a project.
Project diversion	The password data in diverting source project is not diverted.

POINT

- (1) The password data is not save in a project without project save.
- (2) Save a project after delete of password to delete the password data in a project. Or, create a project without password data by creating new project and diverting user data from a project with password data.

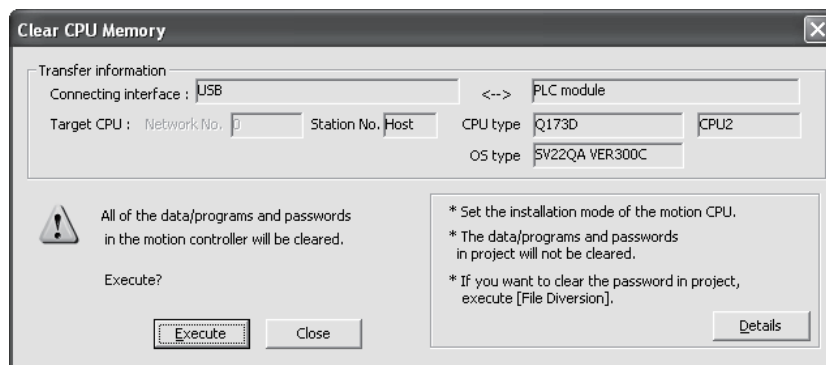
4 AUXILIARY AND APPLIED FUNCTIONS

4.6 All clear function

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

(1) Procedure for clear all

- (a) Set the Motion CPU module to installation mode (Set a rotary switch 1 (SW1) to "A".)
- (b) Select [Execute] button of "Clear CPU Memory" screen displayed by menu [Online] → [Clear CPU Memory].



POINT

- (1) Set the Motion CPU module to installation mode to clear all.
Be sure to set a rotary switch after power supply OFF.
- (2) The user data area of FLASH ROM built-in Motion CPU module is also cleared.
- (3) All user data and password setting are cleared at the "Clear all".
It is recommended to be backup them in advance using MT Developer.

4 AUXILIARY AND APPLIED FUNCTIONS

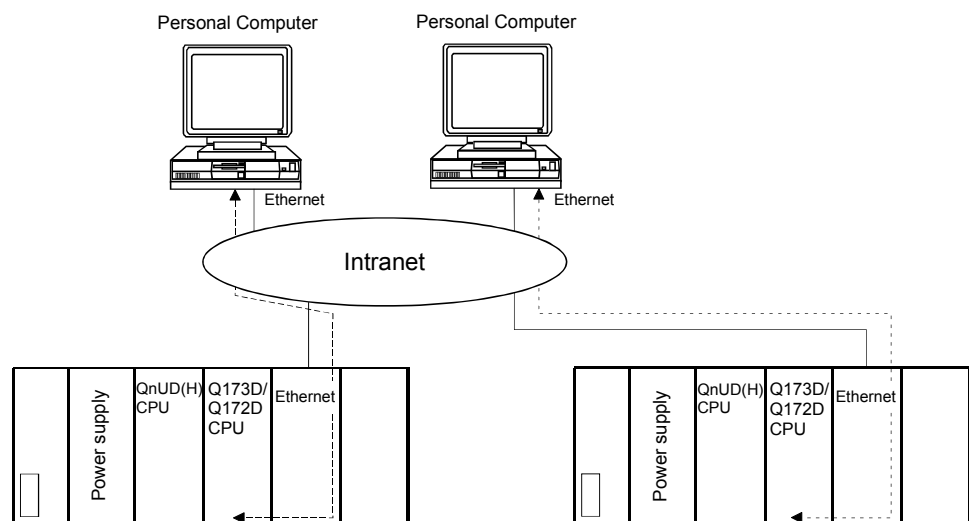
4.7 Communication via Network

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 (Q173DCPU/Q172DCPU).

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

4.7.1 Specifications of the communications via network

- (1) Communications via network enables using MT Developer in the Motion CPU.
- (2) Access range of the communications via network of the Motion CPU is an access range equivalent to QnUD(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.

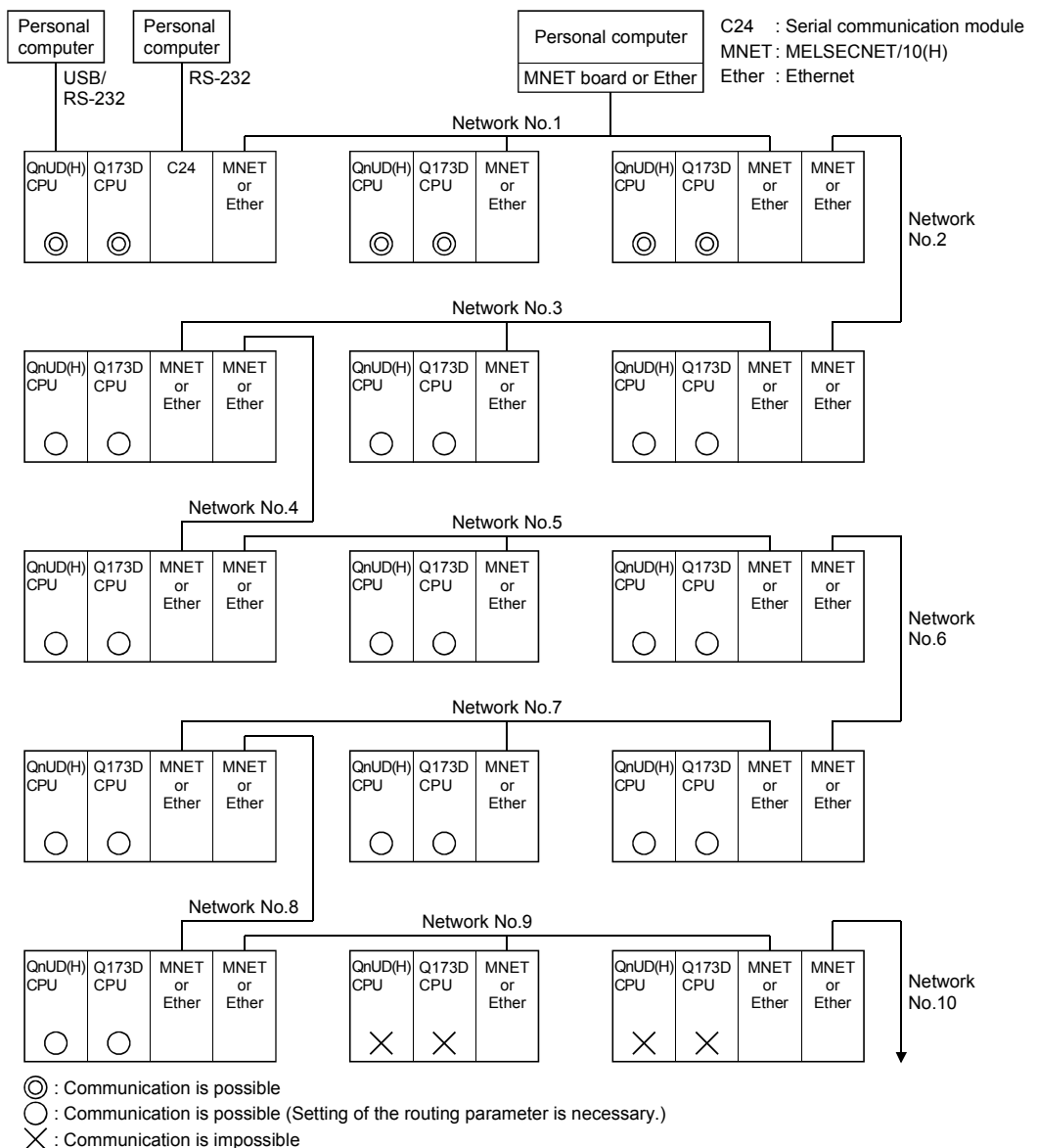


4 AUXILIARY AND APPLIED FUNCTIONS

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 packages (GX Developer, MT Developer, 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 packages 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.

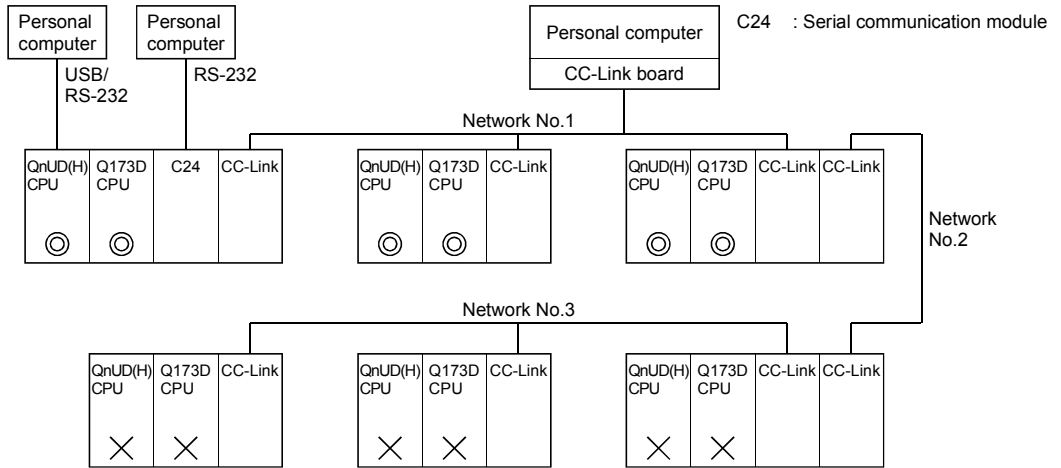
<Example>



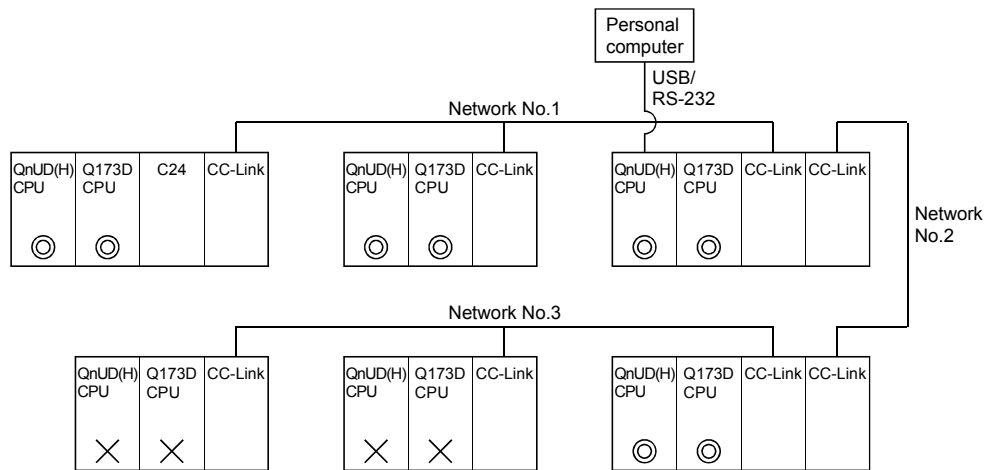
(2) Network configuration via the CC-Link

- (a) It can access the other CPU via the CC-link from the programming software packages (GX Developer, MT Developer, 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 CC-Link from the programming software packages in the personal computer by connecting the personal computer equipped with CC-Link board to the CC-Link.
- (c) The access range of above (1) is only the CPU on the CC-Link which a system connects it to, and it can select a CC-Link network to connect by specifying the I/O No. of the CC-Link module.
- (d) The access range of above (2) is only the CPU of the connected the CC-Link.

<Example 1>



<Example 2>



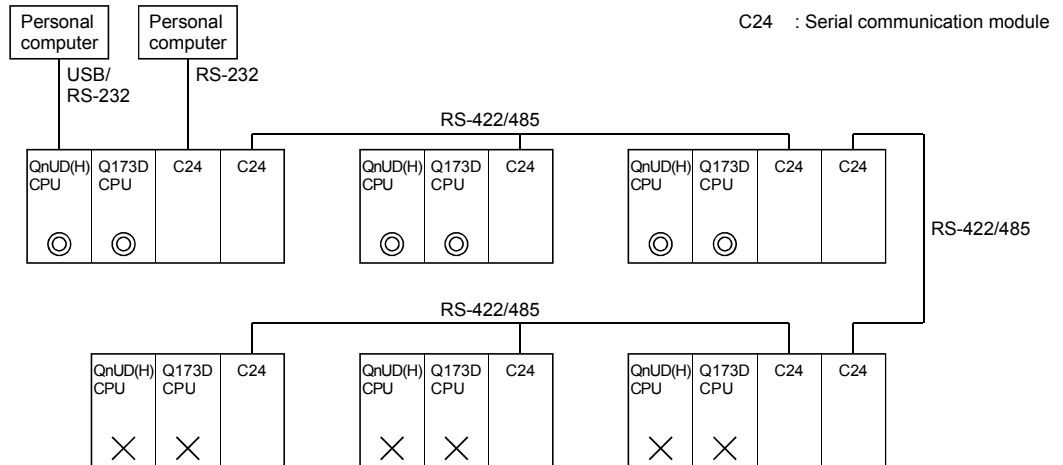
⊙ : Communication is possible
 × : Communication is impossible

4 AUXILIARY AND APPLIED FUNCTIONS

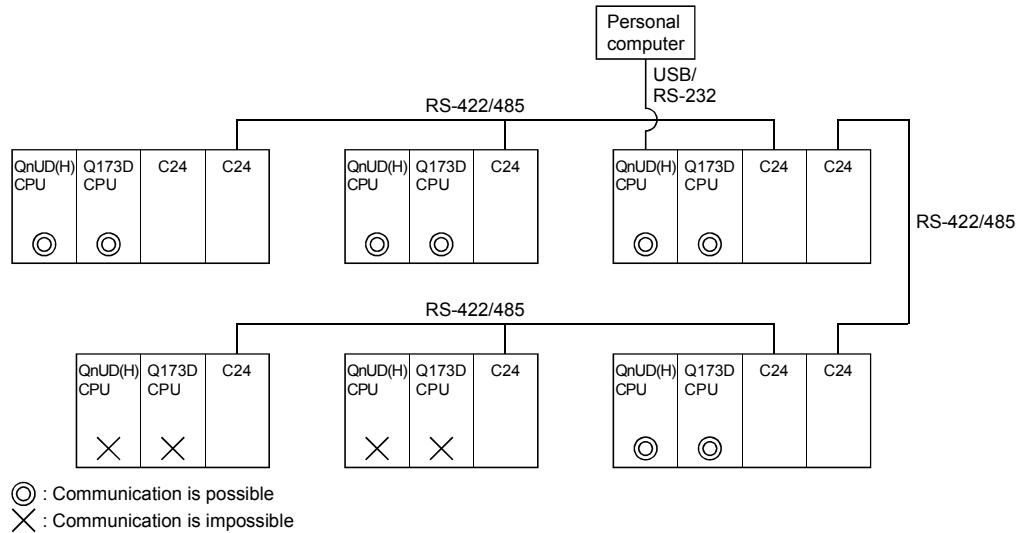
(3) Network configuration via the RS-422/485

- (a) It can access the other CPU via the RS-422/485 from the programming software packages (GX Developer, MT Developer, 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>



4 AUXILIARY AND APPLIED FUNCTIONS

(4) Network configuration which MELSECNET/10(H), Ethernet, CC-Link, RS-422/485 were mixed

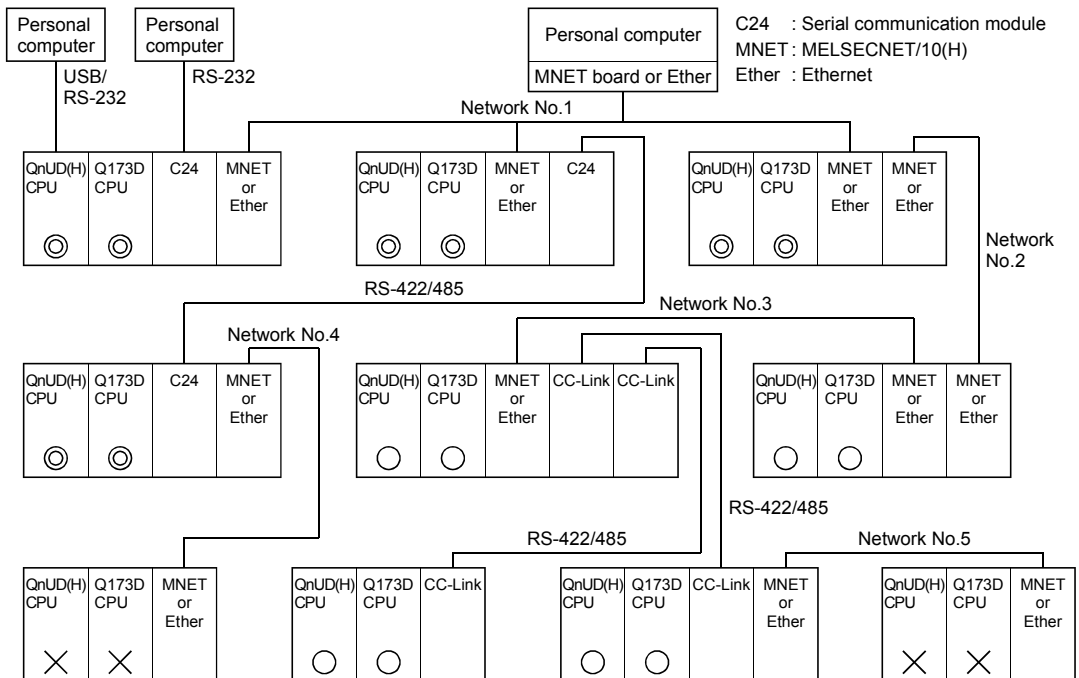
- (a) When the MELSECNET/10(H) or Ethernet is defined as "Network" and CC-Link or RS-422/485 is defined as "Link", combination of whether to be able to access from the programming software packages (GX Developer, MT Developer, etc.) is shown below.

Network communications	Usable/ unusable
Programming software package → CPU (C24) → Network → Link → CPU	○
Programming software package → CPU (C24) → Link → Network → CPU	○
Programming software package → Network → Link → CPU	○
Programming software package → Link → Network → CPU	○
Programming software package → CPU (C24) → Network → Link → Network → CPU	×
Programming software package → CPU (C24) → Link → Network → Link → CPU	×
Programming software package → Network → Link → Network → CPU	×
Programming software package → Link → Network → Link → CPU	×

○ : Usable × : Unusable

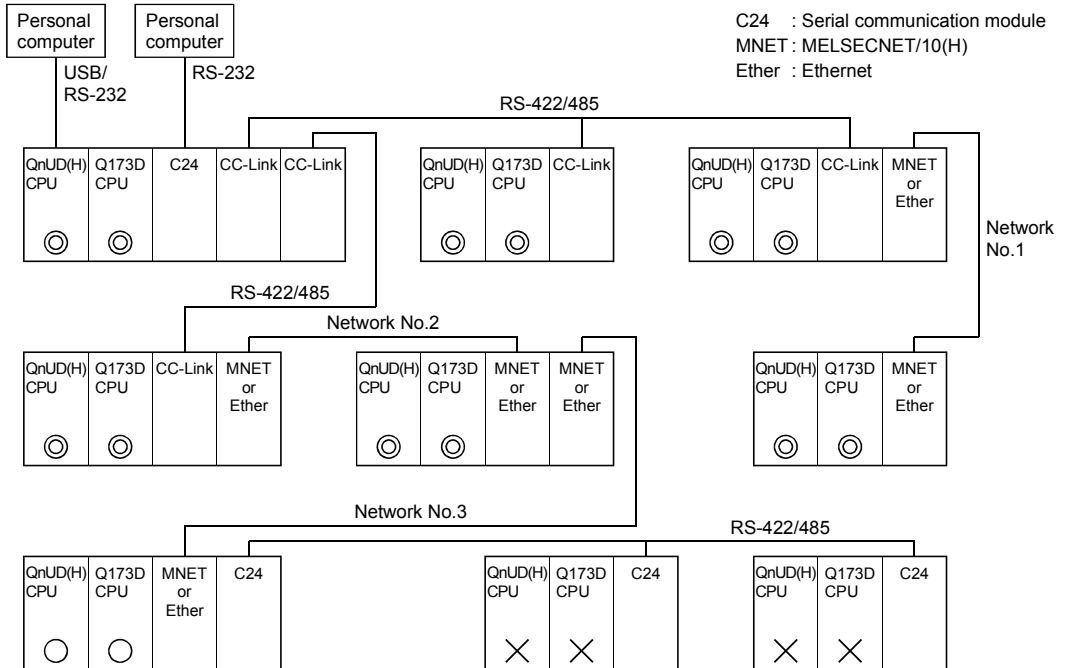
- (b) It can be accessed to 8 network points by setting the routing parameter in the "Network".
- (c) Because routing cannot access, it can access only the connected network. The connected network can be selected by specifying the I/O No. of the module.

<Example 1>

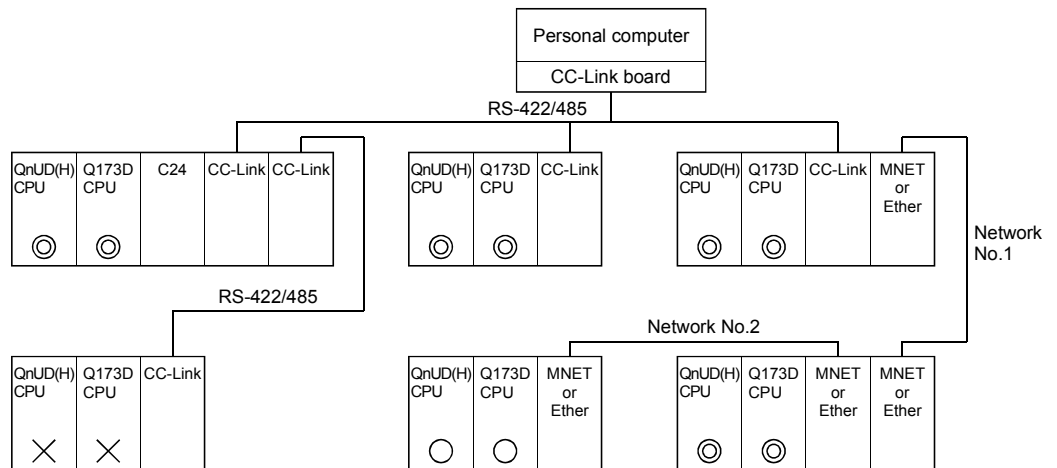


4 AUXILIARY AND APPLIED FUNCTIONS

<Example 2>



<Example 3>



- ⊙ : Communication is possible
- : Communication is possible (Setting of the routing parameter is necessary.)
- ✕ : Communication is impossible

4 AUXILIARY AND APPLIED FUNCTIONS

4.8 Monitor Function of the Main Cycle

- (1) Information for main cycle of the Motion CPU (process cycle executed at free time except for motion control) is stored to the special register.
- (2) Since the automatic refresh of CPU shared memory and normal task of Motion SFC program 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.
 - (c) Reduce the number of normal task programs to execute simultaneously in the Motion SFC program.
 - (d) Reduce the number of automatic refresh points of CPU shared memory.
- (4) When a main cycle is lengthened (more than 1.0[s]), a WDT error may occur in the Motion CPU.
- (5) Details of main cycle monitor register is shown below.

No.	Name	Meaning	Details
SD520	Scan time	Current scan time (1ms units)	<ul style="list-style-type: none">• Current scan time is stored in the unit 1[ms].• Setting range (0 to 65535[ms])
SD521	Maximum scan time	Maximum scan time (1ms units)	<ul style="list-style-type: none">• Maximum main cycle is stored in the unit 1[ms].• Setting range (0 to 65535[ms])

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.

POINT

If the power supply of Multiple CPU system 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 MT Developer, read the servo parameters from the Motion CPU and save data.

4 AUXILIARY AND APPLIED FUNCTIONS

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, #, U□\G) and monitor them.

It can be set by the system setting of MT Developer.

(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	[× 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
U□\G	10000 to (10000+p-1) ^{(Note-1), (Note-2)}

(Note-1): "p" indicates the user setting area points of the Multiple CPU high speed transmission area for the each CPU.

(Note-2): Only device of the self CPU can be used.

POINT

- (1) The updating cycle of data is every operation cycle.
- (2) Set an even number as device setting in the two word data.
- (3) Refer to Chapter 2 for the user setting area points of the Multiple CPU high speed transmission area.

4 AUXILIARY AND APPLIED FUNCTIONS

4.11 Connect/Disconnect Function

This function is used to temporarily suspend SSCNET communication while servo amplifiers and/or SSCNET III cables after Axis 1 are exchanged with the power supply ON in a Multiple CPU system.

SD803 is required for connect/disconnect and SD508 stores the command status for "accept waiting" or "execute waiting" during this process. If a servo amplifier was previously removed using the connect/disconnect function, it must be used again to reconnect the servo amplifier. This function is only required when there is a desire to maintain communication to all axes in front of the one being removed.

No connect/disconnect processing is required if the power supply to Axis 1 is shutdown.

(1) Connect/disconnect status devices

Device No.	Overview	Set by												
SD508	The execute status for a connect/disconnect is stored.	System												
	<table border="1"> <thead> <tr> <th>Monitoring value</th> <th>Status</th> <th>Contents</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Connect/disconnect command accept waiting</td> <td>Connect command or disconnect command is in the status that can be accepted</td> </tr> <tr> <td>-1</td> <td>Connect/disconnect execute waiting</td> <td>SD508 is waiting for connect/disconnect execute command after accepting a connect command or disconnect command.</td> </tr> <tr> <td>-2</td> <td>While connecting/disconnecting</td> <td>Connect/disconnect is in process.</td> </tr> </tbody> </table>		Monitoring value	Status	Contents	0	Connect/disconnect command accept waiting	Connect command or disconnect command is in the status that can be accepted	-1	Connect/disconnect execute waiting	SD508 is waiting for connect/disconnect execute command after accepting a connect command or disconnect command.	-2	While connecting/disconnecting	Connect/disconnect is in process.
	Monitoring value		Status	Contents										
	0		Connect/disconnect command accept waiting	Connect command or disconnect command is in the status that can be accepted										
-1	Connect/disconnect execute waiting	SD508 is waiting for connect/disconnect execute command after accepting a connect command or disconnect command.												
-2	While connecting/disconnecting	Connect/disconnect is in process.												

(2) Connect/disconnect command devices

Device No.	Overview	Set by															
SD803	The connect/disconnect command is set.	User															
	<table border="1"> <thead> <tr> <th>Setting value</th> <th>Command</th> <th>Contents</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>None</td> <td>This value is set if there is no command.</td> </tr> <tr> <td>1 to 32</td> <td>Disconnect command</td> <td>Set axis No. "1 to 32" to be disconnected.</td> </tr> <tr> <td>-10</td> <td>Connect command</td> <td>Set to connect axis while disconnecting.</td> </tr> <tr> <td>-2</td> <td>Connect/disconnect execute command</td> <td>Connect/disconnect processing is executed by setting this value in the status of a connect/disconnect execute waiting.</td> </tr> </tbody> </table>		Setting value	Command	Contents	0	None	This value is set if there is no command.	1 to 32	Disconnect command	Set axis No. "1 to 32" to be disconnected.	-10	Connect command	Set to connect axis while disconnecting.	-2	Connect/disconnect execute command	Connect/disconnect processing is executed by setting this value in the status of a connect/disconnect execute waiting.
	Setting value		Command	Contents													
	0		None	This value is set if there is no command.													
	1 to 32		Disconnect command	Set axis No. "1 to 32" to be disconnected.													
-10	Connect command	Set to connect axis while disconnecting.															
-2	Connect/disconnect execute command	Connect/disconnect processing is executed by setting this value in the status of a connect/disconnect execute waiting.															

POINT
<p>(1) After completion of SSCNET communication disconnect processing, be sure to check the LED display of the servo amplifier for "AA" before turning OFF its the power supply.</p> <p>(2) When a "1 to 32 : Disconnect command" and/or "-10 : Connect command" are set to the "Connect/disconnect command device (SD803)", the status of the SD508 changes to the "-1: Connect/disconnect waiting" state. In order to complete connect/disconnect processing, "-2 : Connect/disconnect execute command" must be set to SD803 to execute the prior connect/disconnect command.</p> <p>(3) When "1 to 32 : Disconnect command" is set to axis not disconnect, the connect/disconnect status device (SD508) returns "0" without entering the status of "-1 : Connect/disconnect execute waiting".</p> <p>(4) Operation failure may occur in some axes if the power supply of servo amplifiers connected after them on the SSCNET system is turned OFF. Be sure to use the disconnect function before turning OFF the power supply of any servo amplifiers connected after an amplifier whose power remains on.</p>

- (3) Procedure for connect/disconnect function to exchange the servo amplifier or SSCNETⅢ cable is shown below.

(a) Operation procedure to disconnect

1) Set the axis No. to disconnect in SD803. (Setting value: 1 to 32)

↓

2) Check that "-1: Disconnect execute waiting" is set in SD508.
(Disconnect execute waiting)

↓

3) Set "-2: Disconnect execute command" in SD803.

↓

4) Check that "0: Disconnect command accept waiting" is set in SD508.
(Completion of disconnection)

↓

5) Turn OFF the power supply of servo amplifier after checking its LED display for "AA" and then disconnect.

4 AUXILIARY AND APPLIED FUNCTIONS

(b) Operation procedure to connect

1) Turn ON the power supply of the servo amplifier.

↓

2) Set "-10: Connect command" in SD803.

↓

3) Check that "-1: Connect execute waiting" is set in SD508.
(Connect execute waiting)

↓

4) Set "-2: Connect execute command" in SD803.

↓

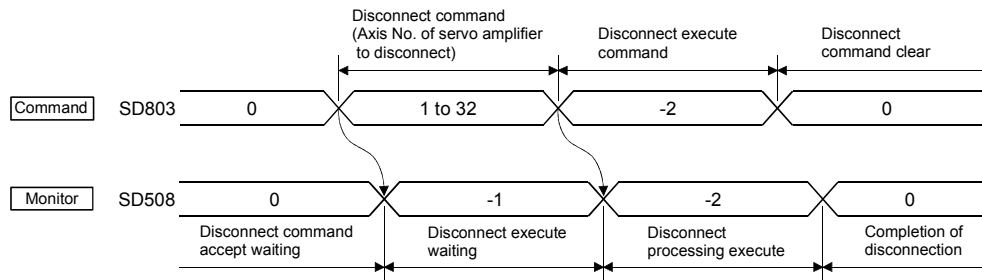
5) Check that SD508 is "0: Connect command accept waiting" is set in SD508.
(Completion of connection)

↓

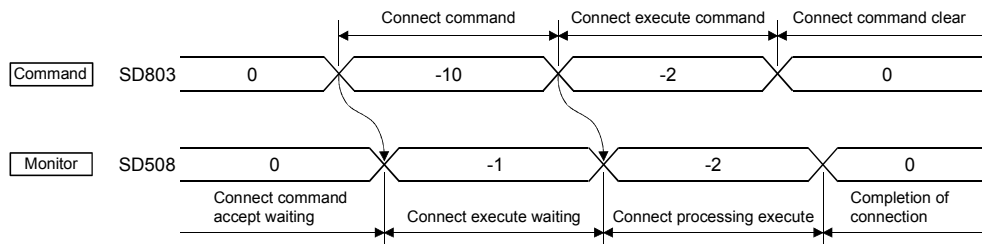
6) Resume operation of servo amplifier after verifying the servo ready status (M2415+20n) is ON.

(4) Flow for device value at connect/disconnect operation is shown below.

(a) Disconnect operation



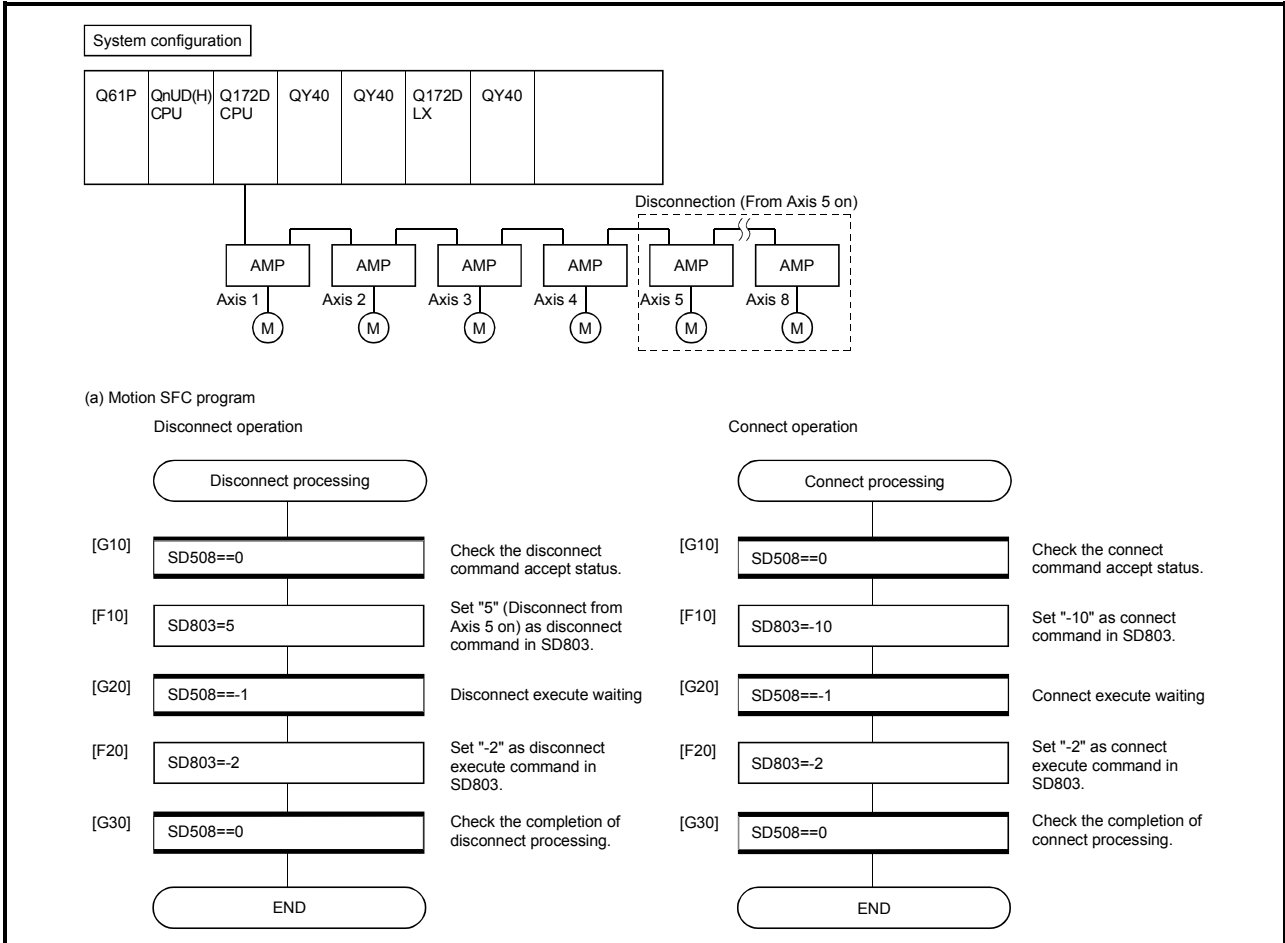
(b) Connect operation



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<Program example>

- (1) Self CPU program which connects/disconnects servo amplifiers from Axis 5 on
- Disconnect procedure: Turn OFF the power supply of servo amplifier after checking its LED display for "AA".
- Connect procedure: Resume operation of servo amplifier after verifying that the servo ready (M2415+20n) is ON.

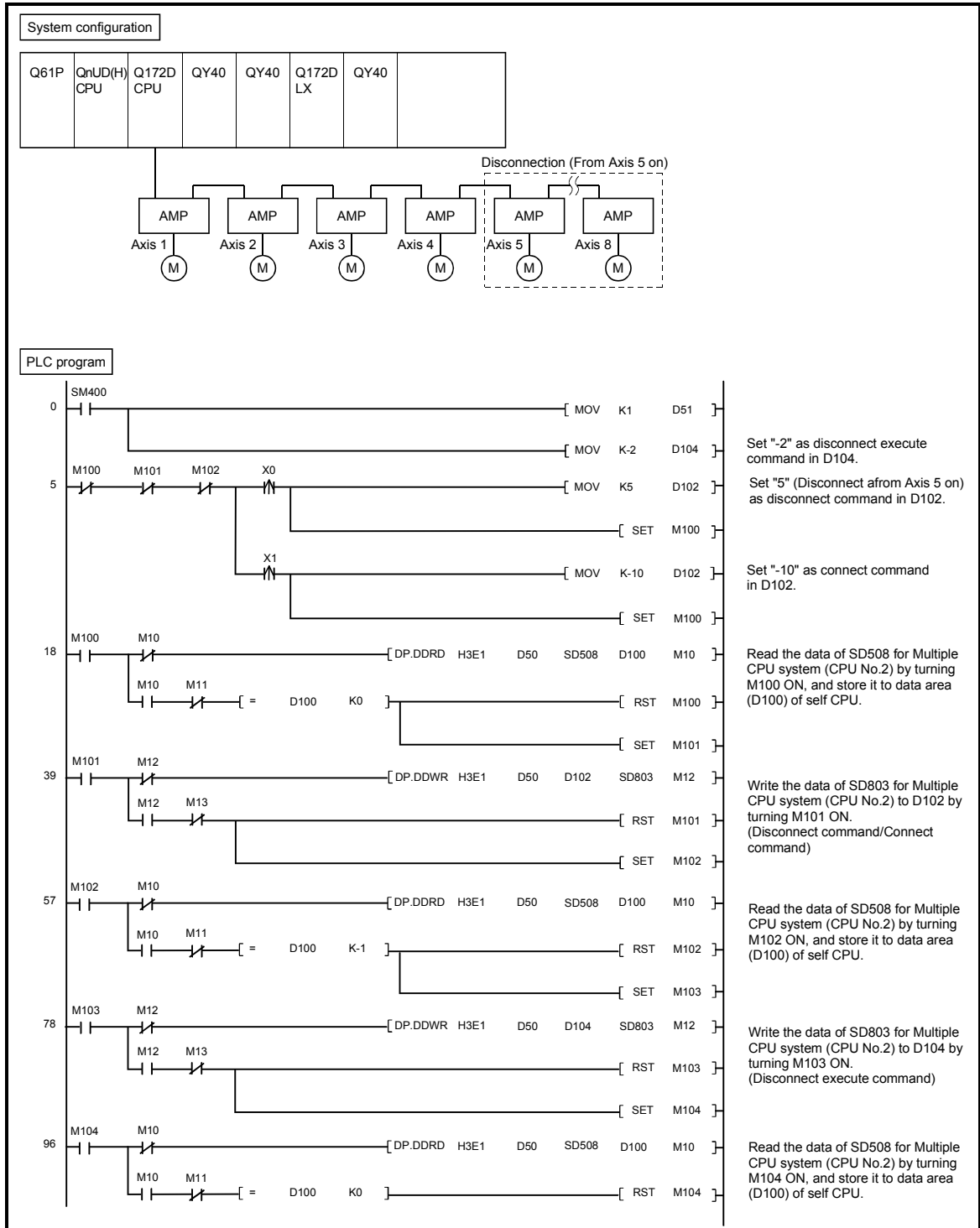


4 AUXILIARY AND APPLIED FUNCTIONS

(2) PLC CPU program which connects/disconnects servo amplifiers from Axis 5 on which is connected to the Motion CPU (CPU No.2).

Disconnect procedure: Turn X0 OFF to ON, and then turn OFF the power supply of servo amplifier after checking the LED display "AA" of servo amplifier.

Connect procedure: Turn X1 OFF to ON, and then resume operation of servo amplifier after checking the servo ready (M2415+20n) of servo amplifier.



4 AUXILIARY AND APPLIED FUNCTIONS

4.12 Remote operation

This function is used to control the following operation of Motion CPU using MT Developer.

- Remote RUN/STOP
- Remote latch clear

POINT

Latch clear can be executed only using the remote control of MT Developer.
--

4.12.1 Remote RUN/STOP

The PLC ready flag (M2000) is turned ON/OFF by MT Developer with RUN/STOP switch of Motion CPU module set to RUN.

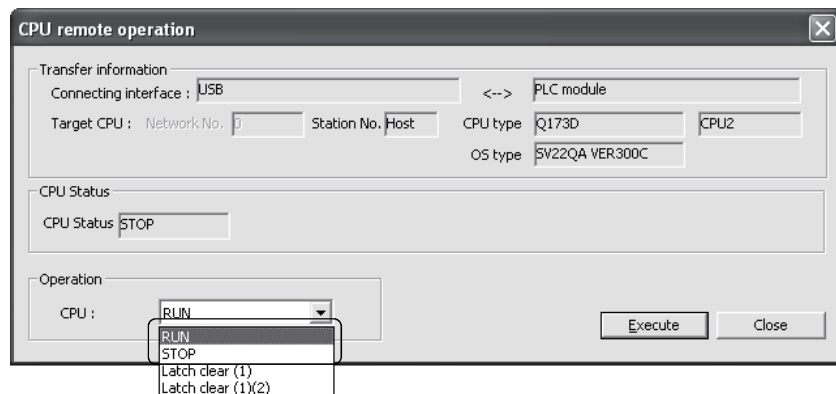
(1) Operation procedure

(a) Remote RUN

Select [RUN] on "CPU remote operation" screen displayed by menu [Online] – [Remote Operation], and click [Execute] button.

(b) Remote STOP

Select [STOP] on "CPU remote operation" screen displayed by menu [Online] – [Remote Operation], and click [Execute] button.



4 AUXILIARY AND APPLIED FUNCTIONS

POINT

- (1) Remote RUN cannot be executed if RUN/STOP switch sets to STOP.
Operation after remote operation by RUN/STOP switch is shown below.

		Position of RUN/STOP switch	
		RUN	STOP
Remote operation	Execute remote RUN	RUN	STOP
	Execute remote STOP	STOP	STOP

- (2) The following parameters are read by turning on the PLC ready flag (M2000).

- Fixed parameter
- Parameter block
- Home position return data
- JOG operation data
- Servo parameter
- Mechanical system program (SV22)
- Motion SFC parameter
- Limit switch parameter

REMARK

The PLC ready flag (M2000) can also be turned ON/OFF (PCPU READY complete flag (SM500) ON/OFF) in the following methods.

- RUN/STOP switch change
- PLC ready flag (M2000) ON/OFF

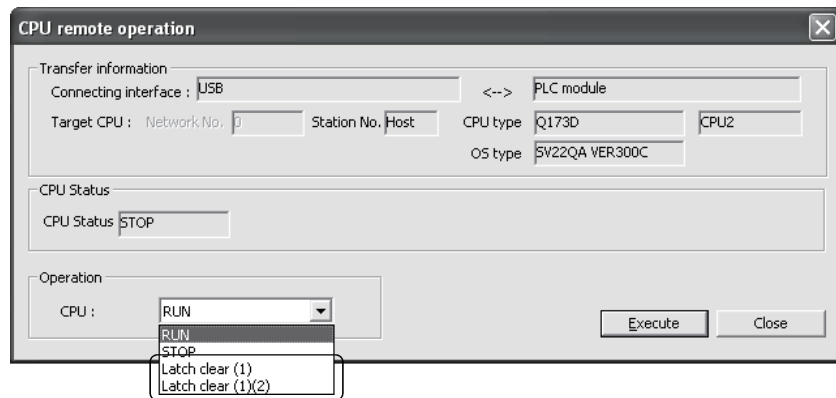
4 AUXILIARY AND APPLIED FUNCTIONS

4.12.2 Remote latch clear

Device data of Motion CPU that latched are cleared by MT Developer at PLC ready flag (M2000) OFF (PCPU READY complete flag (SM500) OFF). Operation for remote latch clear is combined with remote RUN/STOP.

(1) Operation procedure

- (a) Turn OFF the PLC ready flag (M2000) (PCPU READY complete flag (SM500) OFF) by remote STOP.
- (b) Select [Latch clear (1)] or [Latch clear (1)(2)] on "CPU remote operation" screen displayed by menu [Online] – [Remote Operation], and click [Execute] button.
(Note): Execute remote RUN to turn ON the PLC ready flag (M2000) after remote latch clear.



POINT

- (1) Remote latch clear cannot be operated while the PLC ready flag (M2000) is ON (PCPU READY complete flag (SM500) is ON) or test mode.
- (2) The following latch area are cleared in the remote latch clear operation.
 - Latch clear (1) : Clear the range set in latch area (1)
 - Latch clear (1)(2) : Clear the range set in latch area (1) and (2)
- (3) The user area (#0 to #7999) of motion device are also cleared by executing remote latch clear.
- (4) All of the user device not latched are cleared by the remote latch clear operation of latch area (1) and (2).
- (5) Set the range of latch area (1) and (2) in the system basic setting of system setting. (Refer to Section 3.1.3.)

APPENDICES

APPENDIX 1 Special relays/Special registers

APPENDIX 1.1 Special relays

Special relays are internal relays whose applications are fixed in the Motion CPU. For this reason, they cannot be used in the same way as the normal internal relays by the Motion SFC programs.

However, they can be turned ON/OFF as needed in order to control the Motion CPU.

The headings in the table that follows have the following meanings.

Item	Explanation
No.	• Indicates the device No. of the special relay.
Name	• Indicates the name of the special relay.
Meaning	• Indicates the nature of the special relay.
Details	• Indicates detailed information about the nature of the special relay.
Set by (When set)	<ul style="list-style-type: none"> • Indicates whether the relay is set by the system or user, and, if it is set by system, when setting is performed. <Set by> <li style="padding-left: 20px;">S: Set by system (Motion CPU) <li style="padding-left: 20px;">U: Set by user (Motion SFC program or test operation using MT Developer) <li style="padding-left: 20px;">S/U: Set by both system (Motion CPU) and user <When set> Indicated only if setting is done by system (Motion CPU). Main process: Set during each main processing (free time processing of the CPU) Initial process: Set only during initial processing (when power supply is turned ON, or when executed the reset) Status change : Set only when there is a change in status Error : Set when error is occurred. Request : Set only when there is a user request (Special relay, etc.) Operation cycle : Set during each operation cycle of the Motion CPU.

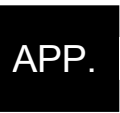


Table 1.1 Special relay list

No.	Name	Meaning	Details	Set by (When set)	Remark
SM0	Diagnostic error	OFF : No error ON : Error	<ul style="list-style-type: none"> • Turn ON if an error occurs as a result of diagnosis. • Remains ON even if the condition is restored to normal thereafter. • Turn ON by ON to OFF of the Motion error detection flag (M2039) for except the stop error after confirming the error content. 		
SM1	Self-diagnostic error	OFF : No self-diagnostic error ON : Self-diagnostic error	<ul style="list-style-type: none"> • Turn ON if an error occurs as a result of self-diagnosis. • Remains ON even if the condition is restored to normal thereafter. • Turn ON by ON to OFF of the Motion error detection flag (M2039) for except the stop error after confirming the error content. 		
SM51	Battery low latch	OFF : Normal ON : Battery low	<ul style="list-style-type: none"> • Turn ON if the voltage of external battery reduces to less than 2.5[V]. • Remains ON even if the condition is restored to normal thereafter. 		
SM52	Battery low	OFF : Normal ON : Battery low	<ul style="list-style-type: none"> • Turn on when the voltage of the external battery reduces to less than 2.5[V]. • Turn OFF when the voltage of external battery returns to normal. 	S (Occur an error)	
SM53	AC/DC DOWN detection	OFF : AC/DC DOWN not detected ON : AC/DC DOWN detected	<ul style="list-style-type: none"> • Turn ON if an instantaneous power failure of within 20[ms] occurs during use of the AC power supply module. Reset when the power supply is switched OFF, then ON. • Turn ON if an instantaneous power failure of within 10[ms] occurs during use of the AC power supply module. Reset when the power supply is switched OFF, then ON. 		
SM58	Battery low warning latch	OFF : Normal ON : Battery low	<ul style="list-style-type: none"> • Turn ON if the voltage of external battery reduces to less than 2.7[V]. • Remains ON even if the condition is restored to normal thereafter. 		
SM59	Battery low warning	OFF : Normal ON : Battery low	<ul style="list-style-type: none"> • Turn on when the voltage of the external battery reduces to less than 2.7[V]. • Turn OFF when the voltage of external battery returns to normal. 		
SM60	Fuse blown detection	OFF : Normal ON : Module with blown fuse	<ul style="list-style-type: none"> • Turn ON if there is at least one output module whose fuse has blown. • Remains ON even if the condition is restored to normal thereafter. 		
SM211	Clock data error	OFF : No error ON : Error	• Turn ON if an error occurs in clock data (SD210 to SD213) value, and turn OFF if no error is detected.	S (Request)	
SM220 (Note-1)	CPU No.1 READY complete	OFF : CPU No.1 READY incomplection ON : CPU No.1 READY completion	• Turn ON if CPU No. 1 which uses Multiple CPU high speed bus can be operated between Multiple CPU.		
SM221 (Note-1)	CPU No.2 READY complete	OFF : CPU No.2 READY incomplection ON : CPU No.2 READY completion	• Turn ON if CPU No. 2 which uses Multiple CPU high speed bus can be operated between Multiple CPU.		
SM222 (Note-1)	CPU No.3 READY complete	OFF : CPU No.3 READY incomplection ON : CPU No.3 READY completion	• Turn ON if CPU No. 3 which uses Multiple CPU high speed bus can be operated between Multiple CPU.		S (Change status)
SM223 (Note-1)	CPU No.4 READY complete	OFF : CPU No.4 READY incomplection ON : CPU No.4 READY completion	• Turn ON if CPU No. 4 which uses Multiple CPU high speed bus can be operated between Multiple CPU.		
SM240	No.1 CPU resetting	OFF : CPU No.1 reset cancel ON : CPU No.1 resetting	• Goes OFF when reset of the CPU No.1 is cancelled.		
SM241	No.2 CPU resetting	OFF : CPU No.2 reset cancel ON : CPU No.2 resetting	• Goes OFF when reset of the CPU No.2 is cancelled.		
SM242	No.3 CPU resetting	OFF : CPU No.3 reset cancel ON : CPU No.3 resetting	• Goes OFF when reset of the CPU No.3 is cancelled.		

Table 1.1 Special relay list (Continued)

No.	Name	Meaning	Details	Set by (When set)	Remark
SM243	No.4 CPU resetting	OFF : CPU No.4 reset cancel ON : CPU No.4 resetting	• Goes OFF when reset of the CPU No.4 is cancelled.	S (Change status)	
SM244	No.1 CPU error	OFF : CPU No.1 normal ON : CPU No.1 during stop error	• Goes OFF when the CPU No.1 is normal. (Including a continuation error) • Comes ON when the CPU No.1 is during stop error. (Note-2)		
SM245	No.2 CPU error	OFF : CPU No.2 normal ON : CPU No.2 during stop error	• Goes OFF when the CPU No.2 is normal. (Including a continuation error) • Comes ON when the CPU No.2 is during stop error. (Note-2)		
SM246	No.3 CPU error	OFF : CPU No.3 normal ON : CPU No.4 during stop error	• Goes OFF when the CPU No.3 is normal. (Including a continuation error) • Comes ON when the CPU No.3 is during stop error. (Note-2)		
SM247	No.4 CPU error	OFF : CPU No.4 normal ON : CPU No.4 during stop error	• Goes OFF when the CPU No.4 is normal. (Including a continuation error) • Comes ON when the CPU No.4 is during stop error. (Note-2)		
SM400	Always ON	ON _____ OFF _____	• Normally is ON.	S (Main processing)	
SM401	Always OFF	ON _____ OFF _____	• Normally is OFF.		
SM500	PCPU READY complete	ON : PCPU READY completion OFF : PCPU READY incomplection	• When the PLC ready flag (M2000) turn OFF to ON, the fixed parameters, servo parameters and limit switch output data, etc., are checked, and if no error is detected, this flag turns ON. • Turn OFF with PLC ready flag (M2000) OFF.	S (Request)	
SM501	Test mode ON	ON : TEST mode ON OFF : Except TEST mode	• Judge whether TEST mode ON or not using MT Developer. • If the TEST mode is not established by TEST mode request using MT Developer, the TEST mode request error flag (SM510) turns ON.		
SM502	External forced stop input	ON : Forced stop OFF OFF : Forced stop ON	• Confirm forced stop ON/OFF.	S (Operation cycle)	
SM503	Digital oscilloscope executing	ON : Digital oscilloscope is stop OFF : Digital oscilloscope is executing	• Confirm the execution of digital oscilloscope using MT Developer.	S (Change status)	
SM510	TEST mode request error	ON : Abnormal OFF : Normal	• Turn ON if the TEST mode is not established by TEST mode request using MT Developer. • When this relay is ON, the error content is stored in the TEST mode request error register (SD510, SD511).	S (Occur an error)	
SM512	Motion CPU WDT error	ON : Abnormal OFF : Normal	• Turn ON when a "watchdog timer error" is detected by the Motion CPU self-diagnosis function. When the Motion CPU detects a WDT error, it executes an immediate stop without deceleration of the operating axes. • The error cause is stored in the "Motion CPU WDT error cause (SD512)".		
SM513	Manual pulse generator axis setting error	ON : At least one D714 to D719 setting is abnormal. OFF : All D714 to D719 settings are normal.	• Judge whether normal/abnormal of the register for manual pulse generator axis setting register (D714 to D719). • When this relay is ON, the error content is stored in the manual pulse generator axis setting error register (SD513 to SD515).		
SM516	Servo program setting error	ON : Abnormal OFF : Normal	• Judge whether normal/abnormal of the positioning data of servo program(K) specified with the Motion SFC program, and if error is detected this flag turns ON. • The content of a servo program setting error is stored at SD516, SD517.		
SM526	Over heat warning latch	OFF : Normal ON : Abnormal	• Turn ON when the temperature of Motion CPU module becomes specified value 85[°C] (185[°F]) or more. Remains ON even if normal status is restored.		
SM527	Over heat warning	OFF : Normal ON : Abnormal	• Turn ON when the temperature of Motion CPU module becomes specified value 85[°C] (185[°F]) or more. Turn OFF when the temperature of Motion CPU module returns to normal.		

APPENDICES

Table 1.1 Special relay list (Continued)

No.	Name	Meaning	Details	Set by (When set)	Remark
SM528	No.1 CPU MULTR complete	OFF to ON : CPU No.1 read completion	• Turn ON when the data read from CPU No.1 is normal by MULTR instruction.	S (Read completion)	
SM529	No.2 CPU MULTR complete	OFF to ON : CPU No.2 read completion	• Turn ON when the data read from CPU No.2 is normal by MULTR instruction.		
SM530	No.3 CPU MULTR complete	OFF to ON : CPU No.3 read completion	• Turn ON when the data read from CPU No.3 is normal by MULTR instruction.		
SM531	No.4 CPU MULTR complete	OFF to ON : CPU No.4 read completion	• Turn ON when the data read from CPU No.4 is normal by MULTR instruction.		
SM801	Clock data read request	OFF : Ignored ON : Read request	• When this relay is ON, clock data is read to SD210 to SD213 as BCD values.	U	

(Note-1) : It is used for interlock condition of Multiple CPU high speed bus dedicated instruction when a synchronous system set in Multiple CPU synchronous startup setting of system setting.

(Note-2) : The CPU No.1 is reset after the factor of the stop error is removed to cancel a stop error → Resetting is cancelled.

APPENDIX 1.2 Special registers

Special registers are internal registers whose applications are fixed in the Motion CPU. For this reason, it is not possible to use these registers in Motion SFC programs in the same way that normal registers are used. However, data can be written as needed in order to control the Motion CPU. Data stored in the special registers are stored as BIN values if no special designation has been made to the contrary.

The headings in the table that follows have the following meanings.

Item	Explanation
Number	• Indicates the No. of the special register.
Name	• Indicates the name of the special register.
Meaning	• Indicates the nature of the special register.
Details	• Indicates detailed information about the nature of the special register.
Set by (When set)	<ul style="list-style-type: none"> • Indicates whether the register is set by the system or user, and, if it is set by system, when setting is performed. <Set by> <li style="padding-left: 20px;">S: Set by system (Motion CPU) <li style="padding-left: 20px;">U: Set by user (Motion SFC program or test operation using MT Developer) <li style="padding-left: 20px;">S/U: Set by both system (Motion CPU) and user <When set> Indicated only if setting is done by system (Motion CPU). <li style="padding-left: 20px;">Main process: Set during each main processing (free time processing of the CPU) <li style="padding-left: 20px;">Initial process: Set only during initial processing (when power supply is turned ON, or when executed the reset) <li style="padding-left: 20px;">Status change : Set only when there is a change in status <li style="padding-left: 20px;">Error : Set when error is occurred. <li style="padding-left: 20px;">Request : Set only when there is a user request (Special relay, etc.) <li style="padding-left: 20px;">Operation cycle : Set during each operation cycle of the Motion CPU.

Table 1.2 Special register list

No.	Name	Meaning	Details	Set by (When set)	Remark								
SD0	Diagnostic errors	Diagnostic error code	<ul style="list-style-type: none"> Error codes for errors found by diagnosis are stored as BIN data. Refer to "APPENDIX 3" for details of the error code. After confirm the error content, except the stop error, it is possible to clear by ON to OFF of the Motion error detection flag (M2039). Clear SD0 to SD26 by ON to OFF of the Motion error detection flag (M2039) for except the stop error after confirming the error content. 										
SD1	Clock time for diagnostic error occurrence	Clock time for diagnostic error occurrence	<ul style="list-style-type: none"> The year (last two digits) and month that SD0 data was updated is stored as BCD 2-digit code. <table border="1"> <tr> <td>B15 to B8</td> <td>B7 to B0</td> <td>Example : January 2006</td> </tr> <tr> <td>Year(0 to 99)</td> <td>Month(1 to 12)</td> <td>H0601</td> </tr> </table>	B15 to B8	B7 to B0	Example : January 2006	Year(0 to 99)	Month(1 to 12)	H0601				
B15 to B8			B7 to B0	Example : January 2006									
Year(0 to 99)			Month(1 to 12)	H0601									
SD2	<ul style="list-style-type: none"> The day and hour that SD0 data was updated is stored as BCD 2-digit code. <table border="1"> <tr> <td>B15 to B8</td> <td>B7 to B0</td> <td>Example : 25st, 10 a.m</td> </tr> <tr> <td>Day(1 to 31)</td> <td>Hour(0 to 23)</td> <td>H2510</td> </tr> </table>	B15 to B8	B7 to B0	Example : 25st, 10 a.m	Day(1 to 31)	Hour(0 to 23)	H2510						
B15 to B8	B7 to B0	Example : 25st, 10 a.m											
Day(1 to 31)	Hour(0 to 23)	H2510											
SD3	<ul style="list-style-type: none"> The minute and second that SD0 data was updated is stored as BCD 2-digit code. <table border="1"> <tr> <td>B15 to B8</td> <td>B7 to B0</td> <td>Example : 35min., 48 sec.</td> </tr> <tr> <td>Minute(0 to 59)</td> <td>Second(0 to 59)</td> <td>H3548</td> </tr> </table>	B15 to B8	B7 to B0	Example : 35min., 48 sec.	Minute(0 to 59)	Second(0 to 59)	H3548						
B15 to B8	B7 to B0	Example : 35min., 48 sec.											
Minute(0 to 59)	Second(0 to 59)	H3548											
SD4	Error information categories	Error information category code	<ul style="list-style-type: none"> Category codes which help indicate what type of information is being stored in the error common information areas (SD5 to SD15) and error individual information areas (SD16 to SD26) are stored. The category code for judging the error information type is stored. <table border="1"> <tr> <td>B15 to B8</td> <td>B7 to B0</td> </tr> <tr> <td>Individual information category codes</td> <td>Common information category codes</td> </tr> </table> <ul style="list-style-type: none"> The common information category codes store the following codes. 0: No error 1: Module No./CPU No./Base No. The individual information category codes store the following codes. 0: No error 5: Parameter No. 13:Parameter No./CPU No. 	B15 to B8	B7 to B0	Individual information category codes	Common information category codes	S (Occur an error)					
B15 to B8	B7 to B0												
Individual information category codes	Common information category codes												
SD5	Error common information	Error common information	<ul style="list-style-type: none"> Common information corresponding to the diagnostic error (SD0) is stored. The error common information type can be judged by SD4 (common information category code). 1: Module No./CPU No./Base No. For the Multiple CPU system, Module No. or CPU No. is stored depending on the error that occurred. (Refer to corresponding error code for which No. has been stored.) CPU No.1: 1, CPU No.2: 2, CPU No.3: 3, CPU No.4: 4 <table border="1"> <thead> <tr> <th>No.</th> <th>Meaning</th> </tr> </thead> <tbody> <tr> <td>SD5</td> <td>Module No./CPU No./Base No.</td> </tr> <tr> <td>SD6</td> <td>I/O No.</td> </tr> <tr> <td>SD7 to SD15</td> <td>Empty</td> </tr> </tbody> </table>	No.	Meaning	SD5	Module No./CPU No./Base No.	SD6	I/O No.	SD7 to SD15	Empty		
No.				Meaning									
SD5				Module No./CPU No./Base No.									
SD6				I/O No.									
SD7 to SD15				Empty									
SD6													
SD7													
SD8													
SD9													
SD10													
SD11													
SD12													
SD13													
SD14													
SD15													

Table 1.2 Special register list (Continued)

No.	Name	Meaning	Details	Set by (When set)	Remark								
SD16 SD17 SD18 SD19 SD20 SD21 SD22 SD23 SD24 SD25	Error individual information	Error individual information	<ul style="list-style-type: none"> Individual information corresponding to the diagnostic error (SD0) is stored. The error individual information type can be judged by SD4 (individual information category code). 5: Parameter No. <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>No.</th> <th>Meaning</th> </tr> </thead> <tbody> <tr> <td>SD16</td> <td>Parameter No.</td> </tr> <tr> <td>SD17 to SD26</td> <td>Empty</td> </tr> </tbody> </table> 0401H :Base setting 0406H :Motion slot setting 0E00H :Multiple CPU setting (Number of Multiple CPU's) 0E01H :Multiple CPU setting (Operation mode/Multiple CPU synchronous startup) E008H :Multiple CPU high speed transmission area setting (CPU specific send range setting/ (System area)) E009H/E00AH :Multiple CPU high speed transmission area setting (Automatic refresh setting) E00BH :Synchronous setting	No.	Meaning	SD16	Parameter No.	SD17 to SD26	Empty	S (Occur an error)			
No.			Meaning										
SD16			Parameter No.										
SD17 to SD26			Empty										
SD26			13: Parameter No./CPU No. <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>No.</th> <th>Meaning</th> </tr> </thead> <tbody> <tr> <td>SD16</td> <td>Parameter No.</td> </tr> <tr> <td>SD17</td> <td>CPU No.(1 to 4)</td> </tr> <tr> <td>SD18 to SD26</td> <td>Empty</td> </tr> </tbody> </table>	No.	Meaning	SD16	Parameter No.	SD17	CPU No.(1 to 4)			SD18 to SD26	Empty
No.			Meaning										
SD16			Parameter No.										
SD17			CPU No.(1 to 4)										
SD18 to SD26			Empty										
SD53			AC/DC DOWN counter No.	Number of times for AC/DC DOWN	<ul style="list-style-type: none"> Every time the input voltage fails to or below 85[%] (AC power)/65[%] (DC power) the rating during calculation of the Motion CPU module, the value is incremented by 1 and stored in BIN code. 								
SD60	Fuse blown No.	Module No. with blown fuse	<ul style="list-style-type: none"> The lowest station I/O No. of the module with the blown fuse is stored. 										
SD200	Status of switch	Status of CPU switch	<ul style="list-style-type: none"> The CPU switch status is stored in the following format. <div style="text-align: center;"> </div> <table border="1" style="margin-left: 20px;"> <tr> <td>1) CPU switch status</td> <td>0: RUN 1: STOP</td> </tr> <tr> <td>2) Memory card switch</td> <td>Always OFF</td> </tr> </table>	1) CPU switch status	0: RUN 1: STOP	2) Memory card switch	Always OFF	S (Main processing)					
1) CPU switch status	0: RUN 1: STOP												
2) Memory card switch	Always OFF												
SD203	Operating status of CPU	Operating status of CPU	<ul style="list-style-type: none"> The CPU operating status is stored as indicated in the following figure. <div style="text-align: center;"> </div> <table border="1" style="margin-left: 20px;"> <tr> <td>1) Operating status of CPU</td> <td>0: RUN 2: STOP</td> </tr> <tr> <td>2) STOP cause</td> <td>0: RUN/STOP switch 4: Error</td> </tr> </table> <p>(Note) Priority is earliest first</p>	1) Operating status of CPU	0: RUN 2: STOP	2) STOP cause	0: RUN/STOP switch 4: Error						
1) Operating status of CPU	0: RUN 2: STOP												
2) STOP cause	0: RUN/STOP switch 4: Error												

Table 1.2 Special register list (Continued)

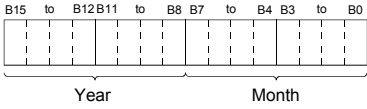
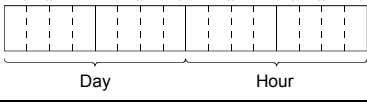
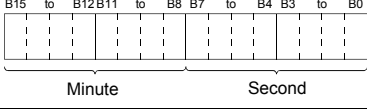
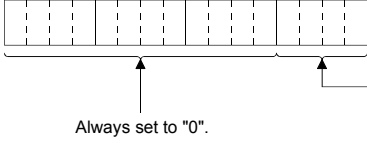
No.	Name	Meaning	Details	Set by (When set)	Remark													
SD210	Clock data	Clock data (Year, Month)	<ul style="list-style-type: none"> The year (last two digits) and month are stored as BCD code. 	S/U (Request)														
SD211		Clock data (Day, Hour)	<ul style="list-style-type: none"> The day and hour are stored as BCD code. 															
SD212		Clock data (Minute, Second)	<ul style="list-style-type: none"> The minutes and seconds are stored as BCD code. 															
SD213		Clock data (Day of week)	<ul style="list-style-type: none"> The day of week is stored as BCD code.  <table border="1" data-bbox="932 965 1051 1149"> <thead> <tr> <th colspan="2">Day of week</th> </tr> </thead> <tbody> <tr><td>0</td><td>Sunday</td></tr> <tr><td>1</td><td>Monday</td></tr> <tr><td>2</td><td>Tuesday</td></tr> <tr><td>3</td><td>Wednesday</td></tr> <tr><td>4</td><td>Thursday</td></tr> <tr><td>5</td><td>Friday</td></tr> <tr><td>6</td><td>Saturday</td></tr> </tbody> </table>			Day of week		0	Sunday	1	Monday	2	Tuesday	3	Wednesday	4	Thursday	5
Day of week																		
0	Sunday																	
1	Monday																	
2	Tuesday																	
3	Wednesday																	
4	Thursday																	
5	Friday																	
6	Saturday																	
SD290	Device assignment	Number of points assigned for X	• Stores the number of points currently set for X devices.	S (Initial processing)														
SD291		Number of points assigned for Y	• Stores the number of points currently set for Y devices.															
SD292		Number of points assigned for M	• Stores the number of points currently set for M devices.															
SD293		Number of points assigned for L	• Stores the number of points currently set for L devices.															
SD294		Number of points assigned for B	• Stores the number of points currently set for B devices.															
SD295		Number of points assigned for F	• Stores the number of points currently set for F devices.															
SD296		Number of points assigned for SB	• Stores the number of points currently set for SB devices.															
SD297		Number of points assigned for V	• Stores the number of points currently set for V devices.															
SD298		Number of points assigned for S	• Stores the number of points currently set for S devices.															
SD299		Number of points assigned for T	• Stores the number of points currently set for T devices.															
SD300		Number of points assigned for ST	• Stores the number of points currently set for ST devices.															
SD301		Number of points assigned for C	• Stores the number of points currently set for C devices.															
SD302		Number of points assigned for D	• Stores the number of points currently set for D devices.															
SD303		Number of points assigned for W	• Stores the number of points currently set for W devices.															
SD304	Number of points assigned for SW	• Stores the number of points currently set for SW devices.																

Table 1.2 Special register list (Continued)

No.	Name	Meaning	Details	Set by (When set)	Remark
SD395	Multiple CPU No.	Multiple CPU No.	• CPU No. of the self CPU is stored.	S (Initial processing)	
SD500 SD501	Real mode axis information register	Real mode axis information register	• The information (Real mode axis: 0/Except real mode axis: 1) used as a real mode axis at the time of switching from real mode to virtual mode is stored. SD500 : b0 to b15 (Axis 1 to 16) SD501 : b0 to b15 (Axis 17 to 32) • The real mode axis information does not change at the time of switching from virtual mode to real mode	S (At virtual mode transition)	
SD502 SD503	Servo amplifier loading information	Servo amplifier loading information	• The loading status (loading: 1/non-loading: 0) of the servo amplifier checked in initial process, and stored as the bit data. SD502 : b0 to b15 (Axis 1 to 16) SD503 : b0 to b15 (Axis 17 to 32) • The axis which turned from non-loading to loading status after power-on is handled as loaded. (However, the axis which turned from loading to non-loading status remains as loaded.)	S (Initial processing)	
SD504 SD505 SD506	Real mode/virtual mode switching error information	Real mode /virtual mode switching error code	• When a mode switching error occurs in real-to-virtual or virtual-to-real mode switching, or a mode continuation error occurs in the virtual mode, its error information is stored.	S (Occur an error)	
SD508	Connect/ Disconnect (Status)	Connect/ disconnect of SSCNET	• This signal is used to temporarily suspend SSCNET communication while servo amplifiers and/or SSCNET III cables after Axis 1 are exchanged with the power supply ON in a Multiple CPU system. SD508 stores the command status for "accept waiting" or "execute waiting" during this process. 0 : Connect/disconnect command accept waiting -1 : Connect/disconnect execute waiting -2 Connect/disconnect executing	S (Main processing)	
SD510 SD511	Test mode request error	It is operating in requirement error occurrence of the test mode, axis information	• Each axis is stopping: 0/Operating: 1, information is stored as a bit data. SD510 : b0 to b15 (Axis 1 to Axis 16) SD511 : b0 to b15 (Axis 17 to Axis 32)		
SD512	Motion CPU WDT error cause	Error meaning of WDT error occurs	• The following error codes are stored in SD512. 1: S/W fault 1 2: Operation cycle over 3: Q bus WDT error 4: WDT error 201 to 215: Q bus H/W fault 250 to 253: Servo amplifier interface H/W fault 300: S/W fault 3 301: 15 CPSTART instructions of 8 or more points were started simultaneously. 303: S/W fault 4		
SD513 SD514 SD515	Manual pulse generator axis setting error	Manual pulse generator axis setting error information	• Contents of the manual pulse generator axis setting error is stored when the manual pulse generator axis setting error flag (SM513) turn on. (Normal: 0/Setting error: 1) SD513 : The manual pulse generator axis setting error is stored in b0 to b2 (P1 to P3). The smoothing magnification setting is stored in b3 to b5 (P1 to P3). SD514 : One pulse input magnification setting error is stored in b0 to b15 (axis 1 to axis 16). SD515 : One pulse input magnification setting error is stored in b0 to b15 (axis 17 to axis 32).	S (Occur an error)	
SD516	Error program No.	Error program No. of servo program	• When the servo program setting error flag (SM516) turns on, the erroneous servo program No. will be stored.		
SD517	Error item information	Error code of servo program	• When the servo program setting error flag (SM516) turns on, the error code corresponding to the erroneous setting item will be stored.		
SD520	Scan time	Scan time (1ms units)	• Main cycle is stored in the unit 1ms. Setting range (0 to 65535[ms])	S (Main processing)	
SD521	Maximum scan time	Maximum scan time (1ms units)	• The maximum value of the main cycle is stored in the unit 1ms. Setting range (0 to 65535[ms])		

APPENDICES

Table 1.2 Special register list (Continued)

No.	Name	Meaning	Details	Set by (When set)	Remark		
SD522	Motion operation cycle	Motion operation cycle	• The time required for motion operation cycle is stored in the [μ s] unit.	S (Operation cycle)			
SD523	Operation cycle of the Motion CPU setting	Operation cycle of the Motion CPU setting	• The setting operation cycle is stored in the [μ s] unit.	S (Initial processing)			
SD803	Connect/ Disconnect (Command)	Connect/ disconnect of SSCNET	<p>• This signal is used to temporarily suspend SSCNET communication while servo amplifiers and/or SSCNET III cables after Axis 1 are exchanged with the power supply ON in a Multiple CPU system. SD803 is required for connect/disconnect during this process.</p> <table border="1"> <tr> <td>1 to 32 : Disconnect command</td> </tr> <tr> <td>-10 : Connect command</td> </tr> <tr> <td>-2 : Connect/disconnect execute command</td> </tr> </table>	1 to 32 : Disconnect command		-10 : Connect command	-2 : Connect/disconnect execute command
1 to 32 : Disconnect command							
-10 : Connect command							
-2 : Connect/disconnect execute command							

APPENDIX 1.3 Replacement of special relays/special registers

When a project for Q173HCPU(-T)/Q172HCPU(-T)/Q173CPUN(-T)/Q172CPUN(-T)/Q173CPU/Q172CPU is converted into a project for Q173DCPU/Q172DCPU using the "Project management - File diversion" in MT Developer, special relays (M9000 to M9255) and special registers (D9000 to D9255) are automatically converted into new special relays (SM2000 to SM2255) and special registers (SD2000 to SD2255) respectively.

However, in order to maintain the same functionality the user must manually convert them to the special relays and special registers shown in Table 1.3 and Table 1.4 below for Q173DCPU/Q172DCPU.

Table 1.3 Replacement of special relays

Device No.			Name	Remark
Special relays for Q173HCPU(-T)/Q172HCPU(-T)/Q173CPUN(-T)/Q172CPUN(-T)/Q173CPU/Q172CPU	Automatically converted to special relays	Special relays for Q173DCPU/Q172DCPU		
M9000	SM2000	SM60	Fuse blown detection	
M9005	SM2005	SM53	AC/DC DOWN detection	
M9006	SM2006	SM52	Battery low	
M9007	SM2007	SM51	Battery low latch	
M9008	SM2008	SM1	Self-diagnostic error	
M9010	SM2010	SM0	Diagnostic error	
M9025	—	—	Clock data set request	
M9026	SM2026	SM211	Clock data error	
M9028	SM2028	SM801	Clock data read request	
M9036	SM2036	SM400	Always ON	
M9037	SM2037	SM401	Always OFF	
M9060	SM2060	—	Diagnostic error reset	Use M2039 for error reset operation.
M9073	SM2073	SM512	Motion CPU WDT error	
M9074	SM2074	SM500	PCPU READY complete	
M9075	SM2075	SM501	Test mode ON	
M9076	SM2076	SM502	External forced stop input	
M9077	SM2077	SM513	Manual pulse generator axis setting error	
M9078	SM2078	SM510	TEST mode request error	
M9079	SM2079	SM516	Servo program setting error	
M9216	SM2216	SM528	No.1 CPU MULTR complete	
M9217	SM2217	SM529	No.2 CPU MULTR complete	
M9218	SM2218	SM530	No.3 CPU MULTR complete	
M9219	SM2219	SM531	No.4 CPU MULTR complete	
M9240	SM2240	SM240	No.1 CPU resetting	
M9241	SM2241	SM241	No.2 CPU resetting	
M9242	SM2242	SM242	No.3 CPU resetting	
M9243	SM2243	SM243	No.4 CPU resetting	
M9244	SM2244	SM244	No.1 CPU error	
M9245	SM2245	SM245	No.2 CPU error	
M9246	SM2246	SM246	No.3 CPU error	
M9247	SM2247	SM247	No.4 CPU error	

Table 1.4 Replacement of special registers

Device No.			Name	Remark
Special relays for Q173HCPU(-T)/Q172HCPU(-T)/Q173CPUN(-T)/Q172CPUN(-T)/Q173CPU/Q172CPU	Automatically converted to special relays	Special relays for Q173DCPU/Q172DCPU		
D9000	SD2000	SD60	Fuse blown No.	
D9005	SD2005	SD53	AC/DC DOWN counter No.	
D9008	SD2008	SD0	Diagnostic errors	
D9010	SD2010	SD1	Clock time for diagnostic error occurrence (Year, month)	
D9011	SD2011	SD2	Clock time for diagnostic error occurrence (Day, hour)	
D9012	SD2012	SD3	Clock time for diagnostic error occurrence (Minute, second)	
D9013	SD2013	SD4	Error information categories	
D9014	SD2014	SD5	Error common information	
D9015	SD2015	SD203	Operating status of CPU	
D9017	SD2017	SD520	Scan time	
D9019	SD2019	SD521	Maximum scan time	
D9025	SD2025	SD210	Clock data (Year, month)	
D9026	SD2026	SD211	Clock data (Day, hour)	
D9027	SD2027	SD212	Clock data (Minute, second)	
D9028	SD2028	SD213	Clock data (Day of week)	
D9060	SD2060	—	Diagnostic error reset error No.	Use M2039 for error reset operation.
D9061	SD2061	SD395	Multiple CPU No.	
D9112	SD2112	SD508	Connect/Disconnect (Status)	
D9182	SD2182	SD510	Test mode request error	
D9183	SD2183	SD511		
D9184	SD2184	SD512	Motion CPU WDT error cause	
D9185	SD2185	SD513	Manual pulse generator axis setting error	
D9186	SD2186	SD514		
D9187	SD2187	SD515		
D9188	SD2188	SD522	Motion operation cycle	
D9189	SD2189	SD516	Error program No.	
D9190	SD2190	SD517	Error item information	
D9191	SD2191	SD502	Servo amplifier loading information	
D9192	SD2192	SD503		
D9193	SD2193	SD504	Real mode/virtual mode switching error information	
D9194	SD2194	SD505		
D9195	SD2195	SD506		
D9196	SD2196	—	PC link communication error codes	Q173DCPU/Q172DCPU does not support PC link communication.
D9197	SD2197	SD523	Operation cycle of the Motion CPU setting	
D9200	SD2200	SD200	State of switch	
D9201	SD2201	—	State of LED	Use 7-segment LED in Q173DCPU/Q172DCPU.

APPENDIX 2 System Setting Errors

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

Table 2.1 System Setting Errors

Error name	7-segment LED (Note-1)	Error code (Note-2)	Error cause	Check timing	Operation at error occurrence
LAY ERROR (SL * *)	"AL" flashes 3- times ↓ "L01" display	10014 (Note-3)	• The slot set in system settings is vacant or a different module is installed.	Power supply ON/ Reset	Cannot be started. (Motion CPU system setting error)
AXIS No. MULTIDEF			• The axis No. setting overlaps in the system settings. • The axis No. (function select switch) setting of servo amplifier overlaps in the same SSCNETIII system.		
AMP No. SETTING			• Not a single axis is set in system settings.		
SYS.SET DATA ERR			• System setting data is not written. • System setting data is written without relative check. Or it is written at the state of error occurrence.		
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"> • Execute the ROM writing again. • Check the adjustment for the version of Motion CPU, MT Developer and operating system software. 		
ROM ERROR4 (* *)			• Data of ROM is abnormal. <ul style="list-style-type: none"> • Execute the ROM writing again. • Check the adjustment for the version of Motion CPU, MT Developer and operating system software. 		
CAN'T USE SL (* *)			• The motion modules that cannot be used are installed. <ul style="list-style-type: none"> • Use the Motion modules (Q172DLX, Q173DPX, Q172DEX). 		
UNIT SET ERR (* *)	• The system setting data that set the motion modules that cannot be used are written. <ul style="list-style-type: none"> • Use the MT Developer of version corresponding to the Motion modules (Q172DLX, Q173DPX, Q172DEX). 				

(Note-1) : "" AL" flashes 3-times → "L01" display"" (Repetition) Error code is not displayed.

(Note-2) : Error code stored in self-diagnostic error (SD0)

(Note-3) : When the error code 10014 occurs, the system setting error flag (M2041) turns ON and the error name is displayed on the error list monitor of MT Developer.

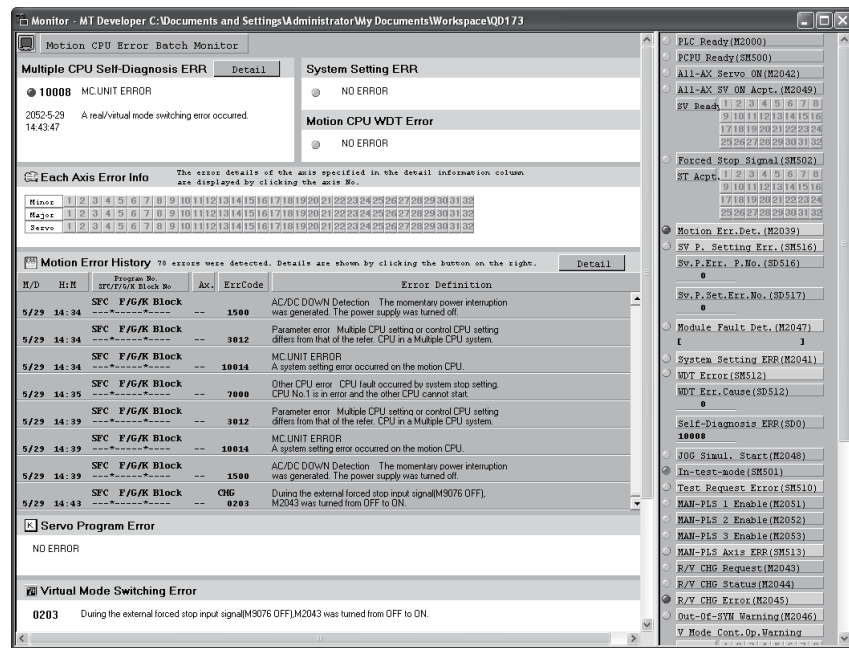
APPENDIX 3 Self-diagnosis error code

Multiple CPU related errors are stored in the CPU shared memory "self CPU operation information area (1H to 1CH)" of each module and self diagnostic error information (SD0 to SD26) of the special register (SD) as the self diagnostic errors.

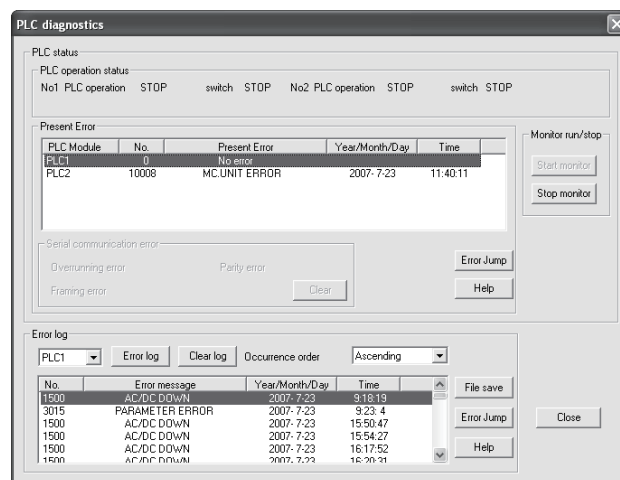
Error codes (1000 to 9999) of Multiple CPU related errors are common to each CPU module.

The error code (10000 to 10999) is stored as required at Motion CPU-specific error occurrence.

Confirm the error codes and contents by "Motion error history" on Motion CPU error batch monitor of MT Developer and remove the error cause if an error occurs.



Confirm operation status and error occurrence of each CPU used in the Multiple CPU system by PLC diagnosis of GX Developer.



(1) Multiple CPU related errors which occurs in Motion CPU

Each digit of error code has been described as follows.

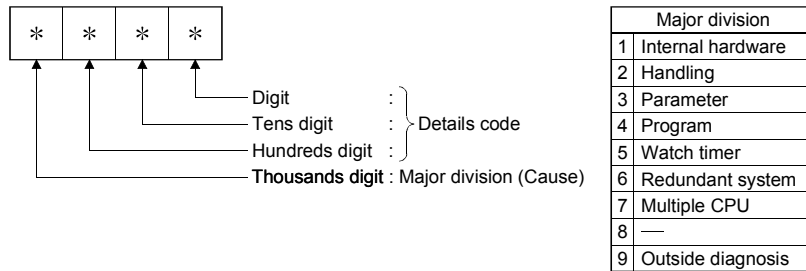


Table 3.1 Multiple CPU related errors which occurs in Motion CPU (1000 to 9999)

Item	Error code (SD0)	Error message	Common information (SD5 to SD15)	Individual Information (SD16 to SD26)	7-segment LED display	CPU operation status	Diagnostic timing
CPU hard error	1000	MAIN CPU DOWN	—	—	"AL" flashes 3 times ↓ Steady "A1" display ↓ 4 digits error code is displayed in two flashes of 2 digits each.	Stop	Always
	1001						
	1002						
	1003						
	1004						
	1005						
	1006						
	1007						
	1008						
	1009						
	1105						
	1150	RAM ERROR	—	—		Stop	At power ON/ At reset
	1300	FUSE BREAK OFF	Module No.	—		Stop (Note-3)	Always
Module hard error	1401	SP. UNIT DOWN	Module No.	—		Stop	At power ON/ At reset
	1403						Always
Base	1413	CONTROL-BUS. ERR.	—	—		Stop	Always
	1414						
	1415		Module No. Base No. (Note-2)				
	1416		CPU No. (Note-1)				
							At power ON/ At reset

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

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

(Note-3) : CPU operation status at error occurrence can be set in the parameters. (LED display varies in conjunction with operation.)

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Error code (SD0)	Error contents and cause	Corrective action	
1000	Runaway or failure of CPU module. (1) Malfunctioning due to noise or other reason (2) Hardware fault	(1) Take noise reduction measures. (2) Reset the CPU module and RUN it again. If the same error is displayed again, this suggests a CPU module hardware fault. Explain the error symptom and get advice from our sales representative.	
1001			
1002			
1003			
1004			
1005			
1006			
1007			
1008			
1009			
1105	The CPU shared memory in the CPU module is faulty.	Check FUSE. LED of the output modules and replace the module whose LED is lit.	
1150	The memory of the CPU module in the Multiple CPU high speed transmission area is faulty.		
1300	There is an output module with a blown fuse.	Set the Motion module/intelligent function module used in the Motion CPU in the system setting. This suggests a Motion module, intelligent function module, CPU module and/or base unit is expecting a hardware fault. Explain the error symptom and get advice from our sales representative.	
1401	There was no response from the Motion module/intelligent function module in the initial processing.	The CPU module, base unit and/or the intelligent function module that was accessed is experiencing a hardware fault. Explain the error symptom and get advice from our sales representative.	
1403	(1) An error is detected at the intelligent function module. (2) The I/O module (including intelligent function module) is nearly removed or completely removed/mounted during running.	Explain the error symptom and get advice from our sales representative.	
1413	An error is detected on the system bus.	Reset the CPU module and RUN it again. If the same error is displayed again, the intelligent function module, CPU module or base unit is faulty. Explain the error symptom and get advice from our sales representative.	
1414			
1415			Fault of the main or extension base unit was detected.
1416			System bus fault was detected at power-on or reset.

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Table 3.1 Multiple CPU related errors which occurs in Motion CPU (1000 to 9999)
(Continued)

Item	Error code (SD0)	Error message	Common information (SD5 to SD15)	Individual Information (SD16 to SD26)	7-segment LED display	CPU operation status	Diagnostic timing		
Multiple CPU high speed bus	1430	MULTI-C.BUS ERR.	—	—	"AL" flashes 3 times ↓ Steady "A1" display ↓ 4 digits error code is displayed in two flashes of 2 digits each.	Stop	At power ON/ At reset		
	1431								
	1432								
	1433		CPU No.						Always
	1434								
	1435								
Power supply	1500	AC/DC DOWN	—	—	None	Continue	Always		
Battery	1600	BATTERY ERROR	Drive name	—	Steady "BT1"	Continue	Always		
					Steady "BT2"				
Handling the intelligent function module/ Multiple CPU module	2100	SP. UNIT LAY ERR.	Module No.	—	"AL" flashes 3 times ↓ Steady "A1" display ↓ 4 digits error code is displayed in two flashes of 2 digits each.	Stop	At power ON/ At reset		
	2107								
	2124		—						
	2125	Module No.							
	2140								
	2150								SP. UNIT VER. ERR.

APPENDICES

Error code (SD0)	Error contents and cause	Corrective action
1430	The error of self CPU is detected in the Multiple CPU high speed bus.	Reset the CPU module and RUN it again. If the same error is displayed again, this suggests a CPU module hardware fault. Explain the error symptom and get advice from our sales representative.
1431	The communication error with other CPU is detected in the Multiple CPU high speed bus.	(1) Take noise reduction measures. (2) Check the main base unit mounting status of the CPU module. (3) Reset the CPU module and RUN it again. If the same error is displayed again, this suggests a CPU module or base unit hardware fault. Explain the error symptom and get advice from our sales representative.
1432	The communication time out with other CPU is detected in the Multiple CPU high speed bus.	Reset the CPU module and RUN it again. If the same error is displayed again, this suggests a CPU module hardware fault. Explain the error symptom and get advice from our sales representative.
1433	The communication error with other CPU is detected in the Multiple CPU high speed bus.	(1) Take noise reduction measures.
1434		(2) Check the main base unit mounting status of the CPU module.
1435		(3) Reset the CPU module and RUN it again. If the same error is displayed again, this suggests a CPU module or base unit hardware fault. Explain the error symptom and get advice from our sales representative.
1500	A momentary power supply interruption has occurred. The power supply went off.	Check the power supply.
1600	(1) The battery voltage in the CPU module has dropped below stipulated level. (2) The battery holder unit that install the battery is not mounted to the CPU module.	(1) Change the battery. (2) Mount the battery holder unit that installs the battery.
2100	In the I/O assignment setting of PLC CPU, the intelligent function module was allocated to an I/O module or vice versa.	Make the PLC parameter's I/O assignment setting again so it is consistent with the actual status of the intelligent function module and the CPU module.
2107	The first I/O No. set in the system settings is overlapped with the one for another module.	Make the I/O No. setting again so it is consistent with the actual status of the modules.
2124	(1) A module is mounted on the 65th or higher slot. (2) The extension base unit set to "None" is mounted.	(1) Remove the module mounted on the 65th or later slot. (2) Remove the extension base unit set to "None".
2125	(1) A module which the CPU cannot recognise has been mounted. (2) There was no response form the intelligent function module.	(1) Install an usable module. (2) The intelligent function module is experiencing a hardware fault. Explain the error symptom and get advice from our sales representative.
2140	The motion modules (Q172DLX, Q172DEX, Q173DPX, Q172LX, Q172EX (-S1/-S2/-S3), Q173PX (-S1)) are installed in CPU slot or I/O 0 to 2 slot.	Remove the Motion modules installed CPU slot or I/O 0 to 2 slot.
2150	In a Multiple CPU system, the control CPU of intelligent function module incompatible with the Multiple CPU system is set to other than CPU No.1.	(1) Change to the intelligent function module (function version B or later) compatible with the Multiple CPU system. (2) Change the control CPU of intelligent function module incompatible with the Multiple CPU system to CPU No.1.

APPENDICES

Table 3.1 Multiple CPU related errors which occurs in Motion CPU (1000 to 9999)
(Continued)

Item	Error code (SD0)	Error message	Common information (SD5 to SD15)	Individual Information (SD16 to SD26)	7-segment LED display	CPU operation status	Diagnostic timing
Parameter	3001	PARAMETER ERROR	—	Parameter No.		Stop	At power ON/ At reset/ STOP → RUN
	3012						At power ON/ At reset
	3013						
	3015			Parameter No./ CPU No.			
Multiple CPU	7000	MULTI CPU DOWN	CPU No. (Note-1) (Note-4)	—	"AL" flashes 3 times ↓ Steady "A1" display ↓ 4 digits error code is displayed in two flashes of 2 digits each.	Stop	Always
	7002		CPU No. (Note-1)				At power supply ON/ at reset
	7010	MULTI EXE. ERROR	CPU No. (Note-1)	—		Stop	At power supply ON/ at reset
	7011		—				
	7013						
	7020	MULTI CPU ERROR	CPU No. (Note-1)	—		Continue	Always
	7030	CPU LAY. ERROR	CPU No.	—		Stop	At power supply ON/ at reset
	7031						
7035	Module No.						

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

(Note-4) : 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 common error information depending on timing.

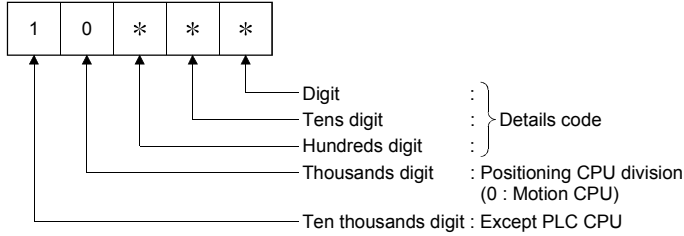
APPENDICES

Error code (SD0)	Error contents and cause	Corrective action
3001	The parameter settings are corrupted.	(1) Check the parameter item corresponding the numerical value (parameter No.), and correct it. (2) Rewrite corrected parameters to the CPU module, reload or reset the Multiple CPU system power supply. (3) If the same error occurs, it is thought to be a hardware error. Explain the error symptom and get advice from our sales representative.
3012	Multiple CPU setting of Multiple CPU setting parameter or control CPU setting of system setting differs from that of the reference CPU settings.	Match the Multiple CPU setting of Multiple CPU setting parameter or control CPU setting of system setting with that of the reference CPU (CPU No.1) settings.
3013	Multiple CPU automatic refresh setting is any of the following. (1) When a bit device is specified as a refresh device, a number other than a multiple of 16 is specified for the refresh start device. (2) The device specified is other than the one that may be specified. (3) The number of send points is an odd number. (4) The total number of send points is greater than the maximum number of refresh points.	Check the following in the Multiple CPU automatic refresh setting and make correction. (1) When specifying the bit device, specify a multiple of 16 for the refresh start device. (2) Specify the device that may be specified for the refresh device. (3) Set the number of send points to an even number. (4) Set the total number of send points is within the range of the maximum number of refresh points.
3015	(1) "Use multiple CPU high speed transmission " is not set in the Multiple CPU setting of Universal module QCPU. (2) In a Multiple CPU system, the CPU verified is different from the one set in the parameter setting.	(1) Set "Use multiple CPU high speed transmission " in the Universal module QCPU. (2) Check the parameter item corresponding to the numerical value (parameter No./CPU No.) and parameter of target CPU, and correct them.
7000	In the operating mode of a Multiple CPU system, a CPU error occurred at the CPU where "All station stop by stop error of CPU" was selected. 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)	Check the error of the CPU resulting in CPU module fault, and remove the errors.
7002	There is no response from the target CPU module in a Multiple CPU system during initial communication.	Reset the CPU module and RUN it again. If the same error is displayed again, this suggests the hardware fault of any of the CPU modules. Explain the error symptom and get advice from our sales representative.
7010	In a Multiple CPU system, a faulty CPU module was mounted.	Replace the faulty CPU module.
7011	Either of the following settings was made in a Multiple CPU system. (1) Multiple CPU automatic refresh setting was made for the inapplicable CPU module. (2) "I/O sharing when using multiple CPUs" setting was made for the inapplicable CPU module.	(1) Correct the Multiple CPU automatic refresh setting. (2) Correct the "I/O sharing when using multiple CPUs" setting.
7013	The system configuration for using the Multiple CPU high speed transmission function is not met. (1) The QnUD(H)CPU is not used for the CPU No.1. (2) The Multiple CPU high speed main base unit (Q3□DB) is not used.	Change to the system configuration to meet the conditions for using the Multiple CPU high speed transmission function.
7013	(1) CPU module which cannot be mounted in OnCPU(H)CPU is mounted. (The module may break down.) (2) Q173HCPU,Q172HCPU,Q173CPUN,Q172CPUN is mounted.	Remove Q173HCPU,Q172HCPU,Q173CPUN,Q172CPUN.
7020	In the operating mode of a Multiple CPU system, an error occurred in the CPU where "system stop" was not selected. (The CPU module where no error occurred was used to detect an error.)	Check the error of the CPU resulting in CPU module fault, and remove the error.
7030	An assignment error occurred in the CPU-mountable slot (CPU slot, I/O slot 0 to 2) in excess of the number of CPU slot (with in the range of CPU number setting parameter).	(1) Set the same value to the number of CPU modules specified in the Multiple CPU setting of the PLC parameter and the number of mounted CPU modules (including CPU (empty)).
7031	An assignment error occurred in the CPU slot (within the range of the CPU number setting parameter).	(2) Make the same as the state of the installation of CPU module set in the system setting.
7035	The CPU module has been mounted on the inapplicable slot.	Mount the CPU module on the applicable slot.

(2) Motion CPU-specific errors

Each digit of error code has been described as follows.

Refer to programming manuals for error details.



Details code	
003	Minor/major error
004	Minor/major error (Virtual servomotor axis)(SV22)
005	Minor/major error (Synchronous encoder axis)(SV22)
006	Servo error
007	Servo program setting error (SV13/SV22)
008	Mode switching error (SV22)
009	Manual pulse generator axis setting error
010	TEST mode request error
011	WDT error
014	System setting error
016	Motion slot fault
020	Motion SFC control error (F/FS)
021	Motion SFC control error (G)
022	Motion SFC control error (K or others (Not F/FS, G))
023	Motion SFC control error (Motion SFC chart)
030	Motion CPU internal bus error

Table 3.2 Motion CPU-specific errors (10000 to 10999)

Error code (SD0)	Error messages	Common information (SD5 to SD15)	Individual information (SD16 to SD26)	7-segment LED display	CPU status operation	
10003	MC.UNIT ERROR	—	—	None	Continue	
10004						
10005						
10006				"AL" flashes 3 times ↓ Steady "S01" display		
10007				None		
10008						
10009						
10010				Steady ". . ." display		
10011						
10014						"AL" flashes 3 times ↓ Steady "L01" display
10016				None		Stop
10020						
10021						
10022						
10023						
10030	Continue					
	Stop					

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Error code (SD0)	Error contents and cause	Corrective action
10003	Minor/major errors had occurred.	Check the Motion error history of MT Developer and the minor/major error codes of minor/major error code of minor/major error code storage device, and remove the error cause. Refer to the error codes for error details of minor/major errors.
10004	Minor/major errors had occurred in virtual servomotor axis. (SV22)	
10005	Minor/major errors had occurred in synchronous encoder axis. (SV22)	
10006	The servo errors had occurred in the servo amplifier connected to the Motion CPU.	Check the Motion error history of MT Developer and the servo error codes of servo error code storage device, and remove the error cause of servo amplifier. Refer to the servo error code for details of servo errors.
10007	Servo program setting error occurred.	Check the Motion error history of MT Developer and the servo program setting error storage device (error program No., error item information), and remove the error cause. Refer to the servo program setting error codes for details of servo program setting errors.
10008	Real mode/virtual mode switching error occurred. (SV22)	Check the Motion error history of MT Developer and the real mode/virtual mode switching error storage device, and remove the error cause. Refer to the real mode/virtual mode switching error codes for details of real mode/virtual mode switching errors.
10009	Manual pulse generator axis setting error occurred.	Check the Motion error history of MT Developer and the manual pulse generator axis setting error storage device, and remove the error cause. Refer to the manual pulse generator axis setting error codes for details of manual pulse generator axis setting errors.
10010	Test mode request error occurred.	Check the Motion error history of MT Developer and the test mode request error storage device, and remove the error cause.
10011	WDT error occurred at Motion CPU.	Check the Motion error history of MT Developer and the Motion CPU WDT error factors, and remove the error cause.
10014	System setting error occurred at Motion CPU.	Check the error message on error monitor screen of MT Developer, and remove the error cause. And then, turn on the power supply again or reset the Multiple CPU system.
10016	Motion slot fault occurred at Motion CPU.	
10020	Motion SFC error occurred at Motion SFC program.	Check the Motion error history of MT Developer, and remove the error cause. Refer to the Motion SFC error code for details of errors.
10021		
10022		
10023		
10030	Motion CPU internal bus error occurred.	Motion CPU module hardware fault. Explain the error symptom and get advice from our sales representative.

(3) Self-diagnostic error information

No.	Name	Meaning	Details														
SD0	Diagnostic errors	Diagnostic error code	<ul style="list-style-type: none"> Error codes for errors found by diagnosis are stored as BIN data. 														
SD1	Clock time for diagnostic error occurrence	Clock time for diagnostic error occurrence	<ul style="list-style-type: none"> The year (last two digits) and month that SD0 data was updated is stored as BCD 2-digit code. <table border="1" style="margin-left: 40px;"> <tr> <td>B15 to B8</td> <td>B7 to B0</td> <td>Example : January 2006</td> </tr> <tr> <td>Year(0 to 99)</td> <td>Month(1 to 12)</td> <td>H0601</td> </tr> </table> 	B15 to B8	B7 to B0	Example : January 2006	Year(0 to 99)	Month(1 to 12)	H0601								
B15 to B8			B7 to B0	Example : January 2006													
Year(0 to 99)			Month(1 to 12)	H0601													
SD2	<ul style="list-style-type: none"> The day and hour that SD0 data was updated is stored as BCD 2-digit code. <table border="1" style="margin-left: 40px;"> <tr> <td>B15 to B8</td> <td>B7 to B0</td> <td>Example : 25st, 10 a.m</td> </tr> <tr> <td>Day(1 to 31)</td> <td>Hour(0 to 23)</td> <td>H2510</td> </tr> </table> 	B15 to B8	B7 to B0	Example : 25st, 10 a.m	Day(1 to 31)	Hour(0 to 23)	H2510										
B15 to B8	B7 to B0	Example : 25st, 10 a.m															
Day(1 to 31)	Hour(0 to 23)	H2510															
SD3	<ul style="list-style-type: none"> The minute and second that SD0 data was updated is stored as BCD 2-digit code. <table border="1" style="margin-left: 40px;"> <tr> <td>B15 to B8</td> <td>B7 to B0</td> <td>Example : 35min., 48 sec.</td> </tr> <tr> <td>Minute(0 to 59)</td> <td>Second(0 to 59)</td> <td>H3548</td> </tr> </table> 	B15 to B8	B7 to B0	Example : 35min., 48 sec.	Minute(0 to 59)	Second(0 to 59)	H3548										
B15 to B8	B7 to B0	Example : 35min., 48 sec.															
Minute(0 to 59)	Second(0 to 59)	H3548															
SD4	Error information categories	Error information category code	<ul style="list-style-type: none"> Category codes which help indicate what type of information is being stored in the error common information areas (SD5 to SD15) and error individual information areas (SD16 to SD26) are stored. The category code for judging the error information type is stored. <table border="1" style="margin-left: 40px;"> <tr> <td>B15 to B8</td> <td>B7 to B0</td> </tr> <tr> <td>Individual information category codes</td> <td>Common information category codes</td> </tr> </table> The common information category codes store the following codes. 0: No error 1: Module No./CPU No./Base No. The individual information category codes store the following codes. 0: No error 5: Parameter No. 13:Parameter No./CPU No. 	B15 to B8	B7 to B0	Individual information category codes	Common information category codes										
B15 to B8	B7 to B0																
Individual information category codes	Common information category codes																
SD5 to SD15	Error common information	Error common information	<ul style="list-style-type: none"> Common information corresponding to the diagnostic error (SD0) is stored. The error common information type can be judged by SD4(common information category code). 1: Module No./CPU No./Base No. <table border="1" style="margin-left: 40px;"> <thead> <tr> <th>No.</th> <th>Meaning</th> </tr> </thead> <tbody> <tr> <td>SD5</td> <td>Module No./CPU No./Base No.</td> </tr> <tr> <td>SD6</td> <td>I/O No.</td> </tr> <tr> <td>SD7 to SD15</td> <td>Empty</td> </tr> </tbody> </table>	No.	Meaning	SD5	Module No./CPU No./Base No.	SD6	I/O No.	SD7 to SD15	Empty						
No.	Meaning																
SD5	Module No./CPU No./Base No.																
SD6	I/O No.																
SD7 to SD15	Empty																
SD16 to SD26	Error individual information	Error individual information	<ul style="list-style-type: none"> Individual information corresponding to the diagnostic error (SD0) is stored. The error individual information type can be judged by SD4(individual information category code). 5: Parameter No. <table border="1" style="margin-left: 40px;"> <thead> <tr> <th>No.</th> <th>Meaning</th> </tr> </thead> <tbody> <tr> <td>SD16</td> <td>Parameter No.</td> </tr> <tr> <td>SD17 to SD26</td> <td>Empty</td> </tr> </tbody> </table> <p>0401H :Base setting 0406H :Motion slot setting 0E00H :Multiple CPU setting (Number of Multiple CPU's) 0E01H :Multiple CPU setting (Operation mode/ Multiple CPU synchronous startup) E008H :Multiple CPU high speed transmission area setting (CPU specific send range setting / (System area)) E009H/E00AH : Multiple CPU high speed transmission area setting(Automatic refresh setting) E00BH :Synchronous setting</p> <p>13: Parameter No./CPU No.</p> <table border="1" style="margin-left: 40px;"> <thead> <tr> <th>No.</th> <th>Meaning</th> </tr> </thead> <tbody> <tr> <td>SD16</td> <td>Parameter No.</td> </tr> <tr> <td>SD17</td> <td>CPU No.(1 to 4)</td> </tr> <tr> <td>SD18 to SD26</td> <td>Empty</td> </tr> </tbody> </table>	No.	Meaning	SD16	Parameter No.	SD17 to SD26	Empty	No.	Meaning	SD16	Parameter No.	SD17	CPU No.(1 to 4)	SD18 to SD26	Empty
No.	Meaning																
SD16	Parameter No.																
SD17 to SD26	Empty																
No.	Meaning																
SD16	Parameter No.																
SD17	CPU No.(1 to 4)																
SD18 to SD26	Empty																

(4) Release of Multiple CPU related error

The release operation of errors that continues operation for CPU can be executed.

Release the errors in the following procedure.

- 1) Remove the error cause.
- 2) Turn off the Motion error detection flag (M2039).

The special relays, special registers and 7-segment LED for the errors are returned to the status before error occurs after release of errors.

If the same error is displayed again after release of errors, an error is set again, and the Motion error detection flag (M2039) turns on.

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APPENDIX 4 Differences Between Q173DCPU/Q172DCPU and Q173HCPU/Q172HCPU

APPENDIX 4.1 Differences Between Q173DCPU/Q172DCPU and Q173HCPU/Q172HCPU

Common differences to each mode are shown in Table 4.1.

Refer to "APPENDIX 4.3 Differences of each mode" for characteristic differences to each mode.

And, refer to "APPENDIX 4.2 Comparison of devices " for detailed differences of devices.

Table 4.1 Differences Between Q173DCPU/Q172DCPU and Q173HCPU/Q172HCPU

Item	Q173DCPU/Q172DCPU	Q173HCPU/Q172HCPU
Peripheral I/F	Via PLC CPU (USB/RS-232)	USB/SSCNET
External battery	Demand	Add Q6BAT at continuous power failure for 1 month or more.
Forced stop input	<ul style="list-style-type: none"> Use EMI terminal of Motion CPU module. Use device set by forced stop input setting in the system setting. 	<ul style="list-style-type: none"> Use device set by forced stop input setting in the system setting.
Multiple CPU high speed transmission memory for data transfer between CPU modules	Included	—
Device	Internal relays (M)	8192 points
	Latch relays (L)	None (Latch for M is possible by latch setting)
	Special relays (M)	—
	Special relays (SM)	2256 points
	Special registers (D)	—
	Special registers (SD)	2256 points
	Motion registers (#)	8736 points
	Multiple CPU area devices (U□/G)	Up to 14336 points
Motion dedicated PLC instructions	D(P).DDR, D(P).DDWR, D(P).SFCS, D(P).SVST, D(P).CHGT, D(P).CHGV, D(P).CHGA, D(P).GINT	S(P).DDR, S(P).DDWR, S(P).SFCS, S(P).SVST, S(P).CHGT, S(P).CHGV, S(P).CHGA, S(P).GINT
Interlock condition	Multiple instructions are executable continuously without interlock condition by the self CPU high speed interrupt accept flag from CPU□. □:CPU No.	Interlock condition by the to self CPU high speed interrupt accept flag from CPU□ is necessary.
Motion modules	Q172DLX, Q172DEX, Q173DPX	Q172LX, Q172EX, Q173PX
System setting	<ul style="list-style-type: none"> QnUD(H)CPU is set as CPU No. 1. Only Multiple CPU high speed main base unit (Q38DB/Q312DB) can be used as main base unit. Motion modules cannot be installed to I/O 0 to 2 slot. 	<ul style="list-style-type: none"> QnUD(H)CPU is set to CPU No. 1. Q3□B can be used as a main base unit. Motion modules can be mounted to I/O 0 to 2 slot.
Latch clear	Remote operation	L.CLR switch
RUN/STOP	Remote operation, RUN/STOP switch	RUN/STOP switch
ROM operation	<ul style="list-style-type: none"> ROM writing is executed with mode operated by RAM/ mode operated by ROM. ROM writing can be executed for the data of MT Developer. 	Rom writing is executed with installation mode/ mode written in ROM.

APPENDICES

Table 4.1 Differences Between Q173DCPU/Q172DCPU and Q173HCPU/Q172HCPU
(Continued)

Item		Q173DCPU/Q172DCPU	Q173HCPU/Q172HCPU
Medium of operating system software		CD-ROM (1 disk)	FD (2 disks)
Model of operating system software		SW8DNC-SV□□□	SW6RN-SV□□□
CPU module No.1		QnUD(H)CPU	Qn(H)CPU
Installation orders CPU No.2 or later		No restriction	Install Motion CPU module on the right-hand side of PLC CPU module.
Combination of Motion CPU modules		Q173DCPU/Q172DCPU only	Combination with Q173CPUN(-T)/Q172CPUN(-T).
CPU empty slot		Settable between CPU modules	Not settable between CPU modules
CPU shared memory	Multiple CPU high speed transmission area	Provided	None
	Access by Multiple CPU shared memory	Possible	Impossible
Automatic refresh	Memory	Multiple CPU high speed transmission area in CPU shared memory	Automatic refresh area in CPU shared memory
	Automatic refresh setting	32 range possible	4 range possible
	Multiple CPU high speed refresh function	Provided	None
LED display		7-segment LED display	Each LED of MODE, RUN, ERR, M.RUN, BAT and BOOT
Latch range setting	Latch (1)	It is possible to clear with latch clear(1) and latch clear (1)(2) of remote latch clear.	Range which can be cleared with the latch clear key.
	Latch (2)	It is possible to clear with lath clear(1)(2) of remote latch clear.	Range which cannot be cleared with the latch clear key.
All clear function		Execute with installation mode	Turn off the PLC ready flag (M2000) and test mode ON flag (M9075) to execute all clear.
Release of Multiple CPU related error		Turn off M2039.	Store the error code to be released in the special register D9060 and turn off to on the special relay M9060.

APPENDICES

APPENDIX 4.2 Comparison of devices

- (1) Motion registers
 - (a) Monitor devices

Table 4.2 Motion registers (Monitor devices) list

Device No.		Name	Remark
Q173DCPU/Q172DCPU	Q173HCPU/Q172HCPU		
#8000 to #8019	#8064 to #8067	Axis 1 monitor device	
#8020 to #8039	#8068 to #8071	Axis 2 monitor device	
#8040 to #8059	#8072 to #8075	Axis 3 monitor device	
#8060 to #8079	#8076 to #8079	Axis 4 monitor device	
#8080 to #8099	#8080 to #8083	Axis 5 monitor device	
#8100 to #8119	#8084 to #8087	Axis 6 monitor device	
#8120 to #8139	#8088 to #8091	Axis 7 monitor device	
#8140 to #8159	#8092 to #8095	Axis 8 monitor device	
#8160 to #8179	#8096 to #8099	Axis 9 monitor device	
#8180 to #8199	#8100 to #8103	Axis 10 monitor device	
#8200 to #8219	#8104 to #8107	Axis 11 monitor device	
#8220 to #8239	#8108 to #8111	Axis 12 monitor device	
#8240 to #8259	#8112 to #8115	Axis 13 monitor device	
#8260 to #8279	#8116 to #8119	Axis 14 monitor device	
#8280 to #8299	#8120 to #8123	Axis 15 monitor device	
#8300 to #8319	#8124 to #8127	Axis 16 monitor device	
#8320 to #8339	#8128 to #8131	Axis 17 monitor device	
#8340 to #8359	#8132 to #8135	Axis 18 monitor device	
#8360 to #8379	#8136 to #8139	Axis 19 monitor device	
#8380 to #8399	#8140 to #8143	Axis 20 monitor device	
#8400 to #8419	#8144 to #8147	Axis 21 monitor device	
#8420 to #8439	#8148 to #8151	Axis 22 monitor device	
#8440 to #8459	#8152 to #8155	Axis 23 monitor device	
#8460 to #8479	#8156 to #8159	Axis 24 monitor device	
#8480 to #8499	#8160 to #8163	Axis 25 monitor device	
#8500 to #8519	#8164 to #8167	Axis 26 monitor device	
#8520 to #8539	#8168 to #8171	Axis 27 monitor device	
#8540 to #8559	#8172 to #8175	Axis 28 monitor device	
#8560 to #8579	#8176 to #8179	Axis 29 monitor device	
#8580 to #8599	#8180 to #8183	Axis 30 monitor device	
#8600 to #8619	#8184 to #8187	Axis 31 monitor device	
#8620 to #8639	#8188 to #8191	Axis 32 monitor device	

Table 4.3 Monitor devices list

Device No.		Name	Remark
Q173DCPU/Q172DCPU	Q173HCPU/Q172HCPU		
#8000 + 20n	#8064 + 4n	Servo amplifier type	
#8001 + 20n	#8065 + 4n	Motor current	
#8002 + 20n	#8066 + 4n	Motor speed	
#8003 + 20n	#8067 + 4n		
#8004 + 20n	—	Command speed	New device in Q173DCPU/Q172DCPU
#8005 + 20n			
#8006 + 20n	—	Home position return re-travel value	
#8007 + 20n			

(Note-1) : "n" in the above device No. indicates the numerical value which correspond to axis No.

(b) Motion error history

Table 4.4 Motion registers (Motion error history) list

Device No.		Name	Remark
Q173DCPU/Q172DCPU	Q173HCPU/Q172HCPU		
#8640 to #8651	#8000 to #8007	Seventh error information in past (Oldest error information)	
#8652 to #8663	#8008 to #8015	Sixth error information in past	
#8664 to #8675	#8016 to #8023	Fifth error information in past	
#8676 to #8687	#8024 to #8031	Fourth error information in past	
#8688 to #8699	#8032 to #8039	Third error information in past	
#8700 to #8711	#8040 to #8047	Second error information in past	
#8712 to #8723	#8048 to #8055	First error information in past	
#8724 to #8735	#8056 to #8063	Latest error information	

Table 4.5 Motion error history list

Device No.		Name	Remark
Q173DCPU/Q172DCPU	Q173HCPU/Q172HCPU		
#8640 + 12n	#8000 + 8n	Error Motion SFC program No.	
#8641 + 12n	#8001 + 8n	Error type	
#8642 + 12n	#8002 + 8n	Error program No.	
#8643 + 12n	#8003 + 8n	Error block No./Motion SFC list/Line No./Axis No.	
#8644 + 12n	#8004 + 8n	Error code	
#8645 + 12n	#8005 + 8n	Error occurrence time (Year/month)	
#8646 + 12n	#8006 + 8n	Error occurrence time (Day/hour)	
#8647 + 12n	#8007 + 8n	Error occurrence time (Minute/second)	
#8648 + 12n	—	Error setting data information	New device in Q173DCPU/Q172DCPU
#8649 + 12n	—	Unusable	
#8650 + 12n	—	Error setting data	
#8651 + 12n			

(Note-1) : "n" in the above device No. indicates the numerical value which correspond to axis No.

(2) Special relays

Table 4.6 Special relay list

Device No.		Name	Remark
Q173DCPU/Q172DCPU	Q173HCPU/Q172HCPU		
SM60	M9000/M2320	Fuse blown detection	
SM53	M9005/M2321	AC/DC DOWN detection	
SM52	M9006/M2322	Battery low	
SM51	M9007/M2323	Battery low latch	
SM1	M9008/M2324	Self-diagnostic error	
SM0	M9010/M2325	Diagnostic error	
—	M9025/M3136	Clock data set request	
SM211	M9026/M2338	Clock data error	
SM801	M9028/M3137	Clock data read request	
SM400	M9036/M2326	Always ON	
SM401	M9037/M2327	Always OFF	
—	M9060/M3138	Diagnostic error reset	Use M2039 for error reset operation.
SM512	M9073/M2329	Motion CPU WDT error	
SM500	M9074/M2330	PCPU READY complete	
SM501	M9075/M2331	Test mode ON	
SM502	M9076/M2332	External forced stop input	
SM513	M9077/M2333	Manual pulse generator axis setting error	
SM510	M9078/M2334	TEST mode request error	
SM516	M9079/M2335	Servo program setting error	
SM528	M9216/M2345	No.1 CPU MULTR complete	
SM529	M9217/M2346	No.2 CPU MULTR complete	
SM530	M9218/M2347	No.3 CPU MULTR complete	
SM531	M9219/M2348	No.4 CPU MULTR complete	
SM240	M9240/M2336	No.1 CPU resetting	
SM241	M9241/M2337	No.2 CPU resetting	
SM242	M9242/M2338	No.3 CPU resetting	
SM243	M9243/M2339	No.4 CPU resetting	
SM244	M9244/M2340	No.1 CPU error	
SM245	M9245/M2341	No.2 CPU error	
SM246	M9246/M2342	No.3 CPU error	
SM247	M9247/M2343	No.4 CPU error	
SM58	—	Battery low warning latch	New device in Q173DCPU/Q172DCPU
SM59	—	Battery low warning	
SM220	—	CPU No.1 READY complete	
SM221	—	CPU No.2 READY complete	
SM222	—	CPU No.3 READY complete	
SM223	—	CPU No.4 READY complete	
SM503	—	Digital oscilloscope executing	
SM526	—	Over heat warning latch	
SM527	—	Over heat warning	

(3) Special registers

Table 4.7 Special registers list

Device No.		Name	Remark
Q173DCPU/Q172DCPU	Q173HCPU/Q172HCPU		
SD60	D9000	Fuse blown No.	
SD53	D9005	AC/DC DOWN counter No.	
SD0	D9008	Diagnostic errors	
SD1	D9010	Clock time for diagnostic error occurrence (Year, month)	
SD2	D9011	Clock time for diagnostic error occurrence (Day, hour)	
SD3	D9012	Clock time for diagnostic error occurrence (Minute, second)	
SD4	D9013	Error information categories	
SD5	D9014	Error common information	New device in Q173DCPU/Q172DCPU
SD6	—		
SD7	—		
SD8	—		
SD9	—		
SD10	—		
SD11	—		
SD12	—		
SD13	—		
SD14	—		
SD15	—		
SD16	—	Error individual information	
SD17	—		
SD18	—		
SD19	—		
SD20	—		
SD21	—		
SD22	—		
SD23	—		
SD24	—		
SD25	—		
SD26	—		
SD203	D9015	Operating status of CPU	
SD520	D9017	Scan time	
SD521	D9019	Maximum scan time	
SD210	D9025	Clock data (Year, month)	
SD211	D9026	Clock data (Day, hour)	
SD212	D9027	Clock data (Minute, second)	
SD213	D9028	Clock data (Day of week)	
—	D9060	Diagnostic error reset error No.	Use M2039 for error reset operation.
SD395	D9061	Multiple CPU No.	
SD508	D9112	Connect/Disconnect (Status)	
SD803	—	Connect/Disconnect (Command)	New device in Q173DCPU/Q172DCPU
SD510	D9182	Test mode request error	
SD511	D9183		

Table 4.7 Special registers list (Continued)

Device No.		Name	Remark
Q173DCPU/Q172DCPU	Q173HCPU/Q172HCPU		
SD512	D9184	Motion CPU WDT error cause	
SD513	D9185	Manual pulse generator axis setting error	
SD514	D9186		
SD515	D9187		
SD522	D9188	Motion operation cycle	
SD516	D9189	Error program No.	
SD517	D9190	Error item information	
SD502	D9191	Servo amplifier loading information	
SD503	D9192		
SD504	D9193	Real mode/virtual mode switching error information	
SD505	D9194		
SD506	D9195		
—	D9196	PC link communication error codes	Q173DCPU/Q172DCPU does not support PC link communication.
SD523	D9197	Operation cycle of the Motion CPU setting	
SD200	D9200	State of switch	
—	D9201	State of LED	Use 7-segment LED in Q173DCPU/Q172DCPU.

(4) Other devices

Table 4.8 Other devices list

Item	Q173DCPU/Q172DCPU	Q173HCPU/Q172HCPU	
Internal relays/ Data registers	M2320 to M2399	Unusable	Special relay allocated devices (Status)
	M2400 to M3039	Device area of 9 axes or more is usable as user devices in Q172DCPU.	Device area of 9 axes or more is unusable as user devices in Q172HCPU.
	M3136 to M3199	Unusable	Special relay allocated devices (Command signal)
	M3200 to M3839	Device area of 9 axes or more is usable as user devices in Q172DCPU.	Device area of 9 axes or more is unusable in Q172HCPU.
	D0 to D639		
D640 to D703			
Personal computer link communication error flag	—	M2034	
PCPU READY complete	SM500	D759	
Home position return re-travel value	D9 + 20n (Data shortened to 1 word) ^(Note-1)	D9 + 20n ^(Note-1)	
	#8006 + 20n, #8007 + 20n ^(Note-1) (Referring at monitoring)		
Travel value change registers	Optional device (Set for D16 + 20n, D17 + 20n are also usable.) ^(Note-1)	D16 + 20n, D17 + 20n ^(Note-1)	
Indirect setting devices (Word devices)	D0 to D8191	D800 to D8191	
	W0 to W1FFF	W0 to W1FFF	
	#0 to #7999	#0 to #7999	
	U□\G10000 to U□\G(10000 + p - 1) ^(Note-2)	—	
Indirect setting devices (Bit devices)	X0 to X1FFF	X0 to X1FFFF	
	Y0 to Y1FFF	Y0 to Y1FFF	
	M0 to M8191	M/L0 to M/L8191	
	—	M9000 to M9255	
	B0 to B1FFF	B0 to B1FFF	
	F0 to F2047	F0 to F2047	
U□\G10000.0 to U□\G(10000 + p - 1).F ^(Note-2)	—		
High-speed reading function settable devices	D0 to D8191	D800 to D3069, D3080 to D8191	
	W0 to W1FFF	W0 to W1FFF	
	U□\G10000 to U□\G(10000 + p - 1) ^(Note-2)	—	
Optional data monitor function settable devices	D0 to D8191	D0 to D8191	
	W0 to W1FFF	W0 to W1FFF	
	#0 to #7999	#0 to #7999	
	U□\G10000 to U□\G(10000 + p - 1) ^(Note-2)	—	

(Note-1) : "n" in the above device No. indicates the numerical value which correspond to axis No.

(Note-2) : "p" indicates the user setting area points of Multiple CPU high speed transmission area in each CPU.

Table 4.8 Other devices list (Continued)

Item		Q173DCPU/Q172DCPU	Q173HCPU/Q172HCPU
Limit switch output data	Output device	X0 to X1FFF	X0 to X1FFF
		Y0 to Y1FFF	Y0 to Y1FFF
		M0 to M8191	M0 to M8191
		—	L0 to L8191
		B0 to B1FFF	B0 to B1FFF
	U□\G10000.0 to U□\G(10000 + p - 1).F (Note-2)	—	
	Watch data	D0 to D8191	D0 to D8191
		W0 to W1FFF	W0 to W1FFF
		#0 to #7999	#0 to #8191
		Absolute value address U□\G10000 to U□\G(10000 + p - 1) (Note-2)	Absolute value address —
	ON region setting	D0 to D8191	D0 to D8191
		W0 to W1FFF	W0 to W1FFF
		#0 to #7999	#0 to #8191
		Constant (Hn/Kn) (Note-3) U□\G10000 to U□\G(10000 + p - 1) (Note-2)	Constant (Hn/Kn) (Note-3) —
	Output enable/disable bit	X0 to X1FFF	X0 to X1FFF
		Y0 to Y1FFF	Y0 to Y1FFF
		M0 to M8191	M0 to M8191
	Forced output bit	—	L0 to L8191
		B0 to B1FFF	B0 to B1FFF
		F0 to F2047	F0 to F2047
SM0 to SM1999 U□\G10000.0 to U□\G(10000 + p - 1).F (Note-2)		M9000 to M9255 —	

(Note-2) : "p" indicates the user setting area points of Multiple CPU high speed transmission area in each CPU.

(Note-3) : Setting range varies depending on the setting units.

POINT
Refer to Chapter 2 for number of user setting area points of Multiple CPU high speed transmission area.

APPENDIX 4.3 Differences of each mode

(1) Motion SFC

Table 4.9 Differences in Motion SFC mode

Item	Q173DCPU/Q172DCPU	Q173HCPU/Q172HCPU
Motion SFC program executing flag	X, Y, M, B, U□\G	—
Operation control/transition control usable device (Word device)	D, W, U□\G, SD, #, FT	D, W, Special D, #, FT
Operation control/transition control usable device (Bit device)	X, PX, Y, PY, M, U□\G□.□, B, F, SM	X, PX, Y, PY, M, L, B, F, Special M

(2) Virtual mode

Table 4.10 Differences in Virtual mode

Item	Q173DCPU/Q172DCPU	Q173HCPU/Q172HCPU
Internal relay/ Data register	M4640 to M4687	Device area of 9 axes or more is unusable in the Q172HCPU.
	M5440 to M5487	
	D1120 to D1239	
Clutch status	Optional device (Set for M2160 to M2223 are also usable.)	M2160 to M2223
Cam axis command signals (Cam/ball screw switching command)	Optional device (Set for M5488 to M5519 are also usable.)	M5488 to M5519
Smoothing clutch complete signals	Optional device (Set for M5520 to M5583 are also usable.)	M5520 to M5583
Real mode axis information register	SD500, SD501	D790, D791
Indirect setting devices of mechanical system program (Word device)	D0 to D8191	D800 to D3069, D3080 to D8191
	W0 to W1FFF	W0 to W1FFF
	#0 to #7999	—
	U□\G10000 to U□\G(10000 + p - 1) (Note-1)	—
Indirect setting devices of mechanical system program (Bit device)	X0 to X1FFF	X0 to X1FFF
	Y0 to Y1FFF	Y0 to Y1FFF
	M0 to M8191	M/L0 to M/L8191
	—	M9000 to M9255
	B0 to B1FFF	B0 to B1FFF
	F0 to F2047	F0 to F2047
	U□\G10000.0 to U□\G(10000 + p - 1).F (Note-1)	—
Speed change ratio of speed change gear	Upper limit value : 0 to 65535 Lower limit value : 0 to 65535	Upper limit value : 1 to 10000 Lower limit value : 1 to 10000
Permissible droop pulse value of output module	1 to 1073741824 [PLS]	1 to 65535[*100PLS]

(Note-1) : "p" indicates user setting area points of Multiple CPU high speed transmission area in each CPU.

POINT

Refer to Chapter 2 for number of user setting area points of Multiple CPU high speed transmission area.

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.

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Mitsubishi shall accept onerous product repairs for seven years after production of the product is discontinued.

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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.

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- (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.
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- (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)
(Q173DCPU/Q172DCPU)



HEAD OFFICE : TOKYO BUILDING, 2-7-3 MARUNOUCHI, CHIYODA-KU, TOKYO 100-8310, JAPAN

MODEL	Q173D-P-COM-E
MODEL CODE	1XB928
IB(NA)-0300134-A(0801)MEE	

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