

Motion Controller



Q170MSCPU Motion Controller User's Manual

-Q170MSCPU -Q170MSCPU-S1



(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 Users manual of the QCPU module to use for a description of the PLC system safety precautions.

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



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

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

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.
- lacktriangle Be sure to ground the Motion controller, servo amplifier and servo motor. (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 servo motor. 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 servo motor 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, servo motor 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 servo motor, 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 servo motor 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, servo motor and regenerative resistor with the correct combinations listed in the instruction manual. Other combinations may lead to fire or faults.
- Use the Motion controller, 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 servo motor, 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 servo motor 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 servo motor 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 servo motor) used in a system must be compatible with the Motion controller, servo amplifier and servo motor.
- Install a cover on the shaft so that the rotary parts of the servo motor 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 servo motor are connected with a timing belt, etc.). Install a stopping device to ensure safety on the machine side.

(2) Security

⚠ CAUTION

To maintain the security (confidentiality, integrity, and availability) of the programmable controller and the system against unauthorized access, denial-of-service (DoS) attacks, computer viruses, and other cyberattacks from external devices via the network, take appropriate measures such as firewalls, virtual private networks (VPNs), and antivirus solutions.

(3) Parameter settings and programming

∆ CAUTION

- Set the parameter values to those that are compatible with the Motion controller, servo amplifier, servo motor 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.

⚠CAUTION

- Set the servo motor 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 servo motor capacity and type (standard, low-inertia, flat, etc.) parameter to values that are compatible with the system application. The protective functions may not function if the settings are incorrect.
- Set the servo amplifier capacity and type parameters to values that are compatible with the system application. The protective functions may not function if the settings are incorrect.
- Use the program commands for the program with the conditions specified in the instruction manual.
- 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.

(4) Transportation and installation

▲CAUTION

- Transport the product with the correct method according to the mass.
- Use the servo motor suspension bolts only for the transportation of the servo motor. Do not transport the servo motor 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
- When transporting the servo motor, 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.

∆CAUTION

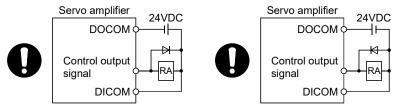
- Do not install or operate Motion controller, servo amplifiers or servo motors that are damaged or that have missing parts.
- Do not block the intake/outtake ports of the Motion controller, servo amplifier and servo motor with cooling fan.
- Do not allow conductive matter such as screw or cutting chips or combustible matter such as oil enter the Motion controller, servo amplifier or servo motor.
- ◆ The Motion controller, servo amplifier and servo motor are precision machines, so do not drop or apply strong impacts on them.
- Securely fix the Motion controller, servo amplifier and servo motor to the machine according to the instruction manual. If the fixing is insufficient, these may come off during operation.
- Always install the servo motor 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.

Forting	Conditions	
Environment	Motion controller/Servo amplifier	Servo motor
Ambient temperature	According to each instruction manual.	0°C to +40°C (32°F to +104°F) (With no freezing)
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	According to each instruction manual	
Vibration	According to each instruction manual	

- When coupling with the synchronous encoder or servo motor 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 servo motor 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.
- When fumigants that contain halogen materials such as fluorine, chlorine, bromine, and iodine are used for disinfecting and protecting wooden packaging from insects, they cause malfunction when entering our products.
 - Please take necessary precautions to ensure that remaining materials from fumigant do not enter our products, or treat packaging with methods other than fumigation (heat method). Additionally, disinfect and protect wood from insects before packing products.

⚠ 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 servo motor.
- 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) and ground. Incorrect connections will lead the servo motor to operate abnormally.
- Do not connect a commercial power supply to the servo motor, 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.



For the sink output interface

For the source output interface

- Do not connect or disconnect the connection cables between each unit, the encoder cable or PLC expansion cable while the power is ON.
- Securely tighten the cable connector fixing screws and fixing mechanisms. Insufficient fixing may lead to the cables coming off during operation.
- Do not bundle the power line or cables.

(6) 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.
- Before starting test operation, set the parameter speed limit value to the slowest value, and make sure that operation can be stopped immediately by the forced stop, etc. if a hazardous state occurs.

(7) Usage methods

♠CAUTION

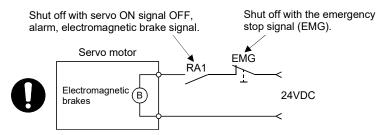
- Immediately turn OFF the power if smoke, abnormal sounds or odors are emitted from the Motion controller, servo amplifier or servo motor.
- Always execute a test operation before starting actual operations after the program or parameters have been changed or after maintenance and inspection.
- Do not 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 this manual 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
Input power	According to each instruction manual.
Input frequency	According to each instruction manual.
Tolerable momentary power failure	According to each instruction manual.

(8) 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 servo motor 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.)

⚠ 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.
- 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.
- Lock the control panel and prevent access to those who are not certified to handle or install electric equipment.
- Do not burn or break a module and servo amplifier. Doing so may cause a toxic gas.

(10) 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.

(11) General cautions

• 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.

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Print Date	* Manual Number	Revision
Apr., 2013	IB(NA)-0300212-A	
Nov., 2018	IB(NA)-0300212-B	[Additional model]
		MR-J4-□B-RJ, MR-MV200, Q171ENC-W8
		[Additional correction]
		For safe operations, Comparison between Q170MSCPU and
		Q170MCPU, Restrictions by the software's version, Q170MSCPU
		system overall configuration, Restrictions on Motion controller, Serial
		absolute synchronous encoder cable Q170ENCCBL□M-A, Connector
		set for serial absolute synchronous encoder cable MR-J3CN2,
		SSCNETⅢ(/H) compatible equipment, General specifications, Motion
		controller specifications, 7 segment LED display, Connection
		examples of manual pulse generator/incremental synchronous
		encoder, Serial absolute synchronous encoder specifications and
		mounting, Battery specifications and transport guidelines, Safety
		circuit design, Check items before start-up, Start-up adjustment
		procedure, Resuming operation after storing the Motion controller,
		Troubleshooting, Internal I/F connector cable, Exterior dimensions
		(serial absolute synchronous encoder), Warranty
Dec., 2023	IB(NA)-0300212-C	[Additional model]
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		between Q170MSCPU and Q170MCPU, Restrictions by the software's
		version, Motion system configuration, Q170MSCPU system overall
		configuration, Restrictions on Motion controller, Motion controller related
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		connector, Setting of the axis No. and axis select rotary switch of servo
0-4 0004	ID/NA) 0200040 D	amplifier, Warranty
Oct., 2024	IB(NA)-0300212-D	[Additional model]
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		[Additional correction]
		Discontinued models, Comparison between Q170MSCPU and Q170MCPU, Restrictions by the software's version, Motion system
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		of the battery holder, Battery life, Battery replacement procedure,
		Exterior dimensions (battery holder)
		Extend difficultions (pattery floider)

Japanese Manual Number IB(NA)-0300205

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INTRODUCTION

Thank you for choosing the Mitsubishi Motion controller Q170MSCPU.

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.

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

Related Manuals

(1) Motion controller

Manual Name	Manual Number (Model Code)
Q170MSCPU Motion controller User's Manual This manual explains specifications of the Q170MSCPU Motion controller, Q172DLX Servo external signal interface module, Q173DPX Manual pulse generator interface module, Servo amplifiers, SSCNETIII cables, and the maintenance/inspection for the system, trouble shooting and others.	IB-0300212 (1XB962)
Q173D(S)CPU/Q172D(S)CPU Motion controller Programming Manual (COMMON) This manual explains the Multiple CPU system configuration, performance specifications, common parameters, auxiliary/applied functions, error lists and others.	IB-0300134 (1XB928)
Q173D(S)CPU/Q172D(S)CPU Motion controller (SV13/SV22) Programming Manual (Motion SFC) This manual explains the functions, programming, debugging, error lists for Motion SFC and others.	IB-0300135 (1XB929)
Q173D(S)CPU/Q172D(S)CPU Motion controller (SV13/SV22) Programming Manual (REAL MODE) This manual explains the servo parameters, positioning instructions, device lists, error lists and others.	IB-0300136 (1XB930)
Q173D(S)CPU/Q172D(S)CPU 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.	IB-0300137 (1XB931)
Q173DSCPU/Q172DSCPU Motion controller (SV22) Programming Manual (Advanced Synchronous Control) This manual explains the dedicated instructions to use the synchronous control by synchronous control parameters, device lists, error lists and others.	IB-0300198 (1XB953)
Motion controller Setup Guidance (MT Developer2 Version1) This manual explains the items related to the setup of the Motion controller programming software MT Developer2.	IB-0300142 (

(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 units, extension cables, memory card battery, and the maintenance/inspection for the system, trouble shooting, error codes and others.	SH-080483ENG (13JR73)
QnUCPU User's Manual (Function Explanation, Program Fundamentals) This manual explains the functions, programming methods and devices and others to create programs with the QCPU.	SH-080807ENG (13JZ27)
QCPU User's Manual (Multiple CPU System) This manual explains the Multiple CPU system overview, system configuration, I/O modules, communication between CPU modules and communication with the I/O modules or intelligent function modules.	SH-080485ENG (13JR75)
QnUCPU User's Manual (Communication via Built-in Ethernet Port) This manual explains functions for the communication via built-in Ethernet port of the CPU module.	SH-080811ENG (13JZ29)
MELSEC-Q/L Programming Manual (Common Instruction) This manual explains how to use the sequence instructions, basic instructions, application instructions and micro computer program.	SH-080809ENG (13JW10)
MELSEC-Q/L/QnA Programming Manual (PID Control Instructions) This manual explains the dedicated instructions used to exercise PID control.	SH-080040 (13JF59)
MELSEC-Q/L/QnA Programming Manual (SFC) This manual explains the system configuration, performance specifications, functions, programming, debugging, error codes and others of MELSAP3.	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.	SH-080042 (13JL99)
MELSEC-L SSCNETII/H Head Module User's Manual This manual explains specifications of the head module, procedures before operation, system configuration, installation, wiring, settings, and troubleshooting.	SH-081152ENG (13JZ78)

(3) Servo amplifier

Manual Name	Manual Number (Model Code)
MR-J5-B/MR-J5W-B User's Manual (Introduction) This manual explains the specifications, functions, start-up procedure and others for AC Servo MR-J5-B/MR-J5W-B Servo amplifier.	IB-0300578ENG (—)
MR-J5 User's Manual (Hardware) This manual explains the installation, wiring, use option and others for AC Servo MR-J5-B/MR-J5W-B Servo amplifier.	SH-030298ENG (—)
MR-J5 User's Manual (Function) This manual explains how to use each function required to operate the AC Servo MR-J5-B/MR-J5W-B Servo amplifier.	SH-030300ENG (—)
MR-J5 User's Manual (Adjustment) This manual explains the operation status adjustment procedure, adjustment method and others for AC Servo MR-J5-B/MR-J5W-B Servo amplifier.	SH-030306ENG (—)
MR-J5 User's Manual (Troubleshooting) This manual explains the causes of alarms, and warnings, etc. for AC Servo MR-J5-B/MR-J5W-B Servo amplifier.	SH-030312ENG (—)
MR-J5-B/MR-J5W-B User's Manual (Parameters) This manual explains the parameters for AC Servo MR-J5-B/MR-J5W-B Servo amplifier.	IB-0300581ENG (—)
SSCNETII/H Interface AC Servo MR-J4B_(-RJ) Servo amplifier Instruction Manual This manual explains the I/O signals, parts names, parameters, start-up procedure and others for AC Servo MR-J4B_(-RJ) Servo amplifier.	SH-030106 (1CW805)
SSCNETII/H Interface Multi-axis AC Servo MR-J4W2B/MR-J4W3B/MR-J4W2-0303B6 Servo amplifier Instruction Manual This manual explains the I/O signals, parts names, parameters, start-up procedure and others for Multi-axis AC Servo MR-J4W2B/MR-J4W3B/MR-J4W2-0303B6 Servo amplifier.	SH-030105 (1CW806)
SSCNETII interface 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.	SH-030051 (1CW202)
SSCNETII interface 2-axis AC Servo Amplifier MR-J3W-0303BN6/MR-J3W-□B Servo amplifier Instruction Manual This manual explains the I/O signals, parts names, parameters, start-up procedure and others for 2-axis AC Servo Amplifier MR-J3W-0303BN6/MR-J3W-□B Servo amplifier.	SH-030073 (1CW604)
SSCNETII Compatible Linear Servo MR-J3-□B-RJ004U□ Instruction Manual This manual explains the I/O signals, parts names, parameters, start-up procedure and others for Linear Servo MR-J3-□B-RJ004U□ Servo amplifier.	SH-030054 (1CW943)
SSCNETII Compatible 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.	SH-030056 (1CW304)
SSCNETII Interface Direct Drive Servo MR-J3-□B-RJ080W Instruction Manual This manual explains the I/O signals, parts names, parameters, start-up procedure and others for Direct Drive Servo MR-J3-□B-RJ080W Servo amplifier.	SH-030079 (1CW601)

Manual Name	Manual Number (Model Code)
SSCNETII interface Drive Safety integrated MR-J3-□B Safety Servo amplifier Instruction Manual This manual explains the I/O signals, parts names, parameters, start-up procedure and others for safety integrated MR-J3-□B Safety Servo amplifier.	SH-030084 (1CW205)
SSCNETII/H interface AC Servo MR-JEB Servo amplifier Instruction Manual This manual explains the I/O signals, parts names, parameters, start-up procedure and others for MR-JE-□B Servo amplifier.	SH-030152ENG (—)
SSCNETII/H interface AC Servo With functional safety MR-JEBF Servo amplifier Instruction Manual This manual explains the I/O signals, parts names, parameters, start-up procedure and others for MR-JEBF Servo amplifier.	SH-030258ENG (—)

Discontinued Models

The following models are described in this manual, but are no longer produced.

For the onerous repair term after discontinuation of production, refer to "WARRANTY".

Model	Production discontinuation
QD75MH1	September 2018
QD75MH2	September 2018
QD75MH4	September 2018
MR-J3-□B	May 2019
MR-J3W-□B	May 2019
MR-J3-□B-RJ006	May 2019
MR-J3-□B-RJ004	May 2019
MR-J3-□B-RJ080W	May 2019
MR-J3-□BS	May 2019
Q7BAT	September 2019
Q170MSBAT-SET	September 2019
QD75P1	September 2021
QD75P2	September 2021
QD75P4	September 2021
QD75D1	September 2021
QD75D2	September 2021
QD75D4	September 2021

1. OVERVIEW

1.1 Overview

This User's Manual describes the hardware specifications and handling methods of the Motion Controller Q170MSCPU for the Q series PLC Multiple CPU system.

The Manual also describes those items related to the specifications of the option module for the Motion controller, Manual pulse generator and cables.

In this manual, the following abbreviations are used.

Generic term/Abbreviation	Description	
Q170MSCPU or Motion controller	Q170MSCPU/Q170MSCPU-S1 Motion controller	
Q172DLX/Q173DPX or Motion module	Q172DLX Servo external signals interface module/	
	Q173DPX Manual pulse generator interface module	
MR-J5(W)-□B	Servo amplifier model MR-J5-□B/MR-J5W-□B	
MR-J4(W)-□B	Servo amplifier model MR-J4-□B/MR-J4W-□B	
MR-J3(W)-□B	Servo amplifier model MR-J3-□B/MR-J3W-□B	
MR-JE-□B	Servo amplifier model MR-JE-□B/MR-JE-□BF	
AMP or Servo amplifier	General name for "Servo amplifier model MR-J5-□B/MR-J5W-□B/MR-J4-□B/MR-J4-□B/MR-J4W-□B/MR-J3-□B/MR-J3-□B/MR-JE-□B/MR-DE-□B/MR-DE-□B/MR-DE-□B/MR-DE-□B/MR-DE-□B/MR-DE-□B/MR-DE-□B/MR-DE-□B/MR-DE-□B/MR-DE-□B/MR-DE-□B/MR-DE-□B/MR-DE-□B/MR-DE	
Multiple CPU system or Motion system	Abbreviation for "Multiple PLC system of the Q series"	
PLC CPU area	PLC control area (CPU No.1) of Q170MSCPU/Q170MSCPU-S1 Motion controller	
Motion CPU area	Motion control area (CPU No.2) of Q170MSCPU/Q170MSCPU-S1 Motion controller	
CPUn	Abbreviation for "CPU No.n (n= 1 to 4) of the CPU module for the Multiple CPU system"	
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□	
Programming software package	General name for MT Developer2/GX Works2/MR Configurator2	
MT Works2	Abbreviation for "Motion controller engineering environment MELSOFT MT Works2"	
MT Developer2 (Note-1)	Abbreviation for "Motion controller programming software MT Developer2 (Version 1.56J or later)"	
GX Works2	Abbreviation for "Programmable controller engineering software MELSOFT GX Works2 (Version 1.98C or later)"	
MR Configurator2 (Note-1)	Abbreviation for "Servo setup software package MR Configurator2 (Version 1.19V or later)"	
Manual pulse generator or MR-HDP01	Abbreviation for "Manual pulse generator (MR-HDP01)"	
Serial absolute synchronous encoder or Q171ENC-W8	Abbreviation for "Serial absolute synchronous encoder (Q171ENC-W8)"	
SSCNETII/H (Note-2)		
SSCNETIII (Note-2)	High speed synchronous network between Motion controller and servo amplifier	
SSCNETII(/H) (Note-2)	General name for SSCNETⅢ/H, SSCNETⅢ	
Absolute position system	General name for "system using the servo motor and servo amplifier for absolute position"	
Intelligent function module	General name for module that has a function other than input or output, such as A/D converter module and D/A converter module.	

Generic term/Abbreviation	Description
SSCNETⅢ/H head module	Abbreviation for "MELSEC-L series SSCNETⅢ/H head module (LJ72MS15)"
Optical hub unit or MR-MV200	Abbreviation for "SSCNETⅢ/H compatible optical hub unit (MR-MV200)"

(Note-1): This software is included in Motion controller engineering environment "MELSOFT MT Works2". (Note-2): SSCNET: Servo System Controller NETwork

REMARK

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

	Item	Reference Manual	
PLC CPU area, peripheral devices for PLC program design,		MELSEC-Q series PLC Manuals,	
I/O modules and intelligent function module		Manual relevant to each module	
Operation method for MT Developer2		Help of each software	
	Multiple CPU system configuration		
	Performance specification	Q173D(S)CPU/Q172D(S)CPU Motion controller	
	Design method for common parameter	Programming Manual (COMMON)	
	Auxiliary and applied functions (common)		
	Design method for Motion SFC program	O473D/S/CDLI/O473D/S/CDLI Motion controller	
SV13/SV22	Design method for Motion SFC parameter	Q173D(S)CPU/Q172D(S)CPU Motion controller (SV13/SV22) Programming Manual (Motion SFC)	
	Motion dedicated PLC instruction	(3V13/3V22) Flogramming Manual (Motion 3FC)	
	Design method for positioning control		
	program in the real mode	Q173D(S)CPU/Q172D(S)CPU Motion controller	
	Design method for positioning control	(SV13/SV22) Programming Manual (REAL MODE)	
	parameter		
SV22	Design method for mechanical system	Q173D(S)CPU/Q172D(S)CPU Motion controller (SV22)	
(Virtual mode)	program	Programming Manual (VIRTUAL MODE)	
SV22			
(Advanced	Design method for synchronous control	Q173DSCPU/Q172DSCPU Motion controller (SV22)	
synchronous	parameter	Programming Manual (Advanced Synchronous Control)	
control)			

1.2 Comparison between Q170MSCPU and Q170MCPU

(1) Comparison of hardware

	Item	Q170MSCPU	Q170MSCPU-S1	Q170MCPU		
Power supply			Built-in (24VDC)			
PLC CPU area		Q03UDCPU or equivalent	Q06UDHCPU or equivalent	Q03UDCPU or equivalent		
Program capacity		(30k steps) 30k steps (120 bytes)	(60k steps) 60k steps (240 bytes)	(20k steps) 30k steps (80 bytes)		
	n processing speed	0.02µs	0.0095µs	0.02µs		
LD Instruction	in processing speed	0.02μs	0.0095μs			
Motion CPU area	a	Q172DSCPU or ed	quivalent (16 axes)	Q172DCPU or equivalent (16 axes)		
Forced stop	input		Use forced stop input terminal			
	Main base unit		None			
	Extension base unit	7 extensions (Up		1 extension (Q52B/Q55B usable)		
Base unit	GOT bus connection	(Q52B/Q55B/Q63B/Q65B/Q68B/Q612B usable) No restriction		Extension base unit use: Connection after the extension base unit of stage 1 Extension base unit not use: Direct bus connection to Motion controller		
	Q172DLX	2 modules				
l	Q172DEX					
Motion	Q173DPX (Note-2)	4 mo	dules	3 modules		
	Base unit for installation					
Battery		Demand				
Q6BAT		Packed together with Motion controller				
Q7BATN (La	arge capacity)		Usable (sold separately)			
	Number of CPUs		2 modules			
l +	CPU No.1	PLC CPU area				
Multiple CPU	CPU No.2		Motion CPU area			
svstem	CPU No.3		- Wolfert Of O dred			
I +	CPU No.4					
Mounting metho		Be sure to mount	t Motion controller on control pane	el by fixing screws		
Exterior dimension		186 (7.32)(H) × 52 (2.05)(W) × 135 (5.31)(D)		178 (7.01)(H) × 52 (2.05)(W) × 135 (5.31)(D)		
Medium of operating system software			The operating system software (SV22 (Virtual mode switching method)) is installed.			
Model of	SV13		-SV13QN	SW8DNC-SV13QG		
operating system	1		S-SV22QN	SW8DNC-SV22QF		
software	SV43		_			
Programming	PLC CPU area		GX Works2			
tool	Motion CPU area		MT Developer2			
.001	MOUOTI OF C area		WIT DOVELOPEIZ			

Comparison of hardware (continued)

	Item		Q170MSCPU	Q170MSCPU-S1	Q170MCPU		
	Communication speed		peed 50Mbps				
	Standard cable		Up to 20m (65.62ft.) between stations				
	Transmission		Maximum overall o	listance 320m (1049.87ft.) (20m (65.62ft.) ×16 axes)		
	distance	Long distance	Up	to 50m (164.04ft.) between static	ons		
ᆙ		cable	Maximum overall di	stance 800m (2624.67ft.) (50m (1	64.04ft.) ×16 axes)		
SSCNET	Servo amplifier		MR-J3-□B, MR-J3W-□ MR-J3-□B-RJ006, N MR-J3-□B Safety, MI VCII (CKD NIKKI DENSO),	MR-J3-□B-RJ080W, R-MT1200, FR-A700,	MR-J3-□B, MR-J3W-□B,		
	Communication speed		150Mbps		,		
	Transmission distance Ung distance Long distance cable Servo amplifier		Up to 20m (65.62ft Maximum overall dista (20m (65.62f	nce 320m (1049.87ft.)			
H/目LIN			Up to 100m (328.08) Maximum overall distar (100m (328.08)	nce 1600m (5249.34ft.)	Unusable		
IDSS			MR-J5-□B, MR-J5-□ MR-J4-□B, MR-J4-□ MR-JE-□B, MR-JI VCII (CKD NIKKI DENSO), AlphaStep/5-phase (0 IAI driver for elec	ÜB-RJ, MR-J5W-□B, ÜB-RJ, MR-J4W-□B, E-□BF, FR-A800, VPH (CKD NIKKI DENSO), DRIENTAL MOTOR),			

⁽Note-1): Occupies 8 slots of the main base unit as empty slots.

When connecting the manual pulse generator, you can use only 1 module.

⁽Note-2): When using the incremental synchronous encoder (while using SV22), you can use the listed number of modules.

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

(a) Comparison of Motion control specifications

Item		Q170MSCPU	Q170MSCPU-S1	Q170MCPU		
Number of control a	axes		Up to 16 axes			
14diffiber of control a		·				
	S\/13	0.22ms/ 1 to 4 axes 0.44ms/ 5 to 10 axes		0.44ms/ 1 to 6 axes		
SV13 Operation cycle		0.88ms/11 to		0.88ms/ 7 to 16 axes		
(default)		0.00113/1110	10 axes	0.44ms/ 1 to 4 axes		
(delauit)	SV22	0.44ms/ 1 to	6 axes	0.44ms/ 1 to 4 axes 0.88ms/ 5 to 12 axes		
	3722	0.88ms/ 7 to 1	16 axes	1.77ms/13 to 16 axes		
Internalation function		Linear interpolation (Linear Agya	a) Circular interpolation (2 ave			
Interpolation function	JIIS	Linear interpolation (Up to 4 axe	es), Circular interpolation (2 axe	, , , ,		
		DTD (D : 11 D : 1)		PTP (Point to Point) control,		
		PTP (Point to Point) cont	·	Speed control, Speed-position		
		Speed-position switching cor	•	switching control, Fixed-pitch feed,		
		Constant speed control, Pos	•	Constant speed control,		
Control modes		Speed control with fixe	ed position stop,	Position follow-up control, Speed		
		Speed switching control, High-		control with fixed position stop,		
		Speed torque control, Synchronous	s control (SV22 (Virtual mode	Speed switching control,		
		switching method/Advanced syn	chronous control method))	High-speed oscillation control,		
				Synchronous control (SV22)		
Acceleration/decele	eration control	Trapezoidal accelera	tion/deceleration, S-curve acce	eleration/deceleration,		
Acceleration/decele	eration control	Advand	ced S-curve acceleration/decel	eration		
Compensation		Backlash compensa	ation, Electronic gear, Phase co	ompensation (SV22)		
Programming langu	ıage	Motion SFC, Dedicated instruction, Mechanical support language (SV22) (Note-1)				
Servo program cap	acity	16k steps				
Number of position	ing points	3200 points (Positioning data can be designated indirectly)				
US	B/RS-232	PLC CPU area control				
Peripheral I/F	RIPHERAL I/F	Motion CPU area control				
, , , , , , , , , , , , , , , , , , ,	CH TIETO CE I/I		Motor of o dred control	Proximity dog method (2 types),		
		Proximity dog method (2 types)	Count method (3 types)	Count method (3 types),		
		Data set method (2 types),		Data set method (2 types),		
		Stopper method (2 types), Limit	_	Dog cradle method,		
Home position retu	rn function	Scale home position signa		Stopper method (2 types),		
Tiorne position reta	iii idilololi	Dogless home position sign		Limit switch combined method,		
		Driver home position		Scale home position signal		
		[detection method		
		Home position return re-try function provided, home position shift function provided				
JOG operation fund	ction	Provided				
Manual pulse gene		Possible to connect 3 modules (Q173DPX use)				
operation function		Possible to con	nect 1 module (Internal I/F use) (Note-2), (Note-3)		
				Possible to connect 8 modules		
0	4	Possible to connect 12 modu	iles (SV22 use) (Note-5)	(SV22 use) ^(Note-4)		
Synchronous enco	der operation	(Q173DPX + Internal I/F -	+ VIA device ('************************************	(Q173DPX + Internal I/F)		
function		+ Via servo amplifier		ABS synchronous encoder		
		ABS synchronous en	coder unusable	unusable		
M-code function		M-code output function	n provided, M-code completion	wait function provided		
	0) (40	Number of output po				
	SV13	Watch data: Motion contro	•			
		Virtual mode switching method:				
Limit switch output		Number of output points	s 32 points	Number of output points 32 points		
function		Advanced synchronous control r		Watch data: Motion control data/		
	SV22	Number of output points		Word device		
		Output timing compensation	·			
		Watch data: Motion control data	/vvoia aevice			

Comparison of Motion control specifications (continued)

Ite	em	Q170MSCPU	Q170MSCPU-S1	Q170MCPU		
ROM operation	function		Provided			
Fortament in most eigenent		Q172DLX, External input signals (FLS/RLS/DOG) of servo Q172DLX or External input signals				
External input si	yriai ———————————————————————————————————	amplifier, Internal	amplifier, Internal I/F (DI), Bit device (FLS/RLS/DOG) of servo amplifier,			
High-speed read (Note-6)	ling function	Via interr	nal I/F/input module, Via tracking o	of Q173DPX		
Forced stop		Motion controller forced stop (El	MI connector, system setting), For	rced stop terminal of servo amplifier		
		Total 25	6 points	Total 256 points		
Number of I/O p	oints	(Internal I/F (Input 4 points, C	Output 2 points) + I/O module	(Internal I/F (Input 4 points,		
		+ Intelligent fur	nction module)	Output 2 points) + I/O module)		
Mark detection f	unction		Provided			
Clock data settir	ng	Cloc	ck synchronization between Multip	e CPU		
Security function	1	Provided (Protection by softw	are security key or password)	Provided (Protection by password)		
All clear function	1		Provided			
Remote operation	pn	R	emote RUN/STOP, Remote latch	clear		
Optional data	SSCNETII	Up to 3 data	a/axis (Communication data: Up to	o 3 points/axis)		
monitor function	SSCNETII/H	Up to 6 data/axis (Communica	ation data: Up to 6 points/axis)	None		
		Mation buffering method (Deal ti	Motion buffering method (Real-			
Digital oscillosco	pe function	Motion buffering method (Real-ti Sampling data: Wo	time waveform can be displayed)			
		Sampling data. Wo	Sampling data: Word 4CH, Bit 8CH			
		Made compatible by setting battery to servo amplifier.				
Absolute position	n system	(No battery required when a servo motor with a batteryless absolute position encoder is used)				
	Г	(Possible to select the absolute data method or incremental method for each axis)				
SSCNETIII communication	Communication type	SSCNETII/H, SSCNETII		SSCNETII		
(Note-8)	Number of lines	1 line ⁽	1 line			
Driver communic (Note-10)	cation function	Provided		None		
Number of	Q172DLX	2 module	es usable	2 modules usable		
Motion related modules	Q173DPX	4 modules us	eable (Note-11)	3 modules usable (Note-11)		
		Interrupt module, Input i	module, Output module,	Interrupt module, Input module,		
DI C module whi	ch can be control	Input/Output composite mod		Output module,		
by Motion CPU		Analogue output module, An	alogue input/output module,	Input/Output composite module,		
by Motion CFO	(alea)	High-speed counter mod	lule, Positioning module,	Analogue input module,		
		Simple Motion module, Contro	ol unit of displacement sensor	Analogue output module		
Number of SSCI	NETⅢ/H head	Up to 4 stat	ions usable	Unusable		
module connecti	on stations	Op 10 4 3tat	TO TO GOODIO	Ondodolo		
Number of optical	al hub unit	Up to 16 u	nits usable	Unusable		
connections						

- (Note-1): SV22 virtual mode only.
- (Note-2): When the manual pulse generator is used via the Q170MSCPU's internal I/F, the Q173DPX cannot be used.
- (Note-3): When the operation cycle is 7.11ms or less, the manual pulse generator I/F built-in CPU can be used.
- (Note-4): Any incremental synchronous encoder connected to the Q170MSCPU's internal I/F will automatically be assigned an Axis No. one integer greater than the number of encoders connected to any Q173DPX modules.
- (Note-5): SV22 advanced synchronous control only.
- (Note-6): Servo amplifier (MR-J5(W)-□B/MR-J4(W)-□B) only.
 - Refer to "Q173DSCPU/Q172DSCPU Motion controller Programming Manual (Advanced Synchronous Control)" for details on encoders that can be used as a synchronous encoder axis.
- (Note-7): This cannot be used in SV22 advanced synchronous control of Q17MSCPU/Q170MSCPU-S1.
- (Note-8): The servo amplifiers for SSCNET cannot be used.
- (Note-9): SSCNETⅢ and SSCNETⅢ/H cannot be combined within the same line.
- (Note-10): Servo amplifier (MR-J5-\B/MR-J4-\B/MR-J3-\B) only.
- (Note-11): When using the incremental synchronous encoder (while using SV22), you can use the listed number of modules. When connecting the manual pulse generator, you can use only 1 module.

(b) Comparison of Motion SFC performance specifications

	Item		Q170MSCPU(-S1)	Q170MCPU	
Motion SFC program	Code total (Motion SFC	C chart + Operation control	652k bytes	543k bytes	
capacity	+ Transition) Text total		668k bytes	484k bytes	
		control + Transition) Motion SFC programs	256 (No.	0 to 255)	
		chart size/program	Up to 64k bytes (Included M	,	
		Motion SFC steps/program	, ,	94 steps	
Motion SFC program	Number of s	elective branches/branch	25	55	
	Number of p	parallel branches/branch	25	55	
	Parallel brar	nch nesting	Up to 4	levels	
	Number of c	peration control programs	4096 with F(Once execution typ combined. (F/FS	e) and FS(Scan execution type) S0 to F/FS4095)	
	Number of to	ransition programs	4096(G0 t	to G4095)	
	Code size/p	rogram	Up to approx. 64k t	oytes (32766 steps)	
	Number of b	locks(line)/program	Up to 8192 blocks (in the c	ase of 4 steps(min)/blocks)	
	Number of c	haracters/block	Up to 128 (comment included)		
		perand/block	Up to 64 (operand: constants, word device, bit devices)		
	() nesting/bl	ock	Up to 32 levels		
	Descriptive expression	Operation control program	Calculation expression, bit conditional expression, branch/repetition processing		
		Transition program	Calculation expression/bit conditional expression/ comparison conditional expression		
		Binary operation	=, +, -, *, /, %		
		Bit operation	~, &, , ^, >>, <<		
Operation control program (F/FS)		Standard function	SIN, COS, TAN, ASIN, ACOS, ATAN, SQRT, LN, EXP, ABS, F FIX, FUP, BIN, BCD		
/ Titi		Type conversion	SHORT, USHORT, LONG, ULONG, FLOAT, UFLOAT, DFLT, SFLT		
Transition program (G)		Bit device status	(None), !		
(G)		Bit device control	SET, RST, DOUT, DIN, OUT		
		Logical operation	(None), !, *, +		
		Comparison operation	==, !=, <,	<=, >, >=	
	Instruction	Motion dedicated function	CHGV, CHGVS ^(Note-1) , CHGT, CHGT2, CHGP	CHGV, CHGT	
		Others	EI, DI, NOP, BMOV, FMOV, MULTW, MULTR, TO, FROM, RTO, RFROM, TIME	EI, DI, NOP, BMOV, FMOV, MULTW, MULTR, TO, FROM, TIME	
		Vision system dedicated		MVPST, MVIN, MVOUT, MVFIN,	
		function		E, MVCOM	
		Data control	SCL, DSCL		
		Program control		SE - SEND, FOR - NEXT, BREAK	
		Synchronous control dedicated function	CAMMIK, CAMPSOI	_	
		ueulcateu iuriction	CAMMK, CAMPSCL		

Comparison of Motion SFC performance specifications (continued)

	Item			Q170MSCPU(-S1) Q170MCPU		
	Number of multi execute programs		programs	Up to 256		
	Number of I	multi active s	teps	Up to 256 steps/all programs		
		Normal tasl	<	Execute in main cycl	e of Motion controller	
				Execute in fixed cycle	Execute in fixed cycle	
		Event task	Fixed cycle	(0.22ms, 0.44ms, 0.88ms, 1.77ms,	(0.44ms, 0.88ms, 1.77ms, 3.55ms,	
Execute specification	Tura susta al	(Execution		3.55ms, 7.11ms, 14.2ms)	7.11ms, 14.2ms)	
	Executed	can be	External	Executed by turning ON the inputs	set as the event task factor among	
	task	masked.)	interrupt	interrupt module Ql	60's 16 input points.	
			PLC interrupt	Execute with interrupt instru	ction (D(P).GINT) from PLC.	
	NIMI took			Executed by turning ON the inputs set as the NMI task factor among		
NIVII		NMI task		interrupt module Ql60's 16 input points.		
Number of I/O points (2	X/Y)			8192 points		
				Total 256 points		
Number of real I/O pair	nto (DV/DV)			(Internal I/F (Input 4 points, Output	256 points	
Number of real I/O poil	nis (PA/PT)			2 points) + I/O module + Intelligent	256 points	
				function module)		
	Internal rela	ıys (M)		12288 points		
	Link relays	(B)		8192 points		
Number of devices	Annunciato	rs (F)		2048 points		
(Device In the Motion	Special rela	ıys (SM)		2256	points	
CPU (area) only)	Data registe	ers (D)		8192 points (Note-2)	8192 points	
(Included the	Link registe	rs (W)		8192	points	
positioning dedicated	dedicated Special registers (SD)		2256	points		
device)	Motion regis	sters (#)		12288 points		
	Coasting tin	ners (FT)		1 point	(888µs)	
		U area devic	es (U□\G)	Up to 14336 points usable (Note-3)		

(Note-1): SV22 advanced synchronous control only

(Note-2): 19824 points can be used for SV22 advanced synchronous control. (Note-3): Usable number of points changes according to the system settings.

(c) Comparison of Mechanical system program specifications

	Item		Q170	MSCPU(-S1)	Q	170MCPU	
	Drive module	Virtual servo motor			0.0		
	Drive module	Synchronous encoder		pul	<u> </u>		
Control units		Roller		mm,	to all		
Control units	Output	Ball screw			Inch		
	module	Rotary table		deg	ree		
		Cam	mm, inc	ch, degree, pulse	mm	, inch, pulse	
Program language		Dedicated	instructions (Servo progr	am + mechanica	al system program)		
	Drive module	Virtual servo motor	16	Total 28	16	Total 24	
	Drive module	Synchronous encoder	12	TOTAL 20	8	TOTAL 24	
		Virtual main shaft	16	[16		
	Virtual axis	Virtual auxiliary input axis	16	Total 32	16	Total 32	
		Gear	32		32		
modules	Direct clutch	20		32			
	T	Smoothing clutch	32		32		
which can be	Transmission module	Speed change gear	32		32		
set per CPU	module	Differential gear	16		16		
		Differential gear to main shaft	16		16		
		Roller	16		16		
	Output	Ball screw	16	Total 16	16	Total 16	
	module	Rotary table	16	Total To	16	Total To	
		Cam	16		16		
		Types		Up to 25			
		Resolution per cycle		256, 512, 1024	1, 2048 ^(Note-1)		
		Memory capacity		132k	bytes		
Cam		Storage memory for cam data		CPU internal I	RAM memory		
		Stroke resolution		327	767		
		Control mode		Two-way car	n, Feed cam		

(Note-1): Relation between a resolution per cycle of cam and type are shown below.

Resolution per cycle	256	512	1024	2048
Туре	256	128	64	32

(3) Comparison of PLC CPU area control and performance

	Item	Q170MSCPU	Q170MSCPU-S1	Q170MCPU	
		Q03UDCPU or	Q06UDHCPU or	Q03UDCPU or equivalent	
PLC CPU area		equivalent (30k steps) equivalent (60k steps) (20k steps)			
Control method		Stored program repeat operation			
I/O control mode		Refresh mode			
Sequence control languaç	ge		nguage (ladder), logic sym (SFC), MELSAP-L, Struct	:	
	LD instruction	0.02 µs	0.0095 µs	0.02 µs	
Processing speed	MOV instruction	0.04 µs	0.019 µs	0.04 µs	
(sequence instruction)	PC MIX value (instruction/µs)	28	60	28	
,	Floating point addition	0.12 µs	0.057 µs	0.12 µs	
Total number of instructio		*: :=	858	, = p	
Operation (floating point of			Yes		
Character string processing			Yes		
PID instruction	.gea deae		Yes		
Special function instruction	n (Trigonometric function		100		
square root, exponential of	• -		Yes		
Constant scan	,	0.5 to 20	00ms (Setting available in	0.5ms unit.)	
		30k steps	60k steps	20k steps	
Program capacity		(120k bytes)	(240k bytes)	(80k bytes)	
	QCPU standard memory	8k bytes			
CPU shared memory	Multiple CPU high speed		201, 5, 4, -		
transmission area		32k bytes			
No. of I/O device points ()	(/Y)	8192 points			
		512 points (Up to 320 points (64			
No. of I/O points (X/Y)					
, ,		points × 5 modules) usable with I/O modu			
Internal relay (M)			8192 points	,	
Latch relay (L)			8192 points		
Link relay (B)]		8192 points		
Timer (T)			2048 points		
Retentive timer (ST)			0 points		
Counter (C)	Points by default		1024 points		
Data register (D)	(changeable by parameters)		12288 points		
Link register (W)			8192 points		
Annunciator (F)			2048 points		
Edge relay (V)]		2048 points		
Link special relay (SB)			2048 points		
Link special register (SW)			2048 points		
File register (R, ZR)		98304 points	393216 points	98304 points	
Step relay (S)		·	8192 points		
Index register/Standard d	evice register (Z)		20 points		
Index register (Z)		Up to 10 points (Z0 to Z18)			
(32-bit modification specification of ZR device)		(Index register (Z) is used in double words.)			
Pointer (P)		4096 points			
Interrupt pointer (I)		256 points			
Special relay (SM)			2048 points		
Special register (SD)			2048 points		
		·			
Function input (FX)			16 points		

Comparison of PLC CPU area control and performance (continued)

			-	<u> </u>	
	Item	Q170MSCPU	Q170MSCPU-S1	Q170MCPU	
Function register (FD)		5 points			
Local device			Yes		
Device initial values			Yes		
	Ni mahamat audamaian	7 extensions (Up t	to 64 slots) ^(Note-1)	1 extension	
	Number of extension	(Q52B/Q55B/Q63B/Q65	B/Q68B/Q612B usable)	(Q52B/Q55B usable)	
Extension base unit	GOT bus connection	No restriction		Extension base unit use: Connection after the extension base unit of stage 1 Extension base unit not use: Direct bus connection to Motion controller	
PLC type when program i	PLC type when program is made by GX Works2		Q06UDHCPU	Q03UDCPU	
Motion dedicated PLC instruction		Q03UDCPU Q06UDHCPU D(P).DDRD, D(P).DDWR, D(P).SFCS, D(P).SVST, D(P).CHGT, D(P).CHGT2, D(P).CHGV, D(P).CHGVS (Note-2), D(P).CHGA, D(P).CHGAS (Note-2), D(P).GINT		D(P).DDRD, D(P).DDWR, D(P).SFCS, D(P).SVST, D(P).CHGT, D(P).CHGT2, D(P).CHGV, D(P).CHGA, D(P).GINT	

(Note-1): Occupies 8 slots of the main base unit as empty slots. (Note-2): SV22 advanced synchronous control only

1.3 Restrictions by the Software's Version

There are restrictions in the function that can be used by the version of the operating system software and programming software.

The combination of each version and a function is shown in Table 1.1.

Table 1.1 Restrictions by the software's version

	Operating system	Programming software version		0 11 6
Function	software version (Note-1), (Note-2)	MELSOFT MT Works2 (MT Developer2)	MR Configurator2	Section of reference
Servo driver VCII series manufactured by CKD Nikki Denso Co., Ltd. (SSCNETIII/H)	00D	1.56J	_	(Note-3)
Servo amplifier via synchronous encoder	00D	1.66U	1.23Z	(Note-4)
Driver communication function (SSCNETⅢ/H)	00D	1.66U	1.23Z	(Note-5)
Optical hub unit	00F	_	-	(Note-3)
Home position return of driver home position return method	00H	1.118Y	-	(Note-3)
Stepping motor module AlphaStep/5-phase manufactured by ORIENTAL MOTOR Co., Ltd.	00H	1.118Y	_	(Note-3)
Servo driver VPH series manufactured by CKD Nikki Denso Co., Ltd.	00H	1.118Y	1	(Note-3)
IAI electric actuator controller manufactured by IAI Corporation	00H	1.118Y	_	(Note-3)
Inverter FR-A800 series	00J	1.118Y		(Note-3)
Improvement of absolute positioning operation for servo driver VCII/VPH series manufactured by CKD Nikki Denso Co., Ltd., and stepping motor module AlphaStep/5-phase manufactured by ORIENTAL MOTOR Co., Ltd.	00L	_	Н	(Note-3)
DOG/CHANGE signal input method support	00Y	1.170C	<u> </u>	(Note-5)
Servo amplifier MR-J5(W)-□B support	0AA	1.187V	1.145B	
Servo amplifier MR-JE-⊡B support	0AA	1.187V	1.145B	
Mark detection signal input method support	0AB	1.190Y	_	(Note-5)
Fixed cycle system processing time monitor	0AB	_	_	(Note-5)

—: There is no restriction by the version.

⁽Note-1): SV13/SV22 is the completely same version.

⁽Note-2): The operating system software version can be confirmed via MT Developer2 or GX Works2. (Refer to Section 2.2 or Section 2.3(6).)

⁽Note-3): Q173D(S)CPU/Q172D(S)CPU Motion controller (SV13/SV22) Programming Manual (REAL MODE)

⁽Note-4): Q173DSCPU/Q172DSCPU Motion controller (SV22) Programming Manual (Advanced Synchronous Control)

⁽Note-5): Q173D(S)CPU/Q172D(S)CPU Motion controller Programming Manual (COMMON)

1.4 Programming Software Version

The programming software versions that support Motion controller are shown below.

Motion controller	MELSOFT MT Works2 (MT Developer2) SV13/SV22	MR Configurator2	
Q170MSCPU	4.501	1.19V	
Q170MSCPU-S1	1.56J		

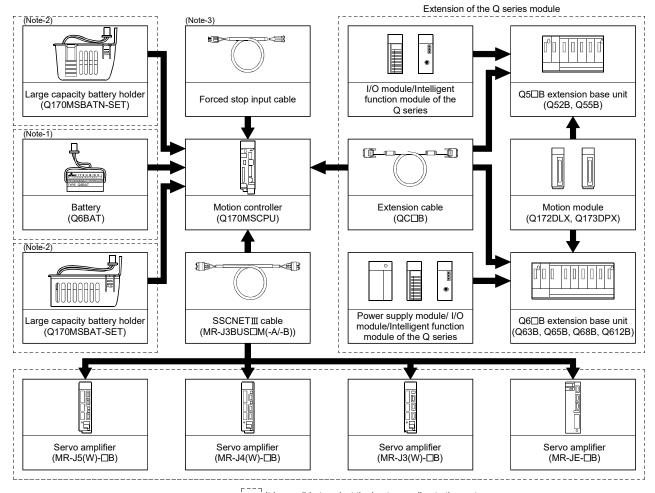
MEMO	

2. SYSTEM CONFIGURATION

This section describes the Motion controller (Q170MSCPU) system configuration, precautions on use of system and configured equipments.

2.1 Motion System Configuration

(1) Equipment configuration in Q170MSCPU system



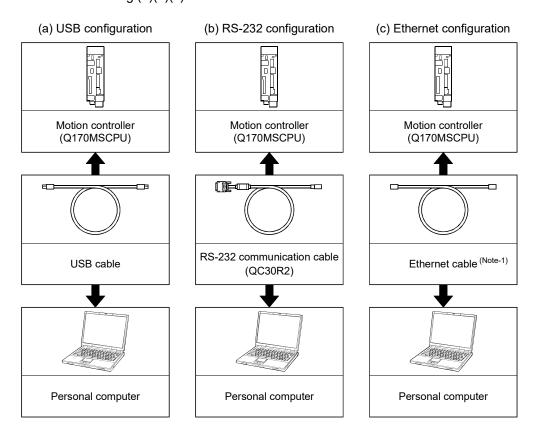
 $[\]begin{tabular}{l} \begin{tabular}{l} \begin{tabu$

⁽Note-1): Be sure to install the Battery (Q6BAT) to the Battery holder. (It is packed together with Q170MSCPU.)

⁽Note-2): Large capacity battery use (Q7BATN/Q7BAT is included), sold separately.

⁽Note-3): Fabricate the forced stop input cable on the customer side.

(2) Peripheral device configuration for the Q170MSCPU The following (a)(b)(c) can be used.



(Note-1): Corresponding Ethernet cables

[Selection criterion of cable (Common for 10BASE-T and 100BASE-TX)]

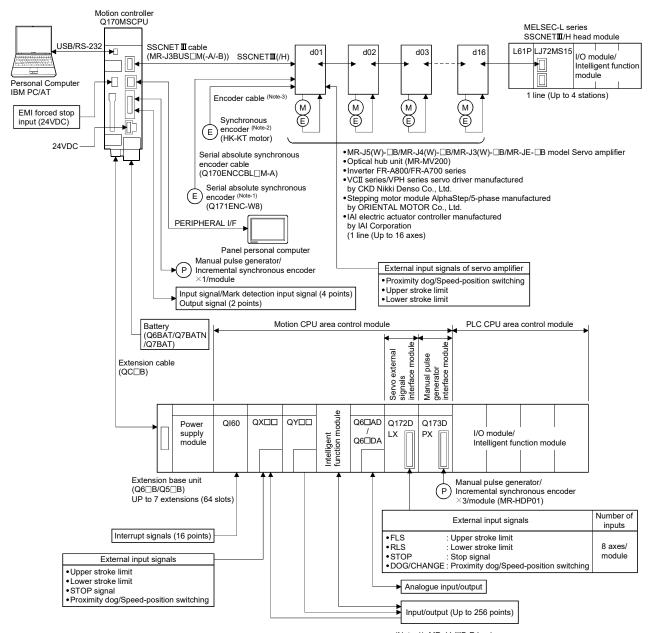
Category : 5 or higherDiameter of lead : AWG26 or higher

• Shield : Copper braid shield and drain wire (STP cable)

Copper braid shield and aluminium layered type shield (STP cable)

• Cable type : Crossover cable, Straight cable

2.1.1 Q170MSCPU System overall configuration



(Note-1): MR-J4-□B-RJ only

(Note-2): MR-J5(W)-□B only

(Note-3): Refer to the servo amplifier (MR-J5(W)-□B) user's manuals for supported encoder cables.

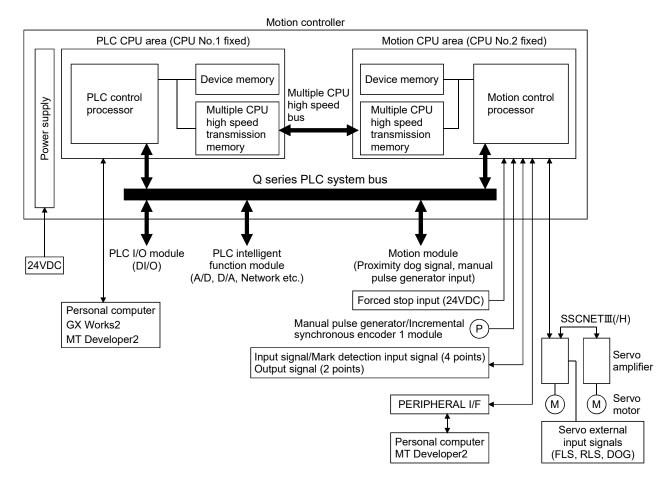
∆ CAUTION

- 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 servo motor) used in a system must be compatible with the Motion controller, servo amplifier and servo motor.
- Set the parameter values to those that are compatible with the Motion controller, servo amplifier, servo motor and regenerative resistor model and the system application. The protective functions may not function if the settings are incorrect.

2.1.2 Q170MSCPU System internal configuration

(1) What is Multiple CPU system for Q170MSCPU?

A Multiple CPU system for Q170MSCPU is a system in which the PLC CPU area and Motion CPU area are connected with the Multiple CPU high speed bus in order to control the I/O modules and intelligent function modules. PLC CPU area is fixed as CPU No.1, and Motion CPU area is fixed as CPU No.2. In addition, the Motion CPU area controls the servo amplifiers connected by SSCNETII cable.



- (a) The device memory is the memory area for the bit devices (X, Y, M, etc.) and word devices (D, W, etc.).
- (b) The Multiple CPU high speed transmission memory between the PLC CPU area and Motion CPU area can be communicated at 0.88ms cycles.

2.1.3 Function explanation of the Q170MSCPU Motion controller

(1) Whole

- (a) The Multiple CPU high speed bus is equipped with between the PLC CPU area and Motion CPU area. With this reserved Multiple CPU high speed bus, data transfer of 0.88ms period is possible for up to 14k words.
- (b) Data transfer between the PLC CPU area and Motion CPU area is possible by Multiple CPU high speed transmission memory or automatic refresh.
- (c) The Multiple CPU high speed transmission cycle is synchronized with the motion control cycle thus optimizing the control system.

(2) PLC CPU area

- (a) The I/O modules, analog I/O modules, pulse I/O modules, positioning modules, information modules and network can be controlled with the sequence program.
- (b) The device data access and program start of the Motion CPU area can be executed by the Motion dedicated PLC instructions.
- (c) The real-time processing can be realized by the Multiple CPU synchronous interrupt program.

(3) Motion CPU area

- (a) Up to 16 axes servo amplifiers per 1 line can be controlled in Q170MSCPU.
- (b) It is possible to set the program which synchronized with the motion operation cycle and executed at fixed cycle (0.22[ms], 0.44[ms], 0.88[ms], 1.77[ms], 3.55[ms], 7.11[ms], 14.2[ms]).
- (c) It is possible to execute a download of servo parameters to servo amplifier, servo ON/OFF to servo amplifier and position commands, etc. by connecting between the Q170MSCPU and servo amplifier with SSCNETII cable.
- (d) It is possible to select the servo control functions/programming languages by installing the corresponding operating system software in the Q170MSCPU.
- (e) Motion modules (Q172DLX/Q173DPX) are controlled with the Motion CPU area, and the signals such as stroke limit signals connected to Motion modules and incremental synchronous encoder (Note-1) can be used as motion control.
- (f) The synchronous control can be executed by using the incremental synchronous encoder (Note-1) (up to 12 axes). The incremental synchronous encoder (1 axis) can also be used with Q170MSCPU's internal I/F.
- (g) The stroke limit signals and proximity dog signals connected to the servo amplifiers can be used for the motion control.

(Note-1): The incremental synchronous encoder can be used in SV22. It cannot be used in SV13.

- (h) I/O controls (DI 4 points, DO 2 points) built-in Q170MSCPU (Motion CPU area) can be realized.
- (i) I/O modules and intelligent function modules (excluding some modules) can be controlled with the Motion CPU area.
 (Refer to Section 2.3(2).)
- (j) Wiring is reduced by issuing the external signal (upper/lower stroke limit signal, proximity dog signal) via the servo amplifier.

2.1.4 Restrictions on Motion controller

- (1) Q170MSCPU Multiple CPU system is composed of the PLC CPU area (CPU No.1 fixed) and Motion CPU area (CPU No.2 fixed). Other CPU (CPU No.3, CPU No.4) cannot be set.
- (2) It takes about 10 seconds to startup (state that can be controlled) of Motion controller. Make a Multiple CPU synchronous startup setting suitable for the system.
- (3) Execute the automatic refresh of the Motion CPU area and PLC CPU area by using the automatic refresh of Multiple CPU high speed transmission area setting.
- (4) The Motion modules, I/O modules and intelligent function modules, etc. can be installed on the extension base unit only.
- (5) The CPU modules cannot be installed on the extension base unit.
- (6) The synchronous encoder interface module Q172DEX/Q172EX(-S1/-S2/-S3) cannot be used.
- (7) Be sure to control the Motion modules (Q172DLX, Q173DPX) with the Motion CPU area. They will not operate correctly if PLC CPU area is set by mistake.
- (8) Q172LX/Q173PX(-S1) for Q173HCPU(-T)/ Q172HCPU(-T)/Q173CPUN(-T)/Q172CPUN(-T)/Q173CPU/Q172CPU cannot be used.
- (9) Motion CPU area cannot be set as the control CPU of Graphic Operation Terminal(GOT).
- (10) Be sure to set the battery.
- (11) There are following methods to execute the forced stop input.
 - Use a EMI connector of Q170MSCPU.
 - Use a device set in the forced stop input setting of system setting.
- (12) Forced stop input for EMI connector of Q170MSCPU cannot be invalidated by the parameter.
 - When the device set in the forced stop input setting is used without use of EMI connector of Q170MSCPU, apply 24VDC voltage on EMI connector and invalidate the forced stop input of EMI connector.
- (13) Be sure to use the cable for forced stop input. The forced stop cannot be released without using it. Fabricate the forced stop input cable on the customer side.

(14) Set "SSCNETII/H" or "SSCNETII" for every line in the SSCNET setting of system setting to communicate with the servo amplifiers and SSCNET II(/H) compatible equipment.

The following shows the servo amplifiers and SSCNET**I**(/H) compatible equipment that can be used when "SSCNETII/H" and "SSCNETII" are set.

Servo amplifier/SSCNETⅢ(/H) compatible equipment		SSCNE	T setting
		SSCNETⅢ/H	SSCNETIII
	MR-J5(W)-□B V er.	0	×
0	MR-J4(W)-□B	0	O (Note-1)
Servo amplifier	MR-J3(W)-□B	×	0
	MR-JE-□B Ver.	0	×
Pulse conversion unit	MR-MT1200	×	0
lance of an	FR-A800 series Ver.	0	0
Inverter	FR-A700 series	×	0
SSCNETⅢ/H head module	LJ72MS15	0	×
Servo driver manufactured by CKD Nikki	VCII series Ver. ●	0	0
Denso Co., Ltd.	VPH series Ver.	0	0
Stepping motor module AlphaStep/5-phase ORIENTAL MOTOR Co., Ltd.	0	×	
IAI electric actuator controller manufactured by IAI Corporation.		0	×

O: Usable

X: Unusable

(Note-1): Operated in J3 compatibility mode

POINTS

It is possible to use different servo amplifiers on the same SSCNET **I**I/H line, but when high accuracy synchronization on the load side is needed for multiple axes such as for interpolation control or synchronous control, build a system using servo amplifiers of the same servo series.

Ver.!: Refer to Section 1.3 for the software version that supports this function.

(15) The following are restrictions for the communication type depending on the communication type and operation cycle settings being used.

Ou south a second	Communication type			
Operation cycle	SSCNETIII/H	SSCNETIII		
0.22ms	MR-J4W3-□B (software version A2 or earlier) cannot be used. (Note-1) One SSCNETⅢ/H head module per line can be set. MR-JE-□B and AlphaStep/5-phase cannot be used. (Note-2) Up to 2 axes per IAI electric actuator controller can be set. (Note-4)	The maximum number of control axes per line is four axes. Set the axis select rotary switch of the servo amplifier to "0 to 3". If the axis select rotary switch of servo amplifier is set to "4 to F", the servo amplifiers are not recognized. MR-J4W3-□B (software version A2 or earlier) cannot be used. (Note-1) MR-J3W-□B cannot be used. FR-A700 series, VCII series, and VPH series cannot be used. (Note-3)		
0.44ms	Two SSCNETIII/H head modules per line can be set. Up to 4 axes per IAI electric actuator controller can be set. (Note-4)	 The maximum number of control axes per line is eight axes. Set the axis select rotary switch of the servo amplifier to "0 to 7". If the axis select rotary switch of servo amplifier is set to "8 to F", the servo amplifiers are not recognized. 		
0.88ms or more	_	_		

-: No restriction

- (Note-1): MR-J4W3-□B (Software version A3 or later) supports operation cycle 0.22ms. However, when using operation cycle 0.22ms, some functions are restricted. Refer to the servo amplifier instruction manual for details.
- (Note-2): When MR-JE-□B or AlphaStep/5-phase are set in system settings, operation is carried out with operation cycle at 0.44ms.
- (Note-3): When FR-A700 series, VCII series, or VPH series is set in system settings, operation is carried out with operation cycle at 0.44ms.
- (Note-4): When the setting exceeds the number of control axes per controller, a major error (error code: 1350) occurs. Set the operation cycle as follows according to the number of control axes per controller.

Number of control axes per controller	Operation cycle
1 to 2 axes	0.22ms or more
3 to 4 axes	0.44ms or more
5 axes or more	0.88ms or more

- (16) If there is an axis which is not set at least 1 axis by system setting in applicable servo amplifier at MR-J5W-□B or MR-J4W-□B use, all axes connected to applicable servo amplifier and subsequent servo amplifiers cannot be connected. Set "Not used" to the applicable axis with a dip switch for the axis which is not used by MR-J5W-□B or MR-J4W-□B.
- (17) The module name displayed by "System monitor" "Product information list" of GX Works2 is different depending on the function version of Motion modules (Q172DLX, Q173DPX).

(Note): Even if the function version "C" is displayed, it does not correspond to the online module change.

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

(18) Use the Graphic Operation Terminal (GOT) that supports Q170MSCPU.

2.2 Checking Serial Number and Operating System Software Version

Checking for the serial number of Motion controller and Motion module, and the operating system software version is described below.

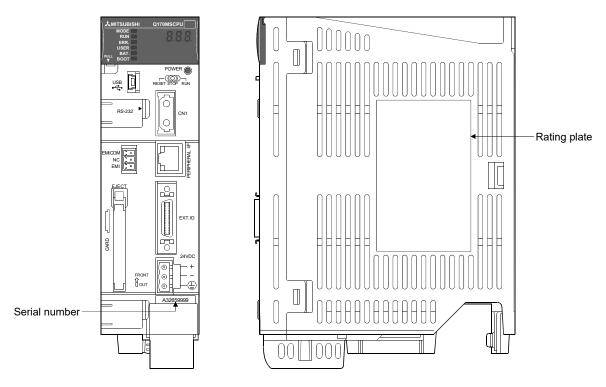
2.2.1 Checking serial number

(1) Motion controller (Q170MSCPU)

(a) Rating plate

The rating plate is situated on the side face of the Motion controller. The SERIAL line displays the Motion controller serial No.

(b) Front of the Motion controllerThe serial number is displayed on the front of the Motion controller.



(c) System monitor (product information list)

The serial number can be checked on the system monitor screen in GX Works2. (Refer to Section 2.2.2.)

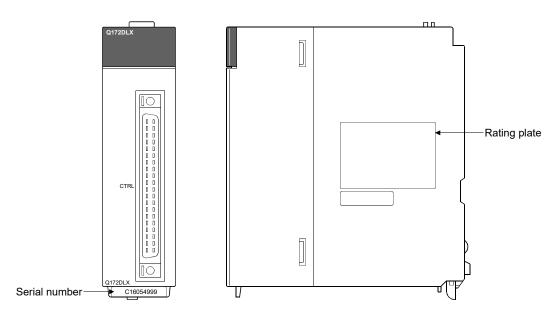
(2) Motion module (Q172DLX/Q173DPX)

(a) Rating plate

The rating plate is situated on the side face of the Motion module. The SERIAL line displays the Motion module serial No.

(b) Front of Motion module

The serial No. is displayed on the protruding portion situated on the lower front side of the Motion module.



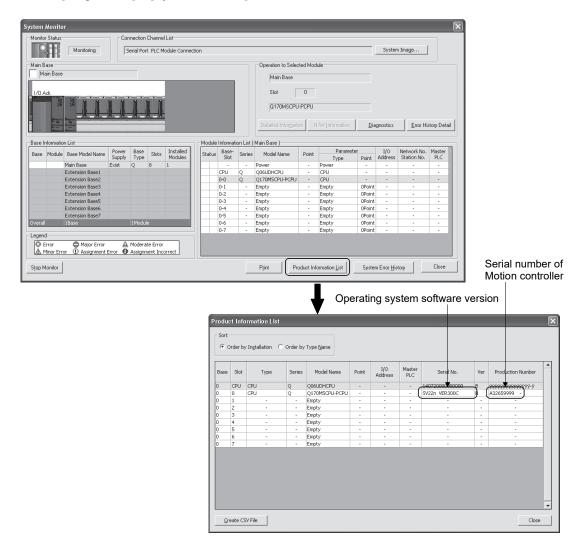
REMARK

The serial number display was corresponded from the Motion modules manufactured in early April 2008.

2.2.2 Checking operating system software version

The operating system software version can be checked on the system monitor screen in GX Works2.

The version can be checked on the product information list displayed by selecting the [Product Information List] button on the system monitor screen displayed through [Diagnostics] – [System monitor] in GX Works2.



2.3 System Configuration Equipment

(1) Motion controller related module

	ı			, t
Dort	Mandalana (Note-1)	5		D
Part name	Model name (Note-1)	Description	consumption	Remark
			5VDC[A]	
Motion controller	Q170MSCPU	Power supply, PLC CPU, Motion CPU, all-in-one type (Battery (Q6BAT), 24VDC power supply connector and connector for forced stop input cable (Note-2) are attached) • Motion CPU area Up to 16 axes control, Operation cycle 0.22[ms] or more, Servo program capacity 16k steps, Internal I/F (Incremental synchronous encoder interface 1ch, Input signal/Mark detection input signal 4 points, Output signal 2 points) • PLC CPU area Program capacity 30k steps, LD instruction processing speed 0.02µs	2.5 ^(Note-3)	
MOUOIT CONTIONE	Q170MSCPU-S1	Power supply, PLC CPU, Motion CPU, all-in-one type (Battery (Q6BAT), 24VDC power supply connector and connector for forced stop input cable (Note-2) are attached) • Motion CPU area Up to 16 axes control, Operation cycle 0.22[ms] or more, Servo program capacity 16k steps, Internal I/F (Incremental synchronous encoder interface 1ch, Input signal/Mark detection input signal 4 points, Output signal 2 points) • PLC CPU area Program capacity 60k steps, LD instruction processing speed 0.0095µs	2.5 ^(Note-3)	
Servo external signals interface module	Q172DLX	Servo external signal input 8 axes (FLS, RLS, STOP, DOG/CHANGE × 8)	0.06	
Manual pulse generator interface module	Q173DPX	Manual pulse generator MR-HDP01/Incremental synchronous encoder interface × 3, Tracking input 3 points		
Manual pulse generator	MR-HDP01	Pulse resolution: 25pulse/rev(100pulse/rev after magnification by 4) Permitted axial loads Radial load: Up to 19.6N Thrust load: Up to 9.8N Permitted speed: 200r/min(Normal rotation), Voltage-output		
Serial absolute synchronous encoder	Q171ENC-W8	Resolution: 4194304pulse/rev Permitted axial loads Radial load: Up to 19.6N, Thrust load: Up to 9.8N Permitted speed: 3600r/min		
Serial absolute synchronous encoder cable	Q170ENCCBL□M-A	Serial absolute synchronous encoder Q171ENC-W8 ↔ MR-J4-□B-RJ 2m(6.56ft.), 5m(16.40ft.), 10m(32.81ft.), 20m(65.62ft.), 30m(98.43ft.), 50m(164.04ft.)		
Connector set for serial absolute synchronous encoder cable	MR-J3CN2	MR-J4-□B-RJ side connector Plug : 36210-0100PL Shell : 36310-3200-008 Q171ENC-W8 side connector Plug : D/MS3106B22-14S Cable clamp: D/MS3057-12A		
Battery	Q6BAT	For memory data backup of the RAM built-in Motion controller Nominal current: 1800mAh		
Large capacity	Q7BATN	For memory data backup of the RAM built-in Motion controller Nominal current: 6000mAh		
battery Q7BAT For memory data backup of the RAM built- Nominal current: 5000mAh		For memory data backup of the RAM built-in Motion controller Nominal current: 5000mAh		

Motion controller related module (continued)

Part name	Model name (Note-1)	Description		Remark
Large capacity	Q170MSBATN-SET	Battery holder for Q7BATN (Attachment Q7BATN)		
battery holder	Q170MSBAT-SET	Battery holder for Q7BAT (Attachment Q7BAT)		
Internal I/F connector set	LD77MHIOCON	Incremental synchronous encoder/Mark detection signal interface connector (Not included with Q170MSCPU/Q170MSCPU-S1)		
	Q61P	100 to 240VAC input, 5VDC 6A output		
_	Q61P-D	100 to 240VAC input, 5VDC 6A output, life detection power supply		
Power supply module (Note-4)	Q62P	100 to 240VAC input, 5VDC 3A/24VDC 0.6A output		
module (Note-4)	Q63P	24VDC input, 5VDC 6A output		
	Q64PN	100 to 240VAC input, 5VDC 8.5A output		
	Q52B	Number of I/O modules installed 2 slots, does not require a power supply module	0.08	
Extension base	Q55B	Number of I/O modules installed 5 slots, does not require a power supply module	0.10	
unit (Note-5)	Q63B	Number of I/O modules installed 3 slots, requires a power supply module	0.11	
	Q65B	Number of I/O modules installed 5 slots, requires a power supply module	0.11	
	Q68B	Number of I/O modules installed 8 slots, requires a power supply module	0.12	
	Q612B	Number of I/O modules installed 12 slots, requires a power supply module	0.13	
	QC05B	Length 0.45m(1.48ft.)		
	QC06B	Length 0.6m(1.97ft.)		
	QC12B	Length 1.2m(3.94ft.)		
Extension cable	QC30B	Length 3m(9.84ft.)		
	QC50B	Length 5m(16.40ft.)		
	QC100B	Length 10m(32.81ft.)		
SSCNETⅢ	MR-J3BUS□M	 Q170MSCPU ↔ MR-J5(W)-□B, MR-J5(W)-□B ↔ MR-J5(W)-□B, MR-J5(W)-□B ↔ LJ72MS15 Q170MSCPU ↔ MR-J4(W)-□B, MR-J4(W)-□B ↔ MR-J4(W)-□B, MR-J4(W)-□B ↔ LJ72MS15 Q170MSCPU ↔ MR-J3(W)-□B, MR-J3(W)-□B ↔ MR-J3(W)-□B Q170MSCPU ↔ MR-JE-□B, MR-JE-□B ↔ MR-JE-□B, MR-JE-□B ↔ LJ72MS15 Standard cord for inside panel 0.15m(0.49ft.), 0.3m(0.98ft.), 0.5m(1.64ft.), 1m(3,28ft.), 3m(9.84ft.) 	_	
cable	MR-J3BUS□M-A	 Q170MSCPU ↔ MR-J5(W)-□B, MR-J5(W)-□B ↔ MR-J5(W)-□B, MR-J5(W)-□B ↔ LJ72MS15 Q170MSCPU ↔ MR-J4(W)-□B, MR-J4(W)-□B ↔ MR-J4(W)-□B, MR-J4(W)-□B ↔ LJ72MS15 Q170MSCPU ↔ MR-J3(W)-□B, MR-J3(W)-□B ↔ MR-J3(W)-□B Q170MSCPU ↔ MR-JE-□B, MR-JE-□B ↔ MR-JE-□B, MR-JE-□B ↔ LJ72MS15 Standard cable for outside panel 5m(16.40ft.), 10m(32.81ft.), 20m(65.62ft.) 		

Motion controller related module (continued)

Part name	Model name (Note-1)	Description	Current consumption 5VDC[A]	Remark
SSCNETⅢ cable	(14016-0)	 Q170MSCPU ↔ MR-J5(W)-□B, MR-J5(W)-□B ↔ MR-J5(W)-□B, MR-J5(W)-□B ↔ LJ72MS15 Q170MSCPU ↔ MR-J4(W)-□B, MR-J4(W)-□B ↔ MR-J4(W)-□B, MR-J4(W)-□B ↔ LJ72MS15 Q170MSCPU ↔ MR-J3(W)-□B, MR-J3(W)-□B ↔ MR-J3(W)-□B Q170MSCPU ↔ MR-JE-□B, MR-JE-□B ↔ MR-JE-□B, MR-JE-□B, MR-JE-□B ↔ LJ72MS15 Long distance cable 30m(98.43ft.), 40m(131.23ft.), 50m(164.04ft.) 		

(Note-1): □=Cable length

(015: 0.15 m (0.49 ft.), 03: 0.3 m (0.98 ft.), 05: 0.5 m (1.64 ft.), 1: 1 m (3.28 ft.), 2: 2 m (6.56 ft.), 3: 3 m (9.84 ft.), 5: 5 m (16.40 ft.), 10: 10 m (32.81 ft.), 20: 20 m (65.62 ft.), 25: 25 m (82.02 ft.), 30: 30 m (98.43 ft.), 40: 40 m (131.23 ft.), 50: 50 m (164.04 ft.))

- (Note-2): Be sure to use the cable for forced stop input. The forced stop cannot be released without using it. Cable for forced stop input is not attached to the Motion controller.
- (Note-3): The manual pulse generator or incremental synchronous encoder that consumes less than 0.2[A] of current can be connected to the internal I/F connector.
- (Note-4): Be sure to use the power supply module within the range of power supply capacity.
- (Note-5): 5VDC internal current consumption of shared equipments with PLC might be changed. Be sure to refer to the MELSEC-Q series PLC Manuals.
- (Note-6): Please contact your nearest Mitsubishi sales representative for the cable of less than 30m(98.43ft.).

(2) PLC module which can be controlled by Motion CPU area

	Part name		Model name	Current consumption 5VDC[A] (Note-1)	Remark
	AC		QX10	0.05 (TYP, All points ON)	
			QX10-TS	0.05 (TYP, All points ON)	
			QX28	0.05 (TYP, All points ON)	
			QX40	0.05 (TYP, All points ON)	
			QX40-TS	0.05 (TYP, All points ON)	
			QX40-S1	0.06 (TYP, All points ON)	
			QX40H	0.08 (TYP, All points ON)	
	DC (Positiv	e common)	QX41	0.075 (TYP, All points ON)	
			QX41-S1	0.075 (TYP, All points ON)	
			QX41-S2	0.075 (TYP, All points ON)	
			QX42	0.09 (TYP, All points ON)	
			QX42-S1	0.09 (TYP, All points ON)	
Input module	DC/AC		QX50	0.05 (TYP, All points ON)	
			QX70	0.055 (TYP, All points ON)	
	DO		QX70H	0.08 (TYP, All points ON)	
	DC sensor		QX71	0.07 (TYP, All points ON)	
			QX72	0.085 (TYP, All points ON)	
			QX80	0.05 (TYP, All points ON)	
			QX80-TS	0.05 (TYP, All points ON)	
			QX80H	0.08 (TYP, All points ON)	
	DO (No moti		QX81	0.075 (TYP, All points ON)	
	DC (Negati	ve common)	QX81-S2	0.075 (TYP, All points ON)	
			QX82	0.09 (TYP, All points ON)	Refer to the MELSEC-Q series PLC
			QX82-S1	0.09 (TYP, All points ON)	Manuals.
			QX90H	0.08 (TYP, All points ON)	
			QY10	0.43 (TYP, All points ON)	
	Relay		QY10-TS	0.43 (TYP, All points ON)	
			QY18A	0.24 (TYP, All points ON)	
	Triac		QY22	0.25 (TYP, All points ON)	
			QY40P	0.065 (TYP, All points ON)	
			QY40P-TS	0.065 (TYP, All points ON)	
		Cink Type	QY41P	0.105 (TYP, All points ON)	
		Sink Type	QY41H	0.37 (TYP, All points ON)	
Output module			QY42P	0.15 (TYP, All points ON)	
	Transistor		QY50	0.08 (TYP, All points ON)	
		Independent	QY68A	0.11 (TYP, All points ON)	
			QY80	0.08 (TYP, All points ON)	
		Cauraa Tuna	QY80-TS	0.08 (TYP, All points ON)	
		Source Type	QY81P	0.095 (TYP, All points ON)	
			QY82P	0.16 (TYP, All points ON)	
	TTL-CMOS	Cink)	QY70	0.095 (TYP, All points ON)	
TTL•CMOS (Sink)		o (SIIIK)	QY71	0.15 (TYP, All points ON)]
Input/Output	DO1 //		QH42P	0.13 (TYP, All points ON)	
composite	DC Input/ Transistor output		QX48Y57	0.08 (TYP, All points ON)]
module	Transistor (ναιραι	QX41Y41P	0.13 (TYP, All points ON)]
Interrupt module			QI60	0.06 (TYP, All points ON)	

PLC module which can be controlled by Motion CPU area (continued)

	Part name	Model name	Current consumption 5VDC[A] (Note-1)	Remark
	Voltage input	Q68ADV	0.64	
		Q62AD-DGH	0.33	
l	Current input	Q66AD-DG	0.42	
Analogue input module		Q68ADI	0.64	
module		Q64AD	0.63	
	Voltage/current input	Q64AD-GH	0.89	
		Q68AD-G	0.46	
	Voltage output	Q68DAVN	0.38	
	Current output	Q68DAIN	0.38	
Analogue output		Q62DAN	0.33	
module	Nathana lawananta aatawat	Q62DA-FG	0.37	Defends the MELOCO Consider DLO
	Voltage/current output	Q64DAN	0.34	Refer to the MELSEC-Q series PLC
		Q66DA-G	0.62	Manuals.
Analogue input/ou	ıtput module	Q64AD2DA	0.17	
I Balanca and	Differential input	QD62D	0.38	
High-speed counter module	5/12/24VDC input/ Differential input	QD65PD2	0.23	
		QD75P1	0.40	
	Open collector output	QD75P2	0.46	
		QD75P4	0.58	
		QD75D1	0.52	
Positioning	Differential output	QD75D2	0.56	
module		QD75D4	0.82	
		QD75MH1	0.15	Refer to the MELSEC-Q QD75MH
	SSCNETⅢ compatible	QD75MH2	0.15	Positioning Module User's Manual
		QD75MH4	0.16	(Details).
Simple Motion		QD77MS2	0.60	Refer to the MELSEC-Q QD77MS
	SSCNETⅢ/H compatible	QD77MS4	0.60	Simple Motion Module User's Manual
module		QD77MS16	0.75	(Positioning Control).
Control () it of all a	nlacement cor	UQ1-01	0.50	Refer to the manual of OPTEX FA
Control unit of dis	placement sensor	UQ1-02	0.50	CO., LTD.

(Note-1): 5VDC internal current consumption of shared equipments with PLC might be changed. Be sure to refer to the manuals of each module.

(3) PLC module which can be controlled by PLC CPU area

They are the same modules as the PLC modules which can be controlled by the universal model QCPU "Q03UDCPU (Q170MSCPU use)" or "Q06UDHCPU (Q170MSCPU-S1 use)".

Refer to the MELSEC-Q series PLC Manuals.

(4) SSCNETⅢ(/H) compatible equipment

(a) SSCNET**Ⅲ**/H compatible equipment

Part name	Model name	Description	Remarks
	MR-J5-□B		
MR-J5 series	MR-J5-□B-RJ		Refer to the servo amplifier
servo amplifier	MR-J5W2-□B	For 2-axis type	(MR-J5(W)-□B) user's manuals.
	MR-J5W3-□B	For 3-axis type	
	MR-J4-□B		
MR-J4 series	MR-J4-□B-RJ		Refer to the servo amplifier
servo amplifier	MR-J4W2-□B	For 2-axis type	(MR-J4(W)-□B) instruction manuals.
	MR-J4W3-□B	For 3-axis type	
MR-JE series	MR-JE-□B		Refer to the servo amplifier
servo amplifier	MR-JE-□BF		(MR-JE-□B) instruction manuals.
SSCNET H	L IZOMO45	Maximum link points: Input 64 bytes, Output 64 bytes	Refer to the MELSEC-L series PLC
head module	LJ72MS15	Transmission cycle: 0.222ms, 0.444ms, 0.888ms	manuals.
Ontical bub unit	MR-MV200	3 branches, 1 unit,	
Optical hub unit	IVIR-IVIV 200	24VDC power supply connector is attached	

(b) SSCNET**I** compatible equipment

Part name	Model name	Description	Remarks
	MR-J3-□B		
	MR-J3W-□B	For 2-axis type	
MR-J3 series	MR-J3-□B-RJ006	For fully closed control	Refer to the servo amplifier
servo amplifier	MR-J3-□B-RJ004	For linear servo motor	(MR-J3(W)-□B) instruction manuals.
	MR-J3-□B-RJ080W	For direct drive motor	
	MR-J3-□B Safety	For drive safety servo	

(5) Operating system software

Application	Software package	
Conveyor assembly use SV13	SW8DNC-SV13QN	
Automatic machinery use SV22	SW8DNC-SV22QN	

(Note-1): The operating system software (SV22 (Virtual mode switching method)) is installed at the time of product purchases.

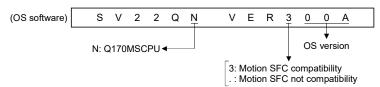
(6) Operating system type/version

(a) Confirmation method in MT Developer2

The operating system software type and version of connected CPU can be confirmed on the following screens.

- 1) Installation screen
- 2) CPU information screen displayed by menu bar [Help] \rightarrow [CPU Information]

Example) When using Q170MSCPU, SV22 and OS version 00A.



(7) Programming software packages

(a) Motion controller engineering environment

Part name	Model name	
MELSOFT MT Works2	SW1DND-MTW2-F	
(MT Developer2 (Note-1))	SVV IDIND-IVI I VVZ-E	

(Note-1): This software is included in Motion controller engineering environment "MELSOFT MT Works2".

(b) PLC software package

Model name	Software package
GX Works2	SW1DND-GXW2-E

(c) Servo set up software package

Model name	Software package	
MR Configurator2	SW1DNC-MRC2-E	

POINTS

When the operation of Windows[®] is unclear in the operation of this software, refer to the official Windows[®] manual or a guidebook from another supplier.

2.4 General Specifications

General specifications of the Motion controller are shown below.

Item	Specification					
Operating ambient temperature	0 to 55°C (32 to 131°F)					
Storage ambient temperature			-25 to 75°	°C (-13 to 167°F)		
Operating ambient humidity			5 to 95% R	H, non-condensing	9	
Storage ambient humidity			5 to 95% R	H, non-condensing	9	
			Frequency	Constant acceleration	Half amplitude	Sweep count
	Compliant with	intermittent	5 to 8.4Hz		3.5mm (0.14inch)	10 times each in
Vibration resistance	resistance JIS B 3502 and IEC 61131-2		8.4 to 150Hz	9.8m/s ²		X, Y, Z directions
			5 to 8.4Hz		1.75mm (0.07inch)	_
		vibration	8.4 to 150Hz	4.9m/s ²		
Shock resistance	Compliant v	with JIS B 3502	and IEC 61131-	2 (147m/s ² , 3 time	es in each of 3 dire	ections X, Y, Z)
Operating ambience	No corrosive gases					
Operating altitude (Note-1)	2000m(6561.68ft.) or less					
Mounting location	Inside control panel					
Overvoltage category (Note-2)	II or less					
Pollution level (Note-3)			2	2 or less		

- (Note-1): Do not use or store the Motion controller under pressure higher than the atmospheric pressure of altitude 0m. Doing so can cause an operation failure. When using the Motion controller under pressure, please contact with our sales representative.
- (Note-2): This indicates the section of the power supply to which the equipment is assumed to be connected between the public electrical power distribution network and the machinery within premises.
 - ${\bf Category} {\rm 1\!\!I applies} \ {\bf to} \ {\bf equipment} \ {\bf for} \ {\bf which} \ {\bf electrical} \ power \ {\bf is} \ {\bf supplied} \ {\bf from} \ {\bf fixed} \ {\bf facilities}.$
 - The surge voltage withstand level for up to the rated voltage of 300V is 2500V.
- (Note-3): This index indicates the degree to which conductive material is generated in terms of the environment in which the equipment is used.

Pollution level 2 is when only non-conductive pollution occurs. A temporary conductivity caused by condensing must be expected occasionally.

∆ CAUTION

- The Motion controller must be stored and used under the conditions listed in the table of specifications above.
- 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.

2.5 Specifications of Equipment

2.5.1 Q170MSCPU Motion controller

This section describes the specification of the Motion controller.

(1) Basic specifications of Q170MSCPU

	Item	Specification		
0.41/D0	Input voltage (Note-1), (Note-2)	21.6 to 26.4VDC (24VDC +/ -10%, ripple ratio 5% or less)		
24VDC power supply	Inrush current (Note-3)	100A 1ms or less (at 24VDC input)		
	Max. input current	1.4A		
5VDC internal power	Max. supplied current	4.5A (Included Q170MSCPU current consumption)		
supply	Q170MSCPU current consumption	2.5A (Note-6)		
Efficiency		80% (TYP)		
Input method		Connector		
Allowable momentary	power failure immunity (Note-4), (Note-5)	10ms (at 24VDC input)		
Mass [kg]		0.8		
Exterior dimensions [m	nm (inch)]	186 (7.32)(H) \times 52 (2.05)(W) \times 135 (5.31)(D)		

POINTS

(Note-1): Input power supply

Q170MSCPU is rated for use with a 24VDC input power only.

The Q170MSCPU breaks down when 28VDC or more input.

(Note-2): Select 24VDC power supply and electric wire within the range of 21.6 to 26.4VDC including any input ripple or spike voltage measured at the input connector of the Q170MSCPU.

(Note-3): Inrush current

Take care that the inrush current of several amperes may flow when the sharp square voltage is applied, or the power supply is turned ON with the mechanical switch. Turn ON the primary (AC side) of power supply.

When selecting a fuse and breaker in the external circuit, take account of the blow out, detection characteristics and above matters.

(Note-4): Allowable momentary power failure period

- (1) An instantaneous power failure lasting less than 10ms^(Note) will cause 24VDC down to be detected, but operation will continue.
- (2) An instantaneous power failure lasting in excess of 10ms^(Note) may cause the operation to continue or initial start to take place depending on the power supply load.

(Note): This is for a 24VDC input. This is 10ms or less for less than 24VDC.

- (Note-5): Select 24VDC power supply with allowable momentary power failure period of 20ms or more.
- (Note-6): The current consumption (0.2[A]) of manual pulse generator/incremental synchronous encoder connected to the internal I/F connector is not included.

(2) Motion control specifications/performance specifications

(a) Motion control specifications

Item		Specification				
Number of control axes		Up to 16 axes				
		0.22ms/ 1 to 4 axes				
	SV13	0.44ms/ 5 to 10 axes				
Operation cycle		0.88ms/ 11 to 16 axes				
(default)		0.44ms/ 1 to 6 axes				
	SV22	0.88ms/ 7 to 16 axes				
Interpolation fund	tions	Linear interpolation (Up to 4 axes), Circular interpolation (2 axes), Helical interpolation (3 axes)				
		PTP (Point to Point) control, Speed control, Speed-position switching control, Fixed-pitch feed,				
		Constant speed control, Position follow-up control, Speed control with fixed position stop,				
Control modes		Speed switching control, High-speed oscillation control, Speed-torque control,				
		Synchronous control (SV22 (Virtual mode switching method/Advanced synchronous control method))				
A + / -		Trapezoidal acceleration/deceleration, S-curve acceleration/deceleration,				
Acceleration/dec	eleration control	Advanced S-curve acceleration/deceleration				
Compensation		Backlash compensation, Electronic gear, Phase compensation (SV22)				
Programming lan	guage	Motion SFC, Dedicated instruction, Mechanical support language (SV22) (Note-1)				
Servo program c	apacity	16k steps				
Number of position	oning points	3200 points (Positioning data can be designated indirectly)				
Peripheral I/F		USB/RS-232 (PLC CPU area control), PERIPHERAL I/F (Motion CPU area control)				
		Proximity dog method (2 types), Count method (3 types), Data set method (2 types),				
		Dog cradle method, Stopper method (2 types), Limit switch combined method,				
Home position re	turn function	Scale home position signal detection method, Dogless home position signal reference method,				
		Driver home position return method				
		Home position return re-try function provided, home position shift function provided				
JOG operation function		Provided				
Manual pulse generator operation		Possible to connect 3 modules (Q173DPX use)				
function		Possible to connect 1 module (Q170MSCPU's internal I/F use) (Note-2), (Note-3)				
Synchronous end	coder operation	Possible to connect 12 modules (SV22 use, Incremental only) (Note-4)				
function		(Q173DPX + Internal I/F + Via device (Note-5) + Via servo amplifier (Note-5), (Note-6))				
M-code function	T	M-code output function provided, M-code completion wait function provided				
	SV13	Number of output points 32 points				
		Watch data: Motion control data/Word device				
Limit switch		Virtual mode switching method : Number of output points 32 points				
output function	SV22	Advanced synchronous control method : Number of output points 64 points × 2 settings				
		Output timing compensation				
ROM operation for	unation	Watch data: Motion control data/Word device				
		Provided O172DLY External input signals (ELS/DS/DOC) of convolutions Internal (ELS/D). Bit devices				
External input sig	,	Q172DLX, External input signals (FLS/RLS/DOG) of servo amplifier, Internal I/F (DI), Bit device				
High-speed read (Note-7)	ing function	Provided (Via internal I/F/input module, Via tracking of Q173DPX)				
Forced stop		Motion controller forced stop (EMI connector, System setting), Forced stop terminal of servo amplifier				
Number of I/O po	oints	Total 256 points				
	T	(Internal I/F (Input 4 points, output 2 points) + I/O module + Intelligent function module)				
	Mark detection	Continuous detection mode, Specified number of detection mode, Ring buffer mode				
	mode setting	,				
Mark detection function	Mark detection signal	Internal I/F (DI), Bit device				
Idilodoli	Mark detection					
	setting	32 settings				
Clock data setting		Clock synchronization between Multiple CPU				
Security function	-	Provided (Protection by software security key or password)				
All clear function		Provided				

Motion control specifications (continued)

Item		Specification		
Remote operation		Remote RUN/STOP, Remote latch clear		
Optional data SSCNETII/H		Up to 6 data/axis (Communication data: Up to 6 points/axis)		
monitor function	SSCNETⅢ	Up to 3 data/axis (Communication data: Up to 3 points/axis)		
Digital oscillosco	pe function	Motion buffering method (Real-time waveform can be displayed) Sampling data: Word 16CH, Bit 16CH		
Absolute position	ı system	Made compatible by setting battery to servo amplifier. (No battery required when a servo motor with a batteryless absolute position encoder is used) (Possible to select the absolute data method or incremental method for each axis)		
SSCNETIII communication	Communication type	SSCNETII/H, SSCNETII		
(Note-8)	Number of lines	1 line (Note-9)		
Driver communic (Note-10)	ation function	Provided		
Number of	Q172DLX	2 modules usable		
Motion related modules	Q173DPX	4 modules usable ^(Note-11)		
Number of SSCN module commun		Up to 4 stations usable		
Number of optical hub unit connections		Up to 16 units usable		

- (Note-1): SV22 virtual mode only.
- (Note-2): When the manual pulse generator is used via the Q170MSCPU's internal I/F, the Q173DPX cannot be used.
- (Note-3): When the operation cycle is 7.11ms or less, the manual pulse generator I/F built-in CPU can be used.
- (Note-4): Any incremental synchronous encoder connected to the Q170MSCPU's internal I/F will automatically be assigned an Axis No. one integer greater than the number of encoders connected to any Q173DPX modules.
- (Note-5): SV22 advanced synchronous control only.
- (Note-6): Servo amplifier (MR-J5(W)- \square B/MR-J4(W)- \square B) only.
 - Refer to "Q173DSCPU/Q172DSCPU Motion controller Programming Manual (Advanced Synchronous Control)" for details on encoders that can be used as a synchronous encoder axis.
- (Note-7): This cannot be used in SV22 advanced synchronous control of Q17MSCPU/Q170MSCPU-S1.
- (Note-8): The servo amplifiers for SSCNET cannot be used.
- (Note-9): SSCNETⅢ and SSCNETⅢ/H cannot be combined within the same line.
- (Note-10): Servo amplifier (MR-J5-□B/MR-J4-□B/MR-J3-□B) only.
- (Note-11): When using the incremental synchronous encoder (while using SV22), you can use the listed number of modules. When connecting the manual pulse generator, you can use only 1 module.

(b) Motion SFC performance specifications

ltom				Specification	
	Item		Specification		
	Code total (Motion SFC chart + Operation control			652k bytes	
Motion SFC program	+ Transition)			OOZIN SYNCE	
capacity	Text total			668k bytes	
	(Operation c		•	,	
	Number of M			256 (No.0 to 255)	
	Motion SFC			Up to 64k bytes (Included Motion SFC chart comments)	
Motion SFC program	Number of Motion SFC steps/program			Up to 4094 steps	
	Number of s			255	
	Number of p		nes/branch	255	
	Parallel bran	ch nesting		Up to 4 levels	
	Number of o	peration con	trol programs	4096 with F(Once execution type) and FS(Scan execution type) combined. (F/FS0 to F/FS4095)	
	Number of tr	ansition prog	ırams	4096 (G0 to G4095)	
Operation control progress	Code size/pr	ogram		Up to approx. 64k bytes (32766 steps)	
Operation control program (F/FS)	Number of b	locks(line)/pr	rogram	Up to 8192 blocks (in the case of 4 steps(min)/blocks)	
((((((((((((((((((((Number of c	haracters/blo	ock	Up to 128 (comment included)	
Transition program	Number of o	perand/block	(Up to 64 (operand: constants, word device, bit devices)	
(G)	() nesting/bl	ock		Up to 32 levels	
		Operation	control program	Calculation expression, bit conditional expression,	
	Descriptive	Operation control program		branch/repetition processing	
	expression	Transition program		Calculation expression/bit conditional expression/	
	Transition program			comparison conditional expression	
	Number of m	nulti execute	programs	Up to 256	
	Number of m	nulti active st	eps	Up to 256 steps/all programs	
		Normal task	1	Execute in main cycle of Motion controller	
		Event task	Fixed cycle	Execute in fixed cycle	
Execute specification		(Execution		(0.22ms, 0.44ms, 0.88ms, 1.77ms, 3.55ms, 7.11ms, 14.2ms)	
·	Executed	can be	External	Executed by turning ON the inputs set as the event task factor	
	task	masked.)	interrupt	among interrupt module QI60's 16 input points.	
			PLC interrupt	Execute with interrupt instruction (D(P).GINT) from PLC.	
		NMI task		Executed by turning ON the inputs set as the NMI task factor	
				among interrupt module QI60's 16 input points.	
Number of I/O points (X/Y)				8192 points	
Number of real 1/0 majoris (D)	(/DV)			Total 256 points	
Number of real I/O points (P)	VPY)			(Internal I/F (Input 4 points, Output 2 points) + I/O module +	
	Internal relation	(o. (M)		Intelligent function module)	
	Internal relay			12288 points	
	Link relays (I			8192 points	
Number of devices	Annunciators (F)			2048 points	
(Device In the Motion CPU	Special relays (SM)			2256 points	
area only)	Data registers (D)			8192 points (Note-1)	
(Included the positioning	Link registers			8192 points	
dedicated device)	Special regis	. ,		2256 points	
	Motion regist			12288 points	
	Coasting tim			1 point (888µs)	
	Multiple CPL	J area device	es (U□\G)	Up to 14336 points (Note-2)	

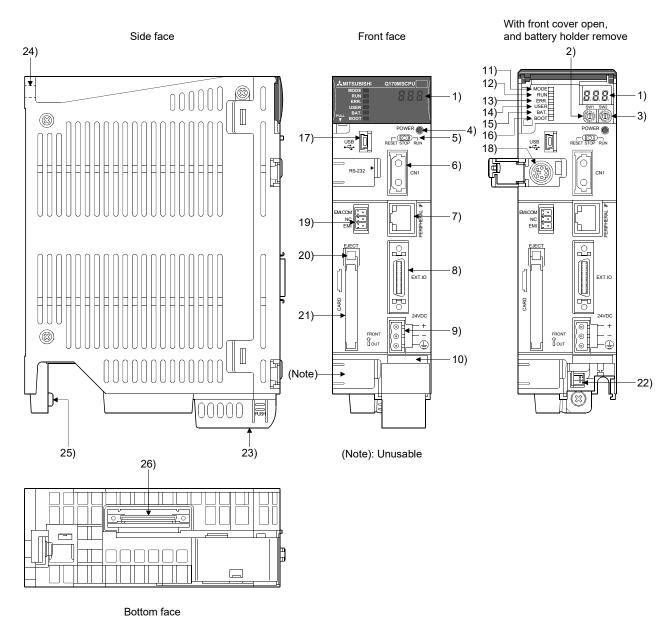
(Note-1): 19824 points can be used for SV22 advanced synchronous control. (Note-2): Usable number of points changes according to the system settings.

(3) PLC control specifications

		Specification			
Item		Q170MSCPU	Q170MSCPU-S1		
PLC CPU area		Q03UDCPU or equivalent	Q06UDHCPU or equivalent		
Control method		Stored program repeat operation			
I/O control mode		Refresh mode			
Sequence control language	е	Relay symbol language (ladder), logic symbolic language (list), MELSAP3 (SFC), MELSAP-L, Structured text (ST)			
	LD instruction	0.02 µs	0.0095 µs		
Processing speed	MOV instruction	0.04 µs	0.019 µs		
(sequence instruction)	PC MIX value (instruction/µs)	28	60		
,	Floating point addition	0.12 µs	0.057 μs		
Total number of instruction	•	·	58		
Operation (floating point or			es		
Character string processing			es		
PID instruction	geu dede		es		
Special function instruction	(Trigonometric function	•	<u> </u>		
square root, exponential or	, •	Y	es		
Constant scan	,,	0.5 to 2000ms (Setting	available in 0.5ms unit.)		
Program capacity		30k steps (120k byte)	60k steps (240k byte)		
1 Togram oupdoity	QCPU standard memory		pytes		
CPU shared memory	Multiple CPU high speed		bytes		
	transmission area	JZR			
No. of I/O device points (X	(Y)	8192	points		
No. of I/O points (X/Y)		4096	points		
Internal relay (M)		8192 points			
Latch relay (L)		8192 points			
Link relay (B)		8192 points			
Timer (T)		2048 points			
Retentive timer (ST)		0 points			
Counter (C)	Points by default	1024 points			
Data register (D)	(changeable by parameters)	12288 points			
Link register (W)		8192 points			
Annunciator (F)	1		points		
Edge relay (V)	1	2048 points			
Link special relay (SB)	1	2048 points			
Link special register (SW)	1	2048 points			
File register (R, ZR)		98304 points	393216 points		
Step relay (S)			points		
Index register/Standard de	vice register (Z)	20 r	points		
Index register (Z)	·		nts (Z0 to Z18)		
(32-bit modification specific	cation of ZR device)	(Index register (Z) is used in double words.)			
Pointer (P)	,		points		
Interrupt pointer (I)			points		
Special relay (SM)			points		
Special register (SD)		2048 points			
Function input (FX)			points		
Function output (FY)		16 points			
Function register (FD)		5 points			
Local device		Yes			
Device initial values		Yes			
	Number of extensions		to 64 slots) (Note-1)		
Extension base unit	Number of extensions		5B/Q68B/Q612B usable)		
PC type when program is r	made by GX Works2	Q03UDCPU	Q06UDHCPU		

(Note-1): Occupies 8 slots of the main base unit as empty slots.

(4) Q170MSCPU names of parts



No.	Name	Application			
1)	7-segment LED	Indicates the operating status and error information.			
2)	Rotary function select 1 switch (SW1)	Set the operation mode. (Normal operation mode, Installation mode, Mode operated by ROM, etc)			
3)	Rotary function select 2 switch (SW2)	Each switch setting is 0 to F. (Factory default in SW1 "0", SW2 "0" position)			
4)	"POWER" LED	ON (red): The internal power (5VDC) is ON. OFF: The internal power (5VDC) is OFF.			
5)	RUN/STOP/RESET switch	 Move RUN/STOP to change the operating state of the Motion controller. RUN: Sequence program/Motion SFC program is started. STOP: Sequence program/Motion SFC program is stopped. RESET (Momentary switch) Set the switch to the "RESET" position 1 second or more to reset the hardware. 			
6)	SSCNETⅢ CN1 connector (Note-1)	Connector to connect the servo amplifier.			
7)	PERIPHERAL I/F connector	For communication I/F with peripheral devices. • Upper LED Remains flashing: It communicates with the peripheral devices. OFF: It does not communicate with the peripheral devices. • Lower LED Data transmission speed ON: 100Mbps OFF: 10Mbps			
8)	Internal I/F connector	Connector to connect the manual pulse generator/incremental synchronous encoder, or to input/output the signals. (Voltage-output/open-collector type, Differential-output type)			
9)	24VDC power supply connector	The DC power of 24VDC is connected.			
10)	Serial number display	Displays the serial number described on the rating plate.			
11)	"MODE" LED	Indicates the mode of the PLC CPU area. ON (green) : Q mode			
12)	"RUN" LED	Indicates the operating status of the PLC CPU area. ON : During operation with the RUN/STOP/RESET switch set to "RUN". OFF: During stop with the RUN/STOP/RESET switch set to "STOP". When an error is detected and operation must be halted due to the error. Remains flashing: Parameters or programs are written with the RUN/STOP/RESET switch set "STOP", and then the RUN/STOP/RESET switch is turned from "STOP" to "RUN". • To turn ON the "RUN" LED after writing the program, carry out the follow steps. 1) Set the RUN/STOP/RESET switch in the order of "RUN" to "STOP" to "RUN". 2) Reset with the RUN/STOP/RESET switch. 3) Power ON the Motion controller again. • To turn ON the "RUN" LED after writing the parameters, carry out the following steps. 1) Reset with the RUN/STOP/RESET switch. 2) Power ON the Motion controller again. (If the RUN/STOP/RESET is set in the order of "RUN" to "STOP" to "Fafter changing the parameters, network parameters and intelligent fundable parameters will not be updated.			

No.	Name	Application			
		Indicates the operating status of the PLC CPU area.			
		ON : Detection of self-diagnosis error which will not stop operation, except battery			
		error. (When operation continued at error detection is set in the parameter			
13)	"ERR." LED	setting.)			
		OFF : Normal			
		Remains flashing: Detection of error whose occurrence stops operation.			
		Resetting with the RUN/STOP/RESET switch becomes valid.			
		Indicates the operating status of the PLC CPU area.			
14)	"USER" LED	ON: Annunciator (F) turned ON			
		OFF: Normal			
		Indicates the operating status of the PLC CPU area.			
		ON (yellow) : Occurrence of battery error due to reduction in battery voltage of the			
		memory card.			
15)	"BAT." LED	ON (green) : Turned ON for 5 seconds after restoring of data backup to the standard			
,		ROM by the latch data backup is completed.			
		Remains flashing (green): Backup of data to the standard ROM by latch data backup is			
		completed.			
		OFF : Normal			
		Indicates the operating status of the PLC CPU area.			
16)	"BOOT" LED	ON : Start of boot operation			
		OFF: Non-execution of boot operation			
17)	USB connector	Connector to connect the peripheral devices for USB connection. (Connector type mini B)			
		Connect with the dedicated cable for USB			
18)	RS-232 connector	Connector to connect the peripheral devices for RS-232 connection.			
		Connect with the dedicated cable (QC30R2) for RS-232.			
	Forced stop input connector	Input to stop all axes of servo amplifier in a lump.			
19)	(EMI) (Note-2)	EMI ON (opened) : Forced stop			
		EMI OFF (24VDC input): Forced stop release			
20)	Memory card EJECT button	Used to eject the memory card from the Motion controller.			
21)	Memory card loading connector	Connector used to load the memory card to the Motion controller.			
22)	Battery connector	Connector to connect the Q6BAT/Q7BATN/Q7BAT.			
23)	Battery holder (Note-3)	Battery holder to set the Q6BAT/Q7BATN/Q7BAT.			
24)	Module fixing screw hole (Note-4)	Hole for screw used to fix to the control panel.			
25)	FG terminal	Ground terminal connected with the shield pattern of the printed circuit board.			
26)	Extension cable connector	Connector for connecting an extension cable (for signal communications with the extension base unit).			

⁽Note-1): Put the SSCNETII cable in the duct or fix the cable at the closest part to the Motion controller with bundle material in order to prevent SSCNETII cable from putting its own weight on SSCNETII connector.

⁽Note-2): Be sure to use the cable for forced stop input. The forced stop cannot be released without using it.

If the cable for forced stop input is fabricated on the customer side, make it within 30m(98.43ft.).

⁽Note-3): Be sure to set the battery. The data (Refer to Section 6.5.) in the RAM built-in Motion controller is not backed up if the battery cable is not set correctly.

⁽Note-4): Purchase the M5 screws.

(5) 7-segment LED display

The LED displays/flashes in the combination with errors.

	Item	7-segme	nt LED	Remark
Start			Initializing	It takes about 10 seconds to initialize (RUN/STOP display). Execute the power cycle of the Motion controller if the operation stops at initializing for several minutes. If the problem persists, it may indicate a Motion controller hardware error. Explain the error symptom (LED display) and get advice from our sales representative for the modules with failure.
		8.8.8.	"E□□" remains flashing	Hardware error or software error during initializing. ☐ indicates the error code. Explain the error symptom (LED display) and get advice from our sales representative for the modules with failure.
Normal		8. 8. 8 _*	" * remains flashing	Normal operation
Installation	mode		Steady "INS" display, " * " remains flashing	Mode to install the operating system software via personal computer.
Operation	Mode operated by RAM	8.8.8*	" 米" remains flashing	Mode to operate based on the user programs and parameters stored in the RAM built-in Motion controller.
mode	Mode operated by ROM	8.8.8.	Steady " . " display, " 米" remains flashing	Mode to operate after the user programs and parameters stored in the FLASH ROM built-in Motion controller are read to the RAM built-in Motion controller.
STOP		558	Steady "STP" display	Stopped the Motion SFC program with the PLC READY flag (M2000) OFF.
RUN		8.8.8.	Steady "RUN" display	Executed the Motion SFC with the PLC READY flag (M2000) ON.
Battery	Early stage warning (2.7V or less)	8.8.8.	Steady "BT1" display	Displayed at battery voltage 2.7V or less. Refer to Section 6.5.
error	Final stage warning (2.5V or less)	8.8.8.	Steady "BT2" display	Displayed at battery voltage 2.5V or less. Refer to Section 6.5.
Operating s	system software d		"A00" remains flashing	It becomes the status of installation mode when the operating system software is not installed.
System setting error			" AL" flashes 3 times ↓ Steady " L01" display	System setting error of the Motion controller Refer to the "Q173D(S)CPU/Q172D(S)CPU Motion controller Programming Manual (COMMON)" for details.
Servo error			" AL" flashes 3 times ↓ Steady " S01" display	Servo error of the Motion controller Refer to the Programming Manual of the operating system software used for details.

Item	7-segme	nt LED	Remark
WDT error	8.8.8.	Steady "" display	Hardware fault or software fault Refer to the Programming Manual of the operating system software used for details.
Self diagnostic error (Error related for Multiple CPU)		" AL" flashes 3 times J Steady " A1" display (Self-diagnosis error) 4-digits error code is displayed in two sequential flashes of 2- digits each. (ex. error code [3012])	Setting error of the Multiple CPU system Refer to the "Q173D(S)CPU/Q172D(S)CPU Motion controller Programming Manual (COMMON)" for details.

POINTS

- (1) An error is displayed at the 7-segment LED, confirm the error code etc. using MT Developer2.
- (2) Refer to the Motion CPU error batch monitor of MT Developer2 or error list of Programming Manual for error details.

(6) Rotary switch assignment

(a) Rotary function select 1 switch (SW1)

Rotary switch	Setting (Note)	Mode	Description
4F012	0	Normal mode	Normal operation mode
082 68 L	Α	Installation mode	Installed the operating system software using MT Developer2

(Note): Do not set other than the above setting.

(b) Rotary function select 2 switch (SW2)

Rotary switch	Setting (Note)	Mode	Description
45075	0	Mode operated by RAM	Normal operation mode (Operation by the setting data and parameters stored in the RAM built-in Motion controller.)
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	6	Mode operated by ROM	Mode to operate based on the setting data and parameters wrote to the FLASH ROM built-in Motion controller.
	8 Ethernet IP address display mode		Mode to display the Ethernet IP address.
	С	SRAM clear	SRAM "0" clear

(Note): Do not set other than the above setting.

▲CAUTION

● Be sure to turn OFF the Motion controller's power supply before the rotary switch setting change.

(7) Operation mode

(a) Rotary switch setting and operation mode

Rotary switch	h setting ^(Note-1)	O	
SW1	SW2	Operation mode	
Α	Any setting (Except C)	Installation mode	
0	0	Mode operated by RAM	
0	6	Mode operated by ROM	
0	8	Ethernet IP address display mode	
Any setting	С	SRAM clear ^(Note-2)	

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

(Note-2): The data (Refer to Section 6.5) in the RAM built-in Motion controller is cleared.

(b) Operation mode overview

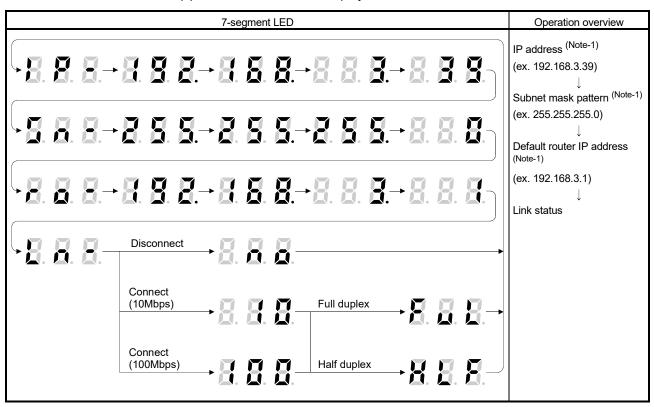
Operation mode	7-segment LED	Operation overview
Installation mode	8.8.5.	 Steady "INS" display at the 7-segment LED. Operating system software can be installed. It is STOP status regardless of the RUN/STOP/RESET switch position at the front side of Motion controller. The stop error "MULTI CPU DOWN (error code: 7000)" will occur at the PLC CPU area.
Mode operated by RAM	8.8.8*	 " . " remains flashing in the first digit of 7-segment LED. It operates based on the user programs and parameters stored in the RAM built-in Motion controller. The user programs and parameters for the ROM operation can be written to the FLASH ROM built-in Motion controller.
Mode operated by ROM	8. 8. B _*	If the ROM writing is not executed, even if the user programs and parameters and parameters are changed using the RTASH ROM built-in Motion controller. If the ROM built-in Motion controller are read to the contents of the Brank writing is not executed, even if the user programs and parameters are changed using the MT Developer2 during mode operated by ROM, operation starts with the contents of the FLASH ROM built-in Motion controller at next power supply on or reset. Also, If the ROM writing is not executed, even if the auto tuning data are reflected on the servo parameter of Motion controller by operation in the auto-tuning setting, operation starts with the contents of the FLASH ROM built-in Motion controller at next power supply on or reset.
Ethernet IP address display mode	Refer to next page (c)	 Refer to next page "(c) Ethernet IP address display mode overview". It is STOP status regardless of the RUN/STOP/RESET switch position on the front side of Motion controller. The stop error "MULTI CPU DOWN (error code: 7000)" will occur at the PLC CPU area.
SRAM clear	8. 8. 8 _*	" . " remains flashing in the first digit of 7-segment LED. The data (Refer to Section 6.5) in the RAM built-in Motion controller is cleared by turning ON the Motion controller's power supply after the rotary switch2 is set to "C".

POINTS

- (1) Be sure to turn OFF the Motion controller's power supply before the rotary switch setting change.
- (2) It is recommended to shift to the mode operated by ROM after the programs and parameters are fixed. The erasing of the programs and parameters can be avoided even if the battery decrease. (The ROM writing cannot be executed for the current position of the servo motor in the absolute position system, home position and latch device. Back up them beforehand using MT Developer2.)

Refer to Section 4.4 of the "Q173D(S)CPU/Q172D(S)CPU Motion controller Programming Manual (COMMON)" for details of the ROM operation.

(c) Ethernet IP address display mode overview



(Note-1): When the Ethernet parameters are not written in the Motion controller, the addresses are displayed as follows.

IP address : 192.168.3.39
 Subnet mask pattern : 255.255.255.0
 Default router IP address : 192.168.3.1

(8) Internal I/F connector

(a) The pin layout of the Q170MSCPU's internal I/F connector Use the internal I/F connector on the front of the Q170MSCPU to connect to manual pulse signals and incremental synchronous encoder signals. The following is the pin layout of the internal I/F connector as viewed from the front.

	Internal I/F connector							
			Pin No.	Signal Name	Pin No.	Signal Name		
		(Note 1)	26	HAL	13	HBL	(Nata 1)	
		(Note-1)≺	25	HAH	12	HBH	(Note-1)	
200	40	(Note-2)	24	HA	11	HB	(Note-2)	
26	13	(Note-6)	23	No connect	10	SEL	(Note-3)	
			22	SG	9	5V	(Note-7)	
			21	No connect	8	No connect]	
		(Note-6)	20	No connect	7	No connect	≻(Note-6)	
		(Note-6)	19	No connect	6	No connect	(Note-o)	
14	1		18	No connect	5	No connect	IJ	
			17	DI3	4	DI4		
			16	DI1	3	DI2		
		(Note-4)	15	COM1	2	COM2	(Note - 5)	
			14	DO1	1	DO2		

·Applicable connector model name:

Soldering type connector (LD77MHIOCON)
10126-3000PE connector (3M Japan Limited make) (Optional)
10326-52F0-008 connector case

•Wire size: AWG28

(Note-1): Differential-output type

Connect the A-phase signal to HAH, and the A-phase inverse signal to HAL. Connect the B-phase signal to HBH, and the B-phase inverse signal to HBL.

(Note-2): Voltage-output/open-collector type

Connect the A-phase signal to HA, and the B-phase signal to HB.

(Note-3): Input type from manual pulse generator/Incremental synchronous encoder is switched by SEL.

Not connected : Voltage-output/open-collector type

SEL-SG connection: Differential-output type

(Note-4): "COM1" is the common terminal of DI1, DI2, DI3 and DI4.

(Note-5): "COM2" is the common terminal of DO1 and Do2.

(Note-6): Do not connect anything to the terminals listed as "No connect".

(Note-7): Do not use the 5V terminals for applications other than power supply for manual pulse generator/incremental synchronous encoder.

(b) Input signal/Mark detection

1) Specifications of input signal/mark detection input signal

Item	l	Specifications
Number of input poir	nts	4 points
Input method		Positive common/Negative common shared
Common terminal ar	rangement	4 points/common (Common contact: COM1)
Isolation method		Photocoupler
Rated input voltage		24VDC
Rated input current (IIN)		Approx. 5mA
Operating voltage range		21.6 to 26.4VDC (24VDC ±10%, ripple ratio 5% or less)
ON voltage/current		17.5VDC or more/3.5mA or more
OFF voltage/current		5VDC or less/0.9mA or less
Input resistance		Approx. 5.6kΩ
Dannana tima	OFF to ON	1ms
Response time	ON to OFF	ins

2) Interface between input signal/mark detection input signal

Input or	Signal name			Pin	No.		Wiring	Internal circuit	Description
output			1	2	3	4	example		
	put	DI□ ^(Note-1)	16	3	17	4		 	Signal input,
Input Mark detection signal input	COM1		1	5		24VDC ^(Note-2)		Mark detection signal input	

(Note-1): □=1 to 4

(Note-2): As for the 24VDC sign, both "+" and "-" are possible.

(c) Output signal

1) Specifications of output signal

Item		Specifications		
Number of output poin	ts	2 points		
Output method		Sink/Source type		
Common terminal arra	ngement	2 points/common (Common contact: COM2)		
Isolation method		Photocoupler		
Rated load voltage		24VDC ±10%		
Maximum load current	(lout)	40mA/point, 80mA/common		
External power supply		21.6 to 26.4VDC (24VDC ±10%, ripple ratio 5% or less)		
Maximum voltage drop at ON (Vdorp)		2.75VDC or less		
OFF voltage/current		11VDC or less/1.7mA or less		
D	OFF to ON	1ms or less		
Response time	ON to OFF	1ms or less (Rated load, resistance load)		

2) Interface between output signal

Input or	Signal name		Signal name Pin No. Wiring		Internal circuit Descript	December	
output			1	2	example	Internal circuit	Description
		DO□ ^(Note-1)	14	1	load		
Output Output	COM2	2	2	24VDC ^(Note-2)	* * *	Signal output	

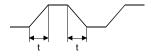
(Note-1): □=1 to 2

(Note-2): As for the 24VDC sign, both "+" and "-" are possible.

- (d) Manual pulse generator/Incremental synchronous encoder input
 - 1) Specifications of manual pulse generator/incremental synchronous encoder

	Item	Specifications		
Signal input form	1	Phase A/Phase B		
<u></u>	Maximum input pulse frequency (Note-1)	1Mpps (After magnification by 4, up to 4Mpps)		
	Pulse width	1µs or more		
	Leading edge/trailing edge time	0.25µs or less		
	Phase difference	0.25µs or more		
	High-voltage	2.0 to 5.25VDC		
	Low-voltage	0 to 0.8VDC		
Differential-	Differential voltage	±0.2V		
output type	Cable length	Up to 30m (98.43ft.)		
(26LS31 or equivalent)	Example of waveform (For 1Mpps)	Phase B 0.25 µs or more 0.25 µs or more 0.25 µs or more 0.25 µs or less 0.25 µs or less (Note): Duty ratio 50%		
	Maximum input pulse frequency (Note-1)	200kpps (After magnification by 4, up to 800kpps)		
	Pulse width	5µs or more		
	Leading edge/trailing edge time	1.2µs or less		
	Phase difference	1.2µs or more		
	High-voltage	3.0 to 5.25 VDC		
	Low-voltage	0 to1.0VDC		
Voltage-output/	Cable length	Up to 10m (32.81ft.)		
Voltage-output/ Open-collector type	Example of waveform (For 200kpps)	Phase A 1.2μs or more 1.2μs or less (Note): Duty ratio 50%		

(Note-1): The maximum input pulse frequency is influenced by the leading/trailing edge time of the input waveform. Countable frequencies are shown below.

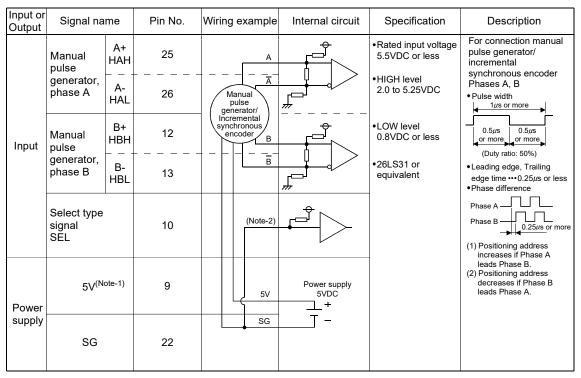


Maximum input pulse frequency	Up to 1Mpps	Up to 500kpps	Up to 200kpps	Up to 100kpps
Leading/trailing edge time (t) (A-phase, B-phase input common shared)	0.25µs or less	0.5µs or less	1.25µs or less	2.5µs or less

POINT

Use a manual pulse generator or an incremental synchronous encoder that consumes less than 0.2[A] of current.

2) Interface between manual pulse generator (differential-output type)/ incremental synchronous encoder



(Note-1): The 5V(P5)DC power supply from the Q170MSCPU must not be used if a separate power supply is applied to the manual pulse generator/incremental synchronous encoder. If a separate power supply is used, be sure it is 5V voltage. Anything else may cause a failure.

(Note-2): Connect SEL to the SG terminal if the manual pulse generator (differential-output type) /incremental synchronous encoder is used.

3) Interface between manual pulse generator (voltage-output/open-collector type)/incremental synchronous encoder

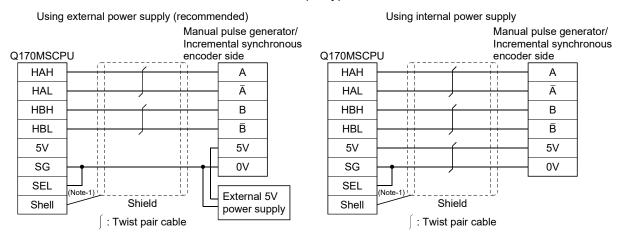
Input or Output	Signal name	Pin No.	Wiring example	Internal circuit	Specification	Description
Input	Manual pulse generator, phase A HA	24	Manual pulse generator/ Incremental synchronous encoder B		Rated input voltage 5.5VDC or less HIGH level 3 to 5.25VDC/ 2mA or less	For connection manual pulse generator/ incremental synchronous encoder Phases A, B • Pulse width 5//s or more (Duty ratio: 50%) • Leading edge, Trailling edge time ••• 1.2//s or less • Phase difference Phase A Phase B 1.2//s or more (1) Positioning address increases if Phase A leads Phase B. (2) Positioning address decreases if Phase B leads Phase A.
	Manual pulse generator, phase B HB	11		•LOW level 1VDC or less/5mA or more	1VDC or less/	
	Select type signal SEL	10	No connect			
Power supply	5V ^(Note-1)	9	5V	Power supply 5VDC	(2)	
	SG	22	SG	J -		

(Note-1): The 5V(P5)DC power supply from the Q170MSCPU must not be used if a separate power supply is applied to the manual pulse generator/incremental synchronous encoder.

If a separate power supply is used, be sure it is 5V voltage.

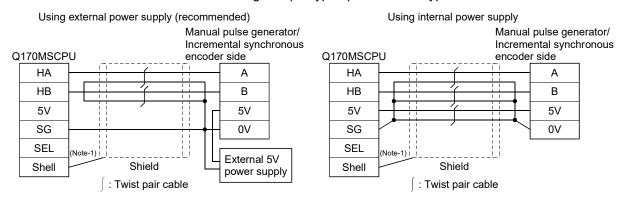
Anything else may cause a failure.

- Connection examples of manual pulse generator/incremental synchronous encoder
 - Differential-output type



(Note-1): Input type from manual pulse generator/incremental synchronous encoder switched by SEL. SEL-SG connection: Difference-output type

Voltage-output type/open-collector type



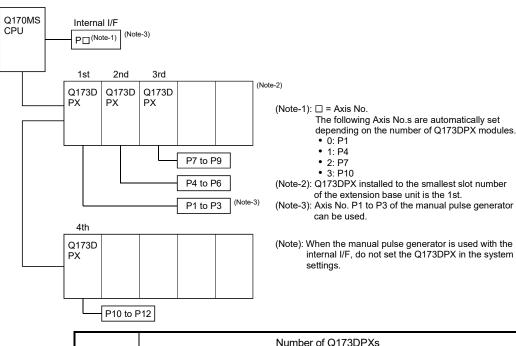
(Note-1): Input type from manual pulse generator/incremental synchronous encoder switched by SEL. Not connected: Voltage-output/open-collector type

⚠CAUTION

- If a separate power supply is applied to the manual pulse generator/incremental synchronous encoder, be sure it is 5V voltage. Anything else may cause a failure.
- Always wire the cables when power is off. Not doing so may damage the circuit of modules.
- Wire the cable correctly. Wrong wiring may damage the internal circuit.
 - (e) Connection of manual pulse generator/incremental synchronous encoder Manual pulse generators/incremental synchronous encoders of the voltageoutput/open-collector type and differential-output type can be connected. Both connection methods are different. (Refer to this section (8)(a).)

Motion controller	Connectable manual pulse generator/ incremental synchronous encoder
Q170MSCPU (Internal I/F)	Up to 1 module

(f) Axis No. of manual pulse generator/incremental synchronous encoder Any incremental synchronous encoder connected to the Q170MSCPU's internal I/F will automatically be assigned an axis No. one integer greater than the number of encoders connected to any Q173DPX modules. The setting for the axis No. of manual pulse generator/incremental synchronous encoder used by the internal I/F and Q173DPX.



Assis NIs		Nu	mber of Q173DF	PXs	
Axis No.	0	1	2	3	4
P1	•				
P2		1	1	1	1
P3					
P4]	•			
P5			2	2	2
P6					
P7	_		•		
P8				3	3
P9		_			
P10			_	•	
P11					4
P12				_	

- ●: Usable by internal I/F.
- 1: Usable only by the 1st Q173DPX
- 2: Usable only by the 2nd Q173DPX
- ③: Usable only by the 3rd Q173DPX
- (4): Usable only by the 4th Q173DPX
- -: Unusable

POINTS

For advanced synchronous control method, set the axis No. of synchronous encoder in the synchronous encoder axis parameter.

Refer to the "Q173DSCPU/Q172DSCPU Motion controller (SV22) Programming Manual (Advanced Synchronous Control)" for details.

(9) PERIPHERAL I/F connector

Item		Specification
	Data transmission speed	100Mbps/10Mbps
Transmission	Communication mode	Full-duplex/Half-duplex
	Transmission method	Base band
	Cable length [m(ft.)]	Up to 30 (98.43)

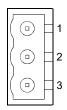
POINTS

Only a LAN connection is available for PERIPHERAL I/F connector. Connection via the Internet is not possible.

(10) 24VDC power supply connector

24VDC power supply is supplied from the 24VDC power supply connector of the front face of the Motion controller.

The pins layout (from front view) and connection of the 24VDC power supply connector is shown below.



Pin No.	Signal name
1	24V(+)
2	24G
3	FG

- Applicable connector model name FKC2.5/3-ST-5.08 connector (PHOENIX CONTACT make) (Attachment)
- Conductor size for power line
 0.3 to 2.5mm² (AWG12 to AWG22)

∆CAUTION

- 24V(+) pin is upper side and 24G pin is lower side of 24VDC power supply connector (from front view) of Motion controller. If the polarity is wrong, the unit may be damaged.
- Twist 24V(+) and 24G for 24VDC power line.
- Power off the Motion controller before wiring 24VDC power supply.
- Use proper size wire for 24VDC power line.

(11) Forced stop input connector

The pins layout (from front view) and connection of the forced stop input connector is shown below.



Pin No.	Signal name
3	EMI.COM
2	No connect (Note-1)
1	EMI

(Note-1): Do not connect anything to the terminals listed as "No connect".

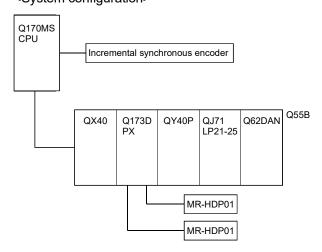
- Applicable connector model name
 FK-MCP1.5/3-ST-3.81 connector (PHOENIX CONTACT make) (Attachment)
- Conductor size for power line
 0.3 to 1.5mm² (AWG16 to AWG22)

(12) Selection of the modules used in the extension base unit

The modules used in the extension base unit are selected according to the total of current consumption of the modules, and peripheral devices (Manual pulse generator, Incremental synchronous encoder, etc.) supplied by the Motion controller and Motion controller internal power supply.

5VDC internal current consumption of shared equipments with PLC might be changed. Be sure to refer to the MELSEC-Q series PLC Manuals.

(a) Calculation example of module selection <System configuration>



• 5VDC current consumption of each module

 Q170MSCPU
 : 2.50 [A]
 QY40P
 : 0.065 [A]

 Incremental synchronous encoder: 0.20 [A]
 QJ71LP21-25
 : 0.55 [A]

 QX40
 : 0.05 [A]
 Q62DAN
 : 0.33 [A]

 Q173DPX
 : 0.38 [A]
 Q55B
 : 0.10 [A]

MR-HDP01 : 0.06 [A]

• Power consumption of overall modules

$$I_{5V} = 2.50 + 0.20 + 0.05 + 0.38 + 0.06 \times 2 + 0.065 + 0.55 + 0.33 + 0.10$$

= 4.295 [A]

System configuration is possible because of the total of current consumption 4.295 [A] is the allowable value 4.5 [A] or less.

POINT

Configure the system in such a way that the total current consumption at 5VDC of all the modules is the allowable value 4.5 [A] or less.

2.5.2 Power supply module

(1) Power supply module specifications

Base loading position	130VA			
Applicable base unit	130VA ote-4) 6A			
Input power supply	130VA ote-4) 6A			
Input power supply	130VA ote-4) 6A			
Input power supply	130VA ote-4) 6A			
Input frequency	130VA ote-4)			
Input voltage distortion factor	130VA ote-4) 6A			
Max. input apparent power 130VA 105VA 45W 160VA Inrush current 20A 8ms or less (Note-4) 100A 1ms or less (at 24VDC input) 20A 8ms or less (Note-4) Rated output current 5VDC 6A 3A 6A 8.5A External output voltage — 24VDC±10% — — Overcurrent protection (Note-1) 5VDC 6.6A or more 3.3A or more 6.6A or more 9.9A or more 6.6 Overvoltage protection (Note-2) 5VDC — 5.5 to 6.5V 5.5 to 6.5V Efficiency 70% or more 65% or more 10ms or less (at 24VDC input) 20ms or less Allowable momentary power failure time (Note-3) 20ms or less 20ms or less 20ms or less Dielectric withstand voltage (Altitude 0 to 2000m (0 to 6561.68ft.)) (0 to 6561.68ft.)) (Altitude 0 to 2000m (0 to 6561.68ft.)) Across inputs/LG and outputs/FG Across inputs/LG and outputs/FG Across inputs/LG and outputs/FG	ote-4)			
Inrush current	ote-4)			
Rated output current 24VDC				
current 24VDC — 0.6A — External output voltage — 24VDC±10% — Overcurrent protection (Note-1) 5VDC 6.6A or more 6.6A or more 9.9A or more 6.6 protection (Note-1) Overvoltage protection (Note-2) 5VDC 5.5 to 6.5V Efficiency 70% or more 65% or more 70% or more Allowable momentary power failure time (Note-3) 20ms or less 20ms or less (at 24VDC input) 20ms or less 510VAC per minute (Altitude 0 to 2000m (O to 6561.68ft.)) Across inputs/LG and outputs/FG and outputs/FG Across inputs/LG and outputs/FG	6A or more			
Overcurrent protection (Note-1) 24VDC — 0.66A or more 0.66B or more 0.66	SA or more			
Overcurrent protection (Note-1) 24VDC — 0.66A or more 0.66A or more 0.66A or more 0.066A or more	6A or more			
protection (Note-1) Overvoltage protection (Note-2) Efficiency 70% or more 65% or more 70% or more 70% or more 10ms or less (at 24VDC input) 510VAC per minute (Altitude 0 to 2000m (0 to 6561.68ft.)) Across inputs/LG and outputs/FG 70% or more 10ms or less (at 24VDC input) 510VAC per minute (Altitude 0 to 2000m (2300VAC per minute) (Altitude 0 to 2000m (0 to 6561.68ft.)) Across inputs/LG and outputs/FG 70% or more 70% or more 70% or more 10ms or less (at 24VDC input) 70% or more 70% or more 10ms or less (at 24VDC input) 70% or more 70% or more 70% or more 10ms or less (at 24VDC input) 70% or more 70% or more 10ms or less (at 24VDC input) 70% or more 70% or more 10ms or less (at 24VDC input) 70% or more 70% or more 10ms or less (at 24VDC input) 70% or more 70% or more 70% or more 10ms or less (at 24VDC input) 70% or more 70% or more 70% or more 10ms or less (at 24VDC input) 70% or more 10ms or less (at 24VDC input) 70% or more 70% or more 70% or more 70% or more 10ms or less (at 24VDC input) 70% or more 70% or more 70% or more 10ms or less (at 24VDC input) 70% or more 10ms or less (at 24VDC input) 700 or more 70% or more 10ms or less (at 24VDC input) 700 or more 70% or more 10ms or less (at 24VDC input) 700 or more 70% or more 10ms or less (at 24VDC input) 700 or more 70% or more 10ms or less (at 24VDC input) 700 or more 70% or more 10ms or less (at 24VDC input) 700 or more 70% or more 10ms or less (at 24VDC input) 700 or more 70% or more 10ms or less (at 24VDC input) 700 or more 70% or more 10ms or less (at 24VDC input) 700 or more 70% or more 10ms or less (at 24VDC input) 700 or more 70% or more 10ms or less (at 24VDC input) 700 or more 70% or more 10ms or less (at 24VDC input) 700 or more 70% or more 10ms or less (at 24VDC input) 700				
Overvoltage protection (Note-2) 5VDC Efficiency 70% or more 65% or more 70% or more Allowable momentary power failure time (Note-3) 20ms or less 20ms or less (at 24VDC input) 510VAC per minute (Altitude 0 to 2000m (10 to 6561.68ft.)) (Altitude 0 to 2000m (0 to 6561.68ft.)) Across inputs/LG and outputs/FG Across inputs/LG and outputs/FG 5.5 to 6.5V 70% or more 70% or more 20ms or less (at 24VDC input) 2300VAC per minute (Altitude 0 to 2000m (10 to 6561.68ft.)) (Altitude 0 to 2000m (0 to 6561.68ft.)) Across inputs/LG and outputs/FG				
Efficiency 70% or more 65% or more 70% or more Allowable momentary power failure time (Note-3) 20ms or less 20ms or less (at 24VDC input) 510VAC per minute (Altitude 0 to 2000m (Altitude 0 to 2000m (0 to 6561.68ft.)) Across inputs/LG and outputs/FG Across inputs/LG and outputs/FG Across inputs/LG and outputs/FG 70% or more 70% or more 20ms or less (at 24VDC input) 510VAC per minute (Altitude 0 to 2000m (Altitude 0 to 2000m (Altitude 0 to 2000m (O to 6561.68ft.)) Across inputs/LG and outputs/FG Across inputs/LG and outputs/FG				
failure time (Note-3) 20ms or less (at 24VDC input) 510VAC per minute (Altitude 0 to 2000m (Altitude 0 to 2000m (0 to 6561.68ft.)) Across inputs/LG and outputs/FG (Altitude 0 to 2000m (0 to 6561.68ft.)) Across inputs/LG and outputs/FG (Altitude 0 to 2000m (0 to 6561.68ft.)) Across inputs/LG and outputs/FG				
failure time (Note-3) 20ms or less (at 24VDC input) 510VAC per minute (Altitude 0 to 2000m (Altitude 0 to 2000m (0 to 6561.68ft.)) Across inputs/LG and outputs/FG (Altitude 0 to 2000m (0 to 6561.68ft.)) Across inputs/LG and outputs/FG (Altitude 0 to 2000m (0 to 6561.68ft.)) Across inputs/LG and outputs/FG				
Dielectric withstand voltage (Altitude 0 to 2000m (O to 6561.68ft.)) Across inputs/LG and outputs/FG (Altitude 0 to 2000m (O to 6561.68ft.)) Across inputs/LG and outputs/FG (Altitude 0 to 2000m (O to 6561.68ft.)) Across inputs/LG and outputs/FG				
Dielectric withstand voltage (Altitude 0 to 2000m (0 to 6561.68ft.)) (0 to 6561.68ft.)) (Across inputs/LG and outputs/FG and outputs/FG and outputs/FG and outputs/FG				
Across inputs/LG and outputs/FG Across inputs/LG Across inputs/LG and outputs/FG and outputs/FG	iute			
Across inputs/LG and outputs/FG Across inputs/LG Across inputs/LG and outputs/FG and outputs/FG	6561.68ft.))			
	utputs/FG			
Across inpute/LC and outpute/EC across				
Across inputs/LG and outputs/FG, across 10MΩ or more by	ts/FG, across			
inputs and LG, across outputs and FG insulation resistance inputs and LG, across outputs and FG insulation resistance	outs and FG			
10M Ω or more by insulation resistance tester	n resistance			
tester (500VDC) tester (500VDC)	;)			
By noise simulator				
• By noise simulator of 1,500Vp-p noise of 500Vp-p noise • By noise simulator of 1500Vp				
voltage, 1 _µ s noise width and 25 to 60Hz voltage, 1 _µ s noise voltage, 1 _µ s noise width an	ıd 25 to 60Hz			
noise frequency width and 25 to noise frequency				
Noise voltage IEC61000-4-4, 2kV 60Hz noise Noise voltage IEC61000-4-	-4, 2kV			
frequency) in all #!			
	D indication			
Operation indicator LED indication (Normal: ON (Green), Error: OFF) (PO	WER LED, LED) (Note-5)			
	ren)			
Fuse Built-in (Unchangeable by user)	D 00:242:4			
L LAnnlication L ERR contact	R. contact,			
Rated switching				
voltage/current 24VDC, 0.5A				
Contact Minimum				
output switching load 5VDC, 1mA				
section Response time OFF to ON: 10ms or less. ON to OFF: 12ms or less.				
Mechanical: 20 million times or more				
Life time Electrical: 100 thousand times at rated switching voltage/current or more				
Surge suppressor None				
Fuse None				

Power supply module specifications (continued)

Item	Q61P	Q62P	Q63P	Q64PN	Q61P-D	
Terminal screw size	M3.5 screw					
Applicable wire size		0.75 to 2mm ²				
Applicable crimping terminal	RAV1.25 to 3.5, RAV2 to 3.5, thickness 0.8mm or less. Two solderless terminals can be connected to one terminal.					
Applicable tightening torque	0.66 to 0.89 N•m					
Exterior dimensions [mm(inch)]	98(H) × 55.2(W) × 90(D) (3.86(H) × 2.17(W) × 3.54(D))			98(H) × 55.2(W) × 115(D) (3.86(H) × 2.17(W) × 4.53(D))	98(H) × 55.2(W) × 90(D) (3.86(H) × 2.17(W) × 3.54(D))	
Mass [kg]	0.40 0.39 0.33			0.47	0.45	

POINTS

(Note-1): Overcurrent protection

The overcurrent protection device shuts off the 5V, 24VDC circuit and stops the system if the current flowing in the circuit exceeds the specified value.

The LED of the power supply module is turned off or lights up in dim green when voltage is lowered. If this device is activated, switch the input power supply off and eliminate the cause such as insufficient current capacity or short. Then, a few minutes later, switch it on to restart the system.

The initial start for the system takes place when the current value becomes normal.

(Note-2): Overvoltage protection

The overvoltage protection device shuts off the 5VDC circuit and stops the system if a voltage of 5.5VDC or more is applied to the circuit. When this device is activated, the power supply module LED is switched OFF.

If this happens, switch the input power OFF, then a few minutes later ON. This causes the initial start for the system to take place. The power supply module must be changed if the system is not booted and the LED remains OFF.

POINTS

(Note-3): Allowable momentary power failure time

- (1) For AC input power supply
 - (a) If the momentary power failure time is within 20ms, the system detects an AC down and suspends the operation processing. However, the system continues operations after the power comes back.
 - (b) If the momentary power failure time exceeds 20ms, the system either continues or initially starts the operations depending on the power supply load. In case that the operation processing is continued, the system operates the same as when the momentary power failure time is within 20ms.
 - (c) When the AC supply of the AC input module is the same as that of the power supply module, the connected sensor is prevented from turning OFF due to the momentary power failure. However, if only the power supply module and an AC input module are connected on the AC line, detection of the AC down for the power supply module may be delayed by the internal capacitor of the AC input module. To prevent the detection of the AC down from being delayed, connect a load of approx. 30mA per AC input module on the AC line.
- (2) For DC input power supply
 - (a) If the momentary power failure is within 10ms^(Note), the system detects a 24VDC down and suspends the operation processing. However, the system continues operations after the power comes back.
 - (b) If the momentary power failure time exceeds 10ms^(Note), the system either continues or initially starts the operations depending on the power supply load. In case that the operation processing is continued, the system operates the same as when the momentary power failure time is within 10ms.

(Note): This is for a 24VDC input. If the input is 24VDC or less, the time will be 10ms or less.

(Note-4): Inrush current

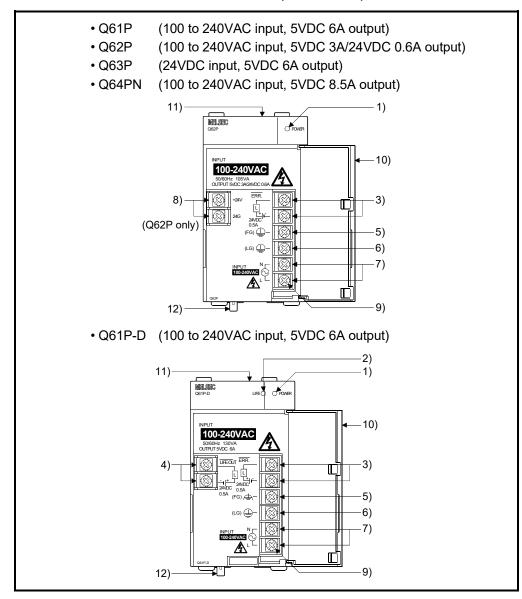
When power is switched on again immediately (within 5 seconds) after power-off, an inrush current of more than the specified value (2ms or less) may flow. Reapply power 5 seconds after power-off.

When selecting a fuse and breaker in the external circuit, take account of the blow out, detection characteristics and above matters.

(Note-5): Refer to "QCPU User's Manual (Hardware Design, Maintenance and Inspection)" for details of the Q61P-D display status.

(2) Names of Parts and Setting

This section describes the names of the parts of each power module.



No.	ı	Name	Application
			ON (green) : Normal (5VDC output, momentary power failure within 20ms)
			OFF : • AC power supply is ON, however, the power supply module is out of order. (5VDC
		AC input power	error, overload, internal circuit failure, blown fuse)
		supply (Note-1)	• AC power supply is not ON
	POWER		Power failure (including a momentary power failure of more than 20ms)
1)	LED		ON (green) : Normal (5VDC output, momentary power failure within 10ms)
			OFF : • DC power supply is ON, however, the power supply module is out of order. (5VDC
		DC input power	error, overload, internal circuit failure, blown fuse)
		supply	• DC power supply is not ON
			Power failure (including a momentary power failure of more than 10ms)
			ON (green) : When operation has started
			1- 1
			ON (orange) : Remaining life of the module approx. 50%
			FLASH (orange): • ON for 5 seconds and OFF for 1 second:
			Remaining life of the module is approx. 1 year
			• At intervals of 0.5 seconds:
2)	LIFE LED		Remaining life of the module is approx. 6 months
,			OFF : • Module life expired
			Ambient temperature is out of range (The ambient temperature of the module is
			exceeding the specification and the life detection function has stopped.)
			ON (red) : Ambient temperature is out of range (The ambient temperature of the module is
			exceeding the specification.)
	FDD terminals		FLASH (red) : Function failure (at intervals of 1 second)
3)	B) ERR terminals		Normally OFF when loaded in an extension base unit.
			• The output signal of the terminal turns off (opens) when the end of the life is detected. (Applicable
			only when the remaining life is 1 year or less).
			• Flicker-OFF (opens) when the life diagnostics error (including detection error) is detected. (Note-2)
4)	LIFE OUT	terminal	Flicker-OFF (opens) when the ambient temperature is detected to be out of range.
,			• The output signal of the terminal turns OFF (opens) when the watchdog timer error is detected in the
			module.
			The 4 operations listed above are also available when the terminal is mounted on an extension base
			unit.
5)	FG termina	<u>l</u>	Ground terminal connected to the shield pattern of the printed circuit board.
6)	LG termina	I	Grounding for the power supply filter. The potential of Q61P, Q62P, and Q64PN terminal is 1/2 of the
	LO torrillia		input voltage.
			Power input terminals connected to a power supply of 100VAC to 200VAC.
7)	Power inpu	t terminals	(Q61P, Q61P-D, Q62P, Q64PN)
			Power input terminals connected to a power supply of 24VDC. (Q63P)
8)	+24V, 24G terminals Used to supply 24VDC power to inside the output module. (using external wiring)		Used to supply 24VDC power to inside the output module. (using external wiring)
0)	(Q62P only)		M3.5 × 7 screw
9)	Terminal so		Protective cover of the terminal block
10)	Tominal CC	J V OI	Used to fix the module to the base unit.
11)	Module fixir	ng screw hole	M3 × 12 screw (user-prepared) (Tightening torque : 0.36 to 0.48 N•m)
12)	Module mo	unting lever	Used to load the module into the base unit.
ر2:	THOUGHT HID	ariang lovel	Cook to load the module into the base drift.

⁽Note-1): When using the Q61P-D in a system configured with an extension base unit, the POWER LED of the Q61P-D on the extension base unit may turn a dull red color when the power is turned OFF. Note that this does not indicate an error.

⁽Note-2): Flicker-OFF indicates that the output signal of the terminal turns OFF and ON three times at intervals of one second before turning OFF (opens).

POINTS

- (1) The Q63P is dedicated for inputting a voltage of 24VDC. Do not input a voltage of except 24VDC into it or trouble may occur on the Q63P.
- (2) Ensure that the earth terminals LG and FG are grounded.

(Ground resistance : 100 Ω or loss)

- Since the LG terminal has a half of the input voltage, touching this terminal may result in an electric shock.
- (3) When the Q61P, Q61P-D, Q62P, Q63P or Q64PN is loaded on the extension base unit, a system error cannot be detected by the $\overline{\text{ERR}}$ terminal. (The $\overline{\text{ERR}}$ terminal is always OFF.)
- (4) Cables for the ERR contact and the LIFE OUT contact must be 30m or less and installed in the control panel.

(3) Life detection power supply module

The Life detection power supply module (Q61P-D) estimates its remaining life internally and displays the service life.

The remaining life of the module can be checked with the LIFE LED located on the front of the module and ON/OFF of the LIFE OUT terminals.

Refer to "QCPU User's Manual (Hardware Design, Maintenance and Repair)" for details of the life detection power supply module.

2.5.3 Extension base unit and extension cable

This section describes the specifications of the extension cables for the base units (Extension base unit), and the specification standards of the extension base unit. 5VDC internal current consumption of base unit might be changed. Be sure to refer to the MELSEC-Q series PLC Manuals.

(1) Extension base unit specifications

(a) Type not requiring power supply module

Type	Q52B	Q55B		
Number of I/O modules	2	5		
Possibility of extension	Exten	ndable		
Applicable module	Q series modules			
5VDC internal current consumption [A]	0.08	0.10		
Fixing hole size	M4 screw hole or ϕ 4.5 hole (for M4 screw)			
Exterior dimensions [mm(inch)]	$106(W) \times 98(H) \times 44.1(D)$ $(4.17(W) \times 3.86(H) \times 1.74(D))$	189(W)×98(H) ×44.1(D) (7.44(W)×3.86(H) ×1.74(D))		
Mass [kg]	0.14	0.23		
Attachment	Fixing screw M4×14 4 pieces			

(b) Type requiring power supply module

Type	Q63B	Q65B	Q68B	Q612B			
Number of I/O modules	3	5	8	12			
Possibility of extension		Extendable					
Applicable module		Q series	modules				
5VDC internal current consumption [A]	0.11	0.11	0.12	0.13			
Fixing hole size	M4 screw hole or ϕ 4.5 hole (for M4 screw)						
Exterior dimensions [mm(inch)]	189(W)×98(H) ×44.1(D) (7.44(W)×3.86(H) ×1.74(D))	245(W)×98(H) ×44.1(D) (9.65(W)×3.86(H) ×1.74(D))	328(W)×98(H) ×44.1(D) (12.91(W)×3.86(H) ×1.74(D))	439(W)×98(H) ×44.1(D) (17.28(W)×3.86(H) ×1.74(D))			
Mass [kg]	0.23	0.28	0.39	0.49			
Attachment	Fixing screw M4 × 14 4 pieces (Note-1)						

(Note-1): The 5 base mounting screws are included with the Q68B and Q612B that have 5 base mounting holes.

(2) Extension cable specifications

The list below describes the specifications of the extension cables which can be used.

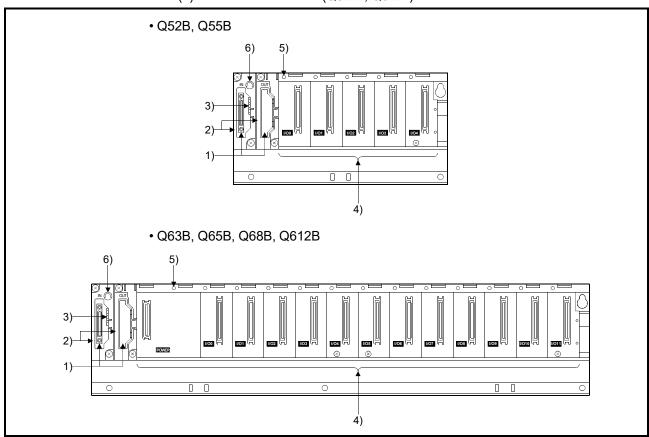
Type	QC05B	QC06B	QC12B	QC30B	QC50B	QC100B
Cable length [m(ft.)]	0.45(1.48)	0.6(1.97)	1.2(3.94)	3.0(9.84)	5.0(16.40)	10.0(32.81)
Application	Connection between the Motion controller and extension base unit, or connection between the extension base units.					
Mass [kg]	0.15	0.16	0.22	0.40	0.60	1.11

POINT

When the extension cables are used in combination, limit the overall length of the combined cable to 13.2m (43.31ft.).

(3) Names of parts of the extension base unit Names of parts of the extension base unit are described below.

(a) Extension base unit (Q5□B, Q6□B)



No.	Name	Application
1)	Extension cable connector	Connector for connecting an extension cable (for signal communications with the extension base unit)
2)	Base cover	Protective cover of extension cable connector. Before an extension cable is connected, the area of the base cover surrounded by the groove under the word "OUT" on the base cover must be removed with a tool such as nippers.
3)	Stage No. setting connector	Connector for setting the number of stages of extension base units.
4)	Module connector	Connector for installing the Motion modules, power supply module, I/O modules, and intelligent function module. To the connectors located in the spare space where these modules are not installed, attach the supplied connector cover or the blank cover module (QG60) to prevent entry of dirt.
5)	Module fixing screw hole	Screw hole for fixing the module to the extension base unit. Screw size: M3 $ imes$ 12
6)	Base mounting hole	Hole for mounting this base unit onto the panel of the control panel (for M4 screw)

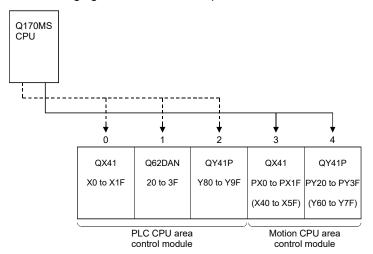
(4) I/O allocations

It is possible to allocate unique I/O No.s for each Motion CPU area independently of the PLC CPU area's I/O No.s.

ON/OFF data input to the Motion CPU area is handled via input devices PX□□, while ON/OFF data output from the Motion CPU area is handled via output devices PY□□.

It is not mandatory to match the I/O device PX/PY No.s used in the Motion program with the PLC I/O No.s; but it is recommended to make them match as much as possible.

The following figure shows an example of I/O allocation.



(Note-1): When the number of modules to be installed is 32 points. (Note-2): When the PX/PY No. does not match the PLC I/O No.

Refer to the Q173D(S)CPU/Q172D(S)CPU Motion Controller Programming Manual (COMMON) about the I/O allocation setting method of the Motion CPU area, and refer to APPENDIX 1.3 and the "QnUCPU User's Manual (Function Explanation, Program Fundamentals)" about the I/O allocation setting method of the PLC CPU area.

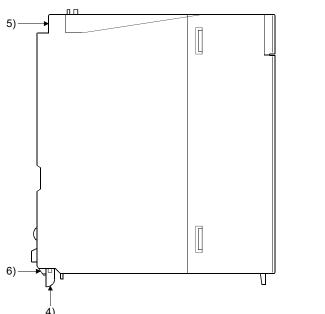
POINT

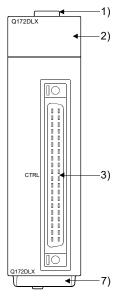
I/O device of the Motion CPU area can be set in the range PX/PY000 to PX/PYFFF. The real I/O points must be 256 points or less. (As for the I/O No., it is possible not to continue.)

2.5.4 Q172DLX Servo external signals interface module

Q172DLX receives external signals (servo external signals) required for positioning control.

(1) Q172DLX name of parts





No.	Name		Application				
1)	Module fixing hook	Hook used to fix the module to the base unit. (Single-motion installation)					
			Display the servo external input status from the external equipment.				
			LED	Details			
2)	Input indicator LED		0 to 1F	Display for servo external signal input status of each axis.			
		CI	The proximity dog/speed-position switching signal (DOG/ CHANGE) does not turn ON without setting Q172DLX in the system setting.				
3)	CTRL connector	Th	The servo external signal input connector of each axis.				
4)	Module mounting lever	U	Used to install the module to the base unit.				
5)	Module fixing screw hole	Hole for the screw used to fix to the base unit. (M3×12 screw : Purchase from another supplier)					
6)	Module fixing projection	Pr	Projection used to fix to the base unit.				
7)	Serial number display	Di	Display the serial number described on the rating plate.				

POINT

Input indicator LED of the proximity dog/speed-position switching signal (DOG/CHANGE) turns ON at the following conditions.

- Q172DLX is set on the system setting of MT Developer2.
- The proximity dog/speed-position switching signal (DOG/CHANGE) is input.

(2) Performance specifications

(a) Module specifications

Item	Specifications		
Number of I/O occupying points	32 points(I/O allocation: Intelligent, 32 points)		
Internal current consumption(5VDC) [A]	0.06		
Exterior dimensions [mm(inch)]	98(H)× 27.4(W)×90(D)		
Mass [kg]	(3.86(H)×1.08(W)×3.54(D)) 0.15		

(b) Input

Item		Specifications		
Number of input points		Servo external signals : 32 points (Upper stroke limit, Lower stroke limit, Stop input, Proximity dog/Speed-position switching signal) $ (4 \text{ points} \times 8 \text{ axes}) $		
Input method		Sink/Source type		
Common terminal arranger	ment	32 points/common (common terminal: B1, B2)		
Isolation method		Photocoupler		
Rated input voltage		12/24VDC		
Rated input current		12VDC 2mA/24VDC 4mA		
Operating voltage range		10.2 to 26.4VDC (12/24VDC +10/ -15%, ripple ratio 5% or less)		
ON voltage/current		10VDC or more/2.0mA or more		
OFF voltage/current		1.8VDC or less/0.18mA or less		
Input resistance		Approx. 5.6kΩ		
Response time of the Upper/Lower stroke limit	OFF to ON	1ms		
and STOP signal	ON to OFF	IIIIS		
Response time of the proximity dog, Speed-	OFF to ON	0.4ms/0.6ms/1ms		
position switching signal	ON to OFF	(CPU parameter setting, Default 0.4ms)		
Operation indicator		ON indication (LED)		
External connector type		40 pin connector		
Applicable wire size		0.3mm ²		
Applicable connector for the	e external	A6CON1 (Attachment),		
connection Applicable connector/ Terminal block converter m	nodule	A6CON2, A6CON3, A6CON4 (Optional) A6TBXY36, A6TBXY54, A6TBX70 (Optional)		

(3) Connection of servo external signals interface module

(a) Servo external signals

There are the following servo external signals.

(Upper stroke limit is limit value of address increase direction/lower stroke limit is limit value of an address decrease direction.)

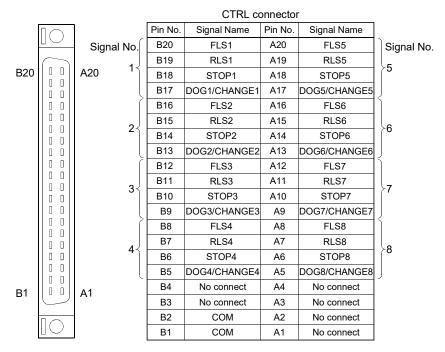
The Q172DLX is assigned a set of input No.s per axis. Make the system setting of MT Developer2 to determine the I/O No.s corresponding to the axis No.s.

Servo external signal	Application	Number of points on one Q172DLX
Upper stroke limit input (FLS) Lower stroke limit input (RLS)	For detection of upper and lower stroke limits.	
Stop signal input (STOP)	For stopping under speed or positioning control.	32 points
Proximity dog/	For detection of proximity dog at proximity dog or count	(4 points/8 axes)
Speed-position switching input	type home position return or for switching from speed	
(DOG/CHANGE)	to position switching control.	

(b) The pin layout of the CTRL connector

Use the CTRL connector on the front of the Q172DLX module to connect to servo external signals.

The following is the pin layout of the Q172DLX CTRL connector as viewed from the front.



Applicable connector model name

A6CON1 type soldering type connector
N361J040AU connector (OTAX Corporation)
N360C040B connector cover
A6CON2 type Crimp-contact type connector

A6CON2 type Crimp-contact type connector
A6CON3 type Pressure-displacement type connector
A6CON4 type soldering type connector

(Optional)

DOG/CHANGE, STOP, RLS, FLS functions of each axis(1 to 8)

 DOG/CHANGE..... Proximity dog/Speed-position switching signal

 STOP...... Stop signal

 RLS Lower stroke limit

 FLS Upper stroke limit

For information about signal details, refer to the programming manual.

(Note): Connector/terminal block conversion modules and cables can be used at the wiring of CTRL connector.

A6TBXY36/A6TBXY54/A6TBX70: Connector/terminal block

converter module

 $\mathsf{AC} \square \mathsf{TB} \ (\square : \mathsf{Length} \ [\mathsf{m}]) \qquad \qquad : \mathsf{Connector/terminal} \ \mathsf{block}$

converter module cable

POINT

Signal No. 1 to 8 can be assigned to the specified axis. Make the assignment in the system settings of MT Developer2.

Input or Output Signal name Pin No. LED Wiring example Internal circuit Specification Description B20 FLS1 0 Supply voltage FLS2 B16 4 12 to 24 VDC (10.2 to 26.4 VDC FLS3 B12 8 stabilized power FLS4 B8 С FLS Upper stroke supply) FLS5 A20 10 limit input FLS6 A16 14 A12 18 FLS7 FLS8 Α8 1C B19 RLS1 1 5 RLS2 B15 RLS3 **B11** 9 RLS4 В7 D RLS Lower stroke RLS5 A19 11 limit input RLS6 A15 15 RLS8 A11 19 High level RLS8 Α7 1D 10.0 VDC or more B18 STOP1 2 2.0mA or more STOP2 B14 6 Input STOP3 B10 Α STOP4 В6 Ε STOP STOP5 A18 12 Stop signal input STOP6 A14 16 STOP7 A10 1A I ow level STOP8 A6 1E 1.8 VDC or less/ DOG/CHANGE1 B17 3 0.18mA or less DOG/CHANGE2 B13 7 DOG/CHANGE3 В9 В DOG/CHANGE4 **B**5 F Proximity doa/ DOG/CHANGE DOG/CHANGE5 A17 13 Speed-position switching signal DOG/CHANGE6 A13 17 DOG/CHANGE7 1B Α9 DOG/CHANGE8 A5 1F Common terminals Power supply for servo external R1 R2 (Note) input signal. 12VDC to 24VDC

(4) Interface between CTRL connector and servo external signal

(Note): As for the connection to power line (B1, B2), both "+" and "-" are possible.

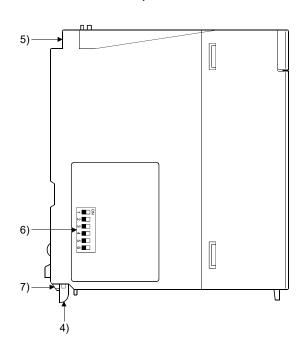
∆CAUTION

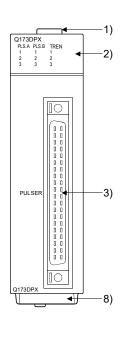
- Always use a shield cable for connection of the CTRL connector and external equipment, and avoid running it close to or bundling it with the power and main circuit cables to minimize the influence of electromagnetic interface. (Separate them more than 200mm (0.66ft.) away.)
- Connect the shield wire of the connection cable to the FG terminal of the external equipment.
- Make parameter setting correctly. Incorrect setting may disable the protective functions such as stroke limit protection.
- Always wire the cables when power is off. Not doing so may damage the circuit of modules.
- Wire the cable correctly. Wrong wiring may damage the internal circuit.

2.5.5 Q173DPX Manual pulse generator interface module

Q173DPX receives signals required for Manual pulse and Incremental synchronous encoder (Voltage-output/Open-collector type/Differential-output type) input.

(1) Q173DPX name of parts





No.	Name		Application				
1)	Module fixing hook	-	Hook used to fix the module to the base unit. (Single-motion installation)				
		D	isplay the input	status from the external equipment.			
			LED	Details			
2)	2) Input indicator LED		PLS.A 1 to 3 PLS.B 1 to 3 PLS.B 1 to 3 PLS.B 1 to 3 TREN 1 to 3 Display for input signal status of manual pulse generator/incremental synchronous encoder phases A, B The manual pulse generator/incremental synchronous encoder phases A, B and tracking enable signal does not turn ON without				
		setting Q173DPX in the system setting.					
3)	PULSER connector	Input connector of the Manual pulse generator/Incremental synchronous encoder.					
4)	Module mounting lever	U	Used to install the module to the base unit.				
5)	Module fixing screw hole		Hole for the screw used to fix to the base unit (M3×12 screw : Purchase from another supplier)				

No.	Name	Application				
		Dip switch 1	Detec SW1 OFF	tion set SW2 OFF	ting of TREN1 signal	
		Dip switch 2	ON ON	ON OFF	TREN is detected at leading edge of TREN signal. TREN is detected at trailing edge	
	Dip switches (Note-1)		OFF	ON	of TREN signal.	
		Dip switch 3	Detec SW3 OFF	tion set SW4 OFF	ting of TREN2 signal	
6)	3 <u> </u>	Dip switch 4	ON ON	ON OFF	TREN is detected at leading edge of TREN signal.	
	(Factory default in OFF		OFF	ON	TREN is detected at trailing edge of TREN signal.	
	(Factory default in OFF position)	Dip switch 5	Detec	Detection setting of TREN3 signal		
	position,		SW5	SW6		
			OFF	OFF	TREN is detected at leading	
		Dip switch 6	ON ON	ON OFF	edge of TREN signal.	
			OFF	ON	TREN is detected at trailing edge of TREN signal.	
7)	Module fixing projection Projection use			to the	base unit.	
8)	Serial number display	Display the se	erial nu	mber de	escribed on the rating plate.	

(Note-1): The function is different depending on the operating system software installed.

△ CAUTION

- Before touching the DIP switches, 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.

POINTS

Input indicator LED of the manual pulse generator/incremental synchronous encoder phases A, B and tracking enable signal turns ON at the following conditions.

- (1) PLS.A 1 to 3, PLS.B 1 to 3
 - Q173DPX is set in the system setting of MT Developer2.
 - All axes servo ON command (M2042) turned on.
 - Manual pulse generator enable flag (M2051, M2052, M2053) turned on.
 - Manual pulse generator signal is input.
- (2) TREN 1 to 3
 - Q173DPX is set in the system setting of MT Developer2.
 - The tracking enable signal is input.

(2) Performance specifications

(a) Module specifications

Item	Specifications		
Number of I/O occupying points	32 points(I/O allocation: Intelligent, 32 points)		
Internal current consumption(5VDC)[A]	0.38		
Exterior dimensions [mm(inch)]	98(H)×27.4(W)×90(D) (3.86(H)×1.08(W)×3.54(D))		
Mass [kg]	0.15		

(b) Tracking enable signal input

Item		Specifications		
Number of input points		Tracking enable signal : 3 points		
Input method		Sink/Source type		
Common terminal arranger	nent	1 point/common (Common contact: TREN.COM)		
Isolation method		Photocoupler		
Rated input voltage		12/24VDC		
Rated input current		12VDC 2mA/24VDC 4mA		
		10.2 to 26.4VDC		
Operating voltage range		(12/24VDC +10/ -15%, ripple ratio 5% or less)		
ON voltage/current		10VDC or more/2.0mA or more		
OFF voltage/current		1.8VDC or less/0.18mA or less		
Input resistance		Approx. 5.6kΩ		
	OFF to ON	0.4ms/0.6ms/1ms		
Response time	ON to OFF	(CPU parameter setting, Default 0.4ms)		
Operation indicator		ON indication(LED)		

(Note): Functions are different depending on the operating system software installed.

(c) Manual pulse generator/Incremental synchronous encoder input

ltem			Specifications		
Number of modules			3/module		
Voltage-output/		High-voltage	3.0 to 5.25VDC		
Open-collector	type	Low-voltage	0 to 1.0VDC		
Differential-outp	out type	High-voltage	2.0 to 5.25VDC		
(26LS31 or equ	ivalent)	Low-voltage	0 to 0.8VDC		
Input frequency	1		Up to 200kpps (After magnification by 4)		
Applicable types			 Voltage-output type/Open-collector type (5VDC), Recommended product: MR-HDP01 Differential-output type: (26LS31 or equivalent) 		
External connector type			40 pin connector		
Applicable wire	size		0.3mm ²		
Applicable connector for the external connection			A6CON1(Attachment), A6CON2, A6CON3, A6CON4 (Optional)		
Cable length Voltage-output/ Open-collector type Differential-output type		ector type	30m (98.43ft.) (Open-collector type: 10m (32.81ft.))		

(3) Connection of manual pulse generator

Manual pulse generators of the voltage-output/open-collector type and differential-output type can be connected. Both connection methods are different. (Refer to this section (5).)

When the manual pulse generator is connected to the Q173DPX, it cannot be connected to the internal I/F.

Motion controller	Connectable manual pulse generator		
0470M00DLL	Up to 3 modules		
Q170MSCPU	(Q173DPX: Up to 1 module)		

(4) Connection of incremental synchronous encoder

Incremental synchronous encoders of the voltage-output/Open-collector type and differential-output type can be connected. Both connection methods are different. (Refer to this section (5).)

The serial absolute synchronous encoder cannot be connected to the Q173DPX.

Motion controller	Connectable synchronous encoder
Q170MSCPU	Up to 12 modules
Q170MSCPU (Combination of Q173DPX and internal I/F ^(Note))	(Q173DPX: Up to 4 modules) Up to 10 modules (Q173DPX: Up to 3 modules)

(Note): Refer to Section 2.5.1 for details of the internal I/F.

Tracking enable signal

Tracking enable signal of Q173DPX is used to start the input from incremental synchronous encoders in the external input mode for the clutch.

The external input signal of the incremental synchronous encoder is indicated below.

This signal is used as the input start signal, high-speed reading function or high-speed input request signal from incremental synchronous encoder.

External input signal of the	Application	Number of points on
incremental synchronous encoder	Application	one Q173DPX
Tracking enable signal input	Input start function from incremental	Each 1 point
Tracking enable signal input	synchronous encoder	(Total 3 points)

(5) Connection of manual pulse generator interface module

(a) The pin layout of the PULSER connector

Use the PULSER connector on the front of the Q173DPX module to connect to manual pulse signals and incremental synchronous encoder signals. The following is the pin layout of the Q173DPX PULSER connector as viewed from the front.

					PULSER connector					
		1		Pin No.	Signal Name	Pin No.	Signal Name			
		_	2)	B20	HB1	A20	HA1	2)		
				B19	SG	A19	SG			
B20		A20		B18	5V	A18	HPSEL1	1)		
			3\ J	B17	HA1N	A17	HA1P]] 3/		
	0 0		3)≺	B16	HB1N	A16	HB1P	3)		
			2)	B15	HB2	A15	HA2	2)		
				B14	SG	A14	SG			
	0 0			B13	5V	A13	HPSEL2	1)		
	0 0		3)√	B12	HA2N	A12	HA2P	3)		
			3)	B11	HB2N	A11	HB2P] ʃ ³)		
	0 0		2)	B10	HB3	A10	HA3	2)		
	0 0			B9	SG	A9	SG			
				B8	5V	A8	HPSEL3	1)		
	0 0		3)√	B7	HA3N	A7	HA3P	3)		
	0 0		3)	B6	HB3N	A6	HB3P]		
				B5	No connect	A5	No connect			
В1	0 0	A1		B4	TREN1-	A4	TREN1+			
٥,		' '		B3	TREN2-	A3	TREN2+			
	П			B2	TREN3-	A2	TREN3+			
]	4)	B1	FG	A1	FG	4)		

Applicable connector model name

A6CON1 type soldering type connector
N361J040AU connector (OTAX Corporation)
N360C040B connector cover

A6CON2 type Crimp-contact type connector
A6CON3 type Pressure-displacement type connector
A6CON4 type soldering type connector

 Input type from manual pulse generator/incremental synchronous encoder switched by HPSEL□.

Not connected: Voltage-output/open-collector type HPSEL SG connection: Differential-output type (Switching is possible for each input 1 to 3)

2): Voltage-output/open-collector type

Connect the A-phase signal to HA1/HA2/HA3, and the B-phase signal to HB1/HB2/HB3.

3): Differential-output type

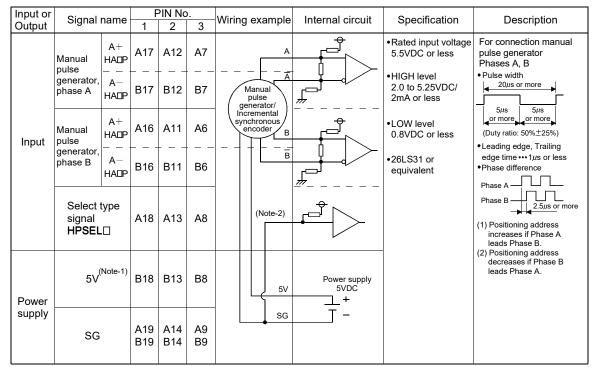
Connect the A-phase signal to HA1P/HA2P/HA3P, and the A-phase inverse signal to HA1N/HA2N/HA3N.

Connect the B-phase signal to HB1P/HB2P/HB3P, and the B-phase

Connect the B-phase signal to HB1P/HB2P/HB3P, and the B-phase inverse signal to HB1N/HB2N/HB3N.

- 4): Connect the shield cable between manual pulse generator/incremental synchronous encoder and Q173DPX at the FG signal.
- 5): Connector/terminal block conversion modules cannot be used.

(b) Interface between PULSER connector and manual pulse generator (Differential-output type)/Incremental synchronous encoder

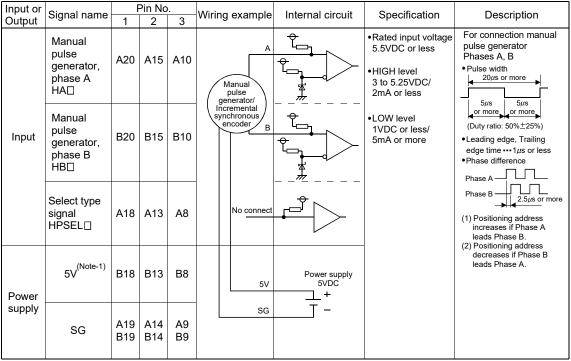


(Note-1): The 5V(P5)DC power supply from the Q173DPX must not be used if a separate power supply is applied to the Manual pulse generator/Incremental synchronous encoder.

If a separate power supply is used, be sure it is 5V voltage. Anything else may cause a failure.

(Note-2): Connect HPSEL□ to the SG terminal if the manual pulse generator (differential-output type) /incremental synchronous encoder is used.

(c) Interface between PULSER connector and manual pulse generator (Voltageoutput/Open-collector type)/Incremental synchronous encoder.



(Note-1): The 5V(P5)DC power supply from the Q173DPX must not be used if a separate power supply is applied to the Manual pulse generator/Incremental synchronous encoder.

If a separate power supply is used, be sure it is 5V voltage. Anything else may cause a failure.

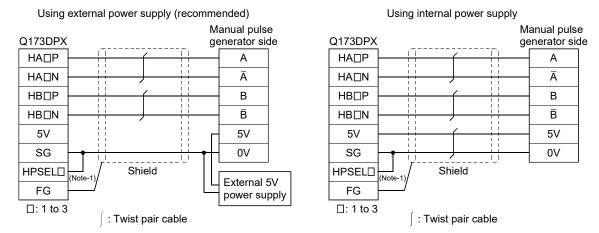
(d) Interface between PULSER connector and tracking enable signal

Input or	Signa	Signal name		Pin No).	Wiring example	Internal circuit	Specification	Description
Output	Olgric	ai ridirio	1	2	3	willing example litternal circuit		opcomodion	Bescription
lanut	Tracking	TREN□+	A4	А3	A2				Tracking enable signal input.
Input	enable	TREN□-	В4	В3	B2	+ - 12V to 24VDC			

(Note): As for the connection to tracking enable (TREN \square +, TREN \square -), both "+" and "-" are possible.

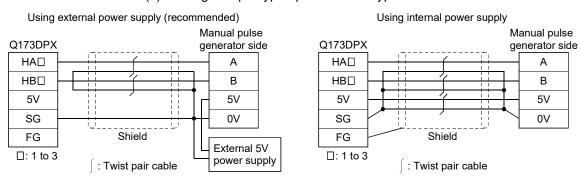
(6) Connection examples of manual pulse generator

(a) Differential-output type



(Note-1): Connect HPSEL□ to the SG terminal if the manual pulse generator (differential-output type)/ incremental synchronous encoder is used.

(b) Voltage-output type/open-collector type



∆CAUTION

- If a separate power supply is applied to the manual pulse generator/incremental synchronous encoder, be sure it is 5V voltage. Anything else may cause a failure.
- Always wire the cables when power is off. Not doing so may damage the circuit of modules.
- Wire the cable correctly. Wrong wiring may damage the internal circuit.
- 5V(P5) terminal is the power supply for the manual pulse generator. Do not apply a voltage and do not use it for other purposes.

2.5.6 Manual pulse generator/Serial absolute synchronous encoder

(1) Manual pulse generator specifications

Item	Specifications			
Model name	MR-HDP01 ^(Note-1)			
Ambient temperature	-10 to 60°C (14 to 140°F)			
Pulse resolution	25pulse/rev (100pulse/rev after magnification by 4)			
Output method	Voltage-output/Output current : Up to 20mA			
Power supply voltage	4.5 to 13.2VDC			
Current consumption [mA]	60			
Outrout laval	"H" level: Power supply voltage ^(Note-2) -1V or more (with no load)			
Output level	"L" level: 0.5V or less (with maximum leading-in)			
Life time	1,000,000 revolutions or more (at 200r/min)			
Permitted axial loads	Radial load : Up to 19.6N, Thrust load : Up to 9.8N			
Mass [kg]	0.4			
Number of max. revolution	Instantaneous Up to 600r/min. normal 200r/min			
Pulse signal status	2 signals : A phase, B : phase, 90° phase difference			
Start friction torque	0.06N•m (20°C (68°F))			

(Note-1): Use MR-HDP01 by connecting with internal I/F or Q173DPX or Q170MSCPU's internal I/F.

(Note-2): If a separate power supply is used, be sure it is 5VDC \pm 0.25V voltage.

(2) Serial absolute synchronous encoder specifications

Item	Specifications			
Model name	Q171ENC-W8 (Note-1)			
Ambient temperature	-5 to 55°C (23 to 131°F)			
Resolution	4194304pulse/rev			
Transmission method	Serial communications (Connected to Q172DEX)			
Direction of increasing addresses	CCW (viewed from end of shaft)			
Protective construction	Dustproof/Waterproof (IP67: Except for the shaft-through portion.)			
Permitted speed at power ON	3600r/min			
Permitted speed at power OFF (Note-2)	500r/min			
Permitted axial loads	Radial load : Up to 19.6N, Thrust load : Up to 9.8N			
Runout at input shaft tip	0.02mm (0.00079 inch) or less (15mm (0.59 inch) from tip)			
Start friction torque	0.04N•m (20°C (68°F))			
Recommended coupling	Bellows coupling			
Permitted angular acceleration	40000rad/s ²			
Vibration resistance	5G (50 to 200Hz)			
Shock resistance	50G (11ms or less)			
Internal current consumption [A]	0.25			
Mass [kg]	0.6			
Connecting coble [m/ft]]	Q170ENCCBL□M(-A)			
Connecting cable [m(ft.)]	(□=Cable length: 2(6.56), 5(16.40), 10(32.81), 20(65.62), 30(98.43), 50(164.04))			
Communications method	Differential driver/receiver			
Transmission distance	Up to 50m (164.04ft.)			

(Note-1): When an "o-ring" is required, please purchase one separately.

(Note-2): If the permitted speed at power OFF is exceeded, a position displacement is generated.

2.5.7 SSCNETⅢ cables

Between the Motion controller and servo amplifiers, or servo amplifier and servo amplifier connected by SSCNETII cable. Up to 16 servo amplifiers can be connected.

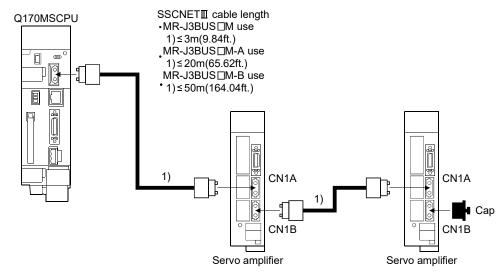
(1) SSCNETⅢ cable specifications

Mode	l name	Cable length [m(ft.)]	Description	
	MR-J3BUS015M	0.15 (0.49)		
	MR-J3BUS03M	0.3 (0.98)		
MR-J3BUS□M	MR-J3BUS05M	0.5 (1.64)		
	MR-J3BUS1M	1 (3.28)		
	MR-J3BUS3M	3 (9.84)	0.470140.00140	
	MR-J3BUS5M-A	5 (16.40)	 Q170MSCPU	
MR-J3BUS□M-A	MR-J3BUS10M-A	10 (32.81)	Servo ampliller + Servo ampliller	
	MR-J3BUS20M-A	20 (65.62)		
	MR-J3BUS30M-B	30 (98.43)		
MR-J3BUS□M-B	MR-J3BUS40M-B	40 (131.23)		
	MR-J3BUS50M-B	50 (164.04)		

(2) Connection between the Q170MSCPU and servo amplifiers

Connect the SSCNETⅢ cables to the following connectors.

Refer to Section 4.2.1 for the connection and disconnection of SSCNETII cable.



(Note): It cannot communicate if the connection of CN1A and CN1B is mistaken.

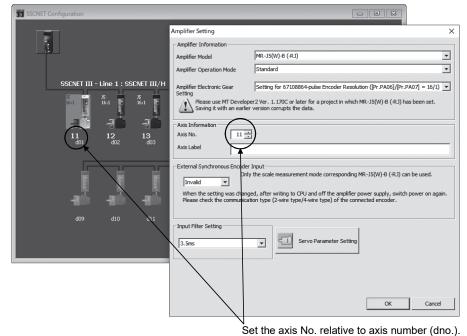
(3) Setting of the axis No. and axis select rotary switch of servo amplifier

Axis No. is used to set the axis numbers of servo amplifiers connected to SSCNETII connector in the program. Axis No. of 1 to 16 can be set.

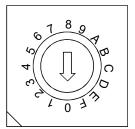
Axis No. is set in the system setting of MT Developer2. Axis No. (1 to 16) is allocated and set for the setting axis number (d01 to d16) of servo amplifier.

Since the axis number (d01 to d16) of a servo amplifier on the system setting screen corresponds to the rotary switches (SW1/SW2) (0 to F)/axis select rotary switch (0 to F) of a servo amplifier, set the rotary switches (SW1/SW2)/axis select rotary switch while referring to Table 2.1 in (a) or Table 2.2 in (b) below.

• Setting display of axis No.



 Rotary switch (SW1/SW2)/ Axis select rotary switch (Servo amplifier)



(a) When using MR-J5(W)-□B

Correspondence between the dno. and the rotary switches (SW1/SW2) of the servo amplifier is shown in Table 2.1.

Table 2.1 Correspondence between dno.s and rotary switches (SW1/SW2) of servo amplifier

dno. ^(Note-1)	Rotary switch			
ano. (tete 1)	SW1 (Note-2)	SW2		
d01	"0"	"0"		
d02	"0"	"1"		
d03	"0"	"2"		
d04	"0"	"3"		
d05	"0"	"4"		
d06	"0"	"5"		
d07	"0"	"6"		
d08	"0"	"7"		

dno. ^(Note-1)	Rotary switch			
ano. (*******)	SW1 (Note-2)	SW2		
d09	"0"	"8"		
d10	"0"	"9"		
d11	"0"	"A"		
d12	"0"	"B"		
d13	"0"	"C"		
d14	"0"	"D"		
d15	"0"	"E"		
d16	"0"	"F"		

(Note-1): The dno. is number of servo amplifier axis displayed with the system setting of MT Developer2.

Axis No. is set relative to dno. in the system settings.

(Note-2): Set rotary switch (SW1) to "0". Rotary switch (SW1) cannot be set to any value other than "0" (1 to F).

(b) When using MR-J4(W)-□B/MR-J3(W)-□B/MR-JE-□B Correspondence between the dno. and the axis select rotary switch of the servo amplifier is shown in Table 2.2.

Table 2.2 Correspondence between dno.s and axis select rotary switches of servo amplifier

dno. (Note-1)	Axis select rotary switch
d01	"0"
d02	"1"
d03	"2"
d04	"3"
d05	"4"
d06	"5"
d07	"6"
d08	"7"

dno. ^(Note-1)	Axis select rotary switch
d09	"8"
d10	"9"
d11	"A"
d12	"B"
d13	"C"
d14	"D"
d15	"E"
d16	"F"

(Note-1): The dno. is number of servo amplifier axis displayed with the system setting of MT Developer2. Axis No. is set relative to dno. in the system settings.

POINT

The setting of axis select rotary switch is different depending on the servo amplifier. Refer to the "Servo amplifier Instruction Manual" for details.

2.5.8 Battery

This section describes the battery specifications and handling precautions used for the Motion controller.

(1) Battery specifications

Model name	Q6BAT	Q7BATN	Q7BAT			
Classification	Manganese dioxide lithium primary battery					
Initial voltage [V]	3.0					
Nominal current [mAh]	1800	6000	5000			
Storage life	Shelf life of 5 years (at room temperature)					
Lithium content [g]	0.57	1.80	1.55			
Applications	For memory dat	Motion controller				
Exterior dimensions [mm(inch)]	φ16(0.63)×32(1.26)	18(0.71)×33(1.30) ×46.5(1.83)	φ24(0.94)×52(2.05)			

Transport guidelines

Products are packed in compliance with the transportation regulations prior to shipment. When repacking any of the unpacked products for transportation, make sure to observe the IATA Dangerous Goods Regulations, IMDG (International Maritime Dangerous Goods) Code, and other local transportation regulations.

For details, please consult the shipping carrier used.

(2) Data back-up of Motion controller by the battery

Be sure to set the battery to the Motion controller.

Set the battery (Q6BAT/Q7BATN/Q7BAT) to battery holder.

The data (Refer to Section 6.5.) in the RAM built-in Motion controller is not backed up without using the battery.

In the following status, the backup time after power OFF is 3 minutes.

- The Q6BAT/Q7BATN/Q7BAT lead connector is disconnected.
- The lead wire of Q6BAT/Q7BATN/Q7BAT is broken.

Table 2.2 Battery life of Q6BAT/Q7BATN/Q7BAT

				Battery life	(Total power failure	e time) [h] (Note-2)			
Motion controller	Battery type	Battery consumption (Note-1)	Power-on time ratio (Note-3)	Guaranteed value ^(Note-4) (MIN) (75°C (167°F))	Guaranteed value (Note-5) (TYP) (40°C (104°F))	Actual service value (Note-6) (Reference value) (TYP) (25°C (77°F))	Backup time after alarm		
			0%	13000	40000				
			30%	18000					
	Q6BAT	2	50%	21000					
			70%	24000					
Q170MSCPU			100%	43800					
(Note-7)			0%	39000					
	Q7BATN/Q7BAT		30%						
	(Large capacity)	2	50%	43800	43800	43800			
	(Large capacity)		70%	43000	43000				
			100%						
			0%	15300					
			30%	21000					
		1	50%	27900			-		
			70%	41500			SM52 ON)		
	l		100%	43800					
			0%	2600	7500	8800			
			30%	3700	10600	12500			
Q170MSCPU-S1	Q6BAT	2	50%	5100	14700	17400			
			70%	8400	23700	28000			
			100%	43800	43800	43800			
			0%	1400	4100	4800			
			30%	2100	5900	6900			
		3	50%	2900	8200	9600			
			70%	4800	13500	15800			
			100%	43800	43800	43800			

Table 2.2 Battery life of Q6BAT/Q7BATN/Q7BAT (continued)

				Rattery life	(Total power failure	time) [h] (Note-2)	
Motion controller	Battery type	Battery consumption (Note-1)	Power-on time ratio (Note-3)	Guaranteed value (Note-4) (MIN) (75°C (167°F))	Guaranteed value (Note-5) (TYP) (40°C (104°F))	Actual service value (Note-6) (Reference value) (TYP) (25°C (77°F))	Backup time after alarm
		1	0% 30% 50% 70% 100%	43800	43800	43800	
	Q7BATN/Q7BAT (Large capacity)	(OTDAT	0%	7600	21500	25000	90 (After SM51/ SM52 ON)
			30%	10900	30400	35300	
Q170MSCPU-S1		2	50%	15100	42000		
			70%	24700	42000	43800	
			100%	43800	43800		
			0%	4100	11900	13750	
			30%	5900	17000	19500	
		3	50%	8200	23600	27000	
			70%	13600	38600	43900	
			100%	43800	43800	43800	

- (Note-1): The battery consumption represents consumption of the Motion controller battery energy.
 - The larger the battery consumption value is, the more battery per time unit is consumed.
 - Refer to the "QCPU User's Manual (Hardware Design, Maintenance and Inspection) for details.
- (Note-2): The actual service value indicates the average value, and the guaranteed value indicates the minimum value.
- (Note-3): The power-on time ratio indicates the ratio of Motion controller power-on time to one day (24 hours). (When the total power-on time is 17 hours and the total power-off time is 7 hours, the power-on time ratio is 70%.)
- (Note-4): The guaranteed value (MIN); equivalent to the total power failure time that is calculated based on the characteristics value of the memory (SRAM) supplied by the manufacturer and under the storage ambient temperature range of -25°C to 75°C (-13 to 167°F) (operating ambient temperature of 0°C to 55°C (32 to 131°F)).
- (Note-5): The guaranteed value (TYP); equivalent to the total power failure time that is calculated based on the normal air-conditioned environment (40°C (104°F)).
- (Note-6): The actual service value (Reference value); equivalent to the total power failure time that is calculated based on the measured value and under the storage ambient temperature of 25°C (77°F). This value is intended for reference only, as it varies with characteristics of the memory.
- (Note-7): Battery consumption 1 cannot be used in Q170MSCPU.

POINTS

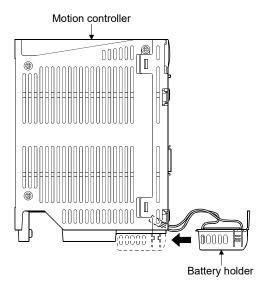
The self-discharge influences the battery life even without a connection to the Motion controller. The battery should be replaced approximately every 4 to 5 years. In addition, replace the battery with a new one in 4 to 5 years even if the total power failure time is the guaranteed value or less.

⚠CAUTION

- Do not short a battery.
- Do not charge a battery.
- Do not disassemble a battery.
- Do not burn a battery.
- Do not overheat a battery.
- Do not solder the battery terminal.
- The data (Refer to Section 6.5.) in the RAM built-in Motion controller is not backed up without using the battery.

(3) Connection procedure with Motion controller

Set the battery (Q6BAT/Q7BATN/Q7BAT) to the battery holder, and connect the lead connector of battery to the battery connector of Motion controller. Put the lead wire in the battery holder, and set it to the Motion controller.



Refer to Section 4.1.4 for the mounting and removal of the battery holder and the connection of the battery lead wire.

2.5.9 Forced stop input terminal

(1) Table of the forced stop input terminal specifications

Item		Specifications		
Number of input points		Forced stop signal : 1 point		
Input method		Sink/Source type		
Rated input current		2.4mA		
Isolation method		Photocoupler		
Operating voltage range		20.4 to 26.4VDC		
		(+10/ -15%, ripple ratio 5% or less)		
ON voltage/current		17.5VDC or more/2.0mA or more		
OFF voltage/curre	DFF voltage/current 1.8VDC or less/0.18mA or less			
Input resistance	resistance Approx. 10kΩ			
Response time	OFF to ON			
	ON to OFF	1ms or less		
External connector type		3 pin connector		
Recommended wire size		0.3 to 1.5mm2 (AWG16 to AWG22)		

DESIGN

3.1 System Designing Procedure

System designing procedure is shown below.

Motion control system design

Select the operating system software to be installed according to the machinery and equipment to be controlled.

Select the number of Q172DLX's and design according to the each axis control system and whether servo external signals are required or not.

- When there is mechanical home position and home position return is made: Proximity dog required
- For speed control: Speed-position switching control signal required
- When overrun prevention is necessary: Stroke limit required
- When each axis stop is necessary: STOP signal required

Select whether the manual pulse generators, incremental synchronous encoders or I/O signals built-in Motion controller are required or not.

Refer to section 2.5.1

Refer to section 2.5.4

Select Q173DPX and design according to whether manual pulse generators and incremental synchronous encoders are required or not

Refer to section 2.5.5

Select interrupt module QI60 according to whether interrupt input are required or not.

Select I/O modules/intelligent function modules according to the specifications of the external equipment to be controlled.

Refer to MELSEC-Q series manual

Select the extension base units, extension power supply module and extension cables, and make I/O assignment according to necessary number of Q172DLXs, Q173DPXs, I/O modules, intelligent function modules.

Refer to section 2.5.4 Refer to section 2.5.5 Refer to MELSEC-Q series manual.

Select the servo amplifier and servo motor according to the motor capacity and number of revolution from the machine mechanism to be controlled each axis.

Refer to the servo amplifier manual.

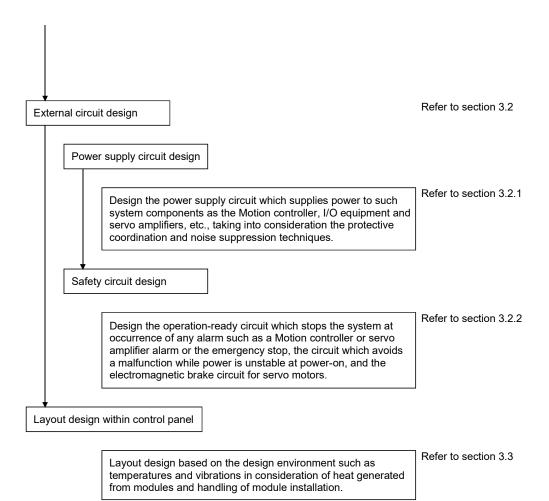
Set the servo amplifier connection by SSCNETII(/H) and axis numbers (dno.) and axis No..

Refer to section 2.5.7

Select SSCNETII/H head module and I/O modules/intelligent function modules according to the specifications of the external equipment to be controlled.

Select the head module connection by SSCNETⅢ/H, station number and axis No.

Refer to MELSEC-L series SSCNETII/H head module manual.



⚠ CAUTION

- Provide appropriate circuits external to the Motion controller to prevent cases where danger may result from abnormal operation of the overall system in the event of an external power supply fault or Motion controller failure.
- Mount the Motion controller, servo amplifier, servo motor and regenerative resistor on incombustible. Mounting 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 mounted and for the wires used. Failing to do so may lead to fire.
- 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 polarity (+/-), as this may lead to destruction or damage.

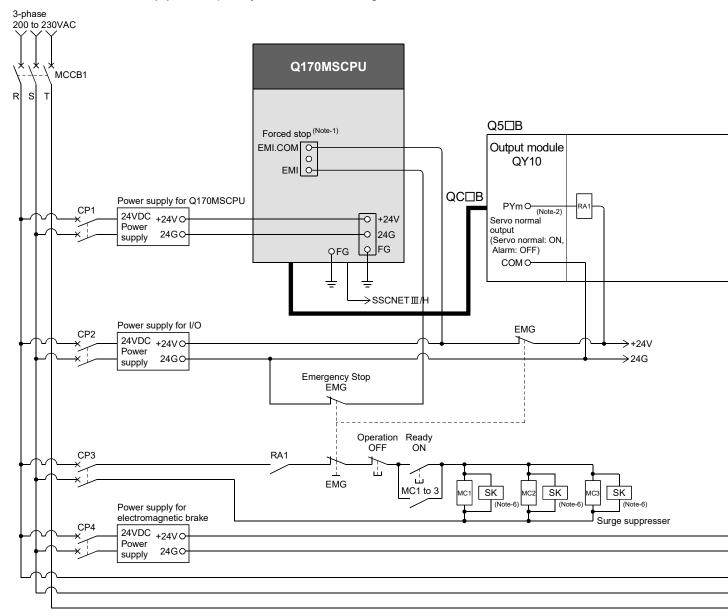
⚠ CAUTION

- Do not touch the heat radiating fins of controller or servo amplifier, regenerative resistor and servo motor, 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 servo motor 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.
- Always mount a leakage breaker on the Motion controller and servo amplifier power source.
- If mounting of an electromagnetic contactor for power shut off during an error, etc., is specified in the instruction manual for the servo amplifier, etc., always mount the electromagnetic contactor.
- Mount an emergency stop circuit externally so that the operation can be stopped immediately and the power shut off.
- Use the Motion controller, servo amplifier, servo motor and regenerative resistor with the correct combinations listed in the instruction manual. Other combinations may lead to fire or faults.
- If safety standards (ex., robot safety rules, etc.,) apply to the system using the Motion controller, servo amplifier and servo motor, 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 servo motor will be a problem during the forced stop, the emergency stop, servo OFF or when the power is shut 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, the emergency stop, servo OFF or when the power is shut OFF, use both dynamic brakes and electromagnetic brakes.
- The dynamic brakes must be used only during the forced stop, the emergency stop and errors where servo OFF occurs. These brakes must not be used for normal braking.
- The brakes (electromagnetic brakes) assembled into the servo motor 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, servo motor) used in a system must be compatible with the Motion controller, servo amplifier and servo motor.
- Install a cover on the shaft so that the rotary parts of the servo motor 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 servo motor are connected with a timing belt, etc.). Mount a stopping device to ensure safety on the machine side.

3.2 External Circuit Design

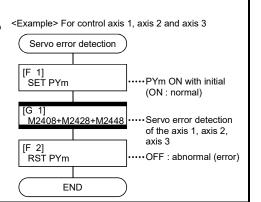
As to the ways to design the external circuits of the Motion system, this section describes the method and instructions for designing the power supply circuits and safety circuits, etc. (Example: Q170MSCPU and MR-J4- \square B use)

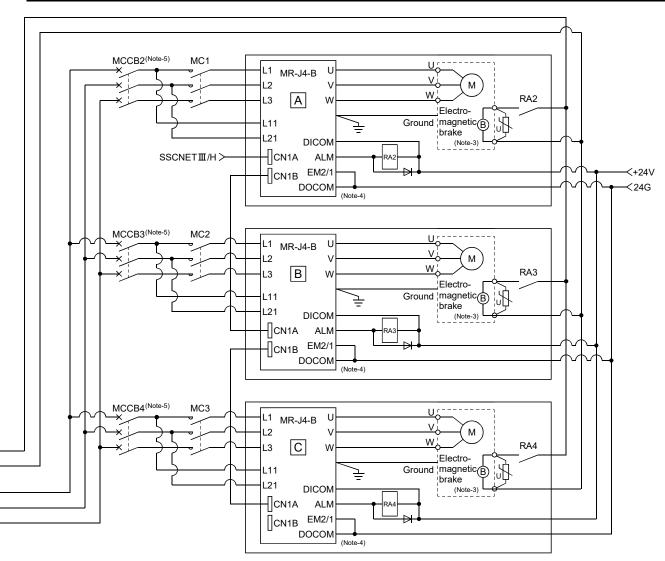
(1) Sample system circuit design for Motion CPU area



POINT

- (1) (Note-1): Make the forced stop input cable within 30m(98.43ft.). The forced stop by the forced stop terminal of input module is also possible.
- (2) (Note-2): Motion SFC program example is shown in the right record.
- (3) (Note-3): It is also possible to use a full wave rectified power supply as the power supply for the electromagnetic brake.
- (4) (Note-4): It is also possible to use forced stop signal of the servo amplifier.
- (5) (Note-5): Refer to the servo amplifier instruction manuals for selection of the circuit breaker and electromagnetic contactor.
- (6) (Note-6): The surge suppressor is recommended to be used for an AC relay or electromagnetic contactor (MC) near the servo amplifier. Refer to the servo amplifier instruction manual for selection of the surge suppressor.

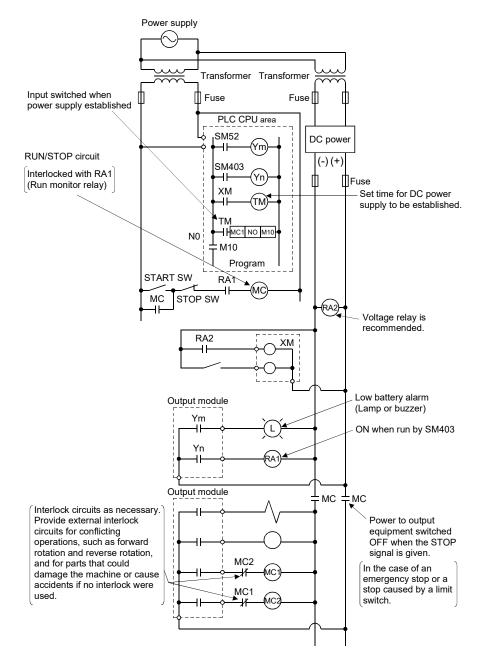




(Note-1): When the control power supply of servo amplifier is shut off, it is not possible to communicate with the servo amplifier after that. Example) When the control power supply L11/L21 of servo amplifier in above \blacksquare figure is shut off, it is also not possible to communicate with the servo amplifier \square .

If only a specific servo amplifier main circuit power supply is shut off, be sure to shut off the main circuit power supply L1/L2/L3, and do not shut off the control power supply L11/L21.

(Note-2): Be sure to shut off the both of main circuit power supply L1/L2/L3 and control power supply L11/L21 after disconnection of SSCNET communication by the connect/disconnect function of SSCNET communication at the time of exchange of servo amplifier. At this time, it is not possible to communicate between the servo amplifier and Motion controller. Therefore, be sure to exchange the servo amplifier after stopping the operating of machine beforehand.



(2) System design circuit example of the PLC CPU area

The start-up procedure is as follows

- 1) Switch the Motion controller power ON.
- 2) Set the Motion controller to RUN.
- 3) When DC power is established, RA2 goes ON.
- 4) Timer (TM) times out after the DC power reaches 100[%]. (The TM set value should be the period of time from when RA2 goes ON to the establishment of 100[%] DC voltage. Set this value to approximately 0.5 seconds.)
- 5) Turn ON the start switch.
- 6) When the electromagnetic contactor (MC) comes on, the output equipment is powered and may be driven by the program. (If a voltage relay is used at RA2, no timer (TM) is required in the program.)

3.2.1 Power supply circuit design

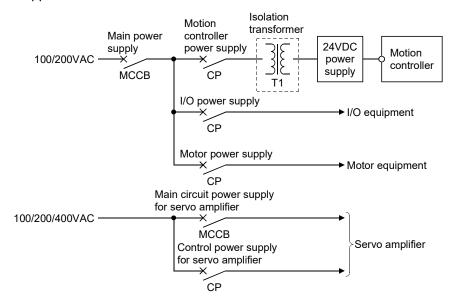
This section describes the protective coordination and noise suppression techniques of the power supply circuit.

(1) Separation and protective coordination (leakage current protection, over current protection) of power supply lines

Separate the lines for Motion controller's power supplies from the lines for I/O devices and servo amplifiers as shown below.

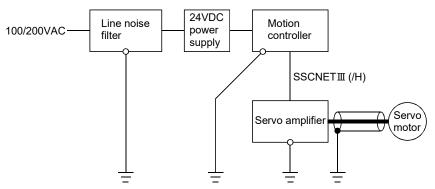
When there is much noise, connect an insulation transformer.

The Motion controller may malfunction as it is affected by various noises such as electric path noises from the power supply lines, and electromagnetic noises from contactors. To avoid such troubles, set the 24VDC power supply according to application.



(2) Grounding

The Motion controller may malfunction as it is affected by various noises such as electric path noises from the power supply lines, radiated and induced noises from other equipment, servo amplifiers and their cables, and electromagnetic noises from contactors. To avoid such troubles, connect the earthing ground of each equipment and the shield grounds of the shielded cables to the earth. For grounding, use the exclusive ground terminal wire of each equipment or a single-point earth method to avoid grounding by common wiring, where possible, since noises may sneak from other equipment due to common impedances.



(Note): Be sure to ground the line noise filter, Motion controller, servo amplifier and servo motor. (Ground resistance : 100Ω or less)

3.2.2 Safety circuit design

(1) Concept of safety circuits

When the Motion controller is powered on and off, normal control output may not be done momentarily due to a delay or a startup time difference between the Motion controller power supply and the external power supply (DC in particular) for the control target.

Also, an abnormal operation may be performed if an external power supply fault or Motion controller failure takes place.

To prevent any of these abnormal operations from leading to the abnormal operation of the whole system and in a fail-safe viewpoint, areas which can result in machine breakdown and accidents due to abnormal operations (e.g. emergency stop, protective and interlock circuits) should be constructed outside the Motion controller.

(2) Emergency stop circuit

The circuit should be constructed outside of the Motion controller or servo amplifier. Shut off the power supply to the external servo amplifier by this circuit, make the electromagnetic brakes of the servo motor operated.

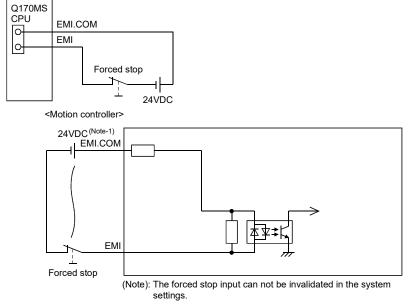
(3) Forced stop circuit

(a) The forced stop of all servo amplifiers is possible in a lump by using the forced stop input of Motion controller. After forced stop, the forced stop factor is removed and the forced stop canceled.

(The servo error detection signal does not turn on with the forced stop.) The forced stop input cannot be invalidated in the parameter setting of system setting.

Make the forced stop input cable within 30[m](98.43[ft.]).

The wiring example for the forced stop input of Motion controller is shown below.

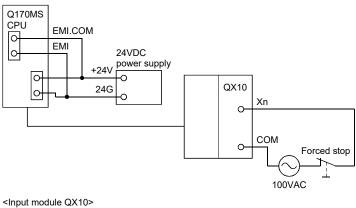


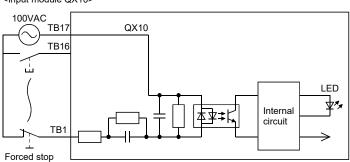
(Note-1): As for the connection, both "+" and "-" are possible.

(b) The forced stop of all servo amplifiers is possible in a lump by using the forced stop input of input modules. After forced stop, the forced stop factor is removed and the forced stop canceled.

(The servo error detection signal does not turn on with the forced stop.) The forced stop input can be set by allocation of the device number in the parameter setting of system setting. When the device is used, apply 24VDC voltage on EMI connector and invalidate the forced stop input of EMI connector.

The wiring example that uses the forced stop input of input module (QX10) is shown below.





(Note): The forced stop input can be set in the system settings.

(c) It is also possible to use the forced stop signal of the servo amplifier. Refer to manual of the servo amplifier about servo motor capacity.

Operation status of the emergency stop, the servo amplifier forced stop, and the Motion controller forced stop are as follows.

Item	Operation of the signal ON	Remark		
Emergency stop		The main circuit power supply of the servo amplifier is shut off by external circuit and the servo motor is stopped.		
Servo amplifier forced stop	Servo OFF	A stop command from the external circuit to the servo amplifier is output and the servo amplifier stops the servo motor.		
Motion controller forced stop		A stop command from the Motion controller to the servo amplifier is output and the servo amplifier stops the servo motor.		

3.3 Layout Design within the Control Panel

3.3.1 Mounting environment

Mount the Motion controller system in the following environment conditions.

- (1) Ambient temperature is within the range of 0 to 55[°C] (32 to 131[°F]).
- (2) Ambient humidity is within the range of 5 to 95[%]RH.
- (3) No condensing from sudden temperature changes
- (4) No corrosive or inflammable gas
- (5) There must not be a lot of conductible dust, iron filings, oil mist, or salt, organic solvents.
- (6) No direct sunlight
- (7) No strong electrical or magnetic fields
- (8) No direct vibrations or shocks on the Motion controller

3.3.2 Calculating heat generation by Motion controller

The ambient temperature inside the panel storing the Motion controller must be suppressed to an ambient temperature of 55°C(131°F) or less, which is specified for the Motion controller.

For the design of a heat releasing panel, it is necessary to know the average power consumption (heating value) of the devices and instruments stored inside.

Here the method of obtaining the average power consumption of system is described. From the power consumption, calculate a rise in ambient temperature inside the control panel.

How to calculate average power consumption

The power consuming parts of the Motion controller are roughly classified into six blocks as shown below.

(1) Total power consumption for 5VDC logic circuits of all modules (including Motion controller)

This is a power to which each module consumes the current supplied by the 5VDC output circuit of the internal power supply.

(including the current consumption of the base unit.)

$$W_{5V} = I_{5V} \times 5 [W]$$

15V: Current consumption of 5VDC logic circuit of each module

(2) Power consumption of internal power supply

The power conversion efficiency of the internal power supply is approx. 80[%], while 20 [%] of the output power is consumed as heat. As a result, 1/4 of the output power is the power consumption.

Therefore the calculation formula is as follows.

$$W_{PW} = \frac{1}{4} \times W_{5V} [W]$$

15V: Current consumption of 5VDC logic circuit of each module

(3) A total of 24VDC average power consumption of the internal output circuit and output module

The average power of the external 24VDC power is the total power consumption of the internal output circuit and each output module.

W₂₄V = $I_{24}V \times 24 \times Simultaneous ON rate [W]$

l24V: Average current consumption of external 24VDC power supply [A] (Power consumption for simultaneous ON points)

(4) Average power consumption due to voltage drop in the output section of the internal output circuit and output module (Power consumption for simultaneous ON points)

Wout = Iout \times Vdrop \times Number of outputs \times Simultaneous ON rate [W]

IOUT : Output current (Current in actual use) [A]

Vdrop: Voltage drop in the internal output circuit and each output module [V]

(5) Average power consumption of the input section of the internal input circuit and input module (Power consumption for simultaneous ON points)

WIN = IIN \times E \times Number of input points \times Simultaneous ON rate [W]

IIN: Input current (Effective value for AC) [A]
E: Input voltage (Voltage in actual use) [V]

(6) Power consumption of the external power supply section of the intelligent function module

Ws = I+15V
$$\times$$
 15 + I-15V \times 15 + I24V \times 24[W]

I+15V: Power consumption of the +15VDC external power supply section of the intelligent function module

I-15V: Power consumption of the -15VDC external power supply section of the intelligent function module

I24V: Power consumption of the 24VDC external power supply section of the intelligent function module

The total of the power consumption values calculated for each block is the power consumption of the overall Motion system

 $W = W_{5V} + W_{PW} + W_{24V} + W_{OUT} + W_{IN} + W_{S} [W]$

From this overall power consumption [W], calculate the heating value and a rise in ambient temperature inside the panel.

The outline of the calculation formula for a rise in ambient temperature inside the panel is shown below.

$$T = \frac{W}{UA} [^{\circ}C]$$

W: Power consumption of overall Motion system (value obtained above)

A : Surface area inside the panel [m²]

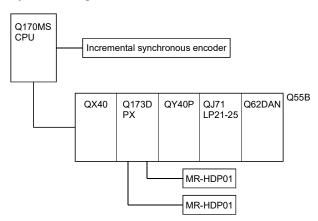
U: When the ambient temperature inside the panel is uniformed by a fan...... 6
When air inside the panel is not circulated.......4

POINT

If the temperature inside the panel has exceeded the specified range, it is recommended to mount a heat exchanger to the panel to lower the temperature. If a normal ventilating fan is used, dust will be sucked into the Motion controller together with the external air, and it may affect the performance of the Motion controller.

(7) Example of average power consumption calculation

(a) System configuration



(b) 5VDC/24VDC current consumption of each module

Model name	5VDC	24VDC	
Q170MSCPU	2.50 [A]	0.08 [A] (Internal output circuit)	
Incremental synchronous encoder	0.20 [A]	_	
QX40 ^(Note-1)	0.05 [A]	_	
Q173DPX	0.38 [A]	_	
MR-HDP01	0.06 [A]	_	
QY40P (Note-1)	0.065 [A]	1.60 [A]	
QJ71LP21-25 ^(Note-1)	0.55 [A]	_	
Q62DAN (Note-1)	0.33 [A]	0.15 [A]	
Q55B ^(Note-1)	0.10 [A]	_	

(Note-1): 5VDC internal current consumption of shared equipments with PLC might be changed. Be sure to refer to the MELSEC-Q series PLC Manuals.

- (c) Total power consumption for 5VDC logic circuits of all modules $W5V = (2.50 + 0.20 + 0.05 + 0.38 + 0.06 \times 2 + 0.065 + 0.55 + 0.33 + 0.10) \times 5$ = 21.475 [W]
- (d) Power consumption of internal power supply WPW = $\frac{1}{4} \times 21.475 = 5.369$ [W]
- (e) A total of 24VDC average power consumption of the internal output circuit and output module

$$W_{24V} = (0.08 + 1.60) \times 24 \times 1 = 40.32 [W]$$

(f) Average power consumption due to voltage drop in the output section of the internal output circuit and output module

Wout =
$$0.04 \times 2.75 \times 2 \times 1 + 0.1 \times 0.2 \times 16 \times 1 = 0.54$$
 [W]

(g) Average power consumption of the input section of the internal input circuit and input module

$$\text{Win} = 0.005 \times 24 \times 4 \times 1 + 0.004 \times 24 \times 16 \times 1 = 2.016 \text{ [W]}$$

(h) Power consumption of the external power supply section of the intelligent function module.

Ws =
$$0.15 \times 24 = 3.60$$
 [W]

(i) Power consumption of overall system

$$W = 21.475 + 5.369 + 40.32 + 0.54 + 2.016 + 3.60 = 73.32$$
 [W]

3.4 Design Checklist

At the worksite, copy the following table for use as a check sheet.

Item	Sub Item	Design confirmation			
		Number of axes	axes		
	Motion controller	Manual pulse generator	pcs.		
	selection	Incremental synchronous encoder			
		Number of I/O points points			
		Manual pulse generator	pcs.		
		Synchronous encoder	pcs.		
		Upper limit point	points		
		Lower limit point	points		
	Motion module	STOP input point	points		
Module	selection	Proximity dog input point	points		
selection		Speed switching input point	points		
		Tracking enable signal point	points		
		Q172DLX modules			
		Q173DPX	modules		
	Extension base unit and extension cable selection	Number of I/O modules/intelligent function			
		modules installed to extension base unit	modules	Ш	
		Distance between Motion controller and		П	
		extension base unit	mm		
		Extension base unit selection			
		Extension cable selection			
External	Fail aufo sinovit design	Avoidance of operation failure at power-on			
circuit design	Fail-safe circuit design	Avoidance of hazard at Motion controller failure			
	Module layout design	Conformance with general specifications such as ambient			
Layout		temperature, humidity, dust, etc.	Ш		
		Total power consumption of base unit	w	П	
		(Calculate the heating value)	VV		
design		Layout in consideration of clearances between enclosure's inside			
		walls, other structures and modules and heats generated by			
		modules within the control panel.			

4. INSTALLATION AND WIRING

4.1 Module Installation

4.1.1 Instructions for handling

⚠CAUTION

- Use the Motion controller in an environment that meets the general specifications contained in this manual. Using this Motion controller in an environment outside the range of the general specifications could result in electric shock, fire, operation failure, and damage to or deterioration of the product.
- When the modules are installed to the base unit while pressing the installation lever located at the bottom of module, insert the module fixing projection into the fixing hole in the base unit until it stops. Then, securely install the module with the fixing hole as a supporting point. Incorrect installation of the module can cause an operation failure, damage or drop.
 - When using the Motion controller in the environment of much vibration, tighten the module with a screw. Tighten the screw in the specified torque range. Under tightening may cause a drop, short circuit or operation failure. Over tightening may cause a drop, short circuit or operation failure due to damage to the screw or module.
- Be sure to connect the extension cable to connectors of the base unit correctly. After connecting, check them for looseness. Poor connections could cause an input or output failure.
- Completely turn off the externally supplied power used in the system before installation or removing the module. Not doing so could result in electric shock or damage to the product.
- Do not install/remove the module onto/from base unit or terminal block more than 50 times, after the first use of the product. Failure to do so may cause the module to malfunction due to poor contact of connector.
- Do not directly touch the module's conductive parts and electronic components. Doing so may cause an operation failure or give damage to the module.
- Lock the control panel and prevent access to those who are not certified to handle or install electric equipment.
- Do not touch the heat radiating fins of controller or servo amplifier's, regenerative resistor and servo motor, 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.
 - Remove the modules while paying attention.

This section describes instructions for handling the Motion controller, motion, I/O and intelligent function modules, base units and so on.

- (1) Module, terminal block connectors and pin connectors are made of resin; do not drop them or subject them to strong impact.
- (2) Do not remove modules' printed circuit boards from the enclosure in order to avoid changes in operation.

(3) Tighten the module fixing screws and terminal block screws within the tightening torque range specified below.

Location of screw	Tightening torque range [N•m]		
Motion controller fixing screw (M5 screw)	2.75 to 3.63 ^(Note-1)		
Motion controller FG fixing screw (M4 $ imes$ 12 screw)	0.82 to 1.11		
Module fixing screw (M3 $ imes$ 12 screw)	0.36 to 0.48		
I/O module terminal block screw (M3 screw)	0.42 to 0.58		
I/O module terminal block fixing screw (M3.5 screw)	0.68 to 0.92		
Power supply module terminal screw (M3.5 screw)	0.68 to 0.92		
Base unit fixing screw (M4 $ imes$ 14 screw)	1.40 to 1.89 ^(Note-1)		

(Note-1): Torque range applies when the mounting panel is 2mm(0.88inch) thick and a fastening nut is used to secure the screw from the back side of the panel.

- (4) When using an extension cable, keep it away from the main circuit cable (high voltage and large current).
 - Keep a distance of 100mm or more from the main circuit.
- (5) Be sure to fix a Motion controller or base unit to the panel using mounting screws. Not doing so could result in vibration that may cause erroneous operation.

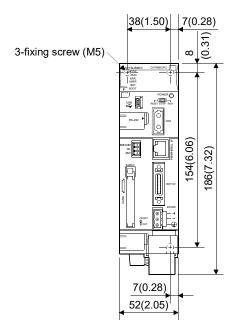
4.1.2 Instructions for mounting the modules

When mounting the Motion controller, base unit to an enclosure or similar, fully consider its operability, maintainability and environmental resistance.

(1) Fitting dimensions

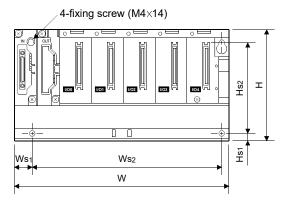
(a) Motion controller

[Unit: mm (inch)]

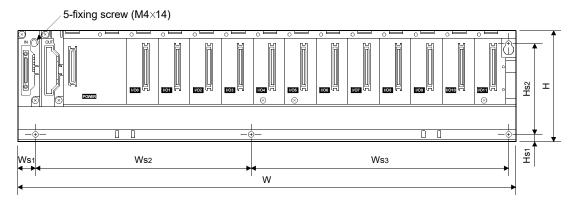


(b) Base unit

1) Q52B, Q55B



2) Q63B, Q65B, Q68B, Q612B,



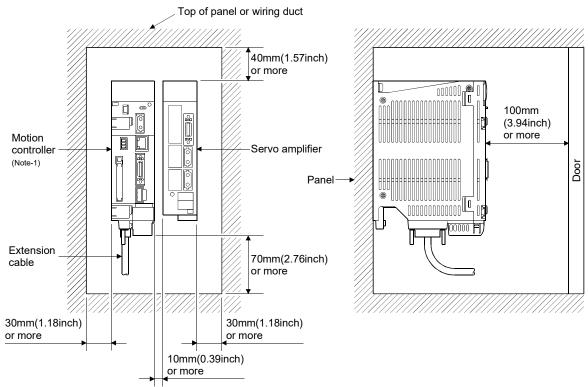
	Q52B	Q55B	Q63B	Q65B	Q68B	Q612B
W	106 (4.17)	189 (7.44)	189 (7.44)	245 (9.65)	328 (12.91)	439 (17.28)
Ws1	15.5 (0.61)					
Ws2 Ws3	83.5 ± 0.3 (3.29 ± 0.01)	167 ± 0.3 (6.57 ± 0.01)	167 ± 0.3 (6.57 ± 0.01) (Ws2 + Ws3)	222.5 (8.76 ± 0.01) (Ws2 + Ws3)	190 ± 0.3 (7.48 ± 0.01) 116 ± 0.3 (4.57 ± 0.01)	190 ± 0.3 (7.48 ± 0.01) 227 ± 0.3 (8.93 ± 0.01)
Н	98 (3.86)					
Hs1	7 (0.28)					
Hs ₂	80 ± 0.3 (3.15 ± 0.01)					

[Unit: mm (inch)]

(2) Module mounting position

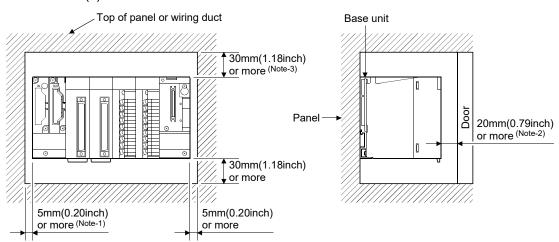
Keep the clearances shown below between the top/bottom faces of the module and other structures or parts to ensure good ventilation and facilitate module replacement.

(a) Motion controller



(Note-1): Fit the Motion controller at the left side of the servo amplifier.

(b) Base unit

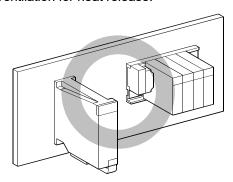


(Note-1): 20mm(0.79inch) or more when the adjacent module is not removed and the extension cable is connected. (Note-2): 80mm(3.15inch) or more for the connector type.

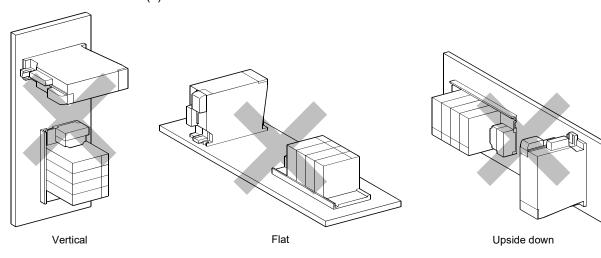
(Note-3): For wiring duct with 50mm(1.97inch) or less height. 40mm(1.57inch) or more for other cases.

(3) Module mounting orientation

(a) Mount the Motion controller in the orientation shown below to ensure good ventilation for heat release.



(b) Do not use it in either of the orientations shown below.



(4) Mounting surface

Mount the Motion controller and base unit on a flat surface. If the mounting surface is not even, this may strain the printed circuit boards and cause malfunctions.

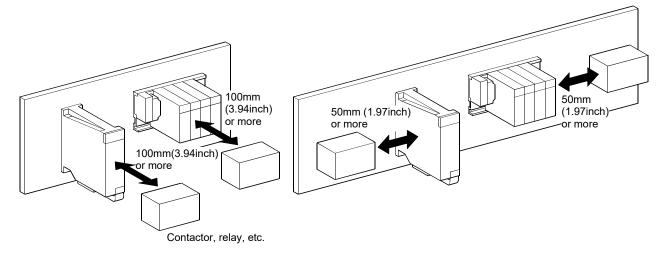
(5) Mounting of unit in an area where the other devices are mounted Avoid mounting base unit in proximity to vibration sources such as large magnetic contractors and no-fuse circuit breakers; mount those on a separate panel or at a distance).

(6) Distances from the other devices

In order to avoid the effects of radiated noise and heat, provide the clearances indicated below between the Motion controller/base unit and devices that generate noise or heat (contactors and relays, etc.).

• In front of Motion controller/base unit : 100mm (3.94inch) or more

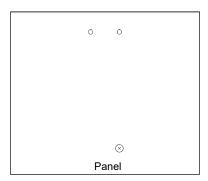
• On the right and left of Motion controller/base unit: 50mm (1.97inch) or more



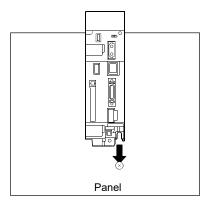
- (7) Mounting method for the modules
 - (a) Motion controller

Mount a Motion controller in the following procedure.

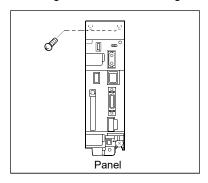
1) Fit the one Motion controller bottom mounting screws into the enclosure.



2) Place the bottom side notch of the Motion controller onto the bottom side screw.



3) Fit the mounting screws into the holes at the top of the Motion controller, then retighten all the mounting screws.



POINT

Screw the Motion controller to the panel.

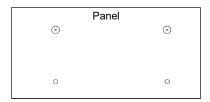
△ CAUTION

Do not touch the heat radiating fins of controller or servo amplifier's, regenerative resistor and servo motor, 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. Remove the modules while paying attention.

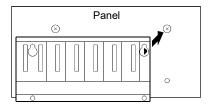
(b) Base unit

Mount a base unit in the following procedure.

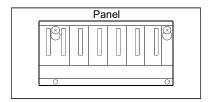
1) Fit the two base unit top mounting screws into the enclosure.



2) Place the right-hand side pear-shaped hole of the base unit onto the right-hand side screw.



3) Place the left-hand side pear-shaped hole of the base unit onto the left-hand side screw.



4) Fit the mounting screws into the holes at the bottom of the base unit, then retighten all the mounting screws.

(Note): Mount a base unit to a panel, with no module installed in the rightend slot

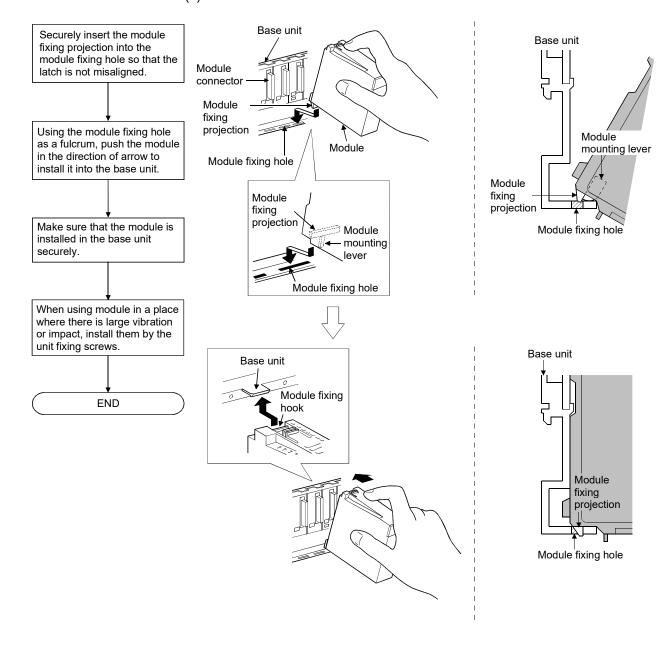
Remove the base unit after removing the module from the right-end slot.

4.1.3 Installation and removal of module to the base unit

This section describes how to install and remove a Motion module, I/O module, intelligent function module or another module to and from the base unit.

(1) Installation and removal of the module from base unit

(a) Installation



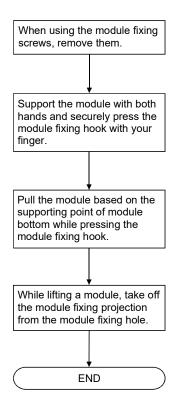
POINTS

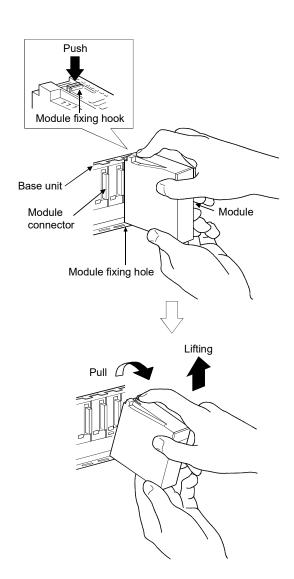
- (1) When installing the module, always insert the module fixing projection into the module fixing hole of the base unit.
 - At that time, securely insert the module fixing projection so that it does not come off from the module fixing hole.
 - If the module is forcibly installed without the latch being inserted, the module connector and module will be damaged.
- (2) When using the modules in a place where there is large vibration or impact, screw the module to the base unit.
 - Module fixing screw: M3×12 (user-prepared)
- (3) Do not install/remove the module onto/from base unit or terminal block more than 50 times, after the first use of the product. Failure to do so may cause the module to malfunction due to poor contact of connector.

∆ CAUTION

- When the modules are installed to the base unit while pressing the installation lever located at the bottom of module, insert the module fixing projection into the fixing hole in the base unit until it stops. Then, securely install the module with the fixing hole as a supporting point. Incorrect installation of the module can cause an operation failure, damage or drop.
 - When using the Motion controller in the environment of much vibration, tighten the module with a screw.
 - Tighten the screw in the specified torque range. Under tightening may cause a drop, short circuit or operation failure. Over tightening may cause a drop, short circuit or operation failure due to damage to the screw or module.

(b) Removal





POINT

When the module fixing screw is used, always remove the module by removing the module fixing screw and then taking the module fixing projection off the module fixing hole of the base unit.

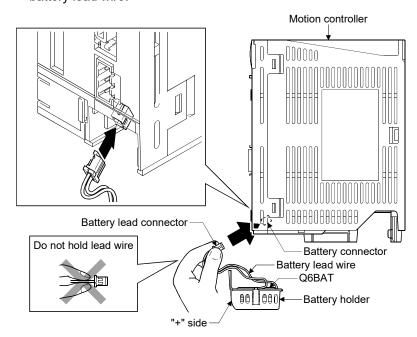
Attempting to remove the module by force may damage the module fixing projection.

4.1.4 Mounting and removal of the battery holder

Mounting and removal procedure of the battery holder to the Motion controller is shown below.

(1) Handling the battery lead wire

- (a) Precautions for mounting the battery Set the battery to the battery holder correctly after confirming "+" side and "-" side for the battery.
- (b) Precautions for handling the battery lead wire Firmly hold the battery lead connector during connection or removal of the battery lead wire.



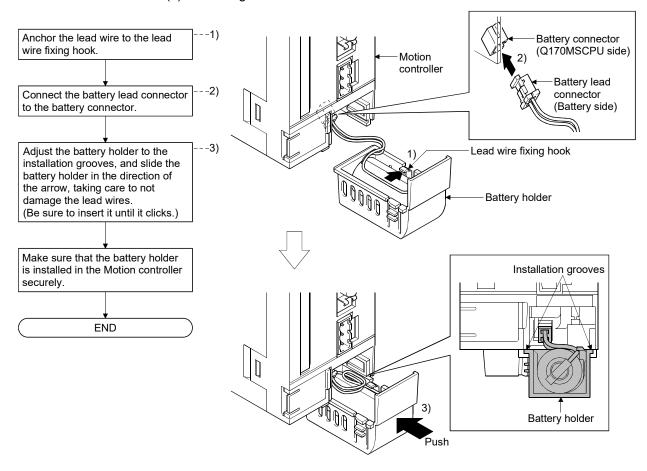
- (c) Connection of the battery lead wire When connecting a battery (Q6BAT/Q7BATN/Q7BAT) to the Motion controller, hold the battery lead connector and attach it to the battery connector. Be sure to insert it until it clicks.
- (d) Removal of the battery lead wire When removing the battery lead wire, firmly hold the battery lead connector while pulling out the wire.

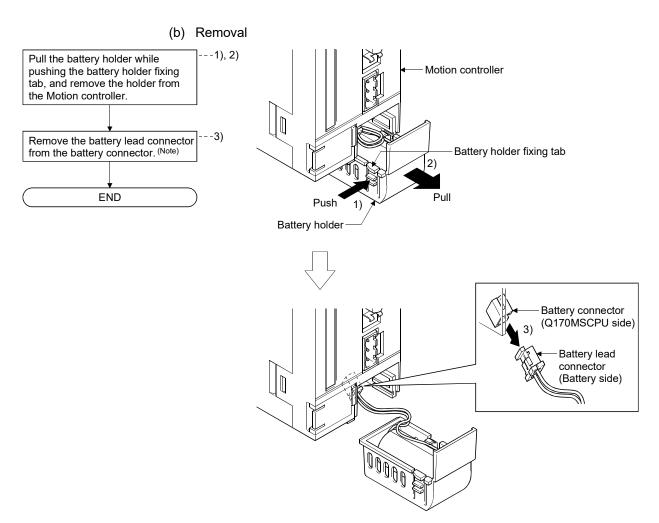
POINT

- (1) Forced removal of a connector while holding the battery lead wire will damage the battery connector or battery lead wire.
- (2) The data (Refer to Section 6.5) in the RAM built-in Motion controller is not backed up if the battery connector is not connected correctly.

(2) Battery holder (For Q6BAT)

(a) Mounting

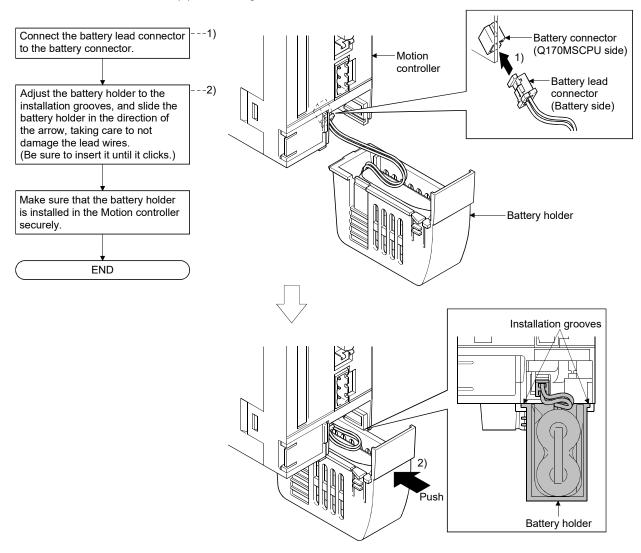


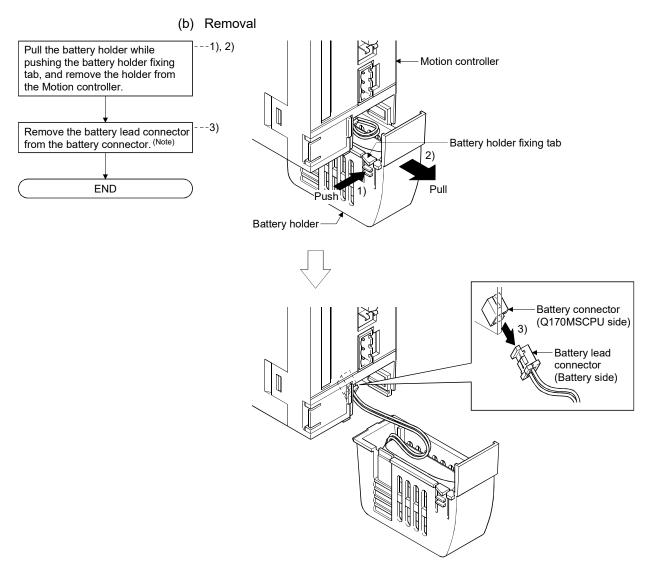


(Note): Do not pull on the lead wire forcibly to remove the connector.

(3) Battery holder (For Q7BATN)

(a) Mounting

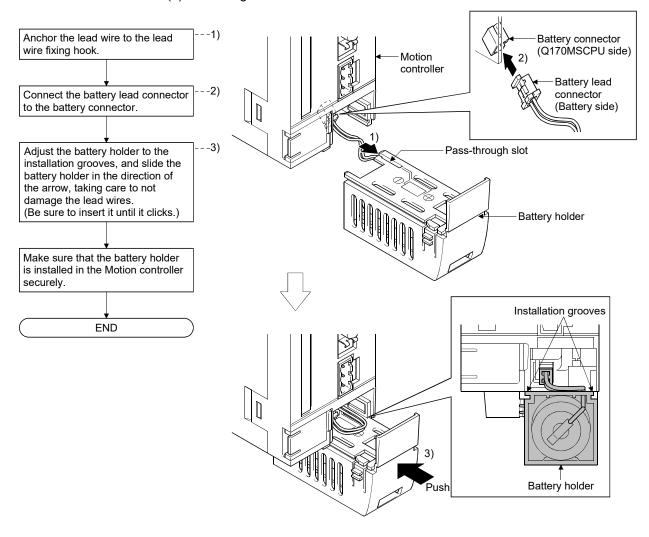


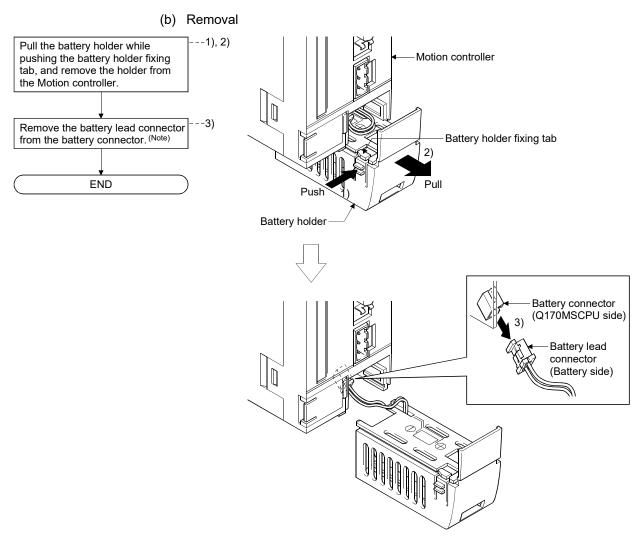


(Note): Do not pull on the lead wire forcibly to remove the connector.

(4) Battery holder (For Q7BAT)

(a) Mounting





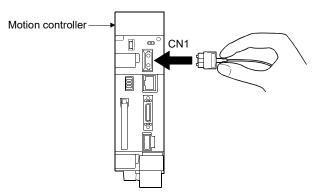
(Note): Do not pull on the lead wire forcibly to remove the connector.

4.2 Connection and Disconnection of Cable

4.2.1 SSCNETⅢ cable

(1) Precautions for handling the SSCNETⅢ cable

- Do not stamp on the SSCNETⅢ cable.
- When laying the SSCNETII cable, be sure to secure the minimum cable bend radius or more. If the bend radius is less than the minimum cable bend radius, it may cause malfunctions due to characteristic deterioration, wire breakage, etc.
- Firmly hold the cable connector tab during connection or disconnection of the SSCNETⅢ cable.



(2) Connection of SSCNETⅢ cable

- When connecting the SSCNETⅢ cable to the Motion controller, hold the SSCNETⅢ cable connector tab and attach it to Motion controller SSCNETⅢ cable connector CN1. Be sure to insert it until it clicks.
- If the cord tip for the SSCNET cable is dirty, optical transmission is interrupted and it may cause malfunctions. If it becomes dirty, wipe with a bonded textile, etc. Do not use solvent such as alcohol.

(3) Disconnection of SSCNETⅢ cable

- When disconnecting the SSCNET**I** cable, hold either the connector or the SSCNET**I** cable connector tab while pulling out the connector.
- After disconnection of SSCNET cable, be sure to put a cap (attached to Motion controller or servo amplifier) to the Motion controller and servo amplifier.
- For SSCNET cable, attach the tube for protection optical cord's end face on the end of connector.

(4) Precautions of SSCNETⅢ cable wiring

SSCNETIII cable is made from optical fiber. If optical fiber is added a power such as a major shock, lateral pressure, haul, sudden bending or twist, its inside distorts or breaks, and optical transmission will not be available. Especially, as optical fiber for MR-J3BUS M and MR-J3BUS M-A is made of synthetic resin, it melts down if being left near the fire or high temperature. Therefore, do not make it touched the part, which becomes high temperature, such as radiator or regenerative option of servo amplifier, or servo motor.

Be sure to use optical fiber within the range of operating temperature described in this manual.

Read described item of this section carefully and handle it with caution.

(a) Minimum bend radius

Make sure to lay the cable with greater radius than the minimum bend radius. Do not press the cable to edges of equipment or others. For SSCNETIII cable, the appropriate length should be selected with due consideration for the dimensions and arrangement of Motion controller and servo amplifier. When closing the door of control panel, pay careful attention for avoiding the case that SSCNETIII cable is hold down by the door and the cable bend becomes smaller than the minimum bend radius.

Model name of SSCNETⅢ cable	Minimum bend radius[mm(inch)]	
MR-J3BUS□M	25 (0.98)	
MD 12D11C M A	Enforced covering cord : 50 (1.97)	
MR-J3BUS□M-A	Cord : 25 (0.98)	
MD IODIIO MAD	Enforced covering cord : 50 (1.97)	
MR-J3BUS□M-B	Cord : 30 (1.18)	

(b) Tension

If tension is added on the SSCNETII cable, the increase of transmission loss occurs because of external force which concentrates on the fixing part of SSCNETII cable or the connecting part of SSCNETII connector. At worst, the breakage of SSCNETII cable or damage of SSCNETII connector may occur. For cable laying, handle without putting forced tension.

Model name of S	SCNETIII cable	Tension strength[N]
MP 13RUS□M □ = 015		70
MR-J3BUS□M	□ = 03 to 3	140
MR-J3BUS□M-A		420 (Enforced covering cord)
MR-J3BUS□M-B		980 (Enforced covering cord)

(c) Lateral pressure

If lateral pressure is added on the SSCNETII cable, the cable itself distorts, the internal optical fiber gets stressed, and transmission loss will increase. At worst, the breakage of SSCNETII cable may occur. As the same condition also occurs at cable laying, do not tighten up SSCNETII cable with a thing such as nylon band (TY-RAP).

Do not stamp on it or tuck it down with the door of the control panel, etc.

(d) Twisting

If SSCNETII cable is twisted, it will become the same stress added condition as when local lateral pressure or bend is added. Consequently, transmission loss increases, and the breakage of SSCNETII cable may occur at worst.

(e) Disposal

When incinerating optical cable (cord) used for SSCNETII cable, hydrogen fluoride gas or hydrogen chloride gas which is corrosive and harmful may be generated. For disposal of SSCNETII cable, request for specialized industrial waste disposal services who has incineration facility for disposing hydrogen fluoride gas or hydrogen chloride gas.

(f) Wiring process of SSCNETⅢ cable

Put the SSCNET cable in the duct or fix the cable at the closest part to the Motion controller with bundle material in order to prevent SSCNET cable from putting its own weight on SSCNET connector.

Leave the following space for wiring.

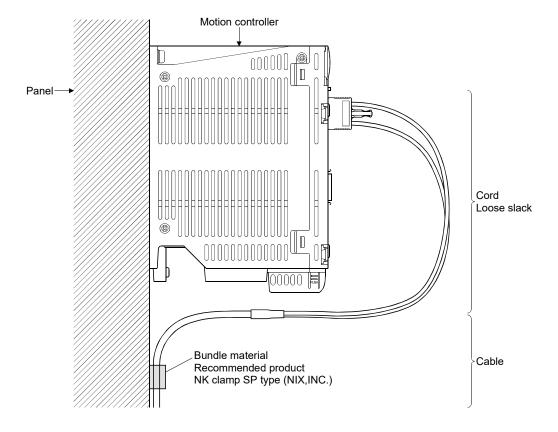
(Note-1): Fit the Motion controller at the left side of the servo amplifier.

· Putting in the duct Top of panel or wiring duct 40mm(1.57inch) or more 000000 100mm (3.94inch) or more Motion Servo amplifier controller (Note-1) Panel Extension 70mm(2.76inch) cable or more 30mm(1.18inch) 30mm(1.18inch) or more or more 10mm(0.39inch) or more

• Bundle fixing

Optical cord should be given loose slack to avoid from becoming smaller than the minimum bend radius, and it should not be twisted. When bundling the cable, fix and hold it in position by using cushioning such as sponge or rubber which does not contain migratable plasticizing.

If using adhesive tape for bundling the cable, fire resistant acetate cloth adhesive tape 570F (Teraoka Seisakusho Co., Ltd) is recommended.



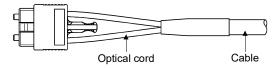
POINTS

- (1) Be sure to connect SSCNETIII cable with the above connector. If the connection is mistaken, between the Motion controller and servo amplifier cannot be communicated.
- (2) Forced removal of the SSCNETIII cable from the Motion controller will damage the Motion controller and SSCNETIII cables.
- (3) After removal of the SSCNETIII cable, be sure to put a cap on the SSCNETIII connector. Otherwise, adhesion of dirt deteriorates in characteristic and it may cause malfunctions.
- (4) Do not remove the SSCNETIII cable while turning on the power supply of Motion controller and servo amplifier.
 - Do not see directly the light generated from SSCNETIII connector of Motion controller or servo amplifier and the end of SSCNETIII cable. When the light gets into eye, may feel something is wrong for eye. (The light source of SSCNETIII cable complies with class1 defined in JISC6802 or IEC60825-1.)
- (5) If the SSCNETIII cable is added a power such as a major shock, lateral pressure, haul, sudden bending or twist, its inside distorts or brakes, and optical transmission will not be available.
 Be sure to take care enough so that the short SSCNETIII cable is added a twist easily.
- (6) Be sure to use the SSCNETⅢ cable within the range of operating temperature described in this manual. Especially, as optical fiber for MR-J3BUS□M and MR-J3BUS□M-A are made of synthetic resin, it melts down if being left near the fire or high temperature. Therefore, do not make it touched the part which becomes high temperature, such as radiator or regenerative option of servo amplifier, or servo motor.
- (7) When laying the SSCNETIII cable, be sure to secure the minimum cable bend radius or more.
- (8) Put the SSCNETIII cable in the duct or fix the cable at the closest part to the Motion controller with bundle material in order to prevent SSCNETIII cable from putting its own weight on SSCNETIII connector.

 When laying cable, the optical cord should be given loose slack to avoid from becoming smaller than the minimum bend radius, and it should not be twisted. When bundling the cable, fix and hold it in position by using cushioning such as sponge or rubber which does not contain migratable plasticizing. If using adhesive tape for bundling the cable, fire resistant acetate cloth adhesive tape 570F (Teraoka Seisakusho Co., Ltd) is recommended.

POINTS

(9) Migrating plasticizer is used for vinyl tape. Keep the MR-J3BUS□M, and MR-J3BUS□M-A cables away from vinyl tape because the optical characteristic may be affected.



SSCNETⅢ cable	Cord	Cable
MR-J3BUS□M	Δ	
MR-J3BUS□M-A	\triangle	Δ
MR-J3BUS□M-B	0	0

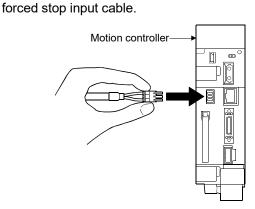
- O: Normally, cable is not affected by plasticizer.
- △: Phthalate ester plasticizer such as DBP and DOP may affect optical characteristic of cable.

Generally, soft polyvinyl chloride (PVC), polyethylene resin (PE) and fluorine resin contain non-migrating plasticizer and they do not affect the optical characteristic of SSCNETⅢ cable. However, some wire sheaths and cable ties, which contain migrating plasticizer (phthalate ester), may affect MR-J3BUS□M and MR-J3BUS□M-A cables (made of plastic). In addition, MR-J3BUS□M-B cable (made of quartz glass) is not affected by plasticizer.

- (10) If the adhesion of solvent and oil to the cord part of SSCNETIII cable may lower the optical characteristic and machine characteristic. If it is used such an environment, be sure to do the protection measures to the cord part.
- (11) When keeping the Motion controller or servo amplifier, be sure to put on a cap to connector part so that a dirt should not adhere to the end of SSCNETIII connector.
- (12) SSCNETⅢ connector to connect the SSCNETⅢ cable is put a cap to protect light device inside connector from dust. For this reason, do not remove a cap until just before connecting SSCNETⅢ cable. Then, when removing SSCNETⅢ cable, make sure to put a cap.
- (13) After removing the cap and the light cord end protective tube during mounting of the SSCNET cable, keep them in the resealable plastic bag that accompanies the SSCNET cable to prevent them from becoming dirty.
- (14) When exchanging the Motion controller or servo amplifier, make sure to put a cap on SSCNETIII connector. When asking repair of Motion controller or servo amplifier for some troubles, make also sure to put a cap on SSCNETIII connector. When the connector is not put a cap, the light device may be damaged at the transit. In this case, exchange and repair of light device is required.

4.2.2 Forced stop input cable

Precautions for handling the forced stop input cable Firmly hold the forced stop input connector during connection or removal of the



(2) Connection of the forced stop input cable

When connecting the forced stop input cable to the Motion controller, hold the cable connector and attach it to the Motion controller forced stop input connector. Be sure to insert it until it clicks.

(3) Removal of the forced stop input cable

When removing the forced stop input cable, firmly hold the connector while pulling out the cable.

POINTS

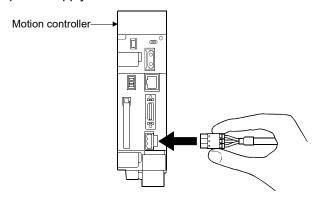
The following handling will damage the Motion controller or forced stop input cable.

- Forced removal of the forced stop input cable from the CPU module.
- The forced stop input cable is twined to other cables.
- Excessive power is applied at cable laying.

Wire the cable correctly.

4.2.3 24VDC power supply cable

(1) Precautions for handling the 24VDC power supply cable Firmly hold the 24VDC power supply connector during connection or removal of the 24VDC power supply cable.



- (2) Connection of the 24VDC power supply cable When connecting the 24VDC power supply cable to the Motion controller, hold the cable connector and attach it to the Motion controller 24VDC power supply connector. Be sure to insert it until it clicks.
- (3) Removal of the 24VDC power supply cable. When removing the 24VDC power supply cable, firmly hold the connector while pulling out the cable.

POINTS

Forced removal of the 24VDC power supply cable from the Motion controller will damage the Motion controller or 24VDC power supply cable.

4.3 Mounting of Serial Absolute Synchronous Encoder

This section describes precautions for handling the serial absolute synchronous encoder.

(1) If the serial absolute synchronous encoder is linked to a chain, a timing belt, or gears, the machine side rotary shaft should be supported by a separate bearing and connected to the serial absolute synchronous encoder through a coupling. Ensure that excessive force (greater than the permitted shaft load) is not applied to the shaft of the serial absolute synchronous encoder.

Permitted shaft load

function or extremely shorten encoder life. Minimize loads applied to the shaft so

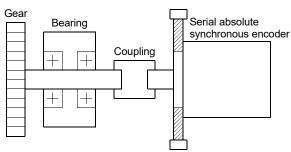
Table 4.1 Permitted Shaft Loads

Radial direction

Up to 19.6N

Thrust direction

Up to 9.8N



(2) Excessive load applied to the shaft of serial absolute synchronous encoder by large mounting errors in eccentricity or angle of deviation may impair encoder

∆CAUTION

that they remain within the permitted shaft load range.

- The serial absolute synchronous encoder contains a glass disk and precision mechanism. Take care when handling it. Encoder function may be impaired if it is dropped or subjected to shocks or vibrations exceeding the prescribed limits.
- Do not connect the shaft of the serial absolute synchronous encoder directly to the machine side rotary shaft. The shaft should be supported by a separate bearing and mounted using a flexible coupling.
- Never hit the end of the serial absolute synchronous encoder coupling shaft with a hammer or similar object when doing things such as connecting a coupling to it. Excessive shock applied to the serial absolute synchronous encoder may damage it.
- The serial absolute synchronous encoder uses optical parts. Mount it in an atmosphere containing as little moisture, oil, and dust as possible.
- When installing a serial absolute synchronous encoder in any place where it is exposed to water and/or oil, provide protection from oil and water, e.g. mount a cover. In addition, run the cable downward to prevent oil and/or water from traveling on the cable into the serial absolute synchronous encoder. When it is necessary to mount the serial absolute synchronous encoder vertically or obliquely, set up a trap on the cable.
- Use the serial absolute synchronous encoder within the specified temperature range (-5 to 55°C (23 to 131°F)).

4.4 Wiring

4.4.1 Instructions for wiring

⚠DANGER

- Completely turn off the externally supplied power used in the system before installation or placing wiring. Not doing so could result in electric shock or damage to the product.
- When turning on the power supply or operating the module after wiring, be sure that the module's terminal covers are correctly attached. Not attaching the terminal cover could result in electric shock.

∆CAUTION

- Be sure to ground of the earth terminal FG and LG. Not doing so could result in electric shock or operation failure. (Ground resistance: 100Ω or less)
- When wiring in the Motion controller, be sure that it is done correctly by checking the product's rated voltage and the terminal layout. Connecting a power supply that is different from the rating or incorrectly wiring the product could result in fire or damage.
- External connections shall be crimped or pressure welded with the specified tools, or correctly soldered. Imperfect connections could result in short circuit, fire, or operation failure.
- Tighten the terminal screws within the specified torque range. If the terminal screws are loose, it could result in short circuit, fire, or operation failure. Tightening the terminal screws too far may cause damages to the screws and/or the module, resulting in drop, short circuit, or operation failure.
- Be sure there are no foreign matters such as sawdust or wiring debris inside the module. Such debris could cause fire, damage, or operation failure.
- The module has an ingress prevention label on its top to prevent foreign matter, such as wiring debris, from entering the module during wiring.

Do not remove this label during wiring.

Before starting system operation, be sure to remove this label because of heat dissipation.

This section describes instructions for the wiring of the power supply.

Refer to the "7 EMC directives" for grounding method and measure against noise.

(1) Power supply wiring

(a) 24VDC power supply wires should be twisted as dense as possible. Connect them with the shortest distance.

Also, to reduce the voltage drop to the minimum, use the thickest wires (Up to 2.0mm²) possible.

Use the wires of the following core size for wiring.

Application	Recommended core size	AWG (Note-1)
24VDC power supply wires	0.3 to 2.5mm ²	AWG12 to AWG22
I/O equipment	0.3 to 0.75mm ² (Outside diameter 2.8mm (0.11inch) or less)	AWG18 to AWG22
Ground wire	2.0mm ² or more	AWG14 or less

(Note-1): AWG stands for "American Wire Gauge". AWG is a unit of the thickness of conducting wire.

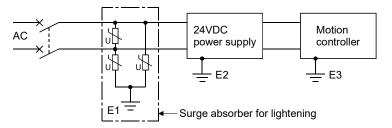
(b) Do not bundle the 24VDC power supply wires with, or run them close to, the main circuit (high voltage, large current) and I/O signal lines (including common line).

Reserve a distance of at least 100mm (3.94inch) from adjacent wires.

(c) Momentary power failure may be detected or the Motion controller may be reset due to surge caused by lightning.

As measures against surge caused by lightning, connect a surge absorber for lightning as shown below.

Using the surge absorber for lightning can reduce the influence of lightning.

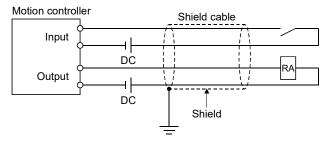


POINTS

- Separate the ground of the surge absorber for lightning (E1), 24VDC power supply (E2) and Motion controller (E3).
- (2) Select a surge absorber for lightning whose power supply voltage does no exceed the maximum allowable circuit voltage even at the time of maximum power supply voltage elevation.

(2) Wiring of I/O equipment

- (a) Insulation-sleeved crimping terminals cannot be used with the terminal block. It is recommended to cover the wire connections of the crimping terminals with mark or insulation tubes.
- (b) The wires used for connection to the terminal block should be 0.3 to 0.75mm² in core and 2.8mm (0.11inch) or less in outside diameter.
- (c) Run the input and output lines away from each other.
- (d) When the wiring cannot be run away from the main circuit and power lines, use a batch-shielded cable and ground it on the Motion controller side. In some cases, ground it on the opposite side.



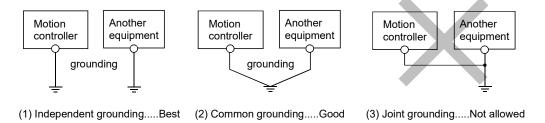
(e) Where wiring runs through piping, ground the piping without fail.

- (f) Run the 24VDC input line away from the 100VAC and 200VAC lines.
- (g) Wiring of 200m (656.17ft.) or longer distance will give rise to leakage currents due to the line capacity, resulting in a fault. Refer to the troubleshooting chapter of the I/O Module User's Manual.
- (h) As a countermeasure against the power surge due to lightning, separate the AC wiring and DC wiring and connect a surge absorber for lightning (Refer to Section 4.4.1(1)).
 Failure to do so increases the risk of I/O device failure due to lightning.

(3) Grounding

For grounding, follow the steps (a) to (c) shown below.

- (a) Use a dedicated grounding wire as far as possible. (Ground resistance: 100Ω or less)
- (b) When a dedicated grounding cannot be performed, use (2) Common Grounding shown below.

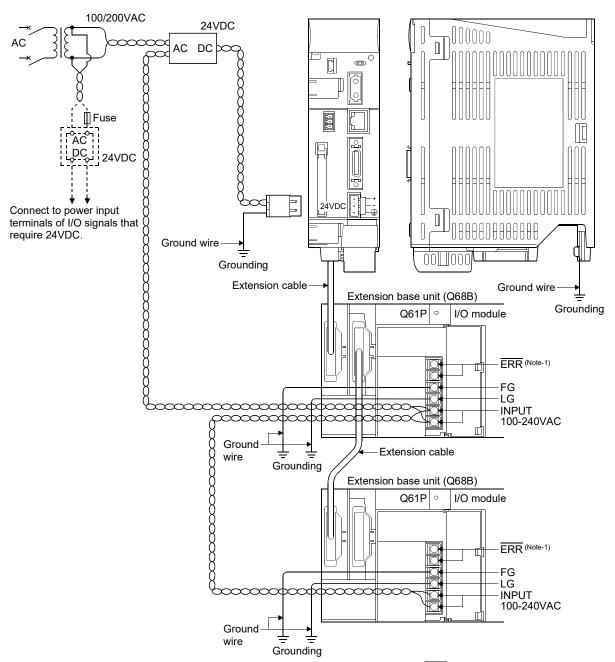


(c) For grounding a cable, use the cable of 2mm² or more.

Position the ground-contact point as nearly to the Motion controller as possible, and reduce the length of the grounding cable as much as possible.

4.4.2 Connecting to the power supply

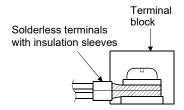
The following diagram shows the wiring example of power lines, grounding lines, etc. to the Motion controller.



(Note-1): The operation of the $\overline{\text{ERR}}$ terminal is always OFF (open).

POINT

- (1) Use a different 24VDC power supply for the Motion controller and for I/O signals.
- (2) Use a different 24VDC power supplies for the Motion controller and the electromagnetic brake of the servo motor.
- (3) Refer to Section 2.5.1(10) for the pin layout of 24VDC power supply connector, and refer to APPENDIX 4.3 for the connection diagram of 24VDC power supply cable.
- (4) Motion controller and 24VDC power supply are an open type device and must be installed in a control panel for use.
 - This not only ensures safety but also ensures effective shielding for Motion controller and 24VDC power supply generated electromagnetic noise.
- (5) Use the thickest possible (up to 2mm²) wires for the 100/200VAC and 24VDC power cables. Be sure to twist these wires starting at the connection terminals. For wiring a terminal block, be sure to use a solderless terminal. Use solderless terminals with insulation sleeves of 0.8mm (0.03inch) or less in thickness to prevent a short circuit when any screws are loosened. Also, only two solderless terminals can be connected per terminal block.



- (6) Ensure that the earth terminals LG and FG are grounded.
 - (Ground resistance : 100Ω or less)
 - If not, the programmable controller may become susceptible to noise. Since the LG terminal has a half of the input voltage, touching this terminal may result in an electric shock.
- (7) No system error can be detected by the $\overline{\mathsf{ERR}}$ terminal of an extension base unit. (The $\overline{\mathsf{ERR}}$ terminal is always set off.)

4.4.3 Wiring of connector

Specialized tools are not required for wiring the 24VDC power supply connector and forced stop input connector because plugs with spring connection are used.

(1) Applicable wire size and wire fabrication

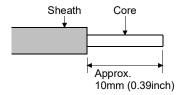
(a) Applicable wire size

The applicable wire size for 24VDC power supply connector and forced stop input connector are shown below.

Connector	Туре	Applicable wire size	
24VDC power supply connector	FKC-2.5/3-ST-5.08	0.3 t0 2.5mm ² (AWG12 to AWG22)	
Forced stop input connector	FK-MCP1.5/3-ST-3.81	0.3 t0 1.5mm ² (AWG16 to AWG22)	

(b) Wire fabrication

Strip the wire according to stripped length indicated in the figure below. Slide the sheath off the wire and gently twist and straighten the strands. When using the wire, be careful not to short with stray strands entering the neighboring poles. Do not use solder on the wire's core as this may lead to insufficient contact.

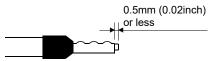


1) Using a ferrule

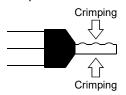
A ferrule can also be used to connect with the connector. Use the ferrules in the table below for the 24VDC power supply connector and forced stop input connector.

) A C .	Ferrule model		0: :		
Connector	Wire size	For 1 wire	For 2 wires	Crimping tool	Manufacturer	
0.07/20	AWG16	AI1.5-10 BK	AI-TWIN2×1.5-10 BK			
24VDC power supply connector	AWG14	Al2.5-10 BU		CRIMPFOX-ZA3	PHOENIX CONTACT	
Forced stop input connector	AWG21	AI0.5-10 WH	_			

• Cut the wire sticking out from the end of the ferrule to 0.5mm (0.02inch) or less.

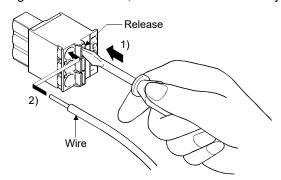


• When using a twin ferrule, be sure to insert the wire in a manner that will keep the insulation sleeve from interfering with the neighboring poles. Be sure to crimp the ferrule.



(2) Inserting wire

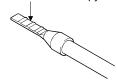
- 1) Press the connector release with a tool such as a flathead screwdriver.
- 2) While holding the release down, insert the wire all the way in.



(Note): When using a ferrule, make sure the bumpy side is facing towards the release.

When inserting 2 wires into one terminal, use a twin ferrule.

Insert the wire with the bumpy side facing the release.



(3) Connecting the power supply

- (a) Do not connect the power supply plug when wires are live.

 The inrush current may damage the internal parts.
- (b) In consideration of safety, the maximum number of modules to a power supply should be 4.
 - Power supply (Recommended product)

Manufacturer	Model name
TDK-Lambda corporation	HWS30-24/A

MEMO		

5. START-UP PROCEDURES

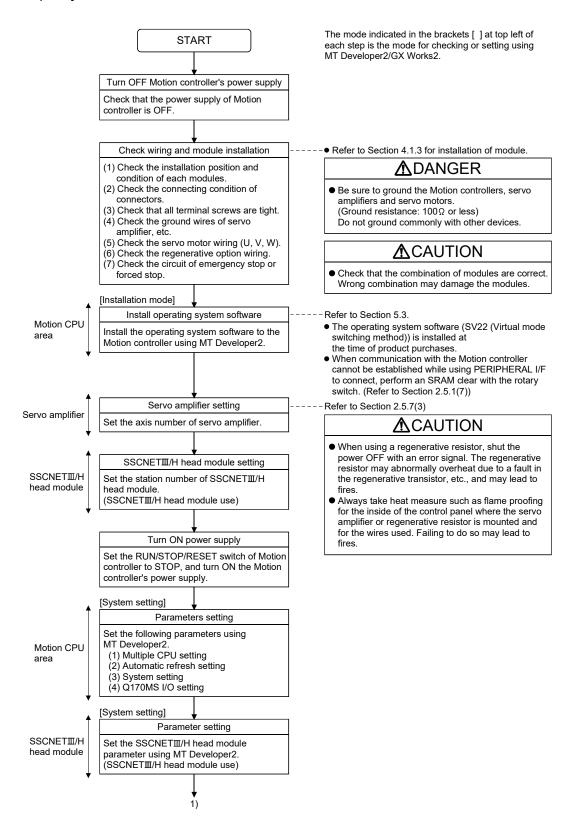
5.1 Check Items before Start-up

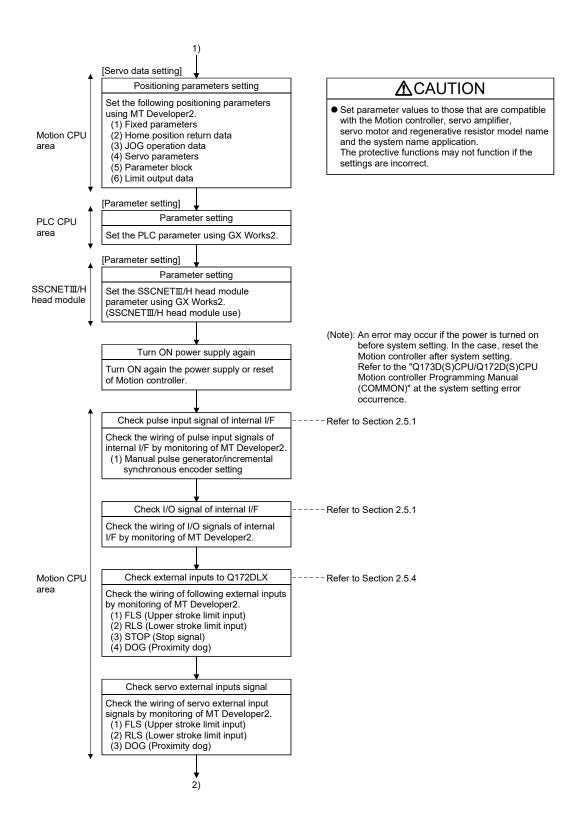
Table 5.1 Check items before start-up

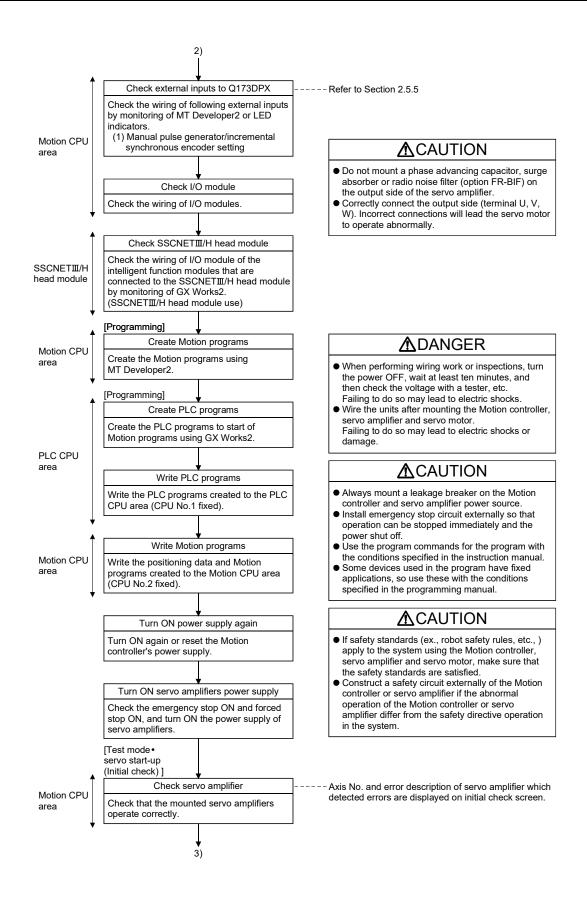
Q170MSCPU Motion controller (2 (3 (4 (5) (6 (7 (8 (8) (1) (1) (1) (1) (1)	Confirmation Items 1) Check for looseness, rattling or distorted installation. 2) Check that the module fixing screw tightening torque is as specified. 3) Check that the wire sizes of cables are correct. 4) Check that the power line is wired correctly. 5) Check that FG is wired correctly. 6) Check that the FG terminal screws are tightened correctly. 7) Check that the FG terminal screws are tightening torque is as specified. 8) Check that the 24VDC wires are twisted as closely as possible and run in the shortest distance. 9) Check that cables are not binded to 24VDC wires, or run close to the power wires. 10) Check the grounding of the earth terminal FG. 11) Check that the forced stop input is wired correctly. 12) Check that the battery is installed. 13) Check that the battery lead connector is connected correctly.		Reference 4.1.2 4.1.1 4.4.1 4.4.2 4.1.1 4.4.1 4.4.1 4.4.1 4.4.1
(2 (3) (4) (5) (6) (7) Q170MSCPU Motion controller (9) (1) (1)	2) Check that the module fixing screw tightening torque is as specified. 3) Check that the wire sizes of cables are correct. 4) Check that the power line is wired correctly. 5) Check that FG is wired correctly. 6) Check that the FG terminal screws are tightened correctly. 7) Check that the FG terminal screws are tightening torque is as specified. 8) Check that the 24VDC wires are twisted as closely as possible and run in the shortest distance. 9) Check that cables are not binded to 24VDC wires, or run close to the power wires. 10) Check the grounding of the earth terminal FG. 11) Check that the forced stop input is wired correctly. 12) Check that the battery is installed. 13) Check that the battery lead connector is connected correctly.		4.4.1 4.4.2 4.1.1 4.4.1
(3 (4 (5) (6) (7) Q170MSCPU Motion controller (9) (1) (1)	3) Check that the wire sizes of cables are correct. 4) Check that the power line is wired correctly. 5) Check that FG is wired correctly. 6) Check that the FG terminal screws are tightened correctly. 7) Check that the FG terminal screws are tightening torque is as specified. 8) Check that the 24VDC wires are twisted as closely as possible and run in the shortest distance. 9) Check that cables are not binded to 24VDC wires, or run close to the power wires. 10) Check the grounding of the earth terminal FG. 11) Check that the forced stop input is wired correctly. 12) Check that the battery is installed. 13) Check that the battery lead connector is connected correctly.		4.4.2 4.1.1 4.4.1
(5) (6) (7) (8) (8) (9) (1) (1) (1) (1)	5) Check that FG is wired correctly. 6) Check that the FG terminal screws are tightened correctly. 7) Check that the FG terminal screws are tightening torque is as specified. 8) Check that the 24VDC wires are twisted as closely as possible and run in the shortest distance. 9) Check that cables are not binded to 24VDC wires, or run close to the power wires. 10) Check the grounding of the earth terminal FG. 11) Check that the forced stop input is wired correctly. 12) Check that the battery is installed. 13) Check that the battery lead connector is connected correctly.		4.4.2 4.1.1 4.4.1
(5) (6) (7) (8) (8) (9) (1) (1) (1) (1)	5) Check that FG is wired correctly. 6) Check that the FG terminal screws are tightened correctly. 7) Check that the FG terminal screws are tightening torque is as specified. 8) Check that the 24VDC wires are twisted as closely as possible and run in the shortest distance. 9) Check that cables are not binded to 24VDC wires, or run close to the power wires. 10) Check the grounding of the earth terminal FG. 11) Check that the forced stop input is wired correctly. 12) Check that the battery is installed. 13) Check that the battery lead connector is connected correctly.		4.1.1 4.4.1 4.4
Q170MSCPU Motion controller (9 (1) (1) (1)	7) Check that the FG terminal screws are tightening torque is as specified. 8) Check that the 24VDC wires are twisted as closely as possible and run in the shortest distance. 9) Check that cables are not binded to 24VDC wires, or run close to the power wires. 10) Check the grounding of the earth terminal FG. 11) Check that the forced stop input is wired correctly. 12) Check that the battery is installed. 13) Check that the battery lead connector is connected correctly.		4.4.1 4.4
Q170MSCPU Motion controller (8 (9 (1) (1) (1)	specified. 8) Check that the 24VDC wires are twisted as closely as possible and run in the shortest distance. 9) Check that cables are not binded to 24VDC wires, or run close to the power wires. 10) Check the grounding of the earth terminal FG. 11) Check that the forced stop input is wired correctly. 12) Check that the battery is installed. 13) Check that the battery lead connector is connected correctly.		4.4.1 4.4
Motion controller (9 (1) (1) (1)	run in the shortest distance. 9) Check that cables are not binded to 24VDC wires, or run close to the power wires. 10) Check the grounding of the earth terminal FG. 11) Check that the forced stop input is wired correctly. 12) Check that the battery is installed. 13) Check that the battery lead connector is connected correctly.		4.4
(9 (1 (1 (1	the power wires. 10) Check the grounding of the earth terminal FG. 11) Check that the forced stop input is wired correctly. 12) Check that the battery is installed. 13) Check that the battery lead connector is connected correctly.		4.4
(<u>1</u> (<u>1</u>	11) Check that the forced stop input is wired correctly. 12) Check that the battery is installed. 13) Check that the battery lead connector is connected correctly.		
(<u>1</u> (<u>1</u>	11) Check that the forced stop input is wired correctly. 12) Check that the battery is installed. 13) Check that the battery lead connector is connected correctly.		3.2
(1	12) Check that the battery is installed. 13) Check that the battery lead connector is connected correctly.		
(1		l _	4.4.4
17.			4.1.4
(1	14) Check that the internal I/F is wired correctly.		
(1	15) Check that the manual pulse generator/incremental synchronous encoder is wired correctly.		2.5.1
(1	1) Check that the extension base unit is Q52B/Q55B (type not requiring power supply module) or Q63B/ Q65B/Q68B/Q612B (type requiring power supply module).		2.5.3
(2	2) Check that the model name of module is correct.		2.3
(3	3) Check that the damage for installed modules.		
(4	4) Check that the modules are installed correctly.		4.1.3
(5	5) Check for looseness, rattling or distorted installation.		4.1.2
Extension base unit (6	6) Check that the module fixing screw tightening torque is as specified.		4.1.1
	7) Check that the total I/O points of I/O modules and intelligent function modules do not exceed the I/O points of the Motion controller.		Refer to the "Q173D(S)CPU /Q172D(S)CPU Motion controller Programming Manual (COMMON)", or "QCPU User's Manual (Hardware Design, Maintenance and Inspection).
	Check that the model name of power supply modules is correct.		2.5.2
<u> </u>	2) Check that the wire sizes of cables are correct.		4.4.1
	3) Check that the power line is wired correctly.		
	4) Check that FG and LG are wired correctly.		4.4.2
	5) Check that the terminal screws are tightened correctly.		
	6) Check that the terminal screws are tightening torque is as specified.		4.1.1
(7	7) Check that the 100VAC, 200VAC and 24VDC wires are twisted as		
8)	closely as possible respectively and run in the shortest distance. 8) Check that cables are not binded to 100VAC, 200VAC and 24VDC wires, or run close to the power wires.		4.4.1
(O	9) Check the grounding of the earth terminal FG and LG.		4.4.2

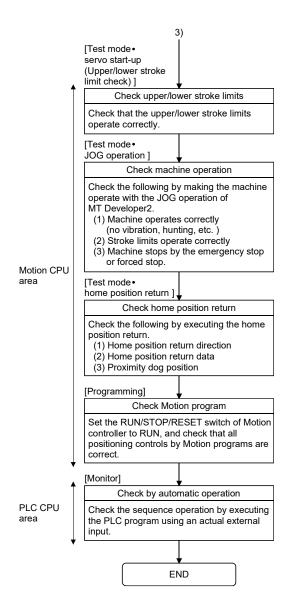
Part name	Confirmation Items	Check	Reference
Q172DLX Servo external signals interface module / Q173DPX Manual pulse	(1) Check that the installation position of modules correspond to the system setting.		Refer to the "Q173D(S)CPU /Q172D(S)CPU Motion controller Programming Manual (COMMON).
generator interface module	(2) Check that the connection with external equipment is correct.		2.5.4 2.5.5
	(1) Check that the wire size of cables is correct.		
	(2) Check that the terminal block screws are tightened correctly.		Refer to the I/O Module
	(3) Check that the cables connected to each terminal of the terminal block correspond to the signal names.		Type Building Block User's Manual
I/O module	(4) Check that the external power supply is connected correctly. (24VDC, 5VDC)		iviariuai
	(5) Check that the 100VAC, 200VAC and 24VDC wires are each twisted as closely as possible and run in the shortest distance.		
	(6) Check that the 100VAC, 200VAC and 24VDC wires are not bind the cable together with and run close to the I/O wires.		4.4.1
	(7) Check that the I/O wires are wired correctly.		
	(1) Check that the model name of SSCNETⅢ cables is correct.		
	(2) Check that the SSCNETIII cable connectors are in the correct connecting position.		2.5.7
	(3) Check that the SSCNETⅢ cables are connected correctly.		
SSCNETⅢ cable	(4) Check for looseness, rattling, or distorted connection.		
SSCINET III Capie	(5) Check that the SSCNETⅢ cables have been secured at or above the minimum bend radius.		4.2.1
	(6) Check that the MR-J3BUS□M or MR-J3BUS□M-A have not come in contact with wires/cables made from migratable materials containing plasticizers.		
Serial absolute	(1) Check that the amplitude, eccentricity, and axial displacement relative to the machine side rotary shaft are within the permissible values.		4.3
synchronous encoder (Q171ENC-W8)	(2) Check that a flexible coupling is being used for coupling with the machine side rotary shaft.		
	(3) Check that the modules are undamaged.		
	(4) Check that excessive shock is not being applied when mounting.		4.3

5.2 Start-up Adjustment Procedure









⚠CAUTION

- 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.
- Execute the test operation in the system that it is low-speed as much as possible and put forced stop, and confirm the operation and safety.

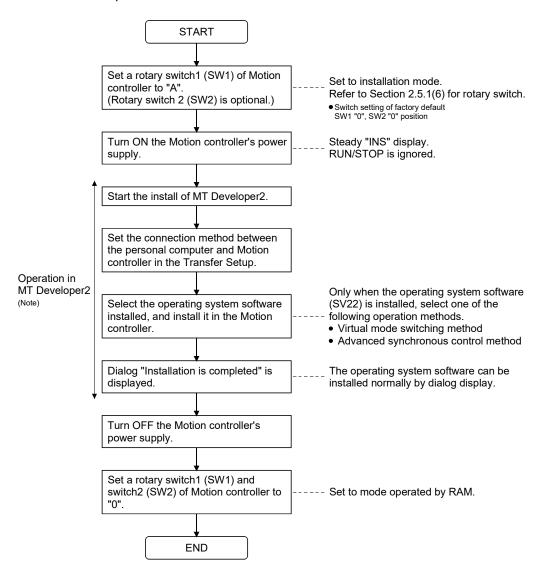
POINTS

- (1) Make note of servo motor module names before the servo motor is mounted on a machine. The servo motor rating plate may not be visible after the servo motor is mounted.
- (2) When the servo amplifier, servo motor is first turned on, check the operation before the servo motor is mounted on a machine to avoid an unexpected accidents such as machine breakage.

5.3 Operating System Software Installation Procedure

The operating system software must be installed to the Motion controller by using the peripheral device and MT Developer2.

The installation procedure is shown below.



(Note): Install the operating system software by screen of MT Developer2. Refer to help of MT Developer2 for details.

POINTS

- (1) When the software security key function is used in Motion controller, if the software security key of the operating system software already installed in Motion controller is different from that embedded to the operating system software to be installed, "Clear all" is executed at installation. It is recommended to backup the data in advance using MT Developer2.
- (2) The operating system software (SV22 (Virtual mode switching method)) is installed at the time of product purchase.
- (3) The operating system software is installed to the Motion CPU area. It has already been installed to the PLC CPU area. The PLC CPU area is never rewritten.
- (4) Be sure to turn power supply OFF before changing rotary switch setting.
- (5) Even if the operating system software is installed, the programs, parameters and absolute position data written in the Motion controller not rewritten.
- (6) Do not do any of the following while installing operation system software. Doing so could result damage the Motion controller.
 - Turn OFF the Motion controller's power supply.
 - Change the RUN/STOP/RESET switch of Motion controller to RESET.
 - Turn OFF the power supply of the personal computer.
 - Pull out the personal computer's communication cable.
- (7) Only when the operating system software (SV22) is installed on the Motion controller, select one of the following operation methods.
 - Virtual mode switching method
 - · Advanced synchronous control method

To change the operation method after the operating system software is installed, install the operating system software (SV22) again, or change the operation method in "Change CPU operation method" of MT Developer2. Refer to help of MT Developer2 for details.

5.4 Trial Operation and Adjustment Checklist

At the worksite, copy the following table for use as a check sheet.

Work Step	Item	Check Items	Check
		Check that each module is installed correctly.	
		Check that each connector is connected correctly.	
		Check each terminal screw for looseness.	
	Installation of	Check that the earth wires of Motion controller or servo amplifiers, etc. are correct.	
Before power supply	unit/module	Check that the servo motor wiring is correct.	
ON	and basic wiring	Check that the regenerative option wiring is correct.	
		Check that the circuit of emergency stop and forced stop are correct.	
		Check that the wiring of each power supply and I/O are correct.	
		Check that the rotary switch setting is correct.	
	Installation of OS	Check that the operating system software is compatible.	
	System setting	Check that the system setting is correct.	
	Q172DLX/Servo	Check that the upper/lower stroke limit inputs are correct.	
	amplifier external	Check that the STOP signal input is correct. (Q172DLX only)	
	signal	Check that the proximity dog and speed-position switching signal input are correct.	
	Program/	Check that the Motion program, PLC program and positioning data are stored in the	
Power supply ON/	positioning data	Motion controller correctly.	
		Check the communications with servo amplifiers.	
Motion controller in		Check that the rotation direction for JOG operation is correct.	
STOP status		Check that the upper/lower limit switches operate correctly.	
	Basic axis	Check that the rotation at maximum command speed is motor rating or less.	
	operations (Check	Check that the machine operates correctly by the JOG operation.	
	each axis)	Check that the machine stops by the upper/lower stroke limit.	
		Check that the machine stops by the emergency stop or forced stop.	
		Check that the home position return is executed correctly.	
		Check that each positioning control of Motion program is operates correctly.	
		Check each operation in manual operation mode of system during Motion program exe	ecution.
		Check that the machine operation stops immediately by the emergency stop or forced	
		stop.	
	Manual operation	Check the operation of each actuator and confirmation limit switch.	
		Check that the emergency stop, forced stop and equipment alarm signals are correct.	
		Checks in compliance with control specifications specific to system and equipment.	
		Check each operation in automatic operation mode of system during Motion program	
Motion controller		execution.	1
Motion controller in RUN status		Check that the automatic operation motions.	
III NON Status	Automatic	Check that the machine operation stops immediately by the emergency stop or forced	
	operation	stop.	
	орстаноп	Check that the module or equipment alarm causes an immediate stop or cycle stop.	
		Check that the restoring operation can be performed after an alarm stop.	
		Make other checks in compliance with control specifications specific to system and	
		equipment.	
	Torque check	Check that the acceleration/deceleration torque is maximum torque or less.	
	,	Check that the continuous effective load torque is rated torque or less.	

MEMO		

6. INSPECTION AND MAINTENANCE

⚠DANGER

- Do not touch the terminals while power is on. Doing so could cause electric shock.
- Correctly connect the battery. Also, do not charge, disassemble, heat, place in fire, short circuit, or solder the battery.
 - Mishandling of a battery may cause overheating, cracks or ignition which could result in injury and fire.
- Switch off all phases of the externally supplied power used in the system when cleaning the module or retightening the terminal or module mounting screws.
 - Failure to do so may result in electric shock.
 - Under tightening of terminal screws can cause a short circuit or malfunction.
 - Over tightening of screws can cause damages to the screws and/or the module, resulting in fallout, short circuits, or malfunction.
- The capacitor is mounted to the modules. Do not incinerate the modules so that the incineration of capacitor may cause burst.
 - For disposal of the modules, request for specialized industrial waste disposal services who has incineration facility.

▲CAUTION

- Read the manual carefully and pay careful attention to safety for the on-line operation (especially program change, forced stop or operation change) performed by connecting peripheral devices to the Motion controller during operation.
 - Erroneous operation may cause machine breakage or accident.
- Never try to disassemble or modify module. It may cause product failure, operation failure, injury or fire.
- Use any radio communication device such as a cellular phone or a PHS phone more than 25cm (9.84 inch) away in all directions of the Motion controller.
 - Failure to do so may cause a malfunction.
- Completely turn off the externally supplied power used in the system before installation or removing the module. Failure to do so may result in electric shock, damage to the module or operation failure.
- Do not install/remove the module on to/from base unit or terminal block more than 50 times, after the first use of the product. Failure to do so may cause the module to malfunction due to poor contact of connector.
- 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.
- 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 damage the module.

In order that you can use the Motion controller in normal and optimal condition at all times, this section describes those items that must be maintained or inspected daily or at regular intervals.

6.1 Maintenance Works

6.1.1 Instruction of inspection works

In order that can use the Motion controller in safety and normal, those items that must be inspected list below.

⚠DANGER

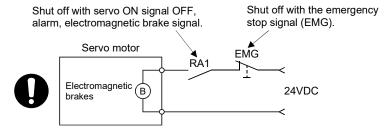
- Never open the front case or terminal covers while the power is ON or the unit is running, as this may lead to electric shocks.
- Never run the unit with the front case or terminal cover removed. The high voltage terminal and charged sections will be exposed and may lead to electric shocks.
- Never remove the front case or terminal cover at times other than wiring work or periodic inspections even if the power is OFF. The insides of the Motion controller and servo amplifier are charged and may lead to electric shocks.
- When performing wiring work or inspections, turn the power OFF, wait at least ten minutes, and then check the voltage with a tester, etc. Failing to do so may lead to electric shocks.
- 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 or fire.
- Do not touch the Motion controller, servo amplifier or servo motor terminal blocks while the power is ON, as this may lead to electric shocks or fire.
- 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.

⚠CAUTION

- lacktriangle Be sure to ground the Motion controller, servo amplifier and servo motor. Do not ground commonly with other devices. (Ground resistance : 100 Ω or less)
- The wiring work and inspections must be done by a qualified technician.
- Wire the units after mounting the Motion controller, servo amplifier and servo motor. Failing to do so may lead to electric shocks or damage.
- Perform the daily and periodic inspections according to the instruction manual.
- Perform maintenance and inspection after backing up the program and parameters for the Motion controller and servo amplifier.
- Do not place fingers or hands in the clearance when opening or closing any opening.
- Periodically replace consumable parts such as batteries according to the instruction manual.
- Do not touch the lead sections such as ICs or the connector contacts.
- Do not place the Motion controller or servo amplifier on metal that may cause a power leakage or wood, plastic or vinyl that may cause static electricity buildup.
- Do not perform a megger test (insulation resistance measurement) during inspection.
- When replacing the Motion controller or servo amplifier, always set the new unit settings correctly.
- After maintenance and inspections are completed, confirm that the position detection of the absolute position detector function is correct.

⚠ CAUTION

- 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 change these to prevent secondary damage from faults. Replacements can be made by our sales representative.
- 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, in order to prevent that state, use a servo motor with electromagnetic brakes for maintenance or mount 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 restart 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.)
- 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.
- 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 servo motor, 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 servo motor 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.
- Do not bunch the control wires or communication cables with the main circuit or power wires, or lay them closely. They should be installed 100mm (3.94inch) or more from each other.
 Trying to bunch or install could result in noise that would cause operation failure.

6.2 Daily Inspection

The items that must be inspected daily are shown below.

Table 6.1 Daily Inspection

Item	Inspection item		ection item	Inspection	Criterion	Action			
1	i i			Check that the fixing		Deticipates at the			
1	controller		er	screws are not loose and	The screws and cover must be mounted securely.	Retighten the screws.			
2	Mounting of base unit		g of base unit	the cover is not dislocated.		SCIEWS.			
3	Installation of Motion modules and I/O modules		and I/O	Check that the module is not dislocated and the unit fixing hook is engaged securely.	The module fixing hook must be engaged and installed correctly.	Securely engaged the module fixing hook.			
	Check for loose terminal screws.				Screws should not be loose.				
4	Connecting conditions between s			Check the distance between solderless terminals.	The proper clearance should be provided between solderless terminals.	Correct.			
				Check the connector part of the cable.	Connections should not be loose.	Retighten the connector fixing screws.			
			[POWER] LED	Check that the LED is ON.	The LED must be ON. (Abnormal if the LED is OFF.).				
			[MODE] LED	Check that the LED is ON.	The LED must be ON. (Abnormal if the LED is OFF or flickering.)				
			[RUN] LED	Check that the LED is ON in RUN status.	The LED must be ON. (Abnormal if the LED is OFF.)				
			[ERR.] LED	Check that the LED is OFF.	The LED must be OFF. (Abnormal if the LED is ON or flickering.)	Refer to Section			
	Module indication LED		[BAT.] LED	Check that the LED is OFF.	The LED must be OFF. (Abnormal if the LED is ON (yellow).)	_			
		Motion	Namaal	8.8.8.	Steady "RUN" display. (Abnormal if "RUN" does not display or incorrect display.)				
			Normal	8.8.8.	Steady "STP" display. (Abnormal if "STP" does not display or incorrect display.)				
5			Battery error warning (2.7V or less)	8.8.8.	"BT1" does not display. (Abnormal if steady "BT1" display.)	Refer to Section 6.5			
			Battery error warning (2.5V or less)	8.8.8.	"BT2" does not display. (Abnormal if steady "BT2" display.)				
			WDT error	8.8.8.	" " does not display. (Abnormal if steady " " display.)	Refer to Section			
			Others		" AL" does not flash. (Abnormal if "" flashes.)	2.5.1			
		I/O module	Input LED	Check that the LED is ON/OFF.	The LED must be ON when the input power is turned ON. The LED must be OFF when the input power is turned OFF. (Abnormal if the LED does not turn ON or turn OFF as indicated above.)	Refer to "I/O Module			
			Output LED		Check that the LED is ON/OFF.	The LED must be ON when the output power is turned ON. The LED must be OFF when the output power is turned OFF. (Abnormal if the LED does not turn ON or turn OFF as indicated above.)	Type Building Block User's Manual".		

6.3 Periodic Inspection

The items that must be inspected one or two times every 6 months to 1 year are listed below. When the equipment is moved or modified, or layout of the wiring is changed, also implement this inspection.

Table 6.2 Periodic Inspection

Item	Inspection item		Inspection	Criterion	Action	
	onment	Ambient temperature Ambient humidity		0 to 55 °C (32 to 131 °F)	When the controller is used in	
1	Ambient enviro	Ambient humidity	Measure with a thermometer and a hygrometer. Measure corrosive gas.	5 to 95 % RH	the board, the ambient temperature in the board becomes the ambient	
		Atmosphere	ividualité derresive gas.	No corrosive gases	temperature.	
2	2 Power voltage		Measure a voltage across the terminals of 24VDC.	21.6 to 26.4	Change the power supply.	
3	nstallation	Looseness, rattling	Move the module to check for looseness and rattling.	The module must be installed solidly.	Retighten the screws. If the Motion controller, Motion modules, or I/O modules are loose, fix it with screws.	
	_	Adhesion of dirt and foreign matter	Check visually.	Dirt and foreign matter must not be present.	Remove and clean.	
	uc	Looseness of terminal screws	Try to further tighten screws with a screwdriver.	Screws must not be loose.	Retighten the terminal screws.	
4	onnecti	screws Proximity of solderless terminals to each other	Check visually.	Solderless terminals must be positioned at proper intervals.	Correct.	
	Ŏ	Looseness of connectors	Check visually.	Connectors must not be loose.	Retighten the connector fixing screws.	
			Check the 7-segment LED at the front side of Motion controller.	Must be turned OFF "BT1" or "BT2" display.	Even if the lowering of a battery capacity is not shown, replace	
5 E	Bat	tery	Check the length of term after purchasing the battery	Must not be used more than 5 years.	the battery with a new one if a service life time of the battery is exceeded.	
		Check that SM51 or SM58 is turned OFF using MT Developer2 Must b in monitor.		Must be turned OFF.	Replace the battery with a new one when SM51 or SM58 is ON.	

6.4 Life

The following parts must be replaced periodically as listed below.

However, these numbers depend on the operating method and environmental conditions. If any part is found to be faulty it must be replaced immediately even if it has not yet reached the end of its life.

For parts replacement, please contact your sales representative.

Table 6.3 Life

Module name	Part name	Life guideline	Remark	
Motion controller		40	The times listed under life	
Motion module	Electrolytic capacitor	10 years	guideline are for reference.	
	Capacitor		If any part is found to be faulty it	
Synchronous		20,000 to 30,000	must be replaced immediately	
encoder	Bearings	hours	even if it has not yet reached the	
			life guideline.	

(1) Capacitor

The life of the capacitor is greatly affected by ambient temperature and operating conditions. The capacitor will reach the end of its life in 10 years of continuous operation in a normal air-conditioned environment.

(2) Bearing

Replace the bearings using 20,000 to 30,000 hours under rated speed as a guideline. This number is affected by operating conditions. Bearings must also be replaced if unusual noise or vibrations are discovered during inspection.

6.5 Battery

The battery installed in the Motion controller is used for data retention during the power failure of the program memory and latch device.

The data stored in the RAM built-in Motion controller is shown below.

- PLC CPU area : Clock data, Latch devices (L), Devices of latch range, Error history and Data in standard RAM
- Motion CPU area: Programs, Parameters, Motion devices (#), Devices of latch range, and Absolute position data

Special relays (SM51, SM52, SM58 or SM59) of Motion CPU area turn on due to the decrease of battery voltage. Even if the special relays turn on, the program and retained data are not erased immediately.

However, if these relays are overlooked, the contents may be erased.

After relay SM51 or SM58 turns on, replace the battery quickly within the data retention time for power failure (3 minutes).

POINT

- (1) PLC CPU area special relays (SM51, SM52) will not detect decrease of battery voltage for the battery installed in the Motion controller.
- (2) SM51 or SM58 turns on when the battery voltage falls below the specified value, and remains ON even after the battery voltage is recovered to the normal value. SM51 or SM58 turns off by power supply on again or reset.
- (3) After SM51, SM52, SM58 or SM59 turns on, replace the battery quickly.
 - SM51 or SM52 turns on at the battery voltage 2.5V or less.
 - SM58 or SM59 turns on at the battery voltage 2.7V or less.
- (4) If SM51 turns on, the contents of the data in the RAM built-in Motion controller cannot be guaranteed.
 - It is recommended to back-up the data periodically.
- (5) Whether or not to check the battery of Motion CPU can be set in the system basic setting of system setting. If "Perform battery check" is not set, a selfdiagnosis error will not occur and the 7-segment LED "BT1" or "BT2" is not also displayed.
 - Refer to the "Q173D(S)CPU/Q172D(S)CPU Motion controller Programming Manual (COMMON)" for details.

6.5.1 Battery life

The battery life is shown below.

Table 6.4 Battery life of Q6BAT/Q7BATN/Q7BAT

	Data of Life (Table to come fail up a time a) The (Note-2)							
		Battery consumption (Note-1)	Battery life (Total power failure time) [h] (Note-2)					
Motion controller	Battery type		Power-on time ratio (Note-3)	Guaranteed value ^(Note-4) (MIN) (75°C (167°F))	Guaranteed value ^(Note-5) (TYP) (40°C (104°F))	Actual service value (Note-6) (Reference value) (TYP) (25°C (77°F))	Backup time after alarm (Note-7)	
		2	0%	13000	40000	43800		
			30%	18000				
	Q6BAT (Note-9)		50%	21000	43800			
			70%	24000				
Q170MSCPU			100%	43800				
(Note-8)			0%	39000				
	Q7BATN (Note-9)/	2	30%		43800		90 (After SM51/ SM52 ON)	
	Q7BAT (Note-9)		50%	43800				
	(Large capacity)		70%					
			100%					
	Q6BAT ^(Note-9)	2	0%	15300				
			30%	21000				
			50%	27900				
			70%	41500				
			100%	43800				
			0%	2600	7500	8800		
			30%	3700	10600	12500		
Q170MSCPU-S1			50%	5100	14700	17400]	
			70%	8400	23700	28000		
			100%	43800	43800	43800		
		3	0%	1400	4100	4800		
			30%	2100	5900	6900		
			50%	2900	8200	9600		
			70%	4800	13500	15800		
			100%	43800	43800	43800		

Table 6.4 Battery life of Q6BAT/Q7BATN/Q7BAT (continued)

———	1		1		•	(1)		
	Battery type	Battery consumption (Note-1)	Battery life (Total power failure time) [h] (Note-2)					
Motion controller			Power-on time ratio (Note-3)	Guaranteed value ^(Note-4) (MIN) (75°C (167°F))	Guaranteed value ^(Note-5) (TYP) (40°C (104°F))	Actual service value (Note-6) (Reference value) (TYP) (25°C (77°F))	Backup time after alarm	
		1	0%	43800	43800	43800	90 (After SM51/ SM52 ON)	
	Q7BATN ^(Note-9) / 1 Q7BAT ^(Note-9) (Large capacity)		30%					
			50%					
			70%					
			100%					
		2	0%	7600	21500	25000		
			30%	10900	30400	35300		
Q170MSCPU-S1			50%	15100	42000			
			70%	24700	42000	43800		
			100%	43800	43800			
		3	0%	4100	11900	13750		
			30%	5900	17000	19500		
			50%	8200	23600	27000		
			70%	13600	38600	43800		
			100%	43800	43800			

(Note-1): The battery consumption represents consumption of the Motion controller battery energy.

The larger the battery consumption value is, the more battery per time unit is consumed.

Refer to the "QCPU User's Manual (Hardware Design, Maintenance and Inspection) for details.

- (Note-2): The actual service value indicates the average value, and the guaranteed value indicates the minimum value.
- (Note-3): The power-on time ratio indicates the ratio of Motion controller power-on time to one day (24 hours).

 (When the total power-on time is 17 hours and the total power-off time is 7 hours, the power-on time ratio is 70%.)
- (Note-4): The guaranteed value (MIN); equivalent to the total power failure time that is calculated based on the characteristics value of the memory (SRAM) supplied by the manufacturer and under the storage ambient temperature range of -25°C to 75°C (-13 to 167°F) (operating ambient temperature of 0°C to 55°C (32 to 131°F)).
- (Note-5): The guaranteed value (TYP); equivalent to the total power failure time that is calculated based on the normal air-conditioned environment (40°C (104°F)).
- (Note-6): The actual service value (Reference value); equivalent to the total power failure time that is calculated based on the measured value and under the storage ambient temperature of 25°C (77°F). This value is intended for reference only, as it varies with characteristics of the memory.

(Note-7): In the following status, the backup time after power OFF is 3 minutes.

- Q6BAT/Q7BATN/Q7BAT lead connector is disconnected.
- Lead wire of Q6BAT/Q7BATN/Q7BAT is broken.

(Note-8): Battery consumption 1 cannot be used in Q170MSCPU.

(Note-9): Set the battery (Q6BAT/Q7BATN/Q7BAT) to battery holder.

POINT

- (1) Do not use the battery exceeding its guaranteed life.
- (2) When the battery hours (total power failure time) may exceed its guaranteed value, take the following measure.
 - Perform ROM operation to protect a program even if the battery dies at the Motion controller's power-OFF.
 - If SM51 turns on, the contents of the data (Refer to Section 6.5) in the RAM built-in Motion controller cannot be guaranteed.
 - It is recommended to back-up the data periodically.
- (3) When the total power failure time exceeds its guaranteed value, and SM51, SM52, SM58 and SM59 of Motion CPU area turns on, immediately change the battery. Even if the alarm has not yet occurred, it is recommended to replace the battery periodically according to the operating condition
- (4) The self-discharge influences the battery life even without a connection to the Motion controller. The battery should be replaced approximately every 4 to 5 years. In addition, replace the battery with a new one in 4 to 5 years even if the total power failure time is the guaranteed value or less.
- (5) It is recommended to shift to the mode operated by ROM after the programs and parameters are fixed. The erasing of the programs and parameters can be avoided even if the battery decrease. (The ROM writing cannot be executed for the current position of the servo motor in the absolute position system, home position and latch device. Back up them beforehand using MT Developer2.)
 - Refer to Section 4.4 of the "Q173D(S)CPU/Q172D(S)CPU Motion controller Programming Manual (COMMON)" for details of the ROM operation.

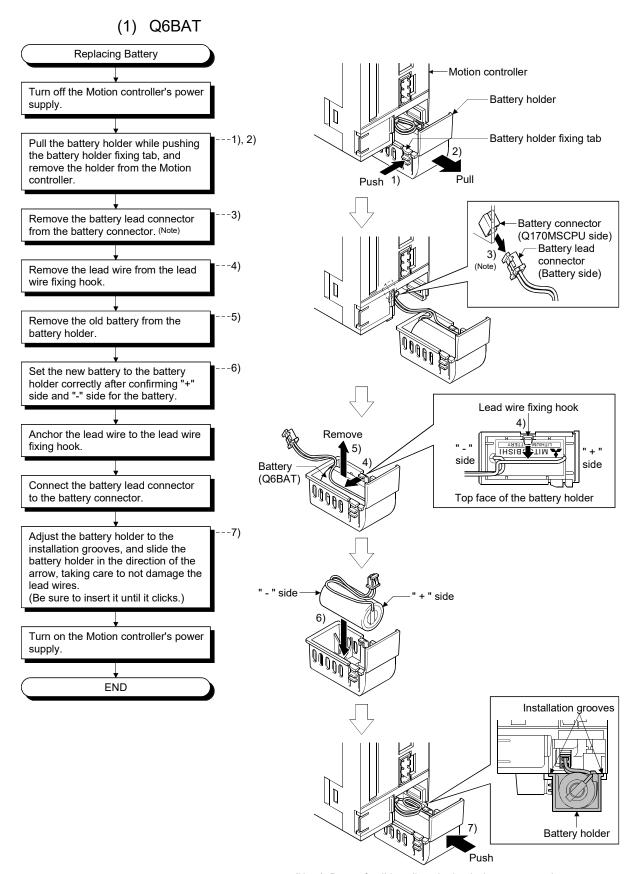
6.5.2 Battery replacement procedure

When the battery has been exhausted, replace the battery with a new one in accordance with the procedure shown below.

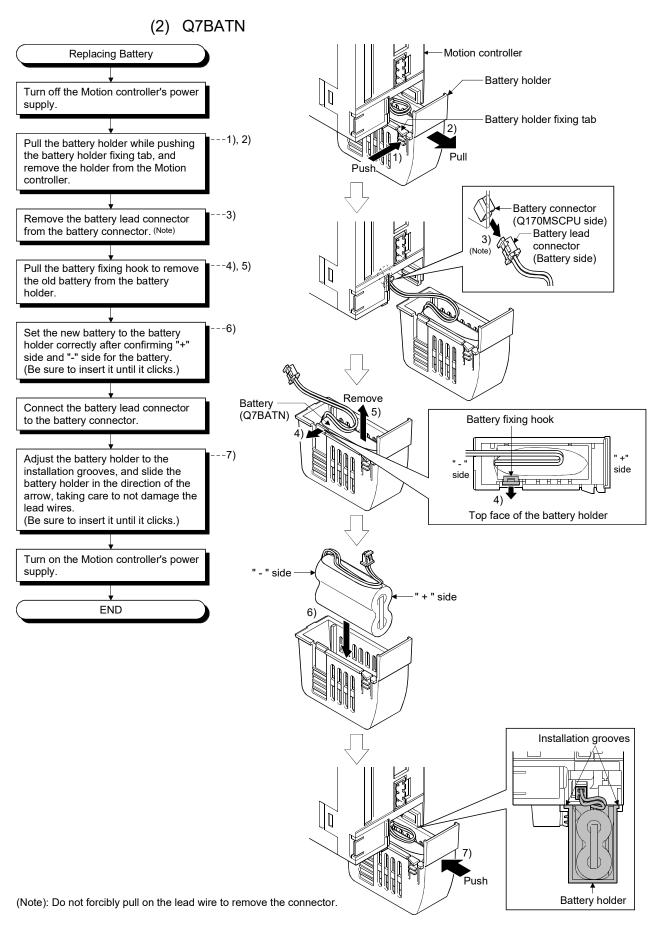
POINTS

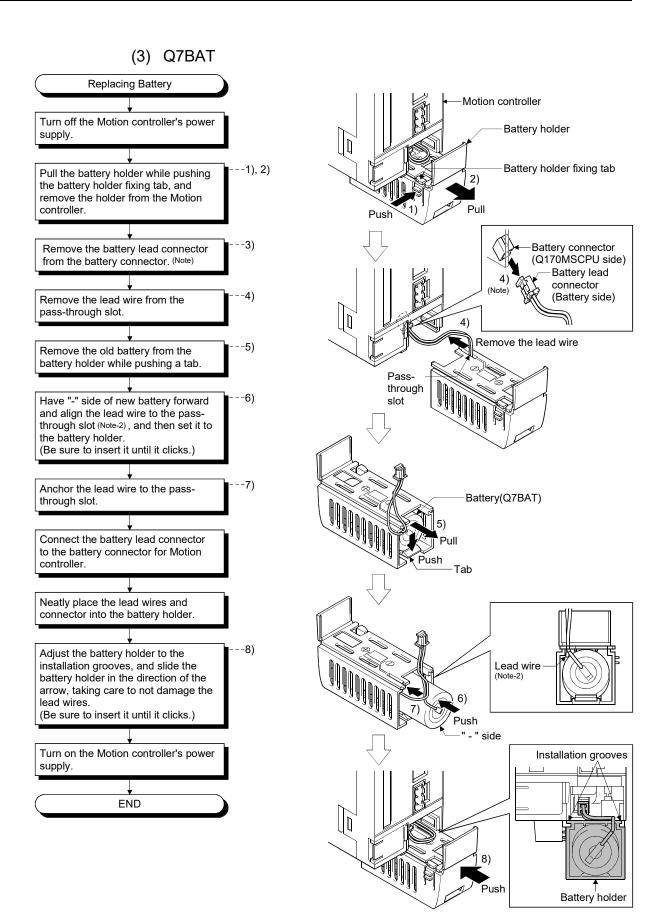
When replacing the battery, pay attention to the following.

- (1) The Motion controller power supply must be on for 10 minutes or longer before dismounting the battery.
- (2) Back up the data using MT Developer2 before starting replacement.
- (3) Firstly back up the data stored in the Motion controller to the personal computer which is installed MT Developer2 then replace the battery with a new one. After setting the battery in the Battery holder, verify the backing up the data to the personal computer which is installed MT Developer2 and the data in the Motion controller, confirm the data is not changing.
 - In the following status, the backup time after power OFF is 3 minutes.
 - The lead connector of Q6BAT/Q7BATN/Q7BAT is disconnected.
 - The lead wire of Q6BAT/Q7BATN/Q7BAT is broken.



(Note): Do not forcibly pull on the lead wire to remove the connector.





(Note-1): Do not forcibly pull on the lead wire to remove the connector. (Note-2): Tilt the battery not to hitch the lead wire to the battery holder.

6.5.3 Resuming operation after storing the Motion controller

When the operation is to be resumed after being stored with the battery removed or the battery has gone flat during storage, the contents of the data (Refer to Section 6.5) in the RAM built-in Motion controller cannot be guaranteed.

Before resuming operation, write the contents of the data that was backed up prior to storage to the RAM built-in Motion controller.

POINT

- (1) Before storing the Motion controller, always back up the contents of the data in the RAM built-in Motion controller.
- (2) When communication with the Motion controller cannot be established while using PERIPHERAL I/F to connect, perform an SRAM clear with the rotary switch. (Refer to Section 2.5.1(7).)

6.5.4 Symbol for the new EU Battery Directive

This section describes a symbol for the new EU Battery Directive (2006/66/EC) that is labeled batteries.



Note: This symbol mark is for EU countries only.

This symbol mark is according to the directive 2006/66/EC Article 20 Information for end-users and Annex II.

Your MITSUBISHI ELECTRIC product is designed and manufactured with high quality materials and components which can be recycled and/or reused.

This symbol means that batteries and accumulators, at their end-of-life, should be disposed of separately from your household waste.

If a chemical symbol is printed beneath the symbol shown above, this chemical symbol means that the battery or accumulator contains a heavy metal at a certain concentration. This will be indicated as follows:

Hg: mercury (0.0005%), Cd: cadmium (0.002%), Pb: lead (0.004%)

In the European Union there are separate collection systems for used batteries and accumulators.

Please, dispose of batteries and accumulators correctly at your local community waste collection/recycling centre.

Please, help us to conserve the environment we live in!

6.6 Troubleshooting

This section describes the various types of trouble that occur when the system is operated, and causes and corrective actions of these troubles.

6.6.1 Troubleshooting basics

The basic three points that must be followed in the troubleshooting are as follows.

(1) Visual inspection

Visually check the following.

- (a) Movement of machine (stopped condition, operating condition)
- (b) Power supply on/off
- (c) Status of input/output devices
- (d) Installation condition of the Motion controller, I/O module, Motion module, intelligent function module, SSCNETII cable, Synchronous encoder cable.
- (e) State of wiring (I/O cables, cables)
- (f) Display states of various types of indicators
 - MODE LED, RUN LED, ERR. LED, BAT LED, 7-segment LED (Installation mode, Operation mode, Battery error, STOP/RUN, etc.), etc.
- (g) Status of setting of various types of switches (Setting of No. of stages of extension base, power interrupt hold-on status).

After checking (a) to (g), monitor the operating conditions of servo motors and error code using MT Developer2 and GX Works2.

(2) Check of trouble

Check to see how the operating condition varies while the Motion controller is operated as follows.

- (a) Set the RUN/STOP/RESET switch of Motion controller to STOP.
- (b) Reset the trouble with the RUN/STOP/RESET switch of Motion controller.
- (c) Turn ON and OFF the Motion controller's power supply.

(3) Narrowing down the range of trouble occurrence causes

Estimate the troubled part in accordance with items (1) and (2) above.

- (a) Motion controller or external devices
- (b) Motion CPU area or PLC CPU area
- (c) I/O module or others
- (d) Servo program or Motion SFC program
- (e) Sequence program

6.6.2 Troubleshooting of Motion controller

This section describes the contents of troubles for the error codes and corrective actions of the troubles.

As for troubleshooting of PLC CPU area, refer to the "QCPU User's Manual (Hardware Design, Maintenance and Inspection)" of their respective modules.

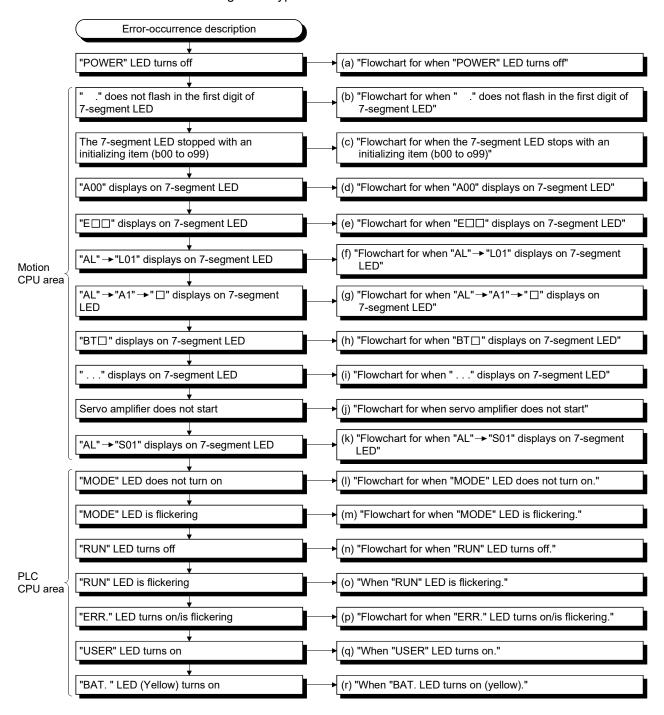
As for troubleshooting of I/O modules, refer to the "I/O Module Type Building Block User's Manual" of their respective modules.

POINT

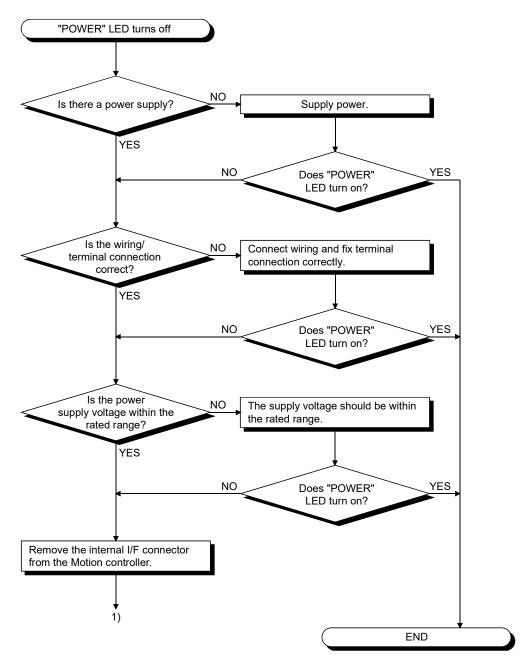
Check that the operating system software is installed before starting the Motion controller

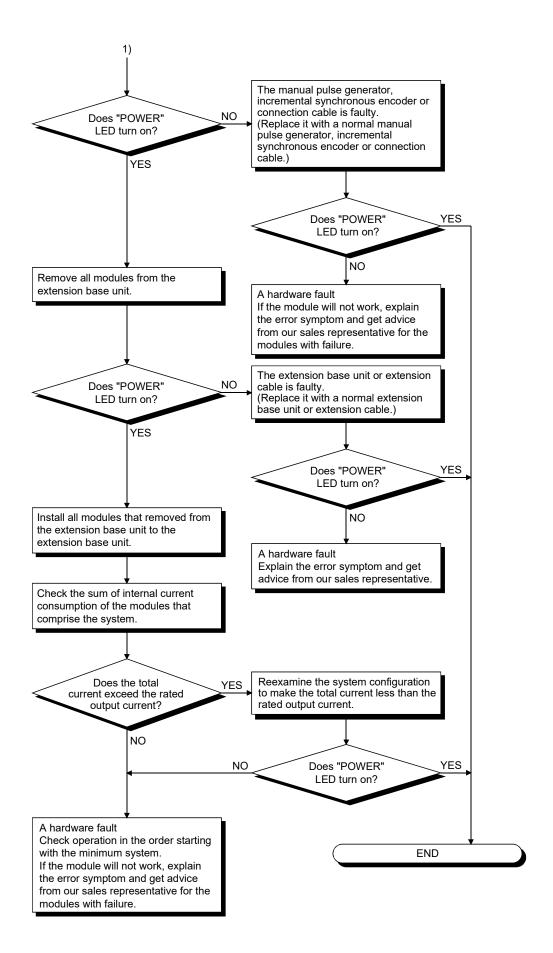
(1) Troubleshooting flowchart

The following show the contents of the troubles classified into a variety of groups according to the types of events.



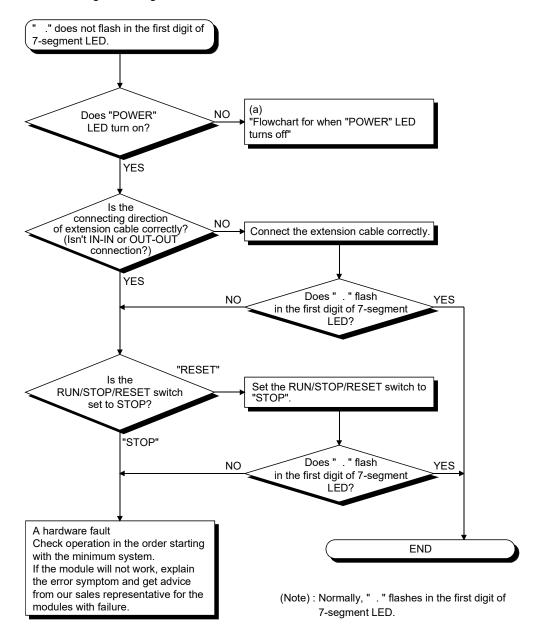
(a) Flowchart for when "POWER" LED turns off
The following shows the flowchart for when "POWER" LED turns off at the
power supply ON or during operation.





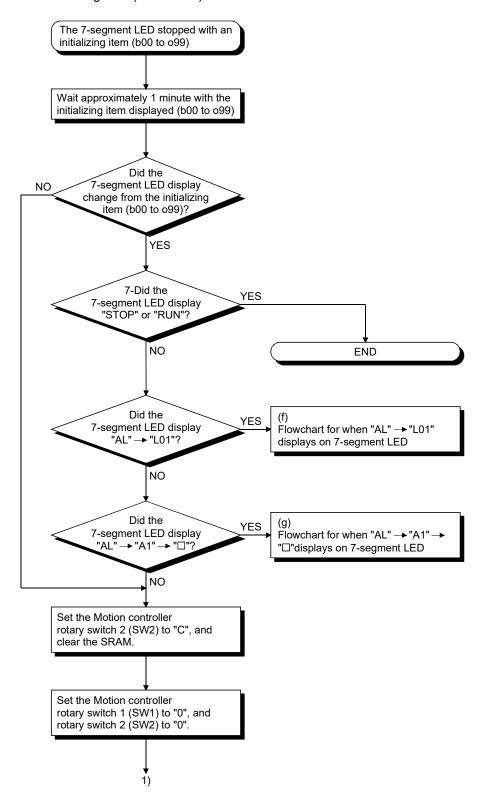
(b) Flowchart for when " ." does not flash in the first digit of 7-segment LED

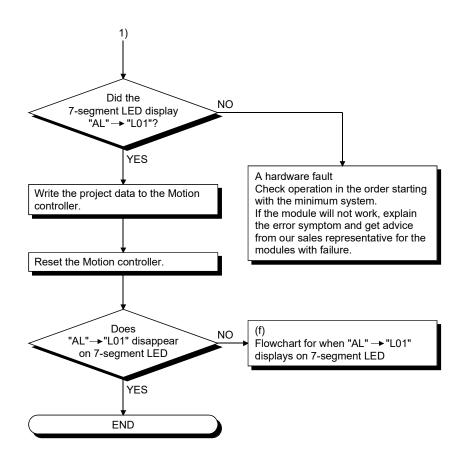
The following shows the flowchart for when " ." does not flash in the first digit of 7-segment LED.



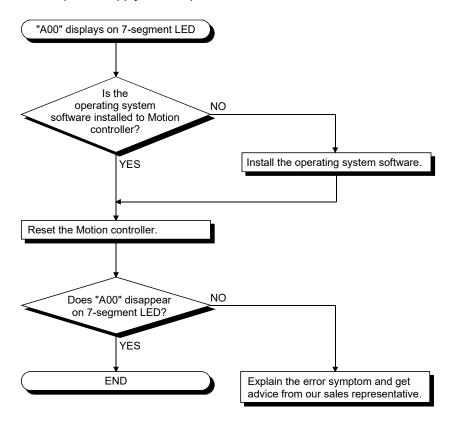
(c) Flowchart for when the 7-segment LED stops with an initializing item (b00 to o99)

The following shows the flowchart for when the 7-segment LED stops with an initializing item (b00 to o99).





(d) Flowchart for when "A00" displays on 7-segment LED "A00" displays when the operating system software is not installed. The following shows the flowchart for when "A00" displays on 7-segment LED at the power supply ON or operation start.

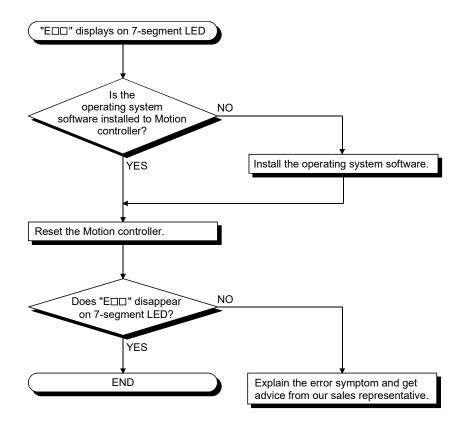


(e) Flowchart for when "E $\square\square$ " displays on 7-segment LED

"E□□" displays when a hardware fault or software fault occurs.

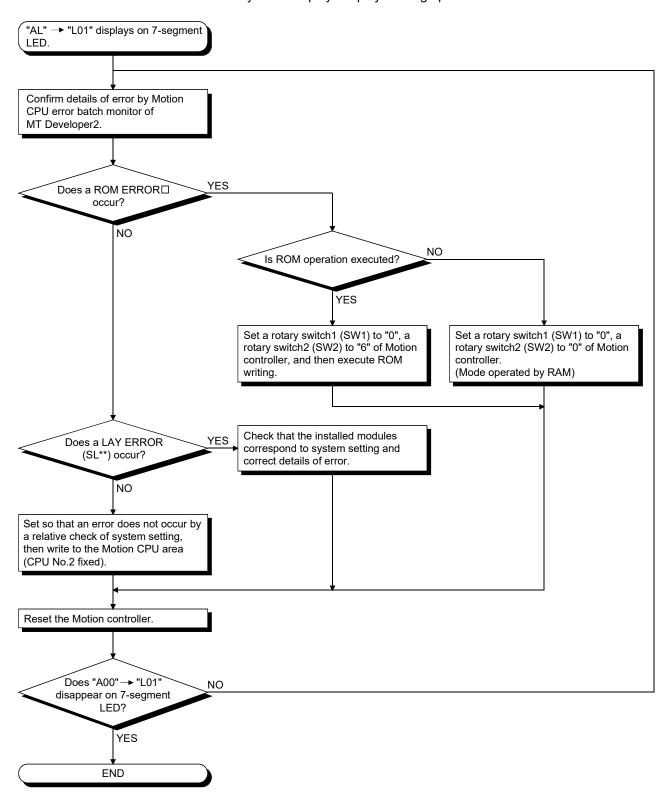
The following shows the flowchart for when "E□□" displays on 7-segment LED at the power supply ON or operation start.

"□" indicates the error code.



(f) Flowchart for when "AL" → "L01" displays on 7-segment LED ""AL" (flashes 3 times) → Steady "L01" display" displays at the system setting error occurrence.

The following shows the flowchart for when ""AL" (flashes 3 times) \rightarrow Steady "L01" display" displays during operation.

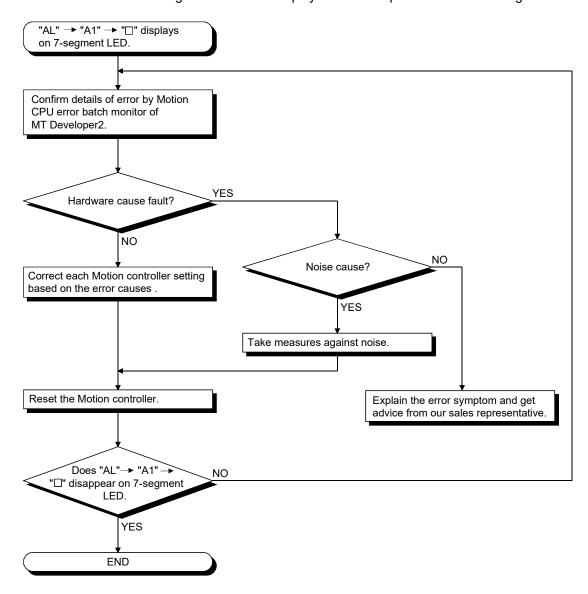


(g) Flowchart for when "AL" \rightarrow "A1" \rightarrow " \square " displays on 7-segment LED.

""AL" (flashes 3 times) \rightarrow Steady "A1" display \rightarrow " \square "" displays at the self-diagnosis error occurrence.

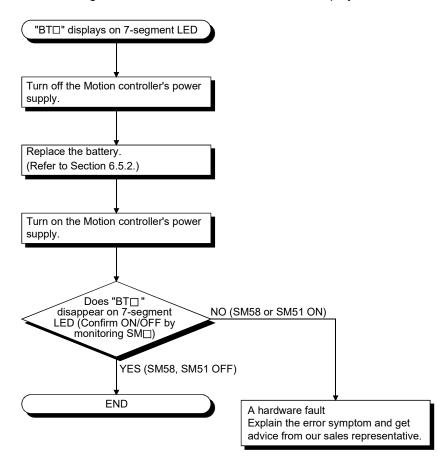
The following shows the flowchart for when ""AL" (flashes 3 times) \rightarrow Steady "A1" display \rightarrow " \square "" displays during operation.

□: 4-digits error code is displayed in two sequential flashes of 2-digits each.



- (h) Flowchart for when "BT□" displays on 7-segment LED
 - "BT1" or "BT2" displays when the battery voltage is lowered.
 - "BT1" or "BT2" displays in the following cases.
 - BT1: Battery voltage 2.7V or less
 - BT2: Battery voltage 2.5V or less

The following shows the flowchart for when "BT□" displays.



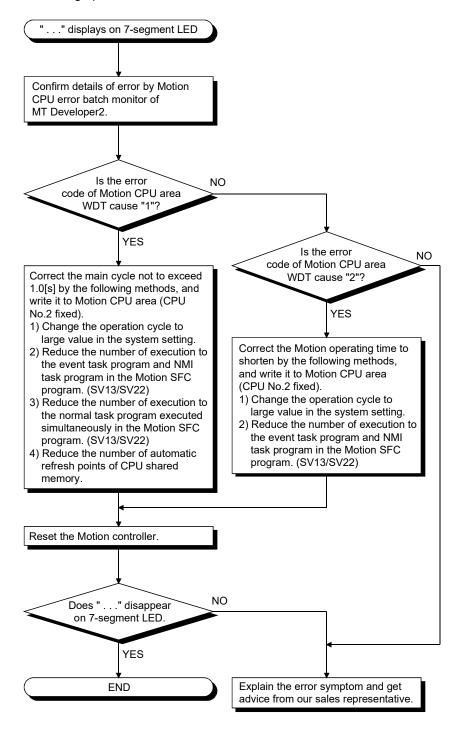
REMARK

If SM51 turns on, the contents of the data (Refer to Section 6.5.) in the RAM built-in Motion controller cannot be guaranteed.

It is recommended to back-up the battery periodically.

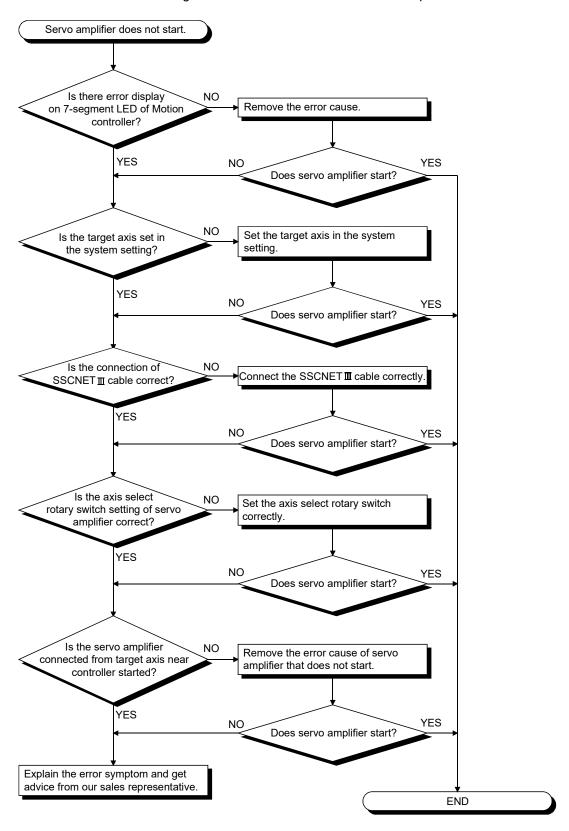
(i) Flowchart for when "..." displays on 7-segment LED "..." displays at the WDT error occurrence.

The following shows the flowchart for when "..." displays on 7-segment LED during operation.



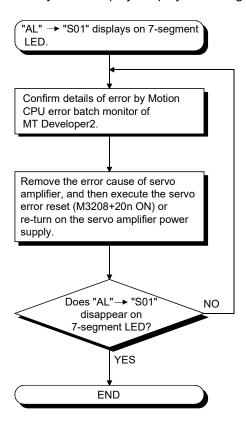
(j) Flowchart for when servo amplifier does not start

The following shows the flowchart for when servo amplifier does not start.

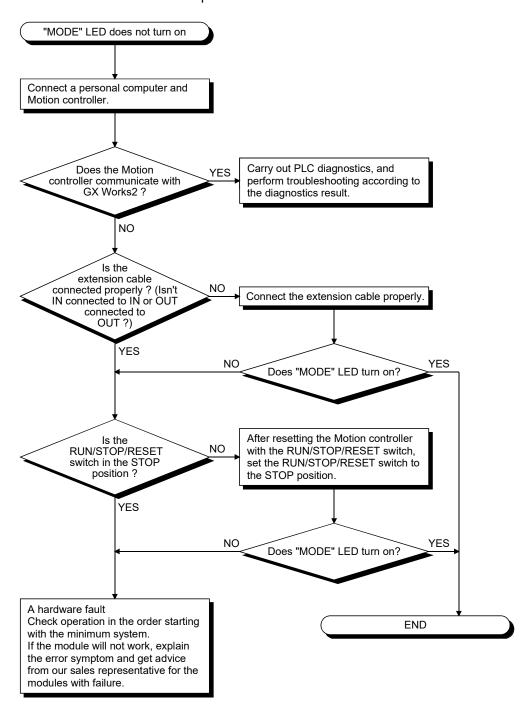


(k) Flowchart for when "AL" → "S01" displays on 7-segment LED ""AL" (flashes 3 times) → Steady "S01" display" displays at the servo error occurrence.

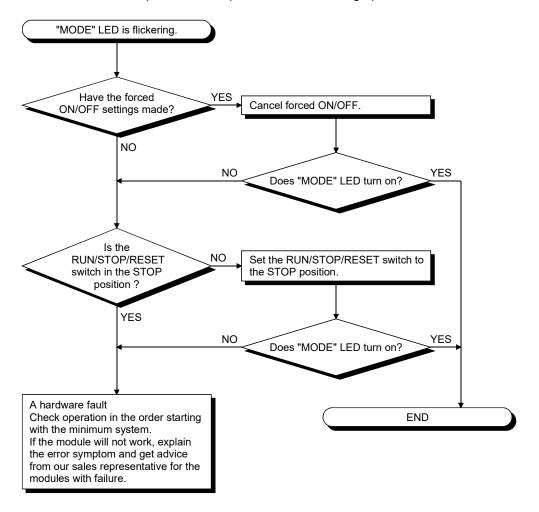
The following shows the flowchart for when ""AL" (flashes 3 times) → Steady "S01" display" displays on 7-segment LED during operation.



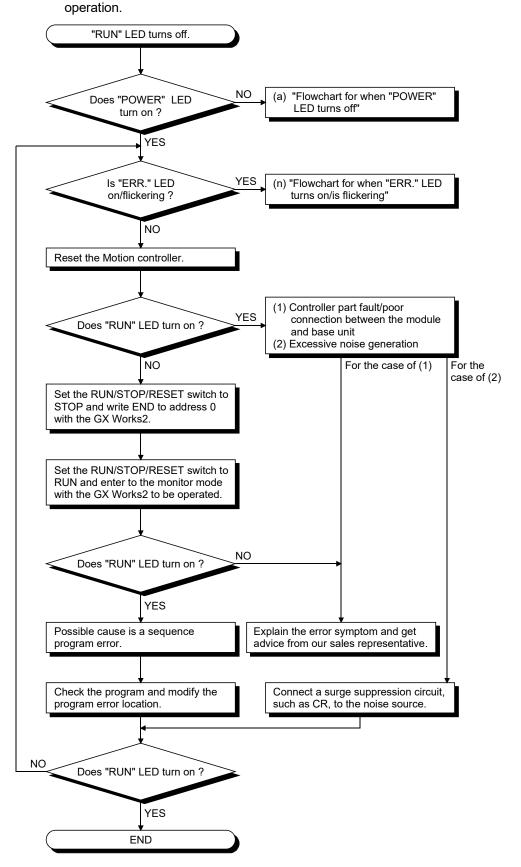
(I) Flowchart for when "MODE" LED does not turn on The following shows the flowchart for when "MODE" LED does not turn on at Motion controller's power-on.



(m) Flowchart for when "MODE" LED is flickering
The following shows the flowchart for when "MODE" LED flickers at Motion controller's power-on, at operation start or during operation.



(n) Flowchart for when "RUN" LED turns off The following shows the flowchart for when "RUN" LED turns off during



(o) When "RUN" LED is flickering

If the "RUN" LED flickers, follow the steps below.

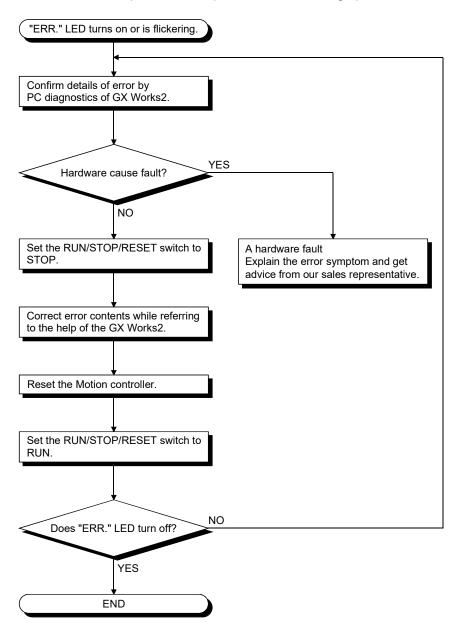
When the programs or parameters are written into the Motion controller during STOP status and then the RUN/STOP/RESET switch is set from STOP to RUN, the RUN LED flickers.

Although this status does not mean the Motion controller error, the Motion controller stops the operation. To set the Motion controller into RUN status, reset the Motion controller using the RUN/STOP/RESET switch or set the RUN/STOP/RESET switch from STOP to RUN again.

With this setting, the RUN LED turns on.

(p) Flowchart for when "ERR." LED turns on/is flickering

The following shows the flowchart for when "ERR." LED turns on or flickers at Motion controller's power-on, at operation start or during operation.



(q) When "USER" LED turns on

If the "USER" LED turns on, follow the steps described below.

"USER" LED turns on when an error is detected by the CHK instruction or the annunciator (F) turns on.

If "USER" LED is on, monitor the special relays SM62 and SM80 in the monitor mode of GX Works2.

When SM62 has turned ON
 The annunciator (F) is ON.
 Using SD62 to SD79, check the error cause.

• When SM80 has turned ON

The "USER" LED turned ON by the execution of the CHK instruction. Using SD80, check the error cause.

Eliminate the error cause after confirming it.

The "USER" LED can be turned off by:

- · Making a reset with the RUN/STOP/RESET switch; or
- Executing the LEDR instruction in the sequence program.

(r) When "BAT." LED turns on (yellow)

If "BAT." LED turns on (yellow), follow the steps described below.

"BAT." LED turns on (yellow) when a low battery capacity is detected in the memory card (SRAM card).

If the "BAT." LED is on, monitor the special relays and special registers in the monitor mode of GX Works2 to check which of the SRAM card batteries was lowered in capacity. (SM51 to SM52, SD51 to SD52)

After confirmation, replace the battery with a new one, and reset the Motion controller with the RUN/STOP/RESET switch or run the LEDR instruction, and the "BAT." LED will turn off.

For information regarding replacing the SRAM card battery, refer to the "QCPU User's Manual (Hardware Design, Maintenance and Inspection)".

6.6.3 Confirming error code

The error codes and error contents can be read using GX Works2 and MT Developer2. Refer to the Operating Manual of GX Works2 and help of MT Developer2 for details of operating method.

6.6.4 Internal I/O circuit troubleshooting

This section describes possible problems with internal I/O circuits and their corrective actions.

(1) Internal input circuit troubleshooting

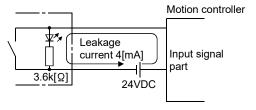
The following describes possible problems with internal input circuits and their corrective actions.

Table 6.5 Internal Input Circuit Troubleshooting and Corrective Action

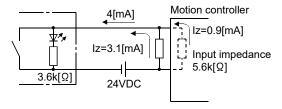
	Condition	Cause	Corrective action
Example 1	Internal input signal is not turned OFF.	Drive by switch with LED indicator. DC input (plus common)	Connect an appropriate resistor so that the current across the Motion controller becomes lower than the off current. DC input (plus common) Motion controller
Example 2	Internal input signal is not turned OFF.	• Sneak path due to the use of two power supplies. DC input Motion controller	be connected is shown below. • Use only one power supply. • Connect a sneak path prevention diode. (Figure below) DC input Motion controller

<Calculation example of Example 1>

If a switch with LED display is connected to Motion controller, and current of 4 [mA] is leaked.



(a) Because the condition for OFF voltage (0.9[mA]) of Motion controller is not satisfied. Connect a resistor as shown below.



(b) Calculate the connecting resistor value R as indicated below.

To satisfy the 0.9 [mA] OFF current of the Motion controller, the resistor R to be connected may be the one where 3.1 [mA] or more will flow.

IR: Iz = Z(Input impedance): R

$$R \le \frac{Iz}{IR} \times Z(Input \text{ impedance}) = \frac{0.9}{3.1} \times 5.6 \times 10^3 = 1625[\Omega]$$

 $R < 1625 [\Omega]$

Assuming that resistor R is 1500 [Ω], the power capacity W of resistor R is:

W =
$$(Input voltage)^2 \div R = 26.4^2 \div 1500 = 0.464 [W]$$

(c) The power capacity of the resistor selected is 3 to 5 times greater than the actual current consumption. 1.5K [Ω], 2 to 3 [W] resistor may therefore be connected to the terminal in question.

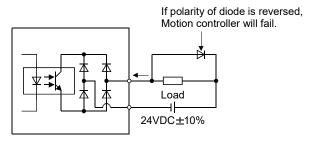
(2) Internal output circuit troubleshooting

The following describes possible problems with internal output circuits and their corrective actions.

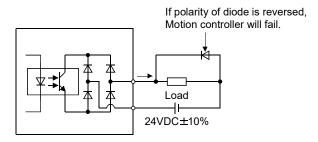
A lamp, relay or photocoupler can be driven. Install a diode(D) for an inductive load (relay etc.), or install an inrush current suppressing resistor(R) for a lamp load. (Permissible current: 40mA or less, inrush current: 100mA or less)

A maximum of 2.6V voltage drop occurs in the servo amplifier.

(a) Circuit example of sink output



(b) Circuit example of source output



⚠ CAUTION

lacktriangle Do not mistake the polarity and " + / - " of diode, as this may lead to destruction or damage.

7. EMC DIRECTIVES

Compliance to the EMC Directive, which is one of the EU Directives, has been a legal obligation for the products sold in European countries since 1996 as well as the Low Voltage Directive since 1997.

Manufacturers who recognize their products are compliant to the EMC and Low Voltage Directives are required to declare that print a "CE mark" on their products.

(1) Authorized representative in Europe

Authorized representative in Europe is shown below.

Name : Mitsubishi Electric Europe BV

Address: Gothaer strase 8, 40880 Ratingen, Germany

7.1 Requirements for Compliance with the EMC Directive

The EMC Directive specifies that products placed on the market must be so constructed that they do not cause excessive electromagnetic interference (emissions) and are not unduly affected by electromagnetic interference (immunity)". Section 7.1.1 through Section 7.1.4 summarize the precautions on compliance with the EMC Directive of the machinery constructed with the Motion controllers. These precautions are based on the requirements and the standards of the regulation, however, it does not guarantee that the entire machinery constructed according to the descriptions will comply with above-mentioned directive. The method and judgement for complying with the EMC Directive must be determined by the person who construct the entire machinery.

7.1.1 Standards relevant to the EMC Directive

The standards relevant to the EMC Directive are listed in the table below.

Certification	Test item	Test details	Standard value
	EN55011:2007/A2:2007 Radiated emission ^(Note-1)	Radio waves from the product are measured.	30M-230MHz QP ^(Note-2) : 40dBμV/m (10m (32.81ft.) in measurement range) 230M-1000MHz QP: 47dBμV/m (10m (32.81ft.) in measurement range)
EN61000-6-4:2007 EN61131-2:2007	EN55011:2007/A2:2007 ^(Note-3) (Power line) EN55022:2006/A1:2007 ^(Note-4) (Electrical communication port) Conducted emission	Noise from the product to the power line and electrical communication port is measured.	AC power line 0.15M-0.5MHz QP : 79dBµV AV ^(Note-5) : 66dBµV 0.5M-30MHz QP: 73dBµV AV: 60dBµV Electrical communication port 0.15M-0.5MHz QP, AV: Logarithmic decrease 0.5M-30MHz QP: 87dBµV AV: 74dBµV
	EN61000-4-2:1995 +A1:1998+A2:2001 Electrostatic discharge immunity	Immunity test in which electrostatic discharge is applied to the product.	8kV: 10 times at 1 second interval, Air discharge 4kV: 10 times at 1 second interval, Contact discharge
	EN61000-4-3:2006 Radiated immunity ^(Note-1)	Immunity test in which electric fields are radiated to the product.	80-1000MHz 10V/m, 1400M-2000MHz 3V/m, 2000M-2700MHz 1V/m, 80%AM modulation @1kHz
	EN61000-4-4:2004 Electrical fast transient/	Immunity test in which burst noise is applied to the power cable and signal	AC power line: ±2kV/5kHz DC power line: ±2kV/5kHz
EN61000-6-2:2005 EN61131-2:2007	EN61000-4-5:2006 Surge immunity	Immunity test in which surge is applied to the power line and signal line.	I/O, communication line: ±1kV/5kHz AC power line Common mode: ±2.5kV Differential mode: ±1.5kV DC power line Common mode: ±0.5kV Differential mode: ±0.5kV I/O, communication line Common mode: ±1kV
	EN61000-4-6:2007 +A:2001 Conducted immunity	Immunity test in which high frequency noise is applied to the power line and signal line.	0.15-80MHz, 80%AM modulation @1kHz, 10Vrms
	EN61000-4-11:2004 ^(Note-3) Short interruptions immunity	Immunity test in which power supply has short interruptions.	0% of rated voltage, 250cycle
	EN61000-4-11:2004 ^(Note-3) Voltage dip	Test in which voltage dip is applied to the power supply.	40% of rated voltage, 10cycle 70% of rated voltage, 25cycle
EN61131-2:2007	EN61131-2:2007 ^(Note-3) Voltage dip immunity	Immunity test in which voltage dip is applied to the power supply.	0% of rated voltage, 0.5cycle 20 times

(Note-1): This product is an open type device (a device designed to be housed inside other equipment) and must be installed inside a conductive control panel.

The corresponding test has been done with the programmable controller installed inside a control panel.

(Note-2): QP : Quasi-peak value

(Note-3): For the AC power supply line.

(Note-4): For the electrical communication port.

(Note-5): AV: Average value

7.1.2 Installation instructions for EMC Directive

(1) Installation

Motion controller is an open type device and must be installed inside a control panel for use.

This not only ensures safety but also ensures effective shielding of Motion controller-generated electromagnetic noise.

(a) Control panel

- 1) Use a conductive control panel.
- 2) When attaching the control panel's top plate or base plate, expose bare metal surface and weld so that good surface contact can be made between the panel and plate.
- 3) To ensure good electrical contact with the control panel, mask the paint on the installation bolts of the inner plate in the control panel so that contact between surfaces can be ensured over the widest possible area.
- 4) Ground the control panel with a thick wire so that a low impedance connection to ground can be ensured even at high frequencies.
- 5) Holes made in the control panel must be 10cm (3.94inch) diameter or less. If the holes are 10cm (3.94 inch) or larger, radio frequency noise may be emitted.

In addition, because radio waves leak through a clearance between the control panel door and the main unit, reduce the clearance as much as practicable.

The leakage of radio waves can be suppressed by the direct application of an EMI gasket on the paint surface.

(2) Connection of power line and ground wire

It is necessary to use the Motion controller grounding terminal only when it is in the grounded condition. Be sure to ground the grounding for the safety reasons and EMC Directives.

Ground wire and power supply cable for the Motion controller system must be connected as described below.

(a) Provide a grounding point near the FG terminals. Ground the FG terminals (FG: Frame Ground) with the thickest and shortest wire possible. (The wire length must be 30cm (11.81inch) or shorter.) The FG terminals function is to pass the noise generated in the Motion controller system to the ground, so wire the ground wire as short as possible to ensure a low impedance. The wire itself carries a large noise content and thus short wiring means that the wire is prevented from acting (noise emission) as an antenna.

(3) Cables

The cables extracted from the control panel contain a high frequency noise component. On the outside of the control panel, therefore, they serve as antennas to emit noise. To prevent noise emission, use shielded cables for the cables which are connected to the I/O modules and intelligent function modules and may be extracted to the outside of the control panel.

The use of a shielded cable also increases noise resistance.

The signal lines (including common line) of the programmable controller, which are connected to I/O modules, intelligent function modules and/or extension cables, have noise durability in the condition of grounding their shields by using the shielded cables. If a shielded cable is not used or not grounded correctly, the noise resistance will not meet the specified requirements.

(a) Grounding of shield section of shield cable

- Ground the exposed shield section of the shielded cable close to the module. When the grounded cables and the not yet grounded cables are bundled, the cables might be induced to electromagnetic.
- 2) Ground the exposed shield section to spacious area on the control panel. A clamp can be used as shown in Figure 7.2. In this case, mask the inner wall surface when coating the control panel, and contact the exposed shield section with the clamp at the exposed bare metal surface.

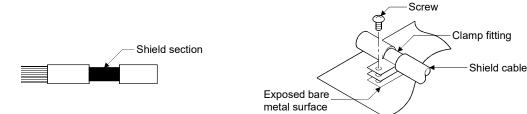


Figure 7.1 Part to be exposed

Figure 7.2 Shield grounding (Correct example)

Note) The method of grounding with a vinyl-coated wire soldered onto the shielded section of the shielded cable as in shown Figure 7.3 is not recommended. Doing so will raise the high-frequency impedance, resulting in loss of the shielding effect.

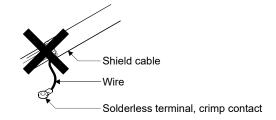


Figure 7.3 Shield grounding (Incorrect example)

(4) Precautions relevant to the electrostatic discharge

There is a weak part to electrostatic discharge in the surface of the module. 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.

7.1.3 Parts of measure against noise

(1) Ferrite core

A ferrite core has the effect of reducing noise in the 30MHz to 100MHz band. It is not required to fit ferrite cores to cables, but it is recommended to fit ferrite cores if shield cables pulled out of the enclosure do not provide sufficient shielding effects.

Note that the ferrite cores must be fitted to the cables in the position immediately before they are pulled out of the enclosure. If the fitting position is improper, the ferrite will not produce any effect.

• Ferrite core (Recommended product)

Manufacturer	Model name
TDK	ZCAT3035-1330

(2) Noise filter (power supply line filter)

A noise filter is a component which has an effect on conducted noise.

The attachment of the noise filter to the power supply line of the servo amplifier and controller's power supply is effective for the reducing noise.

(The noise filter has the effect of reducing conducted noise of 10 MHz or less.)

Noise ferrite (Recommended product)

Manufacturer	Model name	
Mitsubishi electric	FR-BLF	
Soshin Electric	HF3010A-UN	

The precautions required when installing a noise filter are described below.

(a) Do not bundle the wires on the input side and output side of the noise filter. When bundled, the output side noise will be induced into the input side wires from which the noise was filtered.

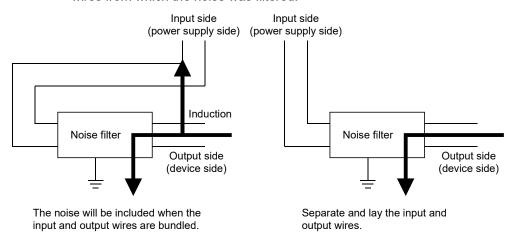


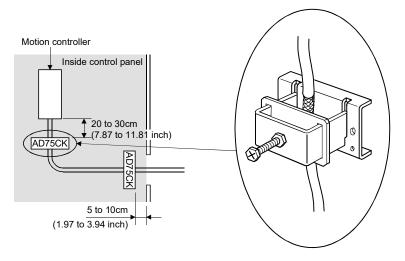
Figure 7.4 Precautions on noise filter

(b) Ground the noise filter grounding terminal to the control cabinet with the shortest wire possible (approx. 10cm (3.94 inch)).

(3) Cable clamp

It is also possible to ground the exposed shielded part of the cable to the panel with the AD75CK cable clamp (Mitsubishi).

- Ground the shield at a position 20 to 30cm (7.87 to 11.81 inch) away from the module.
- When the cables pulled out from the control panel, ground the cables at a
 position 5 to 10cm (1.97 to 3.94inch) near the input/output hole of the control
 panel with the cable clamp (AD75CK), etc.



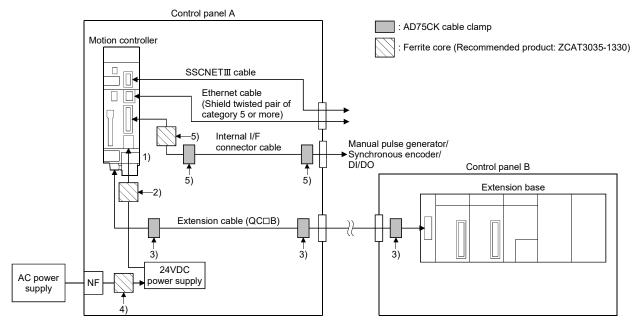
· Cable clamp (Recommended product)

Manufacturer	Model name
	AERSBAN-DSET
Mitsubishi electric	AERSBAN-ESET
	AD75CK

∆CAUTION

Do not ground the cable clamp to the top of control panel.
 Doing so may lead to damage by drop of screws, etc. during installation or removing the cable clamp.

7.1.4 Example of measure against noise



- 1) Ground the FG terminal of the Motion controller and 24VDC power supply module to the control panel.
- 2) Measure against noise of the power supply cable (24VDC twisted cable
 - Wire the power supply cable as short as possible using the twisted cable
 - Install a ferrite core at a position 20 to 30cm (7.87 to 11.81inch) away from the product.
- 3) Measure against noise of the extension cable (QC□B)
 - Ground the cables at a position 20 to 30cm (7.87 to 11.81inch) away from the module with the cable clamp, etc.
 - When the cables are extracted from the control panel, ground the cables at a position 5 to 10cm (1.97 to 3.94inch) away from the exit/entrance of the control panel with the cable clamp, etc.
- 4) Install a ferrite core in the secondary side of NF. (Approx. 1 turn)
- 5) Measure against noise of the internal I/F connector cable
 Install a ferrite core at a position 20 to 30cm (7.87 to 11.81inch) away from the module.
 - Ground the cables at a position 30 to 40cm (11.81 to 15.75inch) away from the module with the cable clamp, etc.
 - When the cables are extracted from the control panel, ground the cables at a position 5 to 10cm (1.97 to 3.94inch) away from the exit/entrance of the control panel with the cable clamp, etc.
 - (1) Refer to Section 2 for the following cables.
 - Ethernet cable
 - RS-232 communication cable
 - USB cable

 - Extension cable
 - · Forced stop input cable
 - (2) Refer to APPENDIX 4.4 for the internal I/F connector cable. Correctly wire the internal I/F connector cable. Use the shielded twisted pair cable.
 - (3) In wiring inside the panel, the power line connected to the power or servo amplifier and the communication cable such as bus connection cable or network cable must not be mixed. If the cables are installed closely with each other for wiring reasons, using a separator (made of metal) can make the cables less influenced by noise.

Mixing the power line and communication cable may cause malfunction due to noise.

APPENDICES

APPENDIX 1 Differences between Q170MSCPU and Q173DSCPU/Q172DSCPU

This section describes the differences between Q170MSCPU and Q173DSCPU/Q172DSCPU, and the details of change.

The specifications of Q170MSCPU are equal to those of Q172DSCPU. Refer to the following manuals for the specifications in common with Q172DSCPU.

Manual name	Manual number
Q173D(S)CPU/Q172D(S)CPU Motion controller	IB-0300134
Programming Manual (COMMON)	
Q173D(S)CPU/Q172D(S)CPU Motion controller (SV13/SV22)	ID 0200425
Programming Manual (Motion SFC)	IB-0300135
Q173D(S)CPU/Q172D(S)CPU Motion controller (SV13/SV22)	
Programming Manual (REAL MODE)	
Q173D(S)CPU/Q172D(S)CPU Motion controller (SV22)	
Programming Manual (VIRTUAL MODE)	IB-0300137
Q173DSCPU/Q172DSCPU Motion controller (SV22)	ID 0200400
Programming Manual (Advanced Synchronous Control)	IB-0300198

APP.

APPENDIX 1.1 Differences between parameters

Table 1.1 Differences between parameters

	Item	Q170MSCPU	Q173DSCPU/Q172DSCPU
	Amplifier setting	[Axis information] [Axis No.]	[Axis information] [Axis No.]
	Amplifier setting	1 to 16	Q173DSCPU: 1 to 32 Q172DSCPU: 1 to 16
System setting	Q170MS I/O setting/ CPU setting	[I/O setting] Used/Unused [First I/O No.] 0000 to 0FF0 [High-speed read setting] (Note-1) Used/Unused [Input signal detection direction] Valid on leading edge (Normally open contact)/ Valid on trailing edge (Normally closed contact)	4,
			"Status for each CPU", and "Error status for CPU and axis". Bit device :X, Y, M, B, F Word device : D, W, #, U□\G

(Note-1): This cannot be set in SV22 advanced synchronous control. (Note-2): SV22 advanced synchronous control only.

POINT

- (1) Set "MR-J5-B" to use the MR-J5W-□B.
 - MR-J5W-□B is recognized as two servo amplifiers or three servo amplifiers. Set two axes or three axes as "MR-J5-B".
- (2) Set "MR-J4-B" to use the MR-J4W-□B.

 MR-J4W-□B is recognized as two servo amplifiers or three servo amplifiers.

 Set two axes or three axes as "MR-J4-B".
- (3) Set "MR-J3-B" to use the MR-J3W-□B.
 MR-J3W-□B is recognized as two servo amplifiers. Set two axes as "MR-J3-B".

APPENDIX 1.2 Differences between peripheral device interfaces

Table 1.2 Differences between peripheral device interfaces

Item		Q170MSCPU	Q173DSCPU/Q172DSCPU	
USB		Connect to the USB connector/	Connect to the PLC CPU module.	
RS-232		RS-232 connector of PLC CPU area.		
	Direct connection	Connect to the PERIPHERAL	Connect to the PERIPHERAL	
PERIPHERAL I/F	Connection via	I/F connector of Motion CPU	I/F connector of Motion CPU	
	HUB	area.	module.	

APPENDIX 1.3 Differences between CPU display and I/O assignment

Table 1.3 Differences between CPU display and I/O assignment

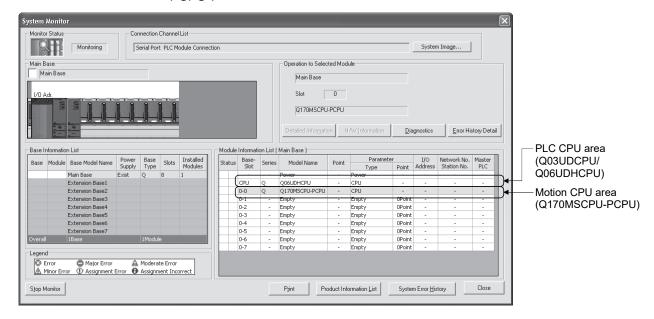
Iten	า	Q170MSCPU	Q173DSCPU/Q172DSCPU
I CPU display		Motion CPU: Q173DSCPU, Q172DSCPU PLC CPU: Q06UDHCPU, etc.	
	Base mode (Auto)	 The main base of eight slots corresponding is built into the Q170MSCPU. 16 points are set to each empty slot. First address of the extension base is "70". 	The main base and extension base are automatically determined. I/O or empty slot, etc. is automatic determined, and the points are assigned.
I/O assignment setting Base mode (Detail)		 I/O assignment points are individually assigned. When the first address of the extension base is set to address "0", the setting is as follows. Main base: 8 slots Number of points of each empty slot: 0 point 	I/O assignment points are individually assigned.

The CPU display and setting of I/O assignment are shown below.

(1) CPU display

Confirm the CPU display of the PLC CPU area and Motion CPU area on the System Monitor screen displayed on [Diagnostics] – [System monitor] of GX Works2.

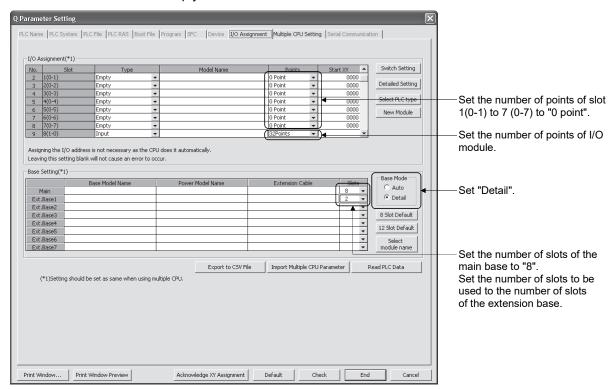
PLC CPU area is displayed as "Q03UDCPU (Q170MSCPU use)/Q06UDHCPU (Q170MSCPU-S1 use)", and Motion CPU area is displayed as "Q170MSCPU-PCPU".



(2) Setting of I/O assignment

Set the I/O assignment points in [I/O assignment] of PC parameter of GX Works2.

- (a) When the Base mode is set to "Auto" (default).16 points are set to empty slot of the main base. Therefore, the first address of the extension base is set to "70".
- (b) When the Base mode is set to "Detail". The first address of the extension base is set to "0" by setting 0 point to the empty slot of the main base.



POINT

The first address of the extension base can be assigned from address "0" by using the sample data.

Refer to "APPENDIX 2.1" for details of the sample data.

APPENDIX 1.4 Differences between I/O signals

Table 1.4 Differences between I/O signals

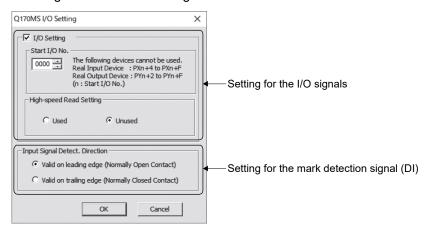
Item	Q170MSCPU	Q173DSCPU/Q172DSCPU
	Q170MSCPU's internal I/F (Note-1)	• Built-in interface in Motion CPU ^(Note-1)
I/O signal	(Input 4 points, output 2 points)	(Input 4 points)
	PLC I/O module	PLC I/O module
	Intelligent function module	Intelligent function module

(Note-1): Real input device (PX) or real output device (PY) is in units of 16 points.

- Real input (PX) : 4 points + Dummy (Unusable: Fixed at 0) 12 points
- Real output (PY): 2 points + Dummy (Unusable: Fixed at 0) 14 points (Example) When the first I/O No. is set to 0(H).
 - PX0 to PX3 (Real input), PX4 to PXF (Unusable: Fixed at 0)
 - PY0 to PY1 (Real output), PY2 to PYF (Unusable: Fixed at 0)

(1) Q170MS I/O setting

The setting method for the I/O signals of internal I/F is shown below.



Item Setting range		Setting range	Initial value	Remarks
I/C	I/O setting Used/Unused Ur		Unused	
First I/O No.		0000 to 0FF0 (in units of 16 points)	0000	
High-speed read setting (Note-1)		Used/Unused	Unused	points or less.
Input signal detection direction		Valid on leading edge (Normally open contact)/ Valid on trailing edge (Normally closed contact)	Valid on leading edge (Normally open contact)	Set the detection direction of the mark detection signal (DI).

(Note-1): This cannot be set in SV22 advanced synchronous control.

(2) Application of input signal

There are two kinds of applications of the input and mark detection for the Q170MSCPU's internal I/F.

The same signal can be used simultaneously by the input and mark detection.

I/O setting	Input signal	Mark detection
Used	I Usable as the real input device (PX)	Usable as the real input device (PX) or mark detection signal (DI)
Unused	Unusable	Usable as the mark detection signal (DI)

(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 area is used as a trigger.

Refer to the "Q173D(S)CPU/Q172D(S)CPU Motion Controller Programming Manual (COMMON)" for the high-speed reading of specified data.

(a) Modules and signals to be used

Input module	Signal	Read timing	Number of settable points
Q173DPX	TREN		3
Internal I/F	PX device	0.8[ms]	4
PLC input module (Note-1)	(Note-2)		8

(Note-1): Only one PLC input module can be used.

(Note-2): Either of the input signal of internal I/F (DI) and PLC input module can be used.

(4) Mark detection function

Any motion control data and all device data can be latched at the input timing of the mark detection signal. Also, data within a specific range can be latched by specifying the data detection range.

Refer to the "Q173D(S)CPU/Q172D(S)CPU Motion Controller Programming Manual (COMMON)" for the mark detection function.

(a) Mark detection signal

Set the input signal for mark detection.

1) Module input signal

a) Q170MSCPU's internal I/F

Input module	Signal	Signal No.	Detection accuracy [µs]	Signal detection direction (Leading edge/Trailing edge)
Q170MSCPU's internal I/F	DI	1 to 4	30	Set direction in the "Q170MS I/O Setting" of System Settings.

2) Bit device

Bit device	Setting range	Detection accuracy [μs]	Signal detection direction (Leading edge/Trailing edge)
X(PX)	0 to 1FFF (Note-1)		
Y(PY)	0 to 1FFF		
М	0 to 8191 ^(Note-2)	Operation cycle 222[µs] : 222	Set direction in the mark detection signal detection
В	0 to 1FFF	• Operation cycle 444[µs] or more : 444	direction.
SM	0 to 1999		
U□\G	10000.0 to (10000+p-1).F (Note-3)		

(Note-1): The range of "PXn+4 to PXn+F" cannot be used (fixed at 0) for the input device (PXn+0 to PXn+F) allocated to the built-in interface in Motion CPU (DI). (n: First input No.)

(Note-2): The range of M0 to M12287 is valid in the SV22 advanced synchronous control.

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

APPENDIX 2 Creation of Project

There are following methods to create the Q170MSCPU project.

- (1) Create the new project.
- (2) Convert the project for Q170MCPU/Q17□D(S)CPU/Q17□HCPU(-T)/Q17□CPUN(-T)/Q17□CPU.
- (3) Create the new project using the sample data.

Refer to the help of MT Developer2 for creation method of project.

The contents to create the project using the sample data describes in APPENDIX 2.1.

APPENDIX 2.1 Sample data

An easy setting can be achieved for the parameter setting such as the automatic refresh setting of Multiple CPU setting and I/O assignment setting by using the sample data.

Creation of project using the sample data is suitable for the machine control in the sequence program.

The sample data have two types (Motion CPU area, PLC CPU area).

(1) Overview

(a) Multiple CPU setting

An easy setting can be achieved for the automatic refresh setting of positioning dedicated signal between the PLC CPU area and Motion CPU area.

(b) I/O assignment setting

The main base of eight slots or equivalent is built into the Q170MSCPU. All points of "empty slot" not used on the main base are set to "0" point by the sample data.

(c) Device comment

The name of positioning dedicated signal can be used as the device comment of the sequence program.

(2) How to use

The methods to use the sample data are shown below.

- · Divert the sample data.
- Overwrite the sample data to the created project.

(3) Setting description

Outline of overwrite sample data is shown table below.

Add the extension base units and each module according to the system.

Refer to this section (7) for details of the sample data.

CPU area	Item	Description	Programming software package	Project name
Motion CPU	Base setting	Extension base Stage1 to Stage 7		SV13: Q170MS_SV13_MT2
area	Multiple CPU setting	Multiple CPU high speed transmission area setting Automatic refresh setting of CPU No.1, 2	MT Developer2	SV22: Q170MS_SV22_MT2 (Note-1) Q170MS_SV22_AD_MT2 (Note-2)
	I/O assignment	Base setting No. of slots for the base unit used I/O assignment Unit types, I/O points, I/O number Base mode setting		C)/40, 0470MQ, C)/40, C)/0
PLC CPU area	PLC system Multiple CPU settings	Points occupied by empty slot No. of PLC Multiple CPU high speed transmission area setting Auto refresh setting of CPU No.1, 2	GX Works2	SV13: Q170MS_SV13_GX2 SV22: Q170MS_SV22_GX2 (Note-1) Q170MS_SV22_AD_GX2 (Note-2)
	Device comment	Set the name of positioning dedicated signal to the comment of device.		

(Note-1): Project for virtual mode switching method. (Note-2): Project for advanced synchronous control method.

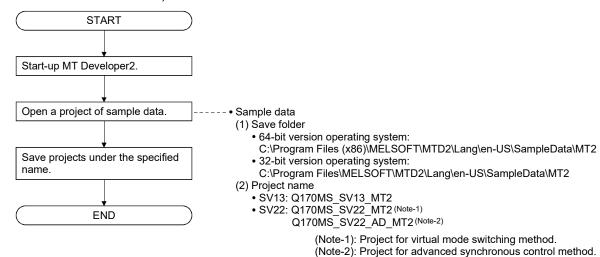
(4) Precautions

- (a) By using the sample data, the positioning dedicated signals of the Motion CPU area are changed to the device value of PLC CPU area by the automatic refresh. It needs to set again the automatic refresh setting after rewriting the sample data to transmit the data to the positioning dedicated signal using the Motion SFC program.
- (b) The existing data is overwritten and erased by diverting the sample data to the created project.
- (c) The project PLC type used in the PLC CPU area is "Q03UD". When using sample data for Q170MSCPU-S1, the PLC type needs to be changed to "Q06UDH" in the change PLC type of GX Works2.
- (d) Sample data is only for workspace format project. There is no single file format project.

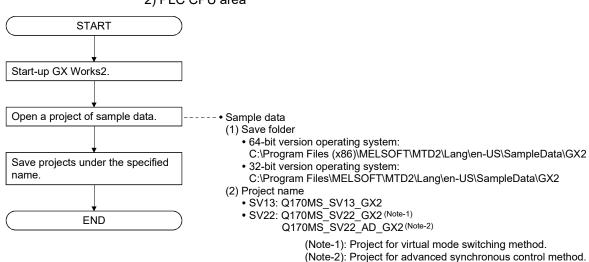
(5) Procedure for project creation

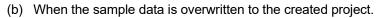
(a) When the sample data is diverted.

1) Motion CPU area

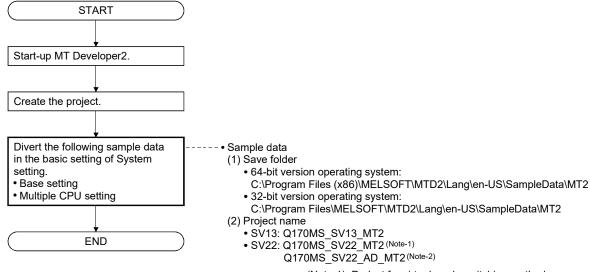


2) PLC CPU area





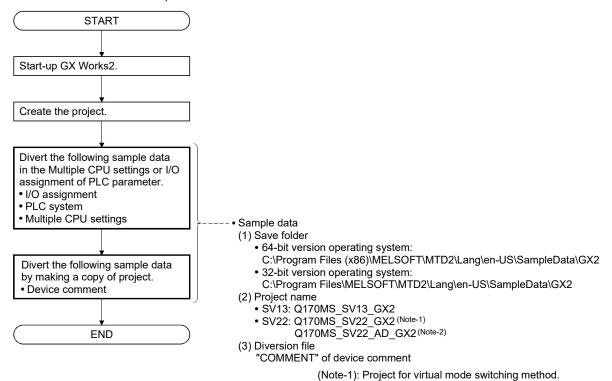
1) Motion CPU area



(Note-1): Project for virtual mode switching method. (Note-2): Project for advanced synchronous control method.

(Note-2): Project for advanced synchronous control method.

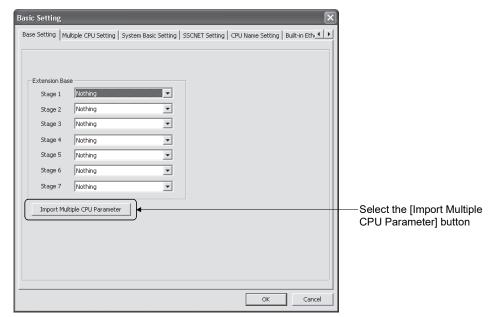
2) PLC CPU area



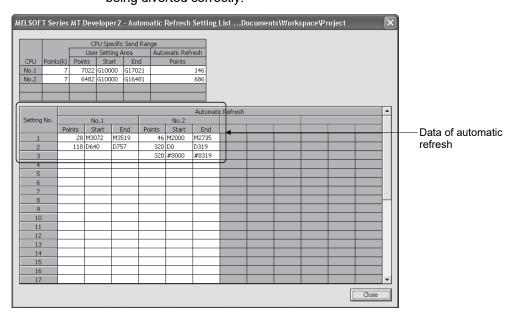
POINT

The existing data is overwritten and erased by diverting the sample data to the created project.

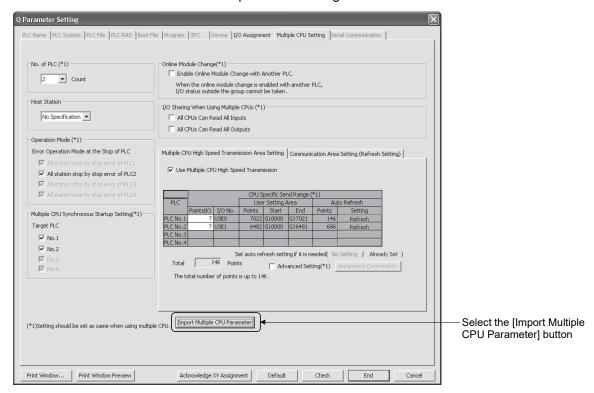
- (6) Operation procedure for sample data Refer to the help of MT Developer2 for details.
 - (a) Motion CPU area (MT Developer2)
 - 1) Multiple CPU setting
 - a) Diversion of sample data
 Divert the sample data by selecting the [Import Multiple CPU
 Parameter] button of the base setting or Multiple CPU setting of the basic setting of system setting.



b) Confirm the sample data Compare the Automatic Refresh Setting List screen with the contents of this section (7), then confirm that the sample data is being diverted correctly.



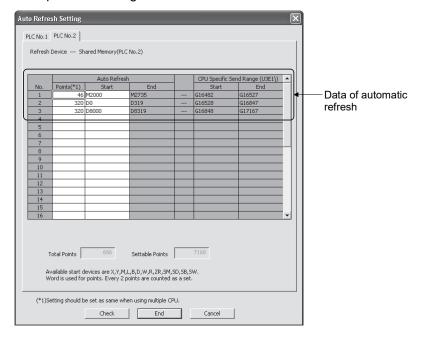
- (b) PLC CPU area (GX Works2)
 - 1) Multiple CPU settings / I/O assignment
 - a) Diversion of sample data
 Divert the sample data by selecting the [Import Multiple CPU
 Parameter] button of the Multiple CPU settings or I/O assignment of the PLC parameter setting.



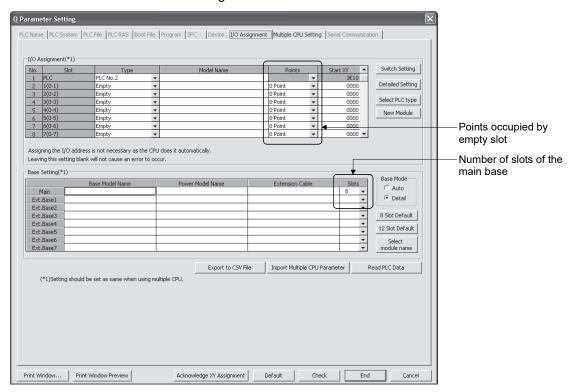
b) Confirm the sample data

Compare the Auto refresh settings screen with the contents of this section (7), then confirm that the sample data is being diverted correctly.

• Multiple CPU settings



• I/O assignment

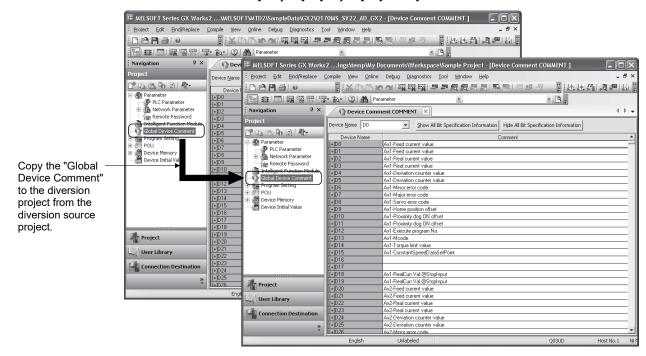


2) Device comment

The device comment data is allocated in the Multiple CPU high speed transmission area setting for the positioning dedicated signal.

The device can be used while confirming the comment to execute the control for the Motion CPU area in the PLC CPU area.

- a) Diversion of device comment
 - After opening the diversion source project (Sample data) and the diversion project, execute the following steps.
 - 1.Operation of the diversion source project (Sample data) (Copy) Select the "Global Device Comment" in the project view and then [Project] – [Object] – [Copy] of menu bar.
 - 2.Operation of the diversion project (Paste)Select the "Global Device Comment" in the project view and then "[Project] [Object] [Paste]" of menu bar.



(7) Description of sample data

- (a) Motion CPU area
 - 1) SV13 (Q170MS_SV13_MT2)
 - a) Base setting

Setting items		Description
S	Stage 1	Nothing
	Stage 2	Nothing
	Stage 3	Nothing
Extension base	Stage 4	Nothing
	Stage 5	Nothing
	Stage 6	Nothing
	Stage 7	Nothing

b) Multiple CPU setting

Setting items	Description
Operating mode	All station stop by stop error of CPU 1/2
Multiple CPU synchronous startup setting	Set CPU No. 1/2 to synchronous startup

c) Multiple CPU high speed transmission area setting

	CPU specific send range					
CPU	User setting area			ea	Automatic refresh	
Points (k)	Points	Start	End	Points		
No.1	7	7022	G10000	G17021	146	
No.2	7	6482	G10000	G16481	686	

d) Automatic refresh setting

• CPU No.1 (Receive)

Cattina Na	Automatic refresh				CPU specific ser	nd range(U3E0\)
Setting No.	Points	Start	End		Start	End
1	28	M3072	M3519	←	G17022	G17049
2	118	D640	D757	←	G17050	G17167

• CPU No.2 (Send)

Automatic refresh				CPU specific se	nd range(U3E1\)	
Setting No.	Points	Start	End		Start	End
1	46	M2000	M2735	\rightarrow	G16482	G16527
2	320	D0	D319	\rightarrow	G16528	G16847
3	320	#8000	#8319	\rightarrow	G16848	G17167

2) SV22 (Q170MS_SV22_MT2) (Project for virtual mode switching method) a) Base setting

Setting items		Description
	Stage 1	Nothing
	Stage 2	Nothing
	Stage 3	Nothing
Extension base	Stage 4	Nothing
	Stage 5	Nothing
	Stage 6	Nothing
	Stage 7	Nothing

b) Multiple CPU setting

Setting items	Description		
Operating mode	All station stop by stop error of CPU 1/2		
Multiple CPU synchronous startup setting	Set CPU No. 1/2 to synchronous startup		

c) Multiple CPU high speed transmission area setting

	CPU specific send range					
CPU	Dainte (b)	User setting area			Automatic refresh	
Points (k	Points (k)	Points	Start	End	Points	
No.1	7	6978	G10000	G16977	190	
No.2	7	5838	G10000	G15837	1330	

d) Automatic refresh setting

• CPU No.1 (Receive)

O - 445 N -	Automatic refresh							CPU specific se	nd range(U3E0\)
Setting No.	Points	Start	End		Start	End			
1	28	M3072	M3519	←	G16978	G17005			
2	44	M4800	M5503	←	G17006	G17049			
3	118	D640	D757	←	G17050	G17167			

• CPU No.2 (Send)

Cattin a Na	Automatic refresh				CPU specific se	nd range(U3E1\)
Setting No.	Points	Start	End		Start	End
1	46	M2000	M2735	\rightarrow	G15838	G15883
2	44	M4000	M4703	\rightarrow	G15884	G15927
3	320	D0	D319	\rightarrow	G15928	G16247
4	600	D800	D1399	\rightarrow	G16248	G16847
5	320	#8000	#8319	\rightarrow	G16848	G17167

3) SV22 (Q170MS_SV22_AD_MT2) (Project for advanced synchronous control method)

a) Base setting

Settir	ng items	Description
	Stage 1	Nothing
	Stage 2	Nothing
	Stage 3	Nothing
Extension base	Stage 4	Nothing
	Stage 5	Nothing
	Stage 6	Nothing
	Stage 7	Nothing

b) Multiple CPU setting

Setting items	Description		
Operating mode	All station stop by stop error of CPU 1/2		
Multiple CPU synchronous startup setting	Set CPU No. 1/2 to synchronous startup		

c) Multiple CPU high speed transmission area setting

	CPU specific send range					
CPU	Deinte (k)	U	ser setting are	Automatic refresh		
Points (k)	Points (K)	Points	Start	End	Points	
No.1	7	7022	G10000	G17021	146	
No.2	7	6482	G10000	G16481	686	

d) Automatic refresh setting

• CPU No.1 (Receive)

Cattina Na	Au	tomatic refre	esh		CPU specific send range(U3E0		
Setting No.	Points	Start	End		Start	End	
1	28	M3072	M3519	←	G17022	G17049	
2	118	D640	D640 D757		G17050	G17167	

• CPU No.2 (Send)

O - 445 N -	Au	tomatic refre	esh		CPU specific se	nd range(U3E1\)
Setting No.	Points	Start	End		Start	End
1	46	M2000	M2735	\rightarrow	G16482	G16527
2	320	D0	D319	\rightarrow	G16528	G16847
3	320	#8000	#8319	\rightarrow	G16848	G17167

(b) PLC CPU area

1) SV13 (Q170MS_SV13_GX2)

When using Q170MSCPU-S1, change the PLC type to "Q06UDH" in the change PLC type of GX Works2.

- a) I/O assignment
 - I/O assignment

	Setting items					Description				
Slot		PLC	PLC	1	2	3	4	5	6	7
Туре		PLC No.1	PLC No.2	Empty	Empty	Empty	Empty	Empty	Empty	Empty
Points				0 point	0 point	0 point	0 point	0 point	0 point	0 point
Start XY		3E00	3E10	0000	0000	0000	0000	0000	0000	0000
	Switch 1			_	_	_	_	_	_	_
O it . I.	Switch 2			_	_	_	_	_	_	_
Switch	Switch 3			_	_	_	_	_	_	_
setting	Switch 4			_	_	_	_	_	_	_
	Switch 5			_	_	_	_	_	_	_
	Error time output mode	_	_		_	_	_	_	_	_
Detailed	Hardware error time PLC operation mode	_	_	-	-	_	_	_	_	_
setting	I/O response time	_	_	_	_	_	_	_	_	_
	Control PLC	_	_	PLC No.1	PLC No.1	PLC No.1	PLC No.1	PLC No.1	PLC No.1	PLC No.1

· Base setting

Setting items	Description
Slots (Main)	8
Base mode	Detail

b) Multiple CPU settings

	Setting items					Descri	otion		
1	No. of PLC		2 modules						
2	Host CPU number					No speci	ication		
3	Operating mode				All station s	top by stop	error of PLO	C1/PLC2	
4	Multiple CPU synchronous startup setting		"PLC No.1", "PLC No.2" checked						
5	Online module change		"Enable online module change with another PLC" not checked						
6	Input sharing when using Multiple CPUs		"All CPUs can read all inputs" not checked						
7	Output sharing when using Multiple CPUs	"All CPUs can read all outputs" not checked							
		Use	e multipl	e CPU high	speed com	munication			
			CPU specific send range						
			PLC			Us	ser setting a	rea	Auto refresh
8	Multiple CPU high speed transmission			point (k)	I/O No.	point	Start	End	point
	area setting		No.1	7	U3E0	7022	G10000	G17021	146
			No.2	7	U3E1	6482	G10000	G16481	686

c) Auto refresh settings

• PLC No.1

N ₂		Auto refresh			CPU specific send range(U3E0		
No.	Point	Point Start End			Start	End	
1	28	M3072	M3519	_	G17022	G17049	
2	118	D640	D757	_	G17050	G17167	

• PLC No.2

		Auto refresh			CPU specific se	nd range(U3E1\)
No.	Point	Start	End		Start	End
1	46	M2000	M2735	_	G16482	G16527
2	320	D0	D319	_	G16528	G16847
3	320	D8000	D8319	_	G16848	G17167

d) PLC system setting

Only "Points occupied by empty slot" is overwritten at the sample data diversion. The content before sample data diversion are retained without rewriting for the other data.

	Setting ite	ms	Description				
		Low speed	100ms				
1	Timer limit setting	High speed	10.00ms				
		RUN	Not used				
2	RUN-PAUSE contacts	PAUSE	Not used				
3	Latch data backup operation va	lid contact	Not used				
4	Remote reset		"Allow" not checked				
5	Output mode at STOP to RUN		"Previous state" checked				
6	Floating point arithmetic proces	sing	_				
7	Intelligent function module setti	ng	Not used				
8	Module synchronization		"Synchronize intelligent module's pulse up" checked				
9	Common pointer No.		Not used				
10	Points occupied by empty slot		16 points				
		Interrupt counter start No.	_				
		I28 Fixed scan interval	100.0ms				
11	System interrupt settings	I29 Fixed scan interval	40.0ms				
		I30 Fixed scan interval	20.0ms				
		I31 Fixed scan interval	10.0ms				
12	Interrupt program / Fixed scan	orogram setting	"High speed execution" not checked				
13	A-PLC		Not checked				
14	Service processing setting	Scan time rate	10%				
15	CPU module change setting		Not used				

- 2) SV22 (Q170MS_SV22_GX2) (Project for virtual mode switching method) When using Q170MSCPU-S1, change the PLC type to "Q06UDH" in the change PLC type of GX Works2.
 - a) I/O assignment
 - I/O assignment

	Setting items					Description				
Slot		PLC	PLC	1	2	3	4	5	6	7
Type		PLC No.1	PLC No.2	Empty	Empty	Empty	Empty	Empty	Empty	Empty
Points				0 point	0 point	0 point	0 point	0 point	0 point	0 point
Start XY		3E00	3E10	0000	0000	0000	0000	0000	0000	0000
	Switch 1			_	_	_	_	_	_	_
0	Switch 2			_	_	_	_	_	_	_
Switch	Switch 3			_	_	_	_	_	_	_
setting	Switch 4			_	_	_	_	_	_	_
	Switch 5			_	_	_	_	_	_	_
	Error time output mode	_	_	_	_	_	_	_	_	_
Detailed	Hardware error time PLC operation mode	_	_			_	_		_	_
setting	I/O response time	_	_	_	_	_	_	_	_	_
	Control PLC	_	_	PLC No.1	PLC No.1	PLC No.1	PLC No.1	PLC No.1	PLC No.1	PLC No.1

· Base setting

Setting items	Description
Slots (Main)	8
Base mode	Detail

b) Multiple CPU setting

	Setting items					Descri	Description			
1	No. of PLC		2 modules							
2	Host CPU number					No specif	fication			
3	Operating mode				All station s	top by stop	error of PLO	C1/PLC2		
4	Multiple CPU synchronous startup setting				"PLC N	No.1", "PLC	No.2" chec	ked		
5	Online module change			"Enable o	nline modul	le change v	vith another	PLC" not ch	necked	
6	Input sharing when using Multiple CPUs		"All CPUs can read all inputs" not checked							
7	Output sharing when using Multiple CPUs	"All CPUs can read all outputs" not checked								
		Use	Use multiple CPU high speed communication							
				CPU specific send range						
			PLC			Us	ser setting a	rea	Auto refresh	
8	Multiple CPU high speed transmission			point (k)	I/O No.	point	Start	End	point	
	area setting		No.1	7	U3E0	6978	G10000	G16977	190	
			No.2	7	U3E1	5838	G10000	G15837	1330	

c) Auto refresh settings

• PLC No.1

NI-		Auto refresh			CPU specific se	nd range(U3E0\)
No.	Point	Start	End		Start	End
1	28	M3072	M3519	_	G16978	G17005
2	44	M4800	M5503	_	G17006	G17049
3	118	D640	D757	_	G17050	G17167

• PLC No.2

NI.	Auto refresh				CPU specific send range(U3E			
NO.	No. Point St		End		Start	End		
1	46	M2000	M2735	_	G15838	G15883		
2	44	M4000	M4703	_	G15884	G15927		
3	320	D0	D319	_	G15928	G16247		
4	600	D800	D1399	_	G16248	G16847		
5	320	D8000	D8319	_	G16848	G17167		

d) PLC system

Only "Points occupied by empty slot" is overwritten at the sample data diversion. The content before sample data diversion are retained without rewriting for the other data.

	Setting ite	ms	Description			
4	Time on limeit a attinger	Low speed	100ms			
1	Timer limit setting	High speed	10.00ms			
2	RUN-PAUSE contacts	RUN	Not used			
	RUN-PAUSE CONTacts	PAUSE	Not used			
3	Latch data backup operation va	alid contact	Not used			
4	Remote reset		"Allow" not checked			
5	Output mode at STOP to RUN		"Previous state" checked			
6	Floating point arithmetic processing		_			
7	Intelligent function module setting		Not used			
8	8 Module synchronization		"Synchronize intelligent module's pulse up" checked			
9	Common pointer No.		Not used			
10	Points occupied by empty slot		16 points			
		Interrupt counter start No.	_			
		I28 Fixed scan interval	100.0ms			
11	System interrupt settings	I29 Fixed scan interval	40.0ms			
		I30 Fixed scan interval	20.0ms			
		I31 Fixed scan interval	10.0ms			
12	Interrupt program / Fixed scan	program setting	"High speed execution" not checked			
13	A-PLC		Not checked			
14	Service processing setting	Scan time rate	10%			
15	CPU module change setting		Not used			

3) SV22 (Q170MS_SV22_AD_GX2) (Project for advanced synchronous control method)

When using Q170MSCPU-S1, change the PLC type to "Q06UDH" in the change PLC type of GX Works2.

- a) I/O assignment
 - I/O assignment

	Setting items		Description								
Slot		PLC	PLC	1	2	3	4	5	6	7	
Туре		PLC No.1	PLC No.2	Empty							
Points				0 point							
Start XY		3E00	3E10	0000	0000	0000	0000	0000	0000	0000	
	Switch 1			_	_	_	_	_	_	_	
O with a la	Switch 2			_	_	_	_	_	_	_	
Switch	Switch 3			_	_	_	_	_	_	_	
setting	Switch 4			_	_	_	_	_	_	_	
	Switch 5			_	_	_	_	_	_	_	
	Error time output mode	_	_		_	_	_	_	_	_	
Detailed setting	Hardware error time PLC operation mode	_	_	-	-	_	_	_	_	_	
	I/O response time	_	_			_	_	_	_	_	
	Control PLC	_	_	PLC No.1							

· Base setting

Setting items	Description
Slots (Main)	8
Base mode	Detail

b) Multiple CPU settings

	Setting items		Description							
1	No. of PLC			2 modules						
2	Host CPU number					No speci	fication			
3	Operating mode				All station s	top by stop	error of PLO	C1/PLC2		
4	Multiple CPU synchronous startup setting				"PLC I	No.1", "PLC	No.2" chec	ked		
5	Online module change	"Enable online module change with another PLC" not checked				necked				
6	Input sharing when using Multiple CPUs	"All CPUs can read all inputs" not checked								
7	Output sharing when using Multiple CPUs	"All CPUs can read all outputs" not checked								
		Use r	multiple	e CPU high	speed com	munication				
						CPU spe	cific send ra	nge		
			PLC			Us	ser setting a	rea	Auto refresh	
8	Multiple CPU high speed transmission			point (k)	I/O No.	point	Start	End	point	
	area setting		No.1	7	U3E0	7022	G10000	G17021	146	
			No.2	7	U3E1	6482	G10000	G16481	686	

c) Auto refresh settings

• PLC No.1

NI-		Auto refresh			CPU specific se	nd range(U3E0\)
No.	Point Start End			Start	End	
1	28	M3072	M3519	_	G17022	G17049
2	118	D640	D757	_	G17050	G17167

• PLC No.2

	Auto refresh				CPU specific send range(U3E1\)			
No.	Point	Start	End		Start	End		
1	46	M2000	M2735	_	G16482	G16527		
2	320	D0	D319	_	G16528	G16847		
3	320	D8000	D8319	_	G16848	G17167		

d) PLC system setting

Only "Points occupied by empty slot" is overwritten at the sample data diversion. The content before sample data diversion are retained without rewriting for the other data.

	Setting ite	ms	Description			
	Low speed		100ms			
1	Timer limit setting	High speed	10.00ms			
_		RUN	Not used			
2	RUN-PAUSE contacts	PAUSE	Not used			
3	Latch data backup operation va	lid contact	Not used			
4	Remote reset		"Allow" not checked			
5	Output mode at STOP to RUN		"Previous state" checked			
6	Floating point arithmetic processing		_			
7	7 Intelligent function module setting		Not used			
8	8 Module synchronization		"Synchronize intelligent module's pulse up" checked			
9	Common pointer No.		Not used			
10	Points occupied by empty slot		16 points			
		Interrupt counter start No.	_			
		I28 Fixed scan interval	100.0ms			
11	System interrupt settings	I29 Fixed scan interval	40.0ms			
		I30 Fixed scan interval	20.0ms			
		I31 Fixed scan interval	10.0ms			
12	Interrupt program / Fixed scan	orogram setting	"High speed execution" not checked			
13	A-PLC		Not checked			
14	Service processing setting	Scan time rate	10%			
15	CPU module change setting		Not used			

(8) Automatic refresh of sample data

The data to the internal relay and data register of PLC CPU area are transmitted to the positioning dedicated signals of Motion CPU area via the Multiple CPU high speed transmission area.

The positioning dedicated signals of Motion CPU area can be controlled by only control of the sequence program of PLC CPU area.

In addition, add the special relays, special registers and user devices to the parameters of automatic refresh if required.

The flow for the data of automatic refresh that uses the sample data is shown below.

(Example) SV13 use PLC CPU area (CPU No.1) Motion CPU area (CPU No.2) Multiple CPU high speed Multiple CPU high speed Internal relay Internal relav transmission area transmission area M0 U3E0\G10000 U3E0\G10000 M0 CPU No.1 CPU No.1 transmitting data receiving data M1999 M1999 M2000 M2000 Transfer in 0.88ms Axis status M2735 cycle Main cycle M2735 Automatic Automatic M2736 M2736 refresh area refresh area M3071 M3071 M3072 M3072 Axis command U3E1\G10000 U3E1\G10000 signal M3519 M3519 CPU No.2 CPU No.2 M3520 M3520 receiving data transmitting data Transfer M8191 in 0.88ms Data register Data register cycle Automatic Automatic D0 END processing Main cycle refresh area refresh area Axis monitor D319 D319 D320 D320 D639 D639 D640 Control change D640 D757 D757 D758 D7999 D8191 D8000 Motion device D8319 D8320 #8000 Monitor device #8319 #8320 #12287

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APPENDIX 3 Processing Times

The operation processing times are the same as Q172DSCPU for each operation control and transition instruction, and Motion dedicated PLC instruction. Refer to the "Q173D(S)CPU/Q172D(S)CPU Motion Controller (SV13/SV22) Programming Manual (Motion SFC)" for processing times.

APPENDIX 4 Cables

In this cable connection diagram, maker names of connectors are omitted. Refer to "APPENDIX 5.6 Connector" for maker names of connectors.

APPENDIX 4.1 SSCNETⅢ cables

In general, use the SSCNETII cables available as our products. Refer to APPENDIX 4.6 for long distance cables exceeding 50(164.04)[m(ft.)] and ultra-long bending life cables.

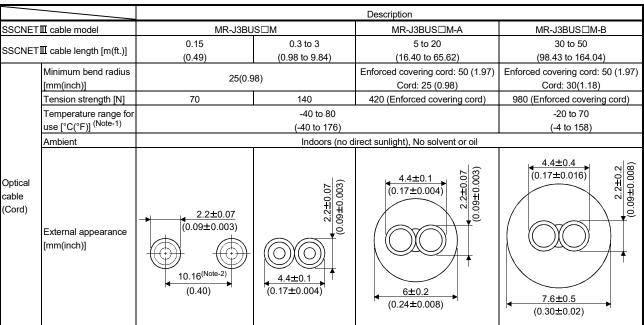
(1) Model explanation

Numeral in the column of cable length on the table is a symbol put in the "□" part of cable model. Cables of which symbol exists are available.

					Cable length [m(ft.)]								Application/
Cable model	0.15 (0.49)	0.3 (0.98)	0.5 (1.64)	(3.28)	3 (9.84)	5 (16.40)	10 (32.81)	20 (65.62)	30 (98.43)	40 (131.23)	50 (164.04)	Flex life	remark
MR-J3BUS□M	015	03	05	1	3							Standard	Standard cord for inside panel
MR-J3BUS□M-A						5	10	20				Standard	Standard cable for outside panel
MR-J3BUS□M-B (Note-1)									30	40	50	Long flex	Long distance cable

(Note-1): For the cable of less than 30 [m] (98.43 [ft.]), contact your nearest Mitsubishi sales representative.

(2) Specifications



(Note-1): This temperature range for use is the value for optical cable (cord) only.

(Note-2): Dimension of connector fiber insert location. The distance of two cords is changed by how to bend it.

POINTS

- (1) If the end face of cord tip for the SSCNETII cable is dirty, optical transmission is interrupted and it may cause malfunctions. If it becomes dirty, wipe with a bonded textile, etc. Do not use solvent such as alcohol.
- (2) Do not add excessive power to the connector of the SSCNETII cable.
- (3) When incinerating the SSCNETII cable (optical fiber), hydrogen fluoride gas or hydrogen chloride gas which is corrosive and harmful may be generated. For disposal of the SSCNETII cable (optical fiber), request for specialized industrial waste disposal services who has incineration facility for disposing hydrogen fluoride gas or hydrogen chloride gas.

(a) MR-J3BUS□M

1) Model explanation

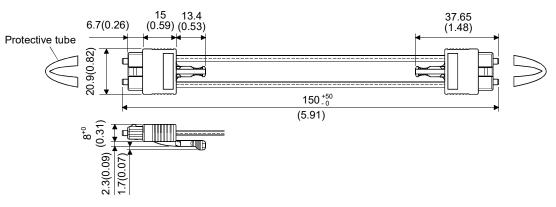
Type: MR-J3BUS M-*
Symbol Cable type
None Standard cord for inside panel
A Standard cable for outside panel
B Long distance cable

Symbol	Cable length [m(ft.)]
015	0.15(0.49)
03	0.3(0.98)
05	0.5(1.64)
1	1(3.28)
3	3(9.84)
5	5(16.40)
10	10(32.81)
20	20(65.62)
30	30(98.43)
40	40(131.23)
50	50(164.04)

2) Exterior dimensions

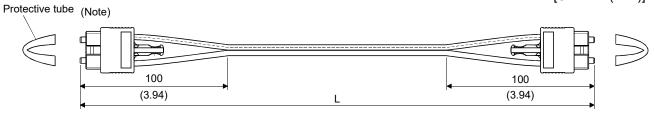
• MR-J3BUS015M

[Unit: mm(inch)]



MR-J3BUS03M to MR-J3BUS3M
 Refer to the table of this section (1) for cable length (L).

[Unit: mm(inch)]



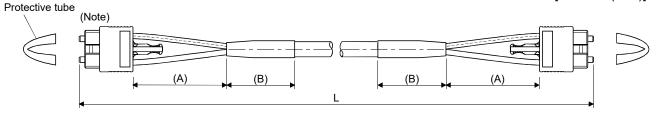
(Note): Dimension of connector part is the same as that of MR-J3BUS015M.

 MR-J3BUS5M-A to MR-J3BUS20M-A,MR-J3BUS30M-B to MR-J3BUS50M-B

Refer to the table of this section (1) for cable length (L).

0001/57#	Variation [mm(inch)]				
SSCNETII cable	А	В			
MR-J3BUS5M-A to MR-J3BUS20M-A	100(3.94)	30(1.18)			
MR-J3BUS30M-B to MR-J3BUS50M-B	150(5.91)	50(1.97)			

[Unit: mm(inch)]



(Note): Dimension of connector part is the same as that of MR-J3BUS015M.

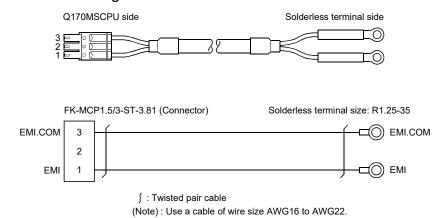
POINTS

After removing the cap and the light cord end protective tube during mounting of the SSCNETI cable, keep them in the resealable plastic bag that accompanies the SSCNETI cable to prevent them from becoming dirty.

APPENDIX 4.2 Forced stop input cable

Fabricate the forced stop input cable on the customer side. Make the forced stop input cable within 30m(98.43ft.).

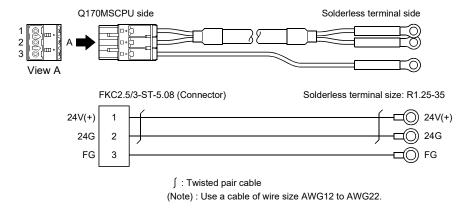
(1) Connection diagram



APPENDIX 4.3 24VDC power supply cable

Fabricate the forced stop input cable on the customer side.

(1) Connection diagram



APPENDIX 4.4 Internal I/F connector cable

Q170MSCPU side

DI2

DI4

FG

3

4

Shell

Fabricate the Q170MSCPU's internal I/F connector cable on the customer side.

Solderless terminal

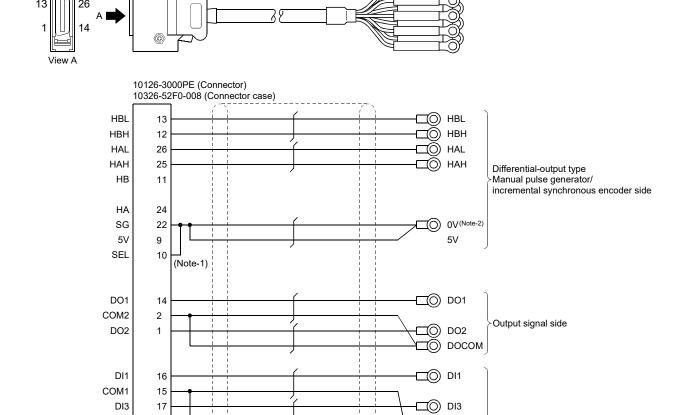
▲CAUTION

When fabricating the internal I/F connector cable, do not make an incorrect connection.
 Doing so may cause an operation failure or damage the module.

(1) Differential-output type

- (a) Connection diagram

 Make the cable within 30m(98.43ft.).
 - 1) When using an external power supply



: Twisted pair cable

(Note-1): Connect SEL to the SG terminal if differential-output type is used.

(Note-2): When using external power supply, connect SG to 0V of a separate power supply.

_____ DI2

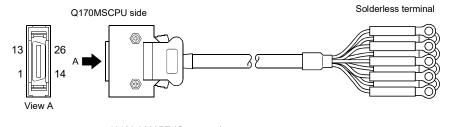
☑O DI4 ☑O DICOM

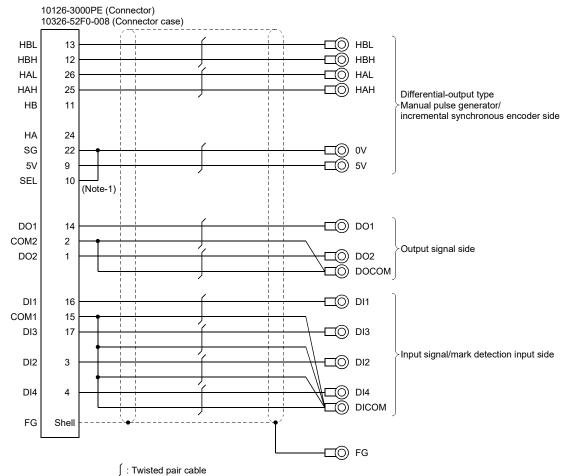
□ FG

Input signal/mark detection input side

(Note-3): Use cable of wire size AWG28.

2) When using an internal power supply





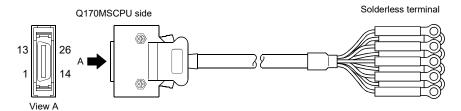
(Note-1): Connect SEL to the SG terminal if differential-output type is used. (Note-2): Use cable of wire size AWG28.

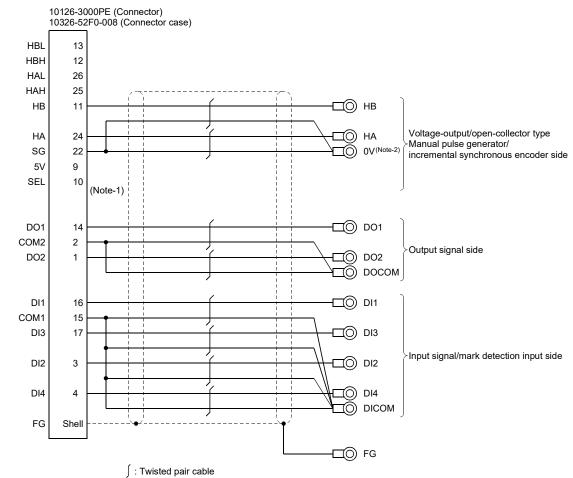
(2) Voltage-output/Open-collector type

(a) Connection diagram

Make the cable within 10m(32.81ft.).

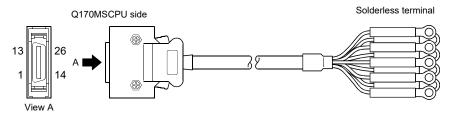
1) When using an external power supply

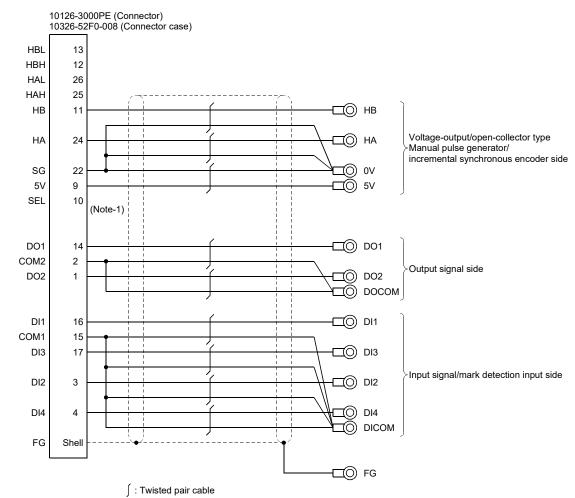




(Note-1): When voltage-output/open-collector type is used, open between SEL and SG. (Note-2): When using external power supply, connect SG to 0V of a separate power supply. (Note-3): Use cable of wire size AWG28.

2) When using an internal power supply





(Note-1): When voltage-output/open-collector type is used, open between SEL and SG. (Note-2): Use cable of wire size AWG28.

APPENDIX 4.5 Serial absolute synchronous encoder cable

Generally use the serial absolute synchronous encoder cables available as our products. If the required length is not found in our products, fabricate the cable on the customer side.

(1) Selection

The following table indicates the serial absolute synchronous encoder cables used with the serial absolute synchronous encoder.

Connector sets are also available for your fabrication.

Table 4.1 Encoder cable models

Туре	Length [m(ft.)]	Remark
Q170ENCCBL□M-A	2(6.56), 5(16.40), 10(32.81), 20(65.62), 30(98.43), 50(164.04)	Q171ENC-W8 ↔ MR-J4-□B-RJ

Use the following or equivalent twisted pair cables as the serial absolute synchronous encoder cables.

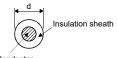
Table 4.2 Connector sets

Connector sets type	Description	Remark	
MR-J3CN2 Servo amplifier connector		Q171ENC-W8 ↔ MR-J4-□B-RJ	

Table 4.3 Wire specifications

Core		Characteristics of one core			Finished OD	
size [mm²	Number of	Structure [Number of wires/mm]	Conductor resistance [Ω/km]	Insulating sheath OD d[mm (inch)] (Note-1)	Finished OD [mm (inch)] (Note-2)	Remark
0.2	24(12 pair)	40/0.08	105 or less	0.88 (0.035)	9.0 (0.35)	Q171ENC-W8 ↔ MR-J4-□B-RJ

(Note-1): "d" is as shown below.



(Note-2): Standard OD (Outside Diameter). Maximum OD is about 10% larger.

⚠CAUTION

When fabricating the encoder cable, do not make an incorrect connection. Doing so may cause runaway or explosion.

(2) Q170ENCCBL□M-A

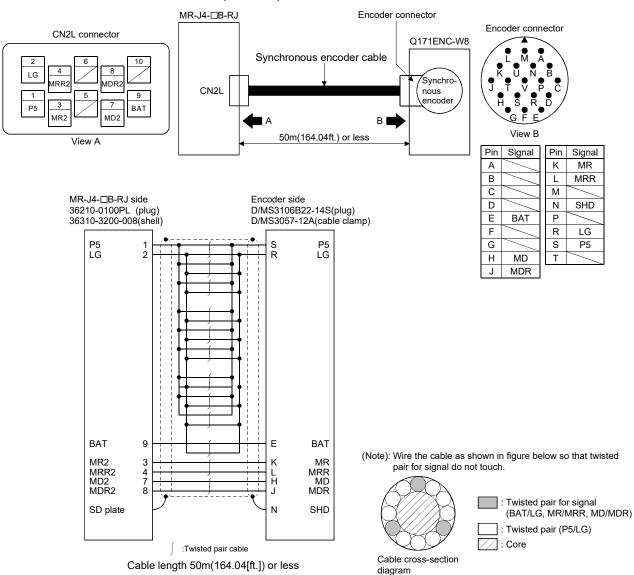
(a) Model explanation

Type: Q170ENCCBL<u>□</u>M-A

Syn	nbol	Cable length [m(ft.)]
	2	2(6.56)
;	5	5(16.40)
1	0	10(32.81)
2	0	20(65.62)
3	0	30(98.43)
5	0	50(164.04)

(b) Connection diagram

When fabricating a cable, use the recommended wire and connector set (MR-J3CN2) for encoder cable given in this section (1), and make the cable as shown in the following connection diagram. Maximum cable length is 50m(164.04ft.).



APPENDIX 4.6 SSCNETⅢ cables (SC-J3BUS□M-C) manufactured by Mitsubishi Electric System & Service

POINTS

- For the details of the SSCNET cables, contact your local sales office.
- Do not look directly at the light generated from CN1A/CN1B connector of servo amplifier or the end of SSCNET cable. The light can be a discomfort when it enters the eye.

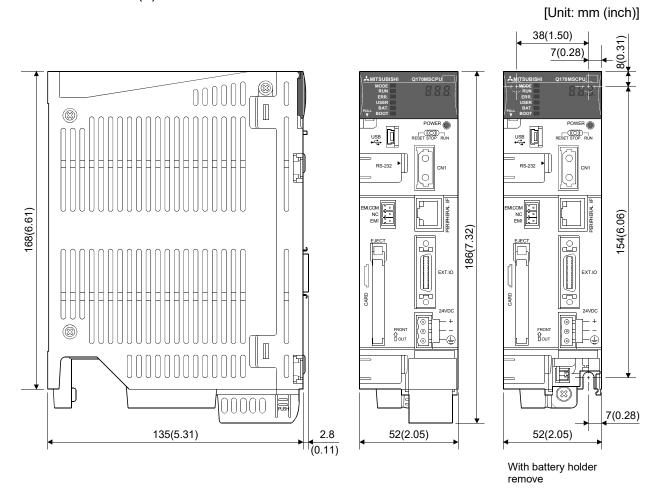
The cable is available per 1[m] up to 100[m]. The number of the length (1 to 100) will be in the \square part in the cable model.

Cable madel	Cable length [m(ft.)]	Donding life	A marilia a bi a m/ma ma a mis	
Cable model	1 to 100 (3.28 to 328.08)	Bending life	Application/remark	
SC-J3BUS□M-C	1 to 100	Ultra-long bending life	Long distance cable	

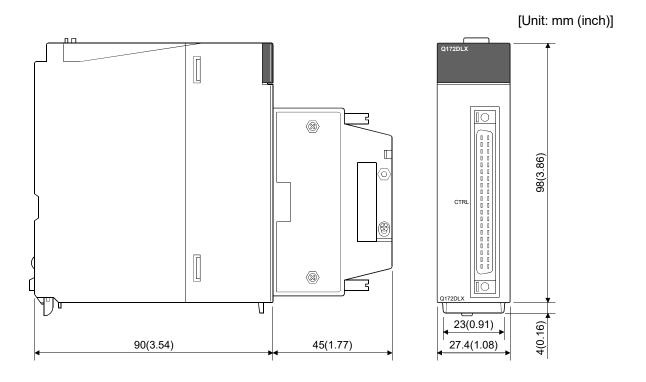
APPENDIX 5 Exterior Dimensions

APPENDIX 5.1 Motion controller

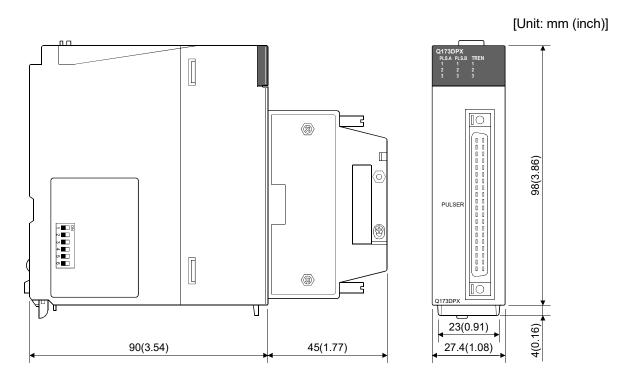
(1) Q170MSCPU/Q170MSCPU-S1



APPENDIX 5.2 Servo external signals interface module (Q172DLX)

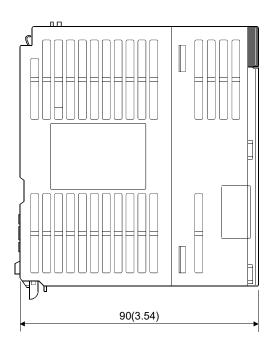


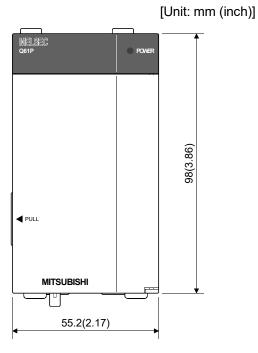
APPENDIX 5.3 Manual pulse generator interface module (Q173DPX)



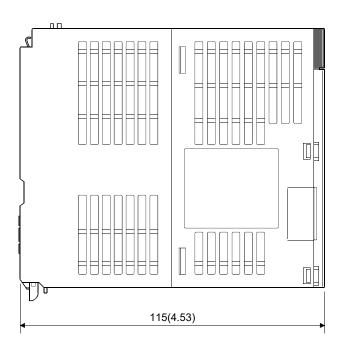
APPENDIX 5.4 Power supply module

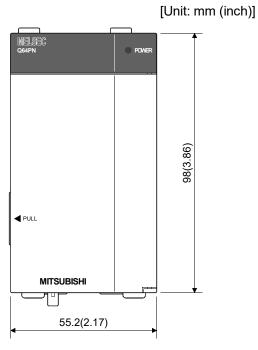
(1) Q61P, Q61P-D, Q62P, Q63P





(2) Q64PN

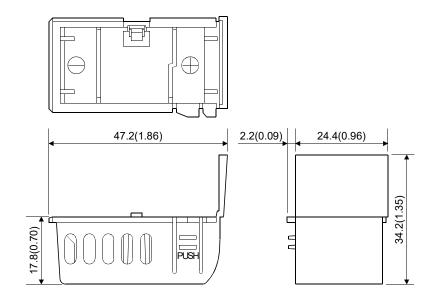




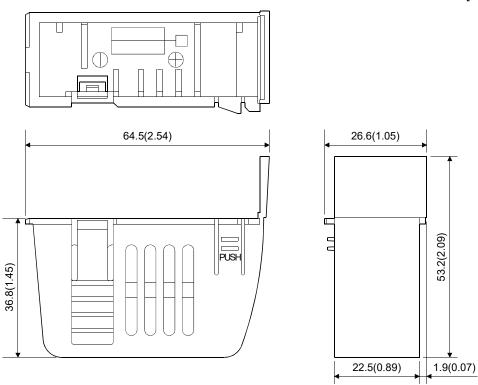
APPENDIX 5.5 Battery holder

(1) Battery holder (For Q6BAT)

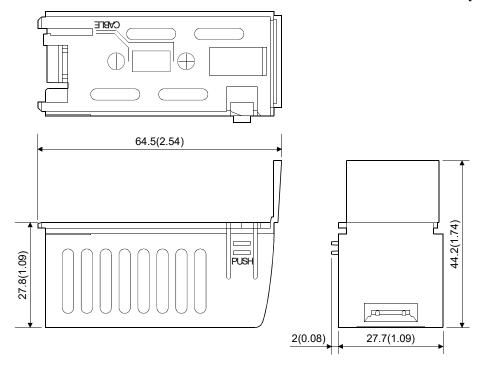
[Unit: mm (inch)]



(2) Battery holder (For Q7BATN)



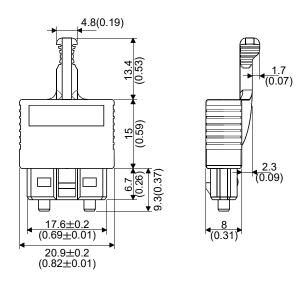
(3) Battery holder (For Q7BAT)



APPENDIX 5.6 Connector

(1) SSCNETⅢ cable connector

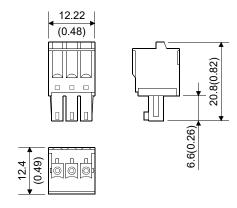
[Unit: mm (inch)]



(2) Forced stop input connector (PHOENIX CONTACT make)

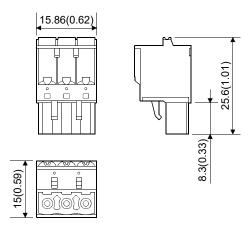
Type Connector: FK-MCP1.5/3/ST-3.81

[Unit: mm (inch)]



(3) 24VDC power supply connector (PHOENIX CONTACT make)

Type Connector: FKC2.5/3-ST-5.08



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(4) Internal I/F connector (3M Japan Limited make)

Time	Model		
Туре	Connector	Connector case	
Soldering type (Quick release metal latch type) (LD77MHIOCON)	10126-3000PE	10326-52F0-008	
Soldering type (Threaded type)	10126-3000PE	10326-52A0-008	
Pressure-displacement type (Quick release metal latch type) (Note-1)	10126-6000EL	10326-3210-000	

(Note-1): The following specialized tools are required.

These specialized tools are not provided by Mitsubishi. Please arrange for them on the customer side.

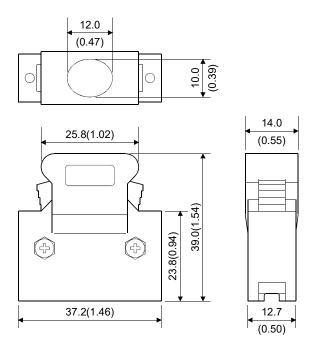
• MDR assembly press for pressure-displacement type (3M Japan Limited make)

Model name: 10960 (Hand press)

10962 (Fixture unit) 10963 (Fixture block)

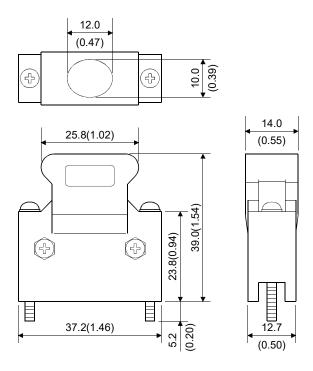
10964-1 (Cable clamp (black) 14 - 50 position)

(a) Soldering type (Quick release metal latch type) (LD77MHIOCON)

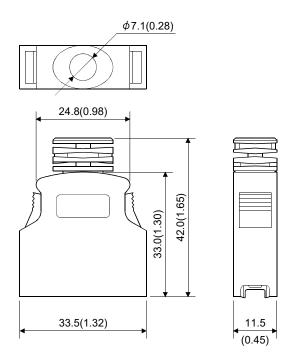


(b) Soldering type (Threaded type)

[Unit: mm (inch)]

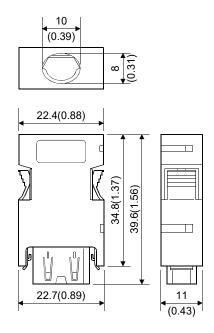


(c) Pressure-displacement type (Quick release metal latch type)



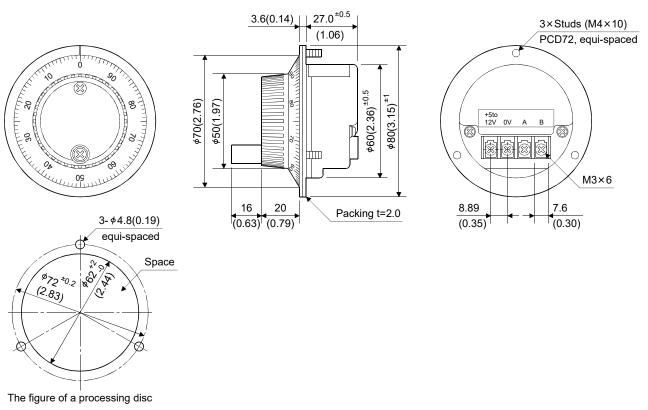
(5) Cable connector for serial absolute synchronous encoder (3M Japan Limited make (SCR type))

Type Plug: 36210-0100PL Shell: 36310-3200-008

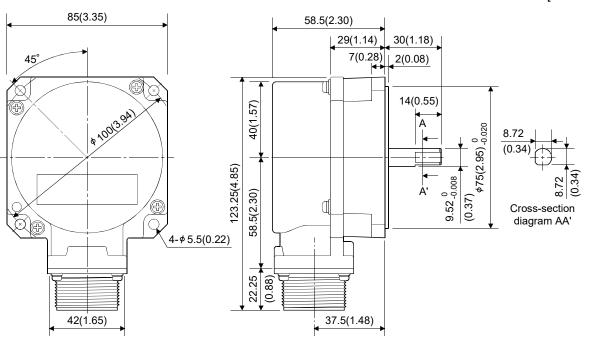


APPENDIX 5.7 Manual pulse generator (MR-HDP01)





APPENDIX 5.8 Serial absolute synchronous encoder (Q171ENC-W8)



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MEMO	

WARRANTY

Please confirm the following product warranty details before using this product.

1. Gratis Warranty Term and Gratis Warranty Range

We will repair any failure or defect hereinafter referred to as "failure" in our FA equipment hereinafter referred to as the "Product" arisen during warranty period at no charge due to causes for which we are responsible through the distributor from which you purchased the Product or our service provider. However, we will charge the actual cost of dispatching our engineer for an on-site repair work on request by customer in Japan or overseas countries. We are not responsible for any on-site readjustment and/or trial run that may be required after a defective unit are repaired or replaced.

[Gratis Warranty Term]

The term of warranty for Product is thirty six (36) months after your purchase or delivery of the Product to a place designated by you or forty two (42) months from the date of manufacture whichever comes first "Warranty Period". Warranty period for repaired Product cannot exceed beyond the original warranty period before any repair work.

[Gratis Warranty Range]

- (1) You are requested to conduct an initial failure diagnosis by yourself, as a general rule. It can also be carried out by us or our service company upon your request and the actual cost will be charged. However, it will not be charged if we are responsible for the cause of the failure.
- (2) This limited warranty applies only when the condition, method, environment, etc. of use are in compliance with the terms and conditions and instructions that are set forth in the instruction manual and user manual for the Product and the caution label affixed to the Product.
- (3) Even during the term of warranty, the repair cost will be charged on you in the following cases;
 - 1) A failure caused by your improper storing or handling, carelessness or negligence, etc., and a failure caused by your hardware or software problem
 - 2) A failure caused by any alteration, etc. to the Product made on your side without our approval
 - 3) A failure which may be regarded as avoidable, if your equipment in which the Product is incorporated is equipped with a safety device required by applicable laws and has any function or structure considered to be indispensable according to a common sense in the industry
 - 4) A failure which may be regarded as avoidable if consumable parts designated in the instruction manual, etc. are duly maintained and replaced
 - 5) Any replacement of consumable parts (battery, fan, etc.)
 - 6) A failure caused by external factors such as inevitable accidents, including without limitation fire and abnormal fluctuation of voltage, and acts of God, including without limitation earthquake, lightning and natural disasters
 - 7) A failure generated by an unforeseeable cause with a scientific technology that was not available at the time of the shipment of the Product from our company
 - 8) Any other failures which we are not responsible for or which you acknowledge we are not responsible for

2. Onerous Repair Term after Discontinuation of Production

(1) We may accept the repair at charge for another seven (7) years after the production of the product is

The announcement of the stop of production for each model can be seen in our Sales and Service, etc.

(2) Please note that the Product (including its spare parts) cannot be ordered after its stop of production.

3. Service in overseas countries

Our regional FA Center in overseas countries will accept the repair work of the Product; However, the terms and conditions of the repair work may differ depending on each FA Center. Please ask your local FA center for details.

4. Exclusion of Loss in Opportunity and Secondary Loss from Warranty Liability

Regardless of the gratis warranty term, Mitsubishi shall not be liable for compensation to:

- (1) Damages caused by any cause found not to be the responsibility of Mitsubishi.
- (2) Loss in opportunity, lost profits incurred to the user by Failures of Mitsubishi products.
- (3) Special damages and secondary damages whether foreseeable or not, compensation for accidents, and compensation for damages to products other than Mitsubishi products.
- (4) Replacement by the user, maintenance of on-site equipment, start-up test run and other tasks.

Change of Product specifications

Specifications listed in our catalogs, manuals or technical documents may be changed without notice.

6. Precautions for Choosing the Products

- (1) For the use of our Motion controller, its applications should be those that may not result in a serious damage even if any failure or malfunction occurs in Motion controller, and a backup or fail-safe function should operate on an external system to Motion controller when any failure or malfunction occurs.
- (2) Our Motion controller is designed and manufactured as a general purpose product for use at general industries. Therefore, applications substantially influential on the public interest for such as atomic power plants and other power plants of electric power companies, and also which require a special quality assurance system, including applications for railway companies and government or public offices are not recommended, and we assume no responsibility for any failure caused by these applications when used.
 - In addition, applications which may be substantially influential to human lives or properties for such as airlines, medical treatments, railway service, incineration and fuel systems, man-operated material handling equipment, entertainment machines, safety machines, etc. are not recommended, and we assume no responsibility for any failure caused by these applications when used.
 - We will review the acceptability of the abovementioned applications, if you agree not to require a specific quality for a specific application. Please contact us for consultation.
- (3) Mitsubishi Electric shall have no responsibility or liability for any problems involving programmable controller trouble and system trouble caused by DoS attacks, unauthorized access, computer viruses, and other cyberattacks.

INFORMATION AND SERVICES

For further information and services, please contact your local Mitsubishi Electric sales office or representative. Visit our website to find our locations worldwide.

MITSUBISHI ELECTRIC Factory Automation Global Website Locations Worldwide www.MitsubishiElectric.com/fa/about-us/overseas/

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MODEL: Q170MS-U-E
MODEL CODE: 1XB962

MITSUBISHI ELECTRIC CORPORATION

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Specifications subject to change without notice.