

MOTION CONTROLLER

Qseries

Q173CPU(N)

Q172CPU(N)

User's Manual

● SAFETY PRECAUTIONS ●

(Read these precautions before using.)

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

These precautions apply only to this equipment. Refer to the Users manual of the CPU module to use for a description of the PLC system safety precautions.

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



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



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

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

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

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

For Safe Operations

1. Prevention of electric shocks

DANGER

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

2. For fire prevention

CAUTION

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

3. For injury prevention

CAUTION

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

4. Various precautions

Strictly observe the following precautions.

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

(1) System structure

CAUTION

- Always install a leakage breaker on the Motion controller and servo amplifier power source.
- If installation of a electromagnetic contactor for power shut off during an error, etc., is specified in the instruction manual for the servo amplifier, etc., always install the electromagnetic contactor.
- Install the emergency stop circuit externally so that the operation can be stopped immediately and the power shut off.
- Use the Motion controller, servo amplifier, servomotor and regenerative resistor with the combinations listed in the instruction manual. Other combinations may lead to fire or faults.
- If safety standards (ex., robot safety rules, etc.,) apply to the system using the Motion controller, servo amplifier and servomotor, make sure that the safety standards are satisfied.
- Construct a safety circuit externally of the Motion controller or servo amplifier if the abnormal operation of the Motion controller or servo amplifier differ from the safety directive operation in the system.
- In systems where coasting of the servomotor will be a problem during the emergency stop, the forced 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.

 CAUTION

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

(2) Parameter settings and programming

 CAUTION

- Set the parameter values to those that are compatible with the Motion controller, servo amplifier, servomotor and regenerative resistor model and the system application. The protective functions may not function if the settings are incorrect.
- The regenerative resistor model and capacity parameters must be set to values that conform to the operation mode, servo amplifier and servo power supply module. The protective functions may not function if the settings are incorrect.
- Set the mechanical brake output and dynamic brake output validity parameters to values that are compatible with the system application. The protective functions may not function if the settings are incorrect.
- Set the stroke limit input validity parameter to a value that is compatible with the system application. The protective functions may not function if the setting is incorrect.

 **CAUTION**

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

(3) Transportation and installation

 **CAUTION**

- Transport the product with the correct method according to the mass.
- Use the servomotor suspension bolts only for the transportation of the servomotor. Do not transport the servomotor with machine installed on it.
- Do not stack products past the limit.
- When transporting the Motion controller or servo amplifier, never hold the connected wires or cables.
- When transporting the servomotor, never hold the cables, shaft or detector.
- When transporting the Motion controller or servo amplifier, never hold the front case as it may fall off.
- When transporting, installing or removing the Motion controller or servo amplifier, never hold the edges.
- Install the unit according to the instruction manual in a place where the mass can be withstood.

 **CAUTION**

- Do not get on or place heavy objects on the product.
- Always observe the installation direction.
- Keep the designated clearance between the Motion controller or servo amplifier and control panel inner surface or the Motion controller and servo amplifier, Motion controller or servo amplifier and other devices.
- Do not install or operate Motion controller, servo amplifiers or servomotors that are damaged or that have missing parts.
- Do not block the intake/outtake ports of the servomotor with cooling fan.
- Do not allow conductive matter such as screw or cutting chips or combustible matter such as oil enter the Motion controller, servo amplifier or servomotor.
- The Motion controller, servo amplifier and servomotor are precision machines, so do not drop or apply strong impacts on them.
- Securely fix the Motion controller and servo amplifier to the machine according to the instruction manual. If the fixing is insufficient, these may come off during operation.
- Always install the servomotor with reduction gears in the designated direction. Failing to do so may lead to oil leaks.
- Store and use the unit in the following environmental conditions.

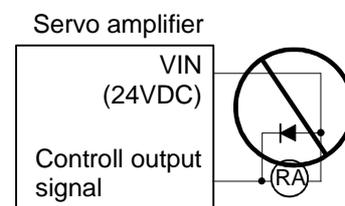
Environment	Conditions	
	Motion controller/Servo amplifier	Servomotor
Ambient temperature	According to each instruction manual.	0°C to +40°C (With no freezing) (32°F to +104°F)
Ambient humidity	According to each instruction manual.	80% RH or less (With no dew condensation)
Storage temperature	According to each instruction manual.	-20°C to +65°C (-4°F to +149°F)
Atmosphere	Indoors (where not subject to direct sunlight). No corrosive gases, flammable gases, oil mist or dust must exist	
Altitude	1000m (3278.69ft.) or less above sea level	
Vibration	According to each instruction manual	

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

(4) Wiring

⚠ CAUTION

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



(5) Trial operation and adjustment

⚠ CAUTION

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

(6) Usage methods

⚠ CAUTION

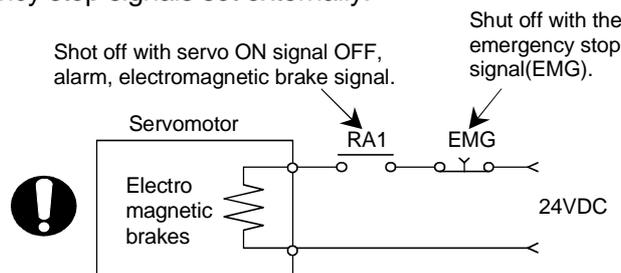
- Immediately turn OFF the power if smoke, abnormal sounds or odors are emitted from the Motion controller, servo amplifier or servomotor.
- Always execute a test operation before starting actual operations after the program or parameters have been changed or after maintenance and inspection.
- The units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

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

(7) Corrective actions for errors

⚠ CAUTION

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



 CAUTION

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

(8) Maintenance, inspection and part replacement

 CAUTION

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

(9) About processing of waste

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

CAUTION

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

(10) General cautions

CAUTION

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

REVISIONS

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

Print Date	* Manual Number	Revision
Nov., 2001	IB(NA)-0300040-A	First edition
May., 2002	IB(NA)-0300040-B	<p>[Addition model] Q173CPUN/Q172CPUN, MR-J2M-B, A10BD-PCF</p> <p>[Addition function]</p> <ul style="list-style-type: none"> • For Windows2000 • ROM operation <ul style="list-style-type: none"> •MODE LED Installation mode/ROM writing mode •BOOT LED Installation mode/ROM writing mode <p>[Partial correction]</p>
Sep., 2003	IB(NA)-0300040-C	<p>[Addition model] Q173CPUN-T/Q172CPUN-T, A31TU-D3K13/A31TU-DNK13, Q172EX-S1, Q173PX-S1, Q64AD, Q68ADV, Q68ADI, Q62DA, Q64DA, Q68DAV, Q68DAI, A6TBXY36, A6TBXY54, A6TBX70, Q170TUD3CBL3M, Q170TUDNCBL3M, Q170TUDNCBL03M-A, Q170TUTM, A31TUD3TM, FR-V5□0-□, Software for SV43</p> <p>[Addition function] For WindowsXP, Home position return function</p> <p>[Additional correction/partial correction] Safety precautions, About processing of waste, Discard of internal rechargeable battery, Instructions for installation of operation system software, Troubleshooting, Precautions for air transportation of battery, etc,</p>

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INTRODUCTION

Thank you for choosing the Q173CPU(N)/Q172CPU(N) Motion Controller.
Please read this manual carefully so that equipment is used to its optimum.

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About Manuals

This manual is only to explain hardware of the Motion controller.

The following manuals are related to this product.

Referring to this list, please request the necessary manuals.

This User's Manual do not describes hardware specification and handling methods of the PLC CPU modules, power supply modules, base unit and I/O module in details.

The above contents, refer to the QCPU (Q Mode) User's Manual and Building Block I/O Module User's Manual.

Related Manuals

	Manual Name	Manual Number (Model Code)
Hardware and Software of Motion CPU	Q173CPU(N)/Q172CPU(N) Motion controller (SV13/SV22) Programming Manual (Motion SFC) This manual explains the Multiple CPU system configuration, performance specifications, functions, programming, debugging and error codes. (Optional)	IB-0300042 (1CT781)
	Q173CPU(N)/Q172CPU(N) Motion controller (SV13/SV22) Programming Manual (REAL MODE) This manual explains the servo parameter, positioning instructions, device list and error list. (Optional)	IB-0300043 (1CT782)
	Q173CPU(N)/Q172CPU(N) Motion controller (SV22) Programming Manual (VIRTUAL MODE) This manual describes the dedicated instructions use to the synchronous control by virtual main shaft, mechanical system program create mechanical module. This manual explains the servo parameter, positioning instructions, device list and error list. (Optional)	IB-0300044 (1CT783)
Hardware and Software of PLC CPU	Basic Model QCPU (Q Mode) User's Manual (Hardware Design, Maintenance and Inspection) This manual explains the specifications of the CPU modules, power supply modules, base modules, extension cables, memory cards and others. (Optional)	SH-080187 (13JR43)
	Basic Model QCPU (Q Mode) User's Manual (Function Explanation, Program Fundamentals) This manual explains the functions, programming methods and devices and so on necessary to create programs with the QCPU (Q mode). (Optional)	SH-080188 (13JR44)
	High Performance Model QCPU (Q Mode) User's Manual (Hardware Design, Maintenance and inspection) This manual explains the specifications of the CPU modules, power supply modules, base modules, extension cables, memory cards and others. (Optional)	SH-080037 (13JL97)

Manual Name		Manual Number (Model Code)
Hardware and Software of PLC CPU	<p>High Performance Model QCPU (Q Mode) User's Manual (Function Explanation, Program Fundamentals)</p> <p>This manual explains the functions, programming methods and devices and so on necessary to create programs with the QCPU (Q mode).</p> <p style="text-align: right;">(Optional)</p>	SH-080038 (13JL98)
	<p>QCPU (Q Mode)/QnACPU Programming Manual (Common Instructions)</p> <p>This manual explains how to use the sequence instructions, basic instructions, application instructions and micro computer program.</p> <p style="text-align: right;">(Optional)</p>	SH-080039 (13JF58)
	<p>QCPU (Q Mode)/QnACPU Programming Manual (PID Control Instructions)</p> <p>This manual explains the dedicated instructions used to exercise PID control.</p> <p style="text-align: right;">(Optional)</p>	SH-080040 (13JF59)
	<p>QCPU (Q Mode)/QnACPU Programming Manual (SFC)</p> <p>This manual explains the system configuration, performance specifications, functions, programming, debugging, error codes and others of MELSAP3.</p> <p style="text-align: right;">(Optional)</p>	SH-080041 (13JF60)
	<p>I/O Module Type Building Block User's Manual</p> <p>This manual explains the specifications of the I/O modules, connector, connector/terminal block conversion modules and others.</p> <p style="text-align: right;">(Optional)</p>	SH-080042 (13JL99)

1. OVERVIEW

1.1 Overview

This User's Manual describes the hardware specifications and handling methods of the Motion Controller's Model Q173CPU(N)/Q172CPU(N) 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, Synchronous encoder, and cable.

In this manual, the following abbreviations are used.

Generic term/Abbreviation	Description
Q173CPU(N)/Q172CPU(N), Motion CPU or Motion CPU module	Q173CPUN/Q172CPUN/Q173CPUN-T/Q172CPUN-T/Q173CPU/Q172CPU Motion CPU module
MR-H-BN	Servo amplifier model MR-H□BN
MR-J2□-B	Servo amplifier model MR-J2S-□B/MR-J2M-B/MR-J2-□B/MR-J2-03B5
AMP or Servo amplifier	Servo amplifier model MR-H□BN/MR-J2S-□B/MR-J2M-B/MR-J2-□B/MR-J2-03B5, Vector inverter FREQROL-V500 series
Q172LX/Q172EX/Q173PX or Motion module	Q172LX Servo external signals interface module/ Q172EX(-S1) Serial absolute synchronous encoder interface module/ Q173PX(-S1) Manual pulse generator interface module
QCPU, PLC CPU or PLC CPU module	Qn(H)CPU
Multiple CPU system or Motion system	General name for Multiple PLC system of the Q series
Programming S/W package	SW6RNC-GSV□E and GX Developer software package
Programming software	"SW□RN-□P"
Operating system software	"SW□RN-SV□Q□"
Manual pulse generator or MR-HDP01	General name for Manual pulse generator (MR-HDP01)
Serial absolute synchronous encoder or MR-HENC	General name for Serial absolute synchronous encoder (MR-HENC)
SSCNET ^(Note)	High speed synchronous communication network between Motion controller and servo amplifier.
Cooling fan unit	Cooling fan unit (Q170FAN)
Dividing unit	Dividing unit (Q173DV)
Battery unit	Battery unit (Q170BAT)
Teaching Unit or A31TU-D3K□/A31TU-DNK□	A31TU-D3K□/A31TU-DNK□
Intelligent function module	General name for MELSECNET/H module/Ethernet module/CC-Link module/Serial communication module
Vector inverter (FR-V500)	General name for vector inverter FREQROL-V500 series

(Note) SSCNET: Servo System Controller Network

REMARK

For information about the QCPU, peripheral devices for PLC program creation, I/O modules and intelligent function module, refer to the manual relevant to each module. Also, refer to the programming manual of the operating system software for information about creating Motion programs, and refer to the help of each software for information about operation of each programming software package.

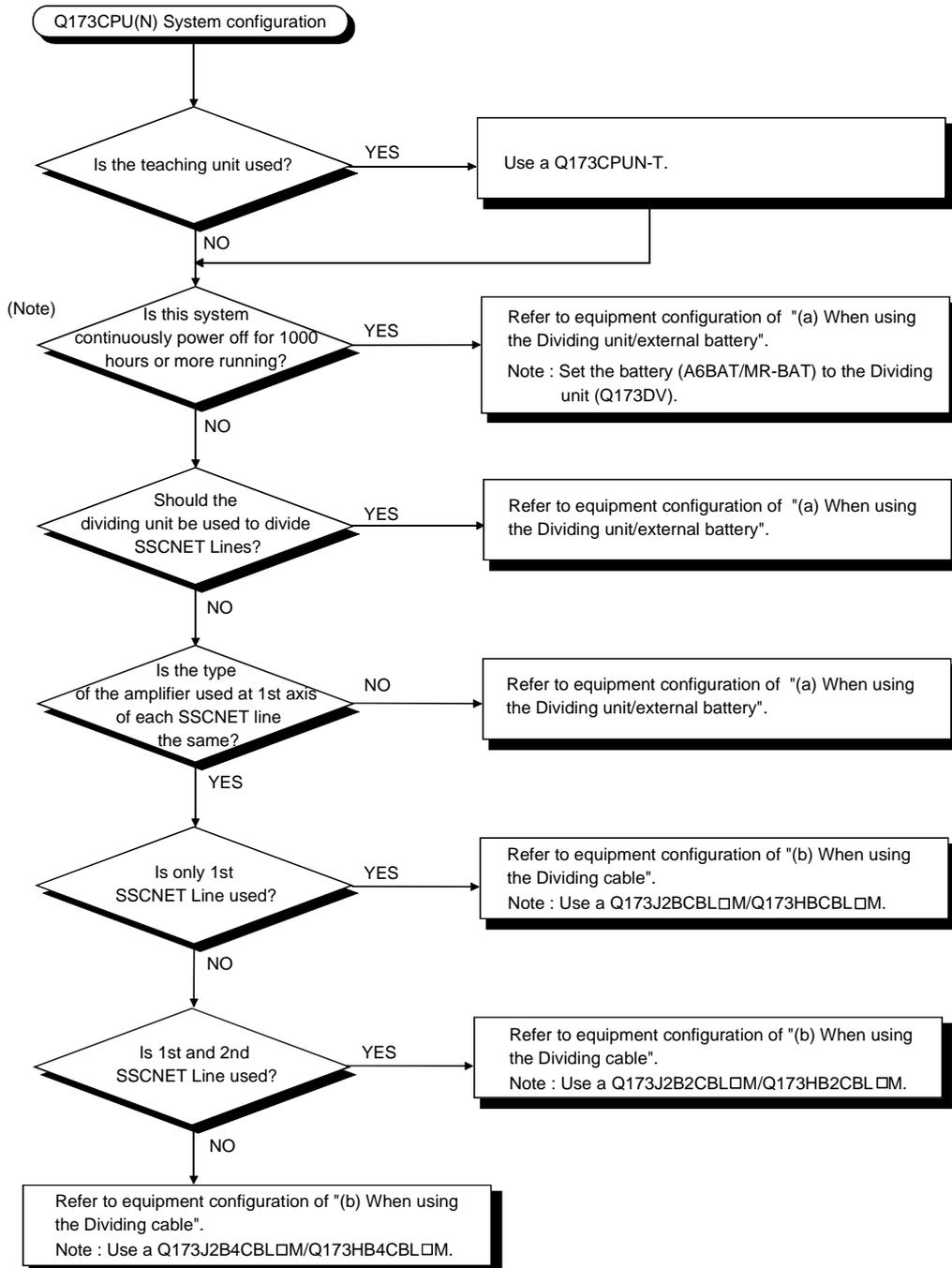
2. SYSTEM CONFIGURATION

This section describes the system configuration of the Q173CPU(N)/Q172CPU(N), cautions on use of the system, and configured equipment.

2.1 Motion System Configuration

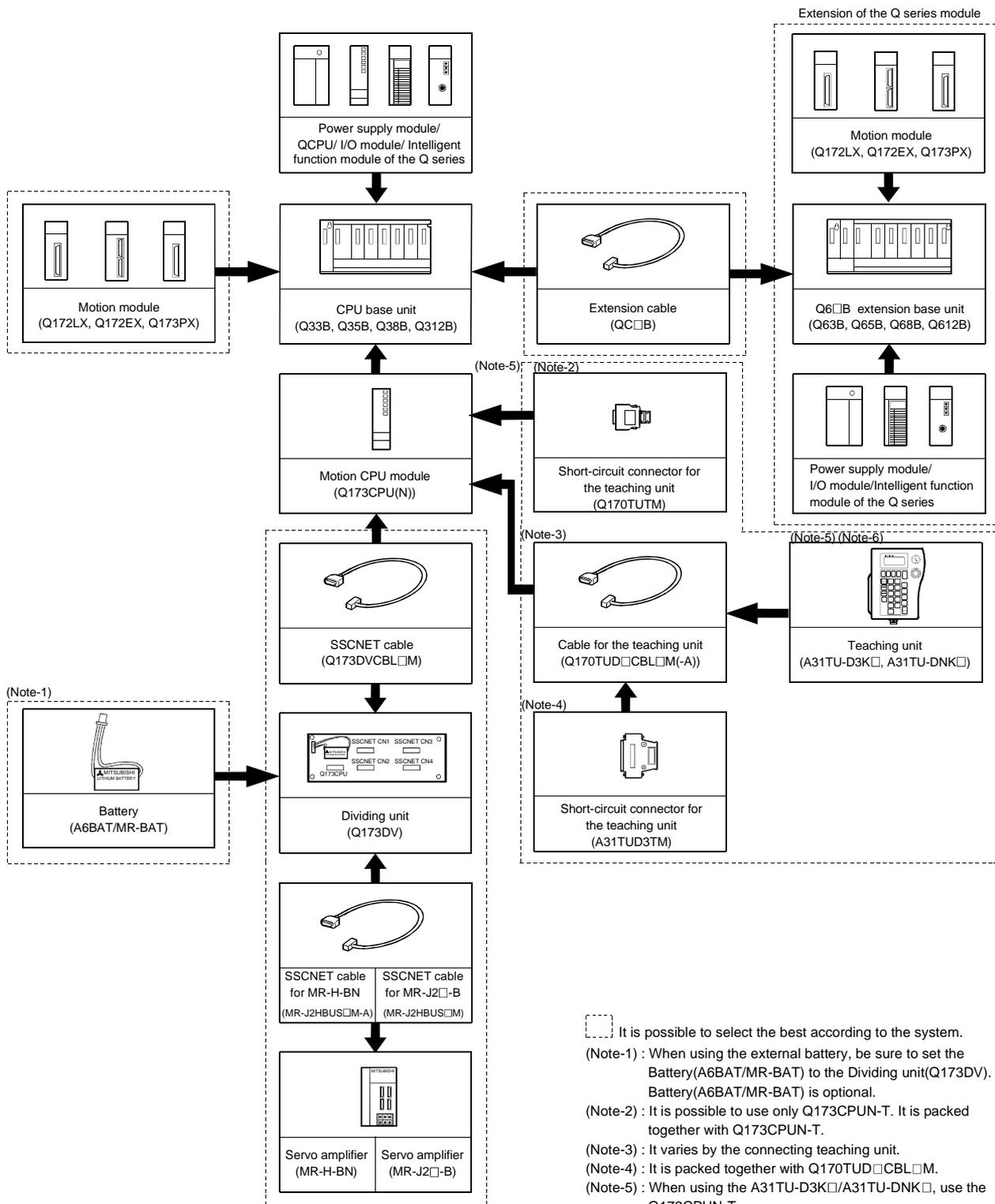
The outline of the equipment configuration, configuration with peripheral devices, and system configuration in the Q173CPU(N)/Q172CPU(N) system is described below.

(1) Equipment configuration in Q173CPU(N) system



(Note) : Continuous power failure time which can be backed up on the internal rechargeable battery is different depending on the charge time. It is possible to continuously power off for 1100 hours because of charge of 40 hours. Refer to the section 2.4.1(6) for details.

(a) When using the Dividing unit/external battery



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

(Note-1) : When using the external battery, be sure to set the Battery(A6BAT/MR-BAT) to the Dividing unit(Q173DV). Battery(A6BAT/MR-BAT) is optional.

(Note-2) : It is possible to use only Q173CPUN-T. It is packed together with Q173CPUN-T.

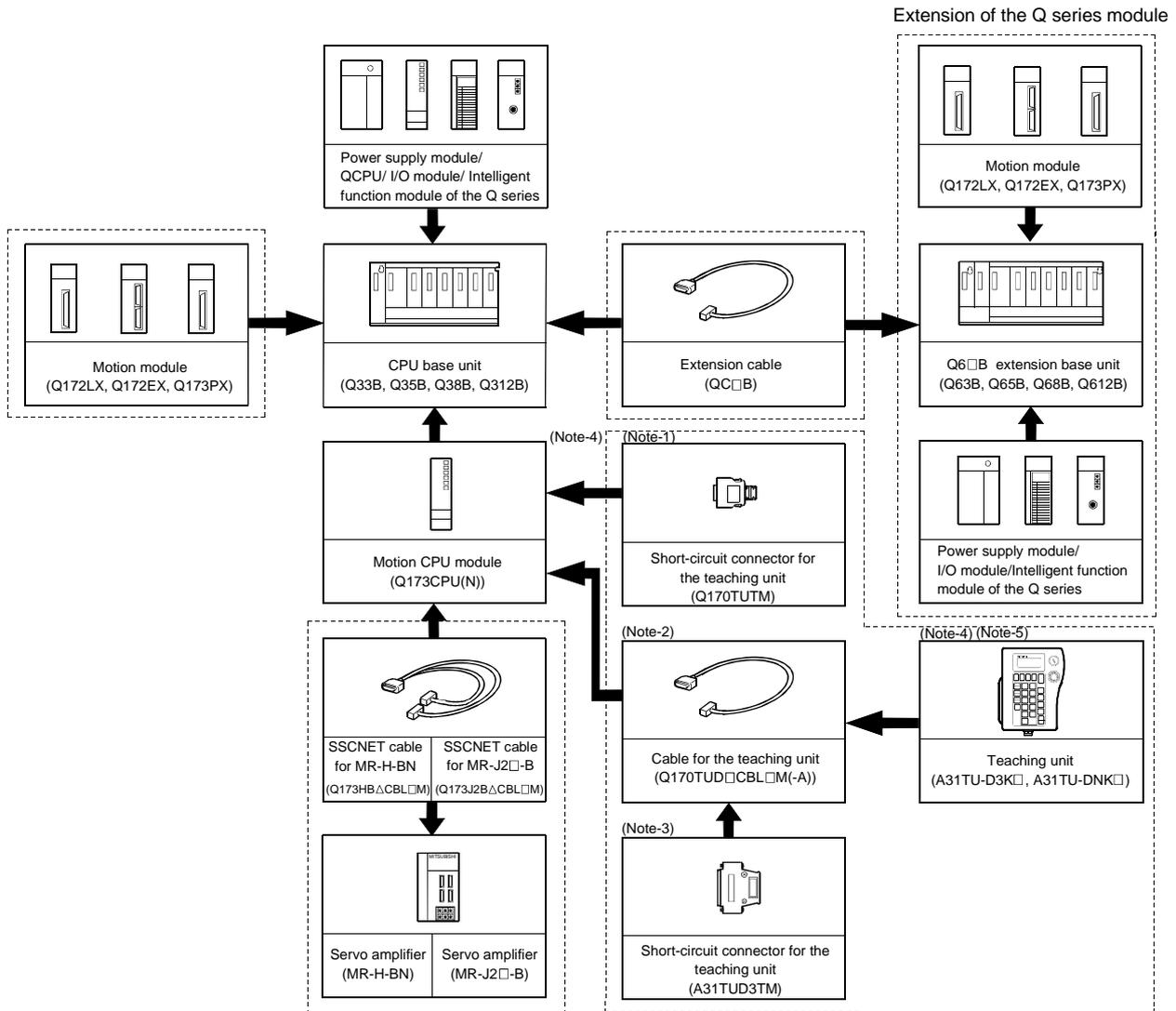
(Note-3) : It varies by the connecting teaching unit.

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

(Note-5) : When using the A31TU-D3K□/A31TU-DNK□, use the Q173CPUN-T.

(Note-6) : A31TU-D3K□/A31TU-DNK□ corresponds to only Japanese. It does not correspond to display for English.

(b) When using the Dividing cable



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

(Note-1) : It is possible to use only Q173CPUN-T. It is packed together with Q173CPUN-T.

(Note-2) : It varies by the connecting teaching unit.

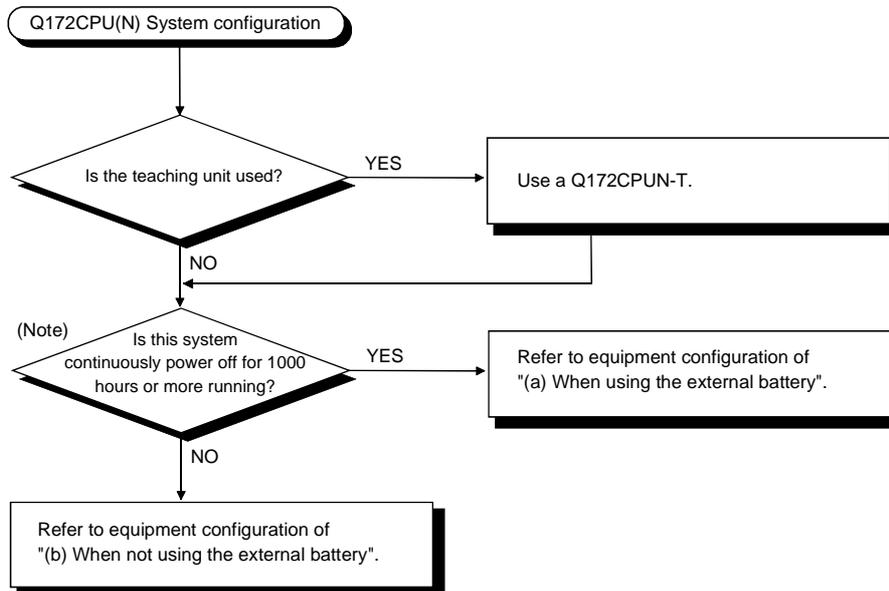
(Note-3) : It is packed together with Q170TUD□CBL□M.

(Note-4) : When using the A31TU-D3K□/A31TU-DNK□, use the Q173CPUN-T.

(Note-5) : A31TU-D3K□/A31TU-DNK□ corresponds to only Japanese. It does not correspond to display for English.

2 SYSTEM CONFIGURATION

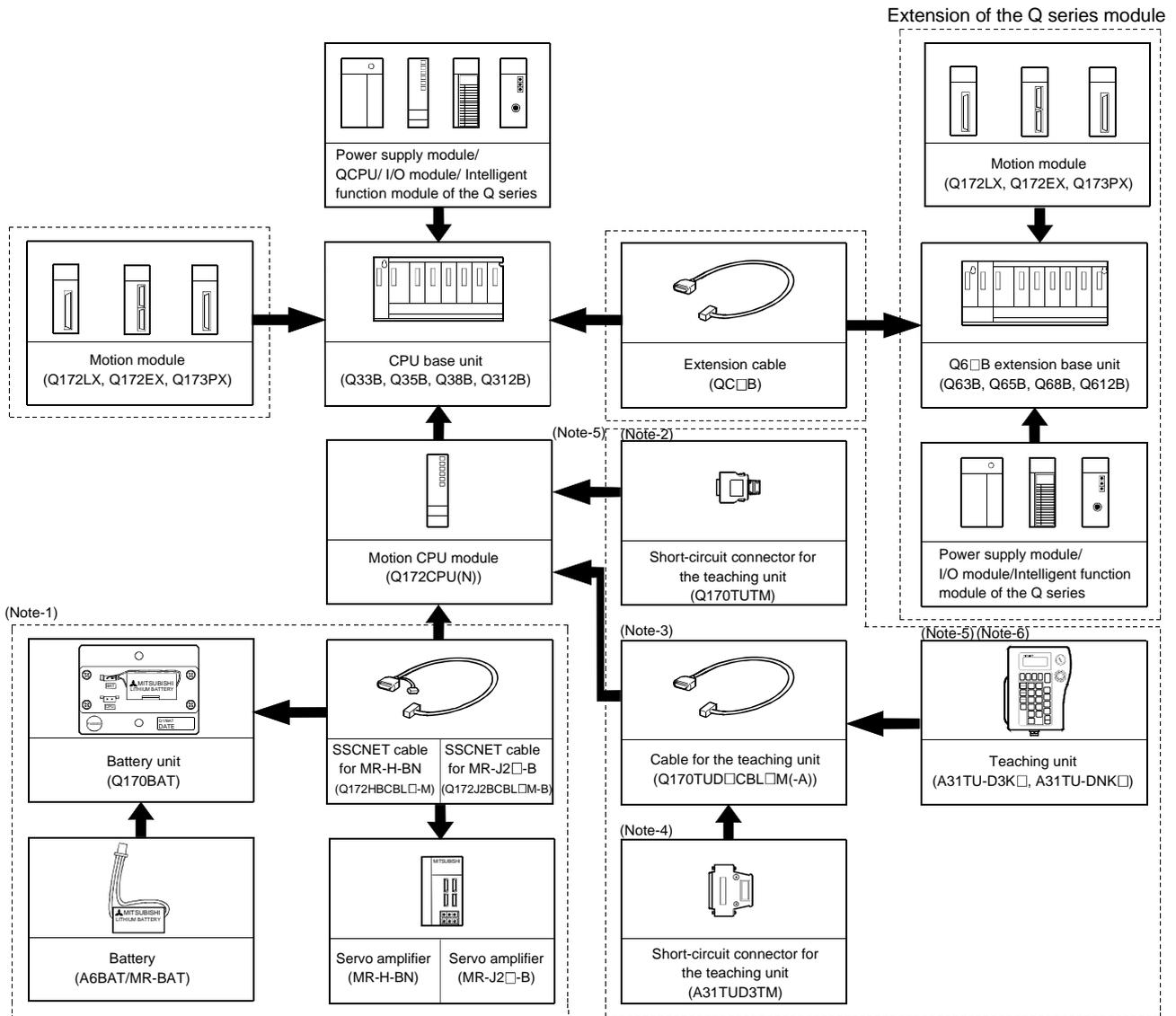
(2) Equipment configuration in Q172CPU(N) system



(Note) : Continuous power off time which can be backed up on the internal rechargeable battery is different depending on the charge time. It is possible to continuously power off for 1100 hours because of charge of 40 hours. Refer to the section 2.4.1 (6) for details.

2 SYSTEM CONFIGURATION

(a) When using the external battery



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

(Note-1) : When using the external battery, be sure to use the SSCNET cable(Q172J2BCBL□M-B/Q172HBCBL□M-B) and to set the battery (A6BAT/MR-BAT). Also install the battery(A6BAT/MR-BAT)in the Battery unit(Q170BAT). Battery(A6BAT/MR-BAT) is optional.

(Note-2) : It is possible to use only Q172CPUN-T. It is packed together with Q172CPUN-T.

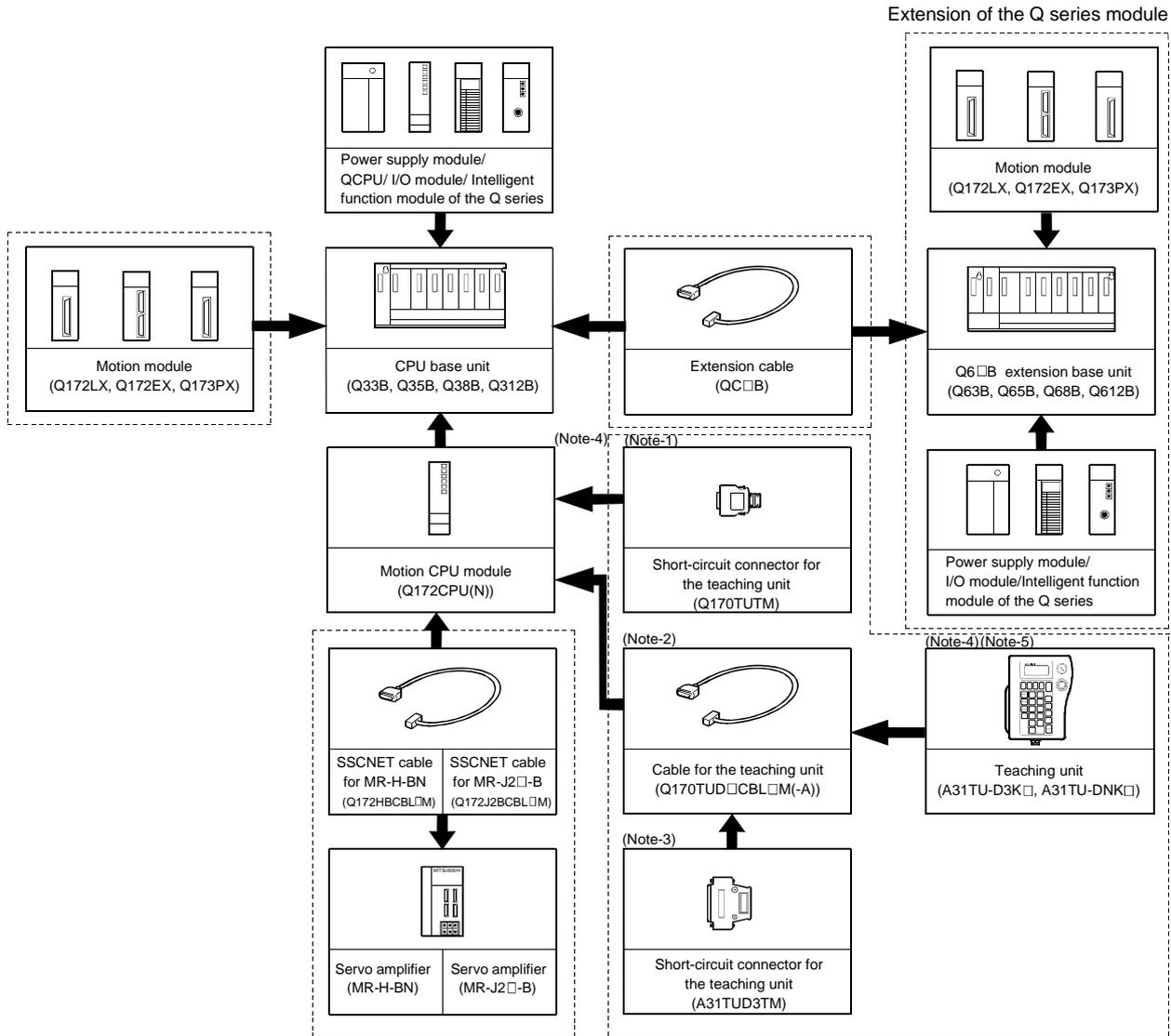
(Note-3) : It varies by the connecting teaching unit.

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

(Note-5) : When using the A31TU-D3K□/A31TU-DNK□, use the Q172CPUN-T.

(Note-6) : A31TU-D3K□/A31TU-DNK□ corresponds to only Japanese. It does not correspond to display for English.

(b) When not using the external battery



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

(Note-1) : It is possible to use only Q172CPUN-T. It is packed together with Q172CPUN-T.

(Note-2) : It varies by the connecting teaching unit.

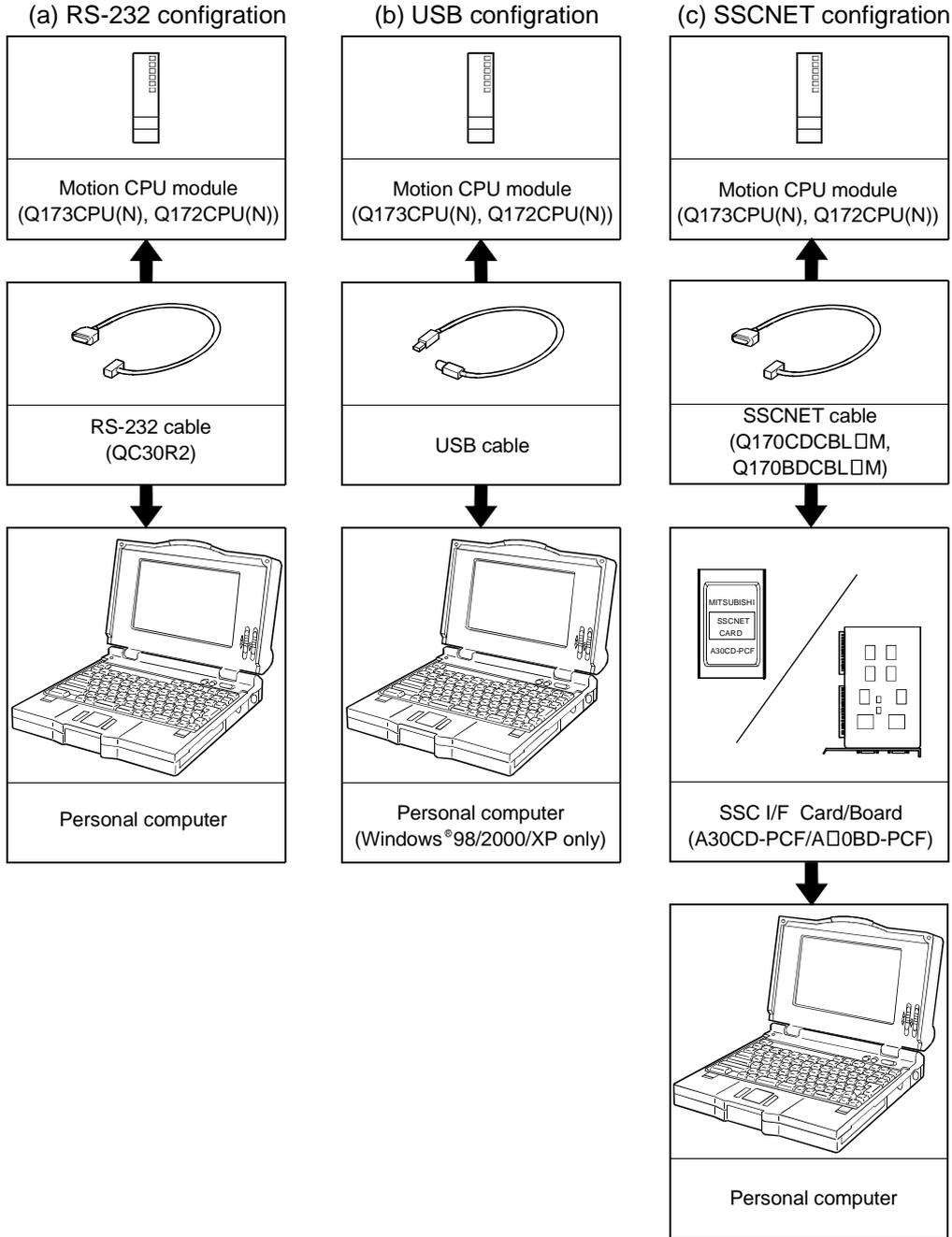
(Note-3) : It is packed together with Q170TUD□CBL□M.

(Note-4) : When using the A31TU-D3K□/A31TU-DNK□, use the Q172CPUN-T.

(Note-5) : A31TU-D3K□/A31TU-DNK□ corresponds to only Japanese. It does not correspond to display for English.

(3) Configuration of peripheral devices for the Q173CPU(N)/ Q172CPU(N)

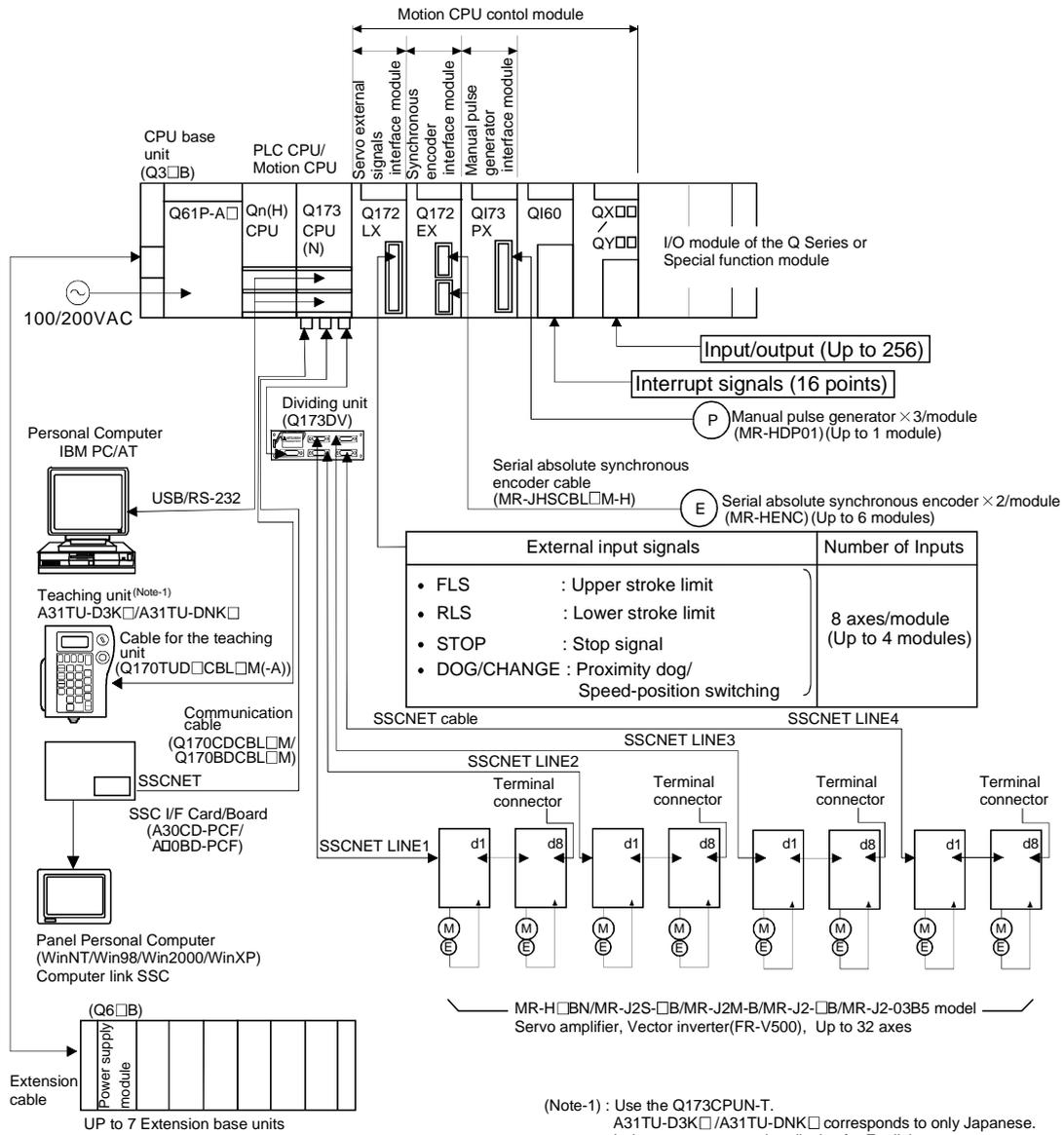
The following (a) (b) (c) can be used.



(Note) : For information about GPP functions of QCPU, refer to the operating manual of PLC. Also, refer to the programming manual of the operating system for information about creating Motion programs, and refer to the help of each software for information about operation of each programming software package.

2 SYSTEM CONFIGURATION

2.1.1 Q173CPU(N) System overall configuration

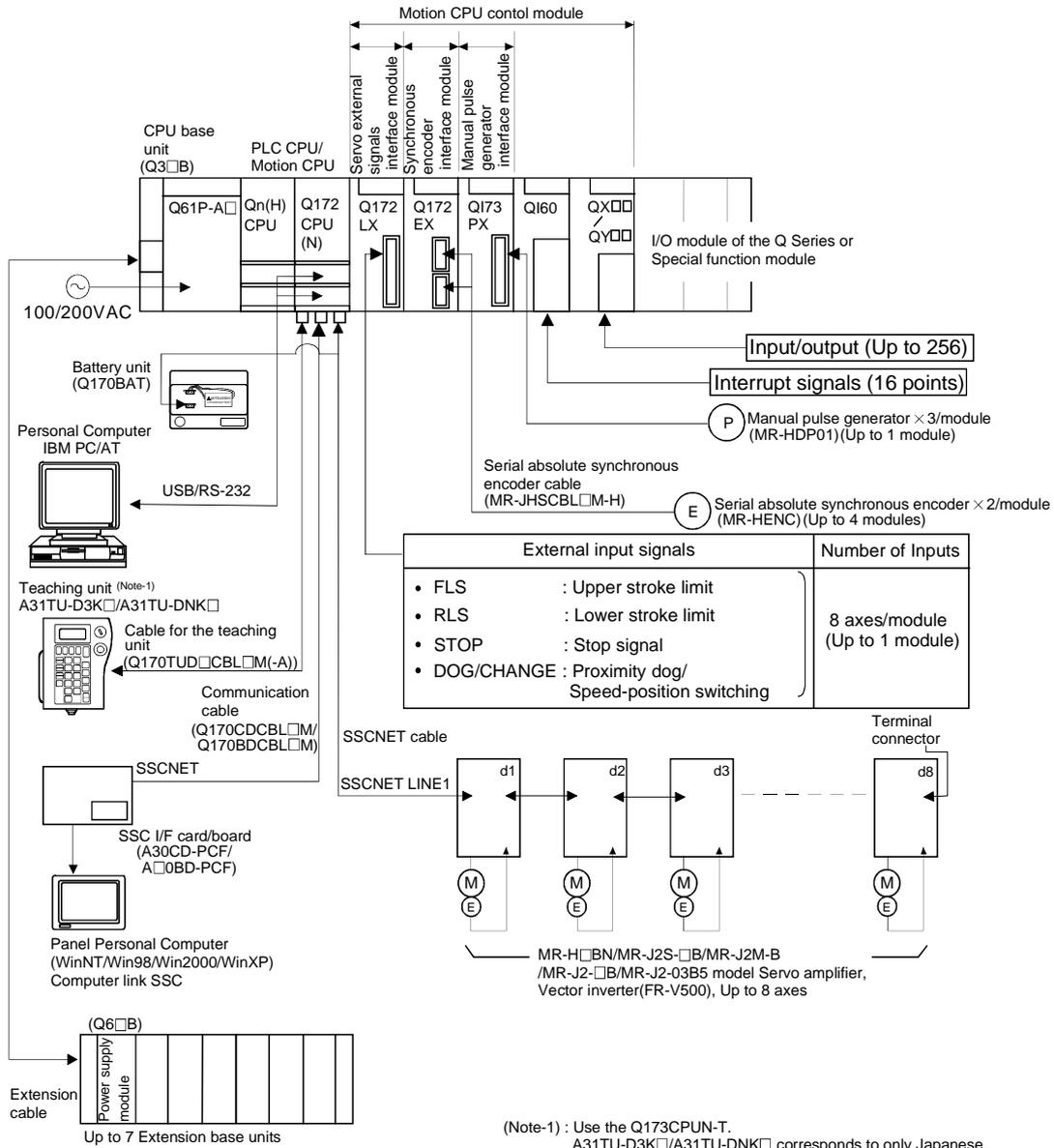


CAUTION

- Construct a safety circuit externally of the Motion controller or servo amplifier if the abnormal operation of the Motion controller or servo amplifier differ from the safety directive operation in the system.
- The ratings and characteristics of the parts (other than Motion controller, servo amplifier and servomotor) used in a system must be compatible with the Motion controller, servo amplifier and servomotor.
- Set the parameter values to those that are compatible with the Motion controller, servo amplifier, servomotor and regenerative resistor model and the system application. The protective functions may not function if the settings are incorrect.
- When a teaching unit is used, the cable for the teaching unit is necessary between the Motion CPU (Q173CPUN-T/Q172CPUN-T) and teaching unit. And, connect the short-circuit connector for teaching unit, after removing the teaching unit or when not using it.

2 SYSTEM CONFIGURATION

2.1.2 Q172CPU(N) System overall configuration



CAUTION

- Construct a safety circuit externally of the Motion controller or servo amplifier if the abnormal operation of the Motion controller or servo amplifier differ from the safety directive operation in the system.
- The ratings and characteristics of the parts (other than Motion controller, servo amplifier and servomotor) used in a system must be compatible with the Motion controller, servo amplifier and servomotor.
- Set the parameter values to those that are compatible with the Motion controller, servo amplifier, servomotor and regenerative resistor model and the system application. The protective functions may not function if the settings are incorrect.
- When a teaching unit is used, the cable for the teaching unit is necessary between the Motion CPU (Q173CPUN-T/Q172CPUN-T) and teaching unit. And, connect the short-circuit connector for teaching unit, after removing the teaching unit or when not using it.

2.1.3 Function explanation of the Q173CPU(N)/Q172CPU(N) Motion CPU modules

- (1) It is possible to download servo parameters to servo amplifier, turn the servo ON/OFF, and send the position commands by connecting the Motion CPU (Q173CPU(N)/Q172CPU(N)) and the servo amplifier with the SSCNET cable.
- (2) It is possible to select the servo control functions/programming languages by installing the corresponding operating system software on the Q173CPU(N)/Q172CPU(N).
- (3) It is possible to use stroke limit signals connected to Q172LX and signals of synchronous encoders connected to Q172EX, etc. for the purpose of motion control by setting the Q173CPU(N)/Q172CPU(N) as the control CPU of various motion modules (Q172LX/Q172EX, etc.) .
- (4) It is possible to perform not only servo control but also DI/O input/output control according to programs implemented in the Motion SFC program by setting the Q173CPU(N)/Q172CPU(N) as the control CPU of the Q series PLC I/O module (When using the Motion SFC as the operating system software).
(For information about the Q series PLC I/O modules that can be controlled by the Motion CPUs, refer to section 2.2 (2).)
- (5) It is possible to exchange data such as automatic refresh among CPU as the Q series PLC Multiple CPU system.
- (6) There is no restriction on the positions at which the modules controlled by the Motion CPU (Q172LX/Q172EX, etc.) may be installed. Specify the installation position in the system settings.
- (7) The change, monitor, or JOG operation of the servo program, and so on are possible by connecting a teaching unit (A31TU-D3K□/A31TU-DNK□).
(Q173CPUN-T/Q172CPUN-T only)

2.1.4 Restrictions on Motion systems

- (1) It is not allowed to use the Motion CPU as the control CPU of a module installed on the QA1S6□B extension base unit. A PLC CPU must be used as the control CPU.
- (2) The connector for installation of memory card on the Motion CPU module is for future function expansion.
- (3) The Motion CPU module cannot be used as standalone module. It must always be used in combination with the PLC CPU (of a version that supports Multiple CPU systems). Moreover, it must be installed on the right side of the PLC CPU module. The PLC CPU cannot be installed in a position to the right of Motion CPU.
- (4) The personal computer CPU unit must be installed on the right side of the Motion CPU module. The Motion CPU cannot be installed in a position to the right of personal computer CPU.
- (5) Use the PLC CPU in the “Q mode.”
- (6) The Motion CPU cannot be set as the control CPU of the intelligent function module or the Graphic Operation Terminal (GOT).
- (7) The SSCNET cable which connects the Motion CPU and servo amplifier and the teaching unit connecting cable which connects the Motion CPU and A31TU-D3K□/A31TU-DNK□ are pulled from the bottom part of the Unit. Make sure to secure sufficient space for pulling out the cable when designing the control panel.
- (8) The Motion CPU is one module element of the Q series multiple PLC system. It is necessary to set the parameters of the Q series multiple PLC system for each PLC CPU. The Motion CPU module must also be set to support the Multiple CPU system by system settings.
- (9) Make sure to use the Motion CPU as the control CPU of motion modules dedicated for the Motion CPU (Q172LX, Q172EX, Q173PX, etc.). They will not operate correctly if a PLC CPU is set and installed as the control CPU by mistake. The Motion CPU is treated as a 32-point intelligent module by PLC CPUs of other machines.
It cannot be accessed from other machines.
- (10) When a Multiple CPU system is configured, make sure to configure the modules so that the total current consumption of the individual modules on the CPU base does not exceed the 5VDC output capacity of the power supply module.
(Refer to section 2.4.2 (3), (4) Power supply module.)

2 SYSTEM CONFIGURATION

- (11) Number of Motion CPU modules and temperature conditions
(Q173CPU/Q172CPU only)

(a) It is possible to remove the Cooling fan unit(Q170FAN) in order to disperse heat from inside the Motion CPU module according to the number of the Motion CPU module and ambient temperature conditions.
Removable/Not removable of the Cooling fan unit (Q170FAN) by number of Motion CPU modules and ambient temperature is as follows.

1) When using only one Motion CPU module

It is possible to remove the Cooling fan unit if the ambient temperature in which the Motion CPU module will be operating is 0 to 40°C (32 to 104°F).

2) When using two or more Motion CPU modules

Do not remove the Cooling fan unit(Q170FAN).

Number of the Motion CPU	Ambient temperature of the Motion CPU	
	0 to 40°C (32 to 104°F)	Over 40 to 55°C (Over 104 to 131°F)
1 module	Removable	Not removable
2 modules or more	Not removable	

- (12) When the built-in battery of the Motion CPU is charged for 40 hours of normal operation, it will be able to provide backup power for the IC-RAM memory for 1100 hours (Guaranteed time)/4300 hours (Actual time) .

Battery backup by the external battery will be necessary if there is a possibility that a continuous power off that lasts longer than the continuous power off hours for the built-in battery. (Refer to section 2.4.10 External battery)

Item		Continuous power off time	
		Guaranteed time (MIN) [h]	Actual time (TYP) [h]
Internal rechargeable battery only	Charging time of 8 hours or more	200	500
	Charging time of 40 hours or more	1100	4300
External battery		60000	240000

2 SYSTEM CONFIGURATION

2.2 System Configuration Equipment

(1) Table of motion module

Part name	Model name ^(Note-1)	Description	Current consumption 5VDC[A]	Remark
Motion CPU module	Q172CPUN	Up to 8 axes control	1.14	
	Q172CPUN-T	Up to 8 axes control, for teaching unit	1.45	
	Q172CPU	Up to 8 axes control, with cooling fan unit	1.62	
	Q173CPUN	Up to 32 axes control	1.25	
	Q173CPUN-T	Up to 32 axes control, for teaching unit	1.56	
	Q173CPU	Up to 32 axes control, with cooling fan unit	1.75	
Servo external signals interface module	Q172LX	Servo external signal 8 axes (FLS, RLS, STOP, DOG/CHANGE×8)	0.05	
Serial absolute synchronous encoder interface module	Q172EX	Serial absolute synchronous MR-HENC interface×2 Tracking input 2 points	0.07	
	Q172EX-S1 ^(Note-2)	Serial absolute synchronous MR-HENC interface×2 Tracking input 2 points, Memory built-in for data exchange		
Manual pulse generator interface module	Q173PX	Manual pulse generator MR-HDP01/ Synchronous encoder interface ×3, Tracking input 3 points	0.11	
	Q173PX-S1 ^(Note-2)	Manual pulse generator MR-HDP01/ Synchronous encoder interface ×3, Tracking input 3 points, Memory built-in for data exchange		
PLC CPU module	Q00CPU	Program capacity 8k	0.25	
	Q01CPU	Program capacity 14k	0.27	
	Q02CPU	Program capacity 28k	0.60	
	Q02HCPU	Program capacity 28k	0.64	
	Q06HCPU	Program capacity 60k	0.64	
	Q12HCPU	Program capacity 124k	0.64	
	Q25HCPU	Program capacity 252k	0.64	
Power supply module	Q61P-A1	100 to 120VAC input/ 5VDC 6A output	—	
	Q61P-A2	200 to 240VAC input/ 5VDC 6A output	—	
	Q63P	24VDC Input/ 5VDC 6A output	—	
	Q64P	100 to 120VAC/200 to 240VAC Input/ 5VDC 8.5A output	—	
CPU base unit	Q33B	Number of I/O modules installed 3 slots	0.105	
	Q35B	Number of I/O modules installed 5 slots	0.110	
	Q38B	Number of I/O modules installed 8 slots	0.114	
	Q312B	Number of I/O modules installed 12 slots	0.121	
Extension base unit	Q63B	Number of I/O modules installed 3 slots	0.105	
	Q65B	Number of I/O modules installed 5 slots	0.110	
	Q68B	Number of I/O modules installed 8 slots	0.114	
	Q612B	Number of I/O modules installed 12 slots	0.121	
Extension cable	QC05B	Length 0.45m(1.48ft.)	—	
	QC06B	Length 0.6m(1.97ft.)		
	QC12B	Length 1.2m(3.9ft.)		
	QC30B	Length 3m(9.8ft.)		
	QC50B	Length 5m(16.4ft.)		
	QC100B	Length 10m(32.8ft.)		

2 SYSTEM CONFIGURATION

Table of motion module(continued)

Part name	Model name ^(Note-1)	Description	Current consumption 5VDC[A]	Remark
Manual pulse generator	MR-HDP01	Pulse resolution: 25PLS/rev(100PLS/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)	0.06	
Teaching unit	A31TU-D3K13	For SV13, with 3-position deadman switch, only Japanese	0.26	
	A31TU-DNK13	For SV13, without deadman switch, only Japanese	0.26	
Cable for the teaching unit	Q170TUD3CBL3M	Q173CPUN-T/Q172CPUN-T ↔ A31TU-D3K13, 3m(9.8ft.) (Attachment : short-circuit connector (A31TUD3TM) for teaching unit)	—	
	Q170TUDNCBL3M	Q173CPUN-T/Q172CPUN-T ↔ A31TU-DNK13, 3m(9.8ft.) (Attachment : short-circuit connector (A31TUD3TM) for teaching unit)	—	
	Q170TUDNCBL03M-A	Exchange cable for Q173CPUN-T/Q172CPUN-T ↔ A31TU-DNK13, 0.3m(0.98ft.)	—	
Short-circuit connector for teaching unit	Q170TUTM	Short-circuit connector for teaching unit for direct connection to Q173CPUN-T/Q172CPUN-T It is packed together with Q173CPUN-T/Q172CPUN-T.	—	
	A31TUD3TM	Short-circuit connector for the teaching unit to connect with Q170TUD3CBL3M/Q170TUDNCBL3M	—	
Serial absolute synchronous encoder	MR-HENC	Resolution: 16384PLS/rev Permitted axial loads Radial load: Up to 98N Thrust load: Up to 49N Permitted speed: 4300r/min	0.15	
Serial absolute synchronous encoder cable	MR-JHSCBL□M-H	Serial absolute synchronous encoder ↔ Q172EX 2m(6.56ft.), 5m(16.4ft.), 10m(32.8ft.), 20m(65.6ft.), 30m(98.4ft.) (Same as encoder cables for HC-SFS/RFS/UFS(2000r/min) series motors)	—	

2 SYSTEM CONFIGURATION

Table of motion module(continued)

Part name	Model name ^(Note-1)	Description	Current consumption 5VDC[A]	Remark
SSCNET cable	Q172HBCBL□□	<ul style="list-style-type: none"> • Q172CPU(N) ↔ Servo amplifier (MR-H□BN) • MR-H□BN ↔ FR-V5NS ^(Note-4) 	—	
	Q172HBCBL□□-B	Q172CPU(N) ↔ Servo amplifier (MR-H□BN) and Battery unit (Q170BAT)		
	Q172J2BCBL□□	<ul style="list-style-type: none"> • Q172CPU(N) ↔ Servo amplifier (MR-J2□-B) ^(Note-3) • Servo amplifier (MR-J2□-B) ^(Note-3) ↔ FR-V5NS ^(Note-4) • Dividing unit (Q173DV) ↔ FR-V5NS ^(Note-4) 		
	Q172J2BCBL□□-B	Q172CPU(N) ↔ Servo amplifier (MR-J2□-B) ^(Note-3) and Battery unit (Q170BAT)		
	Q173HB△CBL□□	Q173CPU(N) ↔ Servo amplifier (MR-H□BN)		
	Q173J2B△CBL□□	Q173CPU(N) ↔ Servo amplifier MR-J2□-B ^(Note-3)		
	Q173DVCBL□□	Q173CPU(N) ↔ Dividing unit(Q173DV)		
	FR-V5NSCBL□	<ul style="list-style-type: none"> • Q172CPU(N) ↔ FR-V5NS ^(Note-4) • FR-V5NS ^(Note-4) ↔ FR-V5NS ^(Note-4) 		
	MR-HBUS□□	Servo amplifier (MR-H□BN) ↔ Servo amplifier (MR-H□BN)		
	MR-J2HBUS□□-A	<ul style="list-style-type: none"> • Servo amplifier (MR-H□BN) ↔ Servo amplifier (MR-J2□-B) ^(Note-3) • Servo amplifier (MR-H□BN) ↔ Dividing unit (Q173DV) 		
	MR-J2HBUS□□	<ul style="list-style-type: none"> • Servo amplifier (MR-J2□-B) ^(Note-3) ↔ Servo amplifier (MR-J2□-B) ^(Note-3) • Servo amplifier (MR-J2□-B) ^(Note-3) ↔ Dividing unit (Q173DV) 		
SSC I/F board	A30BD-PCF	ISA bus loading type, 2ch/board	—	
SSC I/F card	A30CD-PCF	PCMCIA TYPE II, 1ch/card		
Cable for SSC I/F board	Q170BDCBL□□	Q173CPU(N)/Q172CPU(N) ↔ SSC I/F board 3m(9.84ft.), 5m(16.4ft.), 10m(32.8ft.)		
Cable for SSC I/F card	Q170CDCBL□□	Q173CPU(N)/Q172CPU(N) ↔ SSC I/F card 3m(9.84ft.), 5m(16.4ft.), 10m(32.8ft.)		
Dividing unit	Q173DV	For dividing the SSCNET lines of Q173CPU(N) into 4. (Attachment: Battery holder for IC-RAM memory backup)	—	
Battery unit	Q170BAT	For IC-RAM memory backup of Q172CPU(N)	—	
Battery	A6BAT	For IC-RAM memory backup of Q173CPU(N)/Q172CPU(N) module (SFC programs, Servo programs, Parameters)	—	
Cooling fan unit	Q170FAN	Cooling fan of the Motion CPU module	0.08	
Q172CPU(N) connector set	Q172CON	Connector for Q172CPU(N) ^(Note-5) Connector : HDR-E14MG1 Case : HDR-E14LPA5	—	
Q173CPU(N) connector set	Q173CON	Q173CPU(N) side connector set ^(Note-5) Connector : HDR-E26MG1 Case : HDR-E26LPA5	—	
Q173DV connector set	Q173DVCON	Q173CPU(N) side connector set ^(Note-5) Connector : HDR-E26MG1 Case : HDR-E26LPA5 Q173DV side connector set Connector : 10126-3000VE Case : 10326-52F0-008	—	

2 SYSTEM CONFIGURATION

Table of motion module(continued)

Part name	Model name	Description	Current consumption 5VDC[A]	Remark
Connector/terminal block conversion module	A6TBXY36	For positive common sink type input module, sink type output module (standard type)	—	
	A6TBXY54	For positive common sink type input module, sink type output module (2-wire type)		
	A6TBX70	For positive common sink type input module (3-wire type)		
Cable for connector/terminal block conversion module	AC05TB	Length 0.5m (1.64ft.)	—	
	AC10TB	Length 1m (3.28ft.)		
	AC20TB	Length 2m (6.56ft.)		
	AC30TB	Length 3m (9.84ft.)		
	AC50TB	Length 5m (16.4ft.)		
	AC80TB	Length 8m (26.25ft.)		
	AC100TB	Length 10m(32.8ft.)		

(Note-1) : Δ =Number of lines (none: 1 Line, 2: 2 Lines, 4: 4 Lines)

\square =Cable length (05: 0.5m(1.64ft.), 1: 1m(3.28ft.), 2: 2m(6.56ft.), 3: 3m(9.84ft.), 5: 5m(16.4ft.), 10: 10m(32.8ft.), 20: 20m(65.6ft.), 30: 30m(98.4ft.))

(Note-2) : Q172EX-S1 and Q173PX-S1 can be used the operating system software of the special specification that needs data exchange function.

(Note-3) : MR-J2S- \square B/MR-J2M-B/MR-J2- \square B/MR-J2-03B5 type servo amplifier

(Note-4) : SSCNET communication option for vector inverter

(Note-5) : Crimping terminal is not sold in Mitsubishi. The following terminal is requested to be procured by customers.

Specified tool (Honda Connectors make) : FHAT-0029/FHPT-0004C

2 SYSTEM CONFIGURATION

(2) Q series PLC module which can be control by Motion CPU

Part name		Model name	Description	Remark	
Input module	AC	QX10	100-120VAC, 7-8mA, 16 points, Terminal block		
	DC	QX40	24VDC/4mA, Positive common, 16 points, Terminal block		
		QX41	24VDC/4mA, Positive common, 32 points, Connector	*	
		QX42	24VDC/4mA, Positive common, 64 points, Connector	*	
		QX70	12VDC/5V, Positive common/Negative common shared, 16 points, Terminal block		
		QX71	12VDC/5V, Positive common/Negative common shared, 32 points, Terminal block		
		QX72	12VDC/5V, Positive common/Negative common shared, 64 points, Terminal block		
		QX80	24VDC/4mA, Negative common, 16 points, Terminal block		
		QX81	24VDC/4mA, Negative common, 32 points, Connector	*	
Output module	Contact output module	QY10	240VAC/24VDC, 2A/point, 8A/common, 16 points/common, Terminal block		
	Transistor	Sink Type	QY40P	12V/24VDC, 0.1A/point, 1.6A/common, 16 points/common Terminal block	
			QY41P	12V/24VDC, 0.1A/point, 2A/common, 32 points/common Connector	*
			QY42P	12V/24VDC, 0.1A/point, 2A/common, 64 points(32 points/common), Connector	*
			QY50	12V/24VDC, 0.5A/point, 4A/common, 16 points(16 points/common), Terminal block	
	Source Type	QY80	12V/24VDC, 0.5A/point, 4A/common, 64 points(32 points/common), Terminal block		
		QY81P	12V/24VDC, 0.1A/point, 2A/common, 32 points(32 points/common), Connector	*	
	TTL•CMOS(Sink)	QY70	5/12VDC, 16mA/point, 16 points(16 points/common), Terminal block		
		QY71	5/12VDC, 16mA/point, 32 points(32 points/common), Connector	*	
Input/Output composite module	DC Input/ Transistor output	QH42P	24VDC Positive common: 32 points DC12-24V/0.1A Output Sink type: 32 points, Connector, Provided (Thermal protectors, protector against short circuit)	*	
		QX48Y57	24VDC Positive common: 8 points DC12-24V/0.5A Output Sink type: 7 points, Terminal block, Provided (When face is broken, LED lights and signal is output to CPU)		
Interrupt module		QI60	DC24V/4mA, Positive common, 16 points, Terminal block		
Analogue module		Q64AD	4ch, A/D conversion, Voltage • Current input		
		Q68ADV	8ch, A/D conversion, Voltage input		
		Q68ADI	8ch, A/D conversion, Current input		
		Q62DA	2ch, D/A conversion, Voltage • Current output		
		Q64DA	4ch, D/A conversion, Voltage • Current output		
		Q68DAV	8ch, D/A conversion, Voltage output		
		Q68DAI	8ch, D/A conversion, Current output		

Marked "*" connectors are not provided.

2 SYSTEM CONFIGURATION

(3) Table of servo amplifier

The following servo amplifier series can be used.

(a) MR-H□BN

Part name	Model name	Description
MR-H series servo amplifier	MR-H□BN	Refer to catalogue of the servo amplifier about the output capacity of the servomotor.
	MR-H□□KBN	
Battery	MR-BAT	Back-up for the absolute position detection.
Terminal connector	MR-TM	Connected to the last servo amplifier (MR-H□BN) by SSCNET.
SSCNET cable	MR-HBUS□M	MR-H□BN ↔ MR-H□BN 0.5m(1.64ft.), 1m(3.28ft.), 5m(16.4ft.)
	MR-J2HBUS□M-A	• Q173DV ↔ MR-H□BN • MR-H□BN ↔ MR-J2□-B ^(Note-1) 0.5m(1.64ft.), 1m(3.28ft.), 5m(16.4ft.)
	Q172HBCBL□M	MR-H□BN ↔ FR-V5NS ^(Note-2) 0.5m(1.64ft.), 1m(3.28ft.), 5m(16.4ft.)
Encoder cable	MR-HSCBL□M	HA-LH□K, HC-SF/RF/UF(2000r/min) series motor ↔ MR-H□BN.
	MR-EN1CBL□M-H	2m(6.56ft.), 5m(16.4ft.), 10m(32.8ft.), 20m(65.6ft.), 30m(98.4ft.)
	MR-JCCBL□M-L	HA-FF, HC-MF/UF(3000r/min) ↔ MR-H□BN
	MR-JCCBL□M-H	
Encoder connector set	MR-JSCNS	Servo amplifier side connector for HA-LH□K, HC-SF/RF/UF(2000r/min) series motor,
	MR-EN1CNS	Encoder side connector set

(Note-1) : MR-J2S-□B/MR-J2M-B/MR-J2-□B/MR-J2-03B5 type servo amplifier

(Note-2) : SSCNET communication option for vector inverter

When the vector inverter (FR-V5□0-□) is connected, fix the ferrite core to the SSCNET cable.

2 SYSTEM CONFIGURATION

(b) MR-J2S-□B/MR-J2M-B/MR-J2-□B/MR-J2-03B5

Part name	Model name	Description	
MR-J2-Super series servo amplifier	MR-J2S-□B	Refer to catalogue of the servo amplifier about the output capacity of the servomotor.	
	MR-J2S-□B1		
MR-J2M series servo amplifier	MR-J2M-□DU	Drive unit	Refer to catalogue of the servo amplifier about the output capacity of the servomotor.
	MR-J2M-P8B	Interface unit	
	MR-J2M-BU□	Base unit	
MR-J2 series servo amplifier	MR-J2-□B	Refer to catalogue of the servo amplifier about the output capacity of the servomotor.	
MR-J2-Jr series servo amplifier	MR-J2-03B5		
Battery	MR-BAT	Back-up for the absolute position detection.	
Terminal connector	MR-A-TM	Connected to the last servo amplifier(MR-J2S-□B/MR-J2M-B/MR-J2-□B/MR-J2-03B5) by SSCNET	
SSCNET cable	MR-J2HBUS□M-A	<ul style="list-style-type: none"> • Q173DV ↔ MR-H□BN. • MR-H□BN ↔ MR-J2□-B ^(Note-1). 0.5m(1.64ft.), 1m(3.28ft.), 5m(16.4ft.)	
	MR-J2HBUS□M	<ul style="list-style-type: none"> • MR-J2□-B ^(Note-1) ↔ MR-J2□-B ^(Note-1). • MR-J2□-B ^(Note-1) ↔ Q173DV. 0.5m(1.64ft.), 1m(3.28ft.), 5m(16.4ft.)	
	Q172J2BCBL□M	MR-J2□-B ^(Note-1) ↔ FR-V5NS ^(Note-2) . 0.5m(1.64ft.), 1m(3.28ft.), 5m(16.4ft.)	
Encoder cable	MR-JHSCBL□M-L	Standard cable	<ul style="list-style-type: none"> • HC-SFS/RFS/UFS(2000r/min) series motor ↔ MR-J2S-□B/MR-J2M-B. • HC-SF/RF/UF(2000r/min) series motor ↔ MR-J2-□B. 2m(6.56ft.), 5m(16.4ft.), 10m(32.8ft.), 20m(65.6ft.), 30m(98.4ft.)
	MR-JHSCBL□M-H	Long fixing life encoder cable	
	MR-ENCBL□M-H	Long fixing life encoder cable	<ul style="list-style-type: none"> • HC-MFS/KFS/UFS(3000r/min) series motor ↔ MR-J2S-□B/MR-J2M-B. • HC-MF/UF(3000r/min) and HA-FF series motor ↔ MR-J2-□B. 2m(6.56ft.), 5m(16.4ft.), 10m(32.8ft.), 20m(65.6ft.), 30m(98.4ft.)
	MR-JCCBL□M-L	Standard cable	
	MR-JCCBL□M-H	Long fixing life encoder cable	HC-AQ series motor ↔ MR-J2-03B5. 2m(6.56ft.), 5m(16.4ft.), 10m(32.8ft.), 20m(65.6ft.), 30m(98.4ft.) HC-AQ series motor ↔ MR-J2-03B5. 2m(6.56ft.), 5m(16.4ft.), 10m(32.8ft.), 20m(65.6ft.), 30m(98.4ft.) (Motor cable for servomotor with electromagnetic brake)
	MR-JCCBL□M-H	Long fixing life encoder cable	
MR-JRBCBL□M-H	Long fixing life encoder cable	HC-AQ series motor ↔ MR-J2-03B5. 2m(6.56ft.), 5m(16.4ft.), 10m(32.8ft.), 20m(65.6ft.), 30m(98.4ft.) (Motor cable for servomotor with electromagnetic brake)	
Encoder connector set	MR-J2CNS	Servo amplifier and junction side connector set for HC-SFS/RFS/UFS(2000r/min) series motor, HC-SF/RF/UF(2000r/min) series motor.	
	MR-ENCNS		
	MR-JRCNM	Servo amplifier and Junction connector set for HC-AQ series motor.	
	MR-JRBCNM	Servo amplifier side(Motor cable for servomotor with electromagnetic brake) and HC-AQ series motor. (Need MR-JRBCN for electromagnetic brake contact)	
	MR-JRBCN	Electromagnetic brake contact connector for HC-AQ series motor.	
	MR-J2CNM	Servo amplifier and junction side connector set for HC-MFS/KFS/UFS(3000r/min) series and HA-FF, HC-MF/UF(3000r/min) series motor.	

(Note-1) : MR-J2S-□B/MR-J2M-B/MR-J2-□B/MR-J2-03B5 type servo amplifier

(Note-2) : SSCNET communication option for vector inverter

When the vector inverter (FR-V5□0-□) is connected, fix the ferrite core to the SSCNET cable.

2 SYSTEM CONFIGURATION

(5) Operating environment of the personal computer

Operating environment is as follows.

IBM PC/AT with which WindowsNT4.0/98/2000/XP English version operates normally.

Item	WindowsNT [®] 4.0(Service Pack 2 or later) (Note) or Windows [®] 98	Windows [®] 2000	Windows [®] XP
CPU	Pentium133MHz or more	Pentium II 233MHz or more	Pentium II 450MHz or more
Memory capacity	Recommended 32MB or more	Recommended 64MB or more	Recommended 192MB or more
Hard disk free space	Hard disk free space is as following list.		
Disk drive	3.5inch (1.44MB) floppy disk drive, CD-ROM disk drive		
Display	800x600 pixels, 256 colors or more		

(Note) : Impossible to use USB connection.

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

● SW6RNC-GSVE

Model name	Size	
SW6RN-GSV13P	40MB	
SW6RN-GSV22P	40MB	
SW6RN-GSV43P	25MB	
SW3RN-CAMP	2MB	
SW6RN-DOSCP	12MB	
SW6RN-SNETP	Standard	11.5MB
	Custom (When all selection)	12MB
SW3RN-DOCPRNP,	34MB	
SW20RN-DOCPRNP	33MB	

● SW6RNC-GSVHELPE

Model name	Size
SW6RN-GSV13P	23MB
SW6RN-GSV22P	25MB
SW6RN-GSV43P	18MB
SW3RN-CAMP	3MB
SW6RN-DOSCP	5MB
SW6RN-SNETP	3MB
SW3RN-DOCPRNP	4MB
SW20RN-DOCPRNP	4MB

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

(Note-2) : Pentium[®] is trademarks or registered trademarks of Intel Corporation or its subsidiaries in the United States and other countries.

2 SYSTEM CONFIGURATION

POINTS

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

2 SYSTEM CONFIGURATION

2.3 General Specifications

General specifications of Q173CPU(N)/Q172CPU(N) module is as follows.

Item	Specification					
Operating ambient temperature	0 to 55°C (32 to 131°F)					
Storage ambient temperature	-25 to 75°C (Note-3) (-13 to 167°F)					
Operating ambient humidity	5 to 95% RH, non-condensing					
Storage ambient humidity	5 to 95% RH, non-condensing					
Vibration resistance	Conforming JIS B 3501, IEC 61131-2		Frequency	Acceleration	Amplitude	Sweep count
		Under intermittent vibration	10 to 57Hz	—	0.075mm (0.003inch)	10 times each in X, Y, Z directions (For 80 min.)
			57 to 150Hz	9.8m/s ²	—	
		Under continuous vibration	10 to 57Hz	—	0.035mm (0.001inch)	
57 to 150Hz	4.9m/s ²		—			
Shock resistance	Conforming to JIS B 3501, IEC 61131-2(147m/s ² , 3 times in each of 3 directions X, Y, Z)					
Operating ambience	No corrosive gases					
Operating altitude	2000m(6562ft.) or less					
Installation location	Inside control panel					
Overvoltage category (Note-1)	II or less					
Pollution level (Note-2)	2 or less					

(Note-1) : 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.

Category II applies to equipment for which electrical power is supplied from fixed facilities.

The surge voltage withstand level for up to the rated voltage of 300V is 2500V.

(Note-2) : 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.

(Note-3) : Do not use or store the Motion CPU module under pressure higher than the atmospheric pressure of altitude 0m.

Doing so can cause an operation failure. When using the PLC under pressure, please contact your sales representative.

 **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.

2 SYSTEM CONFIGURATION

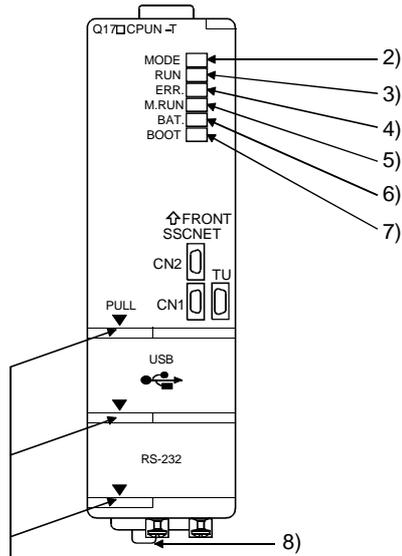
2.4 Specifications of Equipment and Settings

2.4.1 Name of parts for CPU module

This section explains the names and setting of the module.

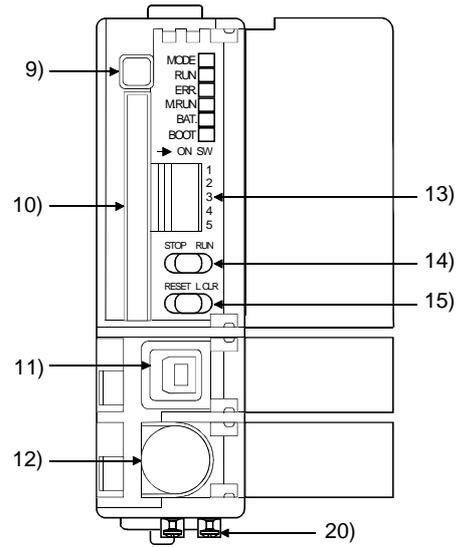
(1) Q173CPUN(-T)/Q172CPUN(-T)

Front face

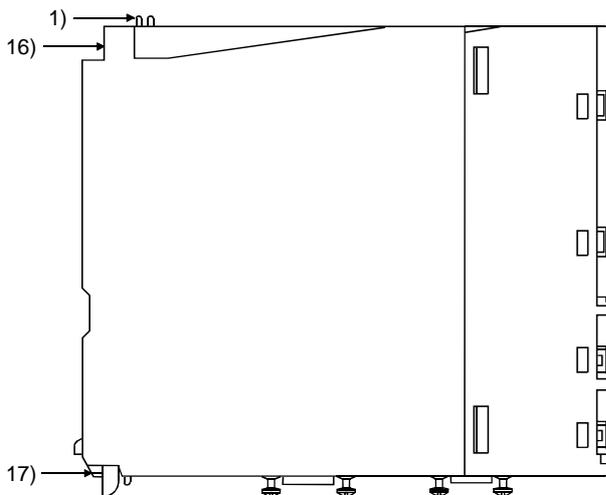


When opening the cover, put your finger here.

With front cover open



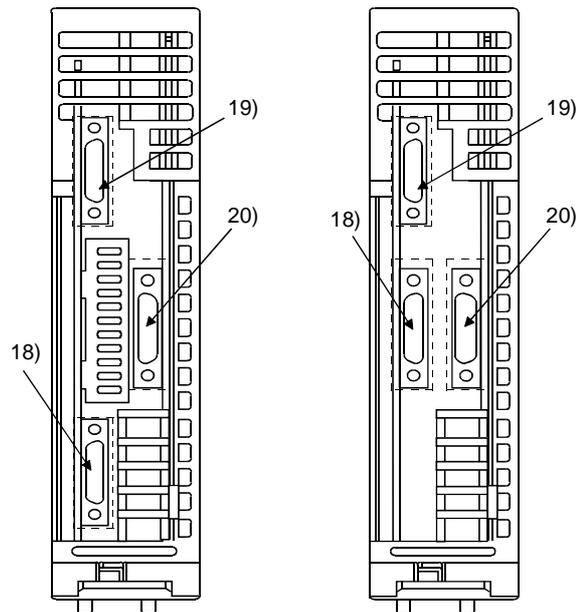
Side face



Bottom

Q172CPUN(-T)

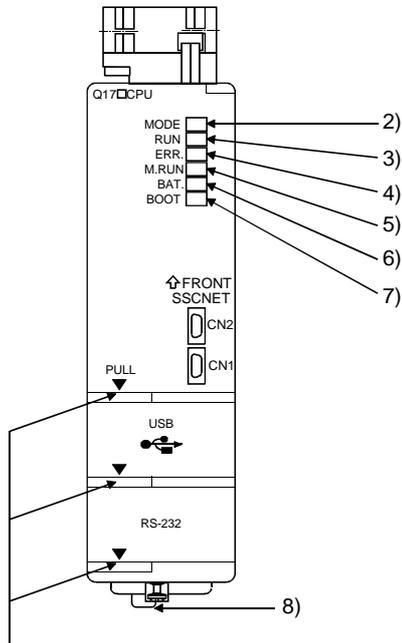
Q173CPUN(-T)



2 SYSTEM CONFIGURATION

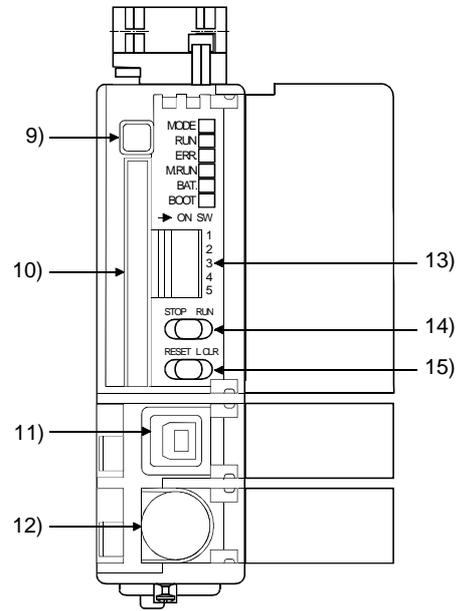
(2) Q173CPU/Q172CPU

Front face

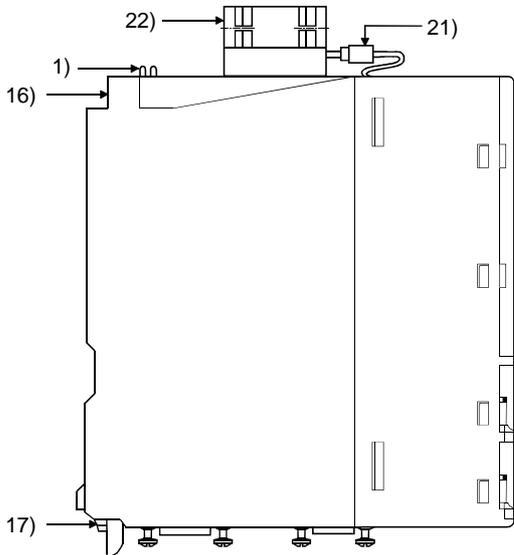


When opening the cover, put your finger here.

With front cover open



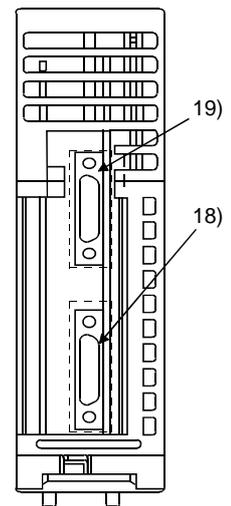
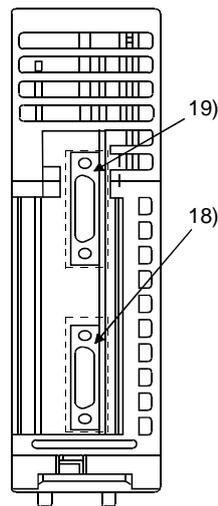
Side face



Bottom

Q172CPU

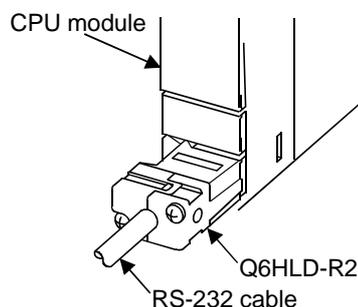
Q173CPU



2 SYSTEM CONFIGURATION

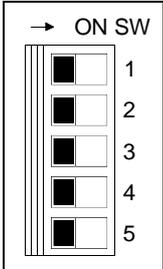
No.	Name	Application
1)	Module fixing hook	Hook used to fix the module to the base unit.(Quick release installation)
2)	MODE LED (Mode judging)	Lit(green) : Normal mode Lit(orange) : Installation mode • mode written in ROM
3)	RUN LED	Lit : Motion CPU normal start Not lit : Motion CPU fault. RUN LED turn off when the trouble occurred at starting or WDT error occurred.
4)	ERR. LED	Lit : When error occurs, LED turn on as follows 1) WDT error 2) System setting error 3) Servo error 4) Motion SFC error 5) Detection of self diagnostic error which will not stop the operation(except for battery error). Flashing : Detection of self diagnostic error which will stop the operation. Not lit : Normal
5)	M. RUN LED	Lit : When motion control is executed. Flashing : When latch clear started. Not lit : When motion control is not executed, or when the self diagnostic error which will stop the operation was detected.
6)	BAT. LED	Lit : When the battery error occurred. (When using the external battery.)
7)	BOOT LED	Lit : Mode operated by ROM Not lit : Mode operated by RAM/Installation mode • mode written in ROM
8)	Module loading lever	Used to install the module to the base unit.
9)	Memory card EJECT button	Used to eject the memory card from the Motion CPU.
10)	Memory card loading connector	Connector used to connect the memory card to the Motion CPU. (The Motion CPU make use of the memory card by operating system software package.)
11)	USB connector (Note)	Connector for connection with USB-compatible peripheral device. (Connector type B) It can be connected by USB-dedicated cable.
12)	RS-232 connector (Note)	Connector for connection with a peripheral device. It can be connected by RS-232 connection cable (QC30R2)

(Note) : When normally connecting a cable to the USB or RS-232 connector, clamp the cable to prevent it from coming off due to the dangling, moving or careless pulling of the cable. Q6HLD-R2 type RS-232C connector disconnection prevention holder is available as a clamp for RS-232 connector.



2 SYSTEM CONFIGURATION

(3) Applications of switches, connectors on Q173CPU(N)/ Q172CPU(N)

No.	Name	Application
13)	Dip switches 	Dip switch 1 Must not be used. Normally OFF. (Shipped from the factory in OFF position)
		Dip switch 2 • ROM operating setting (Shipped from the factory in OFF position) SW2 SW3 OFF OFF → Mode operated by RAM
		Dip switch 3 ON OFF → Must not be set OFF ON → Must not be set ON ON → Mode operated by ROM
		Dip switch 4 Must not be used. Normally OFF. (Shipped from the factory in OFF position)
		Dip switch 5 (Installation • ROM writing switch) ON : Installation mode • mode written in ROM OFF : Normal mode (Mode operated by RAM/Mode operated by ROM) • Turn ON dip switch 5 when installed the operating system software (OS) into the Motion CPU module from the peripheral device. After completing the installation, move to switch and re-start.
14)	RUN/STOP switch (Momentary switch)	Move to RUN/STOP. RUN : Executes Motion program. STOP : Stops Motion program.
15)	RESET/L.CLR switch (Note-1) (Momentary switch)	RESET : Set the switch to the "RESET" position once, and reset the hardware. Applies a reset after an operation error and initialized the operation. L.CLR : Clear the latch area all data which set with the parameters. (LATCH CLEAR also clears data outside the latch area at this time.) Latch clear operating method 1) Set the "RUN/STOP" switch to "STOP". 2) Move the "RESET/L.CLR" switch to "L.CLR" several times until the "M. RUN LED" flashing. ("M. RUN LED" flashing : Latch clear completed.) 3) Move the "RESET/L.CLR" switch to "L.CLR" once more. ("M. RUN LED" turn off.)
16)	Module fixing screw hole	Hole for the screw used to fix to the base unit. (M3x12 screw : Purchase from the other supplier)
17)	Module fixing hook	Hook used to fix to the base unit.
18)	CN1 connector (Note-2)	Connector for connection of the Motion CPU module and servo amplifier.
19)	CN2 connector	Connector for connection a personal computer and SSCNET.
20)	TU connector (Note-3)(Note-4)	Connector for connection of the Motion CPU module and teaching unit
21)	Cooling fan connector (Note-5)	Connector for connection of the Motion CPU module and the Cooling fan unit (Q170 FAN).
22)	Cooling fan unit (Note-5)	The Cooling fan unit(Q170 FAN) designed exclusively for Motion CPU module.

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

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

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

(Note-2) : For example of the Q173CPU(N), the connector CN1 divide signals allocated each of SSCNET LINE 1 to 4.

The Dividing unit (Q173DV) or the Dividing cable (Q173J2B△CBL□□/Q173HB△CBL□□) between the Motion CPU and servo amplifiers divide signals allocated in CN1 of the Q173CPU(N) into each of the four lines.

(Note-3) : When using the Q173CPUN-T/Q172CPUN-T only.

(Note-4) : When connecting the teaching unit, use the cable which adjusts to the model name of the teaching unit.

(Note-5) : When using the Q173CPU/Q172CPU only.

2 SYSTEM CONFIGURATION

(4) Basic specifications of Q173CPU(N)/Q172CPU(N)

(a) Module specifications

Item	Q173CPUN	Q173CPUN-T	Q173CPU	Q172CPUN	Q172CPUN-T	Q172CPU
Teaching unit	—	Usable	—	—	Usable	—
Internal current consumption(5VDC) [A]	1.25	1.56 ^(Note)	1.75	1.14	1.45 ^(Note)	1.62
Exterior dimensions [mm(inch)]	98(3.86)(H) × 27.4(1.08)(W) × 114.3(4.50)(D)		118(4.65)(H) × 27.4(1.08)(W) × 89.3(3.52)(D)	98(3.86)(H) × 27.4(1.08)(W) × 114.3(4.50)(D)		118(4.65)(H) × 27.4(1.08)(W) × 89.3(3.52)(D)
Mass [kg]	0.23	0.24	0.22	0.22	0.23	0.21

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

(b) Motion control specifications/performance specifications

1) SV13/SV22

• Motion control specifications

Item	Q173CPUN(-T)	Q173CPU	Q172CPUN(-T)	Q172CPU
Number of control axes	32 axes		8 axes	
Operation cycle (default)	SV13	0.88ms/ 1 to 8 axes 1.77ms/ 9 to 16 axes 3.55ms/17 to 32 axes	0.88ms/1 to 8 axes	
	SV22	0.88ms/ 1 to 4 axes 1.77ms/ 5 to 12 axes 3.55ms/13 to 24 axes 7.11ms/25 to 32 axes	0.88ms/1 to 4 axes 1.77ms/5 to 8 axes	
Interpolation functions	Linear interpolation (Up to 4 axes), Circular interpolation (2 axes), Helical interpolation (3 axes)			
Control modes	PTP(Point to Point) control, Speed control, Speed-position control, Fixed-pitch feed, Constant speed control, Position follow-up control, Speed switching control, High-speed oscillation control, Synchronous control (SV22)			
Acceleration/ deceleration control	Automatic trapezoidal acceleration/deceleration, S-curve acceleration/deceleration			
Compensation	Backlash compensation, Electronic gear			
Programming language	Motion SFC, dedicated instruction, Mechanical support language (SV22)			
Program capacity	14k steps			
Number of positioning points	3200 points (Positioning data can be designated indirectly)			
Programming tool	IBM PC/AT			
Peripheral I/F	USB/RS-232/SSCNET			
Home position return function	Proximity dog type (2 types), Count type (3 types), Data set type (2 types), Dog cradle type, Stopper type(2 types), Limit switch combined type (Home position return re-try function provided, home position shift function provided)			
JOG operation function	Provided			
Manual pulse generator operation function	Possible to connect 3 modules			
Synchronous encoder operation function	Possible to connect 12 modules		Possible to connect 8 modules	

2 SYSTEM CONFIGURATION

• Motion control specifications (continued)

Item	Q173CPUN(-T)	Q173CPU	Q172CPUN(-T)	Q172CPU
M-code function	M-code output function provided M-code completion wait function provided			
Limit switch output function	Number of output points 32 points Watch data: Motion control data/Word device			
Absolute position system	<ul style="list-style-type: none"> Made compatible by setting battery to servo amplifier. (Possible to select the absolute data method or incremental method for each axis) When the vector inverter is used, only the increment method. 			
Number of SSCNET I/F	5CH		2CH	
Motion related interface module	Q172LX : 4 modules usable Q172EX : 6 modules usable Q173PX : 4 modules usable ^(Note-1)		Q172LX : 1 module usable Q172EX : 4 modules usable Q173PX : 3 modules usable ^(Note-1)	

(Note-1) : When using the incremental synchronous encoder by using SV22, you can use 4 modules.
When connecting the manual pulse generator, you can use only one module.

• Motion SFC performance specifications

Item		Q173CPU(N)/Q172CPU(N)			
Program capacity	Code total (Motion SFC chart+ Operation control+ Transition)	287k bytes			
	Text total (Operation control+ Transition)	224k bytes			
Motion SFC program	Number of Motion SFC programs	256(No.0 to 255)			
	Motion SFC chart size/program	Up to 64k bytes (Included Motion SFC chart comments)			
	Number of Motion SFC steps/program	Up to 4094 steps			
Operation control program (F/FS) / Transition program (G)	Number of operation control programs	4096 with F(Once execution type) and FS(Scan execution type) combined. (F/FS0 to F/FS4095)			
	Number of transition programs	4096(G0 to G4095)			
	Code size/program () nesting/block	Up to approx. 64k bytes (32766 steps) Up to 32			
	Descriptive Expression	Operation control program	Calculation expression/bit conditional expression		
Transition program		Calculation expression/bit conditional expression/comparison conditional expression			
Execute specification	Number of multi executed programs	Up to 256			
	Number of multi active programs	Up to 256 steps/all programs			
	Executed task	Normal task	Executed in motion main cycle		
		Event task (Execution can be masked.)	Fixed cycle	Executed in fixed cycle (0.88ms, 1.77ms, 3.55ms, 7.11ms, 14.2ms)	
			External interrupt	Executed when input ON is set among interrupt module QI60 (16 points).	
		PLC interrupt	Executed with interrupt from PLC CPU.		
NMI task	Executed when input ON is set among interrupt module QI60 (16 points).				
Number of I/O points (X/Y)	8192 points				

2 SYSTEM CONFIGURATION

2) SV43

• Motion control specifications

Item	Q173CPUN	Q173CPU	Q172CPUN	Q172CPU
Number of control axes	32 axes		8 axes	
Operation cycle (default)	0.88ms/ 1 to 4 axes 1.77ms/ 5 to 12 axes 3.55ms/13 to 24 axes 7.11ms/25 to 32 axes		0.88ms/1 to 4 axes 1.77ms/5 to 8 axes	
Interpolation functions	Linear interpolation (Up to 4 axes), Circular interpolation (2 axes), Helical interpolation (3 axes)			
Control modes	PTP(Point to Point) control, Constant-speed control, High-speed oscillation control			
Acceleration/ deceleration control	Automatic trapezoidal acceleration/deceleration, S-curve acceleration/deceleration			
Compensation	Backlash compensation, Electronic gear			
Programming language	Dedicated instruction (EIA language)			
Program capacity	248k bytes			
Number of programs	1024			
Number of simultaneous start programs	Axis designation program: 32 Control program: 16		Axis designation program: 8 Control program: 16	
Number of positioning points	Approx. 10600 points (Positioning data can be designated indirectly)			
Number of I/O (X/Y) points	8192 points			
Number of real I/O (PX/PY) points	Total of 256 points			
Programming tool	IBM PC/AT			
Peripheral I/F	USB/RS-232/SSCNET			
Home position return function	Proximity dog type (2 types), Count type (3 types), Data set type (2 types), Dog cradle type, Stopper type (2 types), Limit switch combined type (Home position return re-try function provided, home position shift function provided)			
JOG operation function	Provided			
Manual pulse generator operation function	Possible to connect 3 modules			
M-code function	M-code output function provided M-code completion wait function provided			
Limit switch output function	Number of output points 32 points Watch data: Motion control data/Word device			
Skip function	Provided			
Override ratio setting function	Override ratio setting : 0 to 100 [%]			
DNC operation	Provided			
Absolute position system	<ul style="list-style-type: none"> • Made compatible by setting battery to servo amplifier. (Possible to select the absolute data method or incremental method for each axis) • When the vector inverter is used, only the increment method. 			
Number of SSCNET I/F	5CH		2CH	
Motion related interface module	Q172LX : 4 modules usable Q173PX : 1 module usable		Q172LX : 1 module usable Q173PX : 1 module usable	

2 SYSTEM CONFIGURATION

• Motion program performance specifications

Item		Q173CPU(N)/Q172CPU(N)
Program capacity	Total of program files	248k bytes
	Number of programs	Up to 1024 (No. 1 to 1024)
Operation controls	Arithmetic operation	Unary operation, Additive operation, Multiplicative operation, Remainder operation
	Comparison operation	Equal to, Not equal to
	Logical operation	Logical shift operation, Logical negation, Logical AND, Logical OR, Exclusive OR
G-codes	Positioning command	G00, G01, G02, G03, G04, G09, G12, G13, G23, G24, G25, G26, G28, G30, G32, G43, G44, G49, G53, G54, G55, G56, G61, G64, G90, G91, G98, G99, G100, G101
M-codes	Output command to data register	M****
Special M-codes	Program control command	M00, M01, M02, M30, M98, M99, M100
Variable	Device variable	PX, PY B, F, D, W, #
Functions	Trigonometric function	SIN, COS, TAN, ASIN, ACOS, ATAN
	Numerical function	ABS, SQR, BIN, LN, EXP, BCD, RND, FIX, FUP, INT, FLT, DFLT, SFLT
Instructions	Start/end	CALL, CLEAR
	Home position return	CHGA
	Speed/torque setting	TL, CHGV, CHGT
	Motion control	WAITON, WAITOFF
	Jump/repetition processing	CALL, GOSUB, IF...GOTO, IF...THEN...ELSE...END, WHILE...DO
	Data operation	BMOV, BDMOV, FMOV, BSET, BRST, SET, RST, MULTW, MULTR, TO, FROM, ON, OFF, IF...THEN...SET/RST/OUT, PB
	DNC operation	DNC
Number of controls	Number of program calls (GOSUB)	Up to 8
	Number of program calls (M98)	Up to 8

2 SYSTEM CONFIGURATION

(5) Selection of Q172EX, Q173PX

Item	Synchronous encoder		Manual pulse generator
	Serial absolute	Incremental	
Q173CPU(N)	12 modules		3 modules
Q172CPU(N)	8 modules		
Module selection	Q172EX	Q173PX	

(6) Q173CPU(N)/Q172CPU(N) internal rechargeable battery

- Initial charging of the Q173CPU(N)/Q172CPU(N)

Turn on the power supply and charge the internal rechargeable battery for eight hours or more, before starting to use the Q173CPU(N)/Q172CPU(N). It is possible to provide backup power for the IC-RAM memory for at least 200 hours by charging the internal rechargeable battery for eight hours or more, even if it is empty.

If the battery is charged for five days while applying power eight hours a day, i.e., 40 hours of normal operation, it will be able to provide backup power for the IC-RAM memory for 1100 hours.

Battery backup by the A6BAT/MR-BAT will be necessary if there is a possibility that a continuous power off that lasts longer than the continuous power off hours for the internal rechargeable battery specified in the table below may occur, for example when transporting the system on a ship.

Item		Continuous power off time	
		Guaranteed time (MIN) [h]	Actual time (TYP) [h]
Internal rechargeable battery only	Charging time of 8 hours or more	200	500
	Charging time of 40 hours or more	1100	4300

2 SYSTEM CONFIGURATION

2.4.2 Power supply module

(1) Table of the power supply module specifications

This section describes the power supply modules specifications.

Item	Performance specifications	
	Q61P-A1	Q61P-A2
Base loading position	Power supply module loading slot	
Applicable base unit	Q33B, Q35B, Q38B, Q312B, Q65B, Q68B, Q612B	
Input power supply	100 to 120VAC (+10%/-15%) (85 to 132VAC)	200 to 240VAC (+10%/-15%) (170 to 264VAC)
Input frequency	50/60Hz ±5%	
Input voltage distortion factor	5% or less	
Max. input apparent power	105VA	
Inrush current	20A 8ms or less	
Rated output current	5VDC	6A
	24VDC	—
Overcurrent protection (Note-1)	5VDC	6.6A or more
	24VDC	—
Overvoltage protection (Note-2)	5VDC	5.5 to 6.5V
	24VDC	—
Efficiency	70% or more	
Permissible instantaneous power off time (Note-3)	20ms or less	
Dielectric withstand voltage	Across inputs/LG and outputs/FG 2,830VAC rms / 3 cycles (Altitude : 2000m (6562ft.))	
Insulation resistance	Across inputs and outputs (LG and FG separated), across inputs and LG/FG, across outputs and FG/LG. 10MΩ or more by insulation resistance tester(500VDC)	
Noise immunity	<ul style="list-style-type: none"> • By noise simulator of 1,500Vp-p noise voltage, 1μs noise width and 25 to 60Hz noise frequency • Noise voltage IEC61000-4-4, 2kV 	
Operation indication	LED indication (Lit at 5VDC output)	
Fuse	Built-in (Unchangeable by user)	
Contact output section	Application	ERR contact (contact switched off (opened: normally closed contact) at an error stop of CPU), for CPU module operating status output
	Rated switching voltage/current	24VDC, 0.5A
	Minimum switching load	5VDC, 1mA
	Response time	OFF to ON: 10ms or less. ON to OFF: 12ms or less.
	Life time	Mechanical : 2 million times or more Electrical : 100 thousand times at rated switching voltage/current or more
	Surge suppressor	None
	Fuse	None
Terminal screw size	M3.5 × 7	
Applicable wire size	0.75 to 2mm ²	
Applicable crimping terminal	RAV1.25 to 3.5, RAV2 to 3.5	
Applicable tightening torque	59 to 78 × 10 ⁻² N•m	
Exterior dimensions[mm(inch)]	98(H) × 55.2(W) × 90(D) (3.86(H) × 2.17(W) × 3.55(D))	
Mass [kg]	0.31	

2 SYSTEM CONFIGURATION

The power supply module specifications (continued)

Item		Performance specifications	
		Q63P	Q64P
Base loading position		Power supply module loading slot	
Applicable base unit		Q33B, Q35B, Q38B, Q312B, Q65B, Q68B, Q612B	
Input power supply		24VDC (+30%/-35%) (15.6 to 31.2VDC)	100 to 120VAC/200 to 240VAC (+10%/-15%) (85 to 132VAC/170 to 264VAC)
Input frequency		—	50/60Hz ±5%
Input voltage distortion factor		—	5% or less
Max. input apparent power		45W	160VA
Inrush current		100A 1ms or less	20A 8ms or less
Rated output current	5VDC	6A	8.5A
	24VDC	—	—
Overcurrent protection (Note-1)	5VDC	6.6A or more	9.9 to 14.4A
	24VDC	—	—
Overvoltage protection (Note-2)	5VDC	5.5 to 6.5V	
	24VDC	—	
Efficiency		70% or more	
Permissible instantaneous power off time (Note-3)		10ms or less(at 24VDC input)	20ms or less
Dielectric withstand voltage		500VAC across primary and 5VDC	Across inputs/LG and outputs/FG 2,830VAC rms/3 cycles (Altitude : 2000m (6562ft.))
Insulation resistance		10M Ω or more by insulation resistance tester	Across inputs and outputs (LG and FG separated), across inputs and LG/FG, across outputs and FG/LG 10 Ω or more by insulation resistance tester(500VDC)
Noise immunity		<ul style="list-style-type: none"> By noise simulator of 500Vp-p noise voltage, 1μs noise width and 25 to 60Hz noise frequency 	<ul style="list-style-type: none"> By noise simulator of 1,500Vp-p noise voltage, 1μs noise width and 25 to 60Hz noise frequency Noise voltage IEC61000-4-4, 2kV
Operation indication		LED indication (Lit at 5VDC output)	
Fuse		Built-in (Unchangeable by user)	
Contact output section	Application	ERR contact (contact switched off (opened: normally closed contact) at an error stop of CPU), for CPU module operating status output	
	Rated switching voltage/current	24VDC, 0.5A	
	Minimum switching load	5VDC, 1mA	
	Response time	OFF to ON: 10ms or less. ON to OFF: 12ms or less	
	Life time	Mechanical : 2 million times or more Electrical : 100 thousand times at rated switching voltage/current or more	
	Surge suppressor	None	
	Fuse	None	
Terminal screw size		M3.5 x 7	
Applicable wire size		0.75 to 2mm ²	
Applicable crimping terminal		RAV1.25 to 3.5, RAV2 to 3.5	
Applicable tightening torque		59 to 78 x 10 ⁻² N•m	
Exterior dimensions[mm(inch)]		98(H) x 55.2(W) x 90(D) (3.86(H) x 2.17(W) x 3.55(D))	98(H) x 55.2(W) x 115(D) (3.86(H) x 2.17(W) x 4.53(D))
Mass [kg]		0.33	0.40

POINTS

(Note-1) : Overcurrent protection

The overcurrent protection device shuts off the 5VDC, 24VDC circuit and stops the system if the current flowing in the circuit exceeds the specified value. When this device is activated, the power supply module LED is switched OFF or dimly lit. If this happens, eliminate the cause of the overcurrent and start up the system again.

(Note-2) : Overvoltage protection

The overvoltage protection device shuts off the 5VDC circuit and stops the system if a voltage of 5.5 to 6.5V 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 ON to restart the system. The power supply module must be changed if the system is not booted and the LED remains OFF.

(Note-3) : Permissible instantaneous power off time

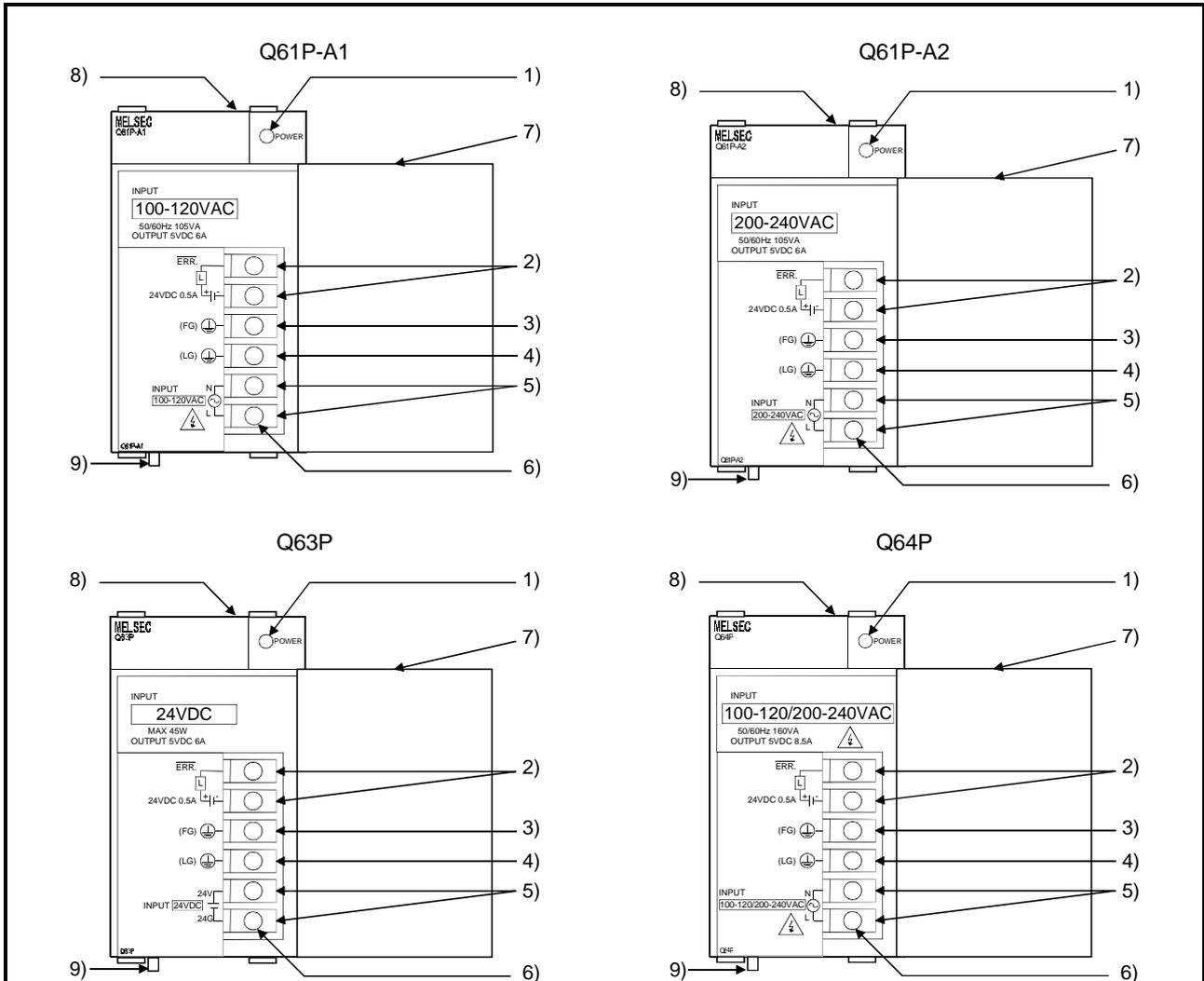
Permissible instantaneous power off is selected to use the power supply module.

2 SYSTEM CONFIGURATION

(2) Names of Parts and Setting

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

(a) Q61P-A1, Q61P-A2, Q63P, Q64P



No.	Name	Application
1)	POWER LED	5VDC power indicator LED
2)	ERR terminals	Turned OFF (opened) when a stop error occurs in the CPU module. Normally off when loaded in an extension base unit.
3)	FG terminal	Ground terminal connected to the shield pattern of the printed circuit board.
4)	LG terminal	Grounding for the power supply filter.
5)	Power input terminals	<ul style="list-style-type: none"> Used to connect a 100VAC or 200VAC power supply.(Q61P-A1, Q61P-A2, Q64P) Used to connect a 24VDC power supply.(Q63P)
6)	Terminal screw	M3.5×7
7)	Terminal cover	Protective cover of the terminal block
8)	Module fixing screw	Used to fix the module to the base unit. (M3×12 screw, tightening torque : 36 to 48×10^{-2} N•m)
9)	Module loading lever	Used to install the module into the base unit.

2 SYSTEM CONFIGURATION

POINTS		
(1) The Q61P-A1 is dedicated for inputting a voltage of 100VAC. Do not input a voltage of 200VAC into it or trouble may occur on the Q61P-A1.		
Power module type	Supply power voltage	
	100VAC	200VAC
Q61P-A1	Operates normally.	Power module causes trouble.
Q61P-A2	Power module does not cause trouble. CPU cannot be operated.	Operates normally.
(2) 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.		
(3) Be sure to ground the earth terminal LG and FG.(Ground resistance: 100Ω or less)		

(3) Selection of the power supply module

The power supply module is selected according to the total of current consumption of the I/O modules, special function module, and peripheral devices supplied by its power module. (Select the power supply module in consideration of the current consumption of the peripheral device connected to the MR-HENC, MR-HDP01 or A31TU-D□K13, etc.)

For information about the current consumption of 5VDC of the I/O modules, special function module, and peripheral device, refer to the QCPU(Q mode) User's Manual(Hardware Design, Maintenance and Inspection).

The current consumption of Motion controller is as follows.

Part name	Model name	Description	Current consumption 5VDC [A]
Motion CPU module	Q173CPUN	Up to 32 axes control	1.25
	Q173CPUN-T	Up to 32 axes control, for teaching unit	1.56
	Q173CPU	Up to 32 axes control, with cooling fan unit	1.75
	Q172CPUN	Up to 8 axes control	1.14
	Q172CPUN-T	Up to 8 axes control, for teaching unit	1.45
	Q172CPU	Up to 8 axes control, with cooling fan unit	1.62
Servo external signal interface module	Q172LX	Servo external signal 8 axes (FLS, RLS, STOP, DOG/CHANGE \times 8)	0.05
Serial absolute synchronous encoder interface module (Note-1)	Q172EX	Serial absolute synchronous MR-HENC interface \times 2 Tracking input 2 points	0.07
	Q172EX-S1	Serial absolute synchronous MR-HENC interface \times 2 Tracking input 2 points, Memory built-in for data exchange	

2 SYSTEM CONFIGURATION

Part name	Model name	Description	Current consumption 5VDC [A]
Manual pulse generator interface module ^(Note-1)	Q173PX	Manual pulse generator MR-HDP01/ Synchronous encoder interface×3, Tracking input 3 points	0.11
	Q173PX-S1	Manual pulse generator MR-HDP01/ Synchronous encoder interface×3, Tracking input 3 points, Memory built-in for data exchange	
Manual pulse generator	MR-HDP01	Pulse resolution: 25PLS/rev (100 PLS/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)	0.06
Teaching unit	A31TU-D3K13	For SV13, with 3-position deadman switch	0.26
	A31TU-DNK13	For SV13, without deadman switch	
Serial absolute synchronous encoder	MR-HENC	Resolution: 16384PLS/rev Permitted speed: 4300r/min	0.15
Cooling fan unit	Q170FAN	Cooling fan of the Motion CPU module	0.08

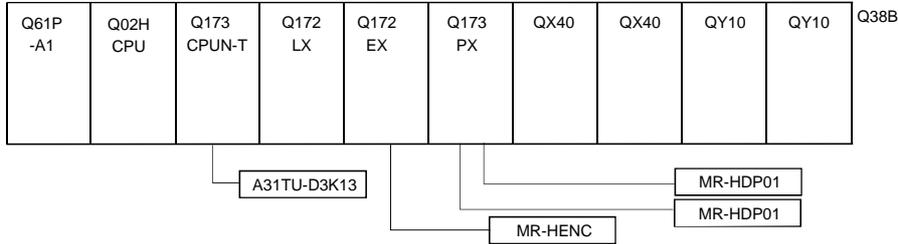
(Note-1) : Select the power supply module in consideration of the current consumption of the connecting peripheral device (MR-HENC or MR-HDP01).

(Note-2) : Current consumption of A31TU-D□K13 is included.

2 SYSTEM CONFIGURATION

(4) Example of the power supply selection calculation (When using the Q173CPUN-T.)

(a) System configuration



(b) 5VDC current consumption of each module

Q02H CPU	: 0.64 [A]	Q173PX	: 0.11 [A]
Q173CPUN-T (Note)	: 1.56 [A]	MR-HDP01	: 0.06 [A]
Q172LX	: 0.05 [A]	QX40	: 0.05 [A]
Q172EX	: 0.07 [A]	QY10	: 0.43 [A]
MR-HENC	: 0.15 [A]	Q38B	: 0.114 [A]

(Note) : Current consumption of A31TU-D3K13(0.26A) is included.

(c) Power consumption of overall modules

$$I_{5V} = 0.64 + 1.56 + 0.05 + 0.07 + 0.15 + 0.11 + 0.06 \times 2 + 0.05 \times 2 + 0.43 \times 2 + 0.114 = 3.774[A]$$

Select of the power supply module(Q61P-A1(100VAC)6A) according to this internal current consumption 3.774[A].

(Note) : Configure the system in such a way that the total current consumption at 5VDC of all the modules is less than the allowable value.

2 SYSTEM CONFIGURATION

2.4.3. Base unit and extension cable

This section describes the specifications of the extension cables for the base units (CPU base unit or extension base unit) used in the system, and the specification standards of the extension base unit.

(1) Table of the base unit specification (a) CPU base unit specifications

Item \ Type	Q33B	Q35B	Q38B	Q312B
Number of I/O modules	3	5	8	12
Possibility of extension	Extendable			
Applicable module	Q series modules			
5VDC internal current consumption [A]	0.105	0.110	0.114	0.121
Fixing hole size	M4 screw hole or ϕ 4.5 hole (for M4 screw)			
Exterior dimensions [mm(inch)]	189(W) \times 98(H) \times 44.1(D) (7.43(W) \times 3.86(H) \times 1.74(D))	245(W) \times 98(H) \times 44.1(D) (9.65(W) \times 3.86(H) \times 1.74(D))	328(W) \times 98(H) \times 44.1(D) (12.92(W) \times 3.86(H) \times 1.74(D))	439(W) \times 98(H) \times 44.1(D) (17.30(W) \times 3.86(H) \times 1.74(D))
Mass [kg]	0.21	0.25	0.35	0.45
Attachment	Fixing screw M4 \times 14 4 pieces (DIN rail fixing adapter is optional)			
DIN rail fixing adapter type	Q6DIN3	Q6DIN2	Q6DIN1	

(b) Extension base unit specifications

Item \ 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]	0.105	0.110	0.114	0.121
Fixing hole size	M4 screw hole or ϕ 4.5 hole (for M4 screw)			
Exterior dimensions [mm(inch)]	189(W) \times 98(H) \times 44.1(D) (7.43(W) \times 3.86(H) \times 1.74(D))	245(W) \times 98(H) \times 44.1(D) (9.65(W) \times 3.86(H) \times 1.74(D))	328(W) \times 98(H) \times 44.1(D) (12.92(W) \times 3.86(H) \times 1.74(D))	439(W) \times 98(H) \times 44.1(D) (17.30(W) \times 3.86(H) \times 1.74(D))
Mass [kg]	0.23	0.25	0.35	0.45
Attachment	Fixing screw M4 \times 14 4 pieces (DIN rail fixing adapter is optional)			
DIN rail fixing adapter type	Q6DIN3	Q6DIN2	Q6DIN1	

2 SYSTEM CONFIGURATION

(2) Table of the extension cable specifications

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

Item \ Type	QC05B	QC06B	QC12B	QC30B	QC50B	QC100B
Cable length[m(ft.)]	0.45(1.48)	0.6(1.96)	1.2(3.94)	3.0(9.84)	5.0(16.40)	10.0(32.8)
Application	Connection between the CPU base unit 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 (43.28ft.).

(3) Names of parts of the base unit

Names of parts of the base unit are described below.

(a) CPU base unit (Q33B, Q35B, Q38B, Q312B)

No.	Name	Application
1)	Extension cable connector	Connector for sending and receiving signals from the extension base unit, to which the extension cables are connected.
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)	Module connector	Connector for installing the power supply module, CPU 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.
4)	Module fixing screw hole	Screw hole for fixing the module to the base. Screw size: M3 × 12
5)	Base fixing hole	Hole for fixing this base unit onto the panel of the control panel (for M4 × 14 screw)
6)	DIN rail adapter fixing hole	Hole for fixing DIN rail adapter

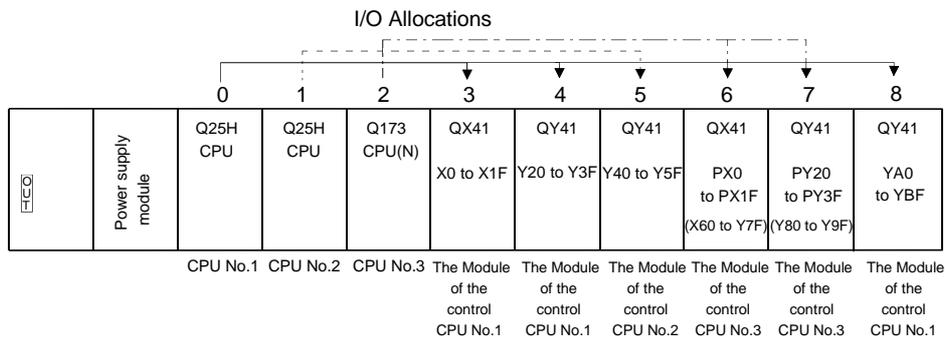
2 SYSTEM CONFIGURATION

(4) I/O allocations

It is possible to allocate unique I/O No.s for each Motion CPU independently of the PLC's I/O No.s. (I/O No.s are unique between the Q series PLC CPU within a given system, but the I/O No.s of the Motion CPU are unique for each Motion CPU.)

ON/OFF data input to the Motion CPU is handled via input devices PX□□, while ON/OFF data output from the Motion CPU 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 the 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 Programming Manual of the operating system software about the I/O allocation setting method,.

Refer to the QCPU(Q Mode) User's Manual(Hardware Design, Maintenance and Inspection) about the I/O allocation setting method of the Qn(H) CPU,.

POINT

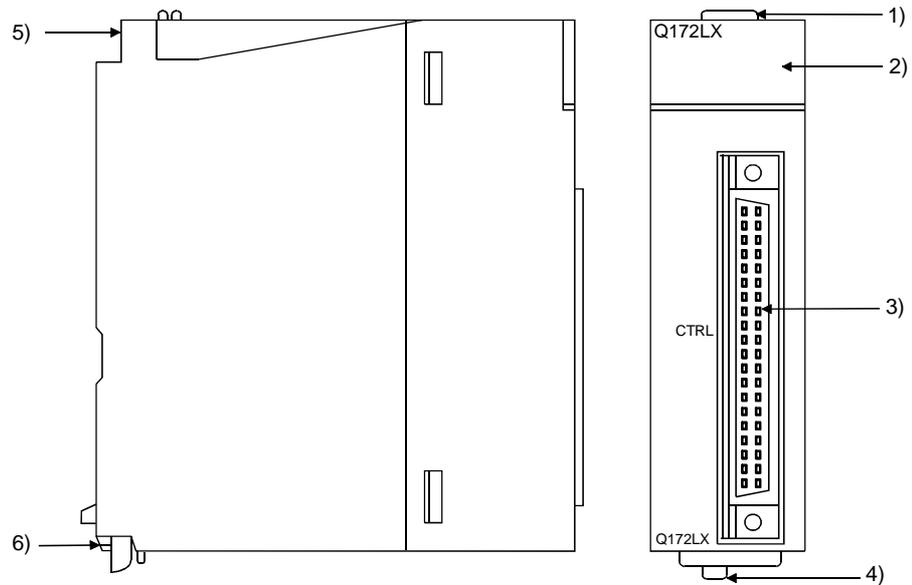
I/O device of the Motion CPU can be set in the range PX/PY000 to PX/PYFFF.
The real I/O points must be 256 points or less. (As for the I/O No., it is possible not to continue.)

2 SYSTEM CONFIGURATION

2.4.4 Q172LX Servo external signals interface module

Q172LX receives external signals (servo external signals) required for positioning control.

(1) Q172LX name of parts



No.	Name	Application				
1)	Module fixing hook	Hook used to fix the module to the base unit. (Quick release installation)				
2)	Mode judging LED	Display the servo external input status from the external equipment. <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 20%;">LED</th> <th>Details</th> </tr> </thead> <tbody> <tr> <td>0 to 1F</td> <td>Indicates to display the servo external signal input status of each axis.</td> </tr> </tbody> </table> <p>This LED is not turned on if it is not set the Q172LX in the system settings.</p>	LED	Details	0 to 1F	Indicates to display the servo external signal input status of each axis.
LED	Details					
0 to 1F	Indicates to display the servo external signal input status of each axis.					
3)	CTRL connector	The servo external signal input connector of each axis.				
4)	Module loading lever	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 the other supplier)				
6)	Module fixing hook	Hook used to fix to the base unit.				

POINT

Mode judging LED turns ON at the following conditions.

(1) DOG/CHANGE

- (a) Q172LX is set on the system setting display of SW6RN-GSV□□P.
- (b) DOG/CHANGE signal is inputted.

2 SYSTEM CONFIGURATION

(2) Performance specifications

(a) Module specification

Item	Specifications
Number of I/O occupying points	32 points(I/O allocation: Intelligent, 32 points)
Internal current consumption(5VDC) [A]	0.05
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) 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 points × 8 axes)
Input method	Sink/Source type
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 and STOP signal	OFF to ON ON to OFF 1ms
Response time of the proximity dog, Speed- position switching signal	OFF to ON ON to OFF 0.4ms/0.6ms/1ms (CPU parameter setting, Default 0.4ms)
Common terminal arrangement	32 points/common (common terminal: B1, B2)
Indicates to display	ON indication (LED)
External connector type	40 pin connector
Applicable wire size	0.3mm ²
Applicable connector for the external connection	A6CON1(Attachment), A6CON2, A6CON3(Optional)
Applicable connector/ Terminal block converter module	A6TBXY36, A6TBXY54, A6TBXY70(Optional)

2 SYSTEM CONFIGURATION

(3) Connection of servo external signals interface module

(a) Servo external signals

There are the following servo external signals.

The Q172LX is assigned a set of input No.s per axis. Make the system setting of the positioning software package to determine the I/O No.s corresponding to the axis No.s.

Servo external signal	Application	Number of points on one Q172LX
Upper stroke limit input (FLS)	For detection of upper and lower stroke limits.	32 points (4 points/8 axes)
Lower stroke limit input (RLS)		
Stop signal input (STOP)	For stopping under speed or positioning control.	
Proximity dog/ Speed-position switching input (DOG/CHANGE)	For detection of proximity dog at proximity dog or count type home position return of for switching from speed to position switching control.	

POINT

Signal No. 1 to 8 can be assigned to the specified axis. To make assignment, make the system settings of the positioning software package.

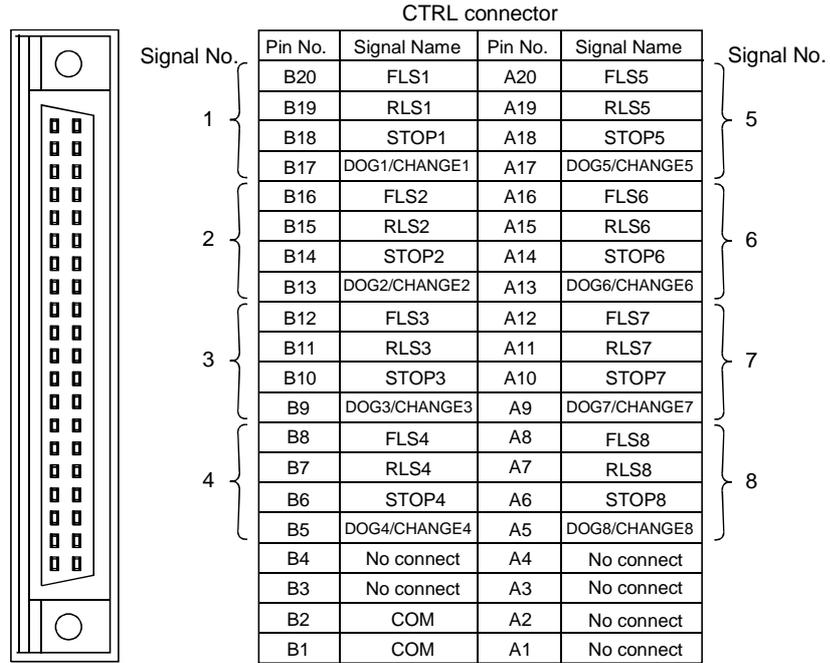
2 SYSTEM CONFIGURATION

(b) The pin layout of the CTRL connector

Use the CTRL connector at the Q172LX module front to connect the servo external signals.

The following pin layout of the Q172LX CTRL connector viewed from the front.

The pin layout and connection description of the CTRL connector are described below.



Applicable connector model name

A6CON1 type soldering type connector
 FCN-361J040-AU connector (FUJITSU TAKAMISAWA COMPONENT LIMITED)
 FCN-360C040-B connector cover

} (Attachment)

A6CON2 type Crimp-contact type connector

A6CON3 type Pressure-displacement 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 conversion module

AC□TB (□:Length [ft.]) : Connector/terminal block conversion cable

2 SYSTEM CONFIGURATION

(4) Interface between CTRL connector and servo external signal

Input or Output	Signal name	CTRL connector	LED	Wiring example	Internal circuit	Specification	Description
Input	FLS1	B20	0	Upper stroke limit input		• Supply voltage 12 to 24 VDC (10.2 to 26.4 VDC, stabilized power supply)	FLS
	FLS2	B16	4				
	FLS3	B12	8				
	FLS4	B8	C				
	FLS5	A20	10				
	FLS6	A16	14				
	FLS7	A12	18				
	FLS8	A8	1C				
	RLS1	B19	1	Lower stroke limit input		• High level 10.0 VDC or more/ 2.0mA or more	RLS
	RLS2	B15	5				
	RLS3	B11	9				
	RLS4	B7	D				
	RLS5	A19	11				
	RLS6	A15	15				
	RLS7	A11	19				
	RLS8	A7	1D				
	STOP1	B18	2	Stop signal input		• Low level 1.8 VDC or less/ 0.18mA or less	STOP
	STOP2	B14	6				
	STOP3	B10	A				
	STOP4	B6	E				
	STOP5	A18	12				
	STOP6	A14	16				
	STOP7	A10	1A				
	STOP8	A6	1E				
DOG/CHANGE1	B17	3	Proximity dog /Speed-position switching signal			DOG/CHANGE	
DOG/CHANGE2	B13	7					
DOG/CHANGE3	B9	B					
DOG/CHANGE4	B5	F					
DOG/CHANGE5	A17	13					
DOG/CHANGE6	A13	17					
DOG/CHANGE7	A9	1B					
DOG/CHANGE8	A5	1F					
Power supply		B1 B2					Common terminals for motion control signals, external signal.

! CAUTION

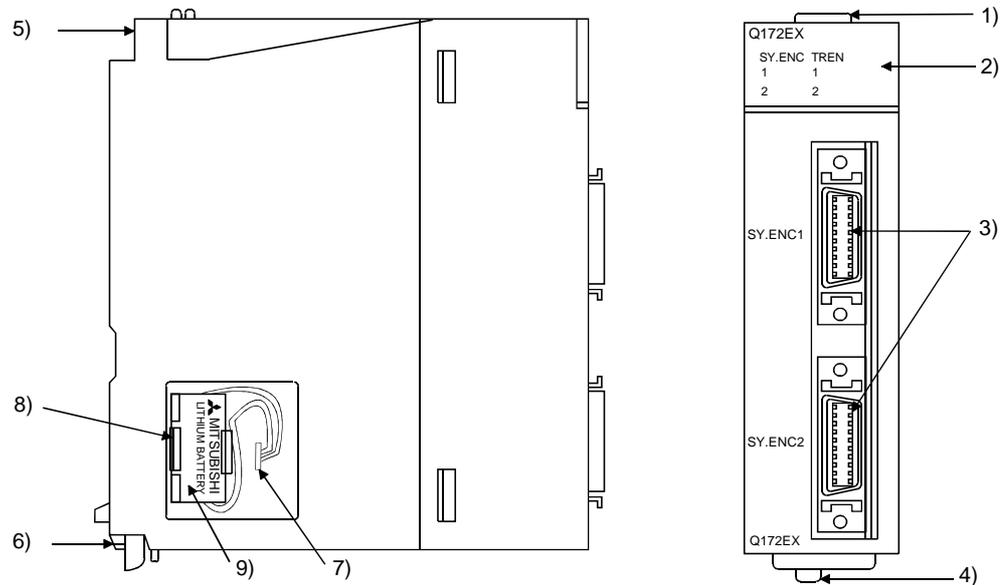
- Always use a shield cable for connection of the CTRL connector and external equipment, and avoid running it close to or bundling it with the power and main circuit cables to minimize the influence of electromagnetic interface. (Separate them more than 200mm (0.66ft.) away.)
- Connect the shield wire 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 SYSTEM CONFIGURATION

2.4.5 Q172EX(-S1) Serial absolute synchronous encoder interface module

Q172EX receive external signals required for serial absolute synchronous encoder.

(1) Q172EX/Q172EX-S1 name of parts



No.	Name	Application						
1)	Module fixing hook	Hook used to fix the module to the base unit. (Quick release installation)						
2)	Mode judging LED	Display the input status from the external equipment. <table border="1"> <thead> <tr> <th>LED</th> <th>Details</th> </tr> </thead> <tbody> <tr> <td>SY.ENC 1, 2</td> <td>Indicates to display the signal input status of each serial absolute synchronous encoder. (When the serial absolute synchronous encoder cable connected property, LED is turned on.)</td> </tr> <tr> <td>TREN 1, 2</td> <td>Indicates to display the signal status of tracking enable.</td> </tr> </tbody> </table>	LED	Details	SY.ENC 1, 2	Indicates to display the signal input status of each serial absolute synchronous encoder. (When the serial absolute synchronous encoder cable connected property, LED is turned on.)	TREN 1, 2	Indicates to display the signal status of tracking enable.
LED	Details							
SY.ENC 1, 2	Indicates to display the signal input status of each serial absolute synchronous encoder. (When the serial absolute synchronous encoder cable connected property, LED is turned on.)							
TREN 1, 2	Indicates to display the signal status of tracking enable.							
3)	SY. ENC connector	Input connector of the serial absolute synchronous encoder.						
4)	Module loading lever	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 the other supplier)						
6)	Module fixing hook	Hook used to fix to the base unit.						
7)	Battery connector	For connection of battery lead wire.						
8)	Battery holder	Used to the Install the Battery (A6BAT/MR-BAT) to the holder.						
9)	Battery (A6BAT/MR-BAT)	For Serial absolute synchronous encoder battery backup.						

2 SYSTEM CONFIGURATION

(2) Performance specifications (a) Module specifications

Item	Specifications	
	Q172EX	Q172EX-S1
Memory for data exchange	None	Provided
Number of I/O occupying points	32 points(I/O allocation: Intelligent, 32 points)	
Internal current consumption(5VDC)[A]	0.07	
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 : 2 points
Input method	Sink/Source type
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. 5.6K Ω
Response time	OFF to ON
	ON to OFF
	0.4ms/0.6ms/1ms (CPU parameter setting, Default 0.4ms)
Common terminal arrangement	1 point/common (Common terminal: TREN.COM)
Indicates to display	ON indication (LED)

2 SYSTEM CONFIGURATION

(c) Serial absolute synchronous encoder input

Item	Specifications
Applicable signal types	Differential-output type : (SN75C1168 or equivalent)
Transmission method	Serial communications
Synchronous method	Counter-clock-wise (viewed from end of shaft)
Communication speed	2.5Mbps
Applicable types	MR-HENC
Position detection method	Absolute(ABS) method
Resolution	16384PLS/rev(14bit)
Number of modules	2/module
External connector type	20 pin connector
Applicable connector for the external connection	MR-J2CNS(Optional)
Applicable wire	UL20276 AWG#22 6Pair
Connecting cable	MR-JHSCBL□M-H (□=cable length 2m(6.56ft.), 5m(16.4ft.), 10m(32.8ft.), 20m(65.6ft.), 30m(98.4ft.) (Note)
Cable length	Up to 30m (98.4ft.)
Back up the absolute position.	Depends on A6BAT/MR-BAT.
Battery service life time(value in actual)	15000[h], (Example of encoders×2, Ambient temperature 40°C (104°F))
	30000[h], (Example of encoders×1, Ambient temperature 40°C (104°F))

(Note) : You can use these cables when the tracking enable signal is not used.

When the tracking enable signal is used, fabricate the cable on the customer side.

(3) Select to number of the synchronous encoder modules

Synchronous encoders are available in voltage output type(incremental), differential output type(incremental) and serial absolute output type(MR-HENC). Q172EX can be connected to only serial absolute output type(MR-HENC).

When using the incremental synchronous encoder of voltage output type or differential output type, must be used Q173PX. (The synchronous encoders are used only in the SV22 virtual mode.)

In addition, the usable numbers of synchronous encoders differ depending on the modules.

The following number of serial absolute synchronous encoders and incremental synchronous encoders combined can be used.

Motion CPU module	Synchronous encoder
Q173CPU(N)	Up to 12 modules (Q172EX: Up to 6 modules)
Q172CPU(N)	Up to 8 modules (Q172EX: Up to 4 modules)

• Tracking enable signal

Tracking enable signal of Q172EX is used as a high-speed reading function. It cannot be used, as the input start signal which start the input form serial absolute synchronous encoders.

When using the inputs start signal which start the input from synchronous encoder, must be used Q173PX. (Type of synchronous encoder is voltage output(incremental)or differential output(incremental).)

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

External input signal of the synchronous encoder	Item	Number of points on one Q172EX
Tracking enable signal input	High-speed reading function	2 points

(4) Connection of synchronous encoder interface module.
 (a) Connection with serial absolute synchronous encoder (MR-HENC)

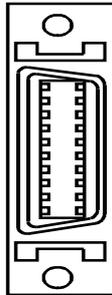
Use the SY.ENC connector at the Q172EX module front to connect the serial absolute synchronous encoder(MR-HENC).

When tracking enable signal is not used, use the MR-JHSCBL□M-H encoder cable between the serial absolute synchronous encoder (MR-HENC) and SY.ENC connector.

The following pin layout of the Q172EX SY.ENC connector viewed from the front.

The pin layout and connection description of the SY.ENC connector are described below.

SY.ENC connector



Pin No.	Signal name	Pin No.	Signal name
1	LG	11	LG
2	LG	12	LG
3	LG	13	No connect
4	TREN	14	TREN.CO
5	No connect	15	No connect
6	MD	16	MDR
7	MR	17	MRR
8	No connect	18	P5
9	BAT	19	P5
10	P5	20	P5

Applicable connector model names
 10120-3000VE connector
 10320-52F0-008 connector cover (3M make)

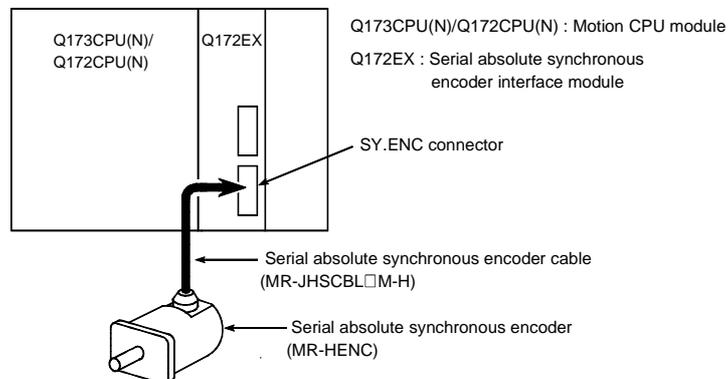
(Note) : Do not connect a wire to MD(6Pin), MDR(16Pin).

(b) Interface with external equipment

The interface between the SY.ENC connector and external equipment is described below.

1) Wiring precautions

Ensure the connector lock after connecting the connector.



2 SYSTEM CONFIGURATION

(5) Interface between SY.ENC connector and external equipment

Input or Output	Signal name	Pin No.	Wiring example	Internal circuit	Specification	Description
		SY.ENC connector				
Input	MR	7			<ul style="list-style-type: none"> Transmission method: serial communications Position detection method: absolute 	
	MRR	17				
	P5	10 18 19 20				
	LG	1 2 3 11 12				
	BAT	9				
	TREN	4				
	TREN.COM	14				
	SD	plate				

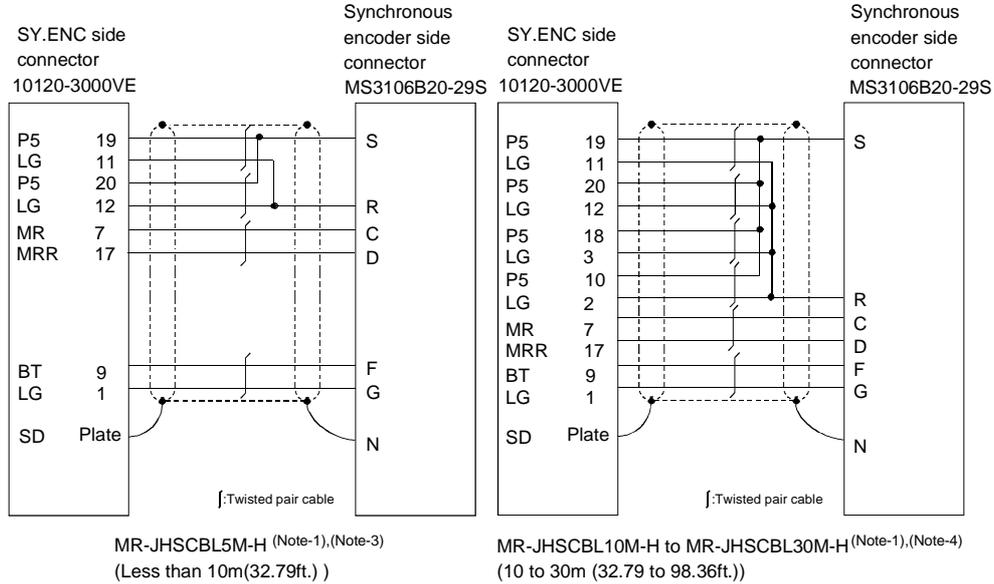
CAUTION

- Always use a shield cable for connection of the SY.ENC 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 interference. (Separate them more than 200mm (0.66 ft.) away.)
- Connect the shield wire of the connection cable to the FG terminal of the external equipment.
- When increasing the cable length, use the cable 30m(98.36ft.) or less. Note that the cable should be run in the shortest possible distance to avoid induced noise.
- 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.

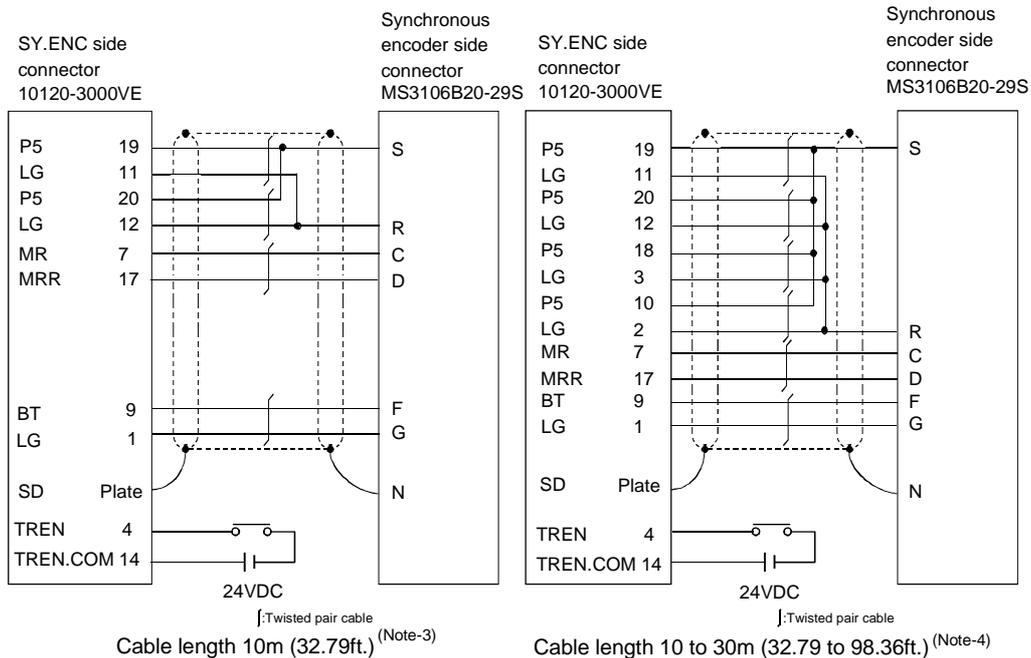
2 SYSTEM CONFIGURATION

(6) Details of encoder cable connections

(a) When not using tracking enable signal



(b) When using tracking enable signal (Note-5)



(Note-1) : Encoder cables are the same as HC-SFS/HC-RFS/HC-UFS(2000r/min) series motor cable.

(Note-2) : Encoder connector sets are the same as HC-SFS/HC-RFS/HC-UFS(2000r/min) series motor encoder connector set.

(Note-3) : Be sure to use a wire model name AWG#24.

(Note-4) : Be sure to use a wire model name AWG#22.

(Note-5) : When using tracking enable signal, fabricate the encoder cable by customer side.

2 SYSTEM CONFIGURATION

(7) Connection of the battery

This section describes the battery specifications, handling precautions and installation of the Q172EX.

(a) Specifications

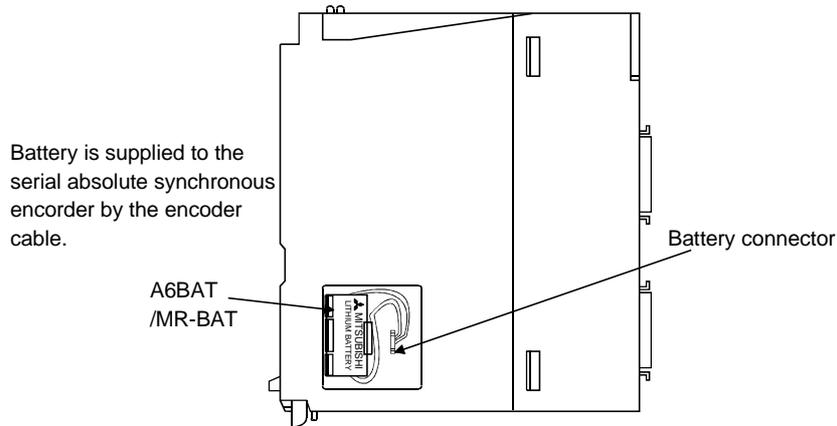
The specifications of the battery for memory back-up are shown in the table below.

Battery Specifications

Item	Model name	A6BAT/MR-BAT
Classification		Manganese dioxide lithium primary battery
Normal voltage[V]		3.6
Battery discharge capacity [mAh]		1600
Battery warranty period		5 years
Applications		For backup absolute positioning data of the serial absolute synchronous encoder(MR-HENC)
Exterior dimensions[mm(inch)]		∅16(0.63) x 30(1.18)

(b) Battery replacement

For Battery replacement procedure, refer to section 6.4.2.



(c) Battery service life time

	Battery service life time	
	Guaranteed time(MIN) [h]	Actual time(TYP) [h]
MR-HENC 1 pcs.	10000	30000
MR-HENC 2 pcs.	5000	15000

 CAUTION

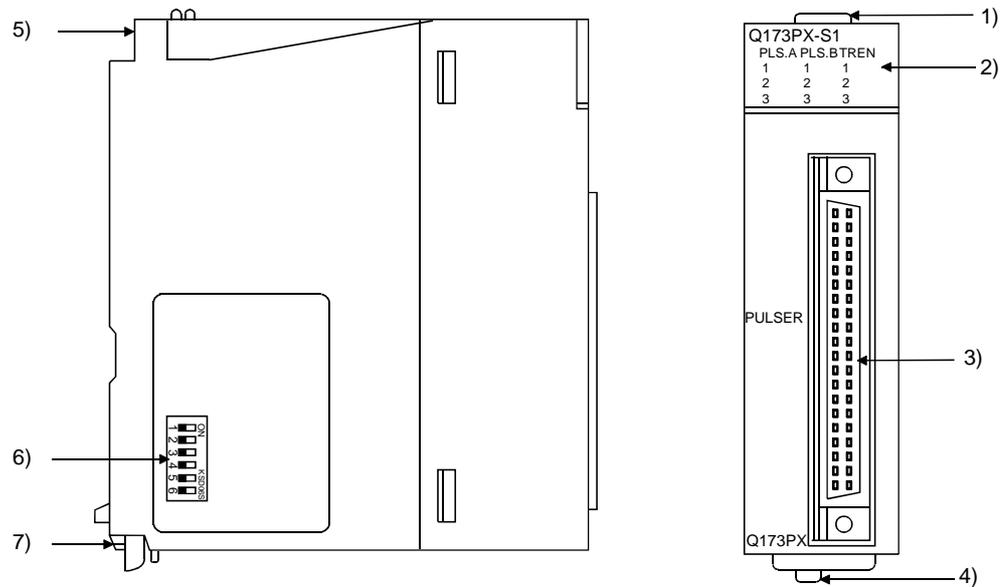
- Do not short a battery.
- Do not charge a battery.
- Do not disassemble a battery.
- Do not burn a battery.
- Do not overheat a battery.
- Do not solder the battery terminals.

2 SYSTEM CONFIGURATION

2.4.6 Q173PX(-S1) Manual pulse generator interface module

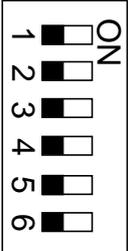
Q173PX receive external signals required for Manual pulse generator and Incremental synchronous encoder (Voltage-output/Open collector type/Differential-output type).

(1) Q173PX/Q173PX-S1 name of parts



No.	Name	Application						
1)	Module fixing hook	Hook used to fix the module to the base unit. (Quick release installation)						
2)	Mode judging LED	<p>Display the input status from the external equipment.</p> <table border="1"> <thead> <tr> <th>LED</th> <th>Details</th> </tr> </thead> <tbody> <tr> <td>PLS.A 1 to 3 PLS.B 1 to 3</td> <td>Input signal status of the Manual pulse generator/Incremental synchronous encoder phases A and B</td> </tr> <tr> <td>TREN 1 to 3</td> <td>Tracking enable signal</td> </tr> </tbody> </table> <p>This LED is not turned on if it is not set the Q173PX in the system settings.</p>	LED	Details	PLS.A 1 to 3 PLS.B 1 to 3	Input signal status of the Manual pulse generator/Incremental synchronous encoder phases A and B	TREN 1 to 3	Tracking enable signal
LED	Details							
PLS.A 1 to 3 PLS.B 1 to 3	Input signal status of the Manual pulse generator/Incremental synchronous encoder phases A and B							
TREN 1 to 3	Tracking enable signal							
3)	PULSER connector	Input connector of the Manual pulse generator/Incremental synchronous encoder.						
4)	Module loading lever	Used to load 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 the other supplier)						

2 SYSTEM CONFIGURATION

No.	Name	Application
6)	Dip switches (Note-1)(Note-2)  (Shipped from the factory in OFF position)	Dip switch 1 Detection setting of TREN1 signal SW1 SW2 OFF OFF ON ON ON OFF OFF ON
		Dip switch 2 TREN is detected when TREN signal turns off to on.
		Dip switch 3 Detection setting of TREN2 signal SW3 SW4 OFF OFF ON ON ON OFF OFF ON
		Dip switch 4 TREN is detected when TREN signal turns off to on.
		Dip switch 5 Detection setting of TREN3 signal SW5 SW6 OFF OFF ON ON ON OFF OFF ON
		Dip switch 6 TREN is detected when TREN signal turns off to on.
7)	Module fixing hook	Hook used to fix to the base unit.

(Note-1) : When using the Q173PX-S1 only.

(Note-2) : The function is different according to the operating system software installed.

POINTS

The lighting condition of input display LED is shown below.

(1) PLS.A 1 to 3, PLS.B 1 to 3

- Q173PX is set on the system setting display of SW6RN-GSV□P.
- All axes servo ON command (M2042) turned on.
- Manual pulse generator enable flag (M2051, M2052, M2053) turned on.
- Manual pulse generator signal is inputted.

(2) TREN 1 to 3

- Q173PX is set on the system setting display of SW6RN-GSV□P.
- Tracking signal is inputted.

2 SYSTEM CONFIGURATION

(2) Performance specifications

(a) Unit specification

Item	Specifications	
	Q173PX	Q173PX-S1
Memory for data exchange	None	Provided
Number of I/O occupying points	32 points(I/O allocation: Intelligent, 32 points)	
Internal current consumption(5VDC)[A]	0.11	
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
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. 5.6K Ω
Response time	OFF to ON	0.4ms/0.6ms/1ms (CPU parameter setting, Default 0.4ms)
	ON to OFF	
Common terminal arrangement		1 point/common(Common contact: TREN.COM)
Indicates to display		ON indication(LED)

2 SYSTEM CONFIGURATION

(c) Manual pulse generator/Incremental synchronous encoder input

Item		Specifications
Number of modules		3/module
Voltage-output/ Open collector type	High-voltage	3.0 to 5.25VDC
	Low-voltage	0 to 1.0VDC
Differential-output type (26LS31 or equivalent)	High-voltage	2.0 to 5.25VDC
	Low-voltage	0 to 0.8VDC
Input frequency		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(Optional)
Cable length	Voltage-output/ Open collector type	30m (98.36ft.)
	Differential-output type	(Open collector type: 10m (32.79ft.))

(3) Connection of manual pulse generator

Manual pulse generators are available in voltage output/open collector type and differential output type. Since these types differ in connection method, design according to the connection method of section 2.4.6 (5).

In addition the usable numbers of manual pulse generator which can be used with each CPU modules are up to 3 modules.

Motion CPU module	Manual pulse generator
Q173CPU(N)	Up to 3 modules (Up to 1 module)
Q172CPU(N)	

(4) Connection of incremental synchronous encoder

Incremental synchronous encoders are available in voltage output/Open collector type and differential output type. Since these types differ in connection method, design according to the connection method of section 2.4.6 (5).

Serial type absolute synchronous encoder (MR-HENC) not connected to Q173PX. Then connect to Q172EX.

In addition, the usable numbers of synchronous encoders differ depending on the modules.

The following number of serial absolute synchronous encoders and incremental synchronous encoders combined can be used.

Motion CPU module	Synchronous encoder
Q173CPU(N)	Up to 12 modules (Q173PX: Up to 4 modules)
Q172CPU(N)	Up to 8 modules (Q173PX: Up to 3 modules)

• Tracking enable signal

Tracking enable signal of Q173PX is used to start the input from incremental synchronous encoders.

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

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

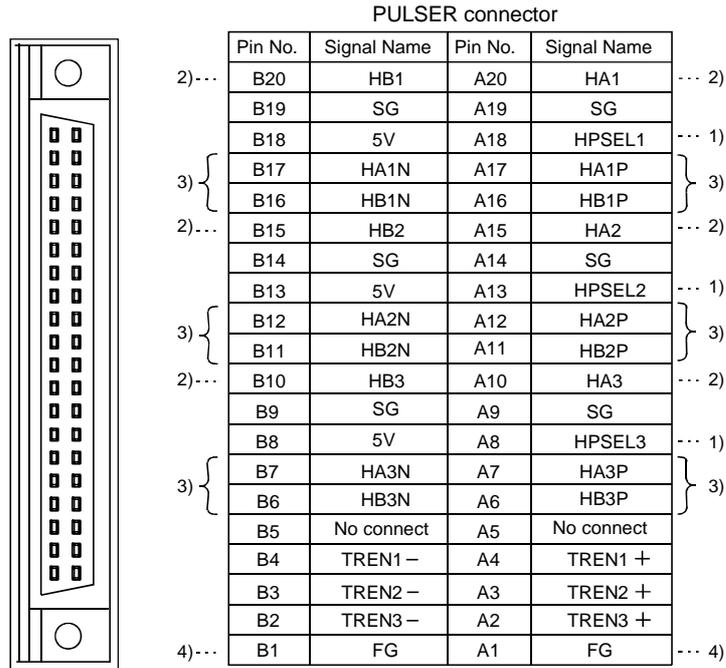
External input signal of the incremental synchronous encoder	Item	Number of points on one Q173PX
Tracking enable signal input	Input start function from incremental synchronous encoder	Each 1 point (Total 3 points)

(5) Connection of manual pulse generator interface module
 (a) The pin layout of the PULSER connector

Use the PULSER connector at the Q173PX module front to connect the manual pulse signals, incremental synchronous encoder signals.

The following pin layout of the Q173PX PULSER connector viewed from the front.

The pin layout and connection description of the PULSER connector are described below.



Applicable connector model name

- A6CON1 type soldering type connector
 - FCN-361J040-AU connector (FUJITSU TAKAMISAWA COMPONENT LIMITED)
 - FCN-360C040-B connector cover
 - A6CON2 type Crimp-contact type connector
 - A6CON3 type Pressure-displacement type connector
- } (Attachment)
 } (Optional)

- 1) : Input type from manual pulse generator/incremental synchronous encoder switched by HPSEL□.
 Not connection : Voltage-output type/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 HA1P/HA2P/HA3P, and the B-phase signal to HB1P/HB2P/HB3P.
- 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 inverse signal to HB1N/HB2N/HB3N.
- 4) : Connect the shield cable between manual pulse generator/incremental synchronous encoder and Q173PX at the FG signal.
- 5) : Connector/terminal block conversion modules cannot be used.

2 SYSTEM CONFIGURATION

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

Interface between Manual pulse generator (Differential output type)/ Incremental synchronous encoder

Input or Output	Signal name		Pin No.			Wiring example	Internal circuit	Specification	Description
			PULSER connector						
			Voltage-Output type						
1	2	3							
Input	Manual pulse generator, phase A	A+ HA□P	A17	A12	A7		<ul style="list-style-type: none"> Rated input voltage 5.5VDC or less HIGH level 2.0 to 5.25VDC LOW level 0.8VDC or less 26LS31 or equivalent 	<p>For connection manual pulse generator Phases A, B</p> <ul style="list-style-type: none"> Pulse width 20μs or more Rise, fall time •••1μs or less. Phase difference <p>Phase A </p> <p>Phase B </p> <p>(1) Positioning address increases if Phase A leads Phase B. (2) Positioning address decreases if Phase B leads Phase A.</p>	
		Manual pulse generator, phase B	B+ HB□P	A16	A11				A6
			B- HB□N	B16	B11				B6
	Select type signal	HPSEL□	A18	A13	A8	(Note-2)			
Power supply	P5 ^(Note-1)		B18	B13	B8				
	SG		A19 B19	A14 B14	A9 B9				

(Note-1) : The 5V(P5)DC power supply from the Q173PX must not be connected if a separated power supply is used as the Manual pulse generator/Incremental synchronous encoder power supply. Use a 5V stabilized power supply as a separated power supply. Any other power supply 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.

2 SYSTEM CONFIGURATION

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

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
		PULSER connector						
		Voltage-Output type						
1	2	3						
Input	Manual pulse generator, phase A HA□	A20	A15	A10		<ul style="list-style-type: none"> Rated input voltage 5.5VDC or less HIGH level 3 to 5.25VDC/ 2mA or less LOW level 1VDC or less/ 5mA or more 	For connection manual pulse generator Phases A, B <ul style="list-style-type: none"> Pulse width $20\mu\text{s}$ or more Rise, fall time $5\mu\text{s}$ or more (Duty ratio: $50\% \pm 25\%$) Rise, fall time $1\mu\text{s}$ or less Phase difference 	
	Manual pulse generator, phase B HB□	B20	B15	B10				
	Select type signal HPSEL□	A18	A13	A8				
Power supply	P5 ^(Note)	B18	B13	B8				
	SG	A19 B19	A14 B14	A9 B9				

(Note) : The 5V(P5)DC power supply from the Q173PX must not be connected if a separated power supply is used as the Manual pulse generator/Incremental synchronous encoder power supply.

Use a 5V stabilized power supply as a separated power supply. Any other power supply may cause a failure.

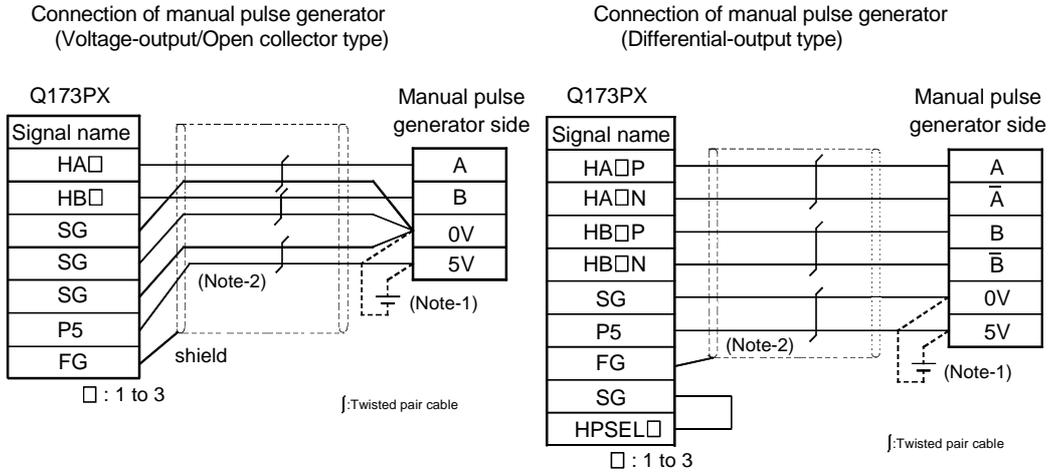
(d) Interface between PULSER connector and tracking enable signal

Interface between tracking enable signal

Input or Output	Signal name	Pin No.			Wiring example	Internal circuit	Specification	Description
		PULSER connector						
		1	2	3				
Input	Tracking enable	TREN□+	A4	A3	A2			Tracking enable signal input.
		TREN□-	B4	B3	B2			

2 SYSTEM CONFIGURATION

(6) Connection examples of manual pulse generator



(Note-1) : The 5V(P5)DC power supply from the Q173PX must not be connected if a separated power supply is used as the Manual pulse generator/Incremental synchronous encoder power supply.

Use a 5V stabilized power supply as a separated power supply. Any other power supply 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.

CAUTION

- If a separate power supply is used as the manual pulse generator/incremental synchronous encoder power supply, use a 5V stabilized power supply. Any other power supply may cause a failure.

2 SYSTEM CONFIGURATION

2.4.7 Manual pulse generator/Serial absolute synchronous encoder

(1) Table of the Manual pulse generator specifications

Item	Specifications
Model name	MR-HDP01
Ambient temperature	-10 to 60°C(14 to 140°F)
Pulse resolution	25PLS/rev(100 PLS/rev after magnification by 4)
Output method	Voltage-output(power supply voltage -1V or more), Output current = Up to 20mA
Power supply voltage	4.5 to 13.2VDC
Current consumption [mA]	60
Life time	1,000,000 revolutions (at 200r/min)
Permitted axial loads	Radial load : Up to 19.6N
	Thrust load : Up to 9.8N
Mass [kg(lb)]	0.4(0.88)
Number of max. revolution	Instantaneous Up to 600r/min. normal 200r/min
Pulse signal status	2 signals : A phase, B : phase, 90° phase
Friction torque	0.1N/m(at 20°C (68°F))

(2) Table of the Serial absolute synchronous encoder specifications

Item	Specifications
Model name	MR-HENC
Resolution	16384PLS/rev
Transmission method	Serial communications(connected to Q172EX)
Direction of increasing addresses	CCW(viewed from end of shaft)
Protective construction	IP52
Permitted speed	4300r/min
Permitted axial loads	Radial load : Up to 98N
	Thrust load : Up to 49N
Runout at input shaft tip	0.02mm(0.00079 inch) or less, 15mm(0.59 inch) from tip
Recommended coupling	Bellows coupling
Permitted angular acceleration	40000rad/s ²
Ambient temperature	-5 to 55°C(23 to 131°F)
Internal current consumption [A]	0.15
Mass [kg(lb)]	1.5 (3.3)
Connecting cable	MR-JHSCBL□M-H □=Cable length : 2m(6.56ft.), 5m(16.4ft.), 10m(32.8ft.), 20m(65.6ft.), 30m(98.4ft.)
Communications method	Differential driver/receiver conforming to RS422A
Transmission distance	Up to 30m(98.4ft.)

2 SYSTEM CONFIGURATION

2.4.8 A31TU-D3K□/A31TU-DNK□ Teaching unit (Japanese version only)

Teaching unit A31TU-D3K□/A31TU-DNK□ can be easily set the teaching of positioning point, each parameter settings, creation of servo program, servo monitor, servo test, and so on without the peripheral devices. (Motion CPU module Q173CPUN-T/Q172CPUN-T is usable only. Refer to the “A31TU-D Teaching Unit Operating Manual for the usable operating system software and version.)

(1) Selection of the teaching unit

There are no deadman switch and emergency stop terminal for the external safety circuit in a A31TU-DNK□.

Use the A31TU-D3K□ to raise safety more by the deadman switch or external safety circuit ^(Note).

Refer to the following table for selection of the teaching unit.

Item	A31TU-D3K□	A31TU-DNK□
3-position deadman switch	Provided (Normally open contact, double contact) Normally open contact is connected by gripping/releasing this switch.	—
Emergency stop switch (Push lock return reset type)	Provided (Normally closed contact, double contact) Normally closed contact is released by pushing switch. Normally closed contact is connected by turning to the right this switch.	Provided (Normally closed contact, double contact) Normally closed contact is released by pushing switch. Normally closed contact is connected by turning to the right this switch.
Terminal for external safety circuit	Provided (Emergency stop switch × 2, Deadman switch × 2, Emergency stop input to Motion CPU × 1)	—
Emergency stop input to Motion CPU	Connect to the external safety circuit. (Normally closed contact input) The emergency stop state of Motion CPU occurs by releasing the normally closed contact of external safety circuit.	Connect directly the emergency stop switch of A31TU-DNK□. (Normally closed contact input) The emergency stop state of Motion CPU occurs by pushing the emergency stop switch of A31TU-DNK□.
Connecting cable with Motion CPU	Q170TUD3CBL3M (Control panel connecting type)	Q170TUDNCBL3M (Control panel connecting type) Q170TUDNCBL03M-A (Direct connecting type)
Remark	It is used as the following cases. • When the deadman switch is used. • When the double contact raises safety by attaching the external safety circuit.	It is used as the following cases. • When the deadman switch is not used. • When the teaching unit is used with simple connecting.

REMARK

External safety circuit

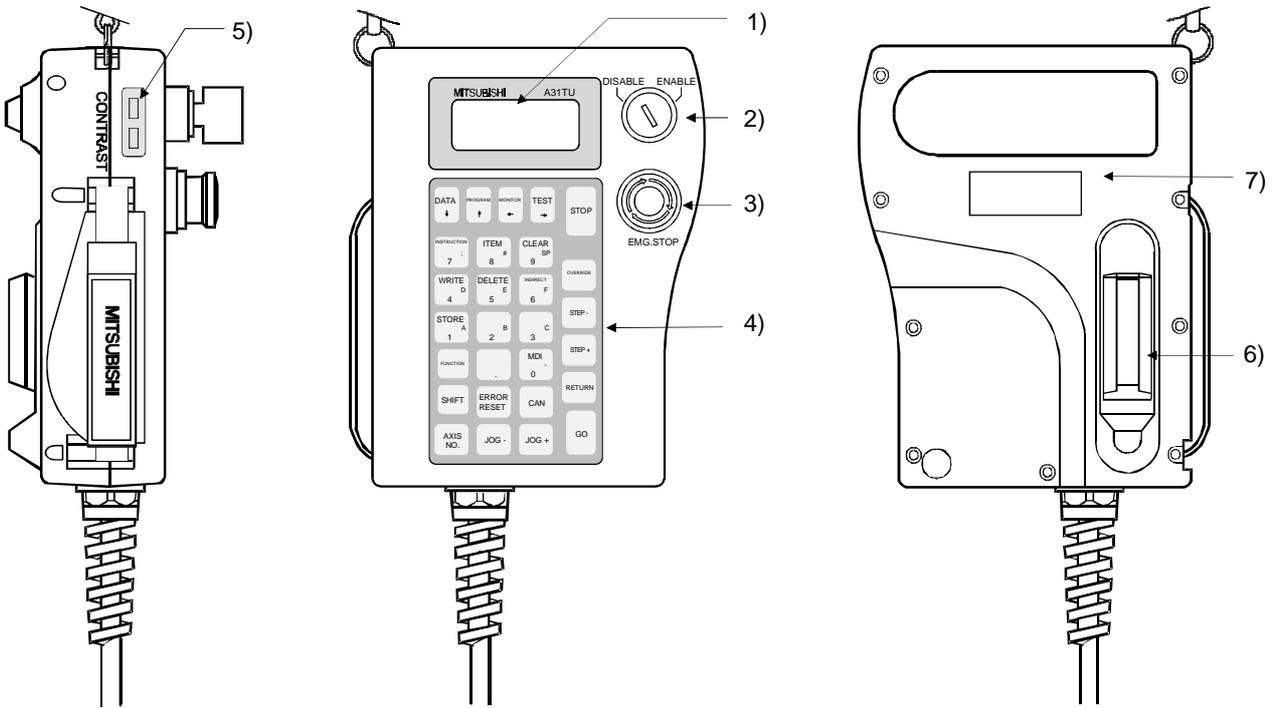
Construct the circuit (power supply OFF of servomotor, etc.) of parts which may occur machine breakdown and accidents due to abnormal operations outside of the Motion CPU in a fail-safe viewpoint, to avoid abnormal operations of whole system.

CAUTION

- If the teaching unit A31TU-D3K□ is released during operation, the emergency stop state of Motion CPU occurs, and the servomotor becomes coasting state.

2 SYSTEM CONFIGURATION

(2) A31TU-D3K□/A31TU-DNK□ Name of parts



No.	Name	Application
1)	Display	4 lines × 16 characters LCD display (With back-lighted auto light off)
2)	DISABLE/ENABLE key select switch	Switch the operation of teaching unit to DISABLE/ENABLE
3)	Emergency stop switch EMG.STOP button	Input the emergency stop signal to the Motion CPU. The emergency stop state of Motion CPU occurs by pushing the switch, and the servomotor stops and becomes coasting state. The emergency stop state is released by turning to the right this switch.
4)	Operation keys	Operation key of the teaching unit
5)	Contrast adjusting switch	Adjust the contrast of display.
6)	3-position deadman switch (A31TU-D3K□ only)	The emergency stop signal is input to the Motion CPU by the external safety circuit. The Motion CPU will be in the state which can be operated by holding the middle position of enable switch. The emergency stop state of Motion CPU occurs by gripping or releasing this switch, and the servomotor stops and becomes coasting state.
7)	Internal buzzer	Buzzer sounds at the operation key input or any alarm occurrence. (It is possible to switch off the buzzer at the key input by setting.)

2 SYSTEM CONFIGURATION

(3) Teaching unit specifications

Items		Specifications	
		A31TU-D3K□	A31TU-DNK□
Operation	Language	Japanese	
	Tact switch	28 keys for SV□	
	ENABLE/DISABLE switch	Operation enable/disable	
	Emergency stop switch	Push lock return reset type	
	Deadman switch	3-position switch	None
	Contrast adjusting switch	Shade/light	
Display method		4 lines × 16 characters LCD display	
Interface		Conforming RS-422	
Protective construction		IP54 equivalent	
Ambient temperature		0 to 40°C (32 to 104°F)	
5VDC power supply		Supplied from Motion CPU	
5VDC consumption current [A]		0.26	
Mass [kg]		1.74 (Including cable 5m (16.4ft.))	

POINTS
<p>(1) The total extended distance of cable between the Motion CPU and teaching unit is within [30m(98.4ft.)] including the A31TU-D3K□/A31TU-DNK□ cable [5m(16.4ft.)]</p> <p>(2) the teaching unit is shipped, a protection sheet is attached in the surface of the display and operation key to prevent the crack for conveyance. Remove a protection sheet to use. Operation and display check without removing a protection sheet are possible, however adhesives may remain in a teaching unit by secular change.</p> <p>(3) When the servomotor is operated by the JOG feed, etc. using the teaching unit (A31TU-D3K□) with deadman switch, operate it pushing the deadman switch at middle position. The emergency stop state of Motion CPU occurs by gripping or releasing this switch, and the servomotor stops and becomes coasting state.</p>

(4) Connection between the teaching unit and Motion CPU

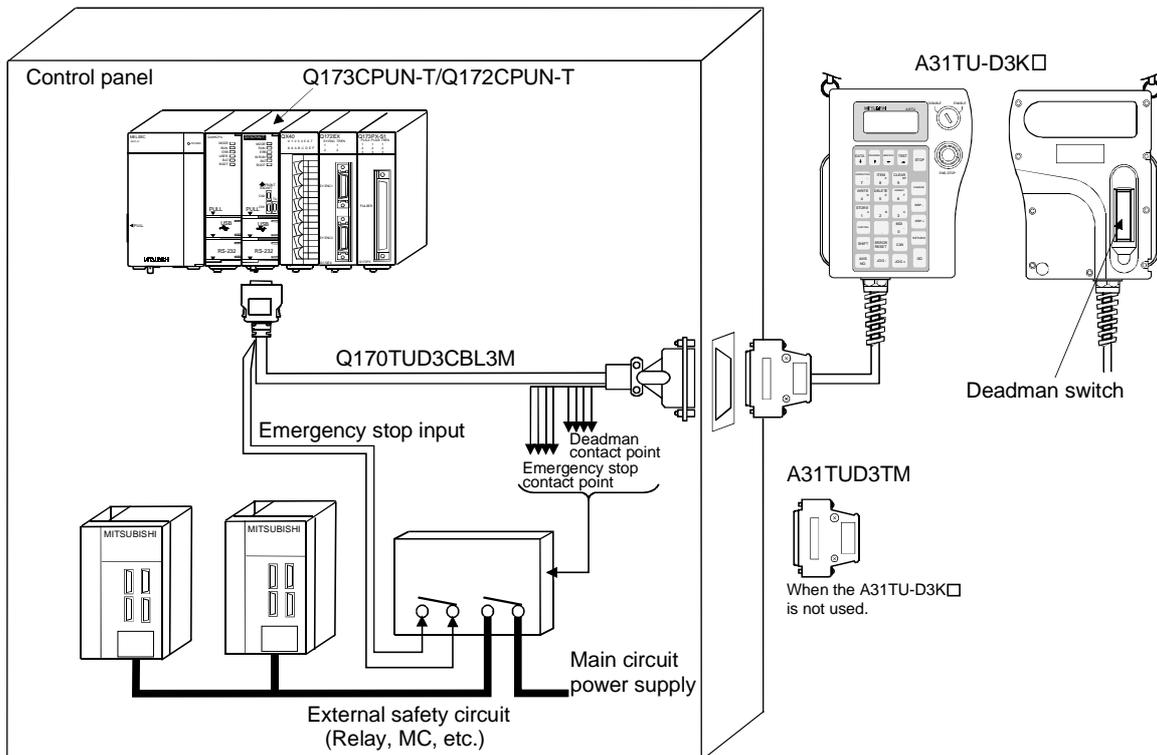
(a) Connection between the teaching unit (A31TU-D3K□) and Motion CPU (Q173CPUN-T/Q172CPUN-T)

- 1) Connect the cable for teaching unit (Q170TUD3CBL3M) between the TU connector of Motion CPU (Q173CPUN-T/Q172CPUN-T) and control panel. (Refer to the exterior dimensions of “Appendix 1.3 Cable for the teaching unit” and “Appendix 2.7 Connector”, when it is fit to the control panel.)
- 2) Connect the connector for external safety circuit (connector for emergency stop switch × 2 sets, connector for deadman switch × 2 sets and connector for emergency stop input to Motion CPU × 1 set) to the external safety circuit.
- 3) Connect the teaching unit (A31TU-D3K□) to the cable for teaching unit (Q170TUD3CBL3M) connected to the control panel.

2 SYSTEM CONFIGURATION

- 4) When the teaching unit (A31TU-D3K□) is not used, connect the short-circuit connector for teaching unit (A31TUD3TM) to the control panel side connector of the cable for teaching unit (Q170TUD3CBL3M).

Connection example between the cable for teaching unit (Q170TUD3CBL3M) and external safety circuit is shown below.



⚠ CAUTION

- Do not use it in the combination of the teaching unit without deadman switch (A31TU-DNK□) and cable for teaching unit with deadman switch (Q170TUD3CBL3M). The protective function stops working.
- When the teaching unit (A31TU-D3K□) is not used in the Motion CPU (Q173CPUN-T/Q172CPUN-T), connect the short-circuit connector for teaching unit (A31TUD3TM) to the control panel side connector of the cable for teaching unit (Q170TUD3CBL3M). If it is not connected, the emergency stop state of Motion CPU occurs, and the servomotor becomes coasting state.

(b) Connection between the teaching unit (A31TU-DNK□) and Motion CPU (Q173CPUN-T/Q172CPUN-T)

There are following two connecting method.

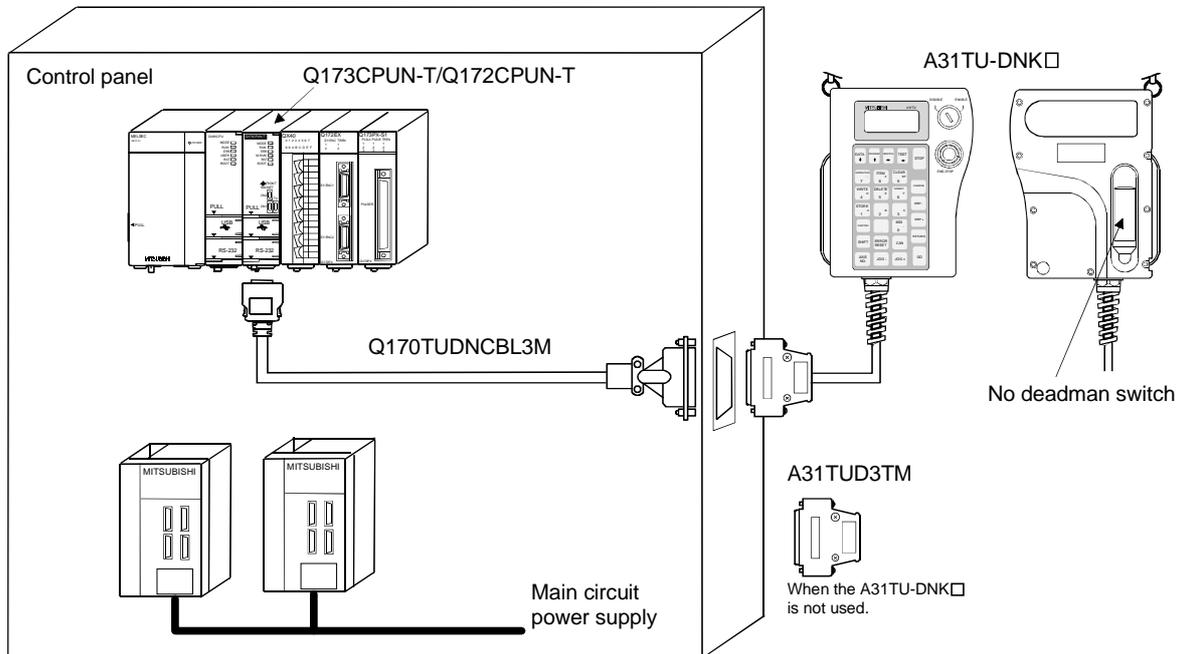
- When the connector is connected to the control panel.
- When the connector is connected directly in the control panel.

1) When the connector is connected to the control panel.

- a) Connect the cable for teaching unit (Q170TUDNCBL3M) between the TU connector of Motion CPU (Q173CPUN-T/Q172CPUN-T) and control panel. (Refer to the exterior dimensions of “Appendix 1.3 Cable for the teaching unit” and “Appendix 2.7 Connector”, when it is fit to the control panel.)
- b) Connect the teaching unit (A31TU-DNK□) to the cable for teaching unit (Q170TUDNCBL3M) connected to the control panel.
- c) When the teaching unit (A31TU-DNK□) is not used, connect the short-circuit connector for teaching unit (A31TUD3TM) to the control panel side connector of the cable for teaching unit (Q170TUDNCBL3M).

2 SYSTEM CONFIGURATION

Connection example between the cable for teaching unit (Q170TUDNCBL3M) is shown below.



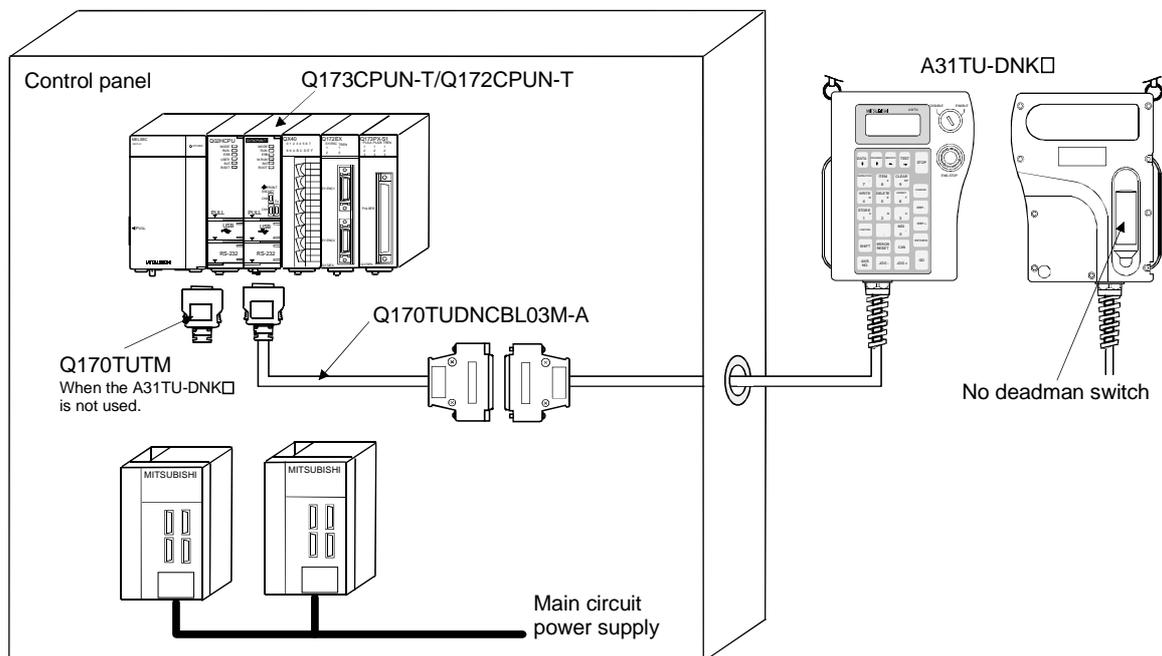
⚠ CAUTION

- Do not use it in the combination of the teaching unit with deadman switch (A31TU-D3K□) and cable for teaching unit without deadman switch (Q170TUDNCBL3M). The protective function stops working.
- When the teaching unit (A31TU-DNK□) is not used in the Motion CPU (Q173CPUN-T/Q172CPUN-T), connect the short-circuit connector for teaching unit (A31TUD3TM) to the control panel side connector of the cable for teaching unit (Q170TUDNCBL3M). If it is not connected, the emergency stop state of Motion CPU occurs, and the servomotor becomes coasting state.

2 SYSTEM CONFIGURATION

- 2) When the connector is connected directly in the control panel.
 - a) Connect the cable for teaching unit (Q170TUDNCBL03M-A) to the TU connector of Motion CPU (Q173CPUN-T/Q172CPUN-T) after connecting to the teaching unit (A31TU-DNK□).
 - b) When the teaching unit (A31TU-DNK□) is not used, connect the short-circuit connector for teaching unit (Q170TUTM) after removing a TU connector of cable for teaching unit (Q170TUDNCBL03M-A) from a TU connector of Motion CPU (Q173CPUN-T/Q172CPUN-T).

Connection example between the cable for teaching unit (Q170TUDNCBL03M-A) is shown below.



CAUTION

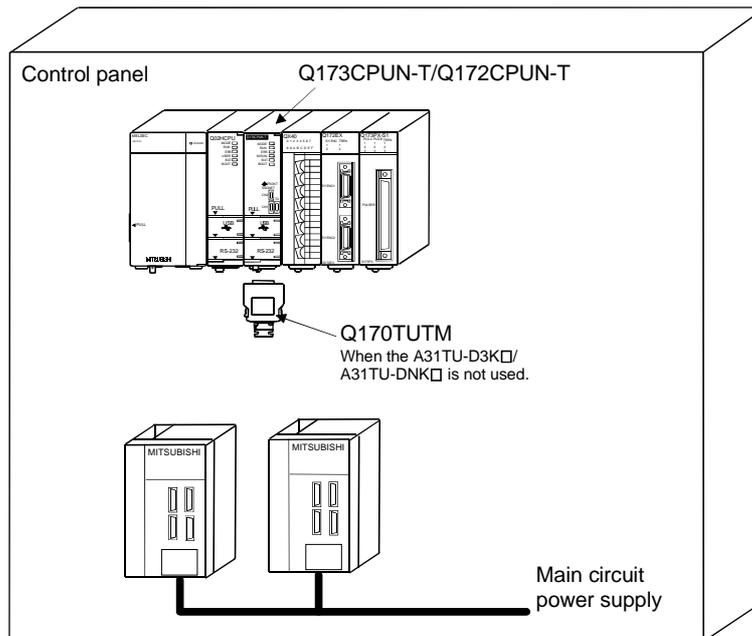
- Do not connect the A31TU-D3K□ to the cable for teaching unit (Q170TUDNCBL03M-A). The protective function stops working.
- Be sure to fix the relay portion of a connector which has connected the cable for teaching unit (Q170TUDNCBL03M-A) with teaching unit (A31TU-DNK□) so that impossible power is not applied for the connector of Motion CPU (Q173CPUN-T/Q172CPUN-T). A connector may be damaged.
- Do not pull a teaching unit (A31TU-DNK□). A connector may be damaged.
- When a teaching unit (A31TU-DNK□) is removed, first be sure to remove a TU connector of Motion CPU (Q173CPUN-T/Q172CPUN-T) so that impossible power is not applied for the connector. If a connector of teaching unit (A31TU-DNK□) is removed connecting a TU connector of Motion CPU (Q173CPUN-T/Q172CPUN-T), a TU connector of Motion CPU (Q173CPUN-T/Q172CPUN-T) may be damaged.
- When the teaching unit (A31TU-DNK□) is not used in the Motion CPU (Q173CPUN-T/Q172CPUN-T), connect the short-circuit connector for teaching unit (Q170TUTM) after removing a TU connector of cable for teaching unit (Q170TUDNCBL03M-A) from a TU connector of Motion CPU (Q173CPUN-T/Q172CPUN-T). If it is not connected, the emergency stop state of Motion CPU occurs, and the servomotor becomes coasting state.

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(c) When not using a teaching unit (A31TU-D3K□/A31TU-DNK□)

Connect a short-circuit connector for teaching unit (Q170TUTM) to a TU connector of Motion CPU (Q173CPUN-T/Q172CPUN-T).

Connection example without teaching unit (A31TU-D3K□/A31TU-DNK□) is shown below.



⚠ CAUTION

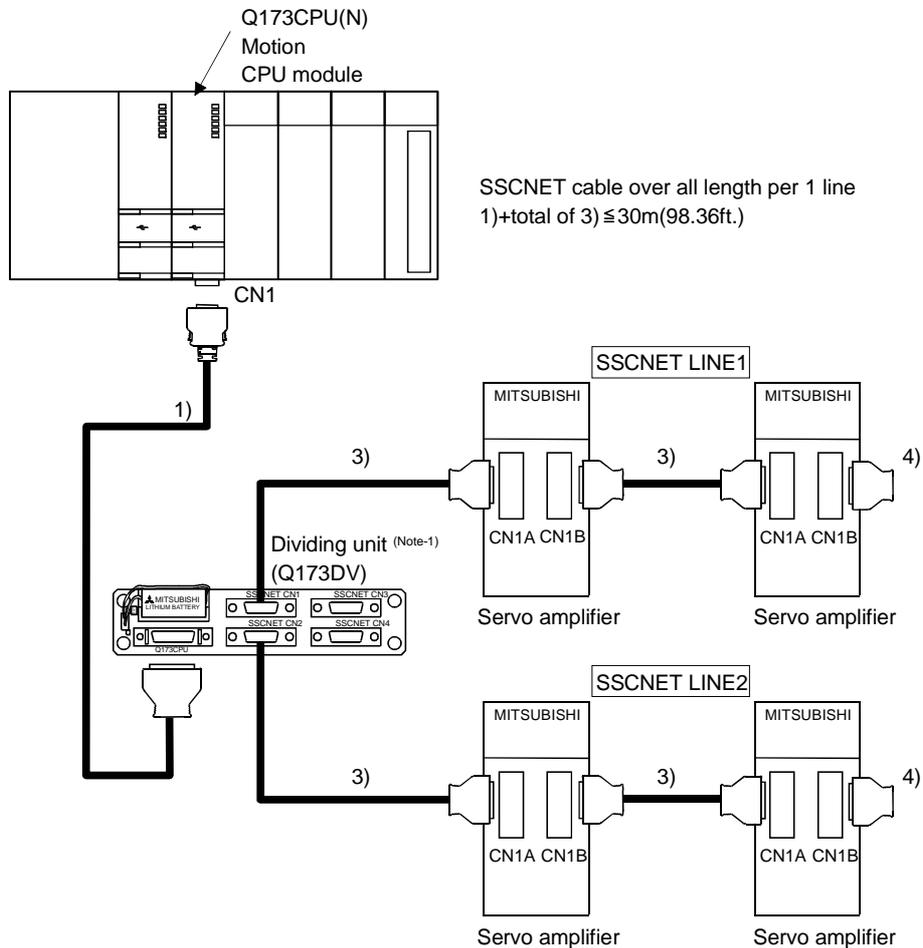
- When the teaching unit (A31TU-D3K□/A31TU-DNK□) is not used in the Motion CPU (Q173CPUN-T/Q172CPUN-T), connect the short-circuit connector for teaching unit (Q170TUTM) to a TU connector of Motion CPU (Q173CPUN-T/Q172CPUN-T). If it is not connected, the emergency stop state of Motion CPU occurs, and the servomotor becomes coasting state.

2 SYSTEM CONFIGURATION

2.4.9 Connection method with SSCNET cables and terminal connector

This section explains how to connect between Motion CPU module and servo amplifiers. Connected between the Motion CPU module and servo amplifiers by the SSCNET. When using the Q172CPU(N), can be used only one SSCNET line for connection to servo amplifier(Connect to CN1). The Q173CPU(N) can be used up to four SSCNET lines for servo amplifier connection(Connect to CN1). One SSCNET line allows connection of up to eight servo amplifiers. Also, SSCNET cables or terminal connector are different depending on the servo amplifiers.

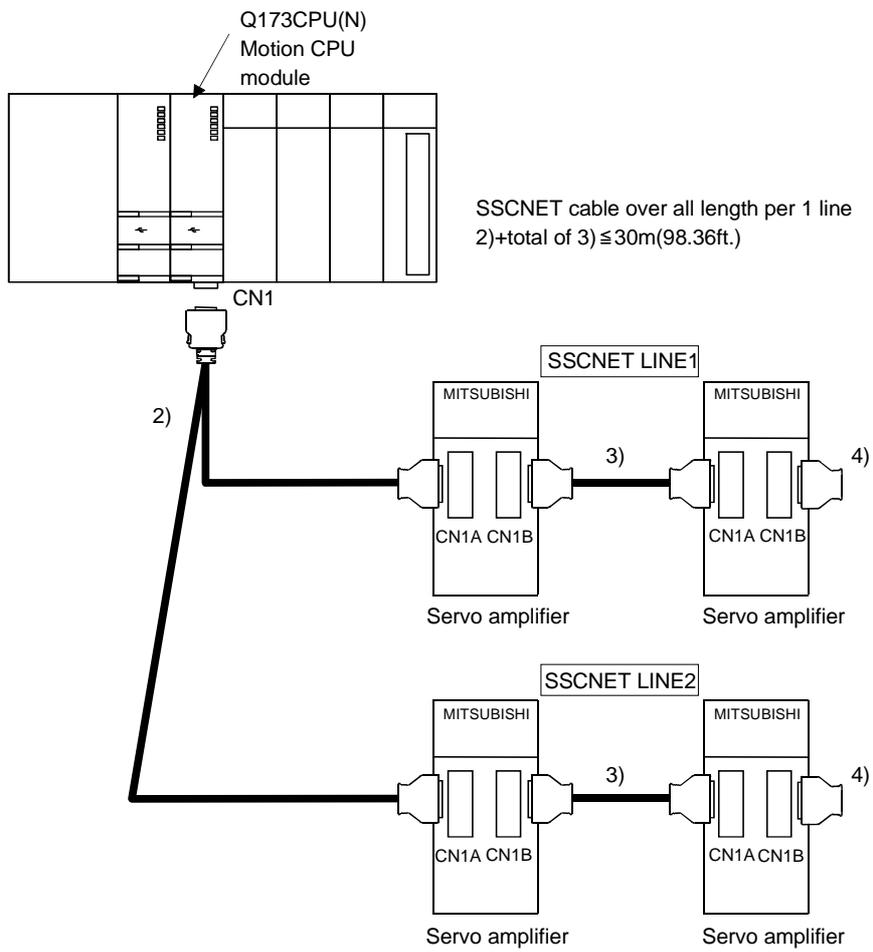
- (1) Connection between Q173CPU(N) and servo amplifiers
 (a) When using the Dividing unit/external battery



(Note-1) : When using the external battery, set the Battery (A6BAT/MR-BAT) into the Dividing unit (Q173DV).

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(b) When using the Dividing cable



2 SYSTEM CONFIGURATION

List of SSCNET cable model name

No.	Part name	Model name ^(Note-2)	Cable length	Description
1)	Motion CPU ↔ Dividing unit	Q173DVCBL□M	0.5m(1.64ft.), 1m(3.28ft.)	Q173CPU(N) ↔ Dividing unit (Q173DV)
2)	Motion CPU ↔ Servo amplifier ^(Note-1)	Q173J2B△CBL□M ^(Note-3)	0.5m(1.64ft.), 1m(3.28ft.), 5m(16.4ft.)	Q173CPU(N) ↔ Servo amplifier (MR-J2□-B)
		Q173HB△CBL□M ^(Note-3)	0.5m(1.64ft.), 1m(3.28ft.), 5m(16.4ft.)	Q173CPU(N) ↔ Servo amplifier (MR-H-BN)
3)	Servo amplifier ↔ Servo amplifier Dividing unit ↔ Servo amplifier	MR-J2HBUS□M	0.5m(1.64ft.), 1m(3.28ft.), 5m(16.4ft.)	Servo amplifier (MR-J2□-B) ↔ Servo amplifier (MR-J2□-B), Dividing unit (Q173DV) ↔ Servo amplifier (MR-J2□-B)
		MR-J2HBUS□M-A	0.5m(1.64ft.), 1m(3.28ft.), 5m(16.4ft.)	Servo amplifier (MR-H-BN) ↔ Servo amplifier (MR-J2□-B), Dividing unit (Q173DV) ↔ Servo amplifier (MR-H-BN)
		MR-HBUS□M	0.5m(1.64ft.), 1m(3.28ft.), 5m(16.4ft.)	Servo amplifier (MR-H-BN) ↔ Servo amplifier (MR-H-BN)
		Q172J2BCBL□M	0.5m(1.64ft.), 1m(3.28ft.), 5m(16.4ft.)	Servo amplifier (MR-J2□-B) ↔ FR-V5NS ^(Note-4) , Dividing unit (Q173DV) ↔ FR-V5NS ^(Note-4)
		Q172HBCBL□M	0.5m(1.64ft.), 1m(3.28ft.), 5m(16.4ft.)	Servo amplifier (MR-H-BN) ↔ FR-V5NS ^(Note-4)
		FR-V5NSCBL□	0.5m(1.64ft.), 1m(3.28ft.), 5m(16.4ft.), 10m(32.8ft.), 20m(65.6ft.)	FR-V5NS ^(Note-4) ↔ FR-V5NS ^(Note-4)
4)	Terminal connector	MR-TM	—	Connected to the last MR-H-BN by SSCNET
		MR-A-TM	—	Connected to the last MR-J2□-B by SSCNET

(Note-1) : Branch from a connector on the Q173CPU(N) side according to the number of lines.

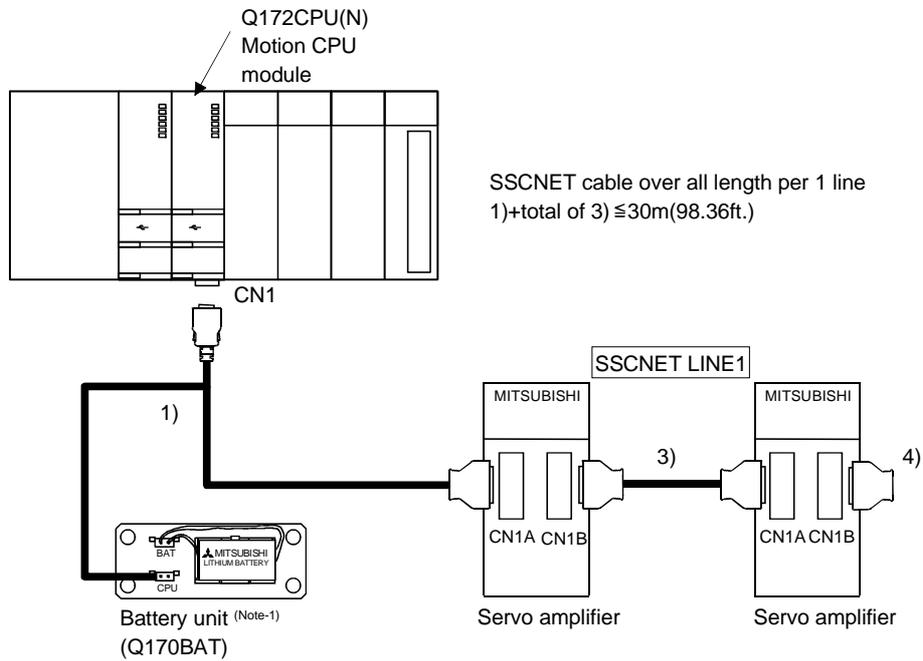
(Note-2) : □=cable length

(Note-3) : △=SSCNET LINE No.(none(LINE1), 2(LINE1/2), 4(LINE1/2/3/4))

(Note-4) : SSCNET communication option for vector inverter

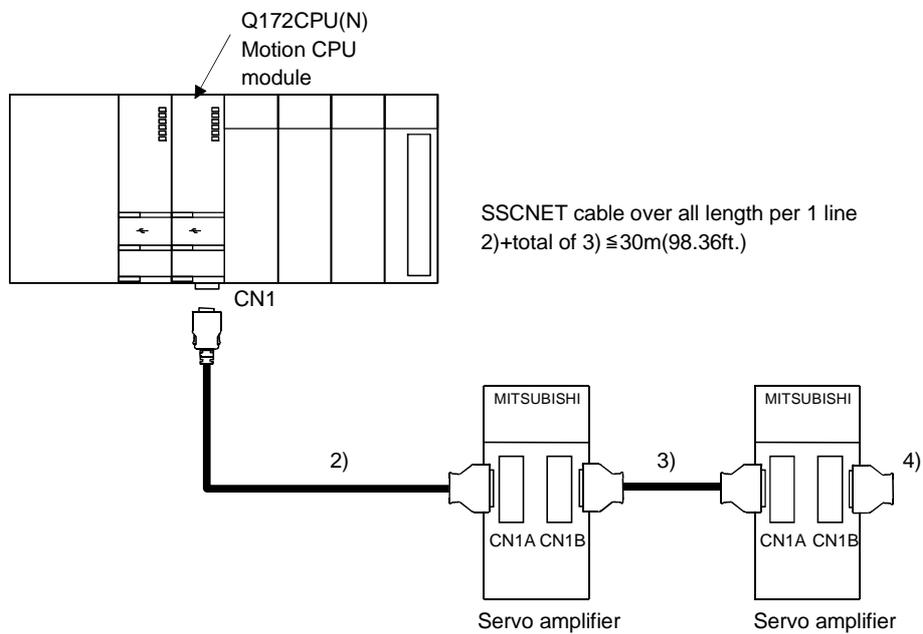
2 SYSTEM CONFIGURATION

(2) Connection between Q172CPU(N) and servo amplifiers (a) When using the external battery



(Note-1) : When using the external battery, set the Battery (A6BAT/MR-BAT) into the battery unit (Q170BAT).

(b) When not using the external battery



2 SYSTEM CONFIGURATION

List of SSCNET cable model name

No.	Part name	Model name ^(Note-1)	Cable length	Description
1)	Motion CPU ↔ Servo amplifier Battery unit	Q172J2BCBL□M-B	0.5m(1.64ft.), 1m(3.28ft.), 5m(16.4ft.)	Q172CPU(N) ↔ Servo amplifier (MR-J2□-B) Battery unit (Q170BAT)
		Q172HBCBL□M-B	0.5m(1.64ft.), 1m(3.28ft.), 5m(16.4ft.)	Q172CPU(N) ↔ Servo amplifier (MR-H-BN) Battery unit (Q170BAT)
2)	Motion CPU ↔ Servo amplifier	Q172J2BCBL□M	0.5m(1.64ft.), 1m(3.28ft.), 5m(16.4ft.)	Q172CPU(N) ↔ Servo amplifier (MR-J2□-B)
		Q172HBCBL□M	0.5m(1.64ft.), 1m(3.28ft.), 5m(16.4ft.)	Q172CPU(N) ↔ Servo amplifier (MR-H-BN)
		FR-V5NSCBL□	0.5m(1.64ft.), 1m(3.28ft.), 5m(16.4ft.), 10m(32.8ft.), 20m(65.6ft.)	Q172CPU(N) ↔ FR-V5NS ^(Note-2)
3)	Servo amplifier ↔ Servo amplifier	MR-J2HBUS□M	0.5m(1.64ft.), 1m(3.28ft.), 5m(16.4ft.)	Servo amplifier (MR-J2□-B) ↔ Servo amplifier (MR-J2□-B)
		MR-J2HBUS□M-A	0.5m(1.64ft.), 1m(3.28ft.), 5m(16.4ft.)	Servo amplifier (MR-H-BN) ↔ Servo amplifier (MR-J2□-B)
		MR-HBUS□M	0.5m(1.64ft.), 1m(3.28ft.), 5m(16.4ft.)	Servo amplifier (MR-H-BN) ↔ Servo amplifier (MR-H-BN)
		Q172J2BCBL□M	0.5m(1.64ft.), 1m(3.28ft.), 5m(16.4ft.)	Servo amplifier (MR-J2□-B) ↔ FR-V5NS ^(Note-2)
		Q172HBCBL□M	0.5m(1.64ft.), 1m(3.28ft.), 5m(16.4ft.)	Servo amplifier (MR-H-BN) ↔ FR-V5NS ^(Note-2)
		FR-V5NSCBL□	0.5m(1.64ft.), 1m(3.28ft.), 5m(16.4ft.), 10m(32.8ft.), 20m(65.6ft.)	FR-V5NS ^(Note-2) ↔ FR-V5NS ^(Note-2)
4)	Terminal connector	MR-TM	—	Connected to the last MR-H-BN by SSCNET
		MR-A-TM	—	Connected to the last MR-J2□-B by SSCNET

(Note-1) : □=cable length

(Note-2) : SSCNET communication option for vector inverter

2 SYSTEM CONFIGURATION

(3) Cable specifications

(a) Q172J2BCBL□M (-B)

Model name	Q172J2BCBL05M(-B)	Q172J2BCBL1M(-B)	Q172J2BCBL5M(-B)
Item			
Cable length [m(ft.)]	0.5(1.64)	1(3.28)	5(16.4)

(b) Q172HBCBL□M (-B)

Model name	Q172HBCBL05M(-B)	Q172HBCBL1M(-B)	Q172HBCBL5M(-B)
Item			
Cable length [m(ft.)]	0.5(1.64)	1(3.28)	5(16.4)

(c) Q173J2B△CBL□M

Model name	Q173J2B△CBL05M	Q173J2B△CBL1M	Q173J2B△CBL5M
Item			
Cable length [m(ft.)]	0.5(1.64)	1(3.28)	5(16.4)

△= SSCNET LINE No. : none(LINE 1), 2(LINE 2), 4(LINE 4)

(d) Q173HB△CBL□M

Model name	Q173HB△CBL05M	Q173HB△CBL1M	Q173HB△CBL5M
Item			
Cable length [m(ft.)]	0.5(1.64)	1(3.28)	5(16.4)

△= SSCNET LINE No. : none(LINE 1), 2(LINE 2), 4(LINE 4)

(e) Q173DVCBL□M

Model name	Q173DVCBL05M	Q173DVCBL1M
Item		
Cable length [m(ft.)]	0.5(1.64)	1(3.28)

(f) MR-HBUS□M

Model name	MR-HBUS05M	MR-HBUS1M	MR-HBUS5M
Item			
Cable length [m(ft.)]	0.5(1.64)	1(3.28)	5(16.4)

(g) MR-J2HBUS□M (-A)

Model name	MR-J2HBUS05M(-A)	MR-J2HBUS1M(-A)	MR-J2HBUS5M(-A)
Item			
Cable length [m(ft.)]	0.5(1.64)	1(3.28)	5(16.4)

2 SYSTEM CONFIGURATION

(h) FR-V5NSCBL□

Model name	FR-V5NSCBL005	FR-V5NSCBL01	FR-V5NSCBL05	FR-V5NSCBL10	FR-V5NSCBL20
Cable length [m(ft.)]	0.5(1.64)	1(3.28)	5(16.4)	10(32.8)	20(65.6)

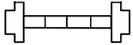
(4) Connection example with servo amplifiers

As the SSCNET cables or terminal connector is different depending on the servo amplifiers, refer to the following connection example.

The SSCNET cables and terminal connector used in the connection example are any of the models shown in the following table.

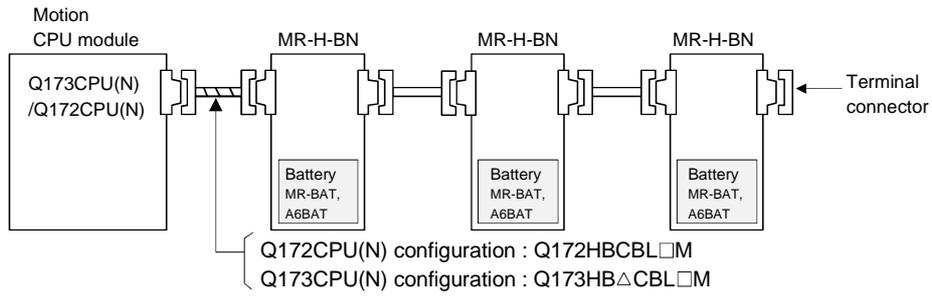
When absolute position detection control is executed, installed battery(MR-BAT/A6BAT) to servo amplifier.

When the vector inverter (FR-V5□0-□) is connected, fix the ferrite core to the SSCNET cable. (Refer to “SSCNET communication option FR-V5NS operating manual” for details.)

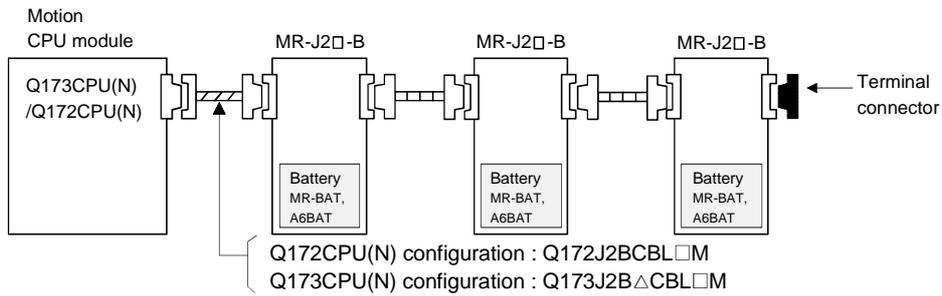
Part name	Model name	Depiction in connection example
Servo amplifier to servo amplifier SSCNET cable	MR-HBUS□M	
	MR-J2HBUS□M	
	MR-J2HBUS□M-A	
	FR-V5NSCBL□	
Motion CPU to servo amplifier SSCNET cable	Q173HB△CBL□M/ Q172HBCBL□M(-B)	
	Q173J2B△CBL□M/ Q172J2BCBL□M(-B)	
Motion CPU to Dividing unit SSCNET cable	Q173DVCBL□M	
Terminal connector	MR-TM	
	MR-A-TM	

2 SYSTEM CONFIGURATION

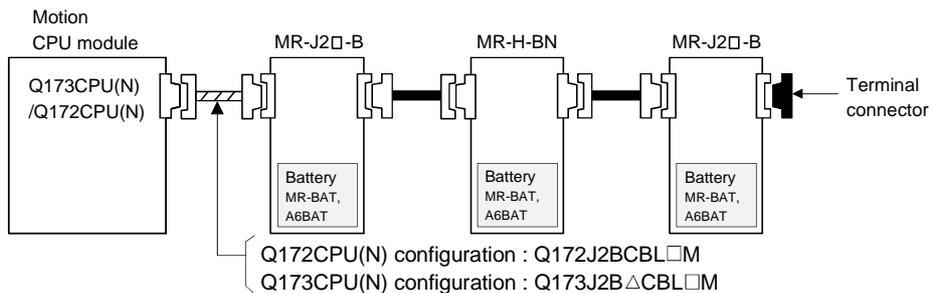
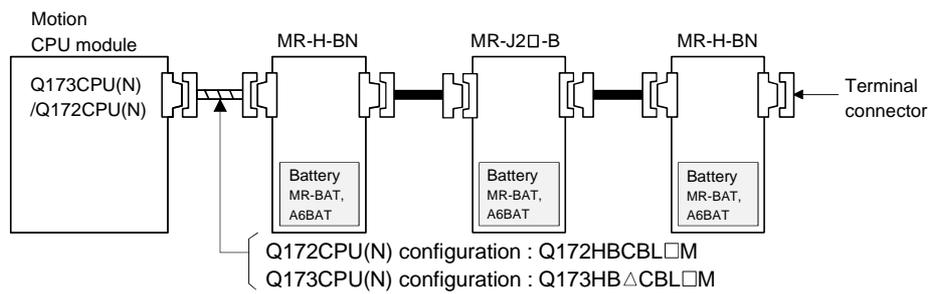
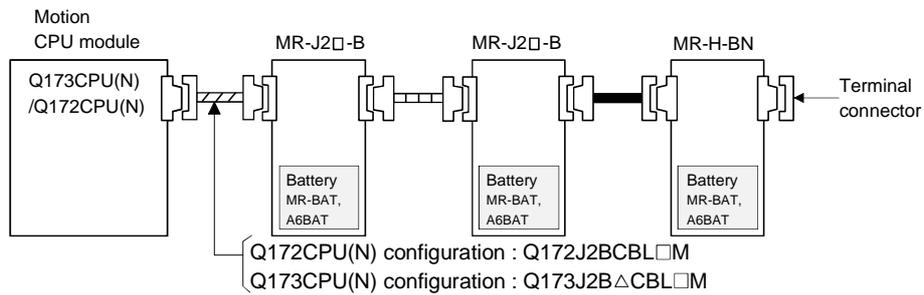
(a) MR-H-BN configuration



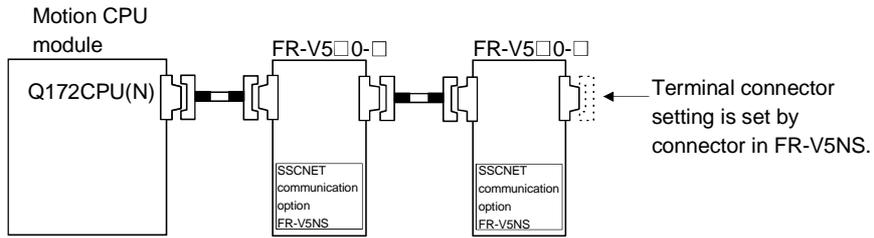
(b) MR-J2□-B configuration



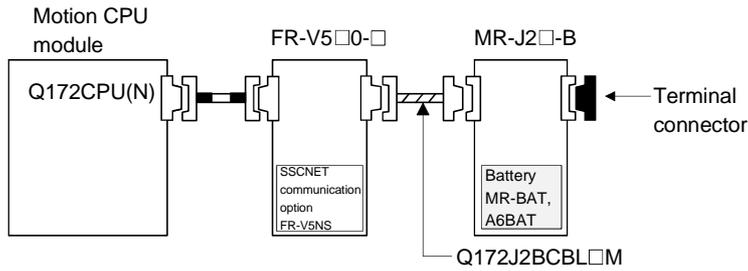
(c) MR-J2□-B/MR-H-BN configuration



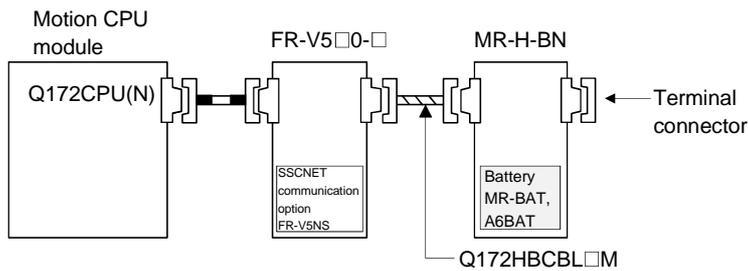
(d) FR-V5□0-□ + FR-V5□0-□ configuration



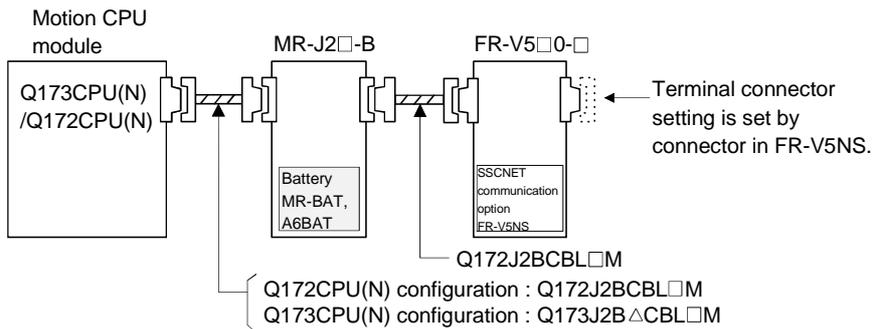
(e) FR-V5□0-□ + MR-J2□-B configuration



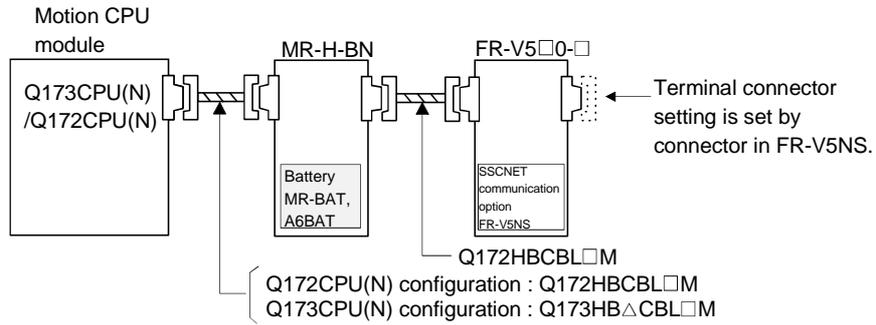
(f) FR-V5□0-□ + MR-H-BN configuration



(g) MR-J2□-B + FR-V5□0-□ configuration



(h) MR-H-BN + FR-V5□0--□ configuration

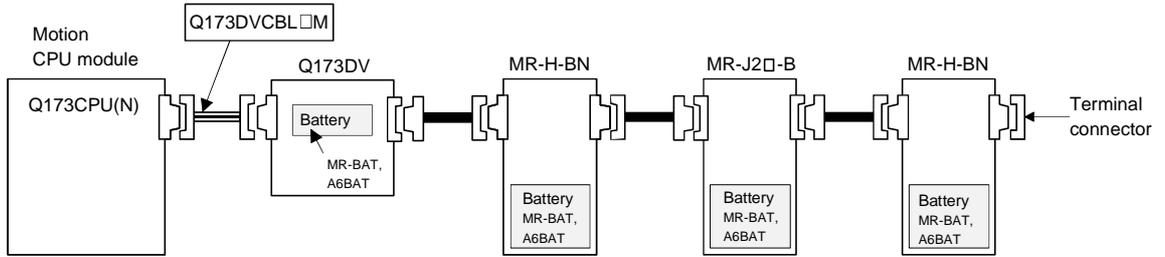


(i) When using the external battery

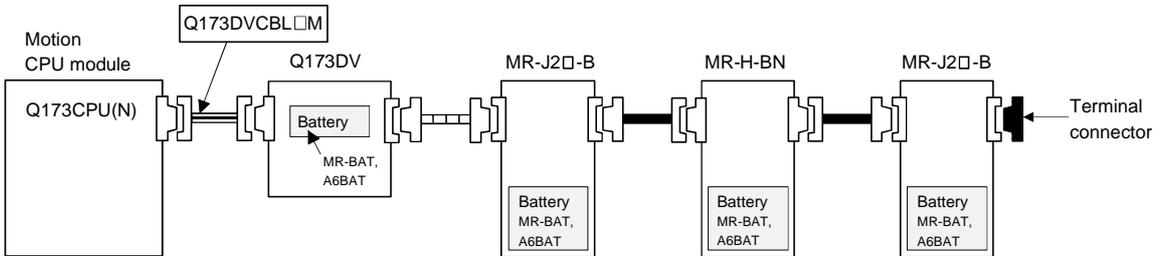
As the SSCNET cable used depend on the servo amplifiers, when using the external battery, refer to the following connection example.

1) Example of Q173CPU(N)

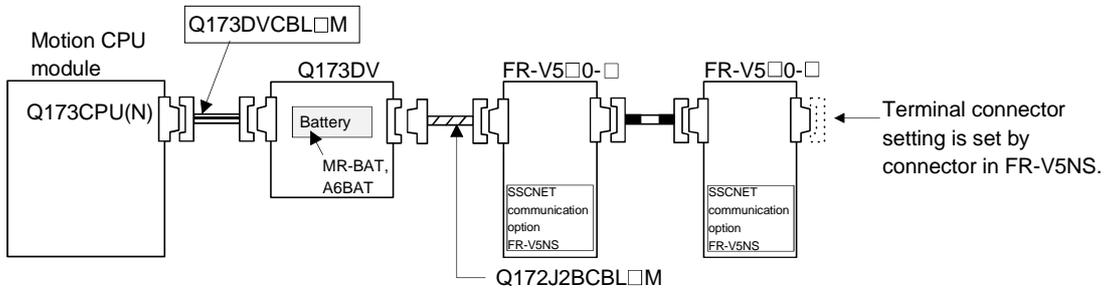
- MR-H-BN + MR-J2□-B + MR-H-BN configuration



- MR-J2□-B + MR-H-BN + MR-J2□-B configuration

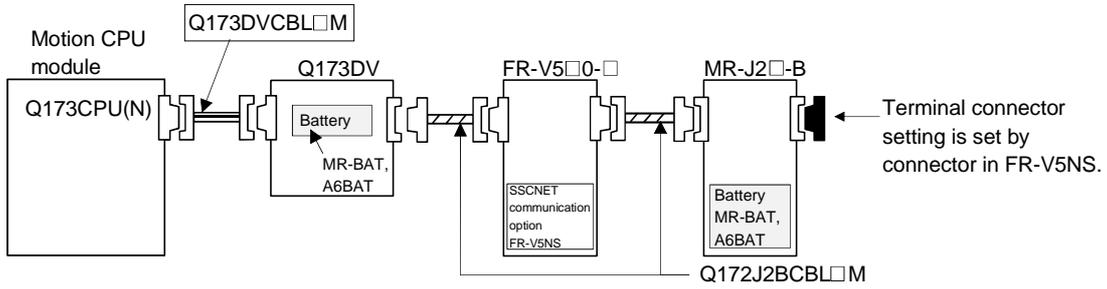


- FR-V5□0-□ + FR-V5□0-□ configuration

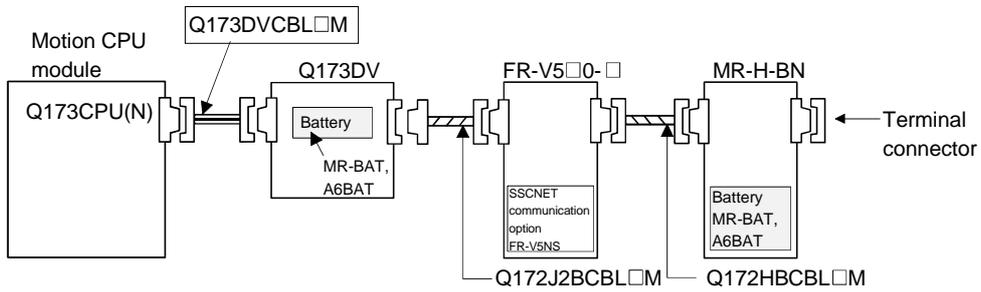


2 SYSTEM CONFIGURATION

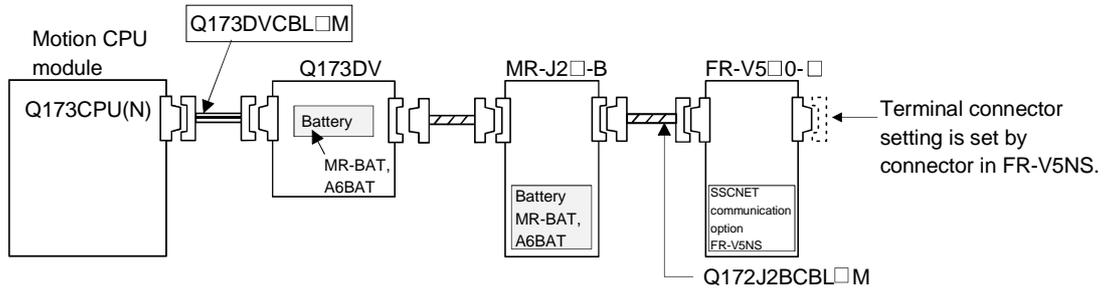
• FR-V5□0-□ + MR-J2□-B configuration



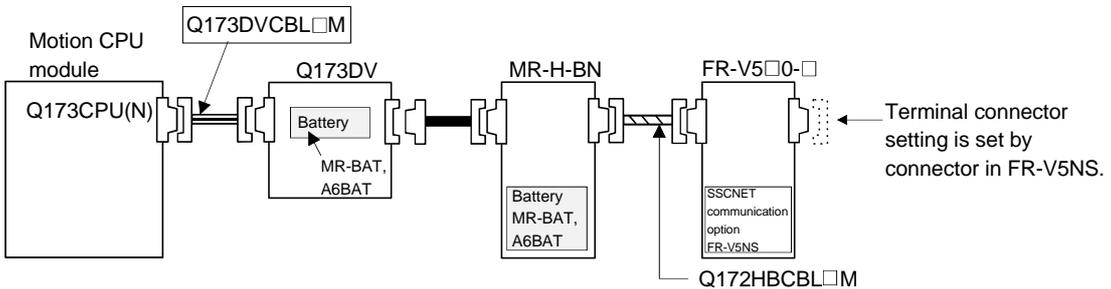
• FR-V5□0-□ + MR-H-BN configuration



• MR-J2□-B + FR-V5□0-□ configuration

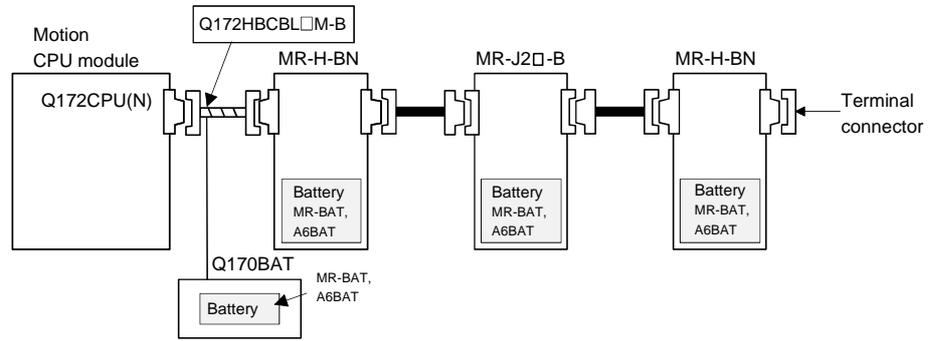


• MR-H-BN + FR-V5□0-□ configuration

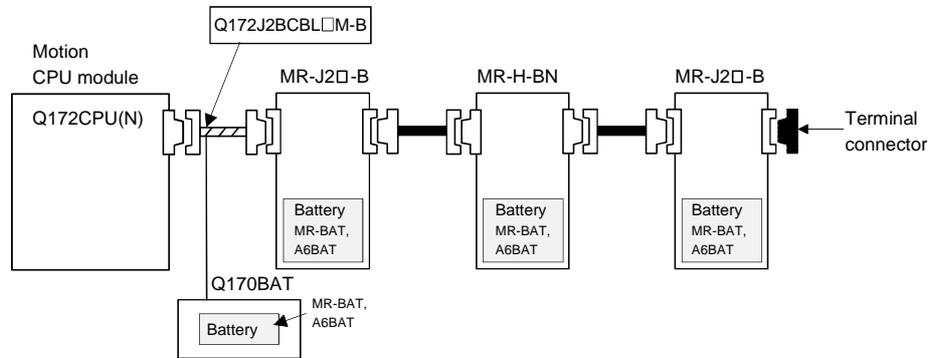


2) Example of Q172CPU(N)

- MR-H-BN + MR-J2□-B + MR-H-BN configuration



- MR-J2□-B + MR-H-BN + MR-J2□-B configuration



2 SYSTEM CONFIGURATION

(5) Setting of the servo amplifier axis numbers (dno.) and axis No.

The axis No.s are used to set the axis numbers of the SSCNET connected servo amplifiers in the program. Axis No.s 1 to 32 can be set for the Q173CPU(N), 1 to 8 for the Q172CPU(N). To set the axis No.s, assign the axis No.s to the axis numbers (dno.) set with the axis selection switches (rotary switch) of the servo amplifiers (Positions 0 to 7 of the rotary switch correspond to d1 to d8 on the system settings screen.) to each SSCNET line in the system settings of the programming software package.

You cannot set the same axis number (dno.) and axis No.(dno.) more than once.

Correspondences between dno.s and rotary switches of servo amplifier

dno. (Note)	SSCNET LINE	Servo amplifier's rotary switch
1	1	"0"
2	1	"1"
3	1	"2"
4	1	"3"
5	1	"4"
6	1	"5"
7	1	"6"
8	1	"7"

dno. (Note)	SSCNET LINE	Servo amplifier's rotary switch
1	2	"0"
2	2	"1"
3	2	"2"
4	2	"3"
5	2	"4"
6	2	"5"
7	2	"6"
8	2	"7"

dno.(Note)	SSCNET LINE	Servo amplifier's rotary switch
1	3	"0"
2	3	"1"
3	3	"2"
4	3	"3"
5	3	"4"
6	3	"5"
7	3	"6"
8	3	"7"

dno. (Note)	SSCNET LINE	Servo amplifier's rotary switch
1	4	"0"
2	4	"1"
3	4	"2"
4	4	"3"
5	4	"4"
6	4	"5"
7	4	"6"
8	4	"7"

(Note) : dno. is the servo amplifier axis numbers displayed in the system settings of the programming software package. Set the axis No. relative to the dno. in system settings.

The Dividing unit (Q173DV) and the SSCNET cables (Q173J2B△CBL□M/ Q173HB△CBL□M) between the Motion CPU and servo amplifiers divide signals allocated in CN1 of the Q173CPU(N) into each of the four lines. The following table shows correspondence between the connector No. after the division and the SSCNET line No. .

Correspondences between SSCNET LINE No. and connector No.

SSCNET LINE No.	Connector No. of the Dividing unit	Connector No. of the SSCNET cable
1	SSCNET CN1	1
2	SSCNET CN2	2
3	SSCNET CN3	3
4	SSCNET CN4	4

(Note) : SSCNET LINE No. Q173CPU(N) : 4 lines / Q172CPU(N) : 1 line.

2 SYSTEM CONFIGURATION

2.4.10 External battery

This section describes the battery specifications which used Motion CPU, handling precautions and equipments.

(1) External battery specifications(For Motion CPU module)

Model name	A6BAT/MR-BAT
Item	
Classification	Manganese dioxide lithium primary battery
Normal voltage [V]	3.6
Battery discharge capacity [mAh]	1600
Battery warranty period	5 years
Lithium content [g]	0.48
Applications	Continuous power off (For IC-RAM back-up of the Q173CPU(N)/Q172CPU(N))
Exterior dimensions [mm(inch)]	φ 16×30

(Note) : The 44th Edition of the IATA (International Air Transportation Association) Dangerous Goods Regulations was effected in January 1st, 2003 and administered immediately.

In this edition, the provisions relating to lithium and lithium ion batteries have been revised to strengthen regulations on the air transportation of battery.

This battery is not dangerous goods (not class 9). Therefore, these batteries of 24 units or less are not subject to the regulations.

These batteries more than 24 units require packing based on Packing Instruction 903.

If you need the self-certification form for the battery safety test, contact Mitsubishi.

For more information, contact Mitsubishi.

(2) Q173CPU(N)/Q172CPU(N) back-up by the external battery

When using the external battery, set the external battery(A6BAT/MR-BAT) in the system settings.

Item		Guaranteed time (MIN) [h]	Actual time(TYP) [h]
Continuous power off time	External battery use	60000	240000

(3) External battery and SSCNET cable

When using the external battery, install A6BAT/MR-BAT to the Dividing unit or Battery unit. Also be sure the following cables.

Item	Installation location of the external battery	SSCNET cable
Q173CPU(N)	Q173DV	Q173DVCBL□M
Q172CPU(N)	Q170BAT	Q172J2BCBL□M-B (For MR-J2□-B)/ Q172HBCBL□M-B (For MR-H-BN)

 CAUTION

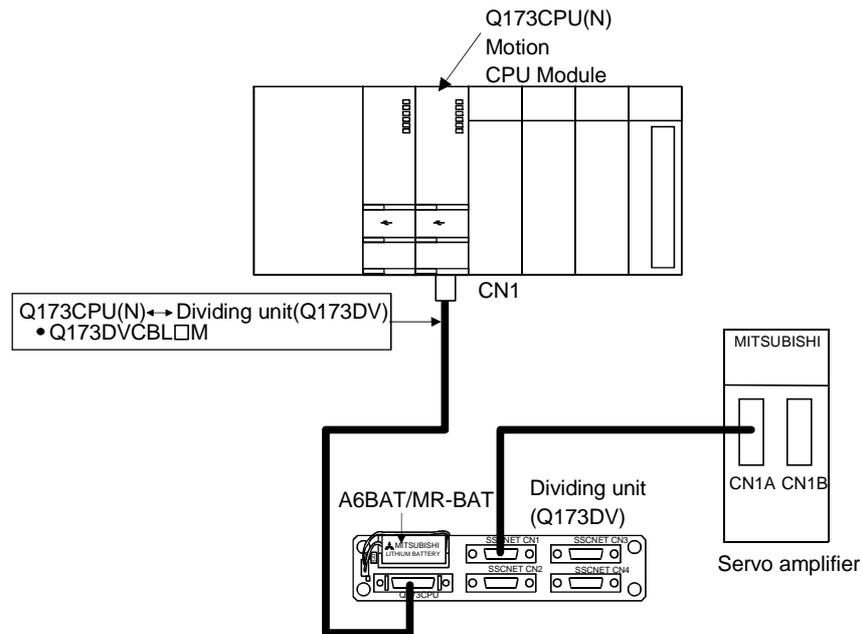
- Do not short a battery.
- Do not charge a battery.
- Do not disassemble a battery.
- Do not burn a battery.
- Do not overheat a battery.
- Do not solder the battery terminal.
- When using the external battery, be sure to select " the external battery use " in the system settings. If not setting the external battery, the back-up data of Motion CPU may not back up, since the battery voltage detection error is not detected.

2 SYSTEM CONFIGURATION

(a) Connection with Q173CPU(N)

Connection procedure of Q173CPU(N) and A6BAT/MR-BAT

- 1) Set the A6BAT/MR-BAT to the Dividing unit(Q173DV)
- 2) Connect the A6BAT/MR-BAT connector to the BAT connector of the Q173DV.
- 3) Connect between Q173CPU(N) and Q173DV by the SSCNET cable (Q173DVCBL□M)

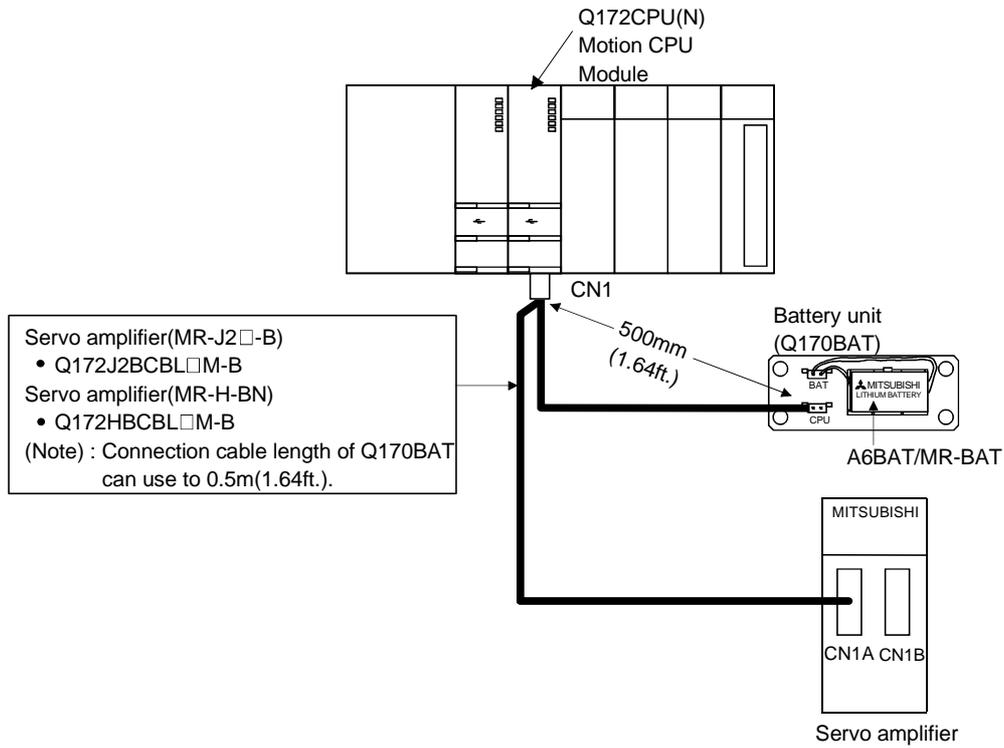


2 SYSTEM CONFIGURATION

(b) Connection with Q172CPU(N)

Connection procedure of Q172CPU(N) and A6BAT/MR-BAT

- 1) Set the A6BAT/MR-BAT to the Battery unit (Q170BAT).
- 2) Connect the A6BAT/MR-BAT connector to the BAT connector of the Q170BAT.
- 3) Connect between Q172CPU(N) and Q170BAT by the SSCNET cable.



2 SYSTEM CONFIGURATION

2.4.11 Cooling fan unit (Q170FAN) (Q173CPU/Q172CPU only)

This section explains the specifications of the Cooling fan unit (Q170FAN) used for the Motion CPU module.

(1) Removable conditions of the Cooling fan unit

It is possible to remove the Cooling fan unit (Q170FAN) in order to disperse heat from inside the Motion CPU module according to the number of Motion CPU module and ambient temperature conditions.

Removable/Not removable of the Cooling fan unit (Q170FAN) by number of Motion CPU module and ambient temperature is as follows.

(a) When using only one Motion CPU module

It is possible to remove the Cooling fan unit if the ambient temperature in which the Motion CPU module will be operating is 0 to 40°C (32 to 104°F) .

(b) When using two or more Motion CPU module

Do not remove the Cooling fan unit(Q170FAN).

Ambient temperature of the Motion CPU	0 to 40°C (32 to 104°F)	Over 40 to 55°C (Over 104 to 131°F)
Number of the Motion CPU		
1 module	Removable	Not removable
2 modules or more	Not removable	

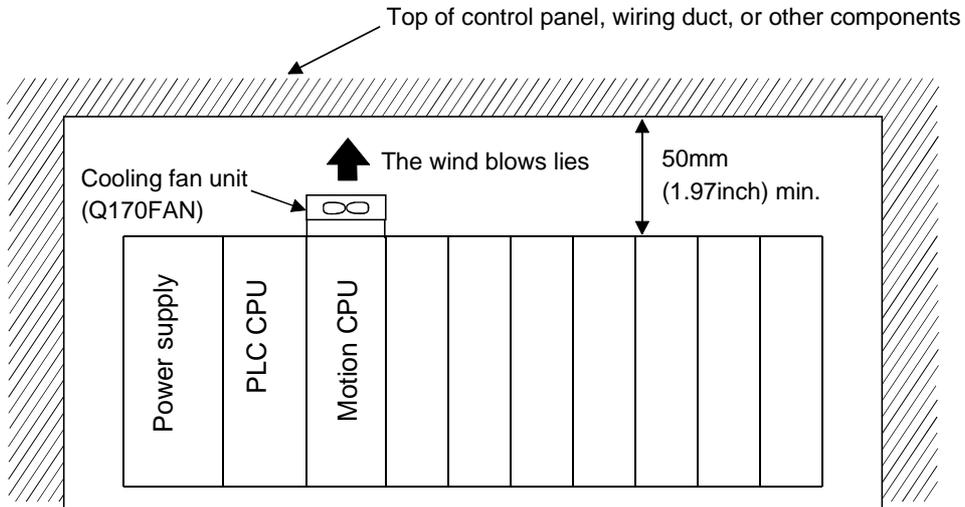
(2) Cooling fan unit specifications

Item	Model name	Q170FAN
Type		Cooling fan
Ambient temperature		0 to 55°C (32 to 131°F)
Operating voltage range [V]		4.3 to 5.8
Rated current [A]		0.08
Air capacity		0.033 [m ³ /min]
Rated rotational speed [r/min]		7000
Service life time		30000 hours rated voltage continuous operation (at 40°C (104°F))
Application		For cooling Motion CPU module
Mass [kg]		0.01

As a guideline for preventive maintenance, the module should be inspected every six months and replaced approximately every two to three years even if the accumulated number of operating hours is less than the service life time shown above (Refer to section 6.3 Periodic Inspections.)

2 SYSTEM CONFIGURATION

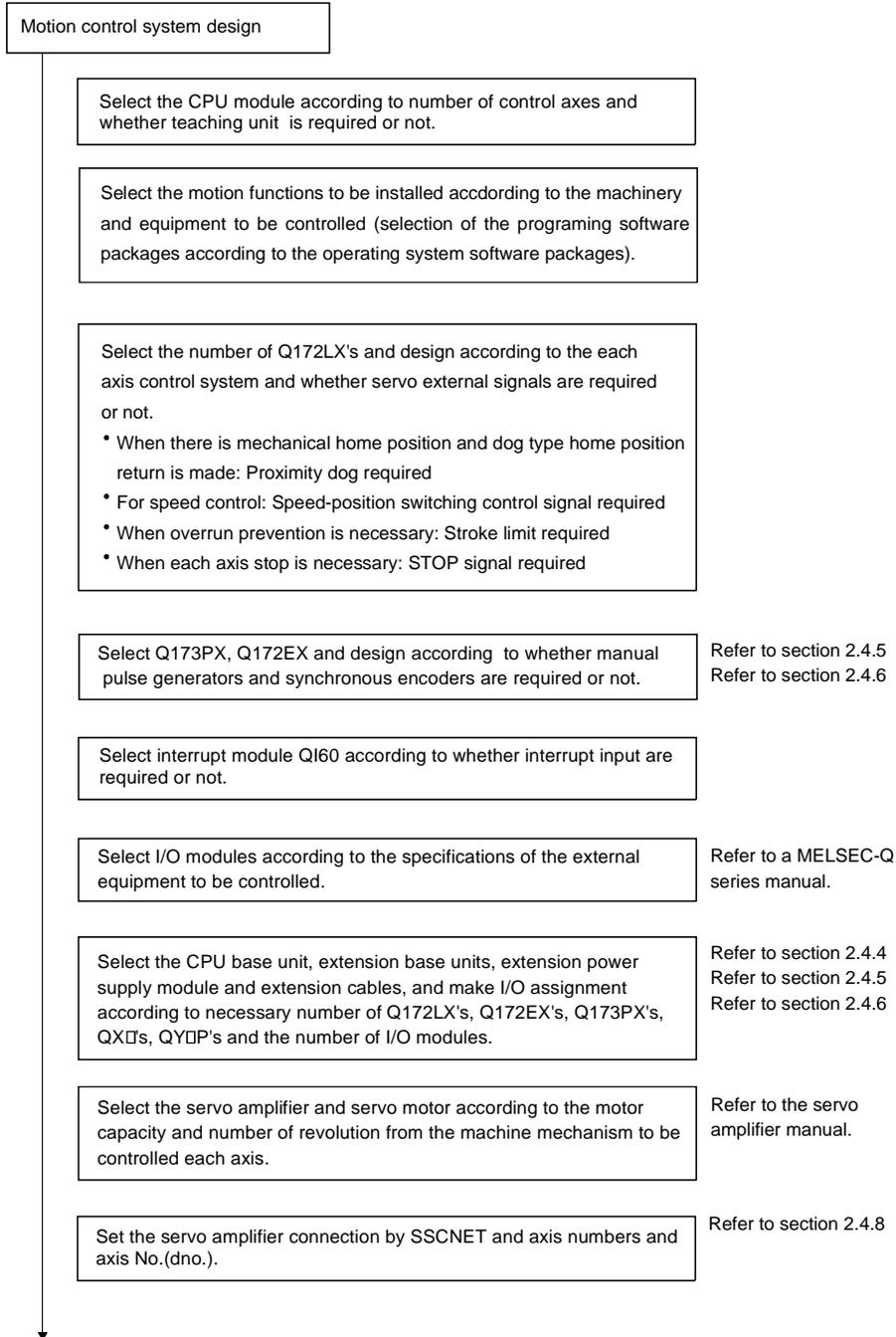
- (3) In point of the layout design within the control panel
Leave 50mm (1.97inch) or more clearance between the top of the modules and structures or parts.



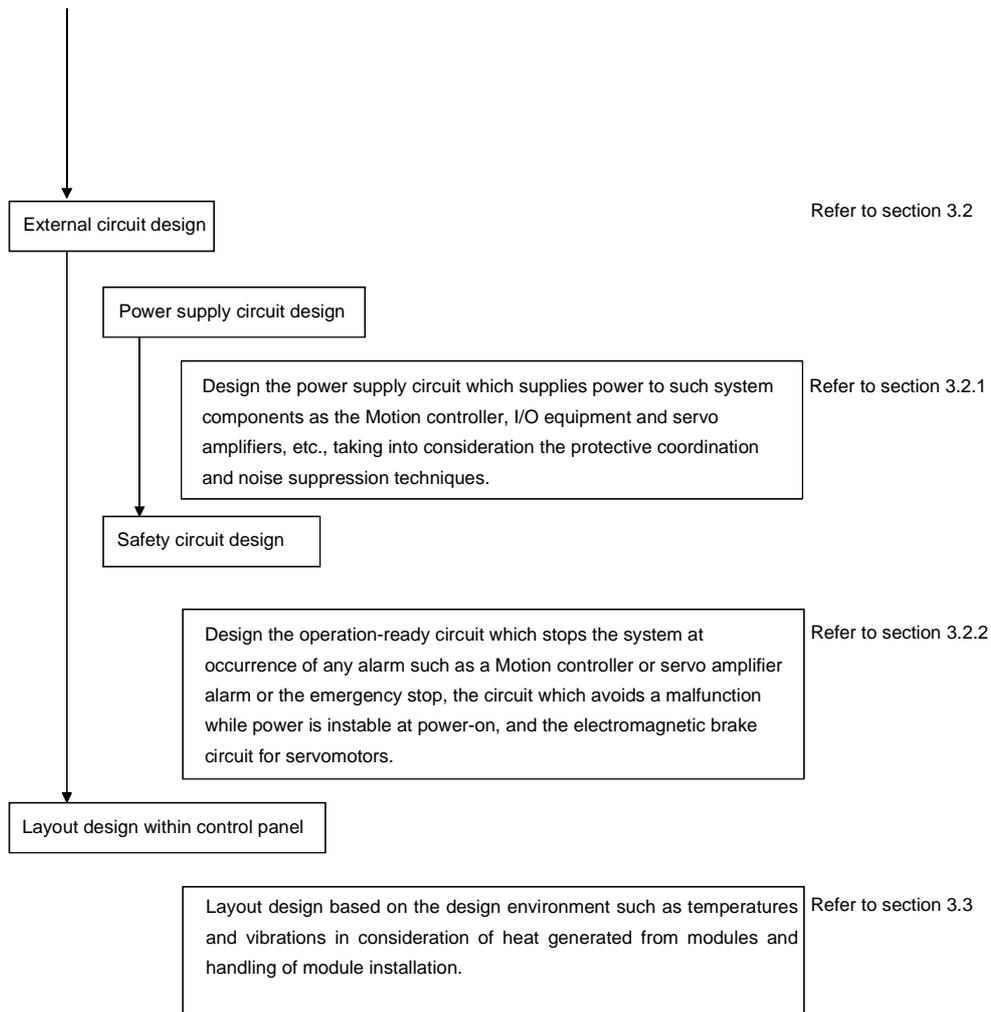
3. DESIGN

3.1 System Designing Procedure

Design the system which uses the Multiple CPU system in the following procedure.



3 DESIGN



CAUTION

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

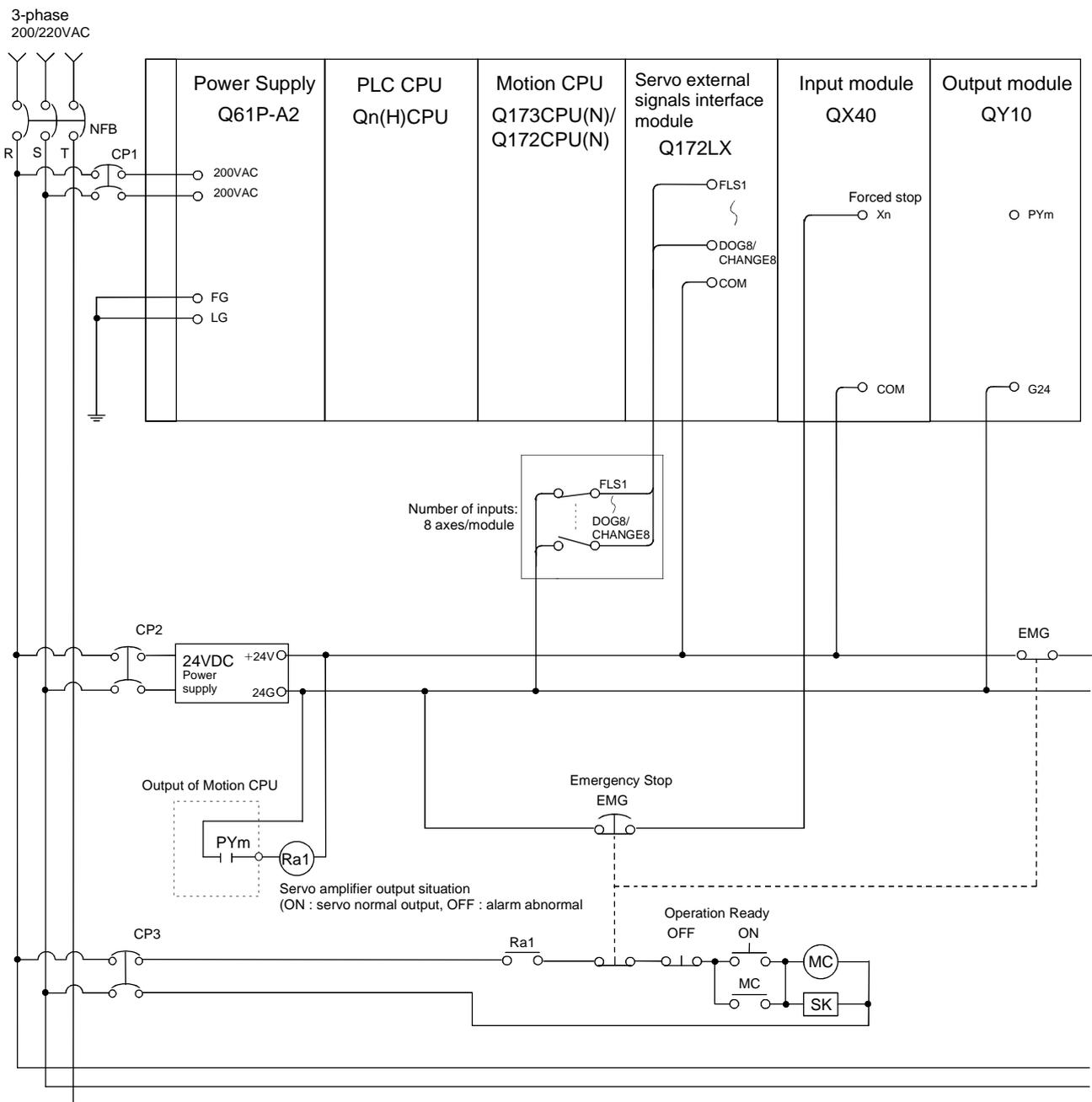
- Do not touch the servo amplifier's heat radiating fins, regenerative resistor and servomotor, etc. while the power is ON and for a short time after the power is turned OFF. In this timing, these parts become very hot and may lead to burns.
- Always turn the power OFF before touching the servomotor shaft or coupled machines, as these parts may lead to injuries.
- Do not go near the machine during test operations or during operations such as teaching. Doing so may lead to injuries.
- 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 an emergency stop circuit externally so that the operation can be stopped immediately and the power shut off.
- Use the Motion controller, servo amplifier, servomotor and regenerative resistor with the combinations listed in the instruction manual. Other combinations may lead to fire or faults.
- If safety standards (ex., robot safety rules, etc.,) apply to the system using the Motion controller, servo amplifier and servomotor, make sure that the safety standards are satisfied.
- Construct a safety circuit externally of the Motion controller or servo amplifier if the abnormal operation of the Motion controller or servo amplifier differ from the safety directive operation in the system.
- In systems where coasting of the servomotor will be a problem during the forced stop, 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 servomotor are for holding applications, and must not be used for normal braking.
- The system must have a mechanical allowance so that the machine itself can stop even if the stroke limits switch is passed through at the max. speed.
- Use wires and cables that have a wire diameter, heat resistance and bending resistance compatible with the system.
- Use wires and cables within the length of the range described in the instruction manual.
- The ratings and characteristics of the parts (other than Motion controller, servo amplifier, servomotor) used in a system must be compatible with the Motion controller, servo amplifier and servomotor.
- Install a cover on the shaft so that the rotary parts of the servomotor are not touched during operation.
- There may be some cases where holding by the electromagnetic brakes is not possible due to the service life time or mechanical structure (when the ball screw and servomotor are connected with a timing belt, etc.). Install a stopping device to ensure safety on the machine side.

3 DESIGN

3.2 External Circuit Design

As to the ways to design the external circuits of the Motion system, this section explains the method and instructions for designing the power supply circuits and safety circuits, etc.

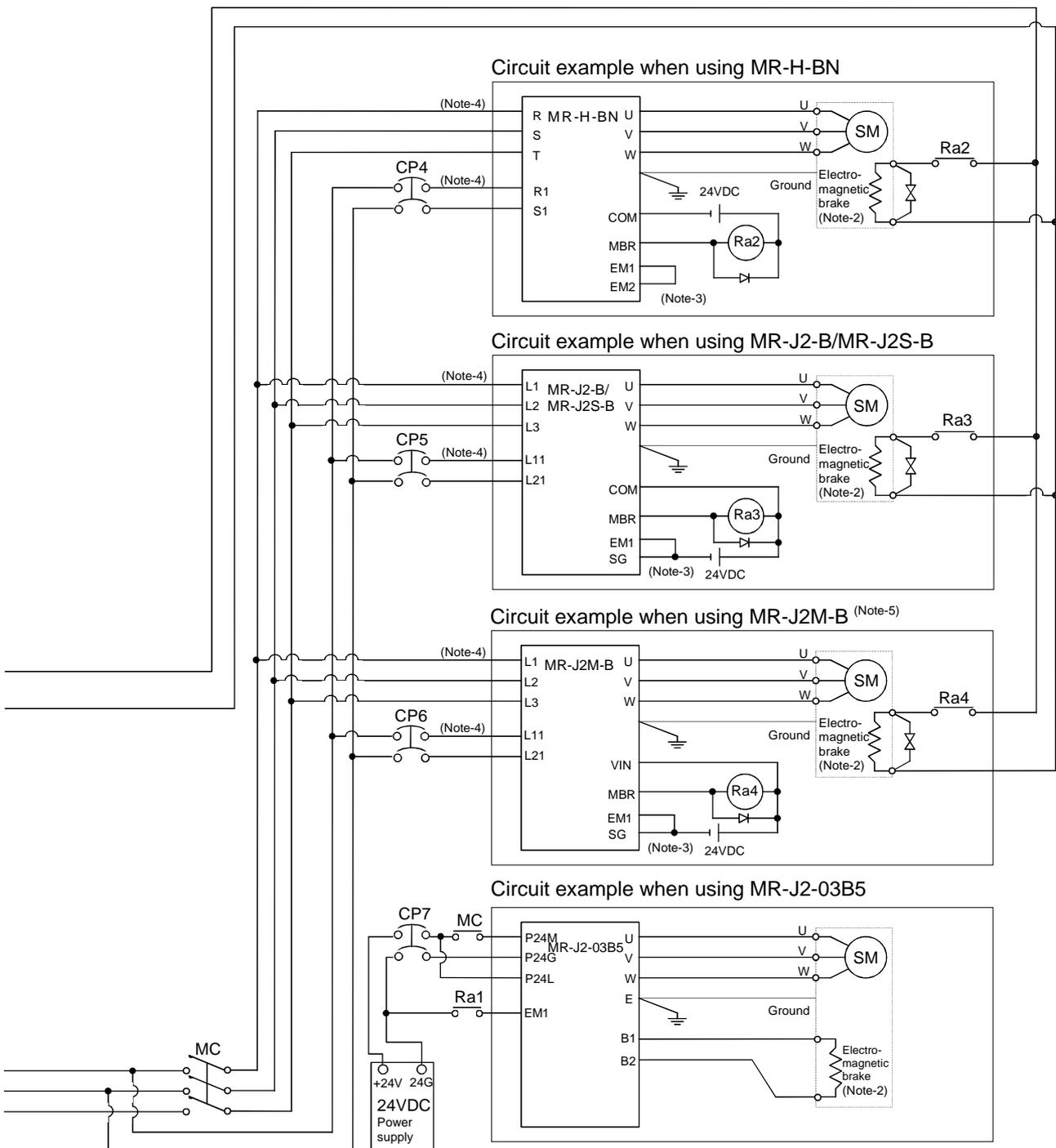
(1) Sample system circuit design for motion control 1



3 DESIGN

POINT	
1) (Note-1) : The following is the Motion SFC program example.	
2) (Note-2) : It is also possible to use a full wave rectified power supply as the power supply for the electromagnetic brake.	
3) (Note-3) : It is also possible to use forced stop signal of the servo amplifier.	
4) (Note-4) : It recommends using one leakage breaker for one servo amplifier. When electric power is supplied to multiple servo amplifiers for one leakage breaker, select the wire connected to the servo amplifier according to the capacity of the leakage breaker.	
5) (Note-5) : Only the point has described the servo amplifier MR-J2M-B.	
	Refer to "MR-J2M-B Servo amplifier Instruction Manual" for details.
6) For information about connection of the SSCNET cable and terminal connector refer to section 2.4.9 (4).	

< Example > For control axis 1 and axis 2



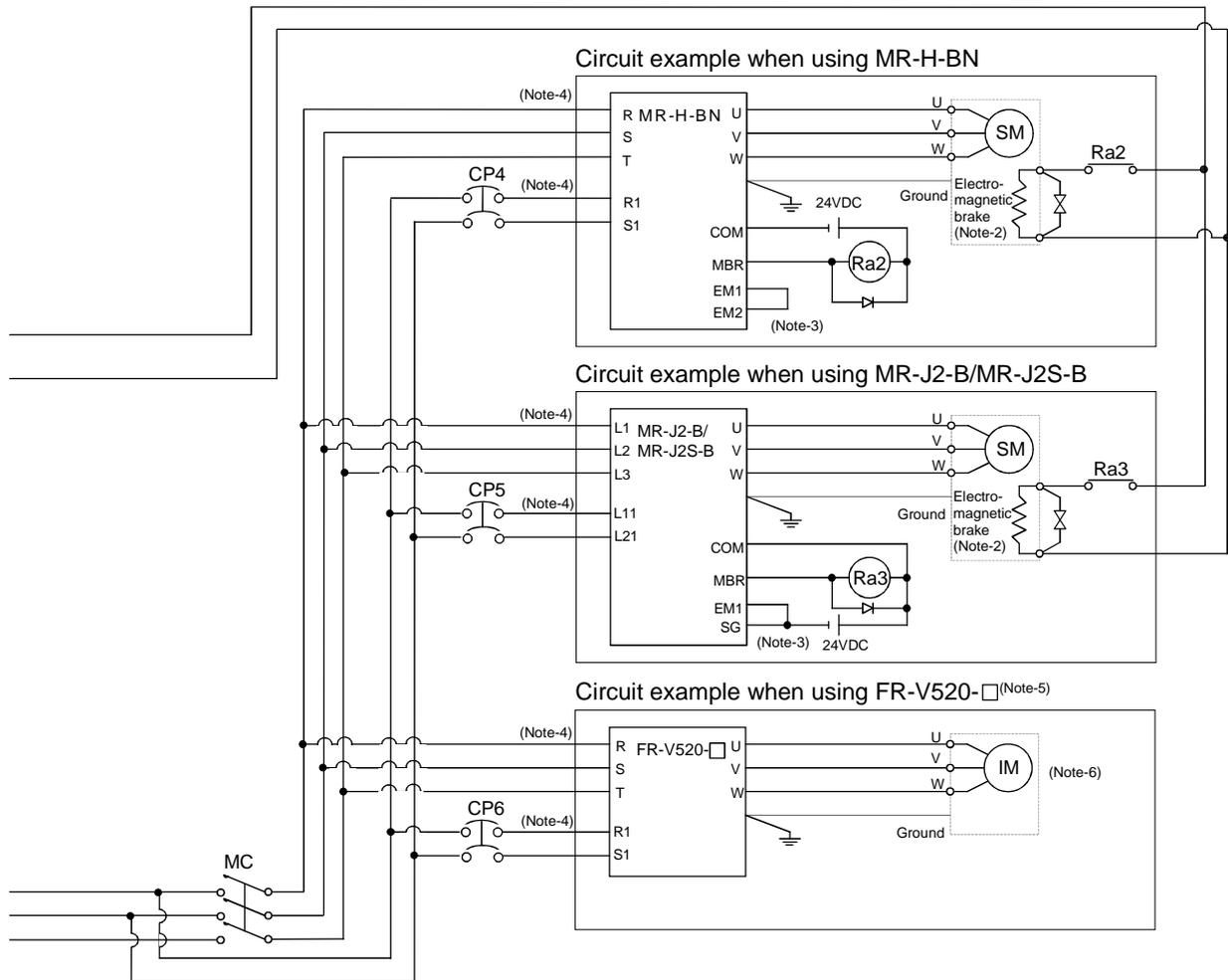
3 DESIGN

POINT	
1)	(Note-1) : The following is the Motion SFC program example.
2)	(Note-2) : It is also possible to use a full wave rectified power supply as the power supply for the electromagnetic brake.
3)	(Note-3) : It is also possible to use forced stop signal of the servo amplifier.
4)	(Note-4) : It recommends using one leakage breaker for one servo amplifier. When electric power is supplied to multiple servo amplifiers for one leakage breaker, select the wire connected to the servo amplifier according to the capacity of the leakage breaker.
5)	(Note-5) : Only the point has described the vector inverter FR-V5□0-□. Refer th "FR-V5□0-□ INSTRUCTION MANUAL(BASIC)" for details.
6)	(Note-6) : Select the brake unit of inverter according to the necessity.
7)	For information about connection of the SSCNET cable and terminal connector refer to section 2.4.9 (4).

< Example > For control axis 1 and axis 2

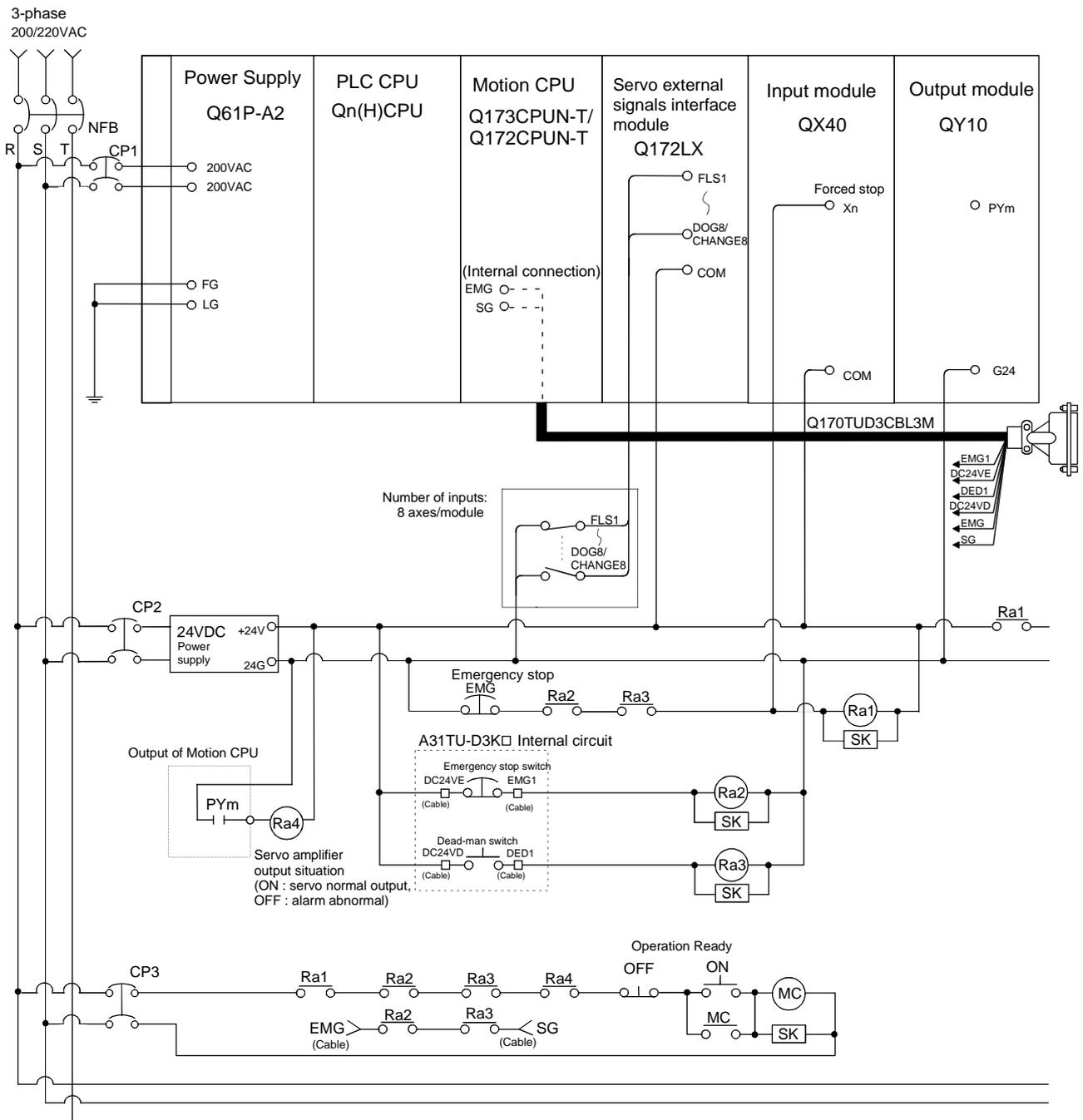
Short-circuit connector for teaching unit
A31TUD3TM(A31TU-D3K□/
A31TU-DNK□ not using)

Teaching unit
(A31TU-DNK□ using)



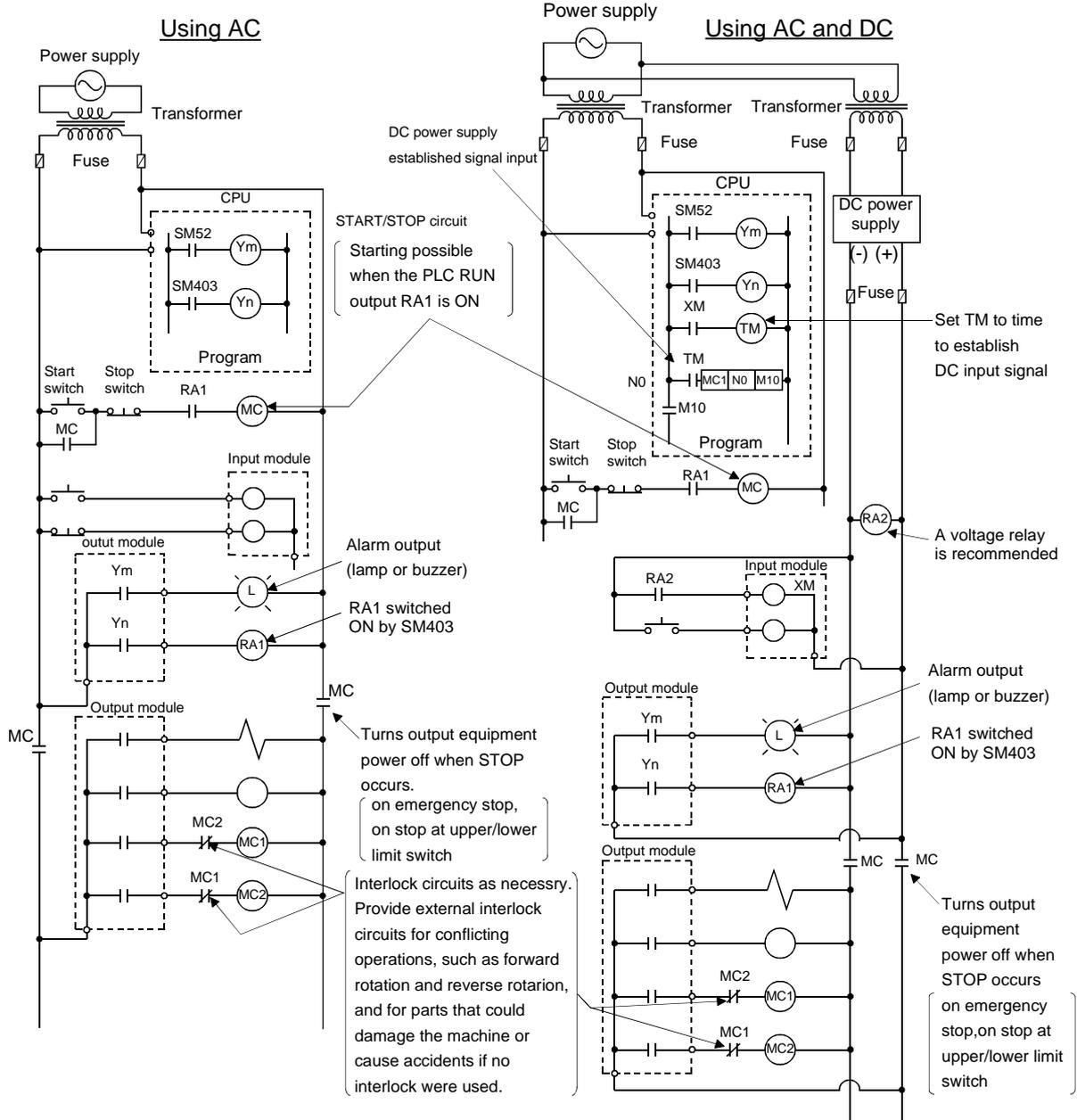
3 DESIGN

(3) Sample system circuit design for motion control 3 (For A31TU-D3K□)



(4) System design circuit example of the PLC I/O

(a) System design circuit example (when not using \overline{ERR} contact of power supply module)



The power-ON procedure is as follows:

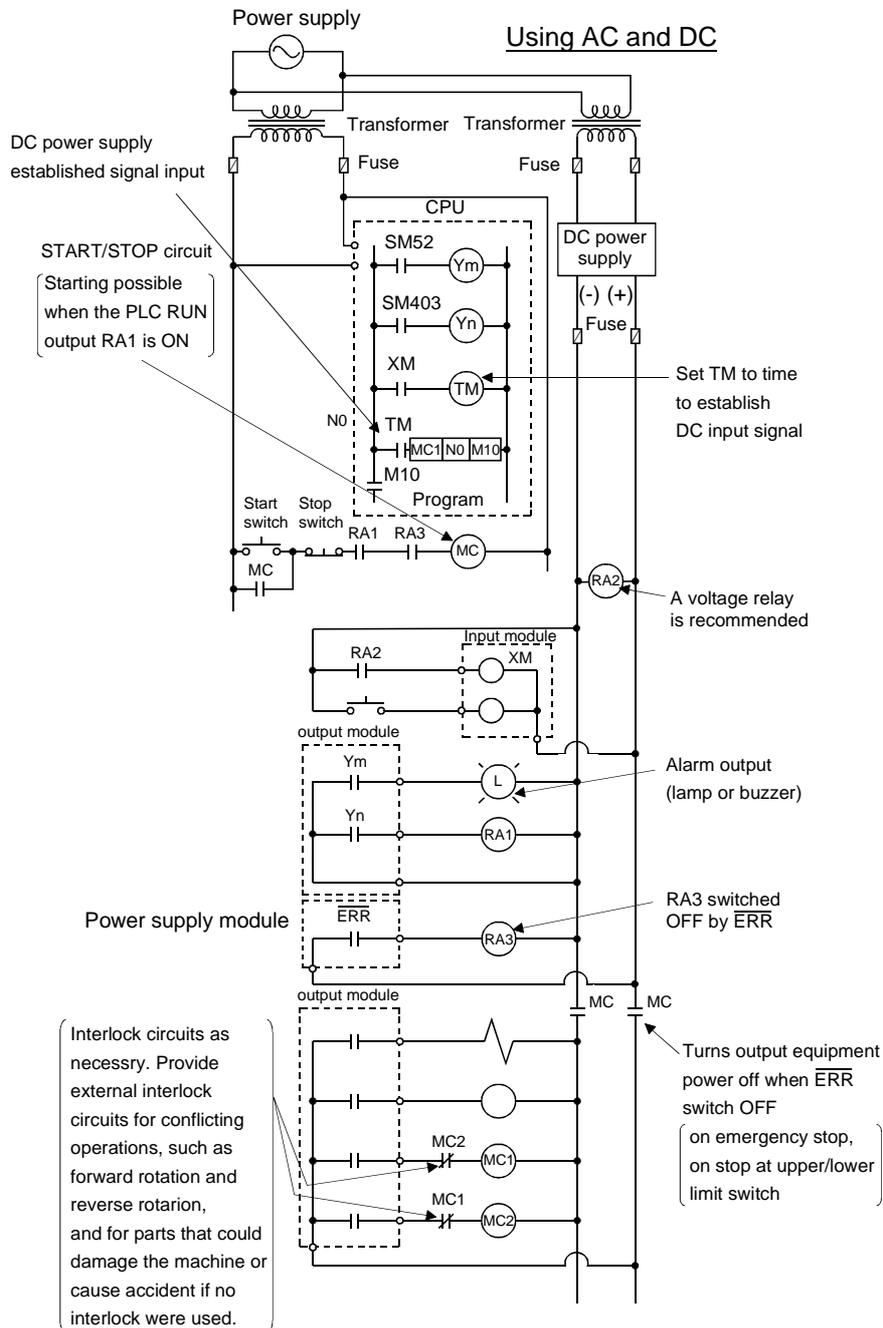
For AC

- 1) Switch power ON.
- 2) Set CPU to RUN.
- 3) Turn ON the start switch.
- 4) When the electromagnetic contactor (MC) comes on, the output equipment is powered and may be driven by the program.

For AC/DC

- 1) Switch power ON.
- 2) Set CPU 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.)

(b) System design circuit example (when using \overline{ERR} contact of power supply module)



The power-ON procedure is as follows:

For AC/DC

- 1) Switch power ON.
- 2) Set CPU 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.)

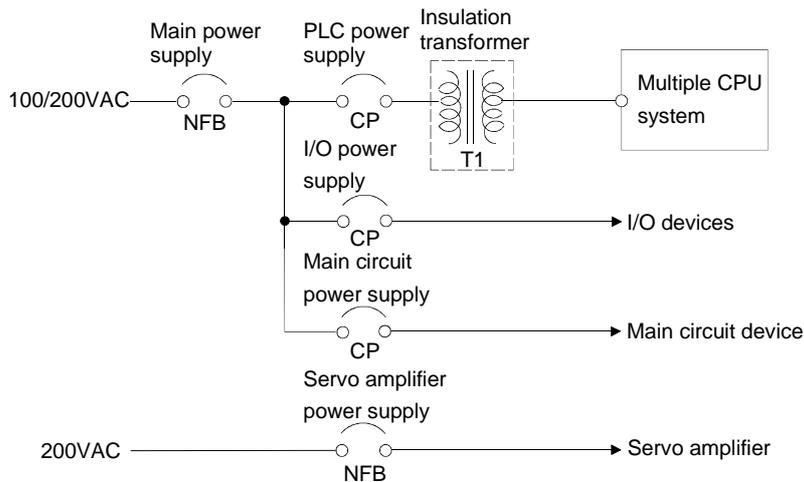
3.2.1 Power supply circuit design

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

When wiring, separate the lines of Multiple CPU system power supplies from those of the I/O equipment and servo amplifier as shown below.

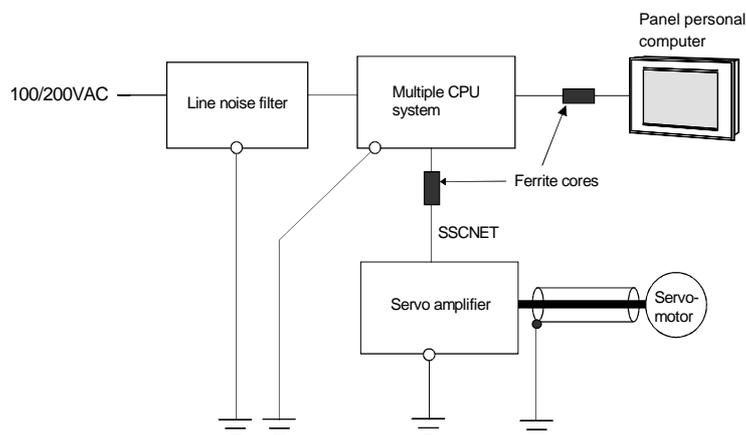
When there is much noise, connect an insulation transformer.



(2) Grounding

The Motion system 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 conductors. To avoid such troubles, connect the earthing ground of each equipment and the shield grounds of the shielded cables to the earth. Also use ferrite cores (ex., ZCAT3035-1330(TDK make)) to prevent the sneak noises from the SSCNET.

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.



3.2.2 Safety circuit design

(1) Concept of safety circuits

When the Motion controller is powered on-off, proper outputs may not be provided temporarily due to the delays and rise times of the Motion controller power supply and external I/O control power supplies (especially DC). Also, abnormal operations may be performed when the external power supply becomes faulty or the Motion controller fails. Construct the circuit (emergency stop, protective and interlock circuits, etc.) of parts which may occur machine breakdown and accidents due to abnormal operations outside of the Motion controller in a fail-safe viewpoint, to avoid abnormal operations of whole system.

(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 servomotor operated.

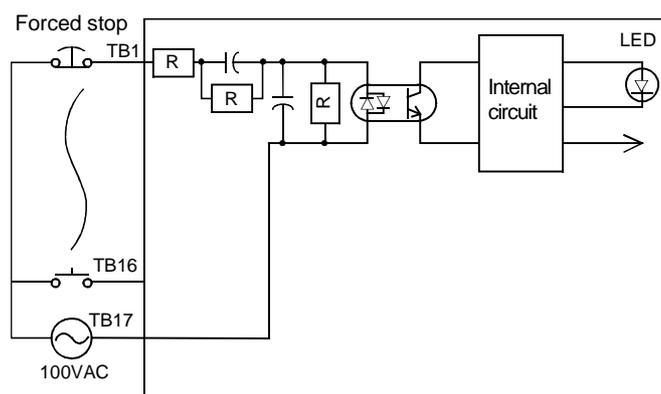
(3) Forced stop circuit

(a) It is possible to effect the forced stop all axes of the external servo amplifier (MR-H-BN/MR-J2□-B) at once via the forced stop input of the input modules. After the forced stop, remove the forced stop factor and cancel the forced stop. (The servo error detection signal does not turn on with the forced stop.)

It is possible to set the forced stop input No. by the parameter setting of the system setting.

The forced stop wiring example is shown below.

Input module (Example : QX10)



(Note): It is possible to set the forced stop (Xn) of the system settings at the user side.

3 DESIGN

- (b) It is also possible to use the forced stop signal of the servo amplifier.
Refer to manual of the servo amplifier about servomotor capacity.
Operation status of the emergency stop and the forced stop are as follows.

Item	Operation of the signal ON	Remark
Emergency stop	Servo OFF	Shut off the power supply to the external servo amplifier by external circuit, make the servomotor stopped.
Forced stop		The servomotor is stopped according to the stop instruction from Motion controller to the servo amplifier.

3 DESIGN

3.3 Layout Design within The Control Panel

3.3.1 Installation environment

Install the Motion controller system in the following environment conditions.

(1) Ambient temperature is a range the following conditions.

Number of the Motion CPU	Q173CPUN(-T)/ Q172CPUN(-T)	Q173CPU/Q172CPU	
		With Cooling fan unit (Shipped from the factory)	Without Cooling fan unit
1	0 to 55°C (32 to 131 °F)	0 to 40°C (32 to 104°F)	— (Note-1)
2 or more			

(Note-1) : It is need to install the Cooling fan unit(Q170FAN).

- (2) Ambient humidity is in a range from 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 DESIGN

3.3.2 Layout design of the base units

This section describes the precautions related to install a Motion controller in an enclosure.

- (1) To improve ventilation and permit easy replacement of the module, leave a space of the following table between the top, bottom, side of the module and any other object.

(For details on layout design refer to section 4.1.2 "Instructions for installation of the base unit".)

		Top	Bottom	Side
Q173CPUN/Q172CPUN Q173CPUN-T/Q172CPUN-T	Duct height to over 50mm(1.96inch)	40mm(1.57inch) or more	100mm(3.94inch) or more	5mm(0.19inch) or more
Q173CPU/Q172CPU (Without Cooling fan unit)	Duct height to 50mm(1.96inch) or less	30mm(1.18inch) or more		
Q173CPU/Q172CPU (With Cooling fan unit (Shipped from the factory))		50mm(1.97inch) or more		

- (2) Provide a wiring duct, if required.

CAUTION

- Due to ventilation problems, do not install the base units vertically or horizontally.
- Install the base units on a flat surface. Unevenness or warping of the surface can apply undue force to printed circuit boards and lead to operation failures.
- Avoid installing the base units close to a vibration source, such as a large electromagnetic contactor or no-fuse breaker. Install them on a separate panel or at a safe distance.
- To limit the effects of reflected noise and heat, leave 100mm(3.94inch) or more clearance to instruments fitted in front of the Motion controller (on the rear of the door). Similarly, leave 50mm(1.97inch) or more clearance between instruments and the left and right sides of the base units.

3.3.3 Calculating heat generation by Motion controller

The ambient temperature inside the control panel storing the Motion controller must be suppressed to a Motion controller operating ambient temperature of 55°C(131°F). It is possible to remove the Cooling fan unit(Q170FAN) depending on the number of CPU modules or operating ambient temperature conditions.(Refer to section 2.4.11 Cooling fan unit (Q170FAN).)

For the design of radiation from the storing panel, it is necessary to know the average power consumption (heating value) of the devices and instruments stored in the control panel. Here the method of obtaining the average power consumption of Q173CPU(N)/Q172CPU(N) system is described. From the power consumption, calculate a rise in ambient temperature inside the control panel.

Calculating average power consumption

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

(1) Power consumption of the power supply module

The power conversion efficiency of the power module is approx. 70 [%], i.e., 30 [%] of the output power is consumed by heating. As a result, 3/7 of the output power becomes the power consumption.

Therefore the calculation formula is as follows.

$$W_{pw} = \frac{3}{7} \times (I_{5V} \times 5) [W]$$

I_{5V} : Current consumption of logic 5 VDC circuit of each module

(2) Power consumption of a total of 5 VDC logic section of each module

The power consumption of the 5 VDC output circuit section of the power module is the power consumption of each module (including the current consumption of the base unit).

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

(3) A total of 24 VDC average power consumption of the output module (power consumption for simultaneous ON points)

The average power of the external 24 VDC power is the total power consumption of each module.

$$W_{24V} = I_{24V} \times 24 [W]$$

I_{24V} : Current consumption of the output module

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

$$W_{OUT} = I_{OUT} \times V_{drop} \times \text{Number of output points} \times \text{Simultaneous ON rate} [W]$$

I_{OUT} : Output current (Current in actual use) [A]

V_{drop} : Voltage drop in each output module [V]

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

$$W_{IN} = I_{IN} \times E \times \text{Number of input points} \times \text{Simultaneous ON rate} [W]$$

I_{IN} : Input current (Effective value for AC) [A]

E : Input voltage (Voltage in actual use) [V]

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

$$W_s = I_{5V} \times 5 + I_{24V} \times 24 + I_{100V} \times 100 \text{ [W]}$$

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

$$W = W_{PW} + W_{5V} + W_{24V} + W_{OUT} + W_{IN} + W_s \text{ [W]}$$

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

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

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

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

A : Surface area inside the control panel[m²]

U : When the ambient temperature inside the control panel

is uniformed by a fan..... 6

When air inside the control panel is not circulated 4

POINT

When a rise in ambient temperature inside the control panel exceeds the specified limit, it is recommended that you install a heat exchanger in the control panel to lower the ambient temperature inside the control panel.

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
(When using the Q173CPUN)

(a) System configuration

Q61P-A1	Q02HCPU	Q173CPUN	Q172LX	Q172EX	Q173PX	QX40	QX40	QY10	QY10	Q38B
---------	---------	----------	--------	--------	--------	------	------	------	------	------

(b) 5 VDC current consumption of each module

- Q02HCPU : 0.64 [A]
- Q173CPUN : 1.25 [A]
- Q172LX : 0.05 [A]
- Q172EX : 0.07 [A]
- Q173PX : 0.11 [A]
- QX40 : 0.05 [A]
- QY10 : 0.43 [A]
- Q38B : 0.114 [A]

(c) Power consumption of power module

$$W_{PW} = 3/7 \times (0.64 + 1.25 + 0.05 + 0.07 + 0.11 + 0.05 + 0.05 + 0.43 + 0.43 + 0.114) \times 5 = 6.84 \text{ [W]}$$

(d) Power consumption of a total of 5 VDC logic section of each module

$$W_{5V} = (0.64 + 1.25 + 0.05 + 0.07 + 0.11 + 0.05 + 0.05 + 0.43 + 0.43 + 0.114) \times 5 = 15.97 \text{ [W]}$$

- (e) A total of 24 VDC average power consumption of the output module
 $W_{24V} = 192 \text{ [W]} \quad (8A/\text{common})$
- (f) Average power consumption due to voltage drop in the output section of the output module
 $W_{OUT} = 0 \text{ [W]}$
- (g) Average power consumption of the input section of the input module
 $W_{IN} = 0.004 \times 24 \times 32 \times 1 = 3.07 \text{ [W]}$
- (h) Power consumption of the power supply section of the intelligent function module.
 $W_S = 0 \text{ [W]}$
- (i) Power consumption of overall system
 $W = 6.84 + 15.97 + 192 + 0 + 3.07 + 0 = 217.88 \text{ [W]}$

3 DESIGN

3.4 Design Checklist

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

Item	Sub Item	Design confirmation		Check	
Module selection	CPU module selection	Number of axes	axes	<input type="checkbox"/>	
		Number of I/O points	points	<input type="checkbox"/>	
		Motion CPU module selection		<input type="checkbox"/>	
		QCPU module selection		<input type="checkbox"/>	
	Motion module selection	Number of Manual pulse generators		pcs.	<input type="checkbox"/>
		Number of Synchronous encoders		pcs.	<input type="checkbox"/>
		Teaching unit			<input type="checkbox"/>
		Number of upper limit points		points	<input type="checkbox"/>
		Number of lower limit points		points	<input type="checkbox"/>
		Number of STOP input points		points	<input type="checkbox"/>
		Number of proximity dog input points		points	<input type="checkbox"/>
		Number of speed switching input points		points	<input type="checkbox"/>
		Number of tracking enable signal points		points	<input type="checkbox"/>
		Q172LX		modules	<input type="checkbox"/>
		Q172EX		modules	<input type="checkbox"/>
		Q173PX		modules	<input type="checkbox"/>
	CPU base unit selection	Number of Motion CPU modules		modules	<input type="checkbox"/>
		Number of I/O modules installed to CPU base		modules	<input type="checkbox"/>
		CPU base unit selection			<input type="checkbox"/>
	Extension base unit and extension cable selection	Number of I/O modules installed to extension base		modules	<input type="checkbox"/>
Distance between CPU base and extension base			mm	<input type="checkbox"/>	
Extension base unit selection				<input type="checkbox"/>	
Extension cable selection				<input type="checkbox"/>	
External circuit design	Fail-safe circuit design	Avoidance of operation failures at power-on		<input type="checkbox"/>	
		Avoidance of hazard at Motion controller failure		<input type="checkbox"/>	
Layout design	Module layout design	Conformance with general specifications such as ambient temperature, humidity, dust, etc.		<input type="checkbox"/>	
		Power consumption of overall base unit (Calculate the heating value)	W	<input type="checkbox"/>	
		Layout in consideration of clearances between enclosure's inside walls, other structures and modules and heats generated by modules within the control panel.		<input type="checkbox"/>	

4. INSTALLATION AND WIRING

4.1 Module Installation

4.1.1 Instructions for handling

 CAUTION
<ul style="list-style-type: none"> ● 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. ● Hold down the module loading lever at the module bottom, and securely install the module fixing hook into the fixing hole in the base unit. Incorrect loading of the module can cause an operation failure, failure 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 install the extension cable to connectors of the base unit correctly. After installation, check them for looseness. Poor connections could cause an input or output failure. ● Completely turn off all lines of power supply externally before loading or unloading the module. Not doing so could result in electric shock or damage to the product. ● Do not directly touch the module's conductive parts. Touching the conductive parts could cause an operation failure or give damage to the module.

This section describes instructions for handling the CPU modules, I/O modules, intelligent function modules, power supply modules and base units, etc. .

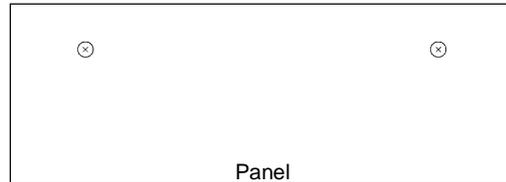
- (1) Do not drop or apply strong impact on the CPU modules, I/O modules, intelligent function modules, power supply modules, base units and memory card, etc. .
- (2) Do not remove modules printed circuit boards from the case in order to avoid failure.
- (3) The module fixing screws and terminal block screws within the tightening torque range specified below.

Location of screw	Tightening torque range
Module fixing screw (M3 × 12 screw)	$36 \text{ to } 48 \times 10^{-2} \text{ N}\cdot\text{m}$
I/O module terminal block screw (M3 screw)	$42 \text{ to } 58 \times 10^{-2} \text{ N}\cdot\text{m}$
I/O module terminal block fixing screw (M3 screw)	$66 \text{ to } 89 \times 10^{-2} \text{ N}\cdot\text{m}$
Power supply module terminal screw (M3.5 screw)	$59 \text{ to } 78 \times 10^{-2} \text{ N}\cdot\text{m}$

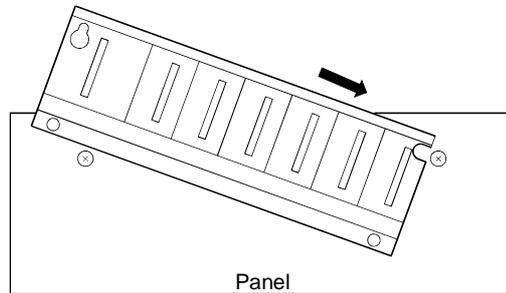
- (4) Make sure to install the power supply module on the CPU base unit and extension base unit. When the power supply module is not installed and if the I/O modules and intelligent function module installed on the base units are light load type, the modules may be operated. In this case, because a voltage becomes unstable, we cannot guarantee the operation.

4 INSTALLATION AND WIRING

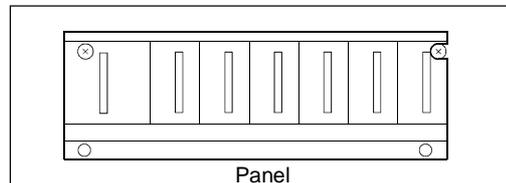
- (5) When an extension cable is used, do not bind the cable together with the main circuit (high voltage, heavy current) line or lay them close to each other.
- (6) Install the CPU base unit (by screwing) in the following procedure.
 - 1) Fit the two fixing screws for top of the CPU base unit to the panel.



- 2) Place the right-hand side notch of the CPU base unit onto the right-hand side screw.



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



- 4) Fit the fixing screws into the fixing screw holes in the CPU base unit bottom and re-tighten the four fixing screws.

(Note) : Install the CPU base unit to a panel, with no module installed in the rightmost slot.
Remove the CPU base unit after unloading the module from the rightmost slot.

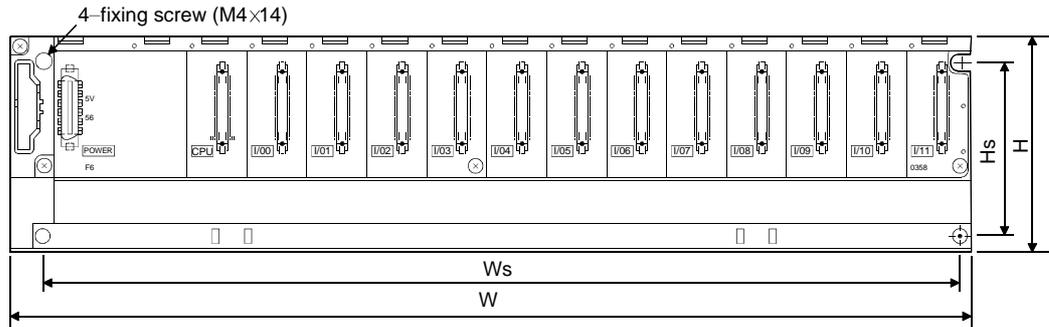
4 INSTALLATION AND WIRING

4.1.2 Instructions for installation of the base unit

Install the Motion controller module to a panel, etc. , considering enough about operability, maintainability and environmental resistance.

(1) Fitting dimensions

Fitting dimensions of each base unit are as follows:

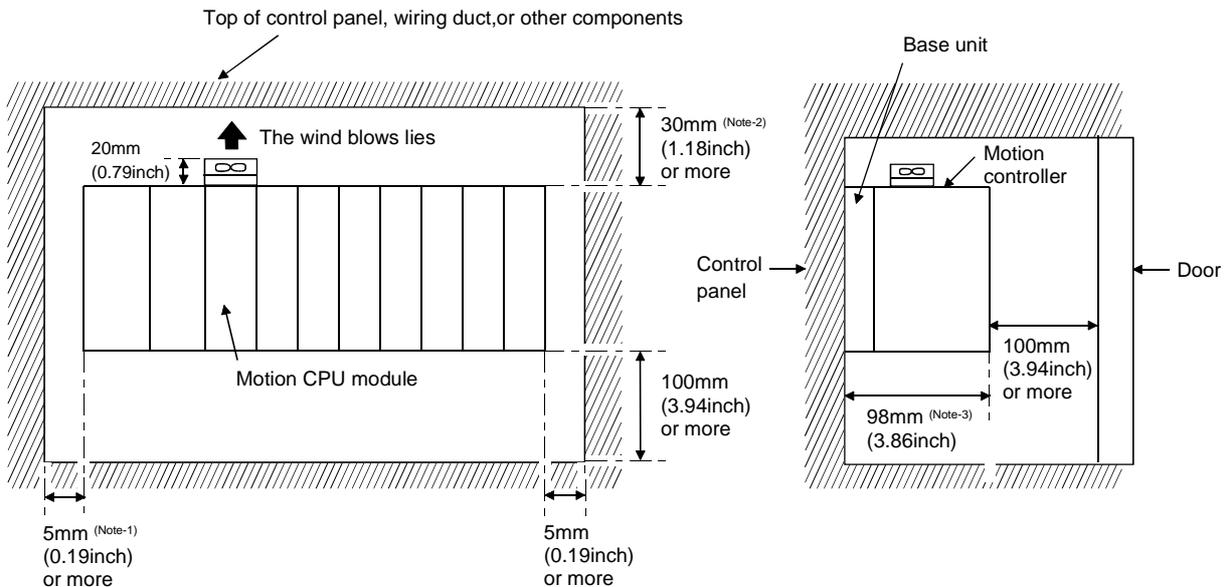


	Q35B	Q38B	Q312B	Q65B	Q68B	Q612B
W	245 (9.65)	328 (12.92)	439 (17.30)	245 (9.65)	328 (12.92)	439 (17.30)
Ws	224.5 (8.85)	308 (12.14)	419 (16.51)	222.5 (8.77)	306 (12.06)	417 (16.43)
H	98 (3.86)					
Hs	80 (3.15)					

[Unit: mm (inch)]

(2) Motion controller installation position

For enhanced ventilation and ease of module replacement, leave the following clearances between the module top/bottom and structure/parts.



(Note-1) : 20mm (0.79 inch) or more when the extension cable is connected without removing the adjacent module.

(Note-2) : Q173CPU/Q172CPU : 50mm (1.97 inch) or more

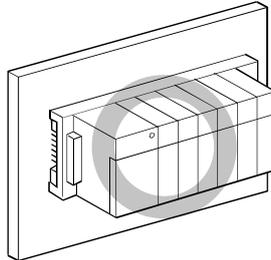
Q173CPUN(-T)/Q172CPUN(-T)(Height of a wiring duct is 50mm (1.97 inch) or more) :

40mm (1.58 inch) or more

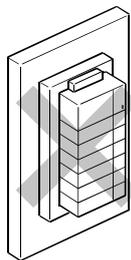
(Note-3) : Q173CPUN(-T)/Q172CPUN(-T) : 123mm (4.84 inch)

(3) Motion controller installation orientation

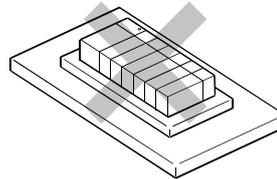
- (a) Since the Motion controller generates heat, it should be fitted on a well ventilated location in the orientation shown below.



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



Vertical



Flat

(4) Installation surface

Fit the base unit on a flat surface. If the installation surface is not even, this may strain the printed circuit boards and cause malfunctions.

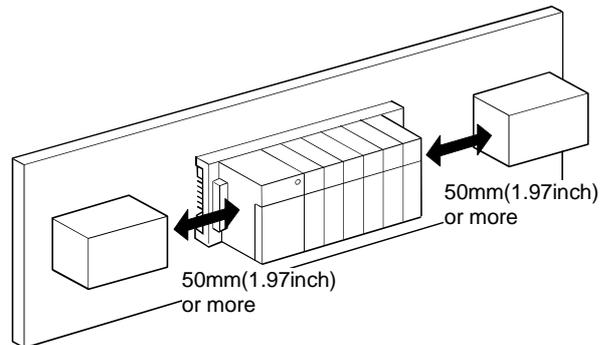
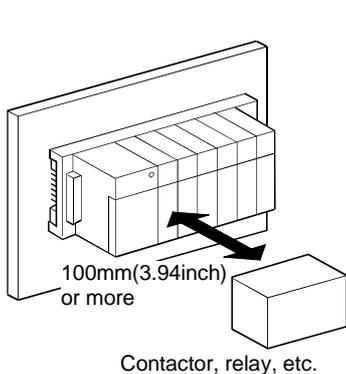
(5) Installation of Motion controller in an area where the other devices are installed

Avoid fitting base unit in proximity to vibration sources such as large electromagnetic contractors and no-fuse circuit breakers; fit them 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 and the other devices (contactors and relays).

- In front of Motion controller: 100 mm (3.94 inch) or more
- On the right and left of Motion controller: 50 mm (1.97 inch) or more



4 INSTALLATION AND WIRING

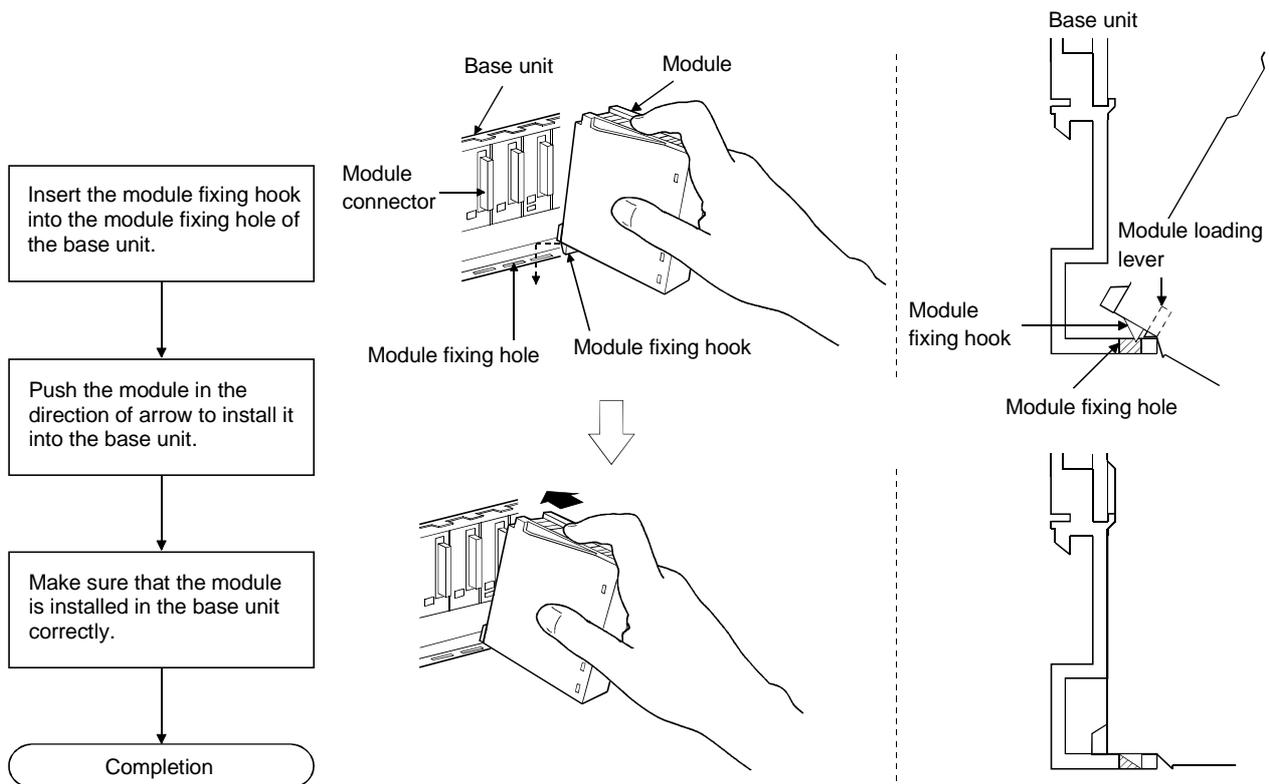
4.1.3 Installation and removal of module

This section explains how to install and remove a power supply module, PLC CPU module, Motion CPU module, 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 Q3□B, Q6□B

The installation and removal procedure of the module from Q3□B/Q6□B base unit are described below.

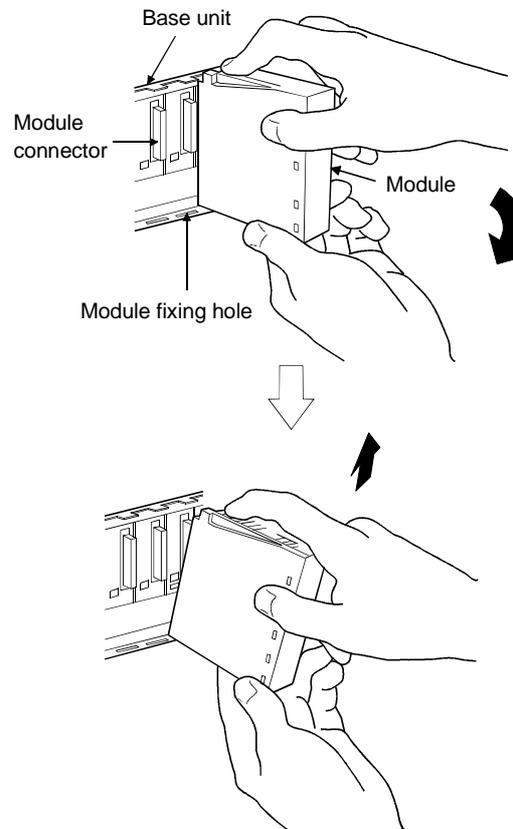
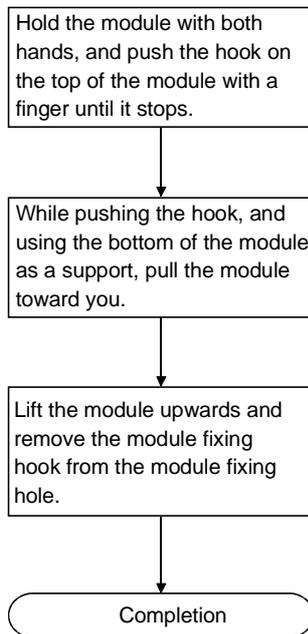
(a) Installation of the module to Q3□B and Q6□B



POINTS

- (1) Always insert the module fixing hook of the module into the module fixing hole. Forcing the hook into the hole will damage the module connector and module.
- (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 (purchase from the other supplier)

(b) Removal from Q3□B and Q6□B



POINT

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

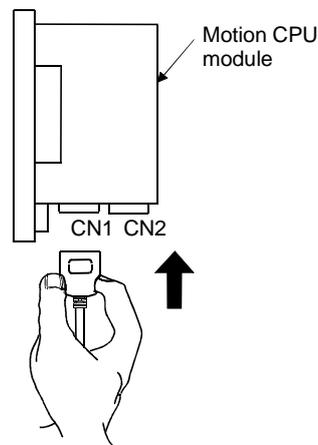
Forcibly removal the module will damage the module.

4.2 Installation and Removal of Cable

4.2.1 Installation and removal of the SSCNET cable

(1) Instructions for handling the SSCNET cable

- Do not stamp the SSCNET cable.
- When laying the SSCNET cable, the minimum bending radius of the cable should be 30 mm(1.18 inch) or more.
If it is less than 30 mm(1.18 inch), an operation failure may occur due to characteristic deterioration, wire breakage, etc. .
- Hold the connector part of the SSCNET cable for installation or removal.



(2) Installation of the SSCNET cable

- When connecting the SSCNET cable to the Motion CPU module, holding the connector part of the SSCNET cable, connect the SSCNET cable to the connector CN1 or CN2 of the Motion CPU module. Connect the connector securely until it clicks.

(3) Removal of the SSCNET cable

- When removing the SSCNET cable, hold and pull the connector part of the SSCNET cable after making sure that the fixing hook have been removed completely.

POINT

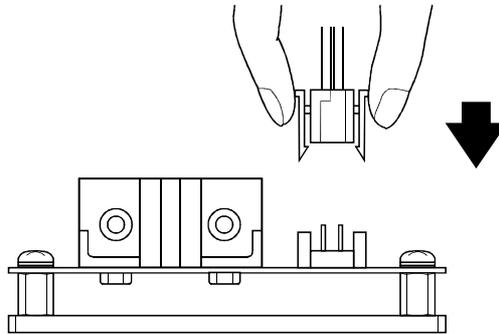
Forcibly removal the SSCNET cable from the module will damage the modules.
--

4 INSTALLATION AND WIRING

4.2.2 Installation and removal of the battery cable

(1) Instructions for handling the battery cable

- Hold the connector part of the battery cable for installation or removal.



(2) Installation of the battery cable

- When connecting the battery cable to the Dividing unit/Battery unit, holding the connector part of the battery cable, connect the battery cable to the connector(BAT) of the Dividing unit/Battery unit.
Connect the connector securely until it clicks.

(3) Removal of the battery cable

- When removing the battery cable, hold and pull the connector part of the battery cable after making sure that the fixing hook have been removed completely.

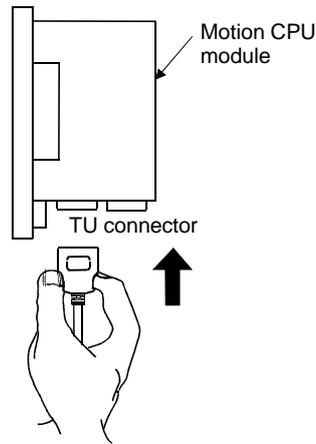
POINT

Forcibly removal the battery cable from the module will damage the modules.

4.2.3 Installation and removal of the cable for teaching unit

(1) Instructions for handling the cable for teaching unit

- Do not stamp the cable for teaching unit.
- When laying the cable for teaching unit, the minimum bending radius of the cable should be 30 mm(1.18 inch) or more.
If it is less than 30 mm(1.18 inch), an operation failure may occur due to characteristic deterioration, wire breakage, etc. .
- Hold the connector part of the cable for teaching unit for installation or removal.
- If the teaching unit is removed, the emergency stop and servomotor become coasting state.



(2) Installation of the cable for teaching unit

- When connecting the cable for teaching unit to the Motion CPU module (Q173CPUN-T/Q172CPUN-T), holding the connector part of the cable for teaching unit, connect the cable for teaching unit to the TU connector of the Motion CPU module (Q173CPUN-T/Q172CPUN-T). Connect the connector securely until it clicks.

(3) Removal of the cable for teaching unit

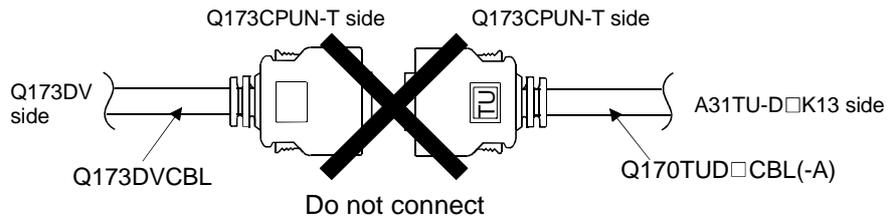
- When removing the cable for teaching unit, hold and pull the connector part of the cable for teaching unit connected to the TU connector of Motion CPU module (Q173CPUN-T/Q172CPUN-T) after making sure that the fixing hook have been removed completely. (When a cable for teaching unit is removed, first be sure to remove a TU connector of Motion CPU (Q173CPUN-T/Q172CPUN-T).)
If a connector of teaching unit is removed first, load may be applied and damaged to a connector of Motion CPU module.

POINTS
(1) Forcibly removal the cable for teaching unit from the module will damage the modules.
(2) When the cable for teaching unit or short-circuit connector is connected to the connector for teaching unit, screw them to the connector for teaching unit. Under tightening can cause a drop, short circuit or operation failure.

4 INSTALLATION AND WIRING

CAUTION

- When a teaching unit is removed, the emergency stop and servomotor become coasting state. In systems where coasting of the servomotor will be a problem, use dynamic brakes.
- Do not connect the Motion CPU module side connector of the cable for teaching unit (Q170TUD□CBL(-A)) and the connecting cable for SSCNET dividing unit (Q173DVCBL) each other. The Motion CPU and servo amplifier are damaged.



4.3 Installation of the Serial Absolute Synchronous Encoder

This section described instructions for handling the Serial absolute synchronous encoder (MR-HENC).

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

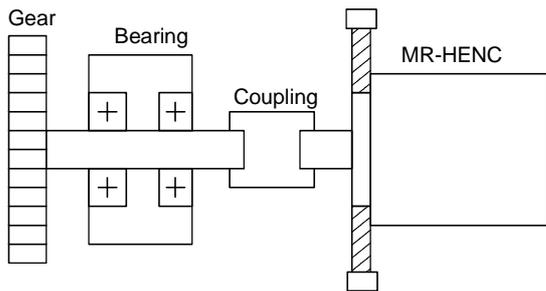


Fig. 4.1 Example of Encoder Linked to a Gear

Table 4.1 Permitted Shaft Loads

	Radial direction	Thrust direction
Permitted shaft load	Up to 98N	Up to 49N

- (2) Large errors in eccentricity and angle of deviation during installation can apply an excessive force to the MR-HENC shaft, which can cause deterioration in performance drastically reduce encoder service time. Minimize loads applied to the shaft such that they lie within the permitted shaft load range. (The permitted shaft loads are shown in table 4.2 for the recommended coupling type).

Table 4.2 Permitted Values for Coupling Mounting Errors

Eccentricity	0.2mm or less
Angle of deviation	1.5° or less
Axial displacement	0.5mm or less

Recommended coupling type specifications

Item	Specification
Maximum torque	0.5N/m
Maximum speed	10000r/min

CAUTION

- The MR-HENC contains a glass disk and precision mechanism. Take care when handling it. The encoder performance may deteriorate if it is dropped or subjected to shocks or vibration exceeding the prescribed limits.
- Do not connect the shaft of MR-HENC directly to machine side rotary shaft. Always connect the shaft of MR-HENC through a flexible coupling.

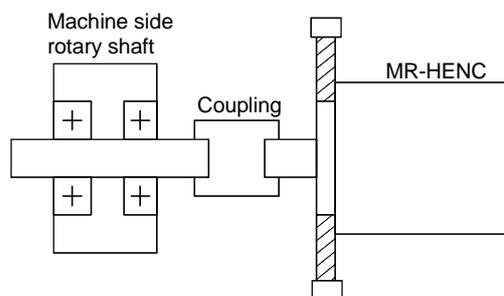


Fig 4.2 Connecting the shaft of MR-HENC to a machine side rotary shaft.

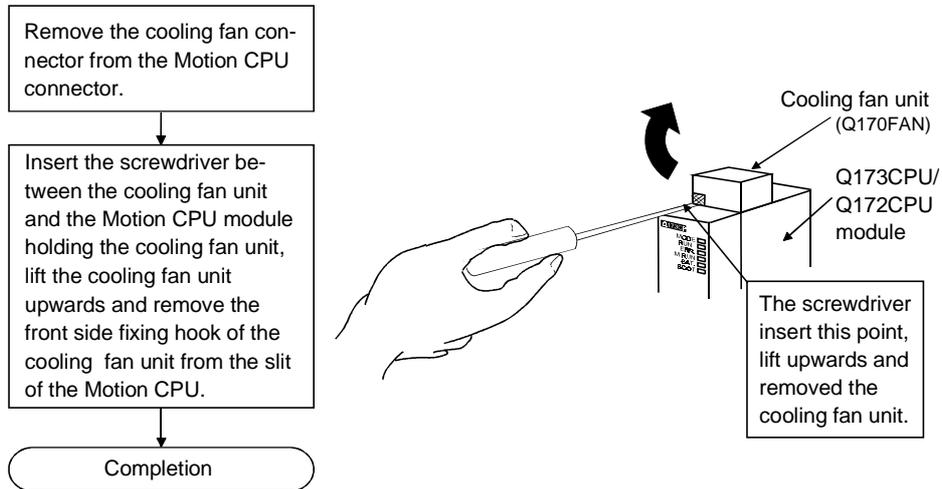
- Never hit the end of the MR-HENC coupling shaft with a hammer when connecting the coupling to it. The large loads applied to MR-HENC will damage it.
- The MR-HENC uses optical parts. Install it in an atmosphere where there are extremely few water drops and little oil and dust.
- In any place where the MR-HENC is exposed to water and/or oil, provide protection from oil and water, e.g. install a cover. In addition, run the cable downward to prevent oil and/or water from running on the cable into the MR-HENC. When it is inevitable to install the MR-HENC vertically or obliquely, trap for the cable.
- Use the MR-HENC within the specified temperature range (0 to 55°C (32 to 131°F)).

4.4 Replacement of the Cooling fan unit (Q170FAN) (Q173CPU/Q172CPU only)

(1) Removal and installation of the cooling fan unit (Q170FAN)

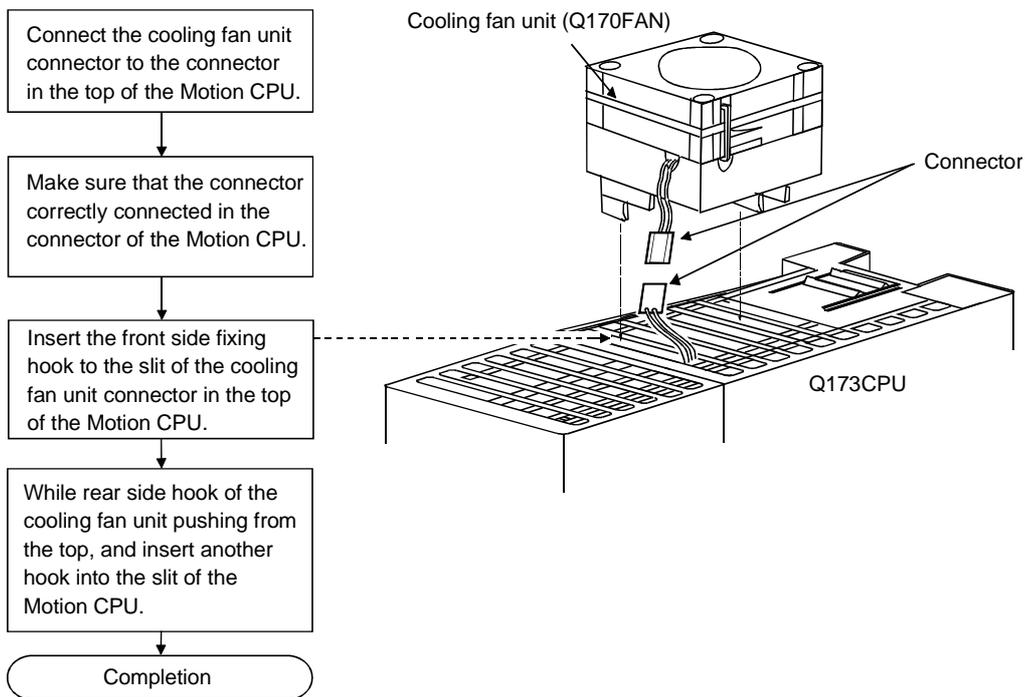
(a) Removal of cooling fan unit from Q173CPU/Q172CPU

The removal of the cooling fan unit are described below.



(b) Installation of cooling fan unit on Q173CPU/Q172CPU

The installation of the cooling fan unit are described below.



CAUTION

- Forcibly installation or removal the cooling fan unit will damage the cover or printed circuit board of modules.
- When install the cooling fan unit, do not pinch the wire.

4 INSTALLATION AND WIRING

4.5 Wiring

4.5.1 Instructions for wiring

DANGER

- Completely turn off the all lines of the power supply externally before wiring. Not completely turning off all power could result in electric shock or damage to the product.
- When turning on the power supply or operating the module after 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: $100\ \Omega$ 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 described instructions for the wiring of the power supply.

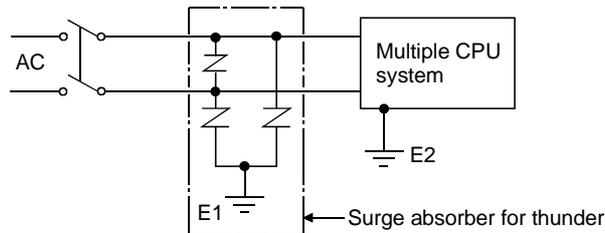
(1) Power supply wiring

- (a) 100VAC, 200VAC and 24VDC wires should be twisted as dense as possible. Connect the modules with the shortest distance.
Also, to reduce the voltage drop to the minimum, use the thickest wires possible (up to 2mm^2).
Use the wires of the following core size for wiring.

Application	Recommended core size
100VAC, 200VAC, 24VDC wires	2.0mm^2 or less
I/O equipment	0.75mm^2 (0.75 to 1.5mm^2 usable)
Ground wire	2.0mm^2 or more

4 INSTALLATION AND WIRING

- (b) Do not bunch or lay them closely the main circuit (high voltage, large current) cables of the 100VAC and 24VDC with the I/O signal cables. If possible, separate them 100mm (3.94inch) or more away.
- (c) As a countermeasure to power surge due to thunder, connect a surge absorber for thunder as shown below.

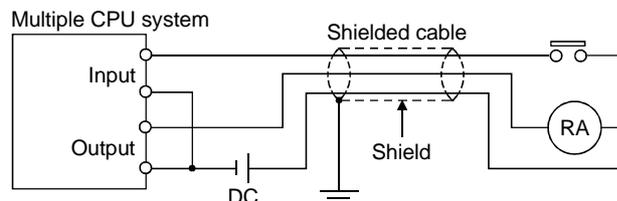


POINTS

- (1) Separate the ground of the surge absorber for thunder (E1) from that of the PLC (E2).
- (2) Select a surge absorber for thunder whose power supply voltage does not exceed the maximum allowable circuit voltage even if 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 in 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.

4 INSTALLATION AND WIRING

- (g) Wiring of 200m (686.67ft.) or more distance will give rise to leakage currents due to the wiring capacity, resulting in a fault.

Refer to the troubleshooting chapter of the I/O Module User's Manual.

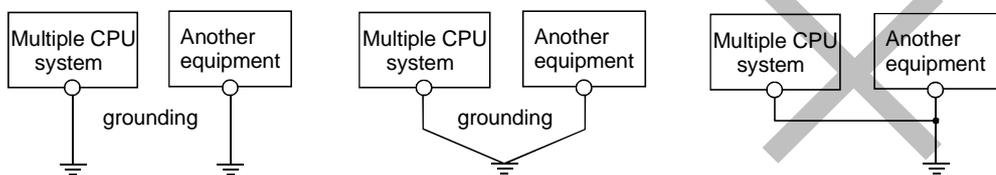
(3) Grounding

To ground the cable, follow the steps (a) to (c) shown below.

- (a) Use the dedicated grounding as independent as possible.

(Ground resistance: $100\ \Omega$ or less)

- (b) When the Multiple CPU system and the another equipment cannot be departed to ground the cable each other, use (2) Common Grounding shown below.



(1) Independent grounding.....Best (2) Common grounding.....Good (3) Joint grounding.....Not allowed

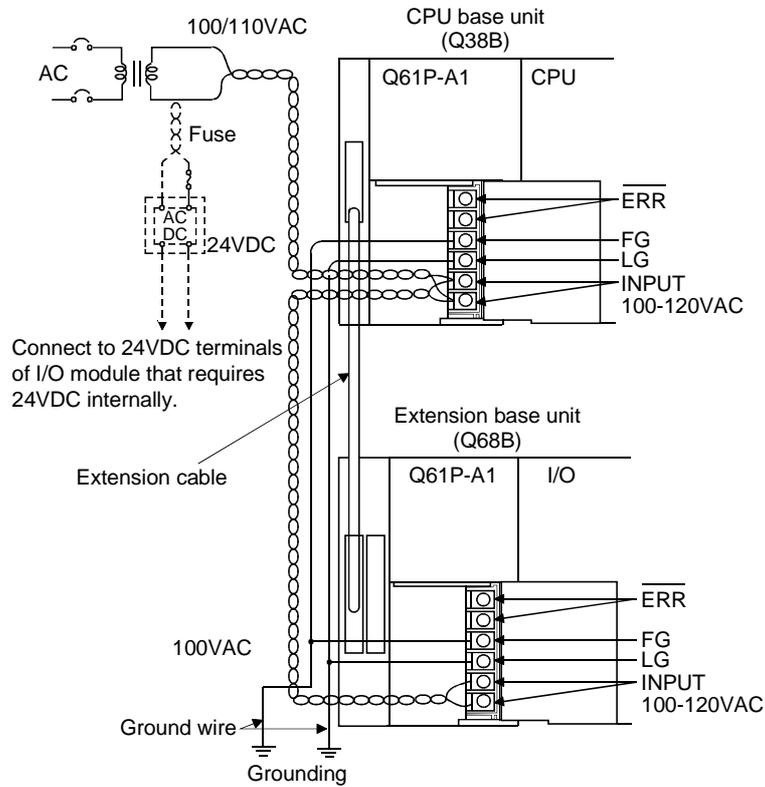
- (c) Use the grounding cable of $2\ \text{mm}^2$ or more.

Position the ground-contact point as nearly to the Multiple CPU system as possible, and use the total length of the grounding cable as short as possible.

4 INSTALLATION AND WIRING

4.5.2 Wiring to the power supply module

The following diagram shows the wiring example of power lines, grounding lines, etc. to the CPU and extension base units.



POINT

- (1) Use the thickest possible (up to 2 mm²) wires for the 100/200 VAC and 24 VDC power cables. Be sure to twist these wires starting at the connection terminals. To prevent a short circuit should any screws loosen, use crimping terminals with insulation sleeves.
- (2) When the LG terminals and FG terminals are connected, be sure to ground the wires. If LG terminals and FG terminals are connected without grounding the wires, the Motion controller may be susceptible to noise. In addition, since the LG terminals have potential of ½ input voltage, the operator may receive an electric shock when touching terminal parts.

4 INSTALLATION AND WIRING

4.6 Installation/Wiring Checklist

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

Item	Sub Item	Installation/wiring confirmation	Check
Installation of module	Installation of the base unit	Check for looseness, ratting or distorted installation.	<input type="checkbox"/>
		Check that the fixing screw tightening torque is as specified.	<input type="checkbox"/>
		Check the unit for damage.	<input type="checkbox"/>
	Installation of modules to the base unit	Check that the installation module model names are correct.	<input type="checkbox"/>
		Check that the Q173CPU(N)/Q172CPU(N) and QCPU are installed to the Motion CPU slots/PLC CPU slots.	<input type="checkbox"/>
		Check that the Q172LX/Q172EX and Q173PX are installed to the Motion CPU control slots.	<input type="checkbox"/>
		Check for looseness, ratting or distorted installation.	<input type="checkbox"/>
		Check that the module fixing screw tightening torque is as specified.	<input type="checkbox"/>
	Installation of the dividing unit	Check that the combination Q173CPU(N) and the Dividing unit are correct.	<input type="checkbox"/>
		Check for looseness, ratting or distorted installation.	<input type="checkbox"/>
		Check that the module fixing screw tightening torque is as specified.	<input type="checkbox"/>
	Installation of the battery unit	Check that the combination Q172CPU(N) and the Battery unit are correct.	<input type="checkbox"/>
		Check for looseness, ratting or distorted installation.	<input type="checkbox"/>
		Check that the module fixing screw tightening torque is as specified.	<input type="checkbox"/>
	Installation of the synchronous encoder	Check that the amplitude, eccentricity and axial displacement relative to the machine side rotary shaft are within the permissible values.	<input type="checkbox"/>
		Check that a flexible coupling is used for coupling with the machine side rotary shaft.	<input type="checkbox"/>
		Check the module for damage.	<input type="checkbox"/>
		Check that excessive impact was not given during installation.	<input type="checkbox"/>
	Installation of the teaching unit	Check the teaching unit for damage.	<input type="checkbox"/>
		Check that the combination of teaching unit and the connecting cable are correct.	<input type="checkbox"/>
Wiring	Wiring of the power supply modules and I/O modules wires	Check that the 100VAC, 200VAC and 24VDC wires are twisted as closely as possible and run in the shortest distance.	<input type="checkbox"/>
		Check that the 100VAC, 200VAC and 24VDC wires are not bind the cable together with and run close to the power and I/O wires.	<input type="checkbox"/>
		Check that each wiring is of the specified wire size.	<input type="checkbox"/>
		Check for looseness of terminal block screw.	<input type="checkbox"/>
		Check that the terminal block screw tightening torque is as specified.	<input type="checkbox"/>
		Check that grounding of the earth terminal FG and LG.	<input type="checkbox"/>

4 INSTALLATION AND WIRING

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

Item	Sub Item	Installation/wiring confirmation	Check
Wiring	Wiring of the SSCNET cable	When using Q173DV, check that the Q173CPU(N) and Q173DV are connected to the SSCNET cable.	<input type="checkbox"/>
		When using the external battery, check that the Q172CPU(N) and Q170BAT are connected to the SSCNET cable.	<input type="checkbox"/>
		Check that SSCNET cable model names are correct. Connection between Q173CPU(N)/Q172CPU(N) and servo amplifier (when using the Dividing cable), Q173DV and servo amplifier (when using Q173DV), and servo amplifier and servo amplifier.	<input type="checkbox"/>
		Check for looseness, ratting or distorted connector and connective.	<input type="checkbox"/>
		Check that the ferrite core is connected to wiring of the SSCNET cable from FR-V5NS.	<input type="checkbox"/>
	Wiring of the teaching unit cable	Check that impossible power does not apply to the relay portion of cable attached teaching unit and cable connects CPU.	<input type="checkbox"/>
		Check that impossible power does not apply to the TU connector of Q173CPUN-T/Q172CPUN-T.	<input type="checkbox"/>

5. TRIAL OPERATION AND ADJUSTMENT

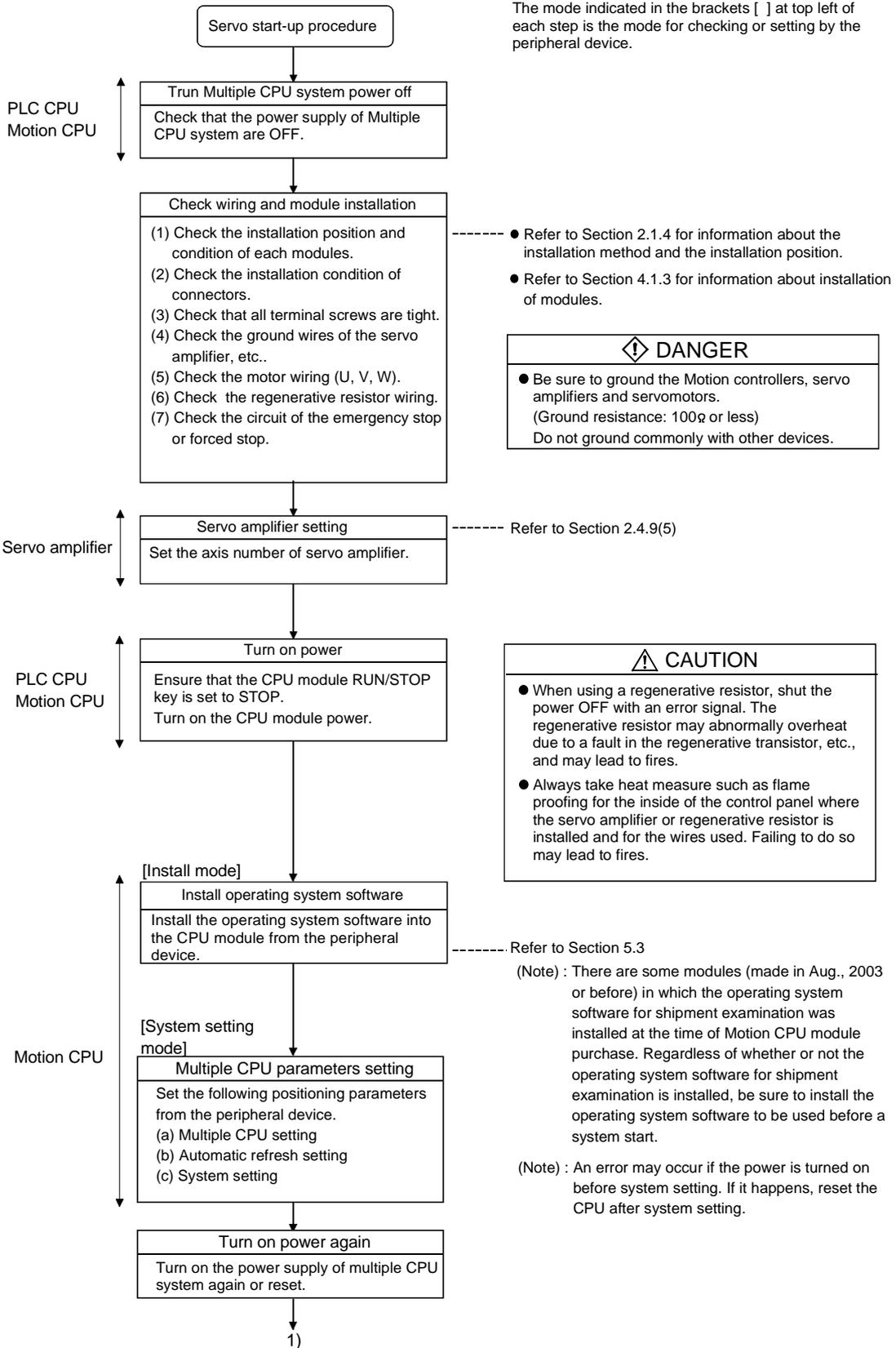
5.1 Checklist before Trial Operation

Table 5.1 Checklists before Trial Operation

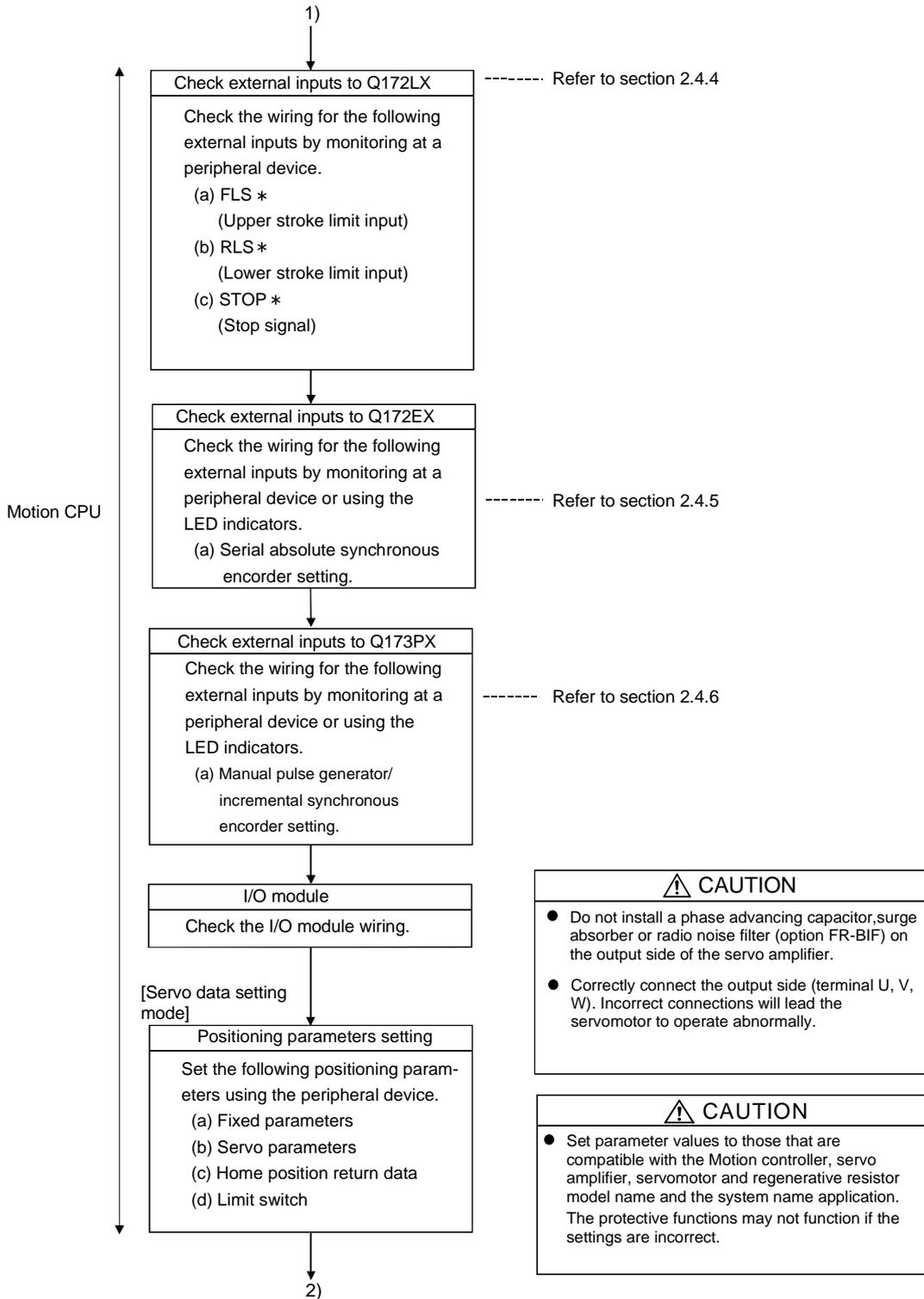
Model name	Confirmation Items	Reference
Q173CPU(N)/Q172CPU(N) Motion CPU module	(1) Check that the battery lead connector is connected into the BAT connector of the Dividing unit correctly.	2.4.10
	(2) Check that the battery voltage is normal. (Normal value: 3.6V)	2.4.10 (1)
Q172LX Servo external signals interface module/ Q172EX Serial absolute synchronous encoder interface module/ Q173PX Manual pulse generator interface module	(1) Check that the installation position of the module corresponds to the system setting.	Refer to the programming manual of the operating system software.
	(2) Check that the external equipment are connected to the Q172LX/Q172EX/ Q173PX correctly.	2.4.4 2.4.5 2.4.6
	(3) Check that the battery is connected to the battery connector.	6.4.2
	(4) Check that the battery voltage of the Q172EX is normal.	2.4.5 (7)
CPU base unit	(1) Check that the installation module model names are correct.	2.4.3 (1)
	(2) Check that the installation orders are correct.	2.1.3
	(3) Check that the modules are installed correctly.	4.1.3 (1)
Power supply module	(1) Check that the power supply module model name installed on base unit is correct.	2.4.2 (1)
	(2) Check that FG and LG are wired correctly.	4.5.2
	(3) Check that the terminal screws are tightened correctly.	4.1.1 (3)
	(4) Check that the cable sizes are correct.	4.5.1 (1)
I/O module	(1) Check that the cables connected to each terminal of the terminal block correspond to the signal names.	Refer to the Q series I/O Module Type Building Block User's Manual
	(2) Check that the terminal screws are tightened correctly.	
	(3) Check that the cable sizes are correct.	
	(4) Check that the external power supply are connected correctly. (24 VDC, 5 VDC)	
Extension base unit	(1) Check that the installation module model names are correct.	2.4.3 (1) (b)
	(2) Check that the total I/O points of the output module and special function module does not exceed the number I/O points of the CPU module.	Refer to the programming manual of the operating system software.
	(3) Check that the installation modules are connected correctly.	4.1.3 (1)
SSCNET cable	(1) Check that the installation SSCNET cable model names are correct.	2.4.9
	(2) Check that the installation positions of the connector for SSCNET cables are correct.	
	(3) Check that the SSCNET cables are connected correctly.	4.2.1
Dividing unit(Q173DV)	(1) Check that the installation SSCNET cable model names are correct.	2.4.9
	(2) Check that the installation positions of the connector for SSCNET cables are correct.	
	(3) Check that the SSCNET cables are connected correctly.	
	(4) Check that the battery is connected to the battery connector.	6.4.2 (2)
Battery unit(Q170BAT)	(1) Check that the SSCNET cables are connected correctly.	2.4.9
	(2) Check that the battery is connected to the battery connector.	6.4.2 (2)
Teaching unit (A31TU-D□K13)	(1) Check that the combination of teaching unit and the connecting cable are correct.	2.4.8
	(2) Check that short-circuit connector for teaching unit is connected, when teaching unit is not using.	

5 TRIAL OPERATION AND ADJUSTMENT

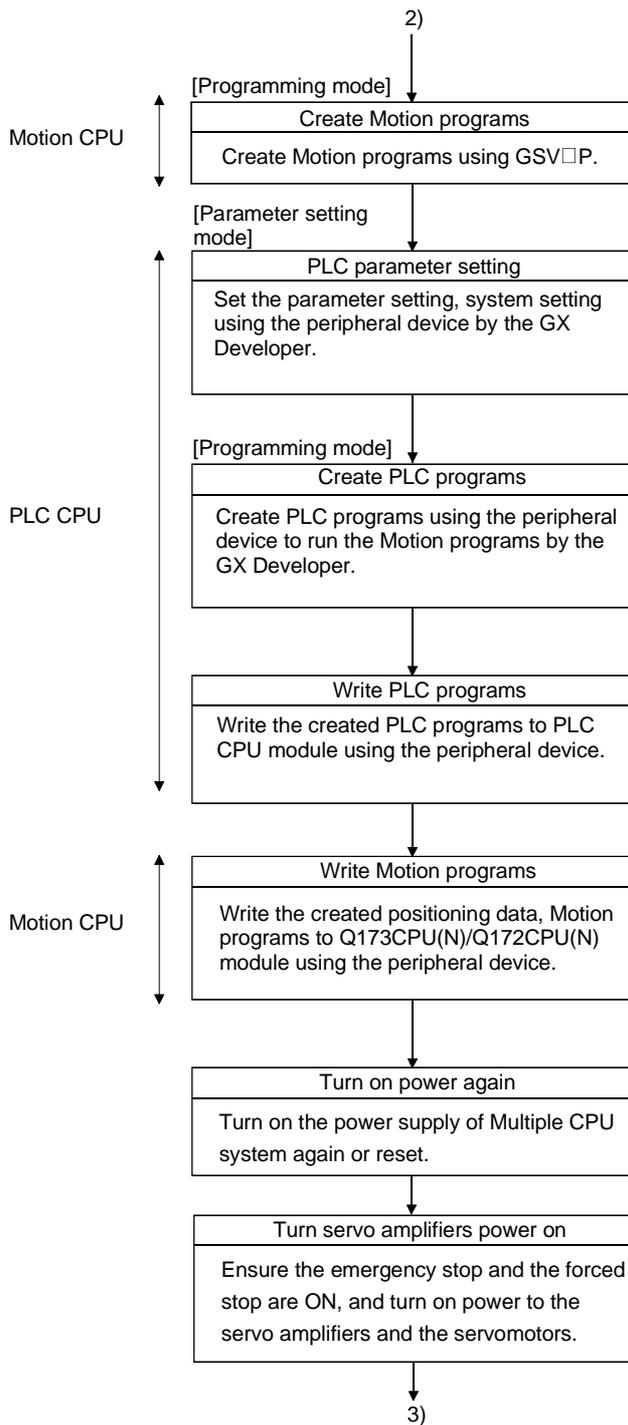
5.2 Trial Operation and Adjustment Procedure



5 TRIAL OPERATION AND ADJUSTMENT



5 TRIAL OPERATION AND ADJUSTMENT



⚠ DANGER

- Never open the front case or terminal cover at times other than wiring work or periodic inspections even if the power is OFF. The insides of the Motion controller and servo amplifier are charged and may lead to electric shocks.
- When performing wiring work or inspections, turn the power OFF, wait at least ten minutes, and then check the voltage with a tester, etc.. Failing to do so may lead to electric shocks.
- Wire the units after installing the Motion controller, servo amplifier and servomotor. Failing to do so may lead to electric shocks or damage.

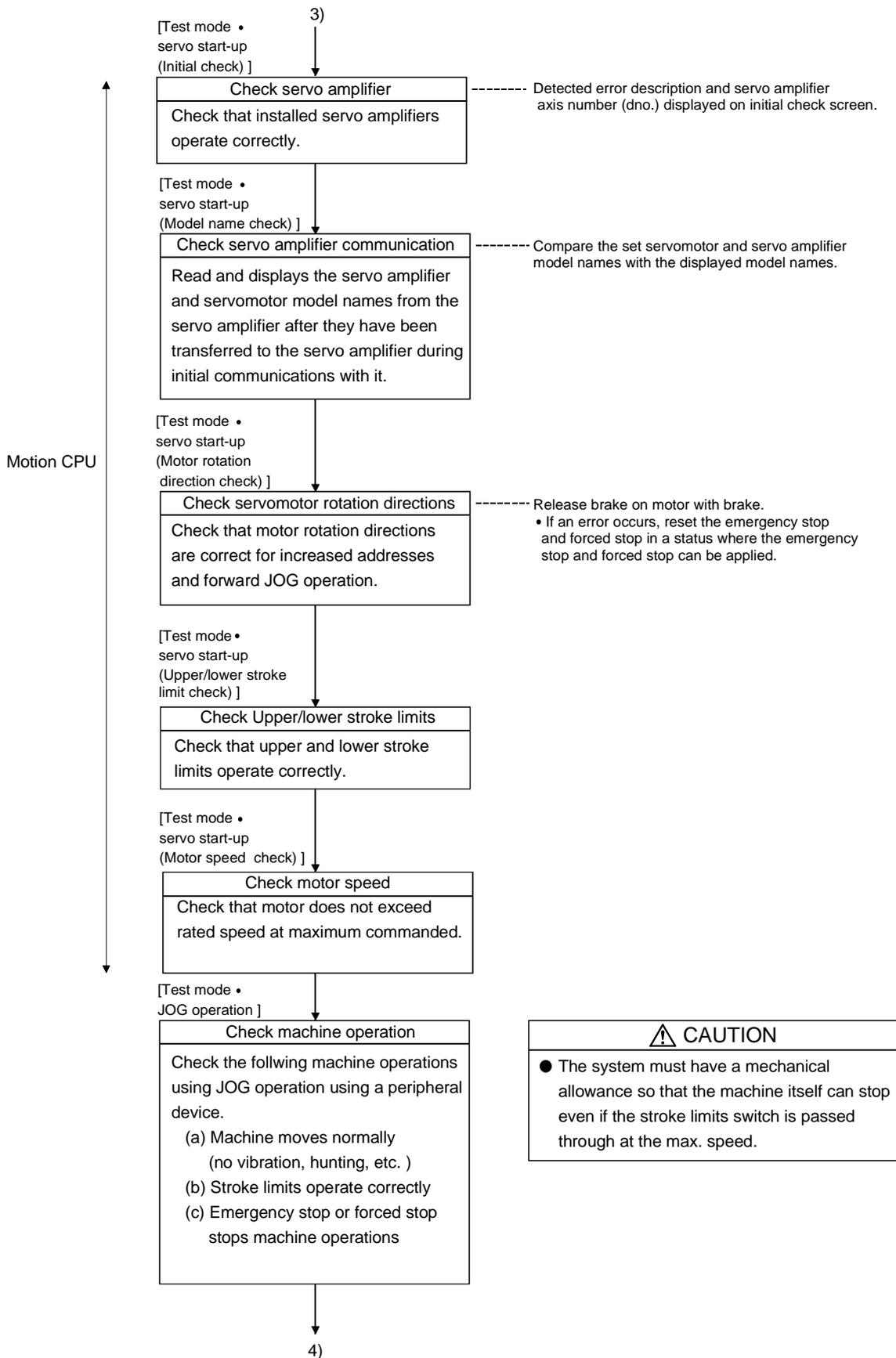
⚠ CAUTION

- Always install a leakage breaker on the Motion controller and servo amplifier power source.
- Install emergency stop circuit externally so that operation can be stopped immediately and the power shut off.
- Use the program commands for the program with the conditions specified in the instruction manual.
- Some devices used in the program have fixed applications, so use these with the conditions specified in the programming manual.

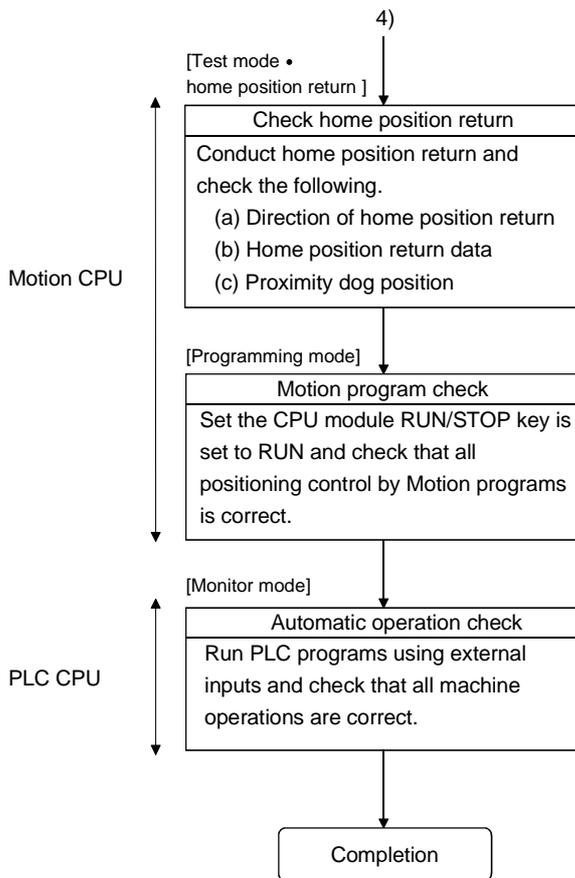
⚠ CAUTION

- If safety standards (ex., robot safety rules, etc.,) apply to the system using the Motion controller, servo amplifier and servomotor, make sure that the safety standards are satisfied.
- Construct a safety circuit externally of the Motion controller or servo amplifier if the abnormal operation of the Motion controller or servo amplifier differ from the safety directive operation in the system.

5 TRIAL OPERATION AND ADJUSTMENT



5 TRIAL OPERATION AND ADJUSTMENT



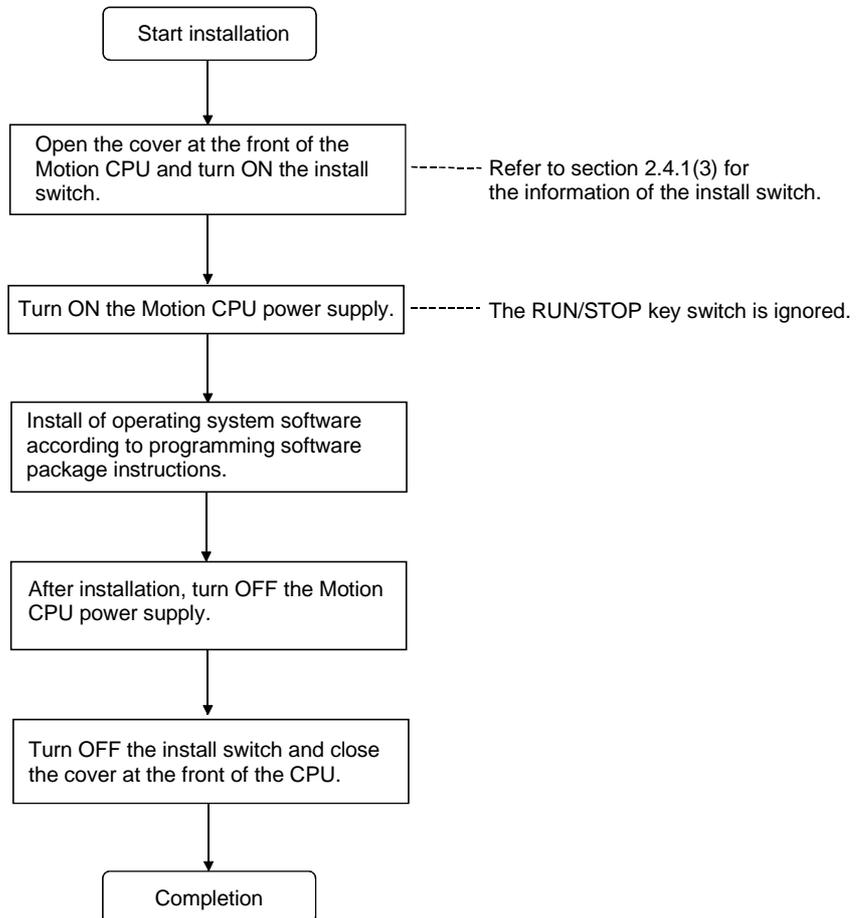
POINTS

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

5 TRIAL OPERATION AND ADJUSTMENT

5.3 Operating System Software Installation Procedure

In the Motion CPU module, the operating system software installation is necessary by using peripheral device and peripheral software package.



POINTS

- (1) There are some modules (made in Aug., 2003 or before) in which the operating system software for shipment examination was installed at the time of Motion CPU module purchase. Regardless of whether or not the operating system software for shipment examination is installed, be sure to install the operating system software to be used before a system start.
- (2) Check the model name and version of the operating system software installed in the Motion CPU module before installation.
- (3) Even if installation is done, the positioning data and servo programs written in the Motion CPU module does not be rewritten.
- (4) Do not turn off the power supply during installation. The Motion CPU module may break down.

5 TRIAL OPERATION AND ADJUSTMENT

5.4 Trial Operation and Adjustment Checklist

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

Work Step	Item	Trial Operation and Adjustment Confirmation	Check
Before power on	Installation of unit/module and basic wiring	Check that each module is installed correctly.	<input type="checkbox"/>
		Check that each connector is connected correctly.	<input type="checkbox"/>
		Check each terminal screw for looseness.	<input type="checkbox"/>
		Check that earth wires of power supply module, servo amplifiers, etc. are correct.	<input type="checkbox"/>
		Check that motor wiring is correct.	<input type="checkbox"/>
		Check that regenerative option wiring are correct.	<input type="checkbox"/>
		Check that the emergency stop and forced stop circuit are correct.	<input type="checkbox"/>
		Check that each power supply wire and each I/O wire are correct.	<input type="checkbox"/>
Power on, Motion CPU module in STOP status, PLC CPU module in STOP status	OS installation	Check that the operating system software installation is compatible.	<input type="checkbox"/>
	System setting	Check the system setting is correct.	<input type="checkbox"/>
	Q172LX external signals	Check that upper and lower stroke limit inputs are correct.	<input type="checkbox"/>
		Check that STOP signal input is correct.	<input type="checkbox"/>
		Check that proximity dog and speed-position switching signal inputs are correct.	<input type="checkbox"/>
	Program/positioning data	Check that Motion program, PLC program and positioning data are stored in CPU module correctly.	<input type="checkbox"/>
	Basic axis operations (Check each axis)	Check that communications with the servo amplifiers can be made.	<input type="checkbox"/>
		Check that rotation direction for JOG operation is correct.	<input type="checkbox"/>
		Check that upper and lower limit switches operate correctly.	<input type="checkbox"/>
		Check that rotation at maximum command speed is less than motor rating.	<input type="checkbox"/>
Check that JOG operation moves machine correctly.		<input type="checkbox"/>	
Check that a stop is effected at upper/lower stroke limit.		<input type="checkbox"/>	
Motion CPU module in RUN status, PLC CPU module in STOP status	Manual operation	Check that the emergency stop or forced stop is made.	<input type="checkbox"/>
		Check that home position return is made correctly.	<input type="checkbox"/>
		Check that each positioning control of Motion program is used correctly.	<input type="checkbox"/>
		Check each operation in manual operation mode of system with Motion program running.	
		Check that machine operation is stopped immediately by the emergency stop or forced stop.	<input type="checkbox"/>
		Check operation of each actuator and operation confirmation limit switch.	<input type="checkbox"/>
	Automatic operation	Check that the emergency stop, forced stop and equipment alarm signals are given correctly.	<input type="checkbox"/>
		Make other checks in compliance with control specifications specific to system and equipment.	<input type="checkbox"/>
		Check each operation in automatic operation mode of system with Motion program running.	
		Check the automatic operation motions.	<input type="checkbox"/>
Check that machine operation is stopped immediately by the emergency stop or forced stop.		<input type="checkbox"/>	
Check that module or equipment alarm causes an immediate stop or cycle stop.		<input type="checkbox"/>	
Torque check	Check that restoring operation can be performed after an alarm stop.	<input type="checkbox"/>	
	Make other checks in compliance with control specifications specific to system and equipment.	<input type="checkbox"/>	
	Check that the acceleration/deceleration torque is less than maximum torque.	<input type="checkbox"/>	
		Check that continuous execute load torque is less than rated torque.	<input type="checkbox"/>

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.
- Turn off the all lines of the power supply externally when cleaning the module, tightening the terminal screws or module fixing screws. Not doing so could result in electric shocks.
Under tightening the terminal screws 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.

 **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 CPU module 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.
- When using cellular phone, keep them away from the Motion controller 25 cm (9.84 inch) or more. It may cause an operation failure.
- Turn off the all lines of the power supply externally when installing or removing the modules. Not doing so could damage the module or result in operation failure.

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 INSPECTION AND MAINTENANCE

6.1 Maintenance Works

6.1.1 Instruction of inspection works

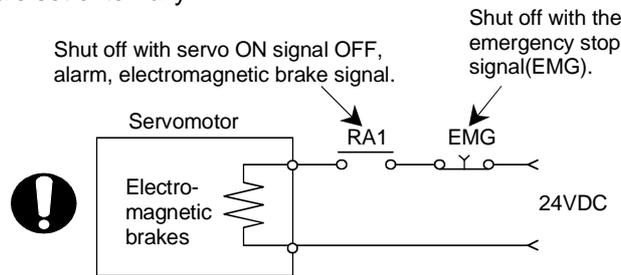
In order that can use the Motion controller in safety and normal, those items that must be inspected list below.

CAUTION

- 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.
- Be sure to ground the Motion controller, servo amplifier and servomotor. 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 installing the Motion controller, servo amplifier and servomotor. Failing to do so may lead to electric shocks or damage.
- Never operate the switches with wet hands, as this may lead to electric shocks.
- Do not damage, apply excessive stress, place heavy things on or sandwich the cables, as this may lead to electric shocks.
- Do not touch the Motion controller, servo amplifier or servomotor terminal blocks while the power is ON, as this may lead to electric shocks.
- Do not touch the built-in power supply, built-in grounding or signal wires of the Motion controller and servo amplifier, as this may lead to electric shocks.
- 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 servomotor with electromagnetic brakes for maintenance 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 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 servo amplifier's heat radiating fins, regenerative resistor and servomotor, etc., while the power is ON and for a short time after the power is turned OFF. In this timing, these parts become very hot and may lead to burns.
- Always turn the power OFF before touching the servomotor shaft or coupled machines, as these parts may lead to injuries.
- Do not go near the machine during test operations or during operations such as teaching. Doing so may lead to injuries.
- Do not bunch the control wires or communication cables with the main circuit or power wires, or install them close to each other. They should be installed 100 mm (3.94 inch) or more from each other. Trying to bunch or install could result in noise that would cause operation failure.

6 INSPECTION AND MAINTENANCE

6.2 Daily Inspection

The items that must be inspected daily are listed below.

Table 6.1 Daily Inspection

Item	Inspection item	Inspection	Criterion	Action						
1	Installation of the base unit	Check that the fixing screws are not loose and the cover is not dislocated.	The screws and cover must be installed correctly.	Retighten the screws.						
2	Installation of the I/O module, etc.	Check that the module is not dislocated and the unit fixing hook is engaged correctly.	The unit fixing hook must be engaged and installed correctly.	Correctly engaged the unit fixing hook.						
3	Connecting condition	Check that terminal screws are not loose.	Screws should not be loose.	Retighten the terminal screws.						
		Check distance between of crimping terminals.	Crimping terminals must be positioned at proper intervals.	Correct.						
		Check connectors of extension cable.	Connector must not be loose.	Retighten the connector fixing screws.						
4	Module indication LED									
					Power supply module	Power supply [POWER] LED	Check that the LED is ON.	The LED must be ON (green). (Abnormal if the LED is OFF.)	Refer to "QCPU (Q Mode) User's Manual (Function Explanation /Program Fundamentals)".	
					PLC CPU module	CPU [RUN] LED	Check that the LED is ON in RUN state.	The LED must be ON. (Abnormal if the LED is OFF.)		
						CPU [ERR.] LED	Check that the LED is OFF.	The LED must be OFF. (Abnormal if the LED is ON or flickers.)		
						CPU [USER] LED	Check that the LED is ON.	The LED must be ON in the detection of CHK instruction or annunciator [F] is ON.		
						CPU [BOOT] LED	Check that the LED is ON/OFF.	The LED must be ON in the mode operated by ROM. The LED must be OFF in the mode operated by RAM/Installation mode • mode written in ROM.		
						CPU [BAT.] LED	Check that the LED is OFF.	The LED must be OFF. (Abnormal if the LED is ON.)		
					Motion CPU module	CPU [MODE] LED	Check that the LED is ON.	The LED must be ON (green). (Abnormal if the LED is OFF.) The LED must be ON (orange) in the Installation mode • Mode written in ROM. (Abnormal if the LED is OFF.)		Refer to Section 2.4.1
						CPU [RUN] LED	Check that the LED is ON.	The LED must be ON. (Abnormal if the LED is OFF.)		
						CPU [ERR.] LED	Check that the LED is OFF.	The LED must be OFF. (Abnormal if the LED is ON or flickers.)		
						CPU [M.RUN] LED	Check that the LED is ON in RUN state.	The LED must be ON during operation in motion control. (Abnormal if the LED is OFF.)		
						CPU [BAT.] LED	Check that the LED is OFF.	The LED must be OFF. (Abnormal if the LED is ON.)		

6 INSPECTION AND MAINTENANCE

Daily Inspection(continued)

Item	Inspection item		Inspection	Criterion	Action
4	Module indication LED I/O module	Input LED	Check that the LED is ON/OFF.	The LED must be ON at input signal ON. The LED must be OFF at input signal OFF. (Abnormal if the LED does not turn ON or turn OFF as indicated above.)	Refer to Section 2.4.1
		Output LED	Check that the LED is ON/OFF.	The LED must be ON at output signal ON. The LED must be OFF at output signal OFF. (Abnormal if the LED does not turn ON or turn OFF as indicated above.)	
5	Cooling fan unit (Q173CPU/Q172CPU only)		Check for vibration, howl and noise.	No vibration, howl and noise. (A service life time of the cooling fan unit : when the number of the revolution lower than the 20% of the initial time.)	Replace it with a new one if a service life time of the cooling fan unit is exceeded,
			Check that the connectors for cooling fan unit is not dislocated and the hooks of cooling fan unit is engaged correctly.	The connectors for cooling fan unit and hooks of cooling fan unit must be engaged and installed correctly.	Engage the connectors and hooks correctly.

6 INSPECTION AND MAINTENANCE

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 method	Criterion	Action
1	Ambient temperature	Measure with a thermometer and a hygrometer. Measure corrosive gas.	0 to 55 °C (32 to 131 °F)	If the controller is used in the control panel, temperature within the control panel is equivalent to ambient temperature.
	Ambient humidity		5 to 95 % RH	
	Atmosphere		No corrosive gases	
2	Power voltage	Measure a voltage across the terminals of 100/200VAC and 24VDC.	85 to 132VAC 170 to 264VAC 15.6 to 31.2VDC	Change the power supply.
3	Looseness, rattling	Move the module to check for looseness and rattling.	The module must be installed fixedly.	Retighten the screws. If the CPU, I/O, or power supply module is loose, fix it with screws.
	Adhesion of dirt and foreign matter	Check visually.	Dirt and foreign matter must not be present.	Remove and clean.
4	Looseness of terminal screws	Try to further tighten screws with a screwdriver.	Screws must not be loose.	Further tighten.
	Distance between of crimping terminals	Check visually.	Crimping terminals must be positioned at proper intervals.	Correct.
	Looseness of connectors	Check visually.	Connectors must not be loose.	Retighten the connector fixing screws.
5	Battery	Preventive maintenance		Even if the lowering of a battery capacity is not shown, replace the battery with a new one if a service life time of the battery is exceeded.
6	Cooling fan unit (Q173CPU/Q172CPU only)	Check visually.	No vibration, howl and noise. (The service life time of the cooling fan unit: when the number of the revolution lower than the 20% of the initial time.)	Replace it with a new one. If a service life time of the cooling fan unit is exceeded,

6.4 External Battery

The special relays (M9006, M9007) turn ON due to the Motion CPU program or the decrease in voltage of memory back-up battery.

Even if these special relays turn ON, the program and the contents of memory back-up are not erased immediately.

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

While a total of the memory back-up time after the M9006, M9007 turn ON is within a specified time, replace the battery with a new one.

POINT
M9007 turns ON due to the decrease in voltage of battery. Even if M9007 turns ON, it holds the data within a specified time. However, for safety, replace the battery with a new one as soon as possible.

When the external battery voltage is lowered, the M9006 and M9007 turn ON. M9006 always detects the battery decrease, and it turns ON when the battery voltage becomes normal.

M9007 detects the battery decrease, and it holds an alarm until the power supply is turned ON again or reset even if the battery voltage becomes normal.

Set the available/not available of external battery in the system settings.

6 INSPECTION AND MAINTENANCE

6.4.1 Battery service life time

(1) Q173CPU(N)/Q172CPU(N), Q172EX module battery service life time

The battery service life time corresponding to the type is shown below.

Type	Classification		Battery service life time (Total power interrupt time) [h] (Note-1)		
			Guaranteed time (MIN)	Actual time (TYP)	After the battery decrease
Q173CPU(N)/ Q172CPU(N)	Built-in (Note-3) (Type of the rechargeable)	Charging time of 8 hours or more	200	500	No battery decrease detection
		Charging time of 40 hours or more	1100	4300	
	External(A6BAT/MR-BAT) (Note-2)		60000	240000	120 (After M9006, M9007 on)
Q172EX	Built-in (A6BAT/MR-BAT)	MR-HENC×1	10000	30000	40 (After Error code 1152)
		MR-HENC×2	5000	15000	

(Note-1) : The actual time in use means the averaged time, and the guaranteed time means the minimum time.

(Note-2) : The external battery for Q173CPU(N) is installed to the Dividing unit(Q173DV).

The external battery for Q172CPU(N) is installed to the Battery unit(Q170BAT).

(Note-3) : The built-in battery for Q173CPU(N)/Q172CPU(N) can not be replaced.

Even if the A6BAT/MR-BAT is not connected to the Q173CPU(N)/Q172CPU(N)/Q172EX or a total power interrupt time does not exceed the guaranteed value, replace it with a new one in 4 to 5 years.
If a total of power interrupt time exceeds the guaranteed value specified above the M9006, M9007 is turned on, replace the battery with a new one immediately.

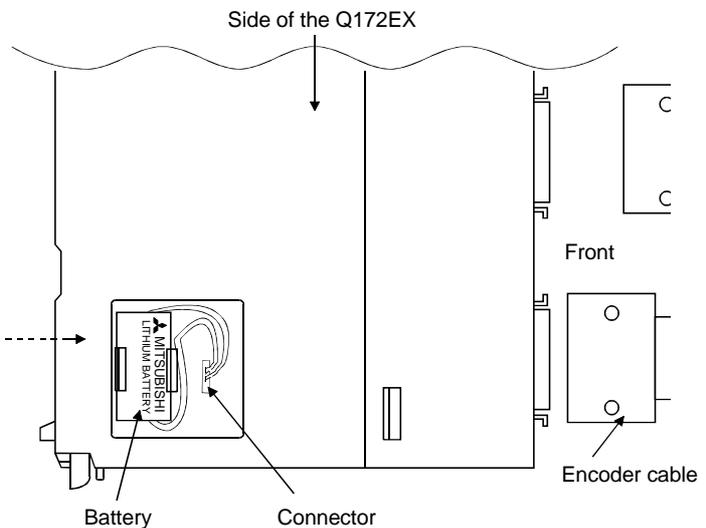
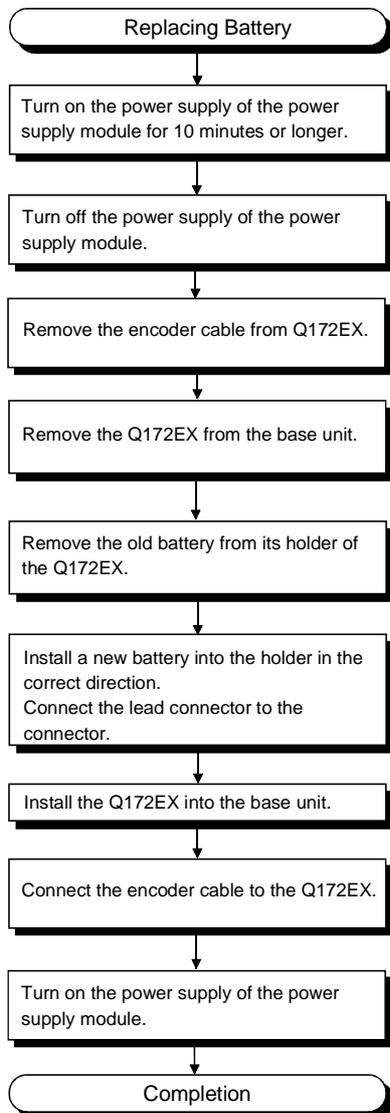
6.4.2 Battery replacement procedure

(1) Q172EX module battery replacement procedure

When the Q172EX module battery has been exhausted, replace the battery with a new one in accordance with the procedure shown below. Before removing the battery, turn ON the power supply for 10 minutes or longer.

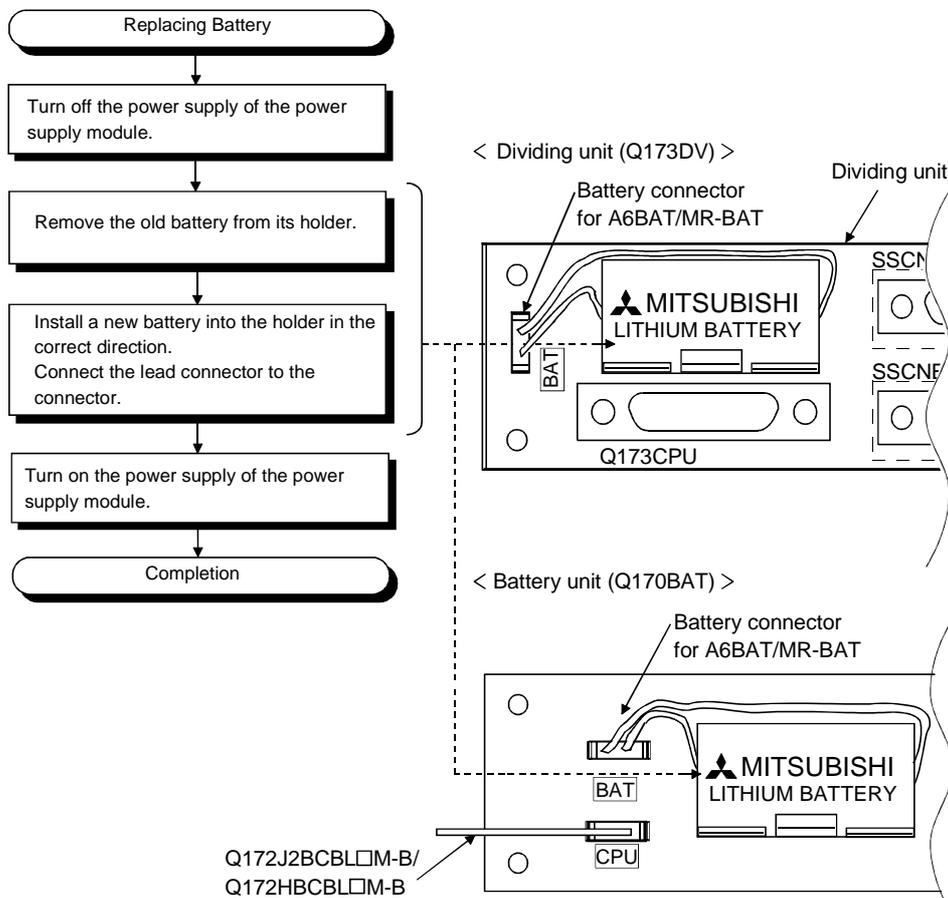
Even when the battery is removed, the memories are backed up by the capacitor for a while. However, if the replacement time exceeds the guaranteed value specified in the table below, the contents stored in the memories may be erased. To prevent this trouble, replace the battery speedily.

Backup time by capacitor
Backup time by capacitor[min]
3



- (2) Battery replacement procedure of the Dividing unit, Battery unit
 When the battery has been exhausted, replace the battery with a new one in accordance with the procedure shown below.

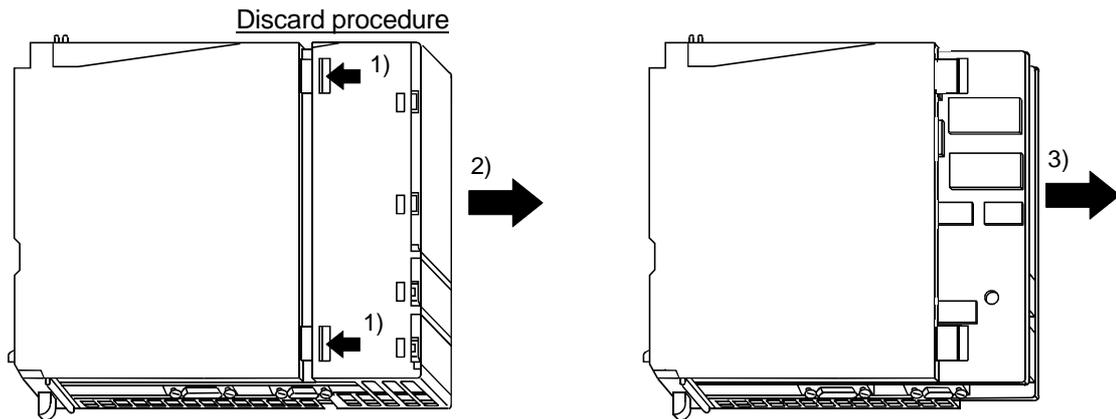
POINTS
Replace the battery taking care of the following.
(a) Start the replacement operation after backing up the data to the personal computer which is installed the GSV □P.
(b) Firstly back up the data stored in the Motion CPU to the personal computer which is installed the GSV □P then replace the battery with a new one. After installation the battery in the Dividing unit or Battery unit, verify the backing up the data to the personal computer which is installed the GSV □P and the data in the Motion CPU module, confirm the data is not changing.



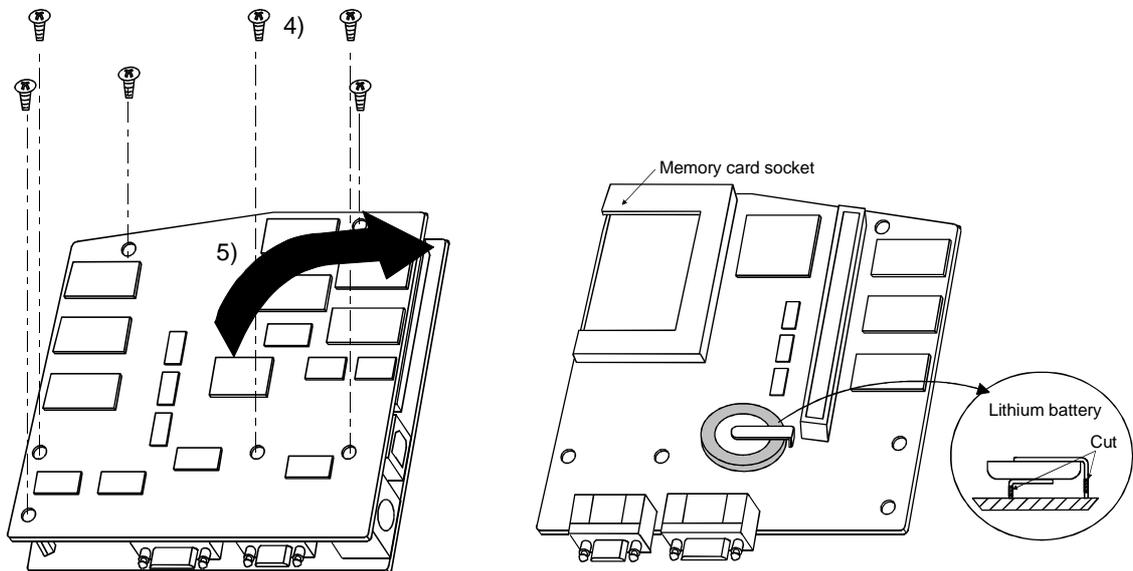
6.5 Discard of internal rechargeable battery

(1) Discard procedure of internal rechargeable battery

The rechargeable lithium battery is built-in in the Motion CPU module. When you discard the Motion CPU module, discard an internal rechargeable battery according to the following procedure.



- 1) 2) Push in 4 hooks of the Motion CPU module side and remove a front cover.
- 3) Take out a printed circuit board from a case.



- 4) Turn up a printed circuit board which has install the memory card socket, and then remove 6 fixing screws (M3) from circuit board.
- 5) Separate printed circuit boards.
- 6) Check that the internal rechargeable battery is set on a surface of printed circuit board which has install the memory card socket, and cut lead sections of internal rechargeable battery.
- 7) When you discard an internal rechargeable battery, please follow the law of each country (area).

6 INSPECTION AND MAINTENANCE

CAUTION

- Do not disassemble the modules except the time of discard.
- Do not short circuit, charge, overheat, incinerate or disassemble the batteries.

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 Basics of troubleshooting

In order to increase the reliability of the system, not only highly reliable devices are used but also the speedy startup of the system after the occurrence of trouble becomes an important factor.

To start up the system speedily, the cause of the trouble must be located and eliminated correctly.

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

(1) Visual inspection

Visually check the following.

- 1) Movement of machine (stopped condition, operating condition)
- 2) Power supply on/off
- 3) State of I/O devices
- 4) Installation condition of the Power supply module, Q173CPU(N)/Q172CPU(N) module, QCPU module, I/O module, Q172LX/Q172EX/Q173PX Motion module, SSCNET cable, Synchronous encoder cable and cable for the teaching unit.
- 5) State of wiring (I/O cables, cables)
- 6) Display states of various types of indicators (MODE LED, RUN LED, M.RUN LED, ERR. LED, I/O LED, etc.)
- 7) Setting states of various types of set switches (Number of extension bases setting, memory back-up, etc.)

After confirming items 1) to 7), Motion CPU module connect the SW6RN-GSV □P, PLC CPU module connect the GX Developer and check the operating conditions of the servomotors and the error code.

(2) Check of trouble

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

- 1) Set the RUN/STOP switch to STOP.
- 2) Reset the trouble with the RESET/L.CLR switch.
- 3) Turn ON and OFF the power supply.

(3) Reduction in area

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

- 1) Multiple CPU system or external devices?
- 2) Motion CPU or PLC CPU?
- 3) I/O module or others?
- 4) Servo program or Motion SFC program?
- 5) PLC program?

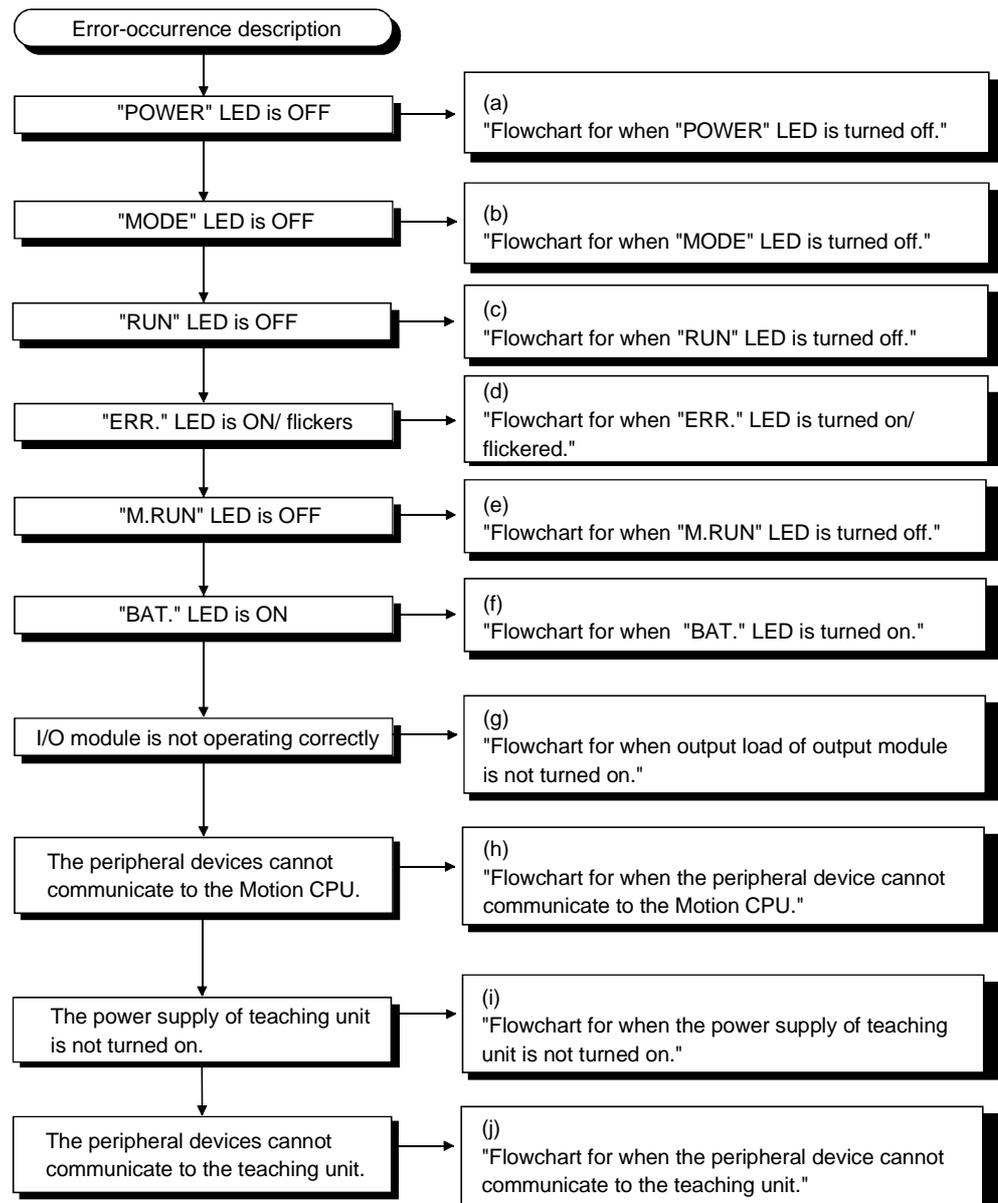
6.6.2 Troubleshooting of Motion CPU module and I/O modules

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

As for troubleshooting of PLC CPU, refer to the QCPU (Q mode) User's Manual(Function Explanation/Program fundamentals) of their respective modules.

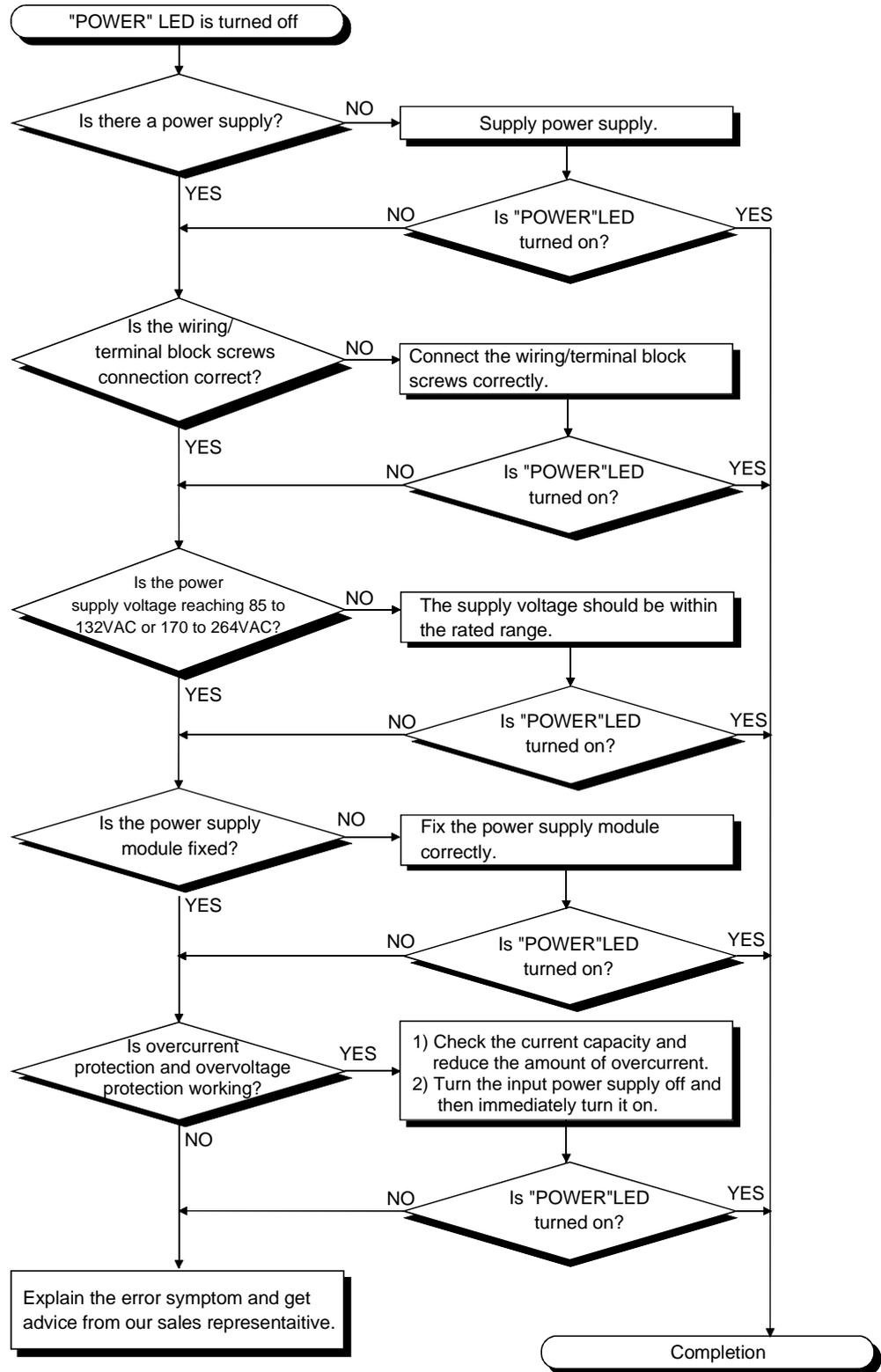
(1) Troubleshooting flowchart

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



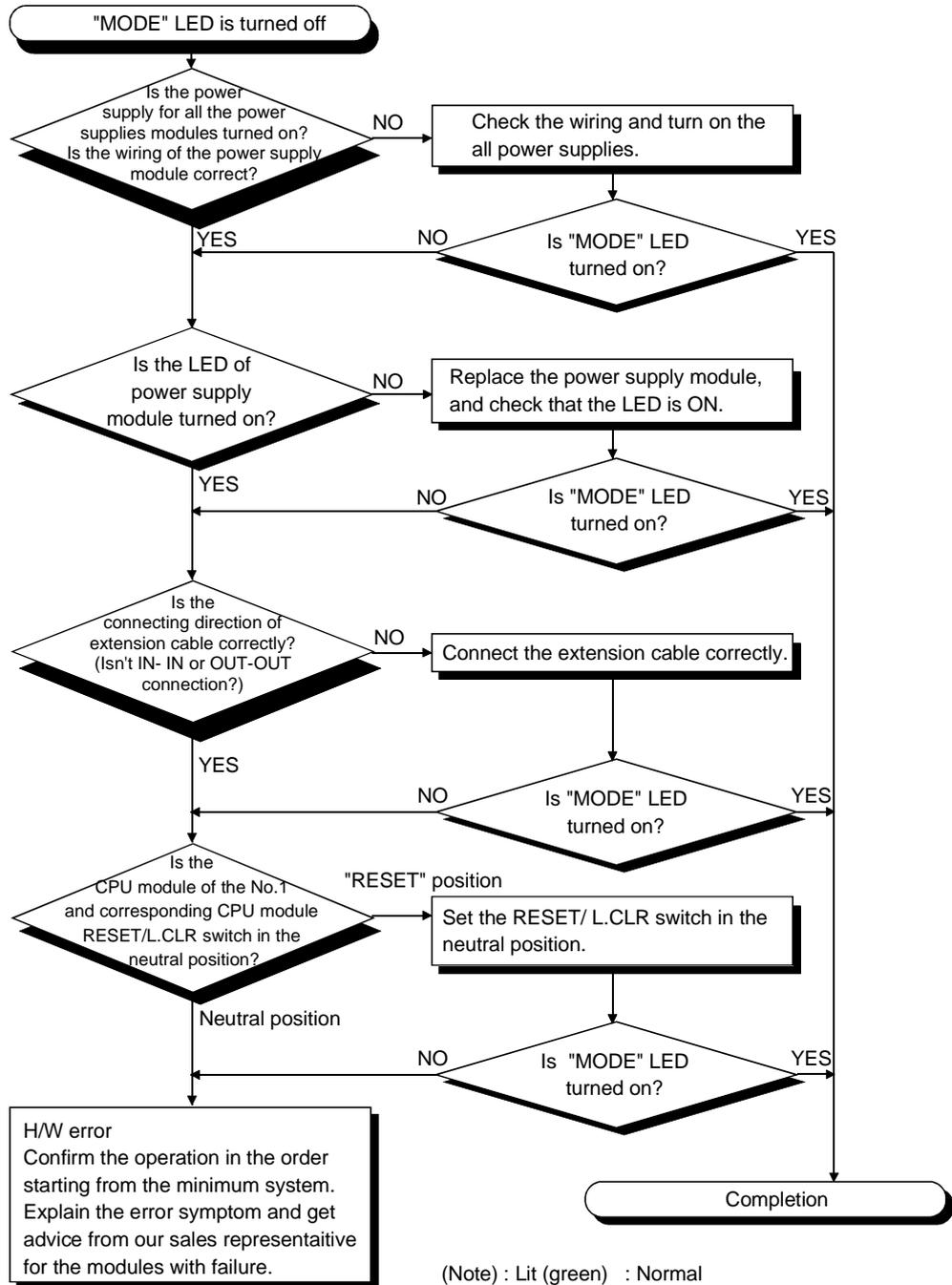
(a) Flowchart for when "POWER" LED is turned off.

The following shows the flowchart when the "POWER" LED is turned off at the power supply ON or during operation.



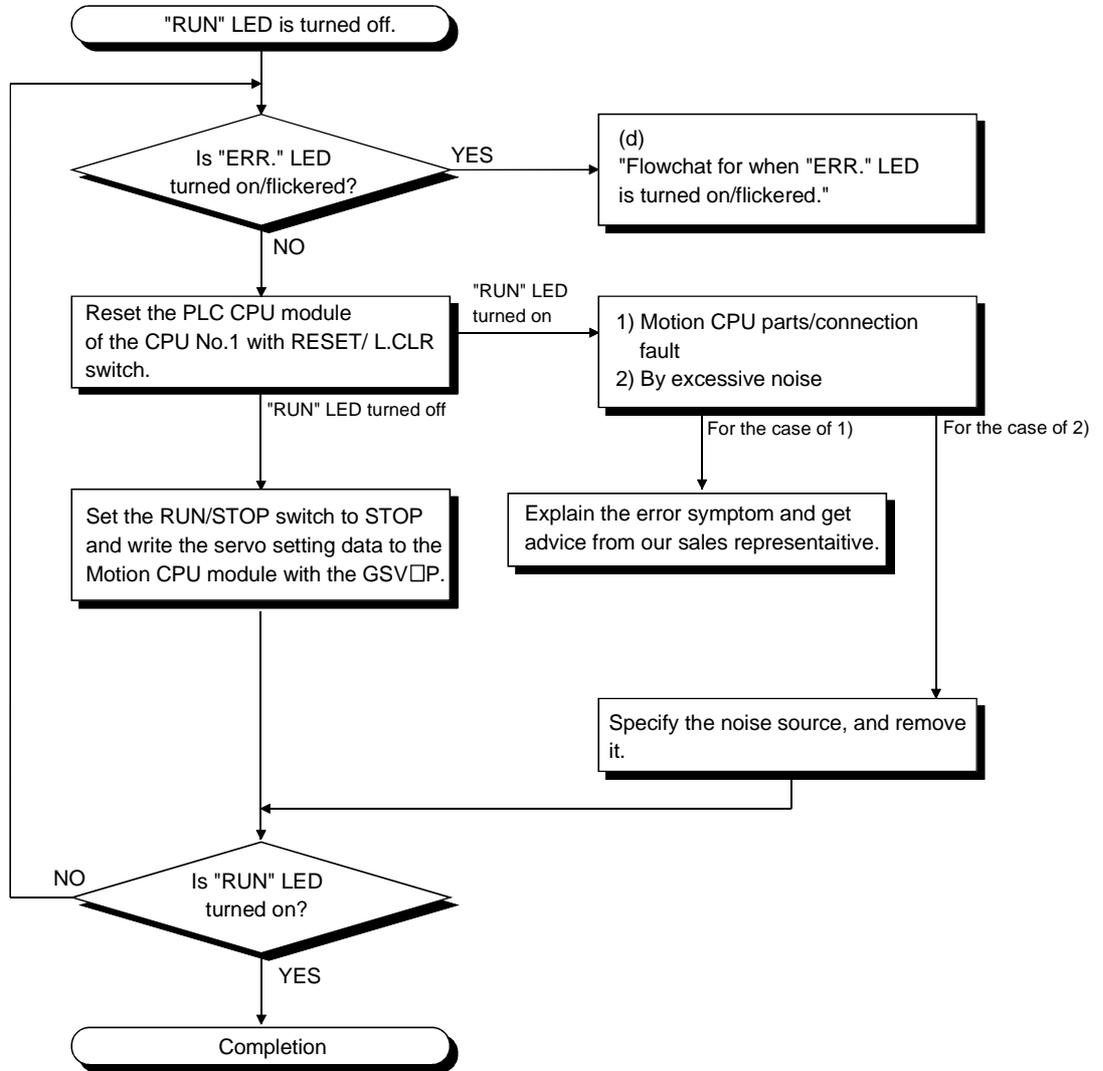
(b) Flowchart for when "MODE" LED is turned off.

The following shows the flowchart when the "MODE" LED is turned off at the power supply ON.

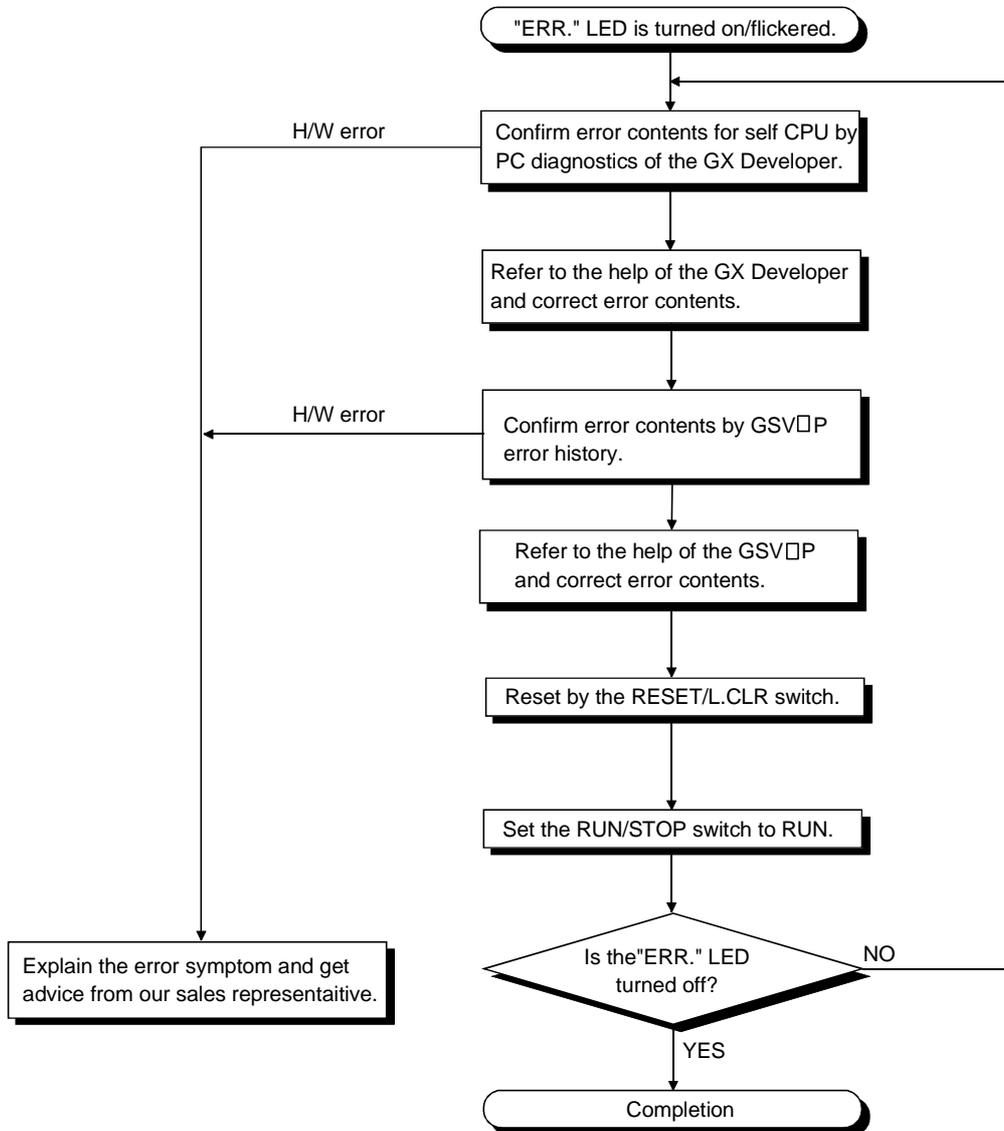


(c) Flowchart for when "RUN" LED is turned off.

The following shows the flowchart when the "RUN" LED is turned off during operation.

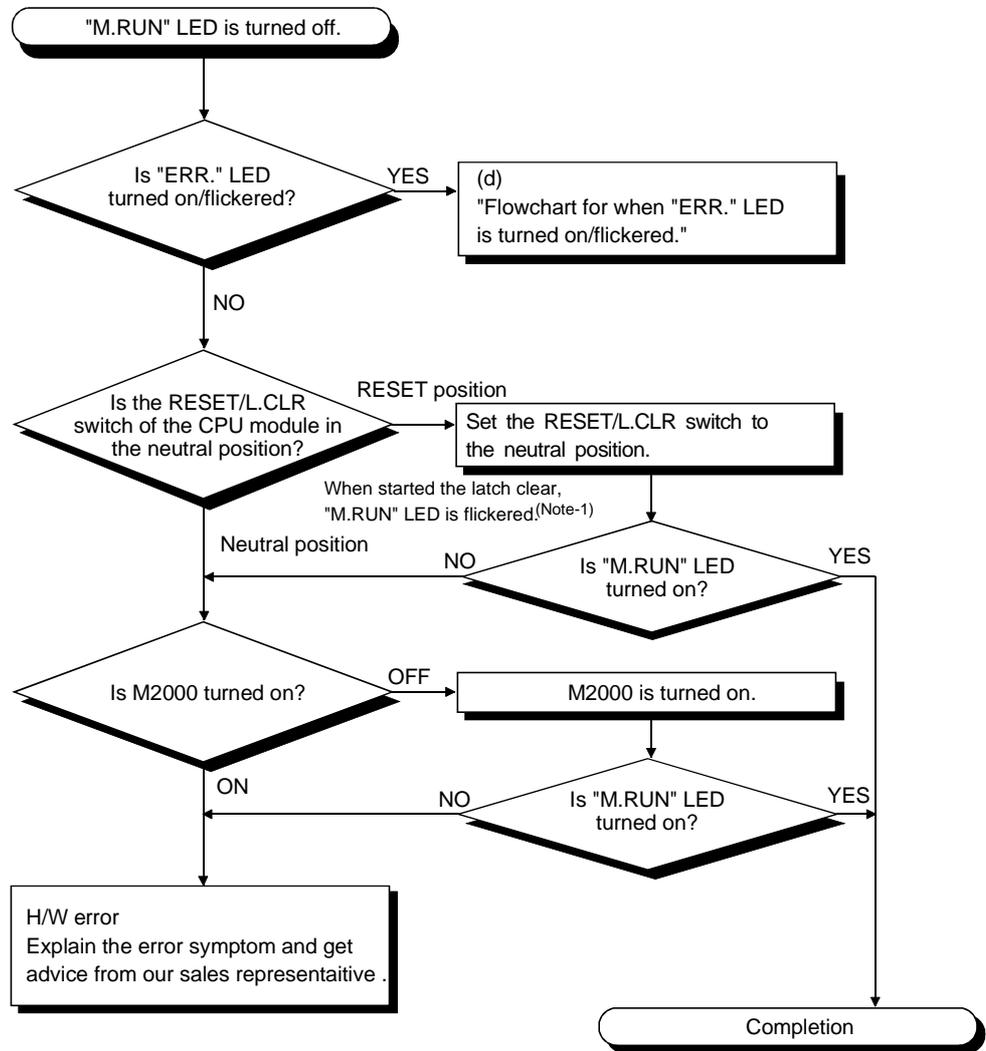


(d) Flowchart for when "ERR." LED is turned on/flickered.
 The following shows the flowchart to be followed when the "ERR." LED is turned on/flickered at the power supply ON or operation start or during operation.



(e) Flowchart for when "M.RUN" LED is turned off.

The following shows the flowchart when the "M.RUN" LED is turned off during operation.



REMARK

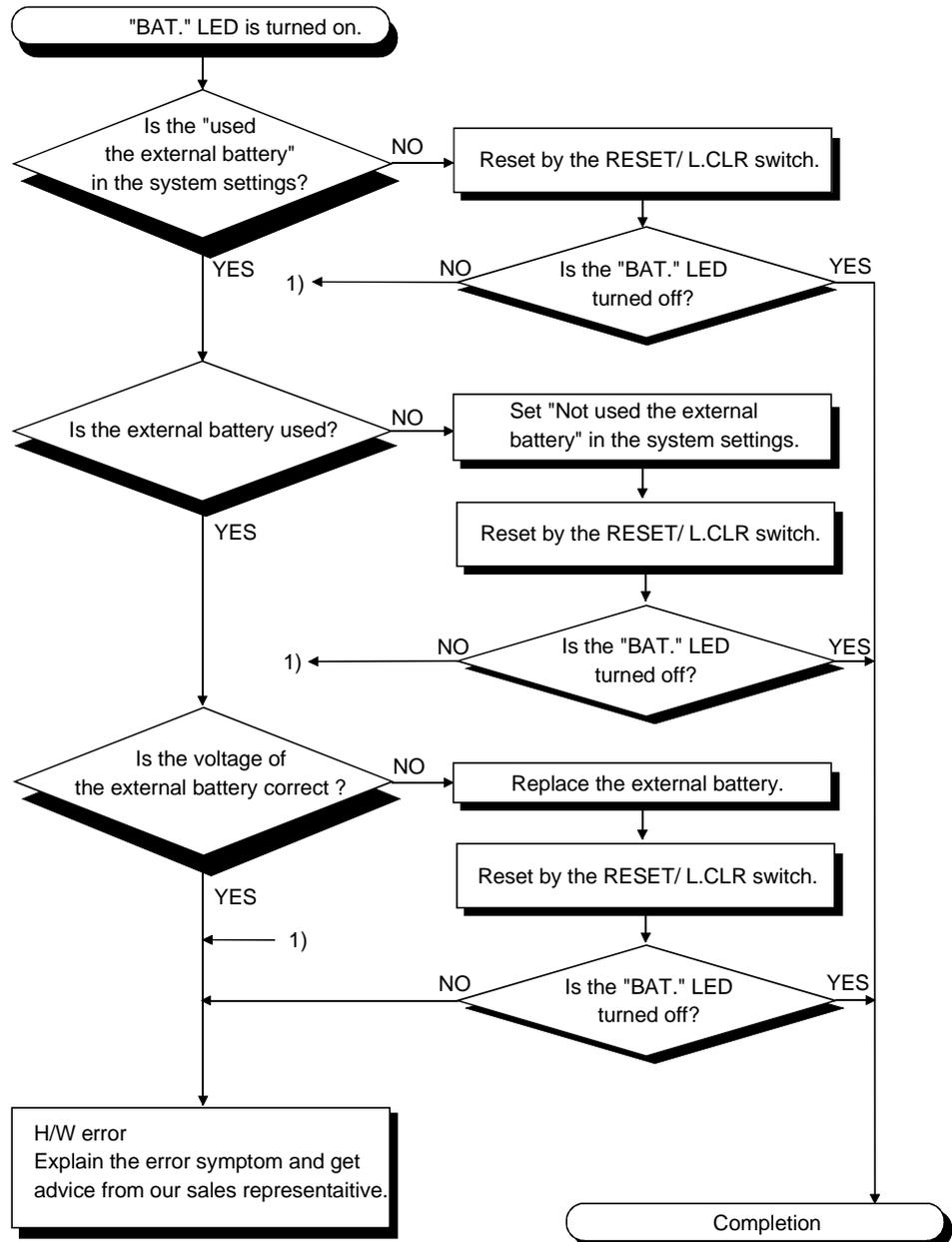
(Note-1) : When the RUN/STOP switch is stop position and the RESET/L.CLR is tilted to L.CLR several times for latch clear operation, the "M.RUN" LED flashes to indicate that the latch clear processing is under operation. When the RESET/L.CLR switch is further tilted to L.CLR while the "M.RUN" LED flickers, "M.RUN" LED turned off and terminates the latch clear processing.

(f) Flowchart for when "BAT." LED is turned on.

In the Motion CPU, when the external battery capacity of the Dividing unit or Battery unit is lowered, the LED is turned on.

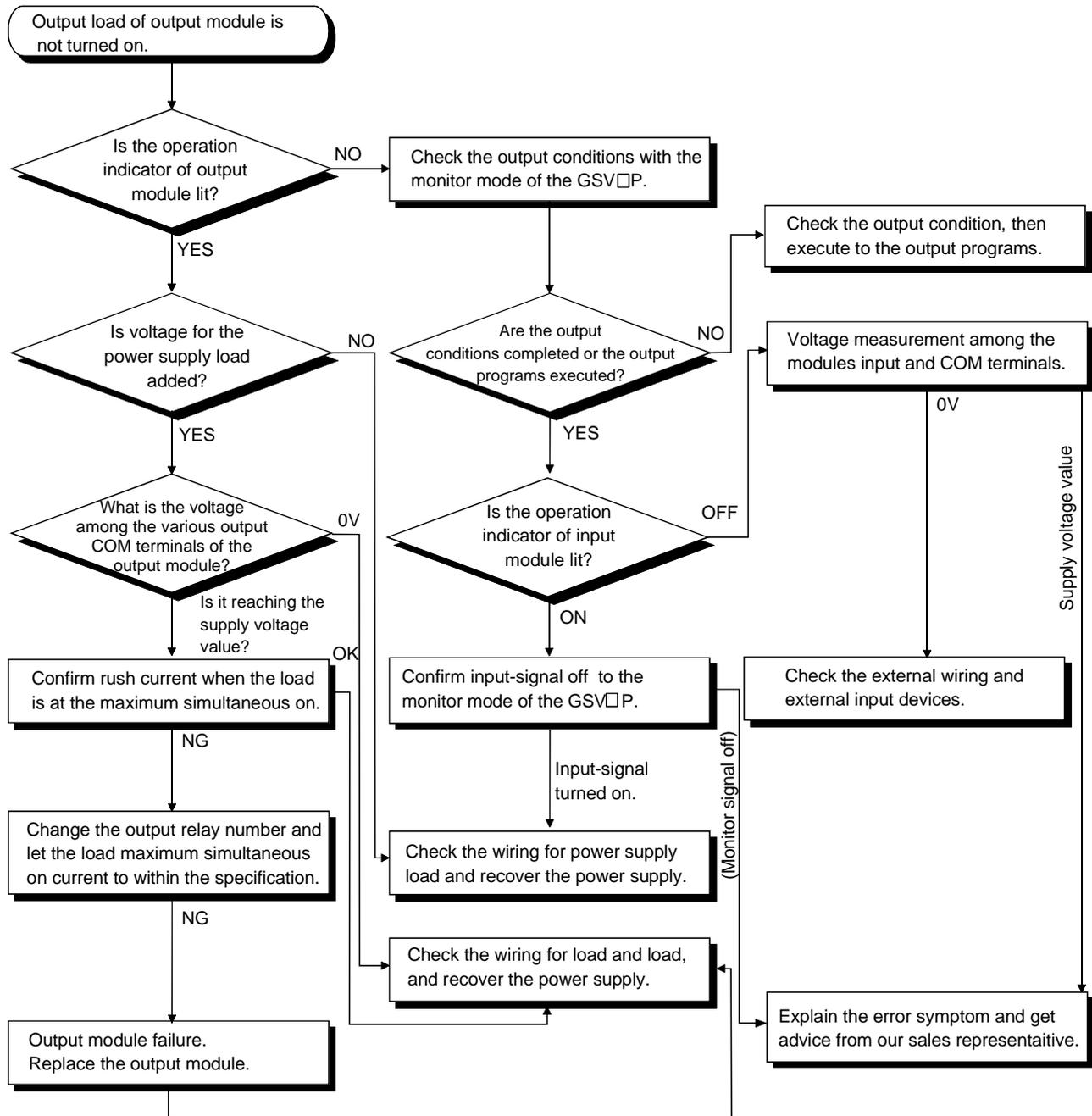
After replacing the battery with a new one, "BAT." LED is turned off with the executing reset by the RESET/L.CLR switch.

When it is selected "used the external battery", though the external battery in the system settings is not used, the LED is also turned on.



(g) Flowchart for when output load of output module is not turned on.

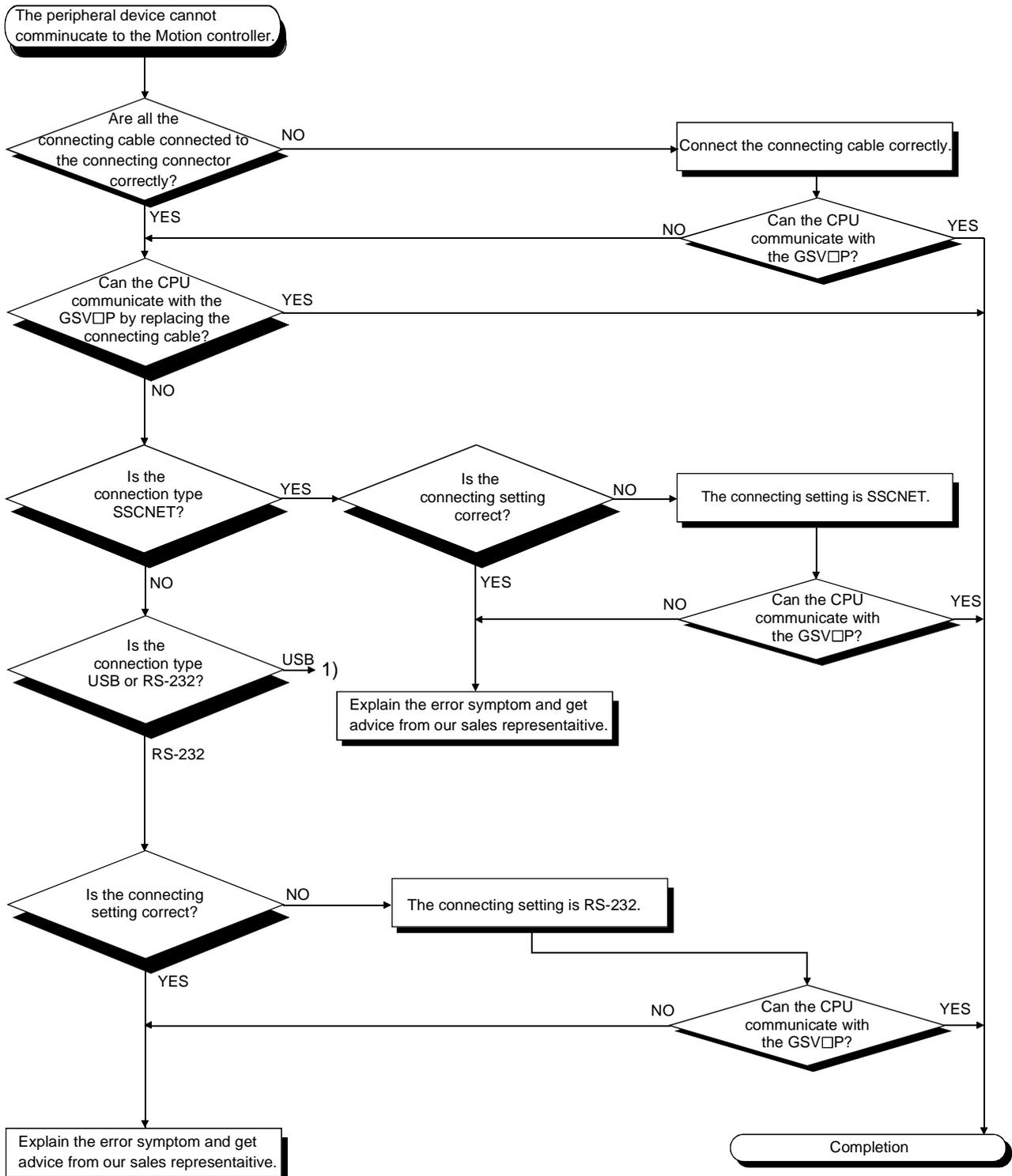
The following shows the flowchart when the output load of the output module is not turned on during operation.

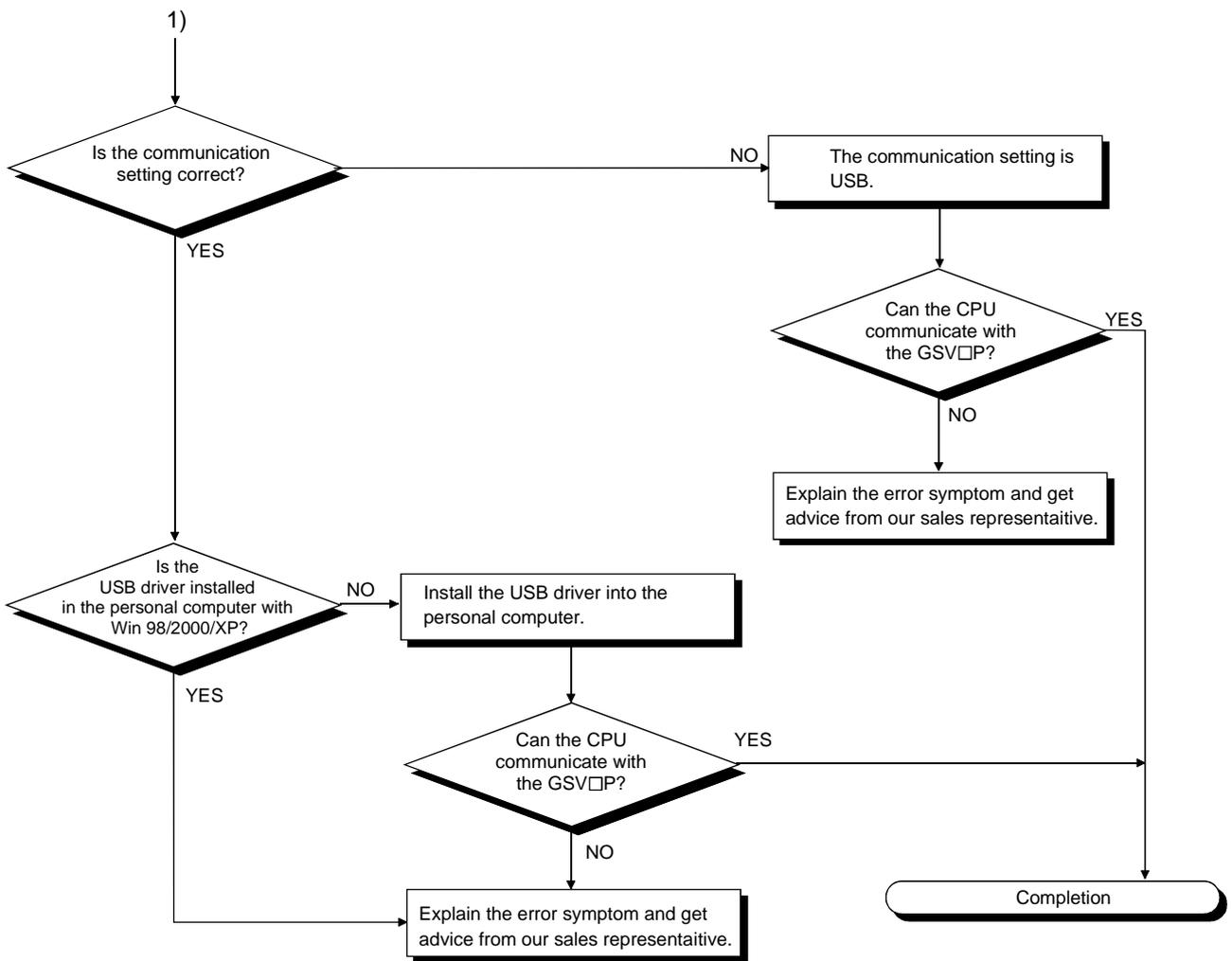


POINT
 For information about input signal of the input module is not turned off, refer to section 6.6.3 I/O modules troubleshooting.

(h) Flowchart for when the peripheral device cannot communicate to the Motion controller.

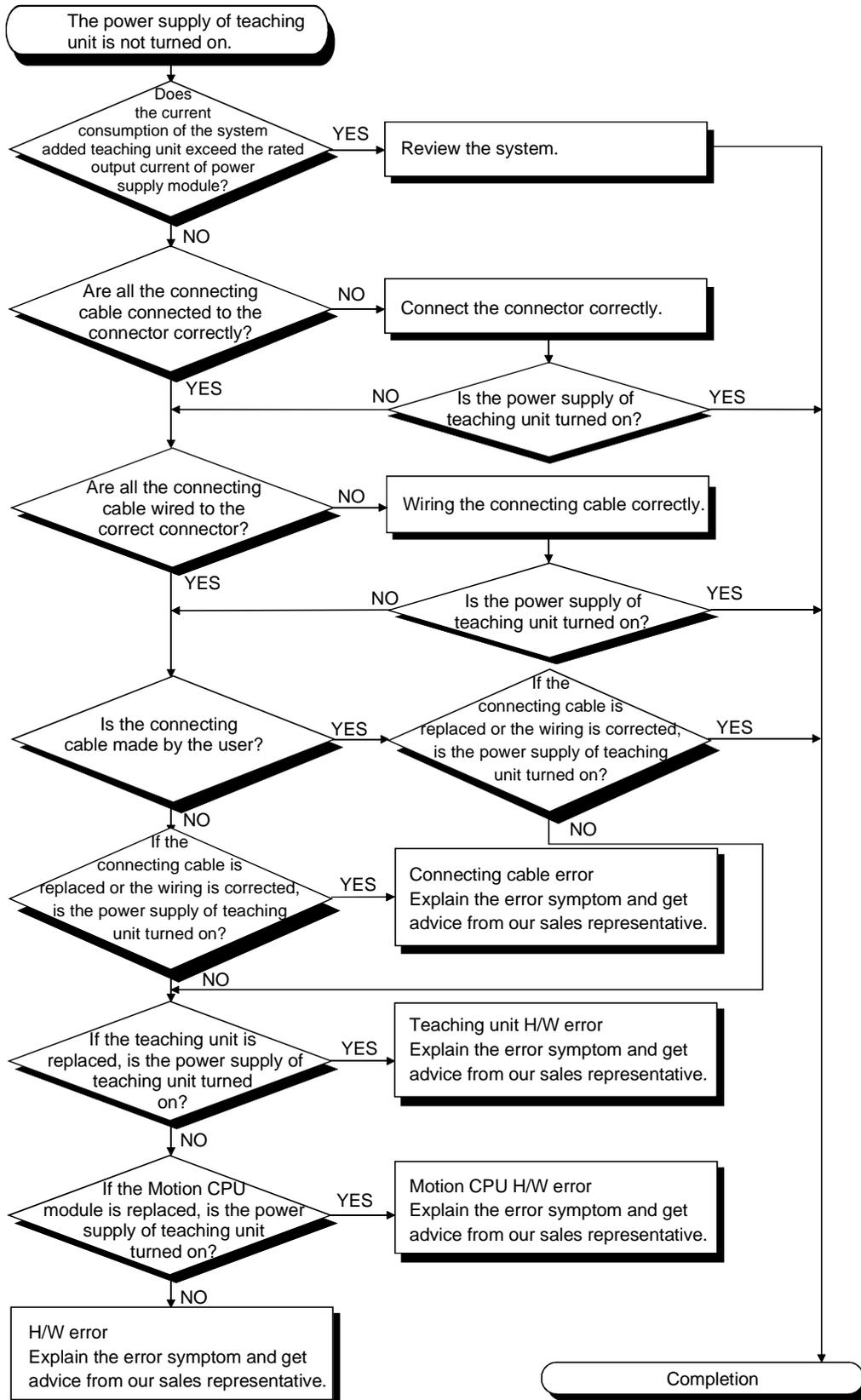
The following shows the flowchart when the Motion CPU cannot communicate with the GSV□P during the power supply ON.





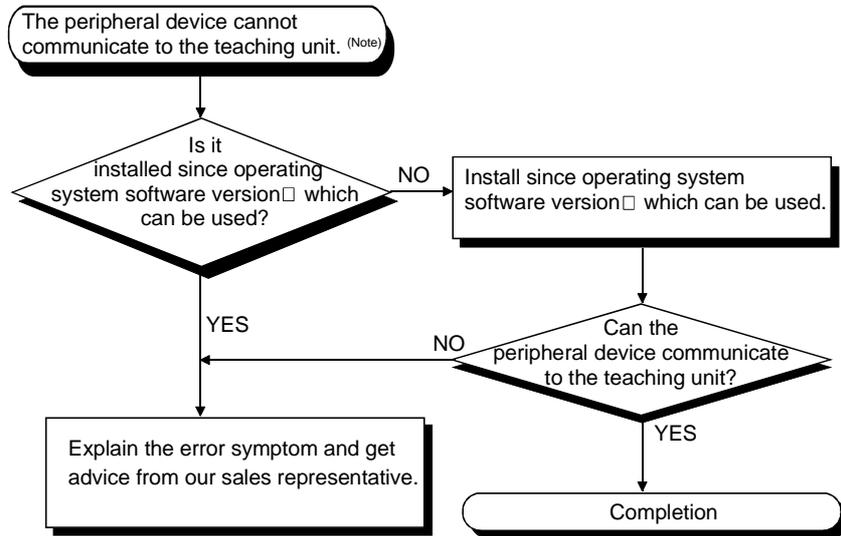
(i) Flowchart for when the power supply of teaching unit is not turned on.

The following shows the flowchart when the power supply of teaching unit is not turned on during the power supply of Motion CPU ON.



(j) Flowchart for when the peripheral device cannot communicate to the teaching unit.

The following shows the flowchart when the peripheral device cannot communicate to the teaching unit during the power supply of teaching unit ON.



(Note) : "CPUタイプガチガイマス" is indicated on the display of teaching unit.

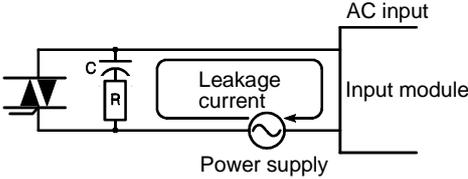
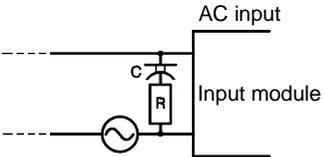
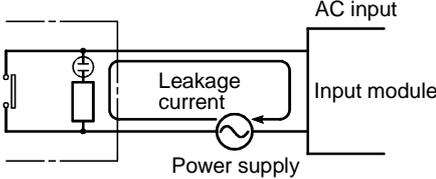
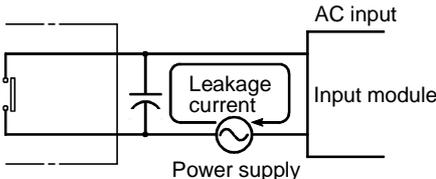
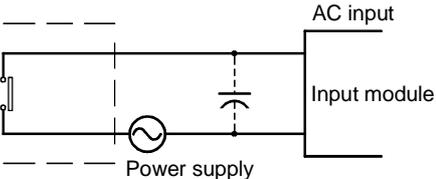
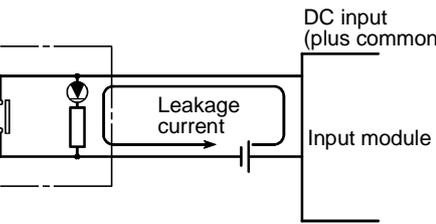
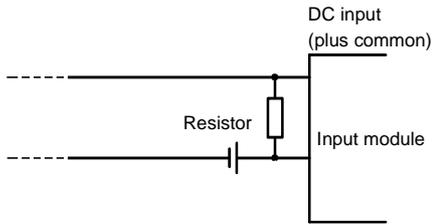
6.6.3 I/O modules troubleshooting

This section describes troubleshooting with I/O circuits and their corrective actions.

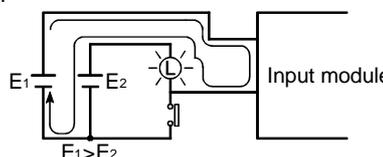
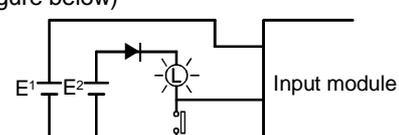
(1) Input circuit troubleshooting and corrective action

This section describes troubleshooting with input circuits and their corrective actions.

Input Circuit Troubleshooting and Corrective Action

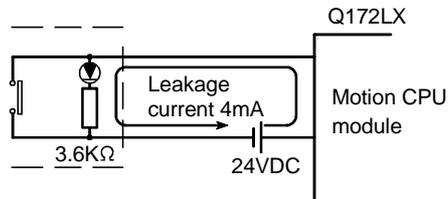
	Condition	Cause	Corrective action
Example 1	Input signal is not turned OFF.	<ul style="list-style-type: none"> Leakage current of input switch (e.g. drive by non-contact switch). 	<ul style="list-style-type: none"> Connect an appropriate resistor which will make the voltage across the terminals of the input module lower than the OFF voltage value.  <p>It is recommended to use 0.1 to $0.47\mu\text{F} + 47$ to 120Ω ($1/2\text{W}$) for the CR constant.</p>
Example 2	Input signal is not turned OFF.	<ul style="list-style-type: none"> Drive by a limit switch with neon lamp. 	<ul style="list-style-type: none"> Same as Example 1. Or make up another independent display circuit.
Example 3	Input signal is not turned OFF.	<ul style="list-style-type: none"> Leakage current due to wiring capacity of wiring cable. (Wiring capacity C of twisted pair wire is approx. 100 PF/m). 	<ul style="list-style-type: none"> Same as Example 1. However, leakage current is not generated when the power supply is located in the input equipment side as shown below. 
Example 4	Input signal is not turned OFF.	<ul style="list-style-type: none"> Drive by switch with LED indicator. 	<ul style="list-style-type: none"> Connect a resistor which will make the voltage between the input module terminal and common higher than the OFF voltage value, as shown below.  <p>(Note-1) : A calculation example of a value for a connected resistor is given on the following page.</p>

Input Circuit Troubleshooting and Corrective Action (Continued)

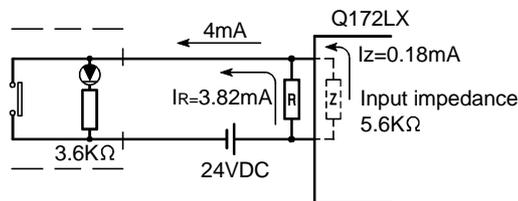
	Condition	Cause	Corrective action
Example 5	Input signal does not turn OFF.	<ul style="list-style-type: none"> Sneak path due to the use of two power supplies. 	<ul style="list-style-type: none"> Use only one power supply. Connect a sneak path prevention diode. (Figure below) 
Example 6	False input due to noise	Depending on short response time setting, noise is imported as input.	Change response time setting. Example : 10ms → 20ms

<Calculation example of Example 4>

For the case with a switch with LED indicator connected to Q172LX, causing 4 mA leakage current.



(a) The 0.18 mA OFF current of the Q172LX is not satisfied. Connect a resistor as shown below.



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

To satisfy the 0.18 mA OFF current of the Q172LX, the resistor R to be connected may be the one where 3.82 mA or more will flow.

$$I_R: I_z = Z(\text{Input impedance}): R$$

$$R \leq \frac{I_z}{I_R} \times Z(\text{Input impedance}) = \frac{0.18}{3.82} \times 5.6 \times 10^3 = 264[\Omega]$$

$$R < 264 \Omega .$$

Assuming that resistor R is 220 Ω , the power capacity W of resistor R is:

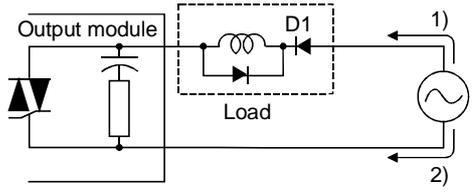
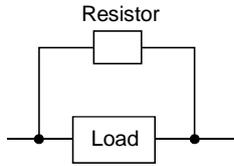
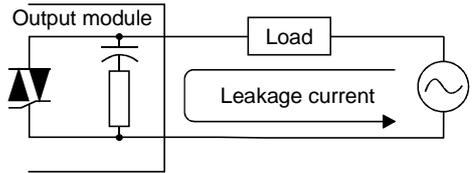
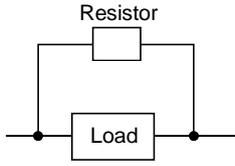
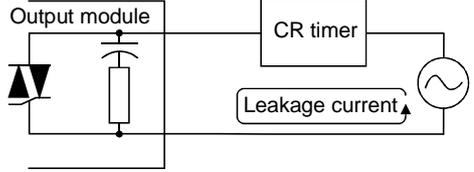
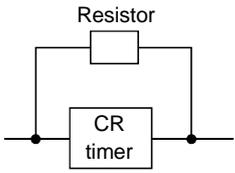
$$W = (\text{Input voltage})^2 \div R = 26.4^2 \div 220 = 3.168 [W]$$

(c) The power capacity of the resistor selected is 3 to 5 times greater than the actual current consumption. 220 [Ω], 10 to 15 [W] resistor may therefore be connected to the terminal in question.

(2) Output circuit troubleshooting and corrective action

This section describes troubleshooting with output circuits and their corrective actions.

Output Circuit Troubleshooting and Corrective Action

	Condition	Cause	Corrective action
Example 1	Overvoltage applied to load when output turns OFF	<ul style="list-style-type: none"> If load is internally half-wave rectified (some solenoids are like this).  <ul style="list-style-type: none"> With polarity of power supply 1), C is charged. With polarity 2), the C charge voltage plus the power supply voltage is applied across D1. Max. voltage is approx. 2.2E. 	<ul style="list-style-type: none"> Connect a resistor between several tens kΩ and several hundreds k across the load. <p>This method causes no problems with output terminals but lead to deterioration or burnout of load internal diodes.</p> 
Example 2	Load does not turn OFF (Triac output).	<ul style="list-style-type: none"> Leakage current due to built-in surge suppressor. 	<ul style="list-style-type: none"> Connect a resistor across the load. <p>If long wiring exists between the output card and the load, leakage currents also arise due to wiring capacity.</p> 
Example 3	Time period fluctuates when load is a CR timer (Triac output)		<ul style="list-style-type: none"> Drive a relay and use the contacts to drive the CR timer. <p>Be careful of example 1, as some timers are half-wave rectified internally.</p>  <p>Calculate resistor constant from load.</p>

6.7 Confirm method of Error Code

When an error occurs, the error code and error message can be read by the personal computer(IBM PC/AT) installation of the SW6RN-GSV□P.

The procedure for reading error codes by the SW6RN-GSV□P is as follows.

- 1) Start the SW6RN-GSV□P.
- 2) Connect the Motion CPU to the personal computer(IBM PC/AT) .
- 3) Select [Create a new project] - [Motion CPU Read] Menu by the SW6RN-GSV□P, and also read the project data from the Motion CPU.
- 4) Select the [Monitor] - [PV Enlarged Monitor] Menu.
- 5) Confirm the error code and error message that is displayed on the screen.

For details of the SW6RN-GSV□P operating method, refer to help of each programming software package.

APPENDICES

APPENDIX 1 Cables

In this cable connection diagram, maker names of connectors are omitted. Refer to “Appendix 2.7 Connector” for maker names of connectors.

APPENDIX 1.1 SSCNET cables

Generally use the SSCNET cables available as our options. If the required length is not found in our options, fabricate the cable on the customer side.

(1) Selection

The following table indicates the SSCNET cables used with each Motion controller and the servo amplifiers. Make selection according to your operating conditions.

Table 1 SSCNET cables

Type ^(Note-1)	Description
Q172J2BCBL□M	<ul style="list-style-type: none"> • Q172CPU(N) ↔ MR-J2□-B • MR-J2□-B ↔ FR-V5NS ^(Note-2) • Q173DV ↔ FR-V5NS ^(Note-2)
Q172J2BCBL□M-B	<ul style="list-style-type: none"> • Q172CPU(N) ↔ MR-J2□-B + Q170BAT
Q172HBCBL□M	<ul style="list-style-type: none"> • Q172CPU(N) ↔ MR-H-BN • MR-H-BN ↔ FR-V5NS ^(Note-2)
Q172HBCBL□M-B	<ul style="list-style-type: none"> • Q172CPU(N) ↔ MR-H-BN + Q170BAT
Q173DVCBL□M	<ul style="list-style-type: none"> • Q173CPU(N) ↔ Q173DV
Q173J2B△CBL□M	<ul style="list-style-type: none"> • Q173CPU(N) ↔ MR-J2□-B
Q173HB△CBL□M	<ul style="list-style-type: none"> • Q173CPU(N) ↔ MR-H-BN
MR-J2HBUS□M	<ul style="list-style-type: none"> • MR-J2□-B ↔ MR-J2□-B • Q173DV ↔ MR-J2□-B
MR-J2HBUS□M-A	<ul style="list-style-type: none"> • MR-H-BN ↔ MR-J2□-B • Q173DV ↔ MR-H-BN
MR-HBUS□M	<ul style="list-style-type: none"> • MR-H-BN ↔ MR-H-BN
FR-V5NSCBL□	<ul style="list-style-type: none"> • Q172CPU(N) ↔ FR-V5NS ^(Note-2) • FR-V5NS ^(Note-2) ↔ FR-V5NS ^(Note-2)

(Note-1) : △ = Number of lines (none: 1 LINE, 2: 2 LINE, 4: 4 LINE)

□ = Cable length (05: 0.5m(1.64ft.), 1: 1m(3.28ft.), 5: 5m(16.4ft.), 10: 10m(32.8ft.), 20: 20m(65.6ft.))

(Note-2) : SSCNET communication option for vector inverter

App.

APPENDICES

Use the following or equivalent twisted pair cables as the SSCNET cables.

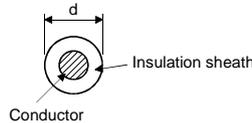
Table 2 Wire models

Type	Length [m(ft.)]	Wire model
Q172J2BCBL□M(-B)	0.5(1.64), 1(3.28), 5(16.4)	UL20276 AWG#28 7pair(CREAM)
Q172HBCBL□M(-B)		
Q173DVCBL□M	0.5(1.64), 1(3.28)	UL20276 AWG#28 13pair(CREAM)
Q173J2B△CBL□M	0.5(1.64), 1(3.28), 5(16.4)	UL20276 AWG#28 7pair(CREAM)
Q173HB△CBL□M		UL20276 AWG#28 10pair(CREAM)
MR-J2HBUS□M		
MR-J2HBUS□M-A		
MR-HBUS□M	A14B2343 6P	

Table 3 Wire specifications

Wire model	Core size [mm ²]	Number of cores	Characteristics of one core			Finished OD [mm] (Note-2)
			Structure [Number of wires/mm]	Conductor resistance [Ω/km]	Insulating sheath OD d[mm] (Note-1)	
UL20276 AWG#28 7pair(CREAM)	0.08	14(7 pairs)	7/0.127	222 or less	0.38	5.5
UL20276 AWG#28 10pair(CREAM)	0.08	20(10 pairs)	7/0.127	222 or less	0.38	6.1
UL20276 AWG#28 13pair(CREAM)	0.08	26(13 pairs)	7/0.127	222 or less	0.38	6.5
A14B2343 6P	0.2	12(6 pairs)	40/0.08	105 or less	0.88	7.2

(Note-1): "d" is as shown below.



(Note-2): Standard OD (Outside Diameter). Maximum OD is about 10% larger.

⚠ CAUTION

- When fabricating the bus cable, do not make incorrect connection. Wrong connection will cause runaway or explosion.

(a) Q172J2BCBL□M(-B)

1) Model explanation

Type: Q172J2BCBL□M-*

Symbol	Connect Battry unit
None	No
B	Yes

Symbol	Cable length [m(ft.)]
05	0.5(1.64)
1	1(3.28)
5	5(16.4)

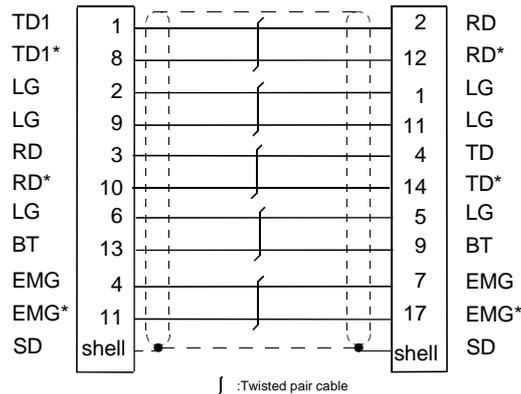
2) Connection diagram

When fabricating a cable, use the recommended wire given on Appendix 1.1, and make the cable as show in the following connection diagram. The overall distance of the SSCNET cables on the same bus is 30m(98.4ft.) .

• Q172J2BCBL□M

Q172J2BCBL□M

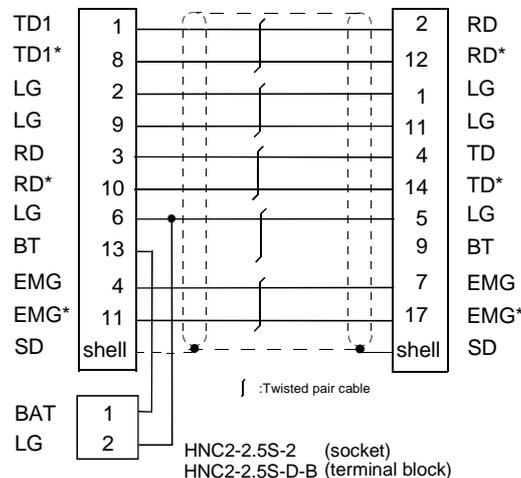
HDR-E14MG1 (connector) 10120-6000EL (connector)
 HDR-E14-LPA5 (connector case) 10320-3210-000 (shell kit)



• Q172J2BCBL□M-B

Q172J2BCBL□M-B

HDR-E14MG1 (connector) 10120-6000EL (connector)
 HDR-E14-LPA5 (connector case) 10320-3210-000 (shell kit)



(b) Q172HBCBL□M(-B)

1) Model explanation

Type: Q172HBCBL□M-*

Symbol	Connect Battery unit
None	No
B	Yes

Symbol	Cable length [m(ft.)]
05	0.5(1.64)
1	1(3.28)
5	5(16.4)

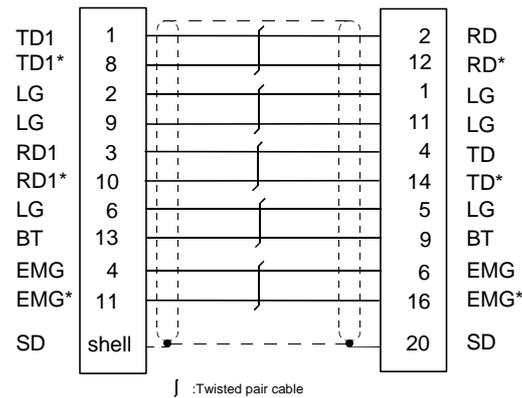
2) Connection diagram

When fabricating a cable, use the recommended wire given on Appendix 1.1, and make the cable as show in the following connection diagram. The overall distance of the SSCNET cables on the same bus is 30m(98.4ft.) .

• Q172HBCBL□M

Q172HBCBL□M

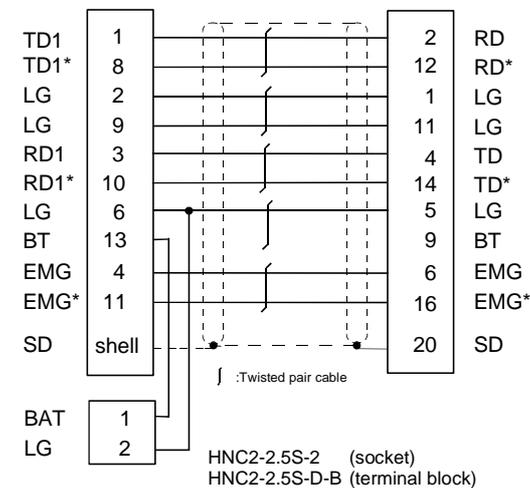
HDR-E14MG1 (connector) PCR-S20FS (connector)
 HDR-E14-LPA5 (connector case) PCR-LS20LA1 (connector case)



• Q172HBCBL□M-B

Q172HBCBL□M-B

HDR-E14MG1 (connector) PCR-S20FS (connector)
 HDR-E14-LPA5 (connector case) PCR-LS20LA1 (connector case)



(c) Q173DVCBL□M

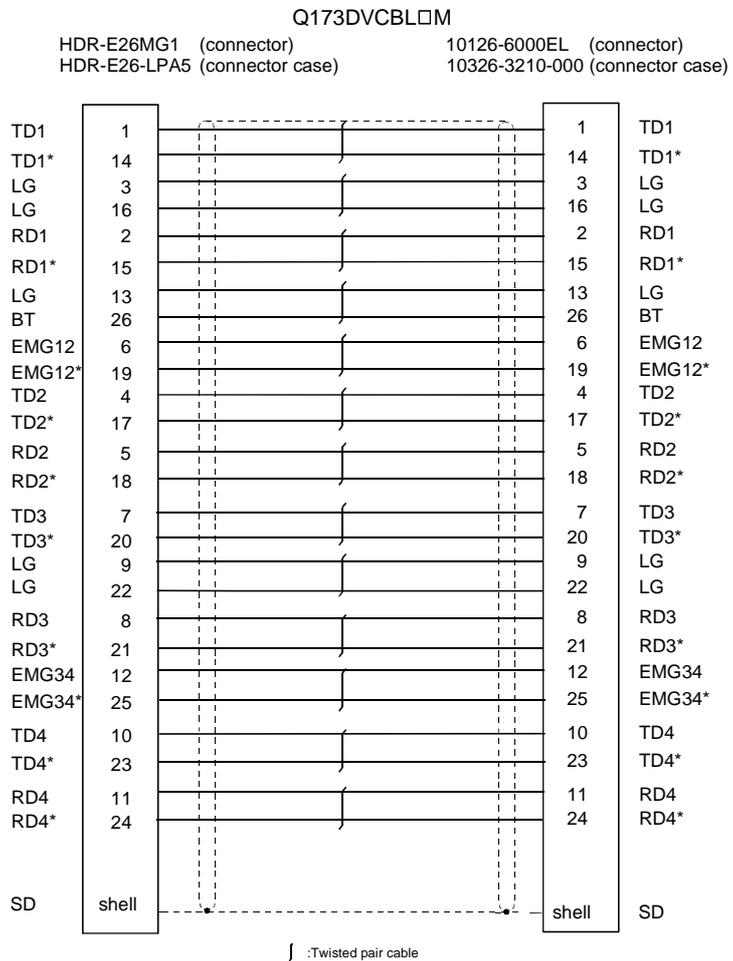
1) Model explanation

Type: Q173DVCBL□M

Symbol	Cable length [m(ft.)]
05	0.5(1.64)
1	1(3.28)

2) Connection diagram

When fabricating a cable, use the recommended wire given on Appendix 1.1, and make the cable as show in the following connection diagram. The overall distance of the SSCNET cables on the same bus is 30m(98.4ft.) .



(d) Q173J2B△CBL□M

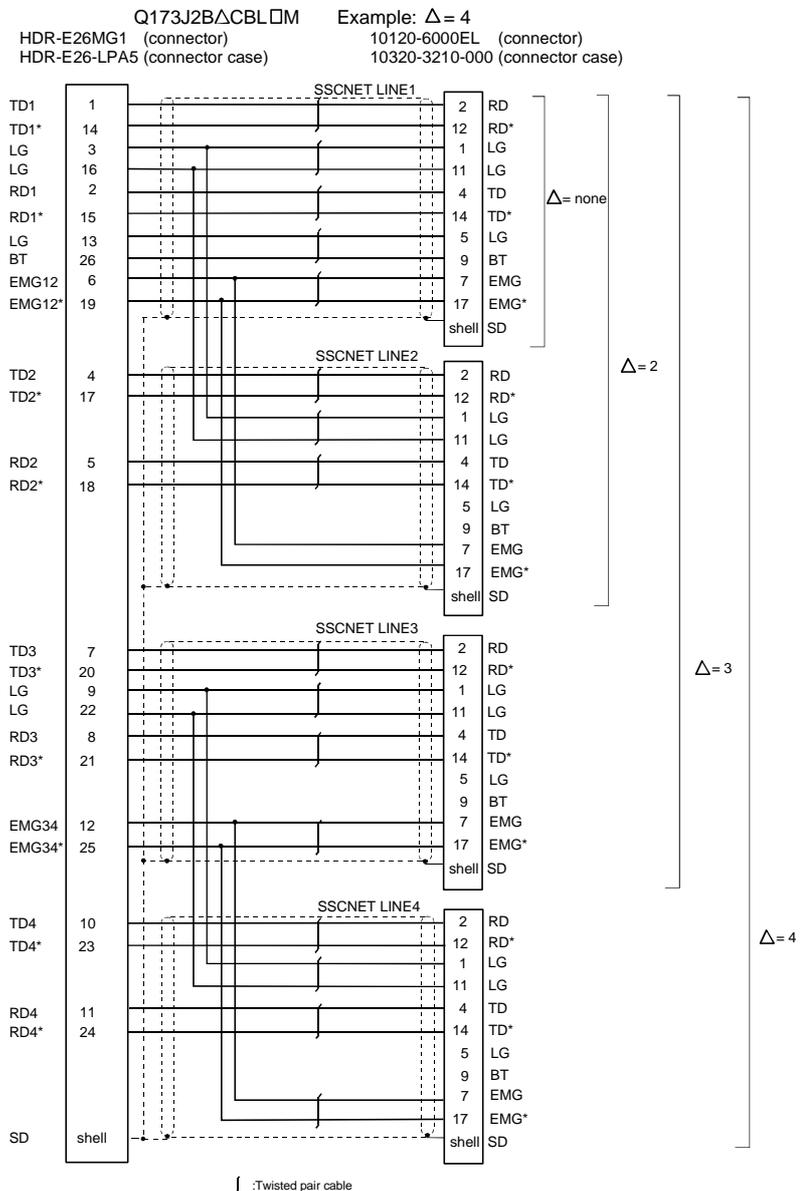
1) Model explanation

Type: Q173J2B△CBL□M

Symbol	Number of SSCNET LINE	Symbol	Cable length [m(ft.)]
none	SSCNET LINE1	05	0.5(1.64)
2	SSCNET LINE2	1	1(3.28)
3	SSCNET LINE3	5	5(16.4)
4	SSCNET LINE4		

2) Connection diagram

When fabricating a cable, use the recommended wire given on Appendix 1.1, and make the cable as show in the following connection diagram. The overall distance of the SSCNET cables on the same bus is 30m(98.4ft.) .



(e) Q173HB△CBL□M

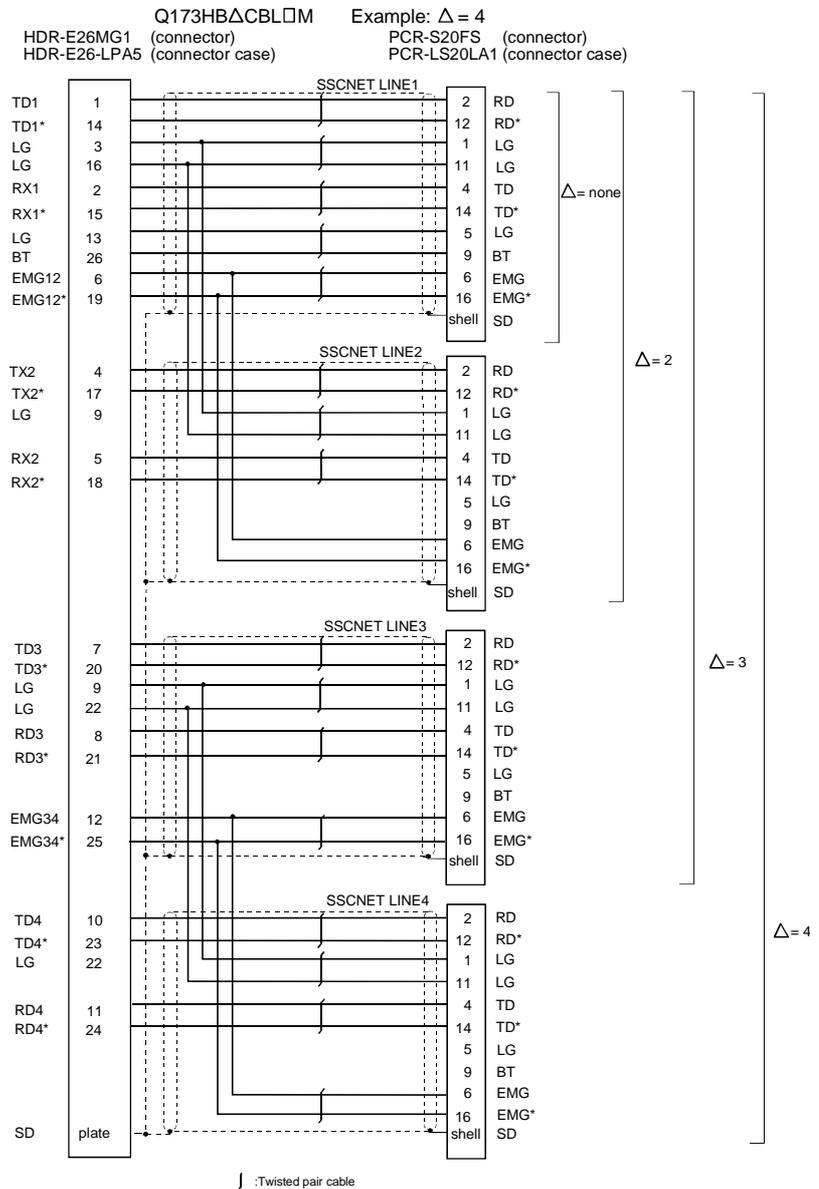
1) Model explanation

Type: Q173HB△CBL□M

Symbol	Number of SSCNET LINE	Symbol	Cable length [m(ft.)]
none	SSCNET LINE1	05	0.5(1.64)
2	SSCNET LINE2	1	1(3.28)
3	SSCNET LINE3	5	5(16.4)
4	SSCNET LINE4		

2) Connection diagram

When fabricating a cable, use the recommended wire given on Appendix 1.1, and make the cable as show in the following connection diagram. The overall distance of the SSCNET cables on the same bus is 30m(98.4ft.) .



(f) MR-J2HBUS□M

1) Model explanation

Type: MR-J2HBUS□M

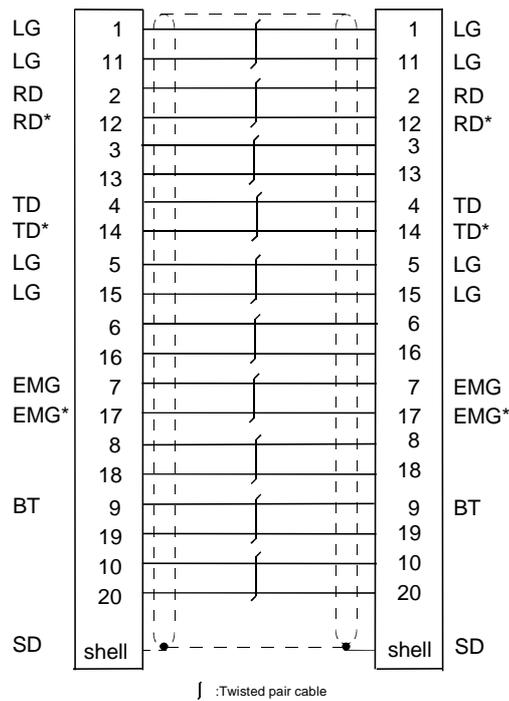
Symbol	Cable length [m(ft.)]
05	0.5(1.64)
1	1(3.28)
5	5(16.4)

2) Connection diagram

When fabricating a cable, use the recommended wire given on Appendix 1.1, and make the cable as show in the following connection diagram. The overall distance of the SSCNET cables on the same bus is 30m(98.4ft.) .

MR-J2HBUS□M

10120-6000EL (connector) 10120-6000EL (connector)
 10320-3210-000 (shell kit) 10320-3210-000 (shell kit)



(g) MR-J2HBUS□M-A

1) Model explanation

Type: MR-J2HBUS□ M-A

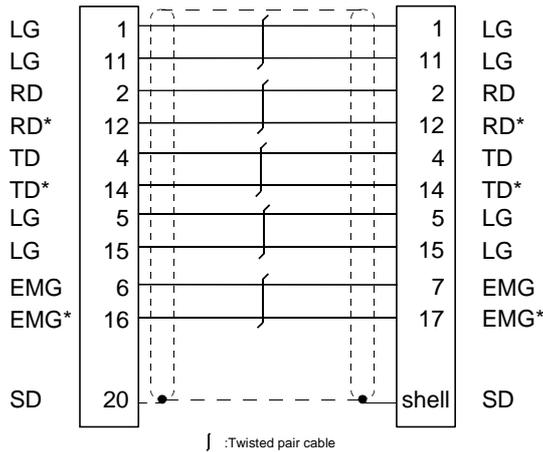
Symbol	Cable length [m(ft.)]
05	0.5(1.64)
1	1(3.28)
5	5(16.4)

2) Connection diagram

When fabricating a cable, use the recommended wire given on Appendix 1.1, and make the cable as show in the following connection diagram. The overall distance of the SSCNET cables on the same bus is 30m(98.4ft.) .

MR-J2HBUS□M-A

PCR-S20FS (connector) 10120-6000EL (connector)
 PCR-LS20LA1 (connector case) 10320-3210-000 (shell kit)



(h) MR-HBUS□M

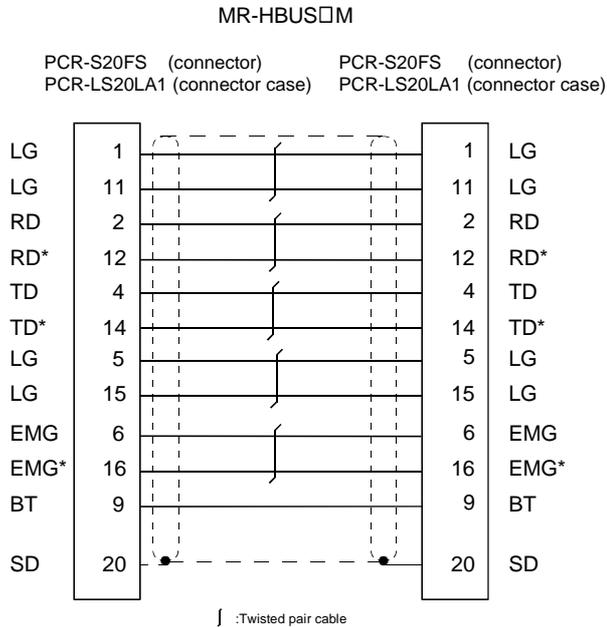
1) Model explanation

Type: MR-HBUS□M

Symbol	Cable length [m(ft.)]
05	0.5(1.64)
1	1(3.28)
5	5(16.4)

2) Connection diagram

When fabricating a cable, use the recommended wire given on Appendix 1.1, and make the cable as show in the following connection diagram. The overall distance of the SSCNET cables on the same bus is 30m (98.4ft.).



APPENDIX 1.2 Serial absolute synchronous encoder cable

Generally use the serial absolute synchronous encoder cables available as our options. If the required length is not found in our options, 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.

Make selection according to your operating conditions. Connector sets(MR-J2CNS) are also available for your fabrication.

Table 1 Wire models

Type	Length [m(ft.)]	Wire model
MR-JHSCBL□M-L	2(6.56), 5(16.4)	UL20276 AWG#28 4pair(BLACK)
	10(32.8), 20(65.6), 30(98.4)	UL20276 AWG#22 6pair(BLACK)
MR-JHSCBL□M-H	2(6.56), 5(16.4)	A14B2339 4P
	10(32.8), 20(65.6), 30(98.4)	A14B2343 6P

Use the following or equivalent twisted pair cables as the serial absolute synchronous encoder cables.

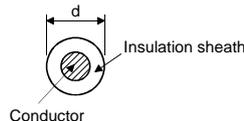
Table 2 Connector sets

Encoder cable type	Connector sets type	Description
MR-JHSCBL□M-L	MR-J2CNS	<ul style="list-style-type: none"> • Connector shell kits • Plug cable clump
MR-JHSCBL□M-H		

Table 3 Wire specifications

Wire model	Core size [mm ²]	Number of cores	Characteristics of one core			Finished OD [mm] (Note-2)
			Structure [Number of wires/mm]	Conductor resistance [Ω/km]	Insulating sheath OD d[mm] (Note-1)	
UL20276 AWG#28 4pair(BLACK)	0.08	8(4 pairs)	4/0.127	222 or less	0.38	4.7
UL20276 AWG#22 6pair(BLACK)	0.3	12(6 pairs)	12/0.127	62 or less	1.2	8.2
A14B2339 4P	0.2	8(4 pairs)	40/0.08	105 or less	0.88	6.5
A14B2343 6P	0.2	12(6 pairs)	40/0.08	105 or less	0.88	7.2

(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 incorrect connection. Wrong connection will cause runaway or explosion.

(2) MR-JHSCBL□M-L/H

Synchronous encoder cable is the same encoder cables of the HC-SFS/HC-RFS/HC-UFS 2000 r/min series servomotors.

1) Model explanation

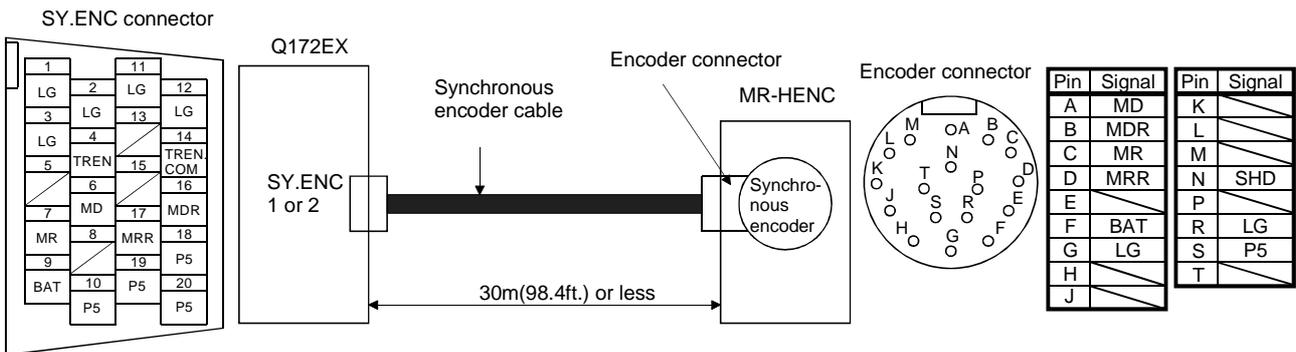
Type: MR-JHSCBL□M-□

Symbol	Specifications
L	Standard flexing life
H	Long flexing life

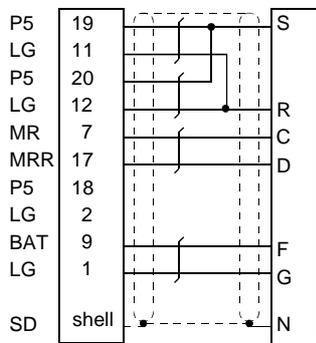
Symbol	Cable length [m(ft.)]
2	2(6.56)
5	5(16.4)
10	10(32.8)
20	20(65.6)
30	30(98.4)

2) Connection diagram

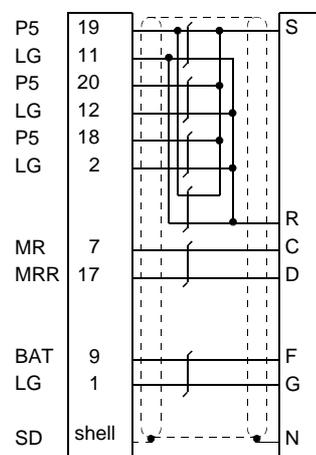
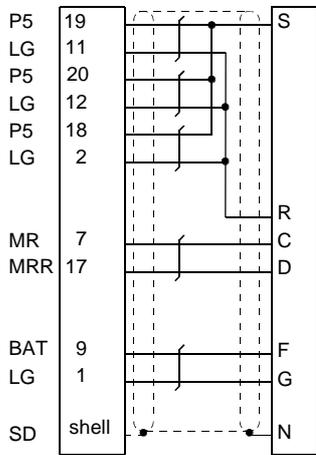
When fabricating a cable, use the recommended wire and connector set for encoder cable given on Appendix 1.2, and make the cable as show in the following connection diagram. Maximum cable length is 30m(98.4ft.).



MR-JHSCBL2M-L,MR-JHSCBL5M-L MR-JHSCBL2M-H,MR-JHSCBL5M-H	MR-JHSCBL10M-L to MR-JHSCBL30M-L	MR-JHSCBL10M-H to MR-JHSCBL30M-H
Q172EX side 10120-3000VE (connector)	Q172EX side 10120-3000VE (connector)	Q172EX side 10120-3000VE (connector)
Encoder side MS3106B20-29S(plug)	Encoder side MS3106B20-29S(plug)	Encoder side MS3106B20-29S(plug)
10320-52F0-008 (connector case)	10320-52F0-008 (connector case)	10320-52F0-008 (connector case)
MS-3057-12A(cable clump)	MS-3057-12A(cable clump)	MS-3057-12A(cable clump)



AWG24 used (Note)
(for less than 10[m](32.8[ft.]))
(Note) : AWG28 can be used for 5m(16.4[ft.]) or less.



J : Twisted pair cable

APPENDIX 1.3 Cable for the teaching unit

Generally use the cables for the teaching unit available as our options. If the required length is not found in our options, fabricate the cable on the customer side.

(1) Selection

The following table indicates the cables used with the cable for the teaching unit. Make selection according to your operating conditions.

Table 4 Wire models

Type	Length [m(ft.)]	Wire model
Q170TUD3CBL3M	3(9.84)	UL20276 AWG#28 13pair(CREAM)
Q170TUDNCBL3M		
Q170TUDNCBL03M-A	0.3(0.98)	
A31TU-D□K13 extended cable	—— (Note)	UL20276 AWG#24 18pair(CREAM)

(Note) : The cable overall distance between the Motion CPU and teaching unit is within 30m (98.4ft.) include the A31TU-D□K13 cable (5m(16.4ft.)).

Use the following cables or equivalent twisted pair cables as the cables for the teaching unit.

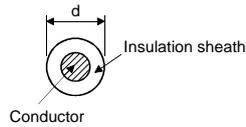
Table 5 Connector models

Cable models for the teaching unit	Description
Q170TUD3CBL3M/ Q170TUDNCBL3M	<ul style="list-style-type: none"> • TU connector side <ul style="list-style-type: none"> HDR-E26FG1 : Connector HDR-E26-LPA5 : Connector case • Teaching unit side <ul style="list-style-type: none"> DB-25SF-N : Connector D20418-J3 : Screw lock DB20962 : Circular clamp
Q170TUDNCBL03M-A	<ul style="list-style-type: none"> • TU connector side <ul style="list-style-type: none"> HDR-E26FG1 : Connector HDR-E26-LPA5 : Connector case • Teaching unit side <ul style="list-style-type: none"> 17JE-13250-02(D8A) : Connector 17L-002A : Stud
A31TU-D□K13 extended cable	<ul style="list-style-type: none"> • Q170TUD□CBL□M(-A) side <ul style="list-style-type: none"> 17JE-23250-02(D8A) : Connector • Teaching unit side <ul style="list-style-type: none"> 17JE-13250-02(D8A) : Connector 17L-002A : Stud

Table 6 Wire specifications

Wire model	Core size [mm ²]	Number of cores	Characteristics of one core			Finished OD [mm] (Note-2)
			Structure [Number of wires/mm]	Conductor resistance [Ω /km]	Insulating sheath OD d[mm] (Note-1)	
UL20276 AWG#28 13pair(CREAM)	0.08	26(13 pairs)	7/0.127	222 or less	0.38	6.5
UL20276 AWG#24 18pair(CREAM)	0.08	36(18 pairs)	7/0.203	92.3 or less	0.85	15.5

(Note-1): "d" is as shown below.



(Note-2): Standard OD (Outside Diameter). Maximum OD is about 10% larger.

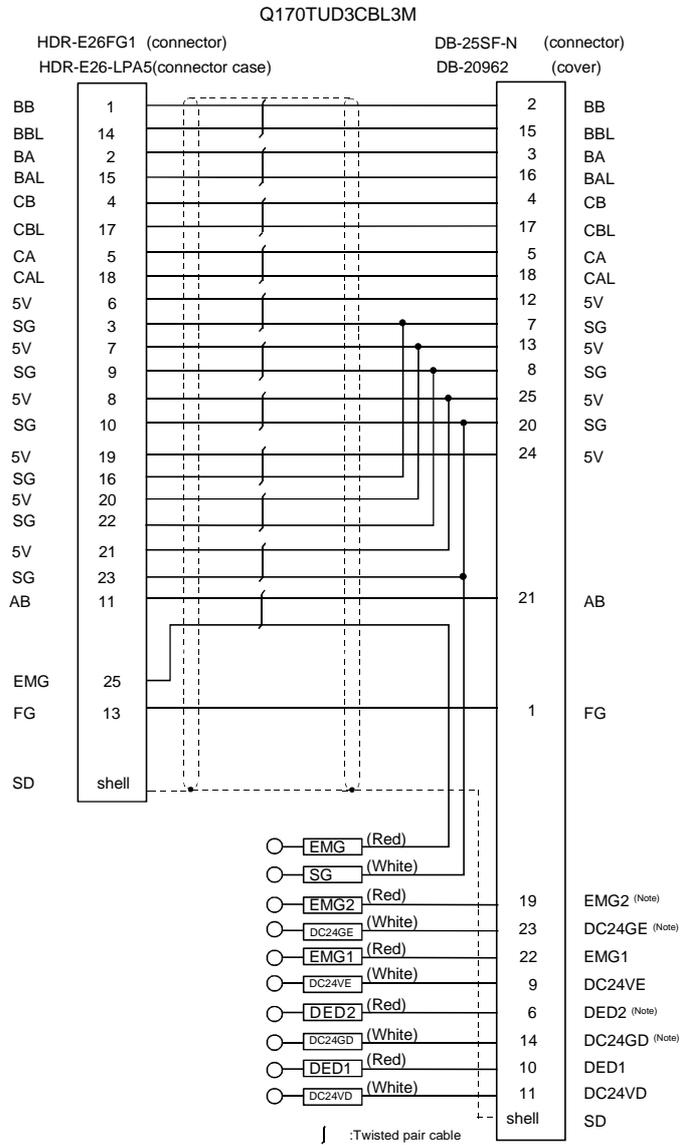
⚠ CAUTION

- When fabricating the cable for teaching unit, do not make incorrect connection. The protective function stops working.

(2) Q170TUD3CBL3M

(a) Connection diagram

When fabricating a cable, use the recommended wire and connector given on Appendix 1.3, and make the cable as show in the following connection diagram. Maximum cable length is 3m(9.84ft.).

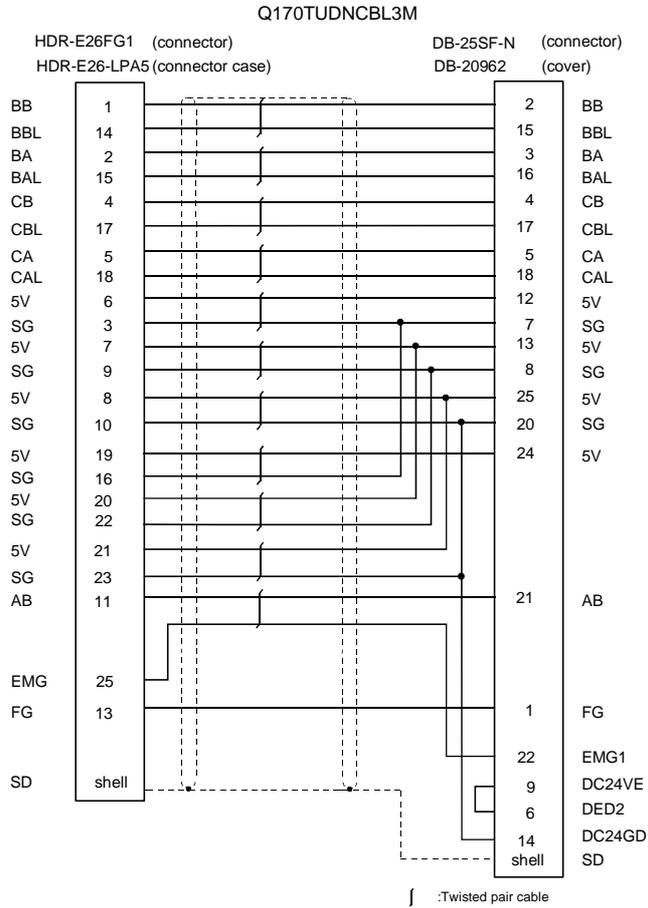


(Note) : These terminals are used to construct a double circuit by external safety circuit.
Please contact your nearest Mitsubishi sales representative for a double circuit.

(3) Q170TUDNCBL3M

(a) Connection diagram

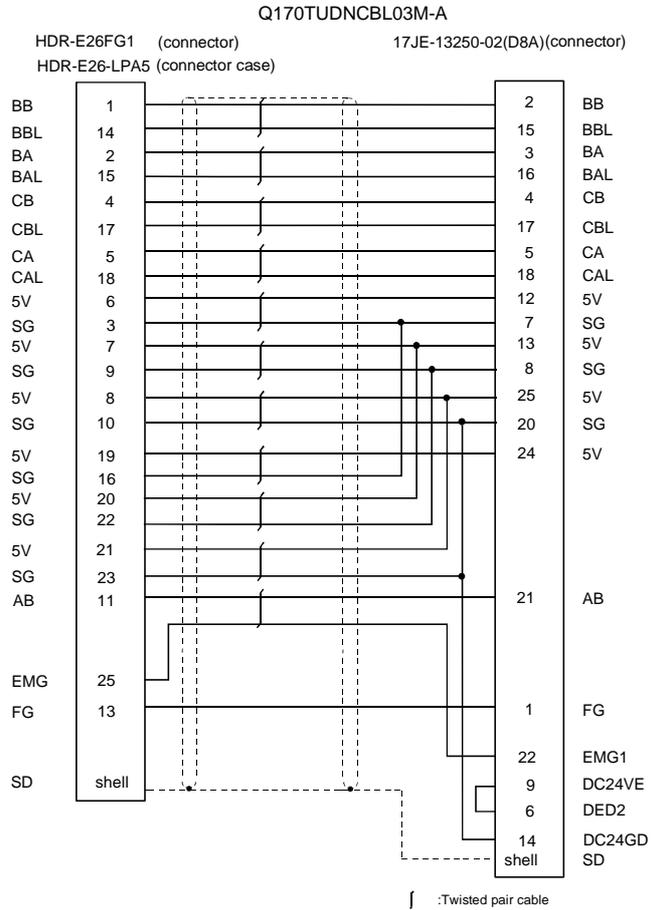
When fabricating a cable, use the recommended wire and connector given on Appendix 1.3, and make the cable as show in the following connection diagram. Maximum cable length is 3m(9.84ft.).



(4) Q170TUDNCBL03M-A

(a) Connection diagram

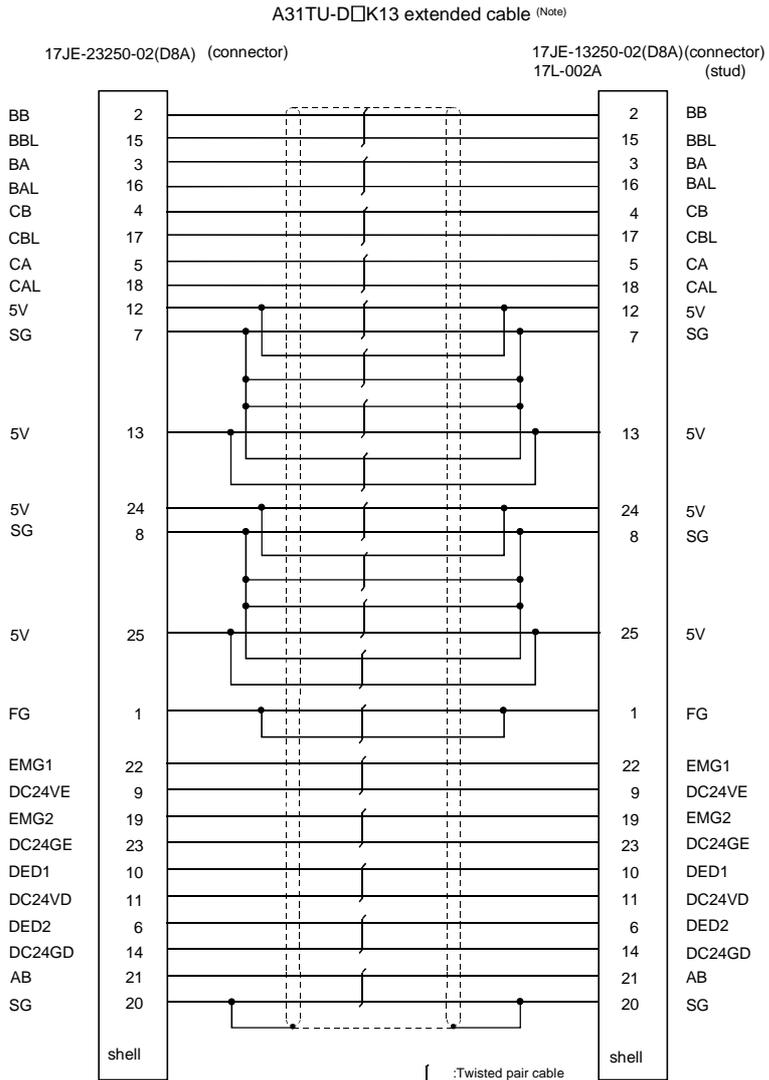
When fabricating a cable, use the recommended wire and connector given on Appendix 1.3, and make the cable as show in the following connection diagram. Maximum cable length is 3m(9.84ft.).



(5) A31TU-D□K13 extended cable

(a) Connection diagram

When fabricating a cable, use the recommended wire and connector given on Appendix 1.3, and make the cable as show in the following connection diagram. The cable overall distance between the Motion CPU and teaching unit is within 30m (98.4ft.) include the A31TU-D□K13 cable (5m(16.4ft.)). (Maximum cable length is 14m(45.9ft.) when using Q170TUD□CBL3M.)



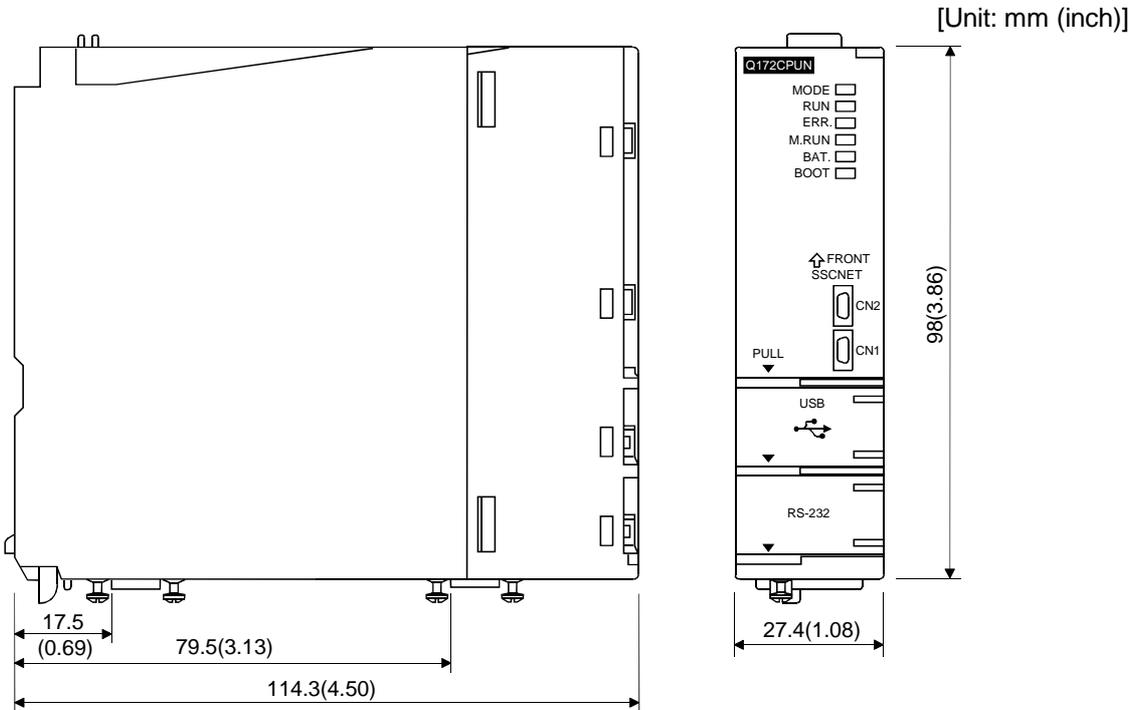
(Note) : Use a cable of wire size AWG24.

APPENDICES

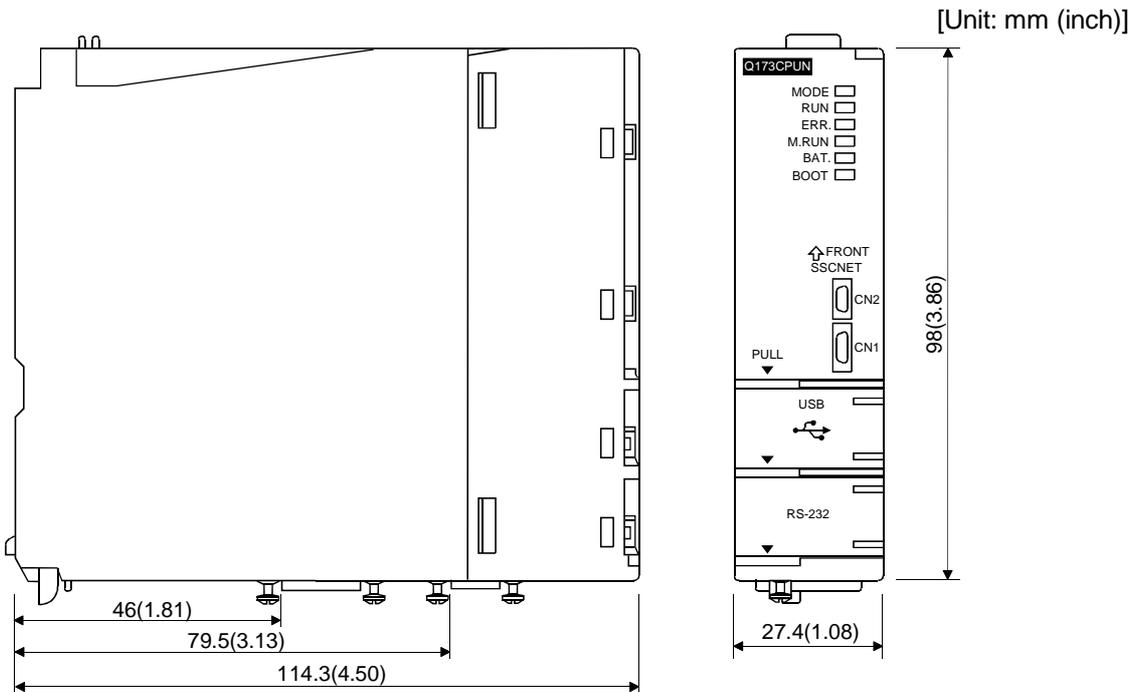
APPENDIX 2 Exterior Dimensions

APPENDIX 2.1 CPU module

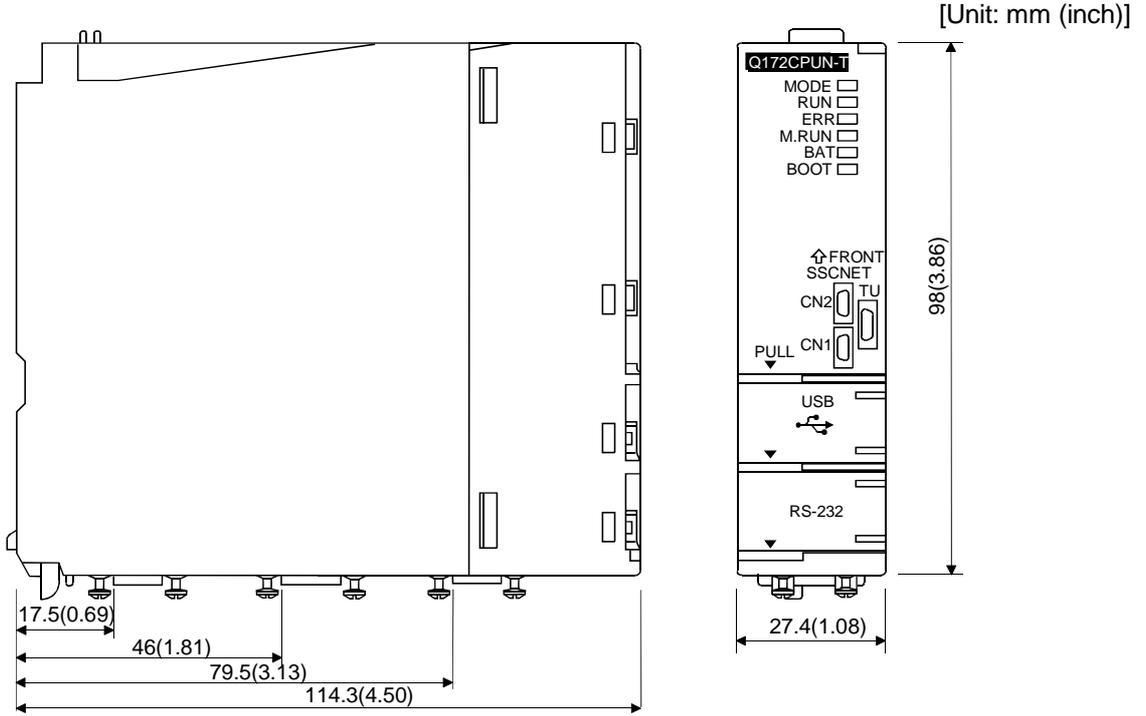
(1) Q172CPUN Module



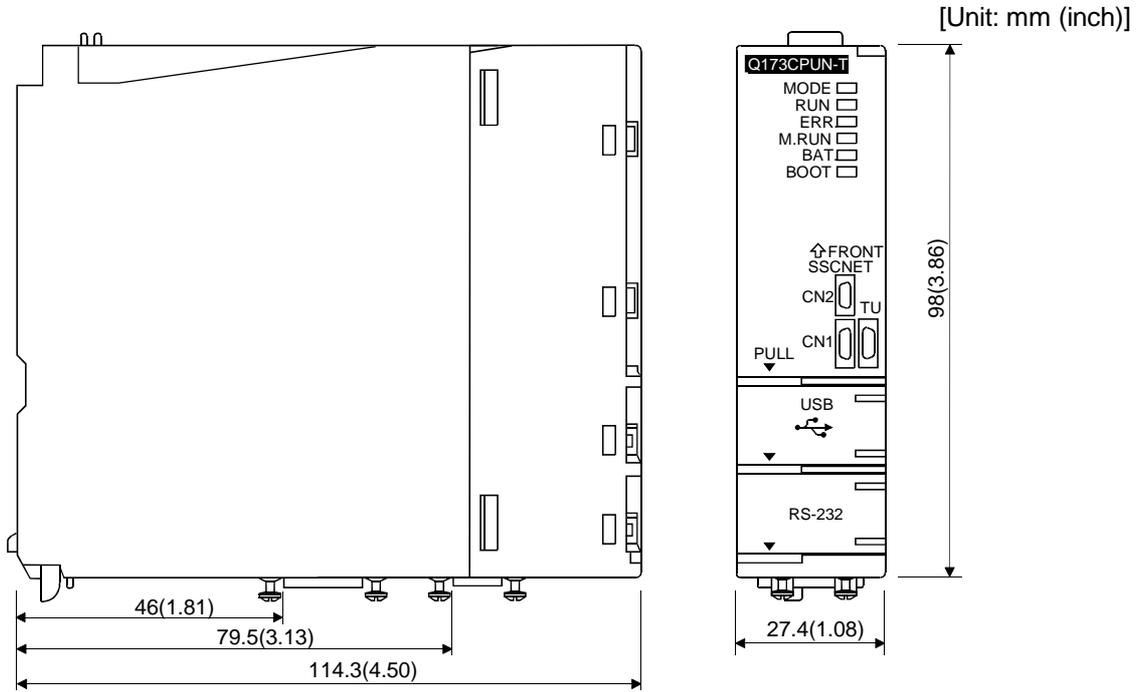
(2) Q173CPUN Module



(3) Q172CPUN-T Module

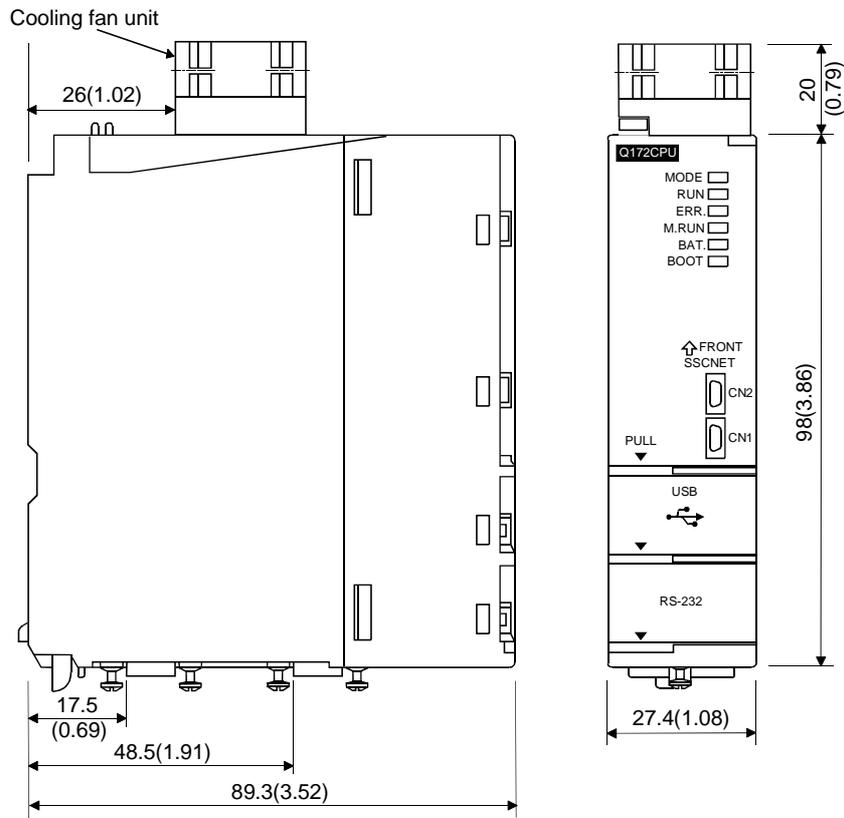


(4) Q173CPUN-T Module



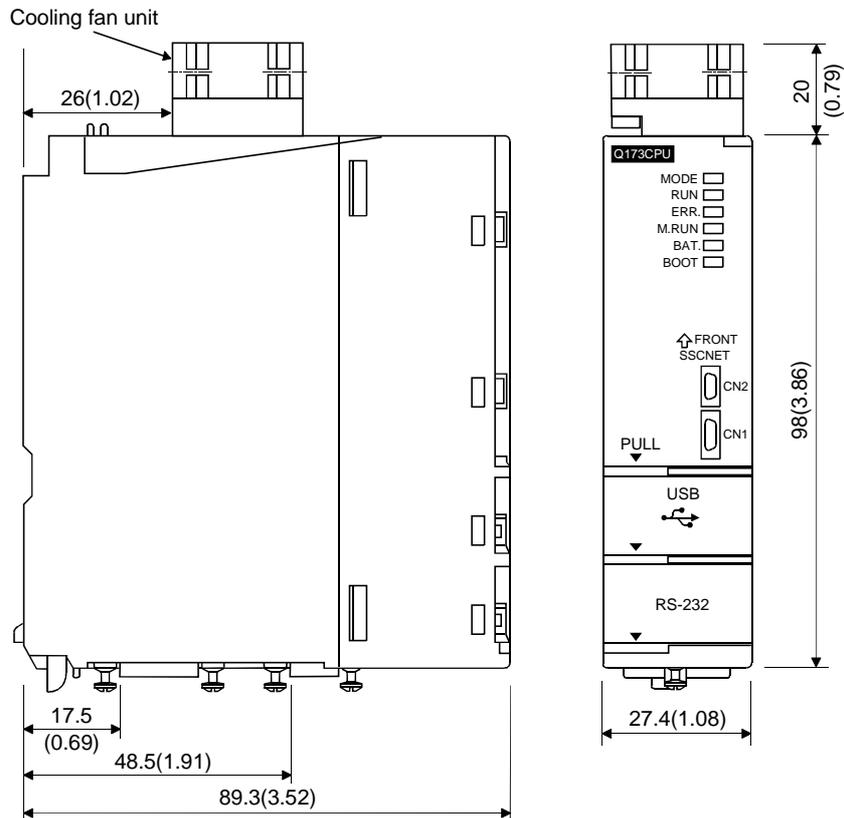
(5) Q172CPU Module

[Unit: mm (inch)]



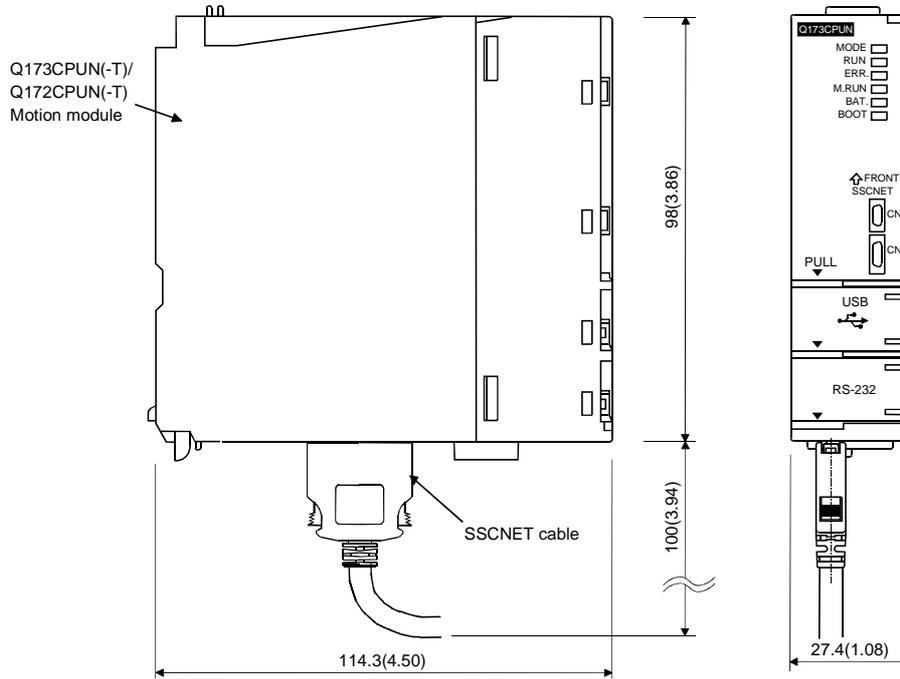
(6) Q173CPU Module

[Unit: mm (inch)]



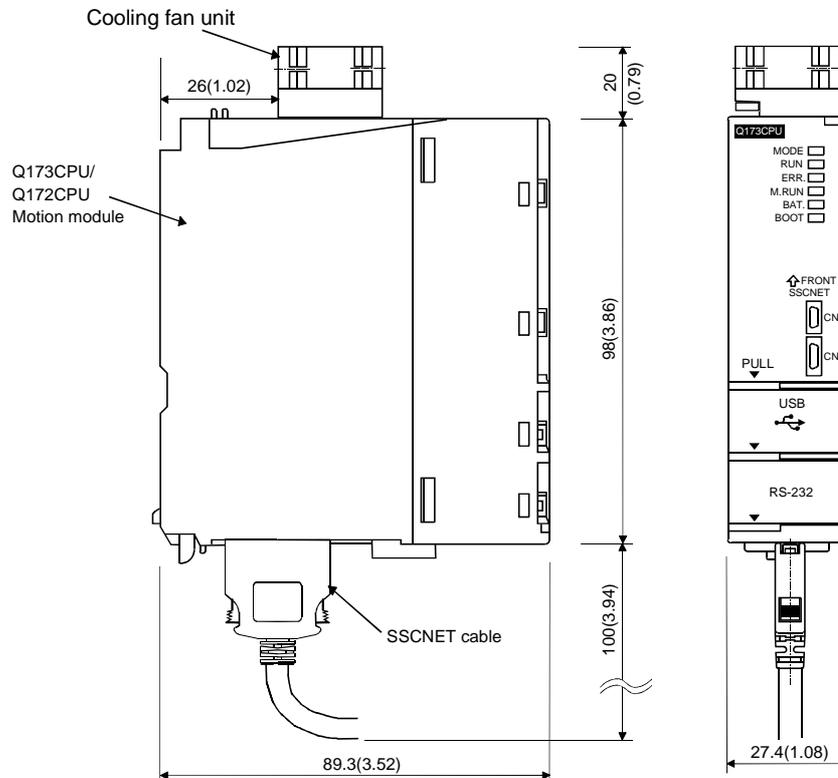
(7) Q173CPUN(-T)/Q172CPUN(-T) Module (with SSCNET cable)

[Unit: mm (inch)]

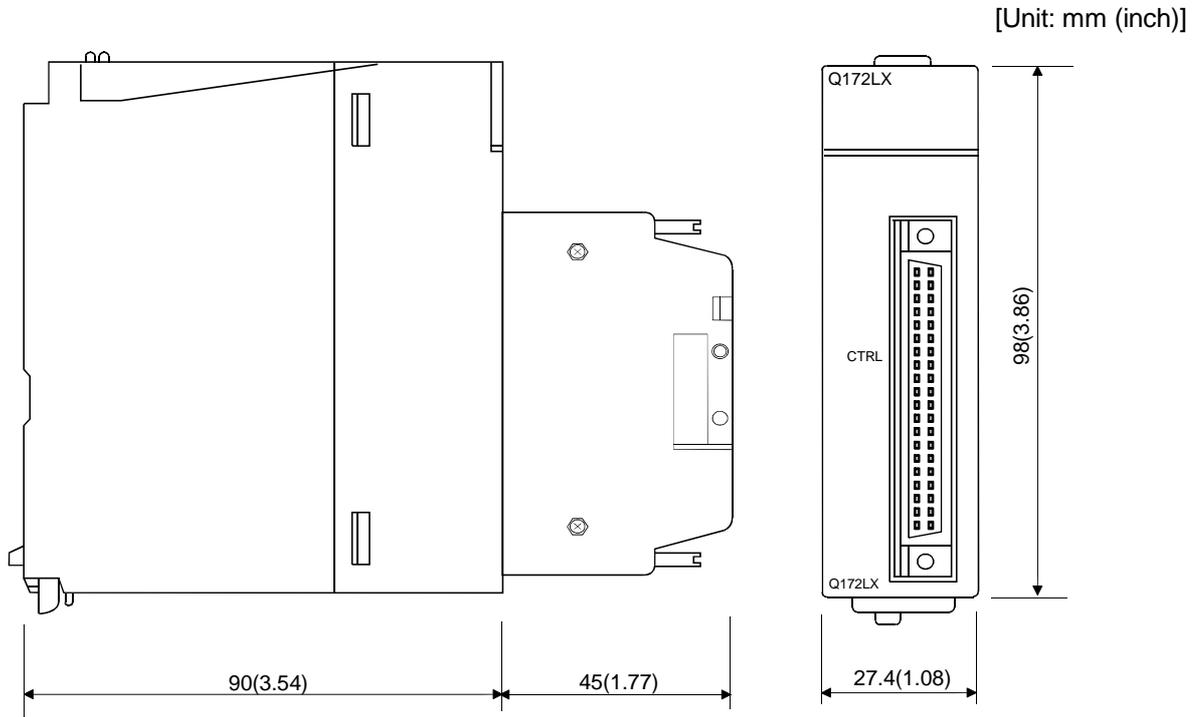


(8) Q173CPU/Q172CPU Module (with SSCNET cable)

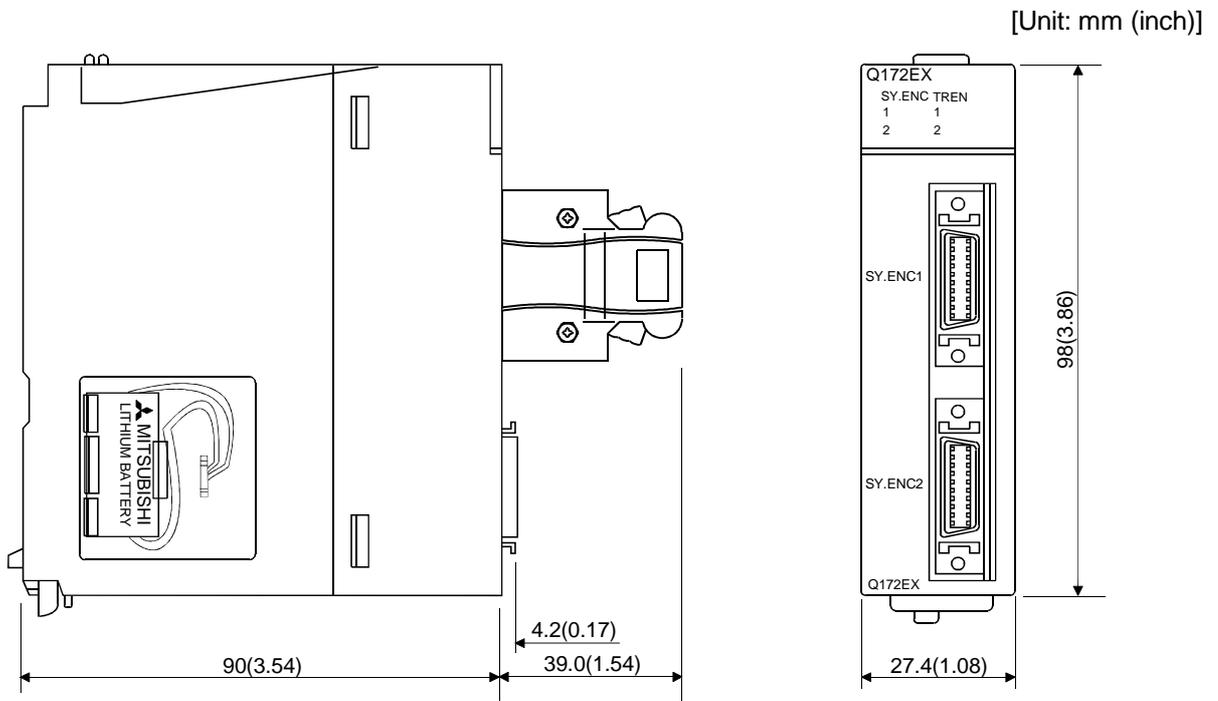
[Unit: mm (inch)]



APPENDIX 2.2 Servo external signals interface module (Q172LX)

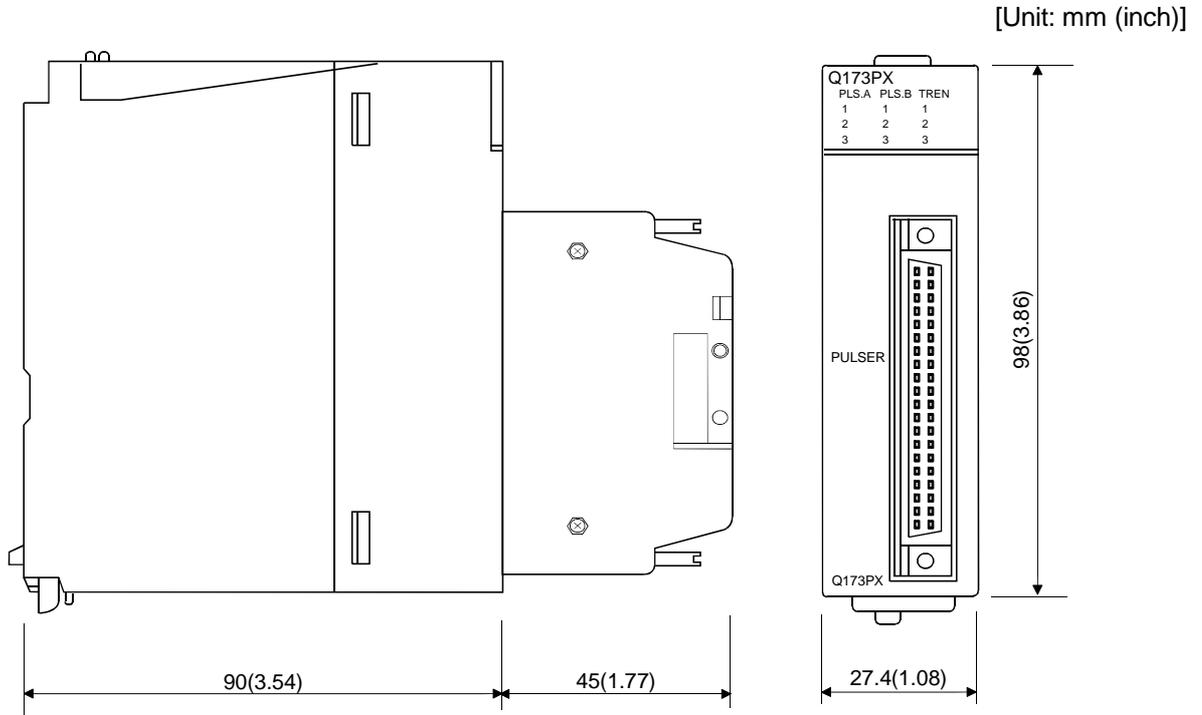


APPENDIX 2.3 Serial absolute synchronous encoder interface module (Q172EX/Q172EX-S1)

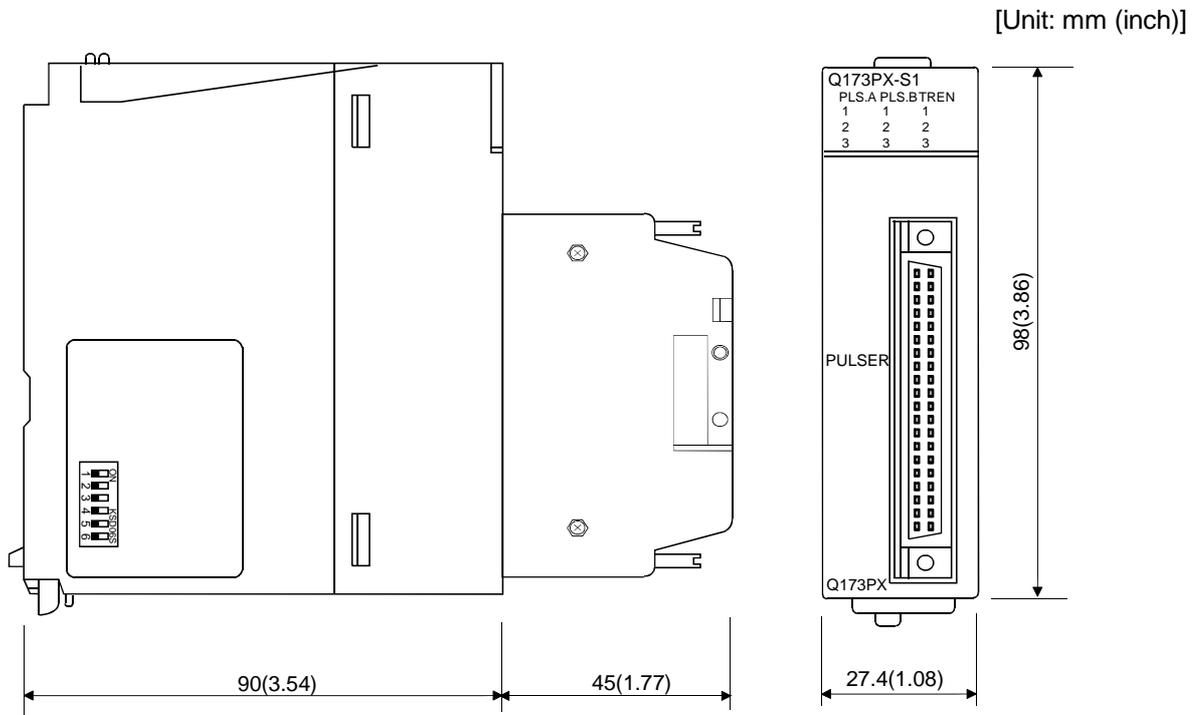


APPENDIX 2.4 Manual pulse generator interface module (Q173PX/Q173PX-S1)

(1) Q173PX



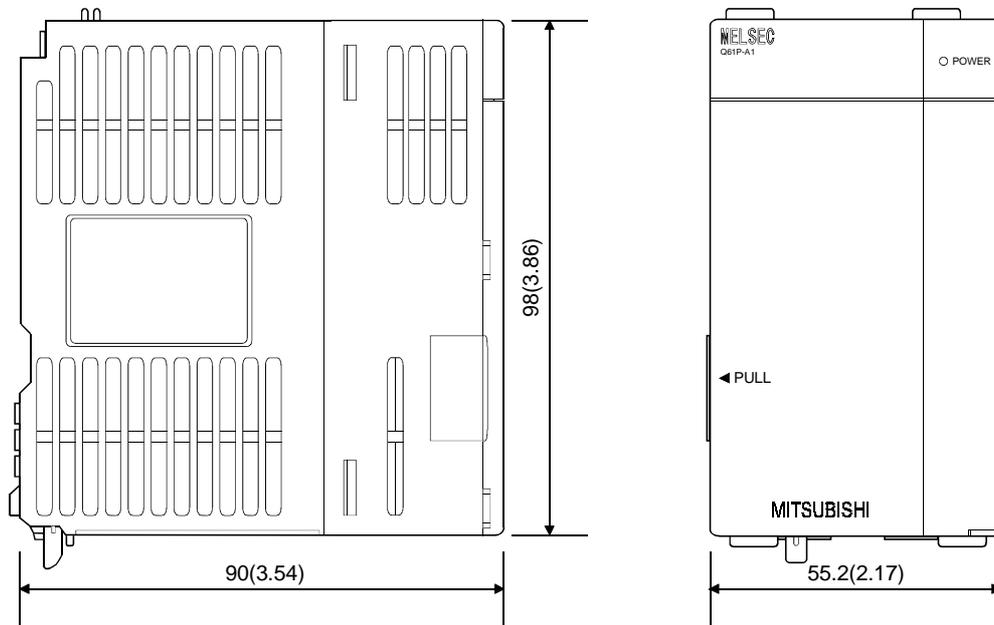
(2) Q173PX-S1



APPENDIX 2.5 Power supply module (Q61P-A1, Q61P-A2, Q63P, Q64P)

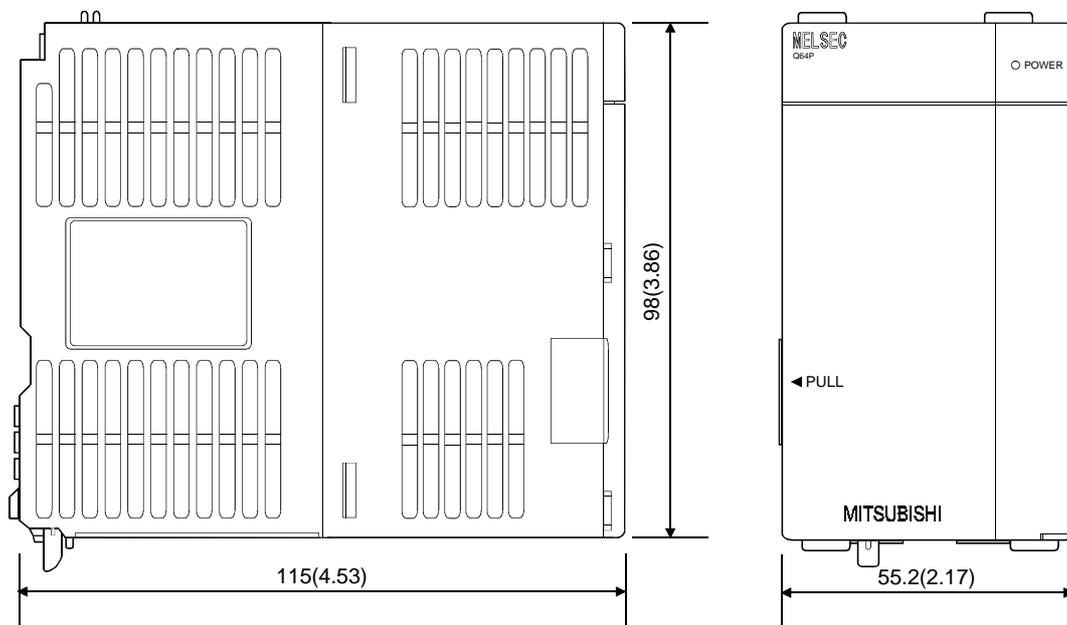
[Unit: mm (inch)]

(1) Q61P-A1, Q61P-A2, Q63P



(2) Q64P

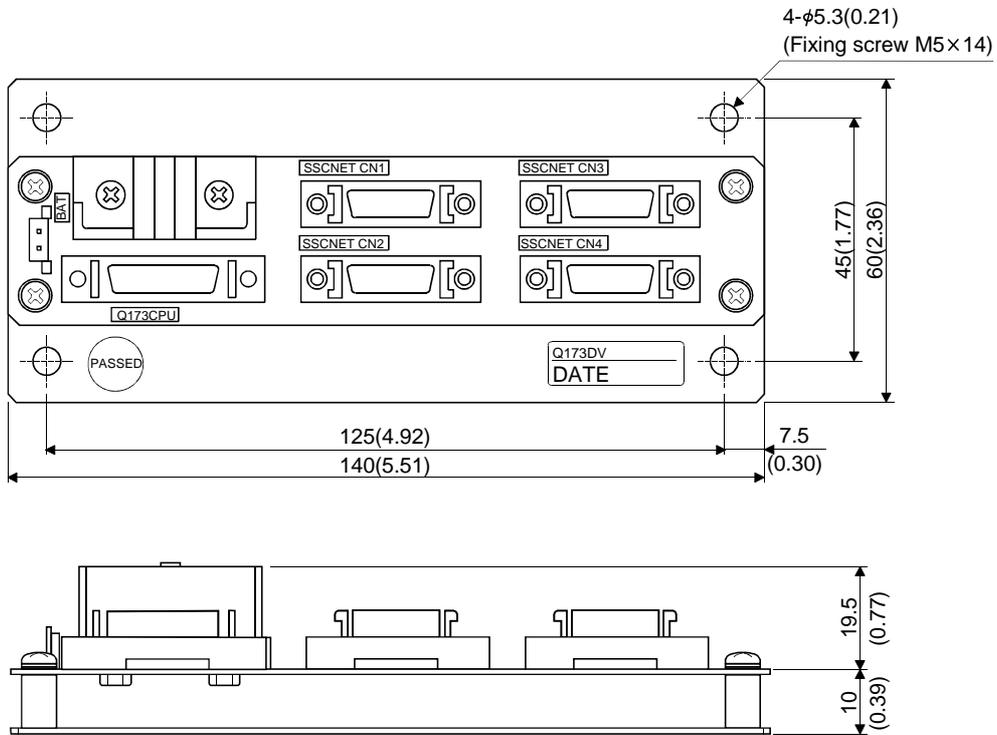
[Unit: mm (inch)]



APPENDIX 2.6 Dividing unit (Q173DV), Battery unit (Q170BAT)

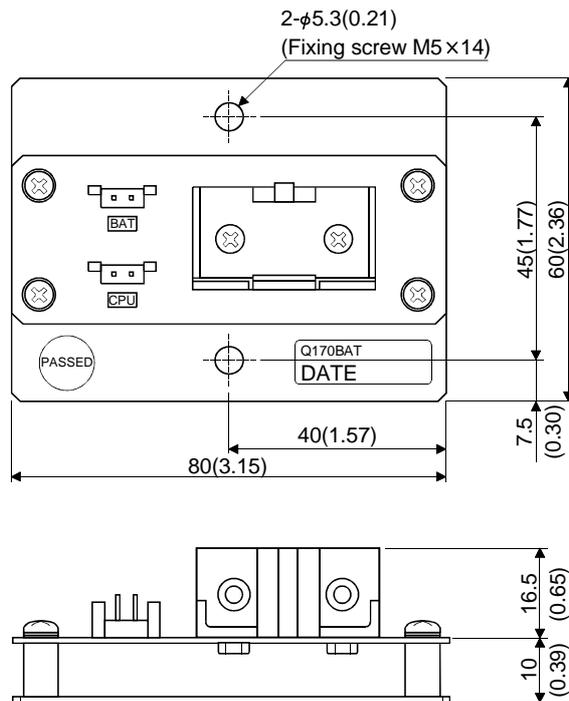
(1) Dividing unit (Q173DV)

[Unit: mm (inch)]



(2) Battery unit (Q170BAT)

[Unit: mm (inch)]



APPENDIX 2.7 Connector

(1) Honda connectors make(HDR model)

Number of pins	Type	
	Connector	Connector case
14	HDR-E14MG1	HDR-E14LPA5
26	HDR-E26MG1	HDR-E26LPA5
	HDR-E26FG1	

Specified tool: FHAT-0029/FHPT-0004C

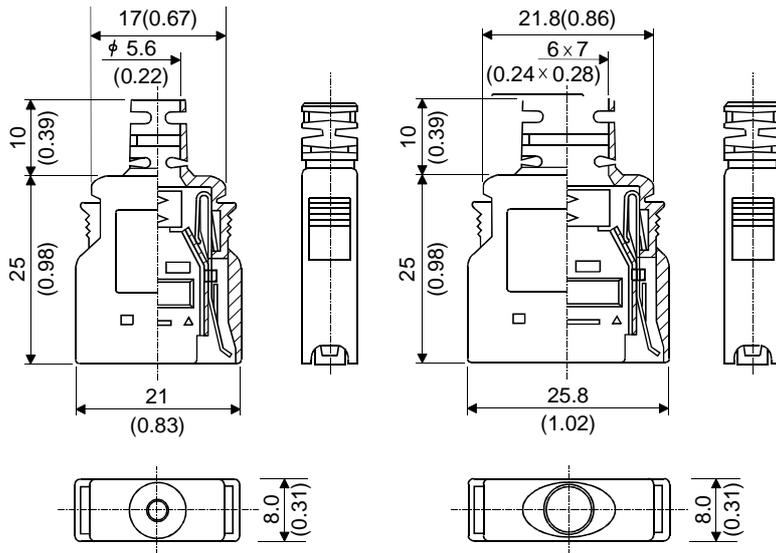
Maker: Honda connectors

These connectors are not sold in Mitsubishi. They are requested to be procured by customers.

Type Connector : HDR-E14MG1
Connector case: HDR-E14LPA5

Type Connector : HDR-E26MG1
: HDR-E26FG1
Connector case: HDR-E26LPA5

[Unit: mm (inch)]



(2) Sumitomo 3M make(MDR type)

Number of pins	Type	Type	
		Connector	Connector case
20	Solder connection type (Quick release metal latch type)	10120-3000VE	10320-52F0-008
	Solder connection type (Threaded type)	10120-3000VE	10320-52A0-008
	Insulation displacement type (Quick release metal latch type)	10120-6000EL ^(Note)	10320-3210-000 ^(Note)
26	Solder connection type (Quick release metal latch type)	10126-3000VE	10326-52F0-008
	Solder connection type (Threaded type)	10126-3000VE ^(Note)	10326-52A0-008 ^(Note)
	Insulation displacement type (Quick release metal latch type)	10126-6000EL ^(Note)	10326-3210-000 ^(Note)

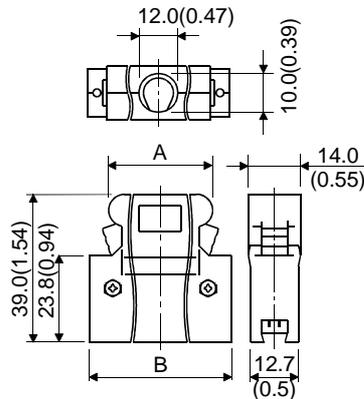
(Note): These connectors are not options, and should be prepared by the customer.

(a) Solder connection type(Quick release metal latch type)

Type Connector : 10120-3000VE/10126-3000VE

Connector case: 10320-52F0-008/10326-52F0-008

[Unit: mm (inch)]



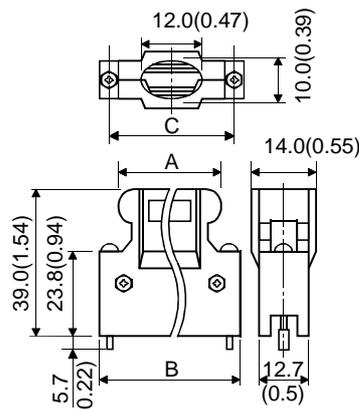
Number of pins	A	B
20 pin	22.0(0.87)	33.3(1.31)
26 pin	25.8(1.02)	37.2(1.46)

(b) Solder connection type(Threaded type)

Type Connector : 10120-3000VE/10126-3000VE

Connector case: 10320-52A0-008/10326-52A0-008

[Unit: mm (inch)]



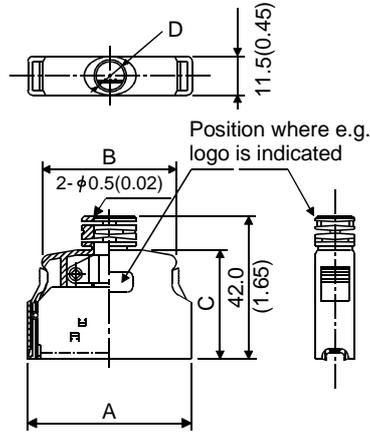
Number of pins	A	B	C
20 pin	22.0(0.87)	33.3(1.31)	27.4(1.08)
26 pin	25.8(1.02)	37.2(1.46)	31.3(1.23)

(c) Insulation displacement type(Quick release metal latch type)

Type Connector : 10120-6000EL/10126-6000EL

Connector case: 10320-3210-000/10326-3210-000

[Unit: mm (inch)]



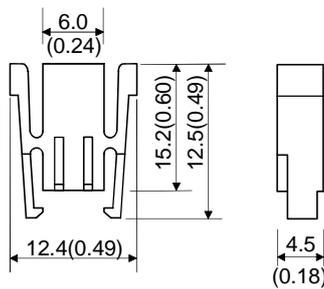
Number of pins	A	B	C	D
20 pin	29.7(1.17)	20.9(0.82)	33.0(1.30)	φ6.7
26 pin	33.5(1.32)	24.8(0.98)	33.0(1.30)	φ6.7

(3) Hirose Electric make

Type Connector : HNC2-2.5S-2

Terminal : HNC2-2.5S-D-B

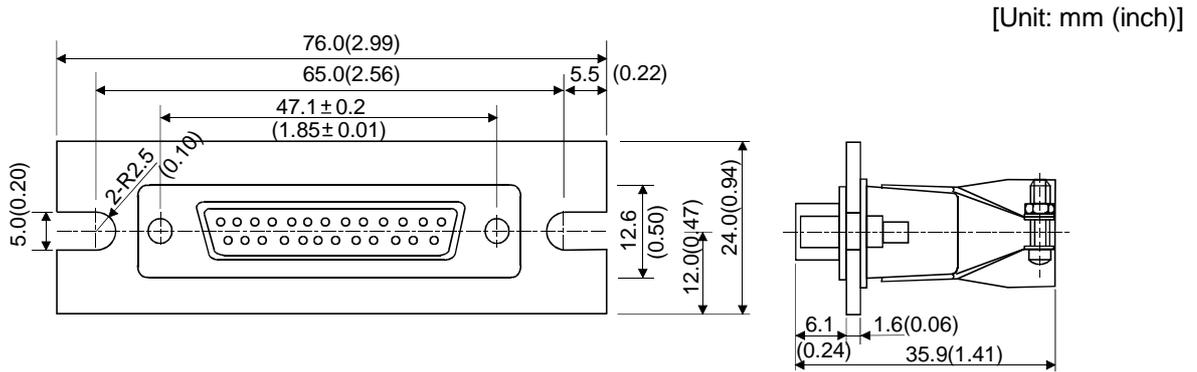
[Unit: mm (inch)]



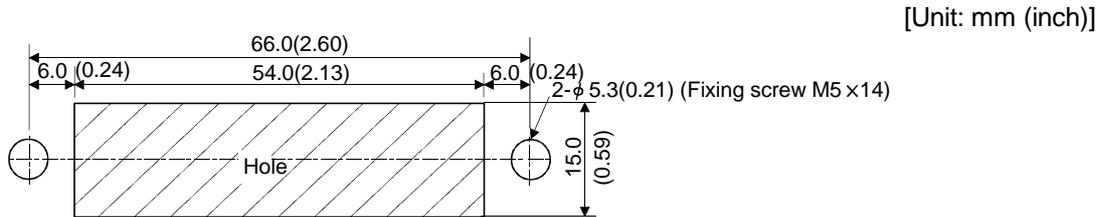
(4) Q170TUD3CBL(A31TU-D3 side connector)

Type Connector : DB-25SF-N (Maker : Japan Aviation Electronics Industry)
 Screw lock : D20418-J3 (Maker : Japan Aviation Electronics Industry)
 Installation plate : Not for sale
 Circular clamp : DB20962 (Maker : Japan Aviation Electronics Industry)

(a) Connector



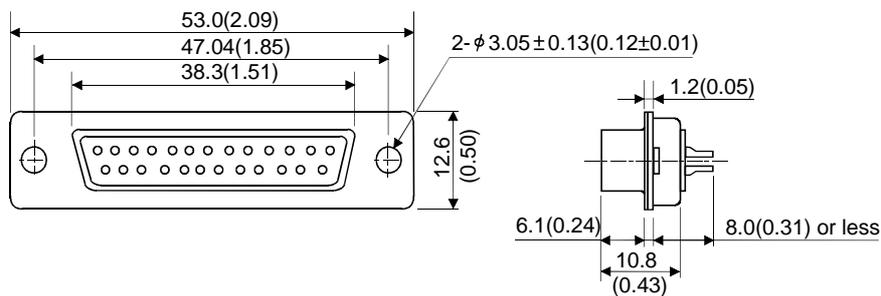
(b) Control panel fixing processing dimension



(5) Japan Aviation Electronics Industry make

Type Connector : DB-25SF-N

[Unit: mm (inch)]

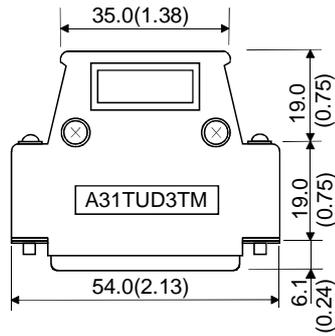
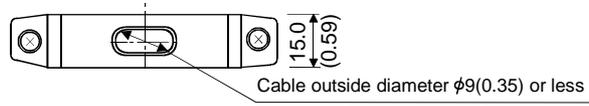


(Note) : Give the processing of the control panel referring to the above chart at cable producing.

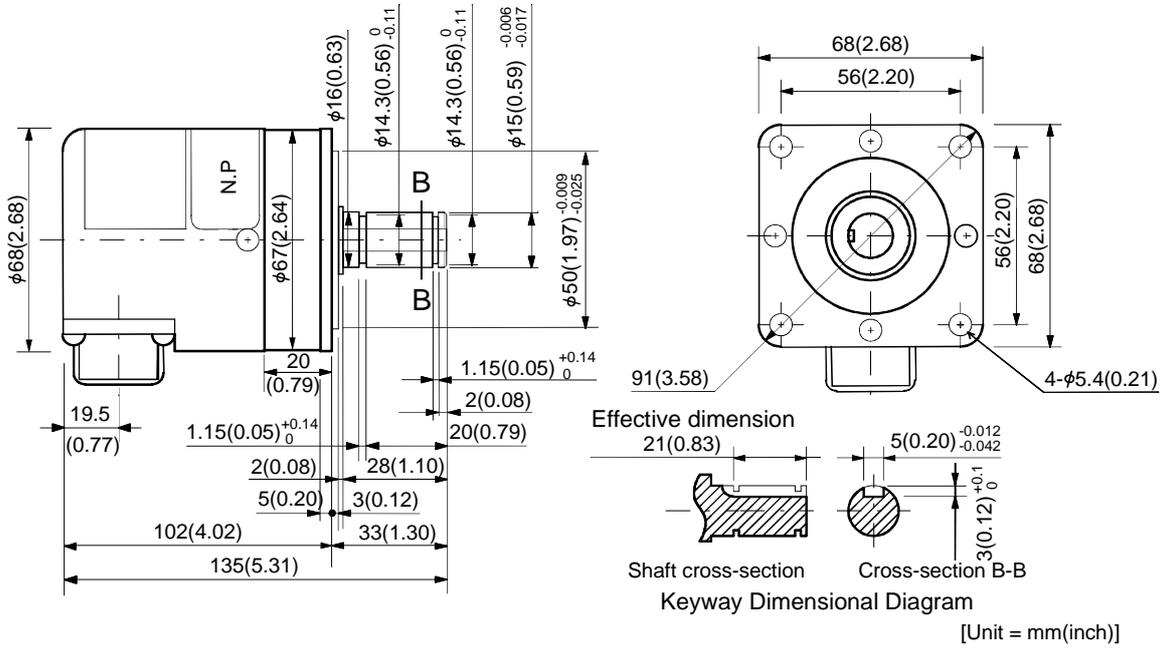
(6) A31TUD3TM

Type Connector : 17JE-23250-02(D8A) (Maker : DDK)

[Unit: mm (inch)]

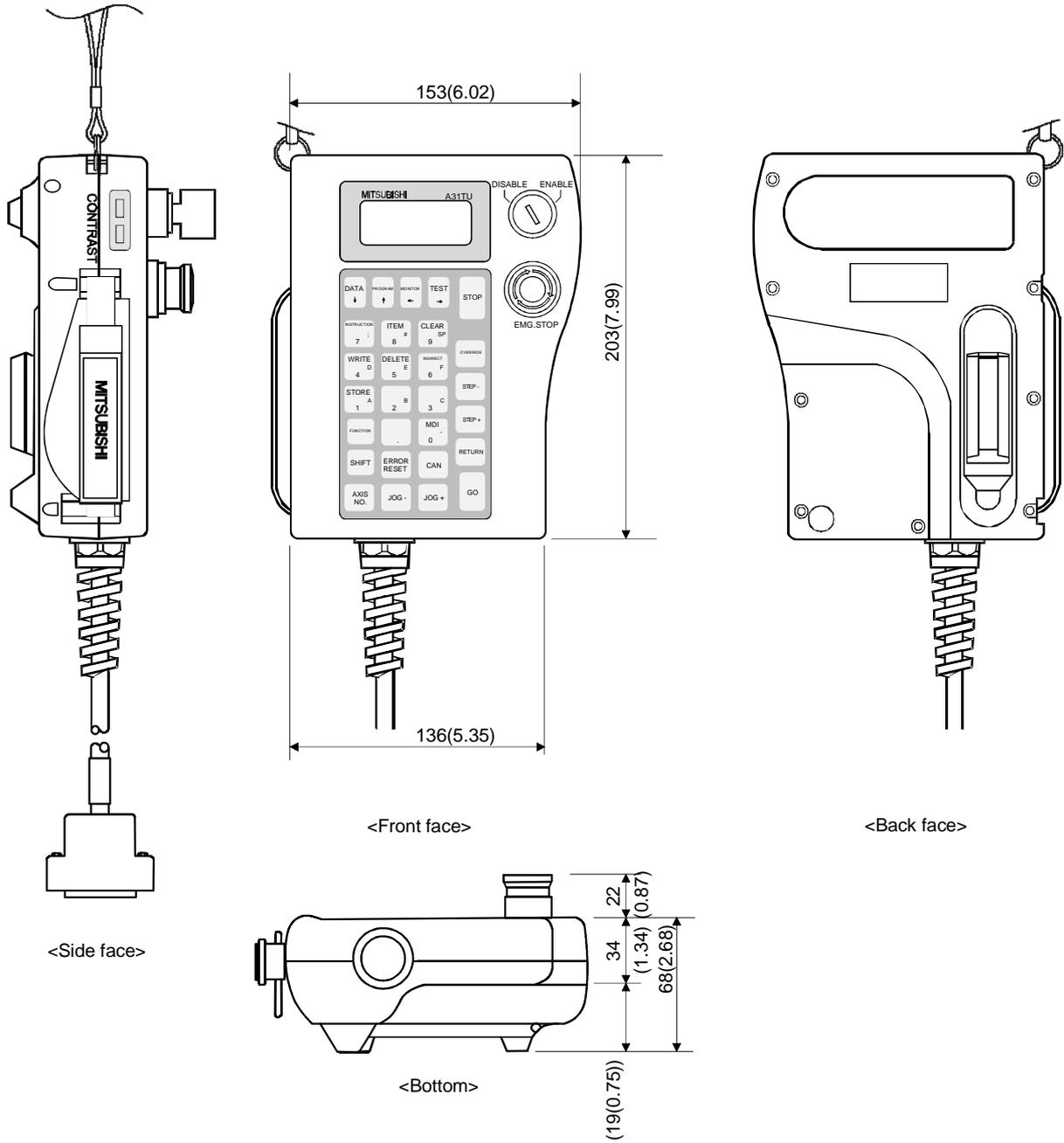


APPENDIX 2.9 Serial absolute synchronous encoder (MR-HENC)



APPENDIX 2.10 Teaching unit (A31TU-D3K□/A31TU-DNK□)

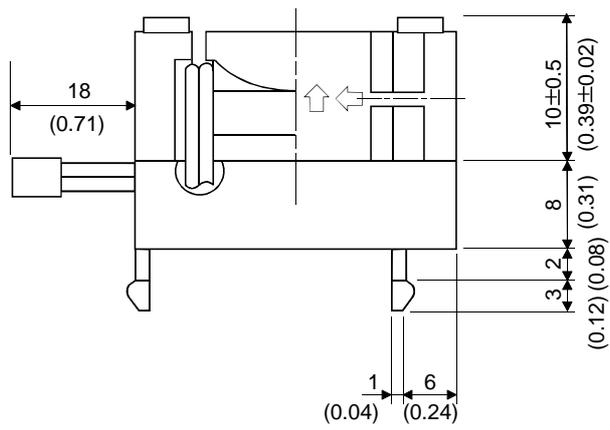
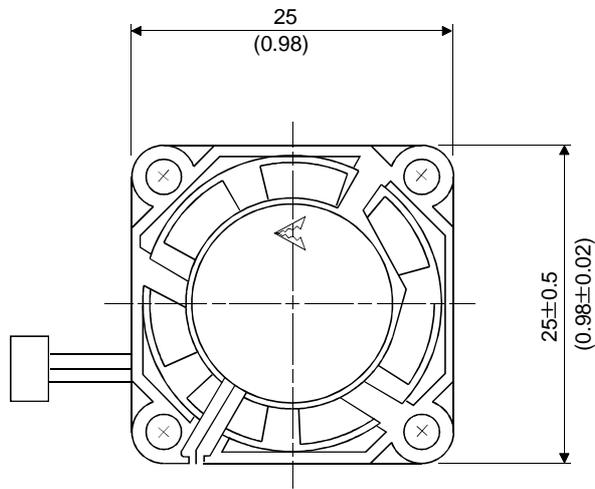
[Unit: mm (inch)]



APPENDICES

APPENDIX 2.11 Cooling fan unit (Q170FAN) (Q173CPU/Q172CPU only)

[Unit: mm (inch)]



FOR MAXIMUM SAFETY

- (1) This product is not designed or manufactured to be used in equipment or systems in situations that can affect or endanger human life.
- (2) 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.
- (3) 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.

MOTION CONTROLLER Qseries (Q173CPU(N)/Q172CPU(N))User's Manual



HEAD OFFICE : 1-8-12, OFFICE TOWER Z 14F HARUMI CHUO-KU 104-6212,JAPAN
NAGOYA WORKS : 1-14 , YADA-MINAMI 5-CHOME , HIGASHI-KU, NAGOYA , JAPAN

MODEL	Q173-U-E
MODEL CODE	1CT780
IB(NA)-0300040-C(0309)MEE	

When exported from Japan, this manual does not require application to the Ministry of Economy, Trade and Industry for service transaction permission.