MITSUBISHI ELECTRIC

MOTION CONTROLLERS

Changes for the Better

MOTION CONTROLLER

Q series

Q173DCPU

Q172DCPU

User's Manual

● SAFETY PRECAUTIONS ●

(Please read these instructions before using this equipment.)

Before using this product, please read this manual and the relevant manuals introduced in this manual carefully and pay full attention to safety to handle the product correctly.
These precautions apply only to this product. Refer to the Users manual of the QCPU module to use for a description of the PLC system safety precautions.
In this manual, the safety instructions are ranked as "DANGER" and "CAUTION".

⚠DANGER	Indicates that incorrect handling may cause hazardous conditions, resulting in death or severe injury.
⚠CAUTION	Indicates that incorrect handling may cause hazardous conditions, resulting in medium or slight personal injury or physical damage.

Depending on circumstances, procedures indicated by ⚠ CAUTION may also be linked to serious results.
In any case, it is important to follow the directions for usage.

Please save this manual to make it accessible when required and always forward it to the end user.

For Safe Operations

1. Prevention of electric shocks

⚠DANGER

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

2. For fire prevention

⚠CAUTION

- Install the Motion controller, servo amplifier, servomotor and regenerative resistor on incombustible. Installing them directly or close to combustibles will lead to fire.
- If a fault occurs in the Motion controller or servo amplifier, shut the power OFF at the servo amplifier's power source. If a large current continues to flow, fire may occur.
- When using a regenerative resistor, shut the power OFF with an error signal. The regenerative resistor may abnormally overheat due to a fault in the regenerative transistor, etc., and may lead to fire.
- Always take heat measures such as flame proofing for the inside of the control panel where the servo amplifier or regenerative resistor is installed and for the wires used. Failing to do so may lead to fire.
- Do not damage, apply excessive stress, place heavy things on or sandwich the cables, as this may lead to fire.

3. For injury prevention

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

4. Various precautions

Strictly observe the following precautions.

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

(1) System structure

⚠CAUTION
● Always install a leakage breaker on the Motion controller and servo amplifier power source. ● If installation of an electromagnetic contactor for power shut off during an error, etc., is specified in the instruction manual for the servo amplifier, etc., always install the electromagnetic contactor. ● Install the emergency stop circuit externally so that the operation can be stopped immediately and the power shut off. ● Use the Motion controller, servo amplifier, servomotor and regenerative resistor with the correct combinations listed in the instruction manual. Other combinations may lead to fire or faults. ● Use the CPU module, base unit and motion module with the correct combinations listed in the instruction manual. Other combinations may lead to faults. ● If safety standards (ex., robot safety rules, etc.,) apply to the system using the Motion controller, servo amplifier and servomotor, make sure that the safety standards are satisfied. ● Construct a safety circuit externally of the Motion controller or servo amplifier if the abnormal operation of the Motion controller or servo amplifier differ from the safety directive operation in the system. ● In systems where coasting of the servomotor will be a problem during the forced stop, emergency stop, servo OFF or power supply OFF, use dynamic brakes. ● Make sure that the system considers the coasting amount even when using dynamic brakes. ● In systems where perpendicular shaft dropping may be a problem during the forced stop, emergency stop, servo OFF or power supply OFF, use both dynamic brakes and electromagnetic brakes.

⚠CAUTION

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

(2) Parameter settings and programming

⚠CAUTION

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

⚠CAUTION

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

(3) Transportation and installation

⚠CAUTION

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

⚠CAUTION

- The Motion controller, servo amplifier and servomotor are precision machines, so do not drop or apply strong impacts on them.
- Securely fix the Motion controller, servo amplifier and servomotor to the machine according to the instruction manual. If the fixing is insufficient, these may come off during operation.
- Always install the servomotor with reduction gears in the designated direction. Failing to do so may lead to oil leaks.
- Store and use the unit in the following environmental conditions.

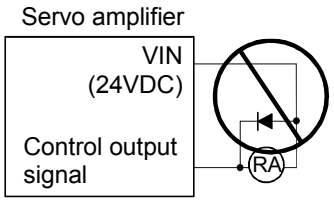
Environment	Conditions	
	Motion controller/Servo amplifier	Servomotor
Ambient temperature	According to each instruction manual.	0°C to +40°C (With no freezing) (32°F to +104°F)
Ambient humidity	According to each instruction manual.	80% RH or less (With no dew condensation)
Storage temperature	According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

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

(4) Wiring

⚠CAUTION

- Correctly and securely wire the wires. Reconfirm the connections for mistakes and the terminal screws for tightness after wiring. Failing to do so may lead to run away of the servomotor.
- After wiring, install the protective covers such as the terminal covers to the original positions.
- Do not install a phase advancing capacitor, surge absorber or radio noise filter (option FR-BIF) on the output side of the servo amplifier.
- Correctly connect the output side (terminal U, V, W). Incorrect connections will lead the servomotor to operate abnormally.
- Do not connect a commercial power supply to the servomotor, as this may lead to trouble.
- Do not mistake the direction of the surge absorbing diode installed on the DC relay for the control signal output of brake signals, etc. Incorrect installation may lead to signals not being output when trouble occurs or the protective functions not functioning.



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

(5) Trial operation and adjustment

⚠CAUTION

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

(6) Usage methods

⚠CAUTION

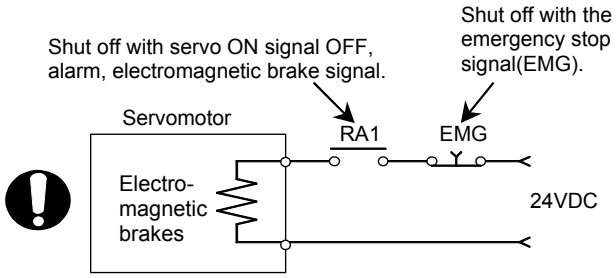
- Immediately turn OFF the power if smoke, abnormal sounds or odors are emitted from the Motion controller, servo amplifier or servomotor.
- Always execute a test operation before starting actual operations after the program or parameters have been changed or after maintenance and inspection.
- Do not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

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

(7) Corrective actions for errors

⚠CAUTION

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



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

(8) Maintenance, inspection and part replacement

⚠CAUTION

- Perform the daily and periodic inspections according to the instruction manual.
- Perform maintenance and inspection after backing up the program and parameters for the Motion controller and servo amplifier.
- Do not place fingers or hands in the clearance when opening or closing any opening.
- Periodically replace consumable parts such as batteries according to the instruction manual.
- Do not touch the lead sections such as ICs or the connector contacts.
- Before touching the module, always touch grounded metal, etc. to discharge static electricity from human body. Failure to do so may cause the module to fail or malfunction.
- Do not directly touch the module's conductive parts and electronic components. Touching them could cause an operation failure or give damage to the module.
- Do not place the Motion controller or servo amplifier on metal that may cause a power leakage or wood, plastic or vinyl that may cause static electricity buildup.
- Do not perform a megger test (insulation resistance measurement) during inspection.

⚠CAUTION

- When replacing the Motion controller or servo amplifier, always set the new module settings correctly.
- When the Motion controller or absolute value motor has been replaced, carry out a home position return operation using one of the following methods, otherwise position displacement could occur.
  1) After writing the servo data to the Motion controller using programming software, switch on the power again, then perform a home position return operation.
  2) Using the backup function of the programming software, load the data backed up before replacement.
- After maintenance and inspections are completed, confirm that the position detection of the absolute position detector function is correct.
- Do not drop or impact the battery installed to the module.
  Doing so may damage the battery, causing battery liquid to leak in the battery. Do not use the dropped or impacted battery, but dispose of it.
- Do not short circuit, charge, overheat, incinerate or disassemble the batteries.
- The electrolytic capacitor will generate gas during a fault, so do not place your face near the Motion controller or servo amplifier.
- The electrolytic capacitor and fan will deteriorate. Periodically replace these to prevent secondary damage from faults. Replacements can be made by our sales representative.

(9) About processing of waste

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

⚠CAUTION

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

(10) General cautions

⚠CAUTION

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

REVISIONS

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

Print Date	* Manual Number	Revision
Jan., 2008	IB(NA)-0300133-A	First edition

Japanese Manual Number IB(NA)-0300125

INTRODUCTION

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

CONTENTS

About Manuals

The following manuals are also related to this product.

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

Related Manuals

(1) Motion controller

Manual Name	Manual Number (Model Code)
Q173DCPU/Q172DCPU Motion controller Programming Manual (COMMON) This manual explains the Multiple CPU system configuration, performance specifications, common parameters, auxiliary/applied functions, error lists and others. (Optional)	IB-0300134 (1XB928)
Q173DCPU/Q172DCPU Motion controller (SV13/SV22) Programming Manual (Motion SFC) This manual explains the functions, programming, debugging, error lists and others for Motion SFC. (Optional)	IB-0300135 (1XB929)
Q173DCPU/Q172DCPU Motion controller (SV13/SV22) Programming Manual (REAL MODE) This manual explains the servo parameters, positioning instructions, device lists, error lists and others. (Optional)	IB-0300136 (1XB930)
Q173DCPU/Q172DCPU Motion controller (SV22) Programming Manual (VIRTUAL MODE) This manual explains the dedicated instructions to use the synchronous control by virtual main shaft, mechanical system program create mechanical module, servo parameters, positioning instructions, device lists, error lists and others. (Optional)	IB-0300137 (1XB931)

(2) PLC

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

(3) Servo amplifier

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

1. OVERVIEW

1.1 Overview

This User's Manual describes the hardware specifications and handling methods of the Motion Controller's Model Q173DCPU/Q172DCPU 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 cables.
In this manual, the following abbreviations are used.

Generic term/Abbreviation	Description
Q173DCPU/Q172DCPU or Motion CPU (module)	Q173DCPU/Q172DCPU Motion CPU module
Q172DLX/Q172DEX/Q173DPX or Motion module	Q172DLX Servo external signals interface module/ Q172DEX Serial Synchronous encoder interface module(Note-1)/ Q173DPX Manual pulse generator interface module
MR-J3-□B	Servo amplifier model MR-J3-□B
AMP or Servo amplifier	General name for "Servo amplifier model MR-J3-□B"
QCPU, PLC CPU or PLC CPU module	QnUD(H)CPU
Multiple CPU system or Motion system	Abbreviation for "Multiple PLC system of the Q series"
CPUn	Abbreviation for "CPU No.n (n= 1 to 4) of the CPU module for the Multiple CPU system"
Self CPU	Motion CPU being programmed by the currently open MT Developer project
Programming software package	General name for MT Developer/GX Developer/MR Configurator
Operating system software	General name for "SW8DNC-SV□Q□"
SV13	Operating system software for conveyor assembly use (Motion SFC) : SW8DNC -SV13Q□
SV22	Operating system software for automatic machinery use (Motion SFC) : SW8DNC -SV22Q□
MT Developer	Abbreviation for "Motion controller programming software MT Developer2 (Version 1.00A or later)"
GX Developer	Abbreviation for "MELSEC PLC programming software package GX Developer (Version 8.48A or later)"
MR Configurator	Abbreviation for "Servo setup software package MR Configurator (Version C0 or later)"
Manual pulse generator or MR-HDP01	Abbreviation for "Manual pulse generator (MR-HDP01)"
Serial absolute synchronous encoder or Q170ENC	Abbreviation for "Serial absolute synchronous encoder (Q170ENC)"
SSCNETⅢ(Note-2)	High speed synchronous network between Motion controller and servo amplifier
Absolute position system	General name for "system using the servomotor and servo amplifier for absolute position"
Battery holder unit	Battery holder unit (Q170DBATC)
External battery	General name for "Q170DBATC" and "Q6BAT"
Intelligent function module	Abbreviation for "MELSECNET/H module/Ethernet module/CC-Link module/ Serial communication module"

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

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

REMARK

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

Item		Reference Manual
PLC CPU, peripheral devices for PLC program design, I/O modules and intelligent function module		Manual relevant to each module
Operation method for MT Developer		Help of each software
SV13/SV22	• Multiple CPU system configuration • Performance specification • Design method for common parameter • Auxiliary and applied functions (common)	Q173DCPU/Q172DCPU Motion controller Programming Manual (COMMON)
	• Design method for Motion SFC program • Design method for Motion SFC parameter • Motion dedicated PLC instruction	Q173DCPU/Q172DCPU Motion controller (SV13/SV22) Programming Manual (Motion SFC)
	• Design method for positioning control program in the real mode • Design method for positioning control parameter	Q173DCPU/Q172DCPU Motion controller (SV13/SV22) Programming Manual (REAL MODE)
SV22 (Virtual mode)	• Design method for mechanical system program	Q173DCPU/Q172DCPU Motion controller (SV22) Programming Manual (VIRTUAL MODE)

1.2 Differences between Q173DCPU/Q172DCPU and Q173HCPU/Q172HCPU

Items		Q173DCPU	Q172DCPU	Q173HCPU	Q173HCPU
Operation cycle (default)	SV13	0.44ms/ 1 to 6 axes 0.88ms/ 7 to 18 axes 1.77ms/19 to 32 axes	0.44ms/ 1 to 6 axes 0.88ms/ 7 to 8 axes	0.44ms/ 1 to 3 axes 0.88ms/ 4 to 10 axes 1.77ms/11 to 20 axes 3.55ms/21 to 32 axes	0.44ms/ 1 to 3 axes 0.88ms/ 4 to 8 axes
	SV22	0.44ms/ 1 to 4 axes 0.88ms/ 5 to 12 axes 1.77ms/13 to 28 axes 3.55ms/29 to 32 axes	0.44ms/ 1 to 4 axes 0.88ms/ 5 to 8 axes	0.88ms/ 1 to 5 axes 1.77ms/ 6 to 14 axes 3.55ms/15 to 28 axes 7.11ms/29 to 32 axes	0.88ms/ 1 to 5 axes 1.77ms/ 6 to 8 axes
Medium of operating system software		CD-ROM (1 disk)		FD (2 disks)	
Model of operating system software		SW8DNC-SV□Q□		SW6RN-SV□Q□	
Peripheral I/F		Via PLC CPU (USB/RS-232)		USB/SSCNET	
Main base unit		Multiple CPU high speed main base unit (Q38DB/Q312DB)		Main base unit (Q33B/Q35B/Q38B/Q312B)	
	Color of base cover	Gray		Clear	
	Mounting on panel	Be sure to mount it by unit fixing screws.		Mount it unit by unit fixing screws when using system in a place where the vibration or impact is large.	
	DIN rail	Unusable		Usable	
CPU module No.1		QnUD(H)CPU		Qn(H)CPU	
Installation orders CPU No.2 or later		No restriction		Install Motion CPU modules on the right-hand side of PLC CPU module.	
CPU empty slot		Settable between CPU modules		Not settable between CPU modules	
PLC CPU module		Universal model (QnUD(H)CPU)		High performance model (Qn(H)CPU)	
Motion CPU module		Q173DCPU/Q172DCPU		Q173HCPU(-T)/Q172HCPU(-T)	
	Combination of Motion CPU modules	Q173DCPU/Q172DCPU only		Combination with Q173CPUN(T)/Q172CPUN(-T)	
	Installation on main base unit	Be sure to install Motion CPU modules by unit fixing screws.		Install Motion CPU modules by unit fixing screws when using them in a place where the vibration or impact is large.	
	Function select switch	Rotary switch 1, Rotary switch 2		Dip switch 1 to 5	
	RESET/L.CLR switch	None		Provided	
	LED indication	7-segment LED display		Each LED of MODE, RUN, ERR, M.RUN, BAT and BOOT	
External battery		Demand		Add Q6BAT at continuous power failure for 1 month or more	
	Battery holder unit	Q170DBATC		Q170HBATC	
Forced stop input		• Use EMI terminal of Motion CPU module • Use device set by forced stop input setting in the system setting.		• Use device set by forced stop input setting in the system setting.	
Cable for forced stop input		Demand		—	
Motion module		Q172DLX/Q172DEX/Q173DPX		Q172LX/Q172EX/Q173PX	
	Installation on main base unit	Impossible to install on I/O slots of 0 to2		Possible to install on I/O slots of 0 to2	
Multiple CPU high speed transmission memory for data transfer between CPU modules		Included		—	

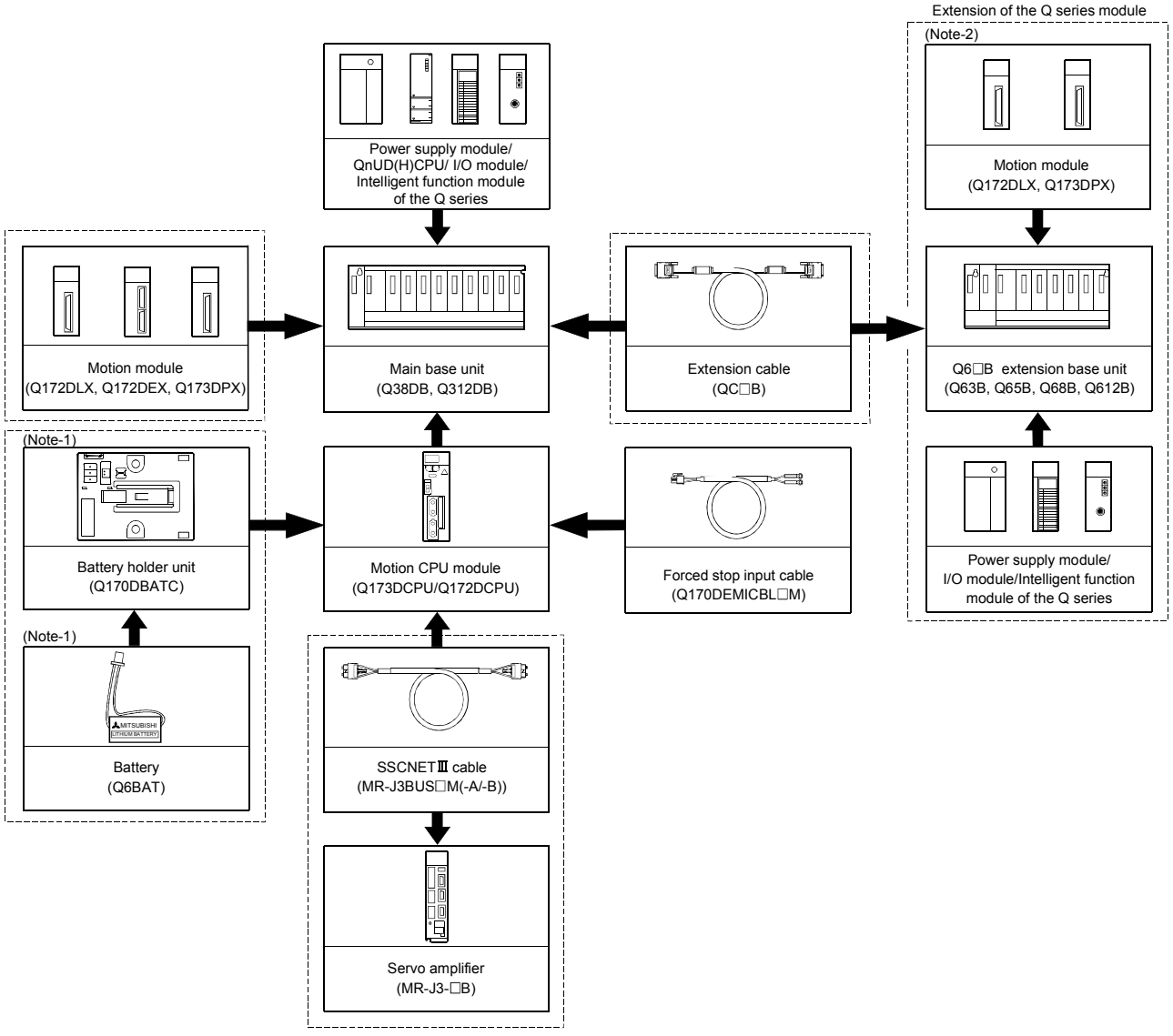
MEMO

2. SYSTEM CONFIGURATION

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

2.1 Motion System Configuration

(1) Equipment configuration in Q173DCPU/Q172DCPU system



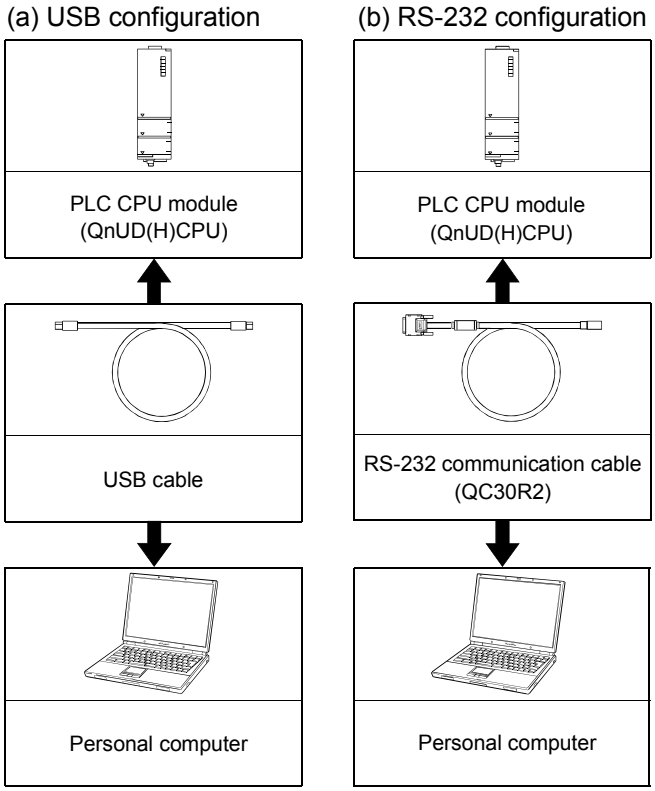
It is possible to select the best according to the system.

(Note-1) : Be sure to install the Battery (Q6BAT) to the Battery holder unit (Q170DBATC). It is packed together with Q173DCPU/Q172DCPU.

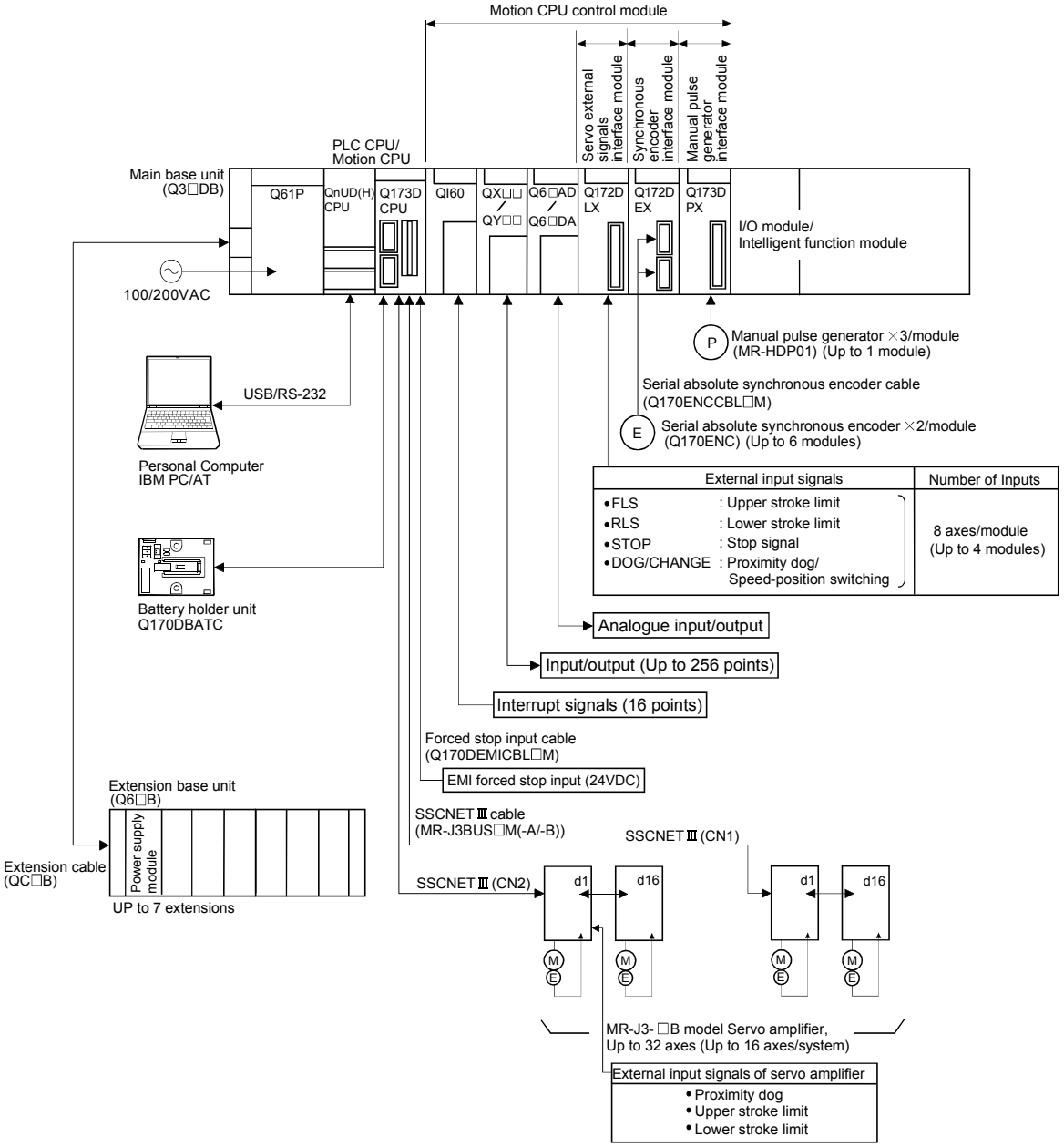
(Note-2) : Q172DEX cannot be used in the extension base unit. Install it to the main base unit.

(2) Peripheral device configuration for the Q173DCPU/Q172DCPU

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



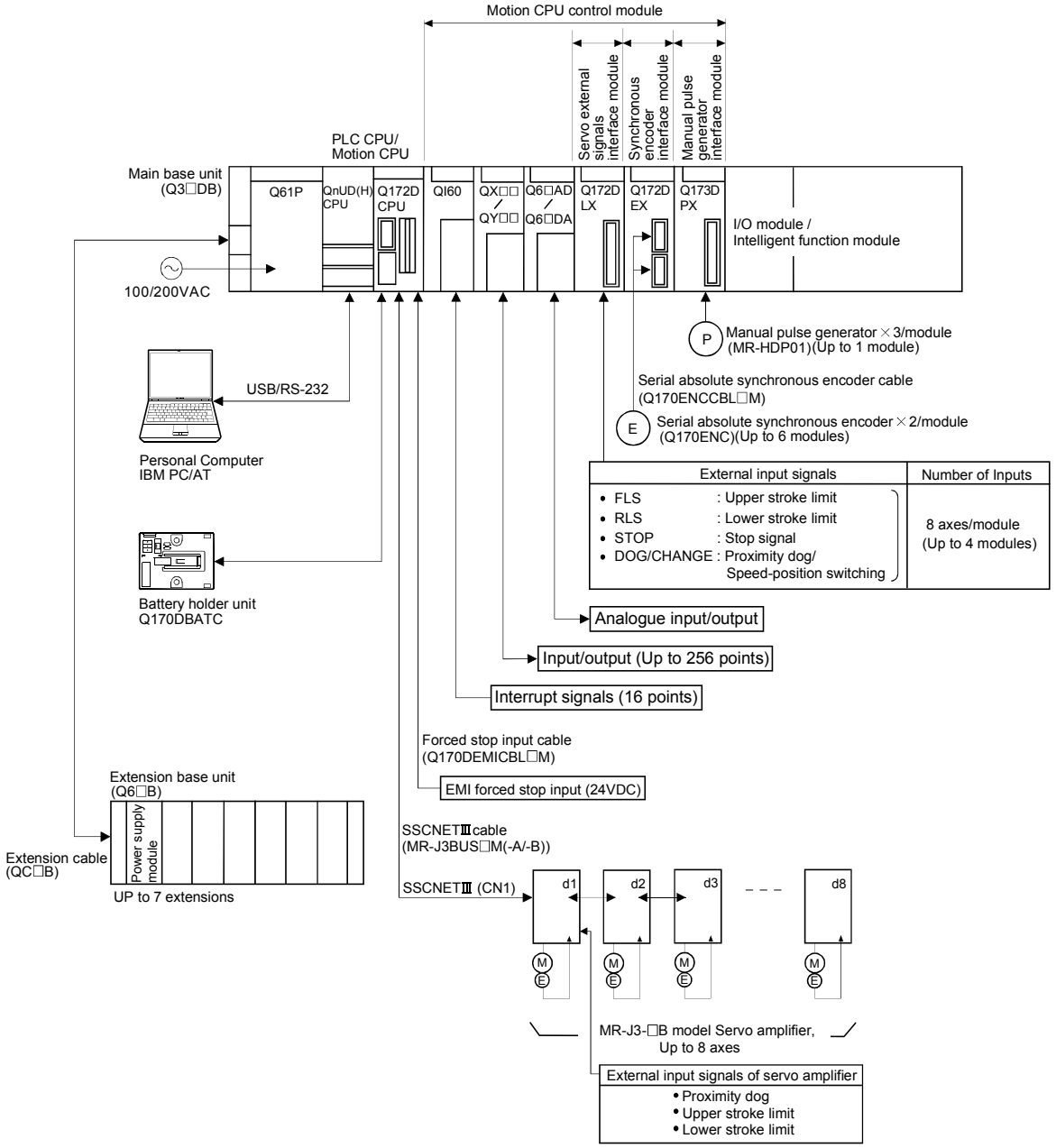
2.1.1 Q173DCPU System overall configuration



⚠CAUTION

- Construct a safety circuit externally of the Motion controller or servo amplifier if the abnormal operation of the Motion controller or servo amplifier differ from the safety directive operation in the system.
- The ratings and characteristics of the parts (other than Motion controller, servo amplifier and servomotor) used in a system must be compatible with the Motion controller, servo amplifier and servomotor.
- Set the parameter values to those that are compatible with the Motion controller, servo amplifier, servomotor and regenerative resistor model and the system application. The protective functions may not function if the settings are incorrect.

2.1.2 Q172DCPU System overall configuration



⚠CAUTION

- Construct a safety circuit externally of the Motion controller or servo amplifier if the abnormal operation of the Motion controller or servo amplifier differ from the safety directive operation in the system.
- The ratings and characteristics of the parts (other than Motion controller, servo amplifier and servomotor) used in a system must be compatible with the Motion controller, servo amplifier and servomotor.
- Set the parameter values to those that are compatible with the Motion controller, servo amplifier, servomotor and regenerative resistor model and the system application. The protective functions may not function if the settings are incorrect.

2.1.3 Function explanation of the Q173DCPU/Q172DCPU Motion CPU modules

(1) Up to 32 axes servo amplifiers per 2 systems (up to 16 axes per 1 system) can be used in Q173DCPU. Up to 8 axes servo amplifiers per 1 system can be used in Q172DCPU.

(2) It is possible to set the program which synchronized with the motion operation cycle and executed at fixed cycle (0.88[ms], 1.77[ms], 3.55[ms], 7.11[ms], 14.2[ms]).

(3) It is possible to execute a download of servo parameters to servo amplifier, servo ON/OFF to servo amplifier and position commands, etc. by connecting between the Q173DCPU/Q172DCPU and servo amplifier with SSCNETⅢ cable.

(4) It is possible to select the servo control functions/programming languages by installing the corresponding operating system software in the Q173DCPU/ Q172DCPU.

(5) Motion modules (Q172DLX/Q172DEX/Q173DPX) are controlled with the Q173DCPU/Q172DCPU, and the signals such as stroke limit signals connected to Motion modules and synchronous encoder are used as motion control.

(6) PLC I/O modules can be controlled with the Q173DCPU/Q172DCPU.
(Refer to Section 2.2 (2) for PLC I/O modules that can be controlled with Motion CPU.)

(7) Data exchange between CPU modules is possible by Multiple CPU high speed transmission memory or automatic refresh in the Multiple CPU system.

2.1.4 Restrictions on Motion systems

(1) Combination of Multiple CPU system

(a) Motion CPU module cannot be used as standalone module.
Be sure to install the universal model PLC CPU module (Q03UDCPU/Q04UDHCPU/Q06UDHCPU) to CPU No.1.
For Universal model PLC CPU module, "Multiple CPU high speed transmission function" must be set in the Multiple CPU settings.

(b) Only Multiple CPU high speed main base unit (Q38DB/Q312DB) can be used.

(c) The combination of Q173DCPU/Q172DCPU and Q173HCPU(-T)/Q172HCPU(-T)/Q173CPUN(-T)/Q172CPUN(-T) cannot be used.

(d) Up to four modules of PLC CPU modules (Q03UDCPU/Q04UDHCPU/Q06UDHCPU/Motion CPU modules can be installed from the CPU slot (the slot on the right side of power supply module) to slot 2 of the main base unit.
CPU modules called as CPU No.1 to CPU No.4 from the left sequentially.
There is no restriction on the installation order of CPU No.2 to No.4.
For CPU module except CPU No.1, an empty slot can be reserved for addition of CPU module. An empty slot can be set between CPU modules.
However, the installation condition when combining with the High performance PLC CPU module/Process CPU module/PC CPU module/C controller module is different depending on the specification of CPU modules, refer to the Manuals of each CPU modules.

(e) It takes about 10 seconds to startup (state that can be controlled) of Motion CPU. Make a Multiple CPU synchronous startup setting suitable for the system.

(f) Execute the automatic refresh of the Motion CPU modules and PLC CPU modules (Q03UDCPU/Q04UDHCPU/Q06UDHCPU) by using the automatic refresh of Multiple CPU high speed transmission area setting.
When the High performance PLC CPU module/Process CPU module/PC CPU module/C controller module is installed in the combination of Multiple CPU system, the Motion CPU module cannot be execute the automatic refresh with these modules.

(g) Use the Motion dedicated PLC instructions that starts by "D(P).". The Motion dedicated PLC instructions that starts by "S(P)." cannot be used. When the High performance PLC CPU module/Process CPU module/PC CPU module/C controller module is installed in the combination of Multiple CPU system, the Motion dedicated PLC instruction from these modules cannot be executed.

(2) Motion modules

(a) Installation position of Q172DEX(Note-1) is only the main base unit. It cannot be used on the extension base unit.

(b) Q172DLX/Q173DPX can be installed on any of the main base unit/ extension base unit.

(c) Q172DLX/Q172DEX(Note-1)/Q173DPX cannot be installed in CPU slot and I/O slot 0 to 2 of the main base unit. Wrong installation might damage the main base unit.

(d) Q172EX(-S1/-S2/-S3)/Q172LX/Q173PX(-S1) for Q173HCPU(-T)/ Q172HCPU(-T)/Q173CPUN(-T)/Q172CPUN(-T)/Q173CPU/Q172CPU cannot be used.

(e) Be sure to use the Motion CPU as the control CPU of Motion modules (Q172DLX, Q172DEX(Note-1), Q173DPX, etc.) for Motion CPU. They will not operate correctly if PLC CPU is set and installed as the control CPU by mistake. Motion CPU is treated as a 32-point intelligent module by PLC CPU of other CPU.

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

(3) Other restrictions

(a) Motion CPU module cannot be set as the control CPU of intelligent function module (except some modules) or Graphic Operation Terminal(GOT).

(b) Be sure to use the external battery.

(c) There are following methods to execute the forced stop input.
- Use a EMI terminal of Motion CPU module
- Use a device set in the forced stop input setting of system setting

(d) Forced stop input for EMI terminal of Motion CPU module cannot be invalidated by the parameter.
When the device set in the forced stop input setting is used without use of EMI terminal of Motion CPU module, apply 24VDC voltage on EMI terminal and invalidate the forced stop input of EMI terminal.

(e) Be sure to use the cable for forced stop input (sold separately). The forced stop cannot be released without using it.

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

(g) When a Multiple CPU system is configured, make sure to configure the modules so that the total current consumption of individual modules on the main base does not exceed the 5VDC output capacity of power supply module.
(Refer to Section 2.4.2 (3) "Selection of the power supply module".)

(h) It is impossible to mount the main base unit by DIN rail when using the Motion CPU module.
Doing so could result in vibration that may cause erroneous operation.

(i) The module name displayed by "System monitor" - "Product information list" of GX Developer is different depending on the function version of Motion modules (Q172DLX, Q172DEX, Q173DPX).
(Note): Even if the function version "C" is displayed, it does not correspond to the online module change.

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

2.2 System Configuration Equipment

(1) Table of Motion controller related module

Part name	Model name (Note-1)	Description	Current consumption 5VDC[A]	Remark
Motion CPU module	Q173DCPU	Up to 32 axes control, Operation cycle 0.44[ms] or more (Attachment battery holder unit and battery (Q6BAT))	1.25	
	Q172DCPU	Up to 8 axes control, Operation cycle 0.44[ms] or more (Attachment battery holder unit and battery (Q6BAT))	1.25	
Servo external signals interface module	Q172DLX	Servo external signal input 8 axes (FLS, RLS, STOP, DOG/CHANGE×8)	0.06	
Synchronous encoder interface module	Q172DEX	Serial absolute synchronous encoder Q170ENC interface×2, Tracking input 2 points	0.19	
Manual pulse generator interface module	Q173DPX	Manual pulse generator MR-HDP01/Incremental synchronous encoder interface ×3, Tracking input 3 points	0.38	
PLC CPU module (Note-2)	Q03UDCPU	Program capacity 30k steps, LD instruction processing speed 20[ns]	0.33	
	Q04UDHCPU	Program capacity 40k steps, LD instruction processing speed 9.5[ns]	0.39	
	Q06UDHCPU	Program capacity 60k steps, LD instruction processing speed 9.5[ns]	0.39	
Power supply module (Note-3)	Q61P-A1	100 to 120VAC input, 5VDC 6A output	——	
	Q61P-A2	200 to 240VAC input, 5VDC 6A output		
	Q61P	100 to 240VAC input, 5VDC 6A output		
	Q62P	100 to 240VAC input, 5VDC 3A/24VDC 0.6A output		
	Q63P	24VDC input, 5VDC 6A output		
	Q64P	100 to 120VAC/200 to 240VAC input, 5VDC 8.5A output		
Main base unit	Q38DB	Multiple CPU high speed bus (4 slots), Number of I/O modules : 8 slots	0.228	
	Q312DB	Multiple CPU high speed bus (4 slots), Number of I/O modules : 12 slots	0.233	
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(3.94ft.)		
	QC30B	Length 3m(9.84ft.)		
	QC50B	Length 5m(16.40ft.)		
	QC100B	Length 10m(32.81ft.)		
Serial absolute synchronous encoder	Q170ENC	Resolution: 262144PLS/rev Permitted axial loads Radial load: Up to 19.6N Thrust load: Up to 9.8N Permitted speed: 3600r/min	0.20	
Serial absolute synchronous encoder cable	Q170ENCCBL□M	Serial absolute synchronous encoder Q170ENC ↔ Q172DEX 2m(6.56ft.), 5m(16.40ft.), 10m(32.81ft.), 20m(65.62ft.), 30m(98.43ft.), 50m(164.04ft.)	——	

Table of Motion controller related module(continued)

Part name	Model name (Note-1)	Description	Current consumption 5VDC[A]	Remark
Connector set for serial absolute synchronous encoder cable	Q170ENCCNS	Q172DEX side connector Connector :10120-3000PE Connector case : 10320-52F0-008 Q170ENC side connector Plug : MS3106B22-14S Cable clump : MS3057-12A	——	
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), Voltage output	0.06	
Battery holder unit (Note-4)	Q170DBATC	Battery holder for Q6BAT (Attachment battery cable)	——	
Battery	Q6BAT	For memory data backup of SRAM built-in Motion CPU (Programs, Parameters, Absolute position data, Latch data)	——	
	A6BAT	For data backup of Q170ENC		
Cable for forced stop input (Note-5)	Q170DEMICBL□M	Length 0.5m(1.64ft), 1m(3.28ft), 3m(9.84ft), 5m(16.40ft), 10m(32.80ft), 15m(49.20ft), 20m(65.62ft), 25m(82.02ft), 30m(98.43ft)	——	
Connector/terminal block conversion module (Note-6)	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 (16.40ft.)	——	
	AC80TB	Length 8m (26.25ft.)	——	
	AC100TB	Length 10m(32.81ft.)	——	

Table of Motion controller related module(continued)

Part name	Model name (Note-1)	Description	Current consumption 5VDC[A]	Remark
SSCNETⅢ cable	MR-J3BUS□M	• Q173DCPU/Q172DCPU ↔ MR-J3-□B • MR-J3-□B ↔ MR-J3-□B • Standard code for inside panel • 0.15m(0.49ft.), 0.3m(0.98ft.), 0.5m(1.64ft.), 1m(3,28ft.), 3m(9.84ft.)	——	
	MR-J3BUS□M-A	• Q173DCPU/Q172DCPU ↔ MR-J3-□B • MR-J3-□B ↔ MR-J3-□B • Standard cable for outside panel • 5m(16.40ft.), 10m(32.81ft.), 20m(65.62ft.)	——	
	MR-J3BUS□M-B (Note-7)	• Q173DCPU/Q172DCPU ↔ MR-J3-□B • MR-J3-□B ↔ MR-J3-□B • Long distance cable • 30m(98.43ft.), 40m(131.23ft.), 50m(164.04ft.)	——	

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

(Note-2) : 5VDC internal current consumption of shared equipments with PLC might be changed. Be sure to refer to the PLC Manuals.

(Note-3) : Be sure to use the power supply module within the range of power supply capacity.

(Note-4) : Battery Q6BAT is not attached to Battery holder unit Q170DBATC. Please purchase it separately.

(Note-5) : Be sure to use the cable for forced stop input (sold separately). The forced stop cannot be released without using it.
Cable for forced stop input is not attached to the Motion CPU module. Please purchase the cable for length according to system separately.

(Note-6) : These modules can be used in Q172DLX. It cannot be controlled using Q173DPX.

(Note-7) : Please contact your nearest Mitsubishi sales representative for the cable of less than 30m(98.43ft.).

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

Part name			Model name	Description	Current consumption 5VDC[A] (Note-1)	Remark
Input module	AC		QX10	100-120VAC, 7-8mA, 16 points, Terminal block	0.05	
	DC		QX40	24VDC/4mA, Positive common, 16 points, Terminal block	0.05	
			QX41	24VDC/4mA, Positive common, 32 points, Connector	0.075 (TYP, All points ON)	(Note-2)
			QX42	24VDC/4mA, Positive common, 64 points, Connector	0.09 (TYP, All points ON)	(Note-2)
			QX70	12VDC/5V, Positive common/Negative common shared, 16 points, Terminal block	0.055 (TYP, All points ON)	
			QX71	12VDC/5V, Positive common/Negative common shared, 32 points, Terminal block	0.07 (TYP, All points ON)	
			QX72	12VDC/5V, Positive common/Negative common shared, 64 points, Terminal block	0.085 (TYP, All points ON)	
			QX80	24VDC/4mA, Negative common, 16 points, Terminal block	0.05 (TYP, All points ON)	
			QX81	24VDC/4mA, Negative common, 32 points, Connector	0.075 (TYP, All points ON)	(Note-2)
Output module	Contact output module		QY10	240VAC/24VDC, 2A/point, 8A/common, 16 points/common, Terminal block	0.43 (TYP, All points ON)	
	Transistor	Sink Type	QY40P	12V/24VDC, 0.1A/point, 1.6A/common, 16 points/common, Terminal block	0.065 (TYP, All points ON)	
			QY41P	12V/24VDC, 0.1A/point, 2A/common, 32 points/common, Connector	0.105 (TYP, All points ON)	(Note-2)
			QY42P	12V/24VDC, 0.1A/point, 2A/common, 64 points(32 points/common), Connector	0.15 (TYP, All points ON)	(Note-2)
			QY50	12V/24VDC, 0.5A/point, 4A/common, 16 points(16 points/common), Terminal block	0.08 (TYP, All points ON)	
		Source Type	QY80	12V/24VDC, 0.5A/point, 4A/common, 16 points(16 points/common), Terminal block	0.08 (TYP, All points ON)	
			QY81P	12V/24VDC, 0.1A/point, 2A/common, 32 points(32 points/common), Connector	0.095 (TYP, All points ON)	(Note-2)
	TTL•CMOS (Sink)		QY70	5/12VDC, 16mA/point, 16 points(16 points/common), Terminal block	0.095 (TYP, All points ON)	
			QY71	5/12VDC, 16mA/point, 32 points(32 points/common), Connector	0.15 (TYP, All points ON)	(Note-2)
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)	0.13 (TYP, All points ON)	(Note-2)
			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)	0.08 (TYP, All points ON)	
Interrupt module			QI60	DC24V/4mA, Positive common, 16 points, Terminal block	0.06 (TYP, All points ON)	

Part name	Model name	Description	Current consumption 5VDC[A] (Note-1)	Remark
Analogue module	Q62AD-DGH	2ch, A/D conversion, Current input (Channel-isolated • High resolution)	0.33	(Note-2)
	Q64AD	4ch, A/D conversion, Voltage • Current input	0.63	
	Q64AD-GH	4ch, A/D conversion, Voltage • Current input (Channel-isolated • High resolution)	0.89	(Note-2)
	Q68ADV	8ch, A/D conversion, Voltage input	0.64	
	Q68ADI	8ch, A/D conversion, Current input	0.64	
	Q62DA	2ch, D/A conversion, Voltage • Current output	0.33	
	Q62DA-FG	2ch, D/A conversion, Voltage • Current output (Channel-isolated)	0.37	(Note-2)
	Q64DA	4ch, D/A conversion, Voltage • Current output	0.34	
	Q68DAV	8ch, D/A conversion, Voltage output	0.39	
	Q68DAI	8ch, D/A conversion, Current output	0.38	

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

(Note-2) : Connectors are not provided.

(3) Table of servo amplifier

Part name	Model name	Description
MR-J3 series servo amplifier	MR-J3-□B MR-J3-□B-RJ006	Refer to catalogue of the servo amplifier.
Battery	MR-J3BAT	Back-up for the absolute position detection

(4) Software packages

(a) Operating system software

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

(b) Motion controller programming software

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

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

(5) Operating environment of personal computer

Operating environment is shown below.
IBM PC/AT with which Windows® Vista/Windows® XP/Windows®2000 English version operates normally.

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

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

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

(6) Related software packages

(a) PLC software package

Model name	Software package
GX Developer	SW8D5C-GPPW-E

(b) Servo set up software package

Model name	Software package
MR Configurator	MRZJW3-SETUP221E

POINTS

(1) When the operation of Windows is not unclear in the operation of this software, refer to the manual of Windows or guide-book from the other supplier.

(2) The following functions cannot be used when the computer is running under Windows® Vista, Windows® XP or Windows® 2000.
This product may not perform properly, when these functions are used.

< Windows® Vista/Windows® XP>
- Activating the application with Windows® compatibility mode
- Fast user switching
- Remote desktop
- Large size
- x64 Edition (64 bit Windows®)

< Windows® 2000>
- Large fonts

2.3 General Specifications

General specifications of Q173DCPU/Q172DCPU module are shown below.

Item	Specification				
Operating ambient temperature	0 to 55°C (32 to 131°F)				
Storage ambient temperature	-25 to 75°C (-13 to 167°F) (Note-3)				
Operating ambient humidity	5 to 95% RH, non-condensing				
Storage ambient humidity	5 to 95% RH, non-condensing				
Vibration resistance		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	$147m/s^2$, 3 times in each of 3 directions X, Y, Z				
Operating ambience	No corrosive gases				
Operating altitude	2000m(6561.68ft.) or less				
Mounting 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 controller under pressure higher than the atmospheric pressure of altitude 0m. Doing so can cause an operation failure.

⚠CAUTION

- The Motion controller must be stored and used under the conditions listed in the table of specifications above.
- When not using the module for a long time, disconnect the power line from the Motion controller or servo amplifier.
- Place the Motion controller and servo amplifier in static electricity preventing vinyl bags and store.
- When storing for a long time, please contact with our sales representative.
  Also, execute a trial operation.

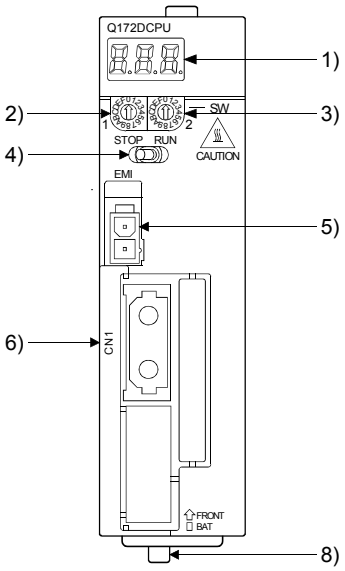
2.4 Specifications of Equipment and Settings

2.4.1 Name of parts for CPU module

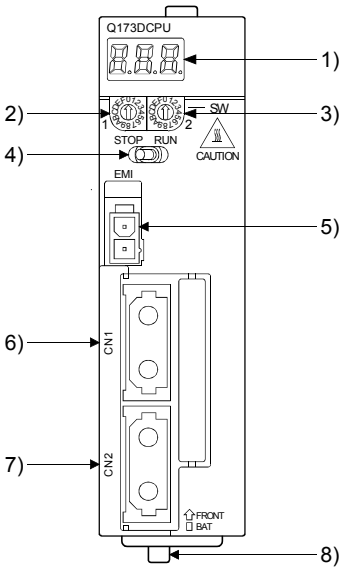
This section explains the names and setting of the module.

(1) Q173DCPU/Q172DCPU

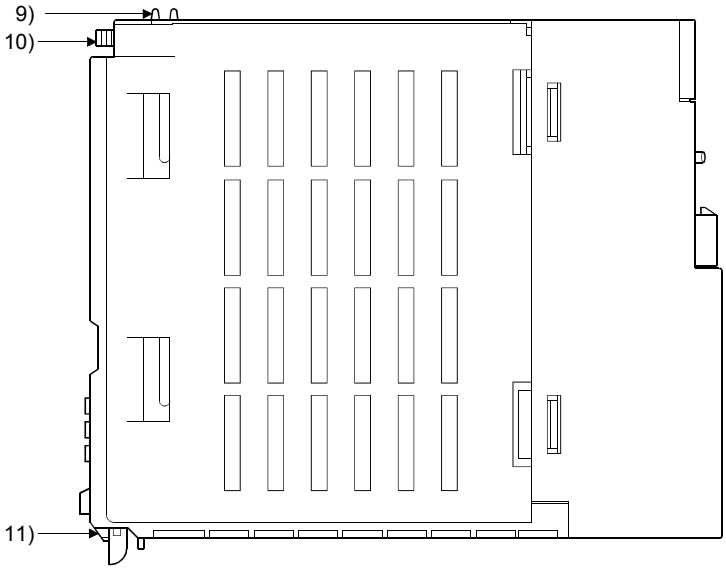
Front face of Q172DCPU



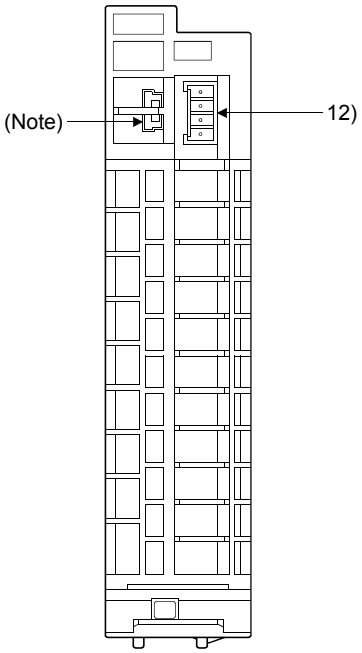
Front face of Q173DCPU



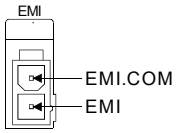
Side face



Bottom



(Note): Unusable
(Under manufacturer test)

No.	Name	Application
1)	7-segment LED	• Indicates the operating status and error information.
2)	Rotary function select 1 switch (SW1)	• Set the operation mode. (Normal operation mode, Installation mode, Mode operated by ROM, etc)
3)	Rotary function select 2 switch (SW2)	• Each switch setting is 0 to F. (Shipped from the factory in SW1 "A", SW2 "0" position)
4)	RUN/STOP switch	Move to RUN/STOP (Shipped from the factory in STOP position) RUN : Motion SFC program is started. STOP : Motion SFC program is stopped.
5)	Forced stop input (EMI) (Note-1) 	• Input to stop all axes of servo amplifier in a lump EMI ON (opened) : Forced stop EMI OFF (24VDC input) : Forced stop release
6)	SSCNETⅢ CN1 connector (Note-2)	Connector to connect the servo amplifier of system 1 (up to 16 axes)
7)	SSCNETⅢ CN2 connector (Note-2), (Note-3)	Connector to connect the servo amplifier of system 2 (up to 16 axes)
8)	Module loading lever	Used to install the module to the base unit
9)	Module fixing hook (Note-4)	Hook used to fix the module to the base unit. (Auxiliary use for installation)
10)	Module fixing screw	Screw used to fix to the base unit. (M3×13)
11)	Module fixing latch	Hook used to fix to the base unit.
12)	Battery connector (BAT) (Note-5)	Connector to connect the battery holder unit Q170DBATC

(Note-1) : Be sure to use the cable for forced stop input. The forced stop cannot be released without using it.
If the cable for forced stop input is fabricated on the customer side, make it within 30m(98.43ft.).

(Note-2) : Put the SSCNET cable in the duct or fix the cable at the closest part to the Motion CPU module with bundle material in order to prevent SSCNET cable from putting its own weight on SSCNET connector.

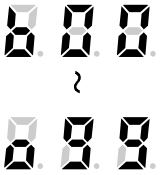
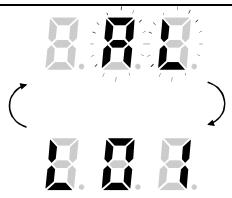
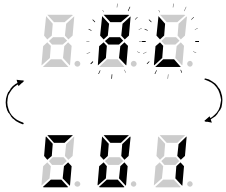
(Note-3) : Q173DCPU only

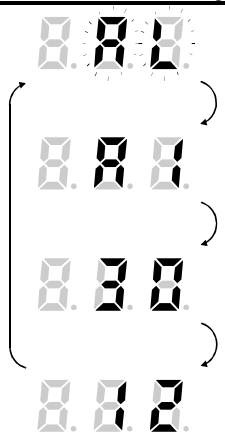
(Note-4) : This screw is auxiliary use for module installation to the main base unit. Be sure to fix modules to the main base unit using supplied fixing screws.

(Note-5) : Be sure to use the external battery. The programs, parameters, absolute position data, and latch data of SRAM built-in Motion CPU module are backed up if the battery cable is not set correctly.

(2) 7-segment LED display

The LED displays/flashes in the combination with errors.

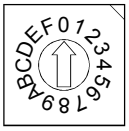
Item		7-segment LED		Remark
Start			Initializing	It takes about 10 seconds to initialize (RUN/STOP display).
Normal			" ☀" remains flashing	Normal operation
Installation mode			Steady "INS" display, " ☀" remains flashing	Mode to install the operating system software via personal computer.
Operation mode	Mode operated by RAM		" ☀" remains flashing	Mode to operate based on the user programs and parameters stored in the SRAM built-in Motion CPU module.
	Mode operated by ROM		Steady "INS" display, " ☀" remains flashing	Mode to operate after the user programs and parameters stored in the FLASH ROM built-in Motion CPU are read to the SRAM built-in Motion CPU.
STOP			Steady "STP" display	Stopped the Motion SFC program.
RUN			Steady "RUN" display	Executed the Motion SFC program.
Battery error	Early stage warning (2.7V or less)		Steady "BT1" display	Displayed at battery voltage 2.7V or less. Refer to Section "6.5 External Battery".
	Final stage warning (2.5V or less)		Steady "BT2" display	Displayed at battery voltage 2.5V or less. Refer to Section "6.5 External Battery".
Operating system software not installed			"A00" remains flashing	It becomes the status of installation mode when the operating system software is not installed.
System setting error			" AL" flashes 3 times ↓ Steady " L01" display	System setting error of the Motion CPU Refer to the "Q173DCPU/Q172DCPU Motion controller Programming Manual (COMMON)" for details.
Servo error			" AL" flashes 3 times ↓ Steady " S01" display	Servo error of the Motion CPU Refer to the "Q173DCPU/Q172DCPU Motion controller (SV13/SV22) Programming Manual (REAL MODE)" or "Q173DCPU/Q172DCPU Motion controller (SV22) Programming Manual (VIRTUAL MODE)" for details.
WDT error			Steady "..." display	H/W fault or S/W fault Refer to the "Q173DCPU/Q172DCPU Motion controller (SV13/SV22) Programming Manual (REAL MODE)" or "Q173DCPU/Q172DCPU Motion controller (SV22) Programming Manual (VIRTUAL MODE)" for details.

Item	7-segment LED		Remark
Self diagnostic error		" AL" flashes 3 times ↓ Steady " A1" display ↓ 4-digits error code is displayed in two sequential flashes of 2-digits each.	Setting error of the Multiple CPU system Refer to the "Q173DCPU/Q172DCPU Motion controller Programming Manual (COMMON)" for details.

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

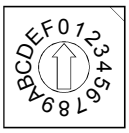
(3) Rotary switch assignment

(a) Rotary function select 1 switch (SW1)

Rotary switch	Setting (Note)	Mode	Description
	0	Normal mode	Normal operation mode
	A	Installation mode	Installed the operating system software using MT Developer

(Note): Not to be set except above setting.

(b) Rotary function select 2 switch (SW2)

Rotary switch	Setting (Note)	Mode	Description
	0	Mode operated by RAM	Normal operation mode (Operation by the setting data and parameters stored in the SRAM built-in Motion CPU module.)
	6	Mode operated by ROM	Mode to operate based on the setting data and parameters wrote to the FLASH ROM built-in Motion CPU module.
	C	SRAM clear	SRAM "0" clear

(Note): Not to be set except above setting.

⚠CAUTION
● Be sure to turn OFF the Multiple system power supply before the rotary switch setting change.

(4) Operation mode

(a) Rotary switch setting and operation mode

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

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

(b) Operation mode overview

Operation mode	7-segment LED	Operation overview
Installation mode		• Steady "INS" display at the 7-segment LED. • Operating system software can be installed. • It is STOP status regardless of the RUN/STOP switch position at the front side of Motion CPU module. • Digital oscilloscope function cannot be used.
Mode operated by RAM		• " . " remains flashing in the first digit of 7-segment LED. • It operates based on the user programs and parameters stored in the SRAM built-in Motion CPU module.
Mode operated by ROM		• " . " remains flashing in the first digit and steady " . " display in the second digit of 7-segment LED. • Operation starts after the user programs and parameters stored in the FLASH ROM built-in Motion CPU module are read to the SRAM built-in Motion CPU module at power supply on or reset of the Multiple CPU system. If the ROM writing is not executed, even if the user programs and parameters are changed using the MT Developer during mode operated by ROM, operation starts with the contents of the FLASH ROM at next power supply on or reset. Also, If the ROM writing is not executed, even if the auto tuning data are reflected on the servo parameter of Motion CPU by operation in the auto-tuning setting, operation starts with the contents of the FLASH ROM at next power supply on or reset.

POINTS

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

(5) Basic specifications of Q173DCPU/Q172DCPU

(a) Module specifications

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

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

(a) Motion control specifications

Item		Q173DCPU	Q172DCPU
Number of control axes		Up to 32 axes	Up to 8 axes
Operation cycle (default)	SV13	0.44ms/ 1 to 6 axes 0.88ms/ 7 to 18 axes 1.77ms/19 to 32 axes	0.44ms/ 1 to 6 axes 0.88ms/ 7 to 8 axes
	SV22	0.44ms/ 1 to 4 axes 0.88ms/ 5 to 12 axes 1.77ms/13 to 28 axes 3.55ms/29 to 32 axes	0.44ms/ 1 to 4 axes 0.88ms/ 5 to 8 axes
Interpolation functions		Linear interpolation (Up to 4 axes), Circular interpolation (2 axes), Helical interpolation (3 axes)	
Control modes		PTP(Point to Point) control, Speed control, Speed-position control, Fixed-pitch feed, Constant speed control, Position follow-up control, Speed control with fixed position stop, Speed switching control, High-speed oscillation control, Synchronous control (SV22)	
Acceleration/ deceleration control		Automatic trapezoidal acceleration/deceleration, S-curve acceleration/deceleration	
Compensation		Backlash compensation, Electronic gear, Phase compensation (SV22)	
Programming language		Motion SFC, Dedicated instruction, Mechanical support language (SV22)	
Servo program capacity		14k steps	
Number of positioning points		3200 points (Positioning data can be designated indirectly)	
Peripheral I/F		Via PLC CPU (USB/RS-232)	
Home position return function		Proximity dog type (2 types), Count type (3 types), Data set type (2 types), Dog cradle type, Stopper type (2 types), Limit switch combined type (Home position return re-try function provided, home position shift function provided)	
JOG operation function		Provided	
Manual pulse generator operation function		Possible to connect 3 modules	
Synchronous encoder operation function		Possible to connect 12 modules	Possible to connect 8 modules
M-code function		M-code output function provided M-code completion wait function provided	
Limit switch output function		Number of output points 32 points Watch data: Motion control data/Word device	

Motion control specifications (continued)

Item	Q173DCPU	Q172DCPU
Absolute position system	Made compatible by setting battery to servo amplifier. (Possible to select the absolute data method or incremental method for each axis)	
Number of SSCNETⅢ systems (Note-1)	2 systems	1 system
Motion related interface module	Q172DLX : 4 modules usable Q172DEX : 6 modules usable Q173DPX : 4 modules usable (Note-2)	Q172DLX : 1 module usable Q172DEX : 4 modules usable Q173DPX : 3 modules usable (Note-2)

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

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

(b) Motion SFC performance specifications

Item				Q173DCPU/Q172DCPU
Motion SFC program capacity	Code total (Motion SFC chart + Operation control + Transition)			543k bytes
	Text total (Operation control + Transition)			484k bytes
Motion SFC program	Number of Motion SFC programs			256 (No.0 to 255)
	Motion SFC chart size/program			Up to 64k bytes (Included Motion SFC chart comments)
	Number of Motion SFC steps/program			Up to 4094 steps
	Number of selective branches/branch			255
	Number of parallel branches/branch			255
	Parallel branch nesting			Up to 4 levels
Operation control program (F/FS) / Transition program (G)	Number of operation control programs			4096 with F(Once execution type) and FS(Scan execution type) combined. (F/FS0 to F/FS4095)
	Number of transition programs			4096(G0 to G4095)
	Code size/program			Up to approx. 64k bytes (32766 steps)
	Number of blocks(line)/program			Up to 8192 blocks (in the case of 4 steps(min)/blocks)
	Number of characters/block			Up to 128 (comment included)
	Number of operand/block			Up to 64 (operand: constants, word device, bit devices)
	( ) nesting/block			Up to 32 levels
	Descriptive expression	Operation control program		Calculation expression/bit conditional expression
		Transition program		Calculation expression/bit conditional expression/ comparison conditional expression
Execute specification	Number of multi execute programs			Up to 256
	Number of multi active steps			Up to 256 steps/all programs
	Executed task	Normal task		Execute in main cycle of Motion CPU
		Event task (Execution can be masked.)	Fixed cycle	Execute in fixed cycle (0.88ms, 1.77ms, 3.55ms, 7.11ms, 14.2ms)
			External interrupt	Execute when input ON is set among interrupt module QI60 (16 points).
			PLC interrupt	Execute with interrupt instruction (D(P).GINT) from PLC CPU.
		NMI task		Execute when input ON is set among interrupt module QI60 (16 points).

(7) Selection of Q172DEX, Q173DPX

Item	Synchronous encoder		Manual pulse generator
	Serial absolute	Incremental	
Q173DCPU	12 modules		3 modules
Q172DCPU	8 modules		
Module selection	Q172DEX	Q173DPX	

2.4.2 Power supply module

(1) Table of the power supply module specifications

This section describes the power supply modules specifications.

Item		Q61P-A1	Q61P-A2	Q61P	Q62P
Base loading position		Q series power supply module loading slot			
Applicable base unit		Q38DB, Q312DB, Q63B, Q65B, Q68B, Q612B			
Input power supply		100 to 120VAC (+10%/-15%) (85 to 132VAC)	200 to 240VAC (+10%/-15%) (170 to 264VAC)	100 to 240VAC (+10%/-15%) (85 to 264VAC)	
Input frequency		50/60Hz ±5%			
Input voltage distortion factor		5% or less			
Max. input apparent power		105VA		130VA	105VA
Inrush current		20A 8ms or less (Note-4)			
Rated output current	5VDC	6A			3A
	24VDC	——			0.6A
External output voltage		——			24VDC±10%
Overcurrent protection (Note-1)	5VDC	6.6A or more			3.3A or more
	24VDC	——			0.66A or more
Overvoltage protection (Note-2)	5VDC	5.5 to 6.5V			
Efficiency		70% or more			65% or more
Allowable momentary power failure time (Note-3)		20ms or less			
Dielectric withstand voltage		Across inputs/LG and outputs/FG 2,830VAC rms / 3 cycles (Altitude : 2000m (6561.68ft.))			
Insulation resistance		Across inputs and outputs (LG and FG separated), across inputs and LG/FG, across outputs and LG/FG 10MΩ or more by insulation resistance tester (500VDC)			
Noise immunity		• 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 (Normal : ON (Green), Error : OFF)			
Fuse		Built-in (Unchangeable by user)			
Contact output section	Application	$\overline{ERR}$ contact			
	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 : 20 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 screw			
Applicable wire size		0.75 to 2mm^2			
Applicable crimping terminal		RAV1.25 to 3.5, RAV2 to 3.5			
Applicable tightening torque		0.66 to 0.89 N•m			
Exterior dimensions[mm(inch)]		98(H) × 55.2(W) × 90(D) (3.86(H) × 2.17(W) × 3.54(D))			
Mass [kg]		0.31		0.40	0.39

The power supply module specifications (continued)

Item		Q63P	Q64P
Base loading position		Q series power supply module loading slot	
Applicable base unit		Q38DB, Q312DB, Q63B, 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 (at 24VDC input)	20A 8ms or less (Note-4)
Rated output current	5VDC	6A	8.5A
	24VDC	——	——
Overcurrent protection (Note-1)	5VDC	6.6A or more	9.9A 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)		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 (6561.68ft.))
Insulation resistance		10MΩ or more by insulation resistance tester	Across inputs and outputs (LG and FG separated), across inputs and LG/FG, across outputs and LG/FG 10MΩ or more by insulation resistance tester (500VDC)
Noise immunity		• By noise simulator of 500Vp-p noise voltage, 1μs noise width and 25 to 60Hz noise frequency	• 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 (Normal : ON (Green), Error : OFF)	
Fuse		Built-in (Unchangeable by user)	
Contact output section	Application	$\overline{\text{ERR}}$ contact	
	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 : 20 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 screw	
Applicable wire size		0.75 to 2mm^2	
Applicable crimping terminal		RAV1.25 to 3.5, RAV2 to 3.5	
Applicable tightening torque		0.66 to 0.89 N•m	
Exterior dimensions[mm(inch)]		98(H) × 55.2(W) × 90(D) (3.86(H) × 2.17(W) × 3.54(D))	98(H) × 55.2(W) × 115(D) (3.86(H) × 2.17(W) × 4.53(D))
Mass [kg]		0.33	0.40

POINTS

(Note-1) : Overcurrent protection

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

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

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

(Note-2) : Overvoltage protection

The overvoltage protection device shuts off the 5VDC circuit and stops the system if a voltage of 5.5VDC or more is applied to the circuit.

When this device is activated, the power supply module LED is switched OFF.

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

POINTS

(Note-3) : Allowable momentary power failure period

(1) For AC input power supply

(a) An instantaneous power failure lasting less than 20ms will cause AC down to be detected, but operation will continue.

(b) An instantaneous power failure lasting in excess of 20ms may cause the operation to continue or initial start to take place depending on the power supply load.

Further, when the AC supply of the AC input module is the same as that of the power supply module, it prevents the sensor connected to the AC input module, which is ON at power-off, from turning OFF by switching off the power supply.

However, if only the AC input module is connected to the AC line, which is connected to the power supply, detection of the AC down for the power supply module may be delayed by the capacitor in the AC input module. Thus, connect a load of approx. 30mA per AC input module to the AC line.

(2) For DC input power supply

(a) An instantaneous power failure lasting less than 10ms(Note) will cause 24VDC down to be detected, but operation will continue.

(b) An instantaneous power failure lasting in excess of 10ms(Note) may cause the operation to continue or initial start to take place depending on the power supply load.

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

(Note-4) : Inrush current

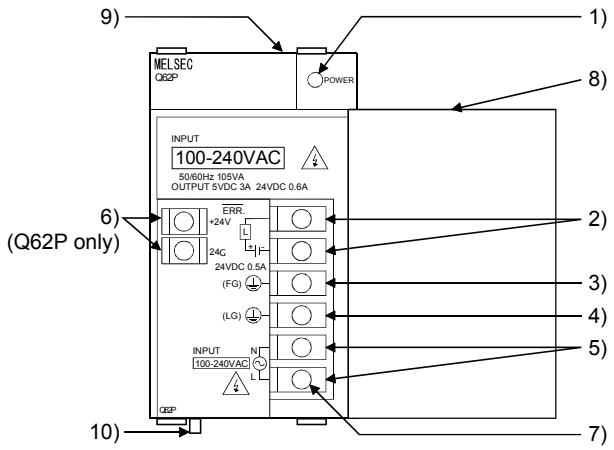
When power is switched on again immediately (within 5 seconds) after power-off, an inrush current of more than the specified value (2ms or less) may flow. Reapply power 5 seconds after power-off.

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

(2) Names of Parts and Setting

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

- Q61P-A1 (100 to 120VAC input, 5VDC 6A output)
- Q61P-A2 (200 to 240VAC input, 5VDC 6A output)
- Q61P (100 to 240VAC input, 5VDC 6A output)
- Q62P (100 to 240VAC input, 5VDC 3A/24VDC 0.6A output)
- Q63P (24VDC input, 5VDC 6A output)
- Q64P (100 to 120VAC/200 to 240VAC input, 5VDC 8.5A output)



No.	Name		Application
1)	POWER LED	AC input power supply	ON (green): Normal (5VDC output, momentary power failure within 20ms) OFF : • AC power supply is ON, however, the power supply module is out of order. (5VDC error, internal circuit failure, blown fuse) • Over current protection or over voltage protection operated. • AC power supply is not ON • Power failure (including an momentary power failure of more than 20ms)
		DC input power supply	ON (green): Normal (5VDC output, momentary power failure within 10ms) OFF : • DC power supply is ON, however, the power supply module is out of order. (5VDC error, internal circuit failure, blown fuse) • Over current protection or over voltage protection operated. • DC power supply is not ON • Power failure (including an momentary power failure of more than 10ms)
2)	$\overline{\text{ERR}}$ terminals	AC input power supply	• Turned ON when the whole system operates normally. • This terminal turns OFF (opens) when the AC power is not input, a stop error (including a reset) occurs in the CPU module, or the fuse is blown. • In a Multiple CPU system configuration, turned OFF when a stop error occurs in any of the CPU modules. Normally OFF when loaded in an extension base unit.
		DC input power supply	• Turned ON when the whole system operates normally. • This terminal turns OFF (opens) when the DC power is not input, a stop error (including a reset) occurs in the CPU module, or the fuse is blown. • In a Multiple CPU system configuration, turned OFF when a stop error occurs in any of the CPU modules. 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. The potential of Q61P-A1, Q61P-A2, Q61P, Q62P and Q64P terminal is 1/2 of the input voltage.
5)	Power input terminals		• Power input terminals connected to a power supply of 100VAC or 200VAC. (Q61P-A1, Q61P-A2, Q64P) • Power input terminals connected to a power supply of 100VAC to 200VAC. (Q61P, Q62P) • Power input terminals connected to a power supply of 24VDC. (Q63P)
6)	+24V, 24G terminals (Q62P only)		Used to supply 24VDC power to inside the output module. (using external wiring)
7)	Terminal screw		M3.5×7 screw
8)	Terminal cover		Protective cover of the terminal block
9)	Module fixing screw hole		Used to fix the module to the base unit. M3×12 screw (user-prepared) (Tightening torque : 0.36 to 0.48 N•m)
10)	Module loading lever		Used to load the module into the base unit.

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 supply module causes trouble.
Q61P-A2	Power supply module does not cause trouble. CPU module 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) Q64P automatically switches the input range 100/200VAC.
Therefore, it is not compatible with the intermediate voltage (133 to 169VAC).
The CPU module may not work normally if the above intermediate voltage is applied.

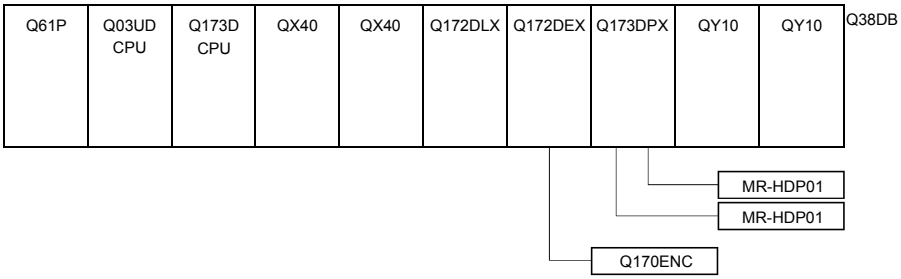
(4) Ensure that the earth terminals LG and FG are grounded.
(Ground resistance : 100 Ω or loss)
Since the LG terminal has a half of the input voltage, touching this terminal may result in an electric shock.

(5) When the Q61P-A1, Q61P-A2, Q61P, Q62P, Q63P or Q64P is loaded on the extension base unit, a system error cannot be detected by the $\overline{\text{ERR}}$ terminal.
(The $\overline{\text{ERR}}$ terminal is always OFF.)

(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, intelligent 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 Q170ENC, MR-HDP01 etc.)
5VDC internal current consumption of shared equipments with PLC might be changed. Be sure to refer to the PLC Manuals. .

(a) Calculation example of power supply selection
<System configuration (Q173DCPU use)>



• 5VDC current consumption of each module

Q03UDCPU	: 0.33 [A]	Q170ENC	: 0.20 [A]
Q173DCPU	: 1.25 [A]	Q173DPX	: 0.38 [A]
QX40	: 0.05 [A]	MR-HDP01	: 0.06 [A]
Q172DLX	: 0.06 [A]	QY10	: 0.43 [A]
Q172DEX	: 0.19 [A]	Q38DB	: 0.228 [A]

• Power consumption of overall modules
I_{5V} = 0.33 + 1.25 + 0.05 × 2 + 0.06 + 0.19 + 0.20 + 0.38 + 0.06 × 2 + 0.43 × 2 + 0.228 = 3.718[A]
Select of the power supply module (Q61P (100/240VAC) 6A) according to this internal current consumption 3.718[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.

2.4.3. Base unit and extension cable

This section describes the specifications of the extension cables for the base units (Main base unit or extension base unit) used in the system, and the specification standards of the extension base unit.
5VDC internal current consumption of base unit might be changed. Be sure to refer to the PLC Manuals.

(1) Table of the base unit specifications

(a) Main base unit specifications

Item \ Type	Q38DB	Q312DB
Number of I/O modules	8	12
Possibility of extension	Extendable	
Applicable module	Q series modules	
5VDC internal current consumption [A]	0.228	0.233
Fixing hole size	M4 screw hole or ϕ4.5 hole (for M4 screw)	
Exterior dimensions [mm(inch)]	328(W)×98(H) ×44.1(D) (12.91(W)×3.86(H) ×1.74(D))	439(W)×98(H) ×44.1(D) (17.28(W)×3.86(H) ×1.74(D))
Mass [kg]	0.41	0.54
Attachment	Fixing screw M4×14 5 pieces (DIN rail fixing adapter is optional)	

(Note): It is impossible to mount the main base unit by DIN rail when using the Motion CPU module.
Doing so could result in vibration that may cause erroneous operation.

(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 ϕ4.5 hole (for M4 screw)			
Exterior dimensions [mm(inch)]	189(W)×98(H) × 44.1(D) (7.44(W)×3.86(H) × 1.74(D))	245(W)×98(H) × 44.1(D) (9.65(W)×3.86(H) × 1.74(D))	328(W)×98(H) × 44.1(D) (12.91(W)×3.86(H) ×1.74(D))	439(W)×98(H) × 44.1(D) (17.28(W)×3.86(H) × 1.74(D))
Mass [kg]	0.23	0.28	0.38	0.48
Attachment	Fixing screw M4×14 4 pieces (Note)			

(Note): The 5 base mounting screws are included with the Q38B and Q312B that have 5 base mounting holes.

(2) Table of the extension cable specifications

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

Item \ Type	QC05B	QC06B	QC12B	QC30B	QC50B	QC100B
Cable length[m(ft.)]	0.45(1.48)	0.6(1.97)	1.2(3.94)	3.0(9.84)	5.0(16.40)	10.0(32.81)
Application	Connection between the main 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

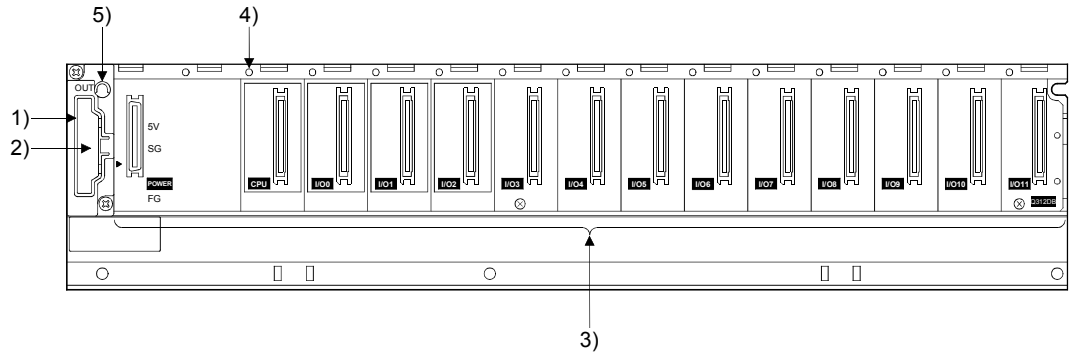
POINT

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

(3) Names of parts of the base unit

Names of parts of the base unit are described below.

(a) Main base unit (Q38DB, Q312DB)



No.	Name	Application
1)	Extension cable connector	Connector for connecting an extension cable (for signal communications with the extension base unit)
2)	Base cover	Protective cover of extension cable connector. Before an extension cable is connected, the area of the base cover surrounded by the groove under the word "OUT" on the base cover must be removed with a tool such as nippers.
3)	Module connector	Connector for installing the Q series 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 unit. Screw size: M3 ×12
5)	Base mounting hole	Hole for mounting this base unit onto the panel of the control panel (for M4 screw)

(Note): It is impossible to mount the main base unit by DIN rail when using the Motion CPU module. Doing so could result in vibration that may cause erroneous operation.

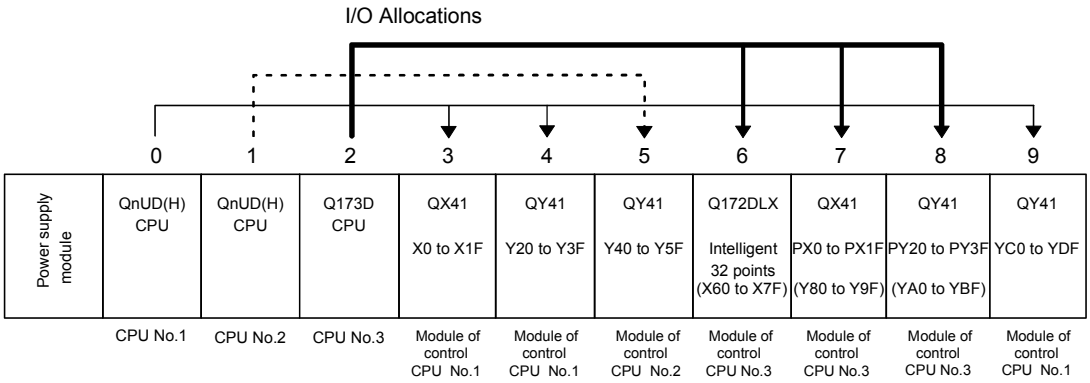
(4) I/O allocations

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

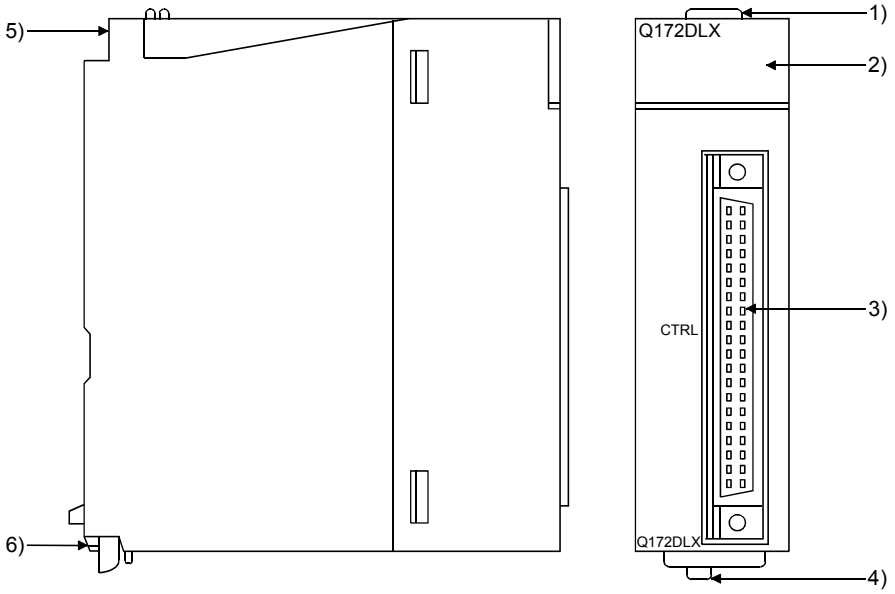
Refer to the Q173DCPU/Q172DCPU Motion Controller Programming Manual (COMMON) about the I/O allocation setting method.
Refer to the QCPU User's Manual (Function Explanation, Program Fundamentals) about the I/O allocation setting method of the QnUD(H)CPU.

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.)

2.4.4 Q172DLX Servo external signals interface module

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

(1) Q172DLX name of parts



No.	Name	Application
1)	Module fixing hook	Hook used to fix the module to the base unit. (Single-motion installation)
2)	Mode judging LED	Display the servo external input status from the external equipment. LED: 0 to 1F — Details: Display for servo external signal input status of each axis. The proximity dog/speed-position switching signal (DOG/CHANGE) does not turn ON without setting Q172DLX in the system setting.
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 of the proximity dog/speed-position switching signal (DOG/CHANGE) turns ON at the following conditions.

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

(2) Performance specifications

(a) Module specifications

Item	Specifications
Number of I/O occupying points	32 points(I/O allocation: Intelligent, 32 points)
Internal current consumption(5VDC) [A]	0.06
Exterior dimensions [mm(inch)]	98(H)× 27.4(W)×90(D) (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	1ms
	ON to OFF	
Response time of the proximity dog, Speed-position switching signal	OFF to ON	0.4ms/0.6ms/1ms (CPU parameter setting, Default 0.4ms)
	ON to OFF	
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)

(3) Connection of servo external signals interface module

(a) Servo external signals

There are the following servo external signals.
(Upper stroke limit is limit value of address increase direction/lower stroke limit is limit value of an address decrease direction.)
The Q172DLX is assigned a set of input No.s per axis. Make the system setting of MT Developer to determine the I/O No.s corresponding to the axis No.s.

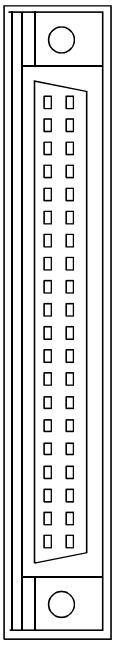
Servo external signal	Application	Number of points on one Q172DLX
Upper stroke limit input (FLS)	For detection of upper and lower stroke limits.	32 points (4 points/8 axes)
Lower stroke limit input (RLS)		
Stop signal input (STOP)	For stopping under speed or positioning control.	
Proximity dog/ Speed-position 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.	

(b) The pin layout of the CTRL connector

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

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

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



CTRL connector

Signal No.	Pin No.	Signal Name	Pin No.	Signal Name	Signal No.
1	B20	FLS1	A20	FLS5	5
	B19	RLS1	A19	RLS5	
	B18	STOP1	A18	STOP5	
	B17	DOG1/CHANGE1	A17	DOG5/CHANGE5	
2	B16	FLS2	A16	FLS6	6
	B15	RLS2	A15	RLS6	
	B14	STOP2	A14	STOP6	
	B13	DOG2/CHANGE2	A13	DOG6/CHANGE6	
3	B12	FLS3	A12	FLS7	7
	B11	RLS3	A11	RLS7	
	B10	STOP3	A10	STOP7	
	B9	DOG3/CHANGE3	A9	DOG7/CHANGE7	
4	B8	FLS4	A8	FLS8	8
	B7	RLS4	A7	RLS8	
	B6	STOP4	A6	STOP8	
	B5	DOG4/CHANGE4	A5	DOG8/CHANGE8	
	B4	No connect	A4	No connect	
	B3	No connect	A3	No connect	
	B2	COM	A2	No connect	
	B1	COM	A1	No connect	

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 [m]) : Connector/terminal block conversion cable

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

(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	5.6kΩ	• 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	5.6kΩ	• 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	5.6kΩ	• 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	5.6kΩ		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 (Note)	B1 B2		– + 12VDC to 24VDC			Common terminals for motion control signals, external signal.

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

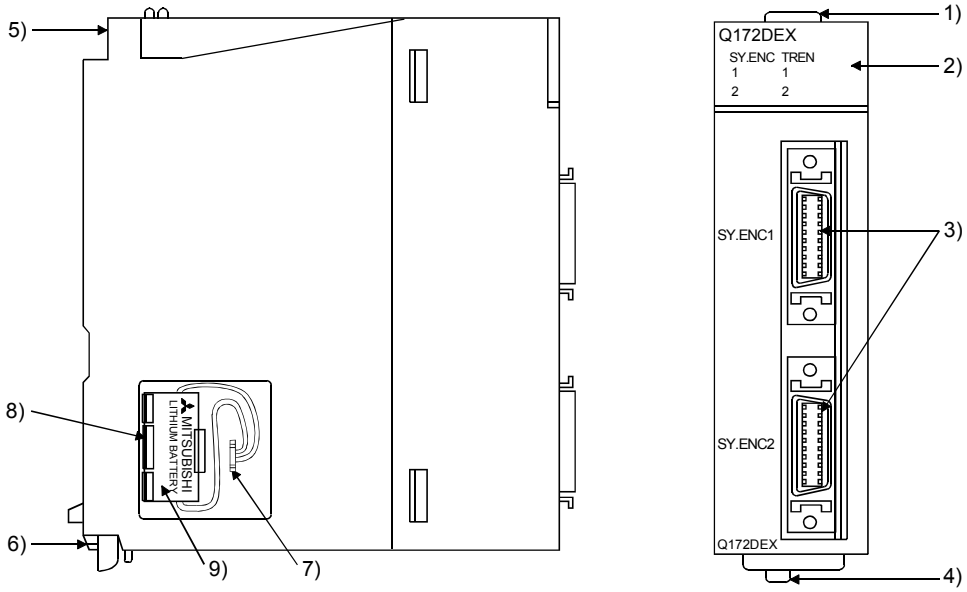
⚠CAUTION

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

2.4.5 Q172DEX Synchronous encoder interface module

Q172DEX receive external signals required for serial absolute synchronous encoder.
The installation position of Q172DEX is only main base.

(1) Q172DEX name of parts



No.	Name	Application
1)	Module fixing hook	Hook used to fix the module to the base unit. (Single-motion installation)
2)	Mode judging LED	Display the input status from the external equipment. LED: SY.ENC 1, 2 — Display for signal input status of each serial absolute synchronous encoder. (LED turns ON at the normal connection (first switching to virtual mode).) LED: TREN 1, 2 — Display for signal status of tracking enable. The tracking enable signal does not turn ON without setting Q172DEX in the system setting.
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 set the Battery (A6BAT/MR-BAT) to the holder.
9)	Battery (A6BAT/MR-BAT)	For Serial absolute synchronous encoder battery backup.

POINT

(1) Mode judging LED of the serial absolute synchronous encoder signal turns ON at the normal connection (first switching to virtual mode).

(2) Mode judging LED of the tracking enable signal turns ON at the following conditions.
- Q172DEX is set on the system structure screen of MT Developer.
- The tracking enable signal is input.

(2) Performance specifications

(a) Module specifications

Item	Specifications
Number of I/O occupying points	32 points(I/O allocation: Intelligent, 32 points)
Internal current consumption(5VDC)[A]	0.19
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. 5.6kΩ
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 terminal: TREN.COM)
Indicates to display		ON indication (LED)

(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	Q170ENC
Position detection method	Absolute (ABS) method
Resolution	262144PLS/rev (18bit)
Number of modules	2/module
External connector type	20 pin connector
Applicable connector for the external connection	Q170ENCCNS (Optional)
Applicable wire	MB14B0023 12Pair
Connecting cable	Q170ENCCBL□M (□=cable length 2m(6.56ft.), 5m(16.40ft.), 10m(32.81ft.), 20m(65.62ft.), 30m(98.43ft.), 50m(164.04ft.)) (Note-1)
Cable length	Up to 50m (164.04ft.)
Back up the absolute position.	Depends on A6BAT/MR-BAT.
Battery service life time (value in actual)	12000[h], (Example of encoders×2, Ambient temperature 40°C (104°F))
	24000[h], (Example of encoders×1, Ambient temperature 40°C (104°F))

(Note-1) : 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(Q170ENC). Q172DEX can be connected to only serial absolute output type(Q170ENC). When using the incremental synchronous encoder of voltage output type or differential output type, must be used Q173DPX. (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
Q173DCPU	Up to 12 modules (Q172DEX: Up to 6 modules)
Q172DCPU	Up to 8 modules (Q172DEX: Up to 4 modules)

- Tracking enable signal

  Tracking enable signal of Q172DEX 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 Q173DPX. (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 Q172DEX
Tracking enable signal input	High-speed reading function	2 points

(4) Connection of synchronous encoder interface module.

(a) Connection with serial absolute synchronous encoder (Q170ENC)

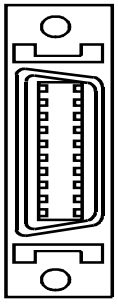
Use the SY.ENC connector at the Q172DEX module front to connect the serial absolute synchronous encoder (Q170ENC).

When tracking enable signal is not used, use the Q170ENCCBL□M encoder cable between the serial absolute synchronous encoder (Q170ENC) and SY.ENC connector.

The following pin layout of the Q172DEX 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
10120-3000PE connector
10320-52F0-008 connector cover
(3M make)

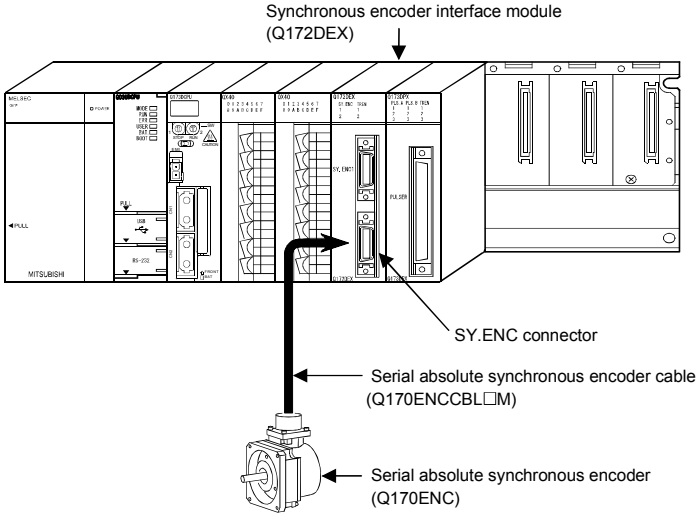
(Note) : Do not connect a wire to MD(6Pin), MDR(16Pin).

(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.



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

Input or Output	Signal name	Pin No. SY.ENC connector	Wiring example	Internal circuit	Specification	Description
Input	MR	7	Serial absolute synchronous encoder	5VDC, Battery	• Transmission method: serial communications • Position detection method: absolute	
	MRR	17				
	P5	10 18 19 20				
	LG	1 2 3 11 12				
	BAT	9				
	TREN (Note)	4	12VDC to 24VDC	5.6kΩ		
	TREN. COM (Note)	14				
	SD	plate				

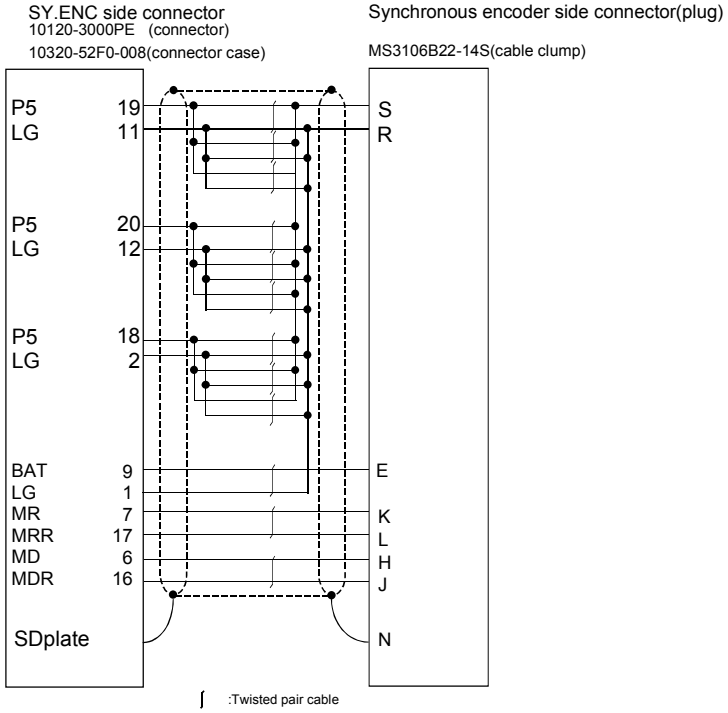
(Note) : As for the connection to power line (TREN, TREN.COM), both "+" and "–" are possible.

⚠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 interface. (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 50m(164.04ft.) 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.

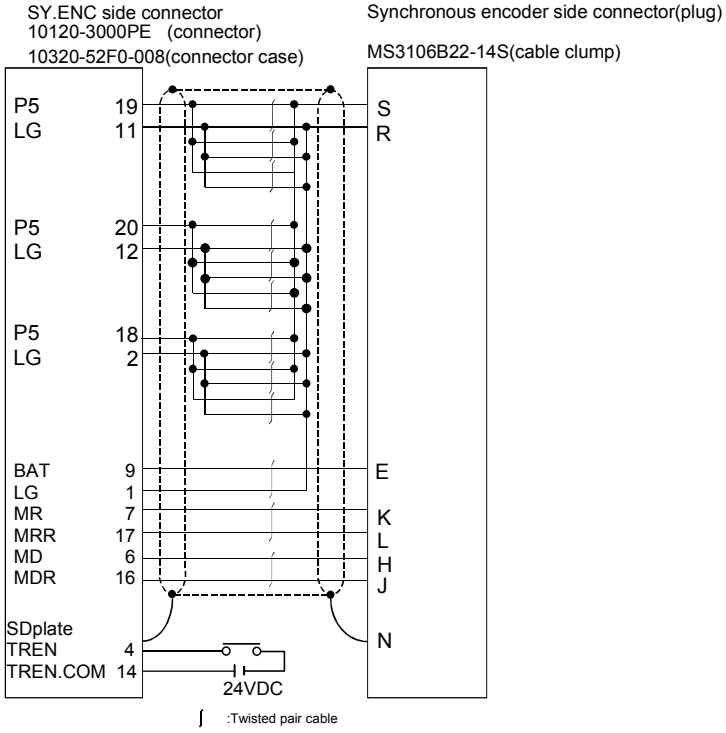
(6) Details of encoder cable connections

(a) When not using tracking enable signal (Note-1)



Q170ENCCBL2M to Q170ENCCBL50M(50m (164.04ft.) or less)

(b) When using tracking enable signal (Note-1), (Note-2)



Cable length 50m(164.04ft.) or less

(Note-1) : Be sure to use a wire model name AWG24.

(Note-2) : When using tracking enable signal, fabricate the encoder cable by customer side.

(7) Connection of the battery

This section describes the battery specifications, handling precautions and installation of the Q172DEX.

(a) Specifications

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

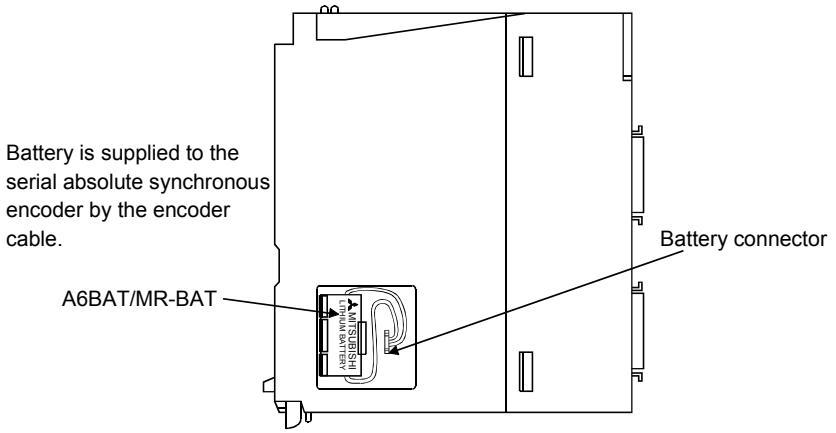
Battery Specifications

Item \ Model name	A6BAT/MR-BAT
Classification	Manganese dioxide lithium primary battery
Normal voltage [V]	3.6
Nominal current [mAh]	1600
Storage life	5 years
Lithium content [g]	0.48
Applications	For backup absolute positioning data of the serial absolute synchronous encoder (Q170ENC)
Exterior dimensions [mm(inch)]	ϕ16(0.63) $\times$ 30(1.18)

(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.

(b) Battery replacement

For Battery replacement procedure, refer to section 6.5.2.



(c) Battery life

Module type	Battery type		Battery life (Total power failure time) [h] (Note-1)				
			Power-on time ratio (Note-2)	Guaranteed value (Note-3) (MIN) (75°C (167°F))	Guaranteed value (Note-4) (TYP) (40°C (104°F))	Actual service value (Note-5) (Reference value) (TYP) (25°C (77°F))	Backup time after alarm
Q172DEX	Internal battery (A6BAT/ MR-BAT)	Q170ENC×1	0%	3000	8000	24000	40 (After Error code 1152 occurrence)
			30%	4000	11000	34000	
			50%	6000	16000	43800	
			70%	10000	26000	43800	
			100%	43800	43800	43800	
		Q170ENC×2	0%	1500	4000	12000	
			30%	2000	5500	17000	
			50%	3000	8000	21900	
			70%	5000	13000	21900	
			100%	43800	43800	43800	

(Note-1) : The actual service value indicates the average value, and the guaranteed time indicates the minimum time.

(Note-2) : The power-on time ratio indicates the ratio of Multiple CPU system power-on time to one day (24 hours).
(When the total power-on time is 17 hours and the total power-off time is 7 hours, the power-on time ratio is 70%.)

(Note-3) : The guaranteed value (MIN) ; equivalent to the total power failure time that is calculated based on the characteristics value of the memory (SRAM) supplied by the manufacturer and under the storage ambient temperature range of -25°C to 75°C (-13 to 167°F) (operating ambient temperature of 0°C to 55°C (32 to 131°F)).

(Note-4) : The guaranteed value (TYP) ; equivalent to the total power failure time that is calculated based on the normal air-conditioned environment (40°C (104°F)).

(Note-5) : The actual service value (Reference value) ; equivalent to the total power failure time that is calculated based on the measured value and under the storage ambient temperature of 25°C (77°F). This value is intended for reference only, as it varies with characteristics of the memory.

POINTS

The self-discharge influences the life of battery without the connection to Q172DEX.
The external battery should be exchanged approximately every 4 or 5 years.
And, exchange the battery with a new one in 4 to 5 years even if a total power failure time is guaranteed value or less.

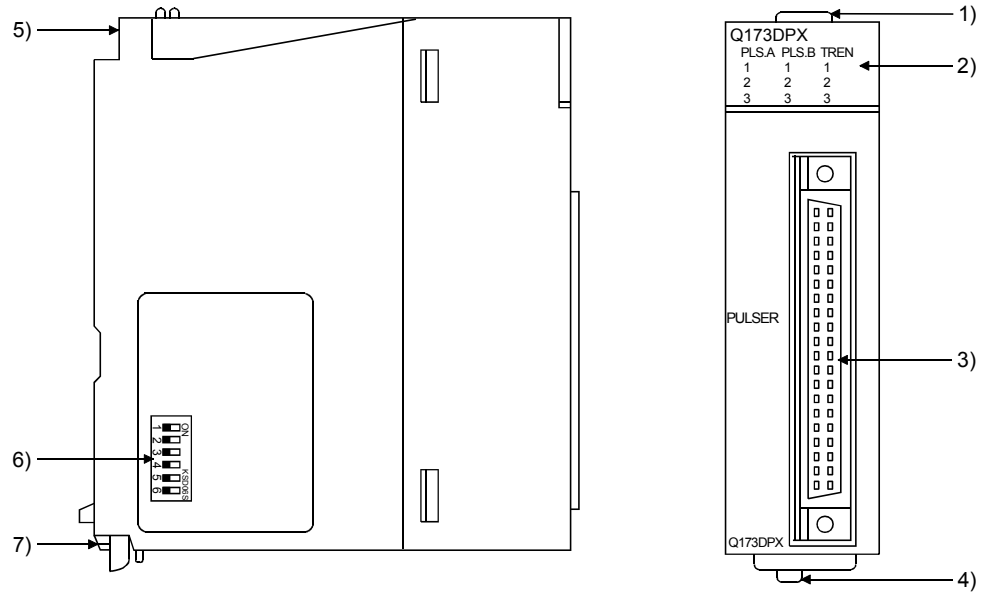
⚠CAUTION

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

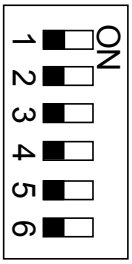
2.4.6 Q173DPX Manual pulse generator interface module

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

(1) Q173DPX name of parts



No.	Name	Application
1)	Module fixing hook	Hook used to fix the module to the base unit. (Single-motion installation)
2)	Mode judging LED	Display the input status from the external equipment. LED / Details PLS.A 1 to 3, PLS.B 1 to 3: Display for input signal status of manual pulse generator/incremental synchronous encoder phases A, B TREN 1 to 3: Display for signal status of tracking enable. The manual pulse generator/incremental synchronous encoder phases A, B and tracking enable signal does not turn ON without setting Q173DPX in the system setting.
3)	PULSER connector	Input connector of the Manual pulse generator/Incremental synchronous encoder.
4)	Module 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)

<table>
<tr><th>No.</th><th>Name</th><th colspan="2">Application</th></tr>
<tr><td rowspan="6">6)</td><td rowspan="6">Dip switches (Note-1)
 

(Shipped from the factory in OFF position)</td><td>Dip switch 1</td><td rowspan="2">Detection setting of TREN1 signal
SW1 SW2
OFF OFF
ON ON
ON OFF } TREN is detected at leading edge of TREN signal.
OFF ON TREN is detected at trailing edge of TREN signal.</td></tr>
<tr><td>Dip switch 2</td></tr>
<tr><td>Dip switch 3</td><td rowspan="2">Detection setting of TREN2 signal
SW3 SW4
OFF OFF
ON ON
ON OFF } TREN is detected at leading edge of TREN signal.
OFF ON TREN is detected at trailing edge of TREN signal.</td></tr>
<tr><td>Dip switch 4</td></tr>
<tr><td>Dip switch 5</td><td rowspan="2">Detection setting of TREN3 signal
SW5 SW6
OFF OFF
ON ON
ON OFF } TREN is detected at leading edge of TREN signal.
OFF ON TREN is detected at trailing edge of TREN signal.</td></tr>
<tr><td>Dip switch 6</td></tr>
<tr><td>7)</td><td>Module fixing hook</td><td colspan="2">Hook used to fix to the base unit.</td></tr>
</table>

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

⚠CAUTION

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

POINTS

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

(1) PLS.A 1 to 3, PLS.B 1 to 3
- Q173DPX is set on the system structure screen of MT Developer.
- All axes servo ON command (M2042) turned on.
- Manual pulse generator enable flag (M2051, M2052, M2053) turned on.
- Manual pulse generator signal is input.

(2) TREN 1 to 3
- Q173DPX is set on the system structure screen of MT Developer.
- The tracking enable signal is input.

(2) Performance specifications

(a) Module specifications

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

(b) Tracking enable signal input

Item		Specifications
Number of input points		Tracking enable signal : 3 points
Input method		Sink/Source type
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	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)

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

(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 (98.43ft.) (Open collector type: 10m (32.81ft.))
	Differential-output type		

(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
Q173DCPU	Up to 3 modules (Up to 1 module)
Q172DCPU	

(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 absolute synchronous encoder (Q170ENC) not connected to Q173DPX. Then connect to Q172DEX.
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
Q173DCPU	Up to 12 modules (Q173DPX: Up to 4 modules)
Q172DCPU	Up to 8 modules (Q173DPX: Up to 3 modules)

• Tracking enable signal

Tracking enable signal of Q173DPX 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 Q173DPX
Tracking enable signal input	Input start function from incremental synchronous encoder	Each 1 point (Total 3 points)

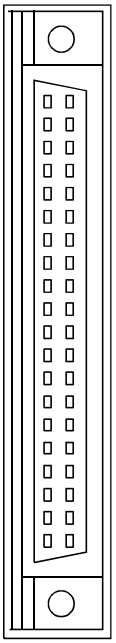
(5) Connection of manual pulse generator interface module

(a) The pin layout of the PULSER connector

Use the PULSER connector at the Q173DPX module front to connect the manual pulse signals, incremental synchronous encoder signals.

The following pin layout of the Q173DPX PULSER connector viewed from the front.

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



PULSER connector

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

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)

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.

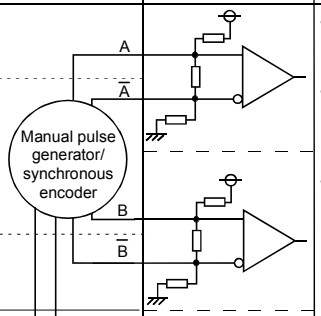
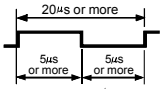
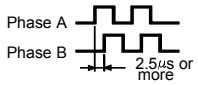
3) : Differential output type
Connect the A-phase signal to HA1P/HA2P/HA3P, and the A-phase inverse signal to HA1N/HA2N/HA3N.
Connect the B-phase signal to HB1P/HB2P/HB3P, and the B-phase inverse signal to HB1N/HB2N/HB3N.

4) : Connect the shield cable between manual pulse generator/incremental synchronous encoder and Q173DPX at the FG signal.

5) : Connector/terminal block conversion modules cannot be used.

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

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

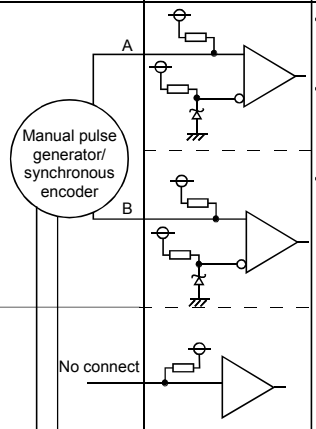
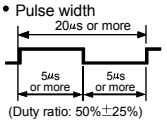
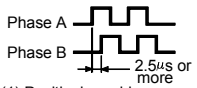
Input or Output	Signal name		Pin No. PULSER connector Voltage-Output type 1	2	3	Wiring example	Internal circuit	Specification	Description
Input	Manual pulse generator, phase A	A+ HA□P	A17	A12	A7			• Rated input voltage 5.5VDC or less • HIGH level 2.0 to 5.25VDC • LOW level 0.8VDC or less • 26LS31 or equivalent	For connection manual pulse generator Phases A, B • Pulse width  (Duty ratio: 50%±25%) • Leading edge, Trailing edge time ••• 1μs or less. • Phase difference  (1) Positioning address increases if Phase A leads Phase B. (2) Positioning address decreases if Phase B leads Phase A.
		A− HA□N	B17	B12	B7				
	Manual pulse generator, phase B	B+ HB□P	A16	A11	A6				
		B− HB□N	B16	B11	B6				
	Select type signal HPSEL□		A18	A13	A8				
Power supply	P5(Note-1)		B18	B13	B8		Power supply 5VDC 5V SG		
	SG		A19 B19	A14 B14	A9 B9				

(Note-1) : The 5V(P5)DC power supply from the Q173DPX 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.

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

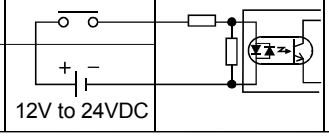
Interface between Manual pulse generator (Voltage-output/Open collector type)/Incremental synchronous encoder

Input or Output	Signal name	Pin No. PULSER connector Voltage-Output type 1	2	3	Wiring example	Internal circuit	Specification	Description
Input	Manual pulse generator, phase A HA□	A20	A15	A10			• 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 • Pulse width  (Duty ratio: 50%±25%) • Leading edge, Trailing edge time ••• 1μs or less. • Phase difference  (1) Positioning address increases if Phase A leads Phase B. (2) Positioning address decreases if Phase B leads Phase A.
	Manual pulse generator, phase B HB□	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 Q173DPX 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

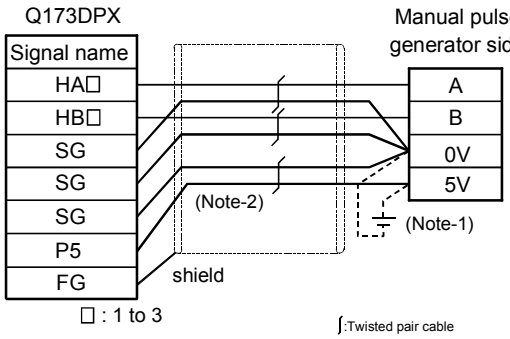
Interface between tracking enable signal

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

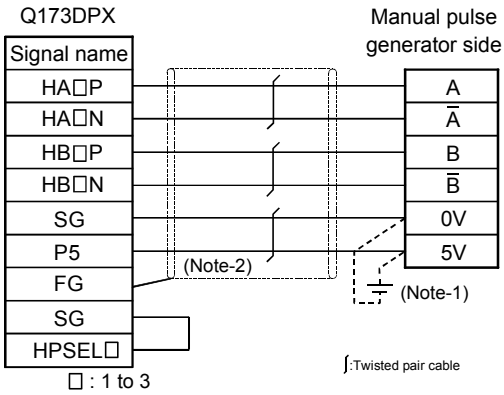
(Note) : As for the connection to tracking enable (TREN□+, TREN□–), both "+" and "–" are possible.

(6) Connection examples of manual pulse generator

Connection of manual pulse generator
(Voltage-output/Open collector type)



Connection of manual pulse generator
(Differential-output type)



(Note-1) : The 5V(P5)DC power supply from the Q173DPX 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.

2.4.7 Manual pulse generator/Serial absolute synchronous encoder

(1) Table of the Manual pulse generator specifications

Item	Specifications
Model name	MR-HDP01 (Note-1)
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 (Note-2)
Current consumption	60mA
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	0.4kg
Number of max. revolution	Instantaneous Up to 600r/min. normal 200r/min
Pulse signal status	2 signals : A phase, B : phase, 90° phase difference
Friction torque	0.1N/m(20°C (68°F))

(Note-1) : It can be used by combining with Q173DPX.

(Note-2) : If a separate power supply is used, use a stabilized power supply of voltage 5VDC ± 0.25V.

(2) Table of the Serial absolute synchronous encoder specifications

Item	Specifications
Model name	Q170ENC (Note-1), (Note-2)
Ambient temperature	-5 to 55°C (23 to 131°F)
Resolution	262144PLS/rev
Transmission method	Serial communications (Connected to Q172DEX)
Direction of increasing addresses	CCW (viewed from end of shaft)
Protective construction	Dustproof/Waterproof (IP65: Except for the shaft-through portion.)
Permitted speed at power ON	3600r/min
Permitted speed at power OFF (Note-3)	500r/min
Permitted axial loads	Radial load : Up to 19.6N, Thrust load : Up to 9.8N
Runout at input shaft tip	0.02mm(0.00079 inch) or less, (15mm(0.59 inch) from tip)
Recommended coupling	Bellows coupling
Permitted angular acceleration	40000rad/s^2
Vibration resistance	5G (50 to 200Hz)
Shock resistance	50G (11ms or less)
Internal current consumption	0.2A
Mass	0.6kg
Connecting cable	Q170ENCCBL□M (□=Cable length : 2m(6.56ft.), 5m(16.40ft.), 10m(32.81ft.), 20m(65.62ft.), 30m(98.43ft.), 50m(164.04ft.))
Communications method	Differential driver/receiver
Transmission distance	Up to 50m(164.04ft.)

(Note-1) : It can be used by combining with Q172DEX.

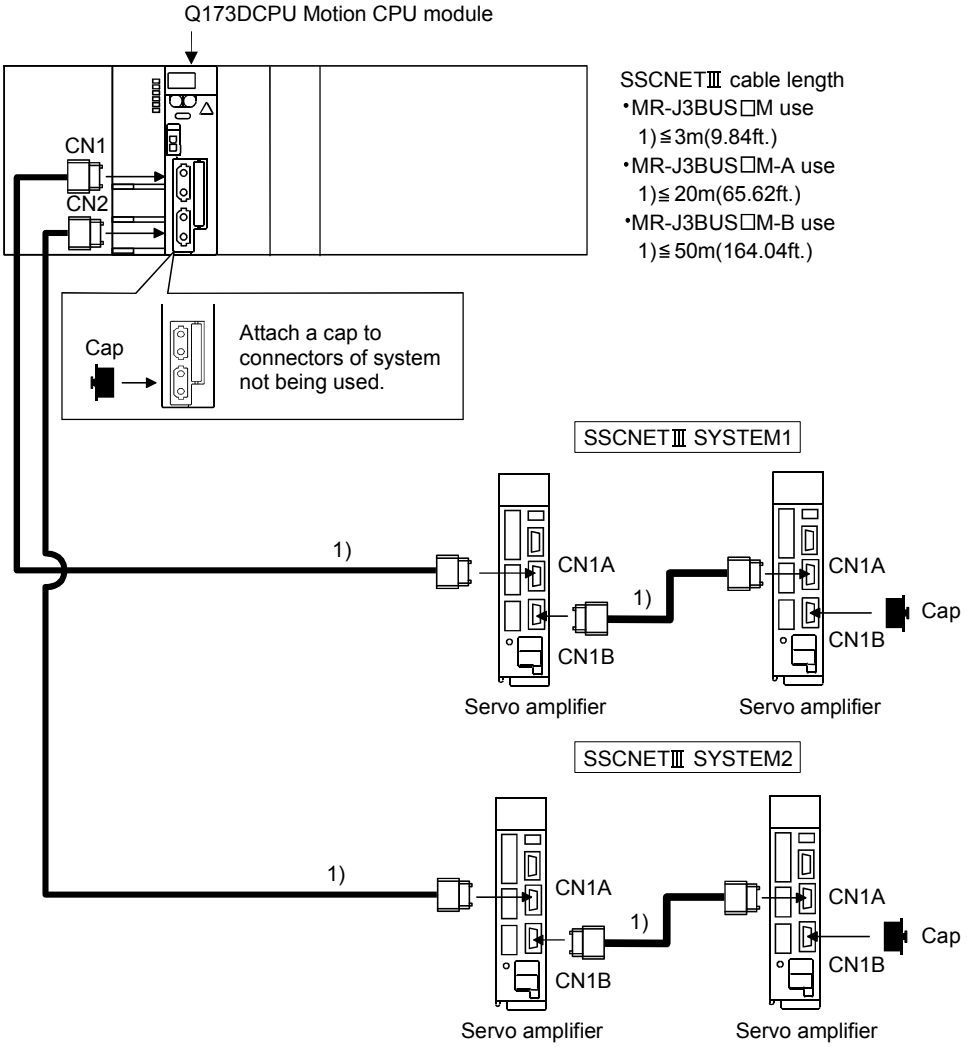
(Note-2) : When "o-ring" is required, please purchase separately by customers.

(Note-3) : If it exceeds a permitted speed at power OFF, a position displacement is generated.

2.4.8 SSCNETⅢ cables and connection method

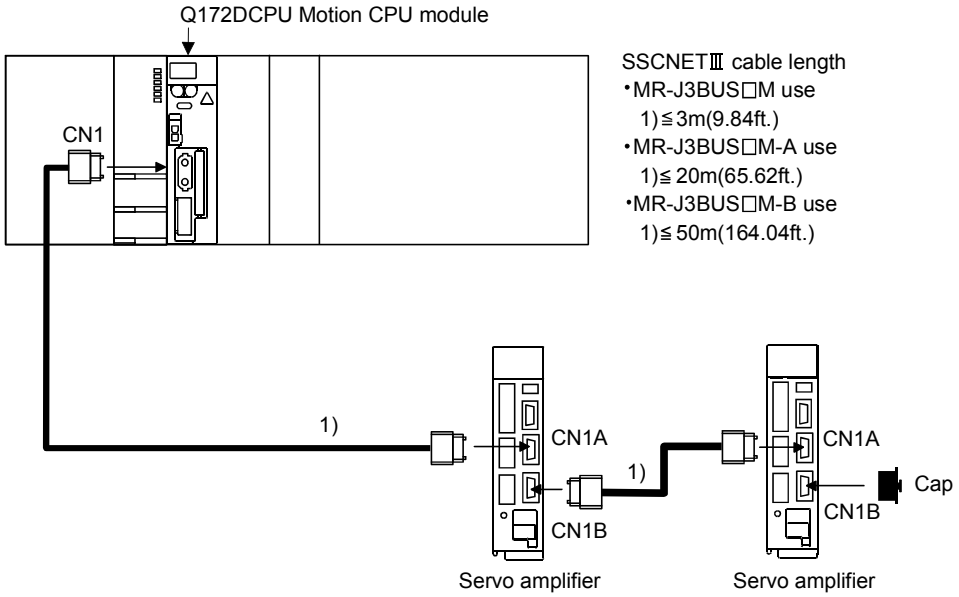
This section describes how to connect between the Motion CPU module and servo amplifiers.
Between the Motion CPU module and servo amplifiers is connected by SSCNETⅢ cable. When using the Q172DCPU, only 1 SSCNETⅢ cable for connection to servo amplifier can be used. (Connect to CN1.) When using the Q173DCPU, up to 2 SSCNETⅢ cables for connection to servo amplifier can be used. (Connect to CN1 and CN2.)
Up to 16 servo amplifies can be connected to 1 SSCNETⅢ cable.
(However, when using the Q172DCPU, up to 8 servo amplifiers can be connected.)

(1) Connection between the Q173DCPU and servo amplifiers



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

(2) Connection between the Q172DCPU and servo amplifiers



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

List of SSCNETⅢ cable model name

Model name (Note)	Cable length	Description	
MR-J3BUS□M	0.15m(0.49ft.), 0.3m(0.98ft.), 0.5m(1.64ft.), 1m(3.28ft.), 3m(9.84ft.)	Standard code for inside panel	• Q173DCPU/Q172DCPU ↔ MR-J3-□B • MR-J3-□B ↔ MR-J3-□B
MR-J3BUS□M-A	5m(16.4ft.), 10m(32.81ft.), 20m(65.62ft.)	Standard cable for outside panel	
MR-J3BUS□M-B	30m(98.43ft.), 40m(131.23ft.), 50m(164.04ft.)	Long distance cable	

(Note) : □=cable length

POINTS

(1) Be sure to connect SSCNETⅢ cable with the above connector. If the connection is mistaken, between the Motion CPU module and servo amplifier cannot be communicated.

(2) SSCNETⅢ connector is put a cap to protect light device inside connector from dust. For this reason, do not remove a cap until just before connecting SSCNETⅢ cable. Then, when removing SSCNETⅢ cable, make sure to put a cap.

(3) Be sure to keep a cap and the tube for protecting light code end of SSCNETⅢ cable in a plastic bag with a zipper of SSCNETⅢ cable to prevent them from becoming dirty.

(4) Do not remove the SSCNETⅢ cable while turning on the power supply of Multiple CPU system and servo amplifier.
Do not see directly the light generated from SSCNETⅢ connector of Motion CPU module or servo amplifier and the end of SSCNETⅢ cable. When the light gets into eye, may feel something is wrong for eye. (The light source of SSCNETⅢ cable complies with class1 defined in JISC6802 or IEC60825-1.)

(5) When exchanging the servo amplifier or Motion CPU module, make sure to put a cap on SSCNETⅢ connector. When asking repair of servo amplifier or Motion CPU module for some troubles, make also sure to put a cap on SSCNETⅢ connector. When the connector is not put a cap, the light device may be damaged at the transit. In this case, exchange and repair of light device is required.

(3) Cable specifications

(a) MR-J3BUS□M

Item \ Model name	MR-J3BUS015M	MR-J3BUS03M	MR-J3BUS05M	MR-J3BUS1M	MR-J3BUS3M
Cable length [m(ft.)]	0.15(0.49)	0.3(0.98)	0.5(1.64)	1(3.28)	3(9.84)

(b) MR-J3BUS□M-A

Item \ Model name	MR-J3BUS5M-A	MR-J3BUS10M-A	MR-J3BUS20M-A
Cable length [m(ft.)]	5(16.40)	10(32.81)	20(65.62)

(c) MR-J3BUS□M-B

Item \ Model name	MR-J3BUS30M-B	MR-J3BUS40M-B	MR-J3BUS50M-B
Cable length [m(ft.)]	30(98.43)	40(131.23)	50(164.04)

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

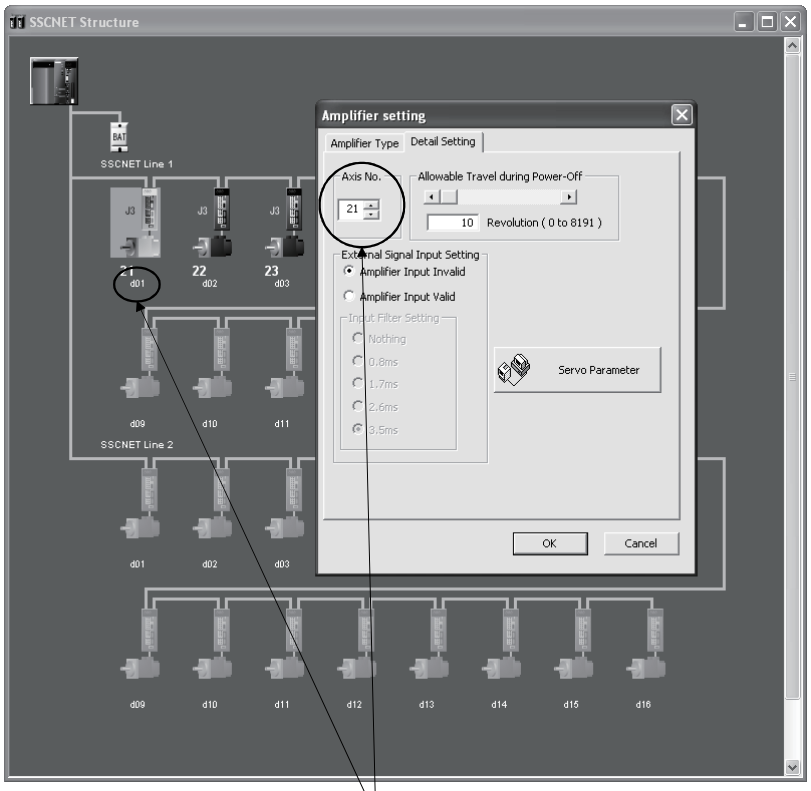
Axis No. is used to set the axis numbers of servo amplifiers connected to SSCNETⅢ connector(CN□) in the program.

Axis No. of 1 to 32 can be set for Q173DCPU, and axis No. of 1 to 8 can be set for Q172DCPU.

Axis No. is set for each system with SSCNET structure screen of system setting of MT Developer. Axis No. (Q173DCPU:1 to 32/Q172DCPU:1 to 8) is allocated and set for the setting axis number (d01 to d16) of servo amplifier.

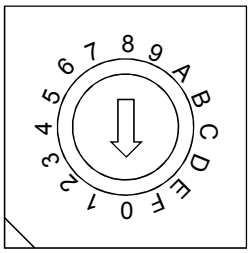
Since the axis number (d01 to d16) of servo amplifier on the SSCNET structure screen corresponds to axis select switch (0 to F) of servo amplifier, set the axis select switch referring to the table of next page.

• SSCNET structure (Allocation of axis No.)



• Set the axis No. relative to axis number (dno.).

• Axis select switch (Servo amplifier)



(Note) : Correspondence between dno. and axis select switch of servo amplifiers is shown in the next page.

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

dno. (Note)	SSCNETⅢ system	Axis select switch of servo amplifier	dno. (Note)	SSCNETⅢ system	Axis select switch of servo amplifier
d01	1	"0"	d01	2	"0"
d02	1	"1"	d02	2	"1"
d03	1	"2"	d03	2	"2"
d04	1	"3"	d04	2	"3"
d05	1	"4"	d05	2	"4"
d06	1	"5"	d06	2	"5"
d07	1	"6"	d07	2	"6"
d08	1	"7"	d08	2	"7"
d09	1	"8"	d09	2	"8"
d10	1	"9"	d10	2	"9"
d11	1	"A"	d11	2	"A"
d12	1	"B"	d12	2	"B"
d13	1	"C"	d13	2	"C"
d14	1	"D"	d14	2	"D"
d15	1	"E"	d15	2	"E"
d16	1	"F"	d16	2	"F"

(Note) : The dno. is number of servo amplifier axis displayed with SSCNET structure screen of MT Developer.
Axis No. is set relative to dno. in the SSCNET structure screen of system settings.

Correspondence between SSCNETⅢ system and connector No. of CPU module is shown below.

Correspondence between SSCNETⅢ system No. and connector No. of CPU module

SSCNETⅢ system No.	Connector No. of CPU
1	SSCNETⅢ CN1
2	SSCNETⅢ CN2

(Note) : Number of SSCNETⅢ systems: Q173DCPU : 2 systems / Q172DCPU : 1 system

2.4.9 External battery

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

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

Item \ Model name	Q6BAT
Classification	Manganese dioxide lithium primary battery
Initial voltage [V]	3.0
Nominal current [mAh]	1800
Storage life	Actually 5 years (Room temperature)
Lithium content [g]	0.49
Applications	For memory data backup of SRAM built-in Motion CPU
Exterior dimensions [mm(inch)]	ϕ16(0.63)×32(1.26)

(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) Data back-up of Motion CPU by the external battery

Be sure to use the external battery.
Set the battery (Q6BAT) to battery holder unit (Q170DBATC).
The programs, parameters, absolute position data, and latch data of SRAM built-in Motion CPU module are backed up without using the external battery.
In the following status, the backup time after power OFF is 3 minutes.
• The battery connector/Q6BAT lead connector is disconnected.
• The battery cable/lead wire of Q6BAT is broken.

Module type	Battery type	Battery life (Total power failure time) [h] (Note-1)				
		Power-on time ratio (Note-2)	Guaranteed value (Note-3) (MIN) (75°C (167°F))	Guaranteed value (Note-4) (TYP) (40°C (104°F))	Actual service value (Note-5) (Reference value) (TYP) (25°C (77°F))	Backup time after alarm
Q173DCPU/ Q172DCPU	External battery (Q6BAT)	0%	3000	8000	24000	90 (After SM51/SM52 ON)
		30%	4000	11000	34000	
		50%	6000	16000	43800	
		70%	10000	26000	43800	
		100%	43800	43800	43800	

(Note-1) : The actual service value indicates the average value, and the guaranteed time indicates the minimum time.
(Note-2) : The power-on time ratio indicates the ratio of Multiple CPU system power-on time to one day (24 hours).
(When the total power-on time is 17 hours and the total power-off time is 7 hours, the power-on time ratio is 70%.)
(Note-3) : The guaranteed value (MIN) ; equivalent to the total power failure time that is calculated based on the characteristics value of the memory (SRAM) supplied by the manufacturer and under the storage ambient temperature range of -25°C to 75°C (-13 to 167°F) (operating ambient temperature of 0°C to 55°C (32 to 131°F)).
(Note-4) : The guaranteed value (TYP) ; equivalent to the total power failure time that is calculated based on the normal air-conditioned environment (40°C (104°F)).
(Note-5) : The actual service value (Reference value) ; equivalent to the total power failure time that is calculated based on the measured value and under the storage ambient temperature of 25°C (77°F). This value is intended for reference only, as it varies with characteristics of the memory.

POINTS

The self-discharge influences the life of battery without the connection to Motion CPU module. The external battery should be exchanged approximately every 4 or 5 years.
And, exchange the battery with a new one in 4 to 5 years even if a total power failure time is guaranteed value or less.

⚠CAUTION

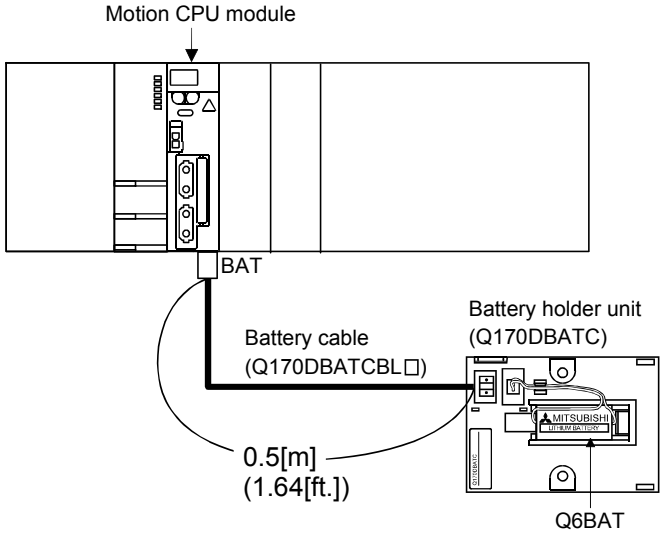
- Do not short a battery.
- Do not charge a battery.
- Do not disassemble a battery.
- Do not burn a battery.
- Do not overheat a battery.
- Do not solder the battery terminal.
- The programs, parameters, absolute position data and latch data of SRAM built-in Motion CPU module are backed up without using the external battery.

(3) Connection procedure with Motion CPU module

(a) Set Q6BAT to Battery holder unit(Q170DBATC).

(b) Connect the lead connector of Q6BAT to the connector (BATTERY) of Q170DBATC.

(c) Connect between the connector (BAT) of Motion CPU module and connector (CPU) of Q170DBATC.



2.4.10 Forced stop input terminal

(1) Table of the forced stop input terminal specifications

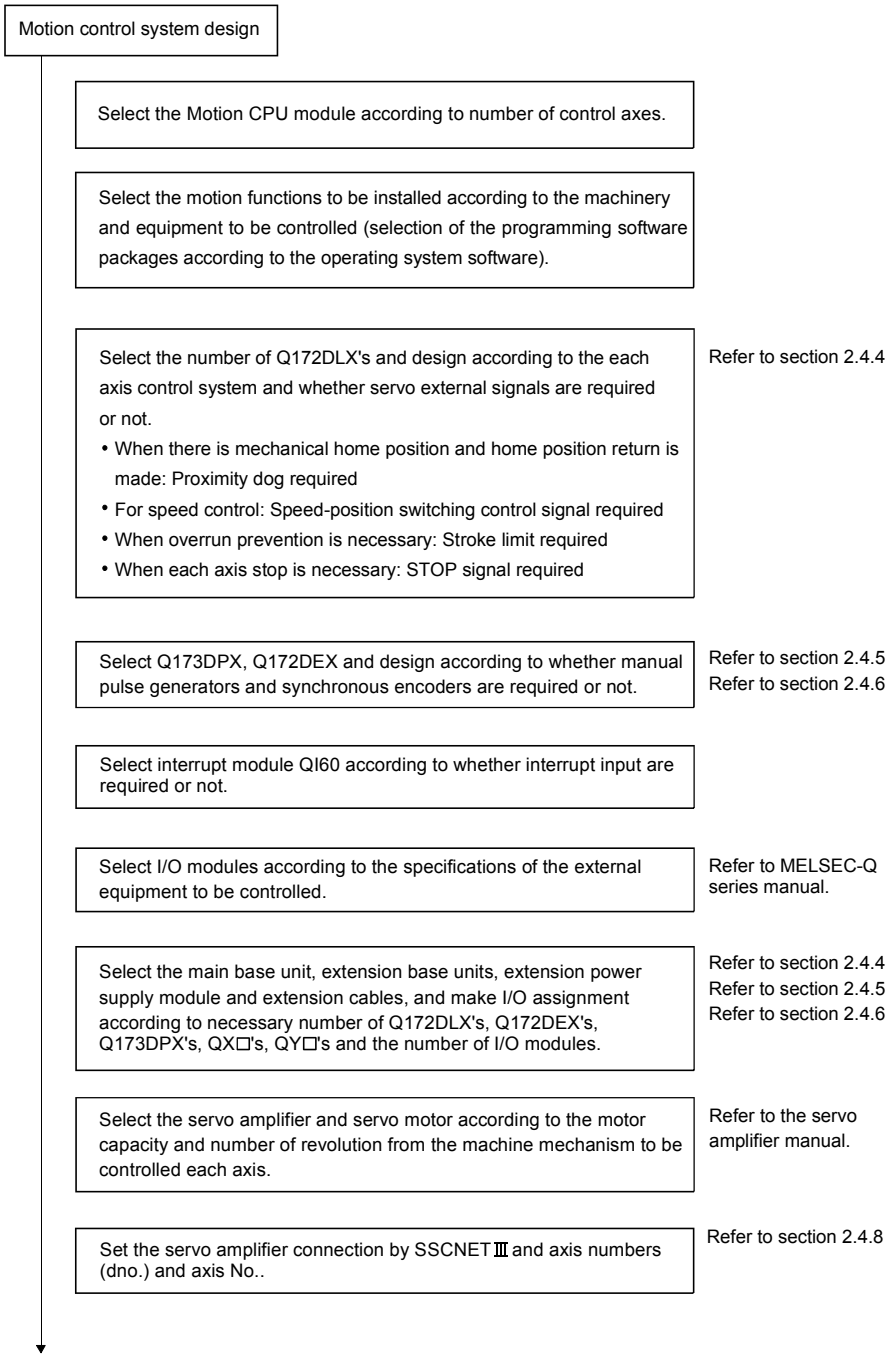
Item		Specifications
Number of input points		Forced stop signal : 1 point
Input method		Sink/Source type
Isolation method		Photocoupler
Operating voltage range		20.4 to 26.4VDC (+10/ -15%, ripple ratio 5% or less)
ON voltage/current		17.5VDC or more/3.0mA or more
OFF voltage/current		1.8VDC or less/0.18mA or less
Input resistance		Approx. 10kΩ
Response time	OFF to ON	1ms
	ON to OFF	
External connector type		2 pin connector
Applicable wire size		$0.3mm^2$ (AWG22)

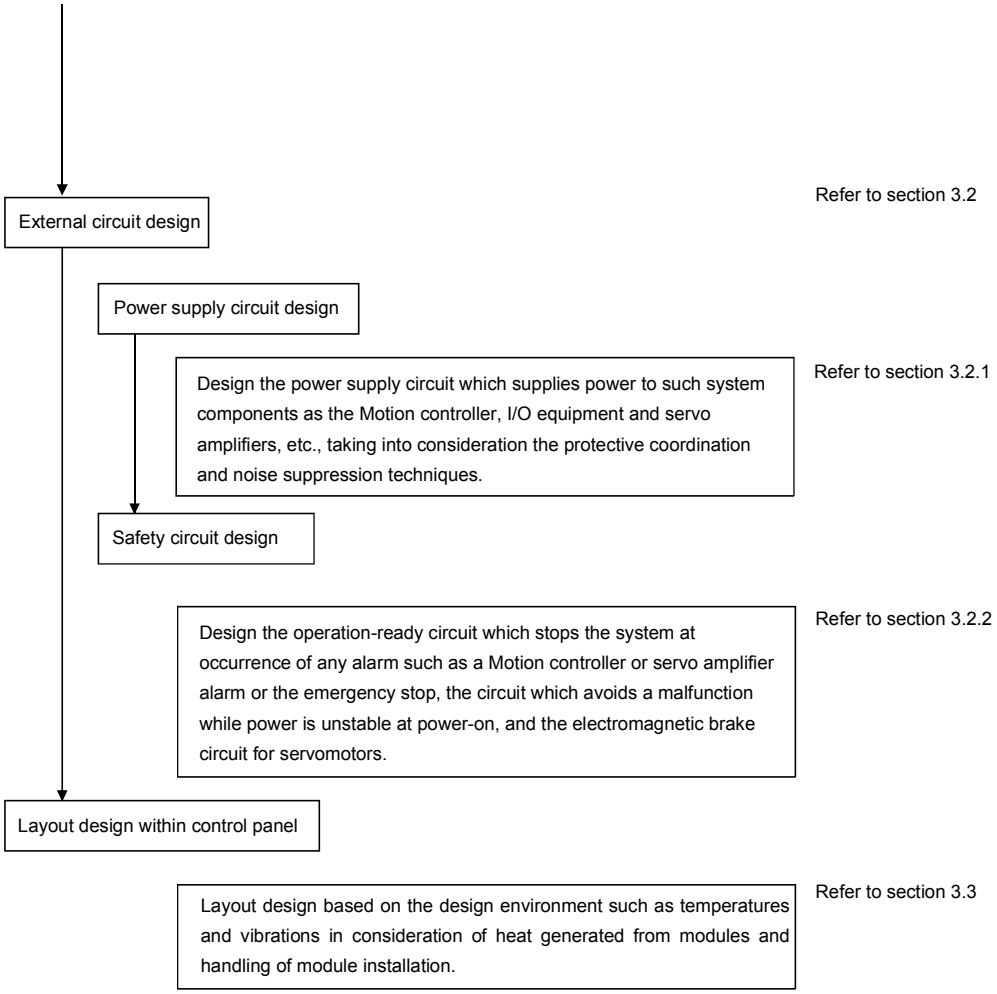
MEMO

3. DESIGN

3.1 System Designing Procedure

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





⚠ 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.
- Mount the Motion controller, servo amplifier, servomotor and regenerative resistor on incombustible. Mounting them directly or close to combustibles will lead to fire.
- If a fault occurs in the Motion controller or servo amplifier, shut the power OFF at the servo amplifier's power source. If a large current continues to flow, fire may occur.
- When using a regenerative resistor, shut the power OFF with an error signal. The regenerative resistor may abnormally overheat due to a fault in the regenerative transistor, etc., and may lead to fire.
- Always take heat measures such as flame proofing for the inside of the control panel where the servo amplifier or regenerative resistor is mounted and for the wires used. Failing to do so may lead to fire.
- Do not apply a voltage other than that specified in the instruction manual on any terminal. Doing so may lead to destruction or damage.
- Do not mistake the polarity (+ / -), as this may lead to destruction or damage.

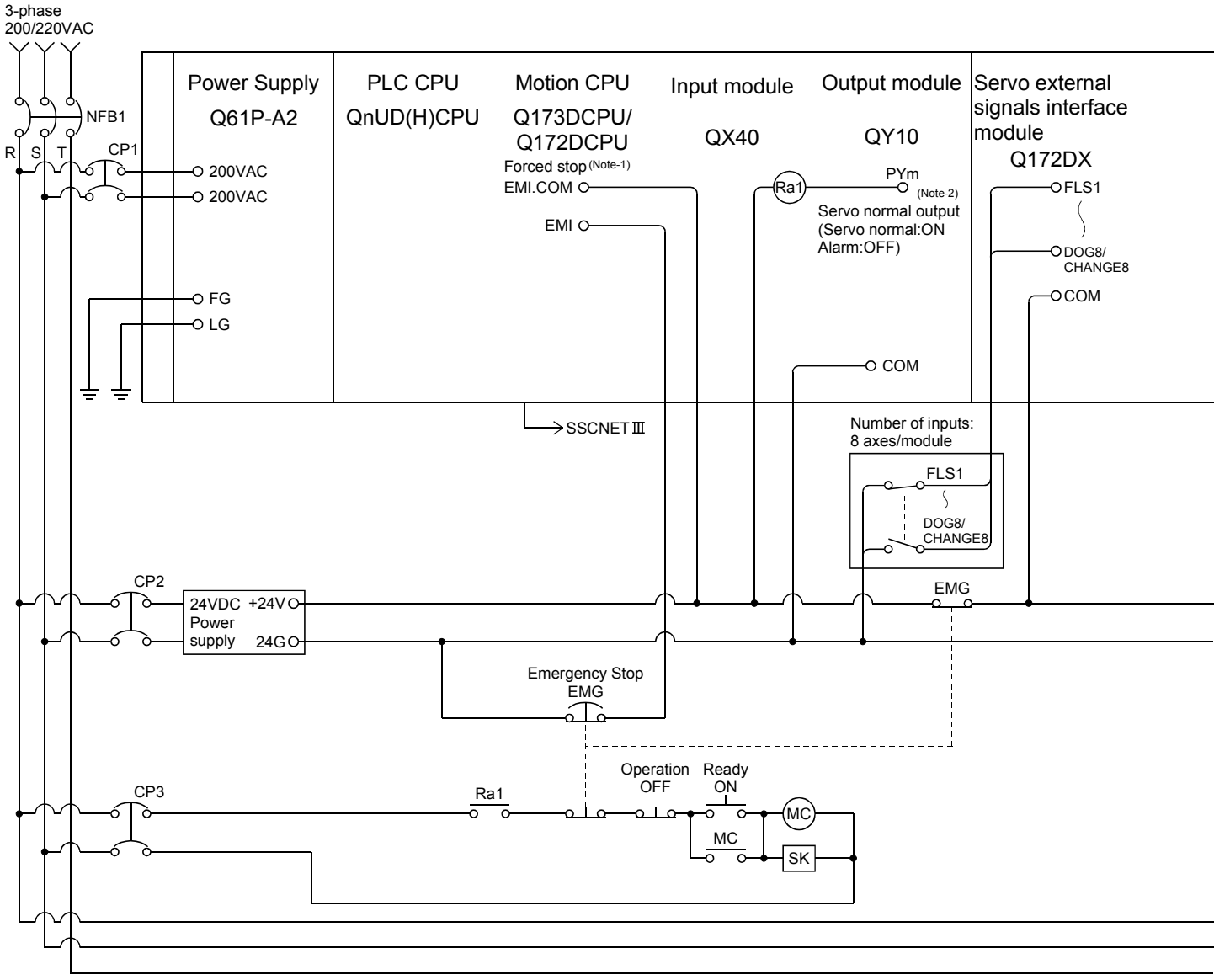
⚠ CAUTION

- Do not touch the heat radiating fins of controller or servo amplifier, regenerative resistor and 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 mount a leakage breaker on the Motion controller and servo amplifier power source.
- If mounting of an electromagnetic contactor for power shut off during an error, etc., is specified in the instruction manual for the servo amplifier, etc., always mount the electromagnetic contactor.
- Mount an emergency stop circuit externally so that the operation can be stopped immediately and the power shut off.
- Use the Motion controller, servo amplifier, servomotor and regenerative resistor with the correct combinations listed in the instruction manual. Other combinations may lead to fire or faults.
- If safety standards (ex., robot safety rules, etc.,) apply to the system using the Motion controller, servo amplifier and 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 life or mechanical structure (when the ball screw and servomotor are connected with a timing belt, etc.). Mount a stopping device to ensure safety on the machine side.

3.2 External Circuit Design

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

(1) Sample system circuit design for motion control 1



POINT

(1) (Note-1) : Make the forced stop input cable within 30m(98.43ft.).
The forced stop by the forced stop terminal of input module is also possible.

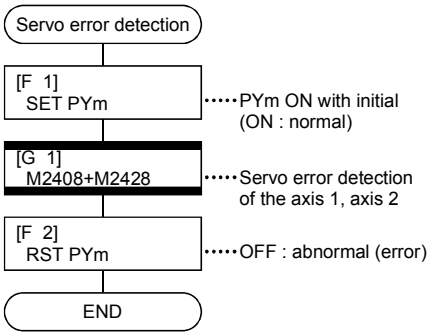
(2) (Note-2) : Motion SFC program example is shown in the right record.

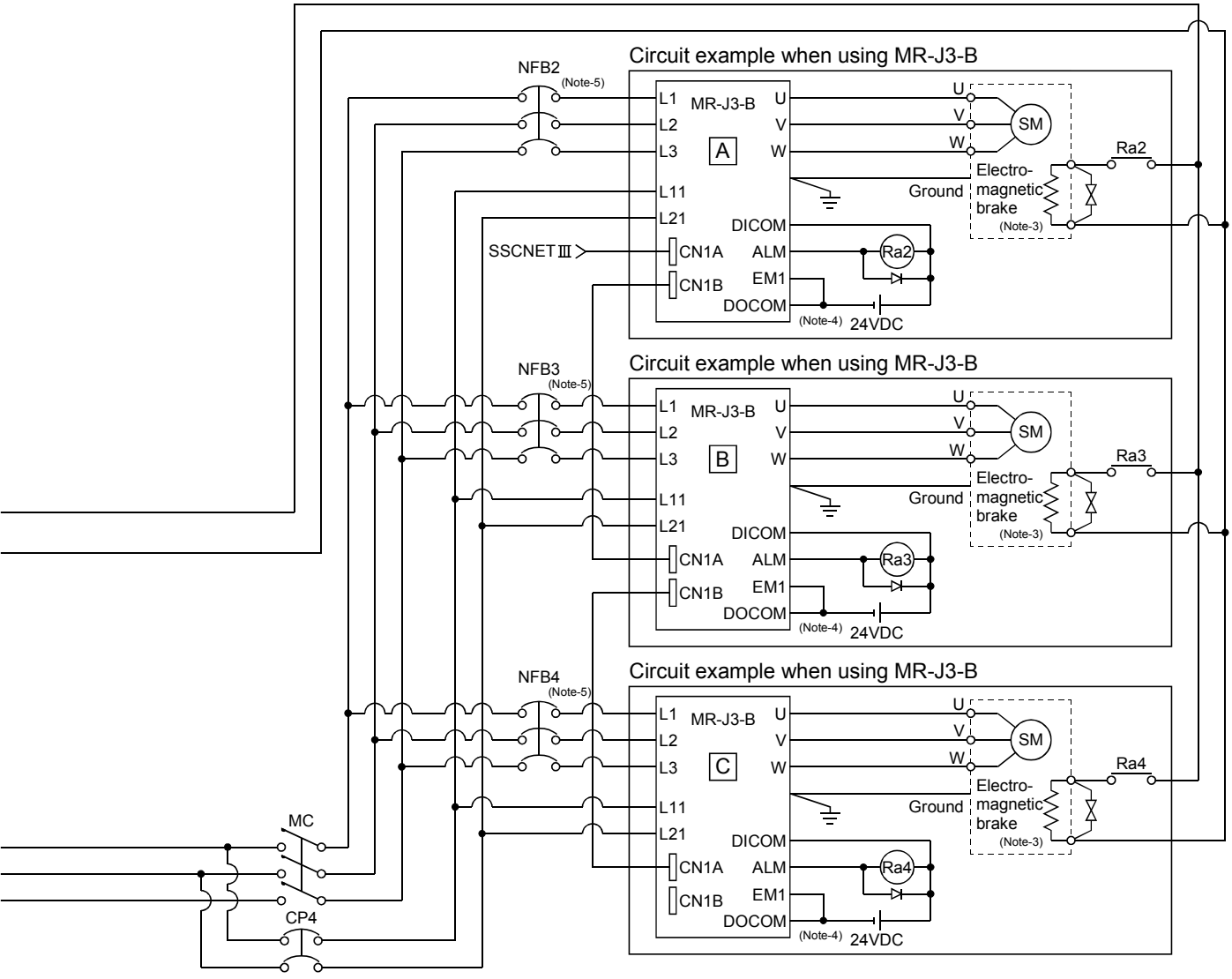
(3) (Note-3) : It is also possible to use a full wave rectified power supply as the power supply for the electromagnetic brake.

(4) (Note-4) : It is also possible to use forced stop signal of the servo amplifier.

(5) (Note-5) : 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.

<Example> For control axis 1 and axis 2



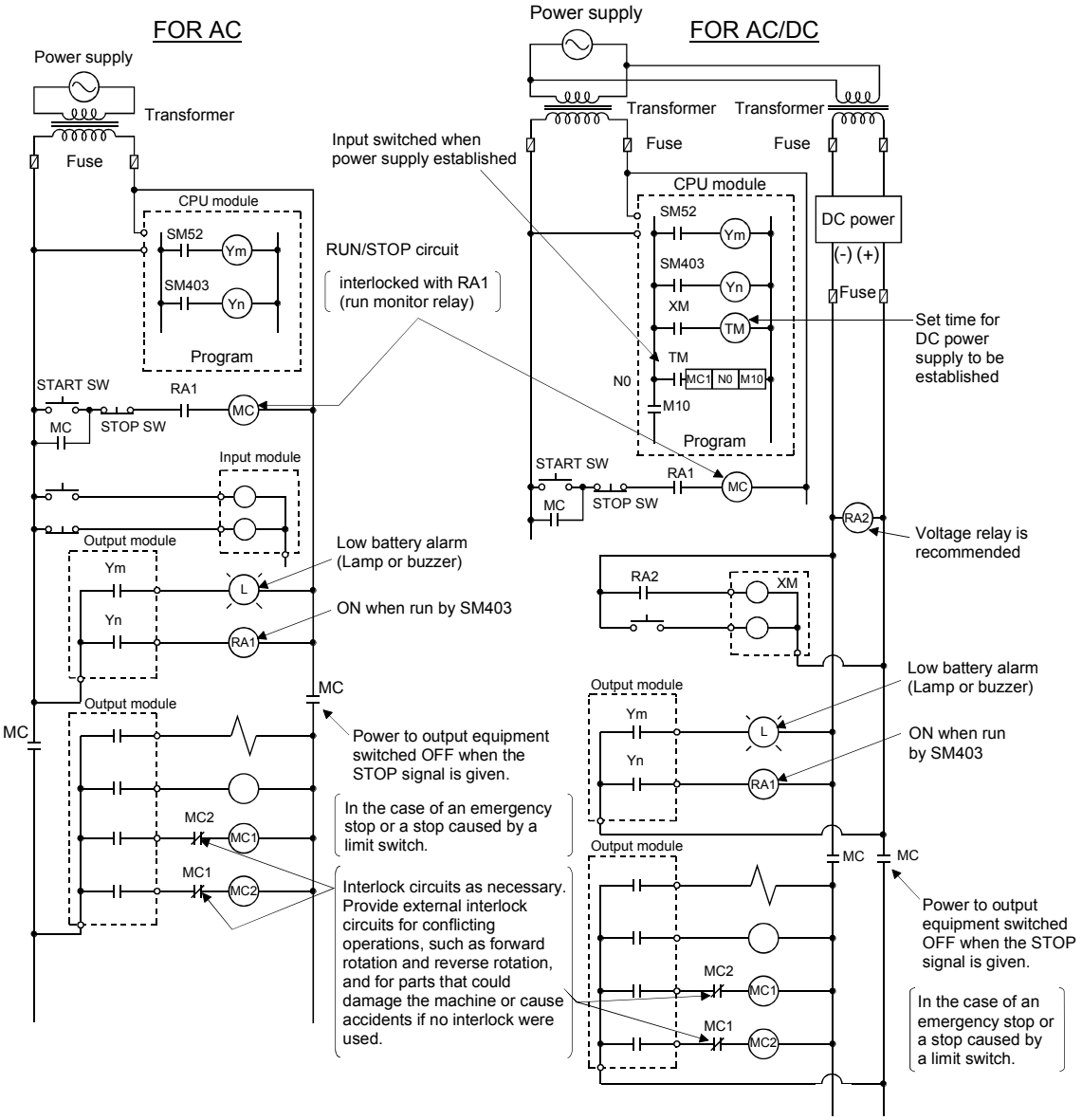


(Note-1) : When the control power supply of servo amplifier is shut off, it is not possible to communicate with the servo amplifier after that.
Example) When the control power supply L11/L21 of servo amplifier in above B figure is shut off, it is also not possible to communicate with the servo amplifier C.
If only a specific servo amplifier power supply is shut off, be sure to shut off the main circuit power supply L1/L2/L3, and do not shut off the control power supply L11/L21.

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

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

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



The power-ON procedure is as follows:

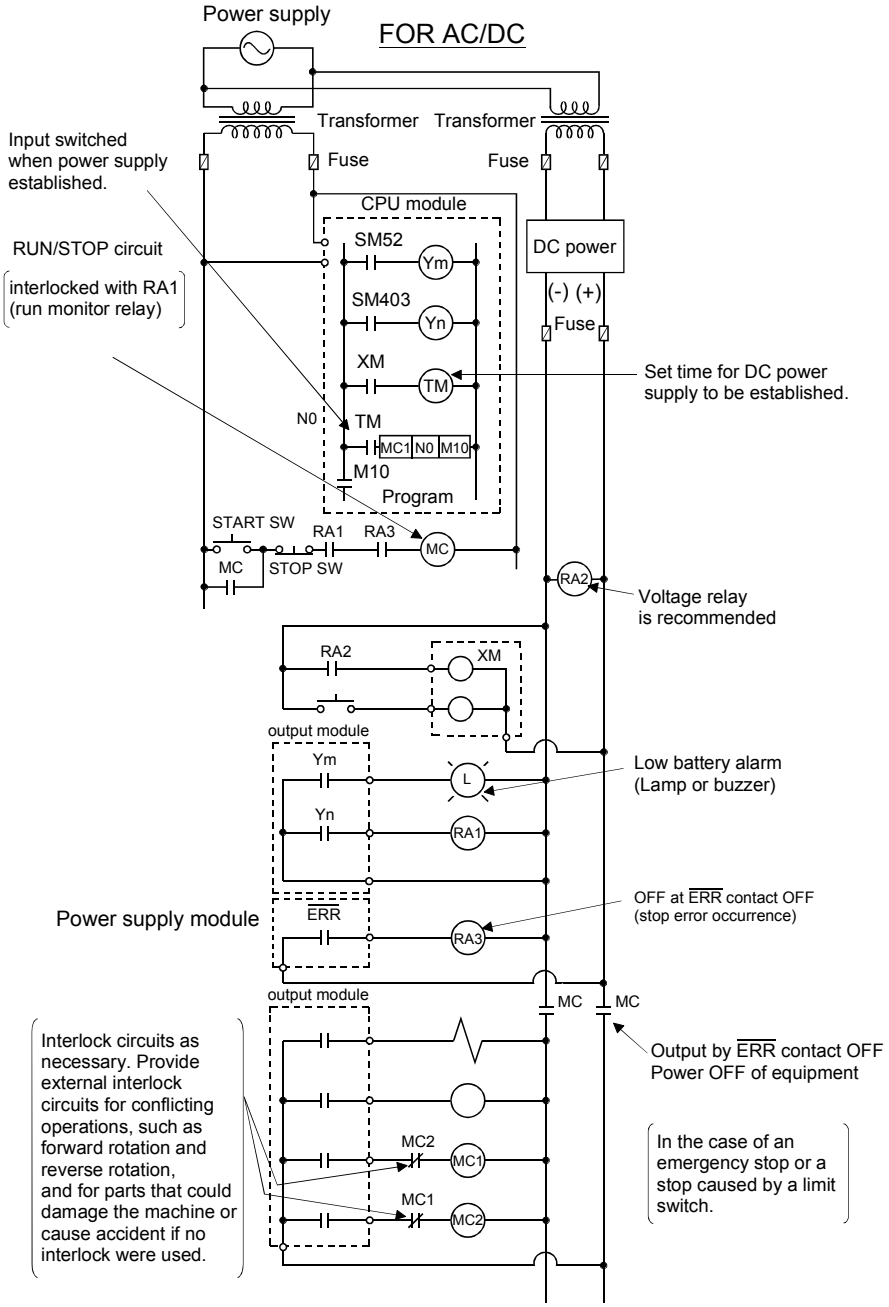
For AC

1) Switch power ON.
2) Set CPU to RUN.
3) Turn ON the start switch.
4) When the magnetic 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 $\overline{\text{ERR}}$ terminal 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 magnetic contactor (MC) comes on, the output equipment is powered and may be driven by the program. (If a voltage relay is used at RA2, no timer (TM) is required in the program.)

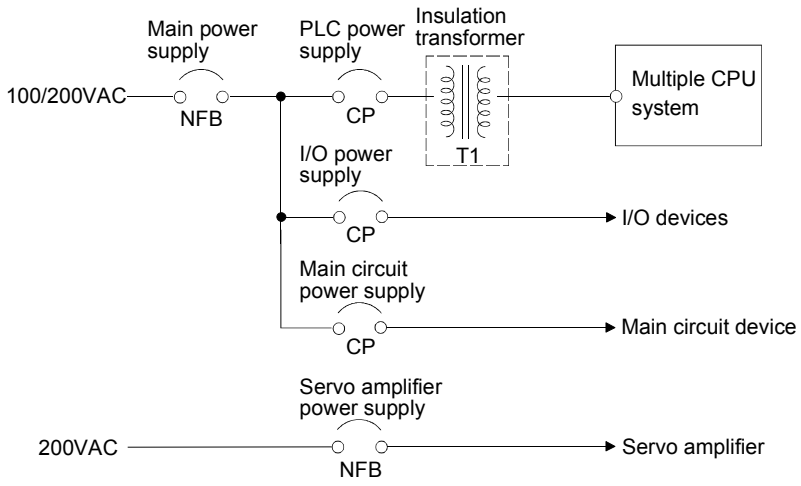
3.2.1 Power supply circuit design

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

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

Separate the lines for Multiple CPU system power supplies from the lines for I/O devices and servo amplifiers as shown below.

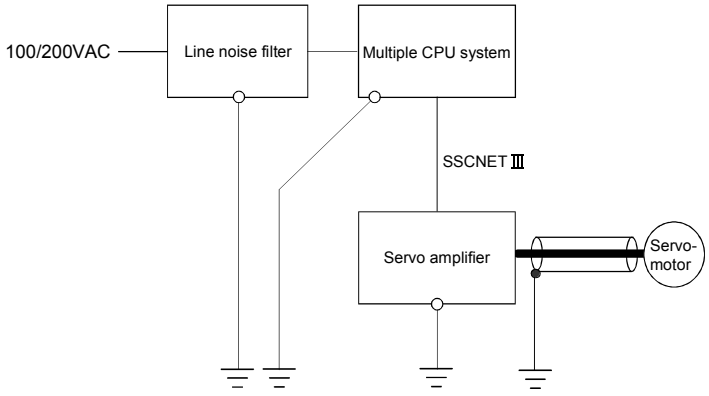
When there is much noise, connect an insulation transformer.



(2) Grounding

The Motion system may malfunction as it is affected by various noises such as electric path noises from the power supply systems, 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.

For grounding, use the exclusive ground terminal wire of each equipment or a single-point earth method to avoid grounding by common wiring, where possible, since noises may sneak from other equipment due to common impedances.



(Note): Be sure to ground the line noise filter, Multiple CPU system, servo amplifier and servomotor. (Ground resistance : 100 Ω or less)

3.2.2 Safety circuit design

(1) Concept of safety circuits

When the Multiple CPU system is powered on and off, normal control output may not be done momentarily due to a delay or a startup time difference between the Multiple CPU system power supply and the external power supply (DC in particular) for the control target.
Also, an abnormal operation may be performed if an external power supply fault or Motion controller failure takes place.
To prevent any of these abnormal operations from leading to the abnormal operation of the whole system and in a fail-safe viewpoint, areas which can result in machine breakdown and accidents due to abnormal operations
(e.g. emergency stop, protective and interlock circuits) should be constructed outside the Multiple CPU system.

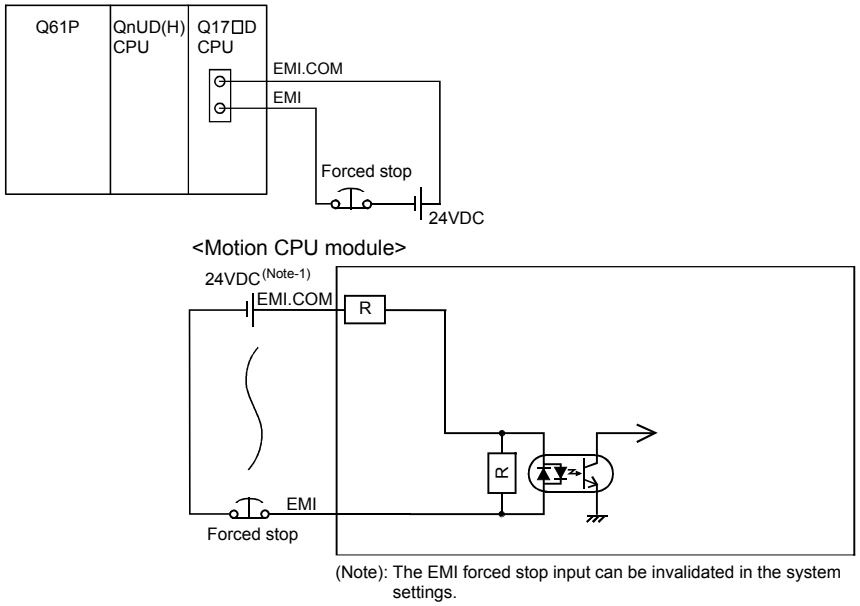
(2) Emergency stop circuit

The circuit should be constructed outside of the Multiple CPU system 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) The forced stop of all servo amplifiers is possible in a lump by using the EMI forced stop input of Motion CPU modules. After forced stop, the forced stop factor is removed and the forced stop canceled.
(The servo error detection signal does not turn on with the forced stop.)
The EMI forced stop input cannot be invalidated in the parameter setting of system setting.
Make the forced stop input cable within 30m(98.43ft.).

The wiring example for the EMI forced stop input of Motion CPU module is shown below.

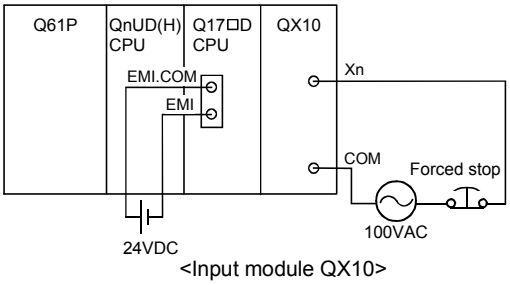


(Note): The EMI forced stop input can be invalidated in the system settings.

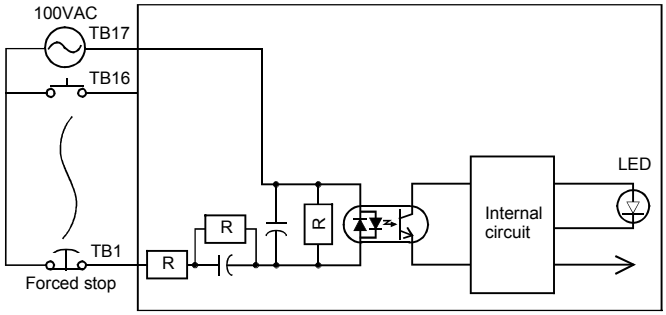
(Note-1): Both of positive common and negative common can be used.

(b) The forced stop of all servo amplifiers is possible in a lump by using the forced stop input of input modules. After forced stop, the forced stop factor is removed and the forced stop canceled.
(The servo error detection signal does not turn on with the forced stop.)
The forced stop input can be set by allocation of the device number in the parameter setting of system setting. When the device is used, apply 24VDC voltage on EMI terminal and invalidate the forced stop input of EMI terminal.

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



<Input module QX10>



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

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

3.3 Layout Design within The Control Panel

3.3.1 Mounting environment

Mount the Motion controller system in the following environment conditions.

(1) Ambient temperature is within the range of 0 to 55°C (32 to 131°F) .

(2) Ambient humidity is within the range of 5 to 95[%]RH.

(3) No condensing from sudden temperature changes

(4) No corrosive or inflammable gas

(5) There must not be a lot of conductible dust, iron filings, oil mist, or salt, organic solvents.

(6) No direct sunlight

(7) No strong electrical or magnetic fields

(8) No direct vibrations or shocks on the Motion controller

3.3.2 Layout design of the base units

This section describes the precautions related to mount 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 mounting of the base unit".)

- Top 40mm (1.57inch) or more
- Bottom 100mm (3.94inch) or more
- Front 100mm (3.94inch) or more
- Side 5mm (0.20inch) or more

(2) Provide a wiring duct, if required.

⚠ CAUTION

- Due to ventilation problems, do not mount the base units vertically or horizontally.
- Mount 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 mounting the base units close to a vibration source, such as a large electromagnetic contactor or no-fuse breaker. Mount 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 panel storing the Motion controller must be suppressed to an ambient temperature of 55°C(131°F) or less, which is specified for the Motion controller.
For the design of a heat releasing panel, it is necessary to know the average power consumption (heating value) of the devices and instruments stored inside.
Here the method of obtaining the average power consumption of Q173DCPU/ Q172DCPU system is described. From the power consumption, calculate a rise in ambient temperature inside the control panel.

How to calculate average power consumption

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

(1) Power consumption of power supply module

The power conversion efficiency of the power supply module is approx. 70[%], while 30 [%] of the output power is consumed as heat. As a result, 3/7 of the output power is the power consumption.
Therefore the calculation formula is as follows.

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

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

(2) Total power consumption for 5VDC logic circuits of all modules (including CPU module)

The power consumption of the 5 VDC output circuit section of the power supply 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

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

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

I_{24V}: Average current consumption of 24VDC power supply for internal consumption of the output module [A]
(Power consumption for simultaneous ON points)

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

$W_{OUT} = I_{OUT} \times$ Vdrop $\times$ Number of outputs $\times$ Simultaneous ON rate [W]

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

$W_{IN} = I_{IN} \times E \times$ Number of input points $\times$ 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 external power supply section of the intelligent function module

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

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

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

From this overall power consumption [W], calculate the heating value and a rise in ambient temperature inside the panel.
The outline of the calculation formula for a rise in ambient temperature inside the panel is shown below.

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

W : Power consumption of overall Motion system (value obtained above)
A : Surface area inside the panel [m^2]
U : When the ambient temperature inside the panel is uniformed by a fan 6
When air inside the panel is not circulated 4

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

(7) Example of average power consumption calculation (Q173DCPU use)

(a) System configuration

Q61P	Q03UD CPU	Q173D CPU	QX40	QX40	Q172D LX	Q172D EX	Q173D PX	QY10	QY10	Q38DB

(b) 5 VDC current consumption of each module

Q03UDCPU (Note)	: 0.33 [A]
Q173DCPU	: 1.25 [A]
QX40 (Note)	: 0.05 [A]
Q172DLX	: 0.06 [A]
Q172DEX	: 0.19 [A]
Q173DPX	: 0.38 [A]
QY10 (Note)	: 0.43 [A]
Q38DB (Note)	: 0.228 [A]

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

(c) Power consumption of power module

$W_{PW} = 3/7 \times (0.33 + 1.25 + 0.05 + 0.05 + 0.06 + 0.19 + 0.38 + 0.43 + 0.43 + 0.228) \times 5 = 7.28$ [W]

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

$W_{5V} = (0.33 + 1.25 + 0.05 + 0.05 + 0.06 + 0.19 + 0.38 + 0.43 + 0.43 + 0.228) \times 5) = 16.99$ [W]

(e) A total of 24 VDC average power consumption of the output module

$W_{24V} = 0$ [W]

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

$W_{OUT} = 0$ [W]

(g) Average power consumption of the input section of the input module

$W_{IN} = 0.004 \times 24 \times 32 \times 1 = 3.07$ [W]

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

$W_S = 0$ [W]

(i) Power consumption of overall system

$W = 7.28 + 16.99 + 0 + 0 + 3.07 + 0 = 27.34$ [W]

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	Motion CPU module selection	Number of axes	axes	☐
		Motion CPU module selection		☐
	PLC CPU module selection	Number of I/O points	points	☐
		PLC CPU module selection		☐
	Motion module selection	Manual pulse generator	pcs.	☐
		Synchronous encoder	pcs.	☐
		Upper limit point	points	☐
		Lower limit point	points	☐
		STOP input point	points	☐
		Proximity dog input point	points	☐
		Speed switching input point	points	☐
		Tracking enable signal point	points	☐
		Q172DLX	modules	☐
		Q172DEX	modules	☐
		Q173DPX	modules	☐
	Main base unit selection	Motion CPU module	modules	☐
		I/O module/intelligent function module installed to main base,	modules	☐
		Main base unit selection		☐
	Extension base unit and extension cable selection	Number of I/O modules/intelligent function modules installed to extension base,	modules	☐
		Distance between Main base and extension base	mm	☐
		Extension base unit selection		☐
		Extension cable selection		☐
External circuit design	Fail-safe circuit design	Avoidance of operation failure at power-on		☐
		Avoidance of hazard at Motion controller failure		☐
Layout design	Module layout design	Conformance with general specifications such as ambient temperature, humidity, dust, etc.		☐
		Total power consumption of base unit (Calculate the heating value)	W	☐
		Layout in consideration of clearances between enclosure's inside walls, other structures and modules and heats generated by modules within the control panel.		☐

4. INSTALLATION AND WIRING

4.1 Module Installation

4.1.1 Instructions for handling

⚠CAUTION

- Use the Motion controller in an environment that meets the general specifications contained in this manual. Using this Motion controller in an environment outside the range of the general specifications could result in electric shock, fire, operation failure, and damage to or deterioration of the product.
- While pressing the installation lever located at the bottom of module, insert the module fixing tab into the fixing hole in the base unit until it stops. Then, securely install the module with the fixing hole as a supporting point. Incorrect installation of the module can cause an operation failure, 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 connect the extension cable to connectors of the base unit correctly. After connecting, check them for looseness. Poor connections could cause an input or output failure.
- Completely turn off the externally supplied power used in the system before installation or removing the module. Not doing so could result in electric shock or damage to the product.
- Do not install/remove the module onto/from base unit or terminal block more than 50 times, after the first use of the product. Failure to do so may cause the module to malfunction due to poor contact of connector.
- Do not directly touch the module's conductive parts and electronic components. Touching them could cause an operation failure or give damage to the module.

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

(1) Module, terminal block connectors and pin connectors are made of resin; do not drop them or subject them to strong impact.

(2) Do not remove modules' printed circuit boards from the enclosure in order to avoid changes in operation.

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

Location of screw	Tightening torque range
Motion CPU module fixing screw (M3 × 13 screw)	0.36 to 0.48 N•m
Module fixing screw (M3 × 12 screw)	0.36 to 0.48 N•m
I/O module terminal block screw (M3 screw)	0.42 to 0.58 N•m
I/O module terminal block fixing screw (M3.5 screw)	0.68 to 0.92 N•m
Power supply module terminal screw (M3.5 screw)	0.68 to 0.92 N•m

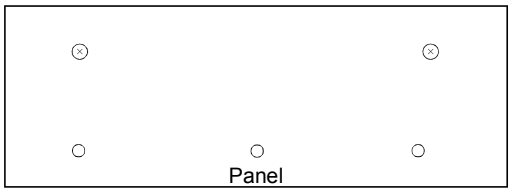
(4) Be sure to install a power supply module on the main base unit and extension base unit. Even if the power supply module is not installed, when the I/O modules and intelligent function module installed on the base units are light load type, the modules may be operated. In this case, because a voltage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

(5) When using an extension cable, keep it away from the main circuit cable (high voltage and large current).
Keep a distance of 100mm or more from the main circuit.

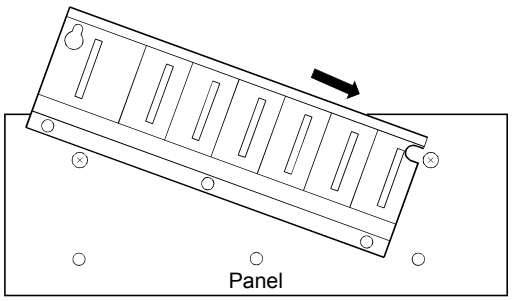
(6) Be sure to fix a main base unit to the panel using fixing screws. Not doing so could result in vibration that may cause erroneous operation.

Mount a main base unit in the following procedure.

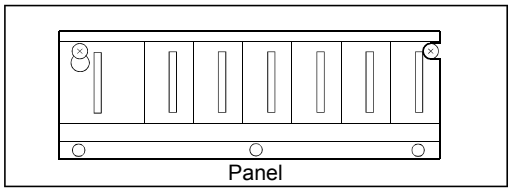
(a) Fit the two base unit top mounting screws into the enclosure.



(b) Place the right-hand side notch of the base unit onto the right-hand side screw.



(c) Place the left-hand side pear-shaped hole onto the left-hand side screw.



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

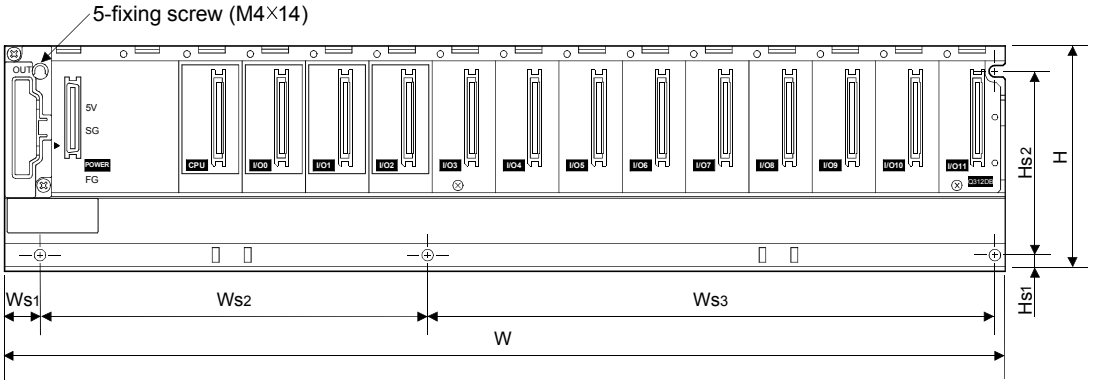
(Note) : Mount a main base unit to a panel, with no module installed in the right-end slot.
Remove the base unit after removing the module from the right-end slot.

4.1.2 Instructions for mounting the base unit

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

(1) Fitting dimensions

Fitting dimensions of each base unit are as follows:



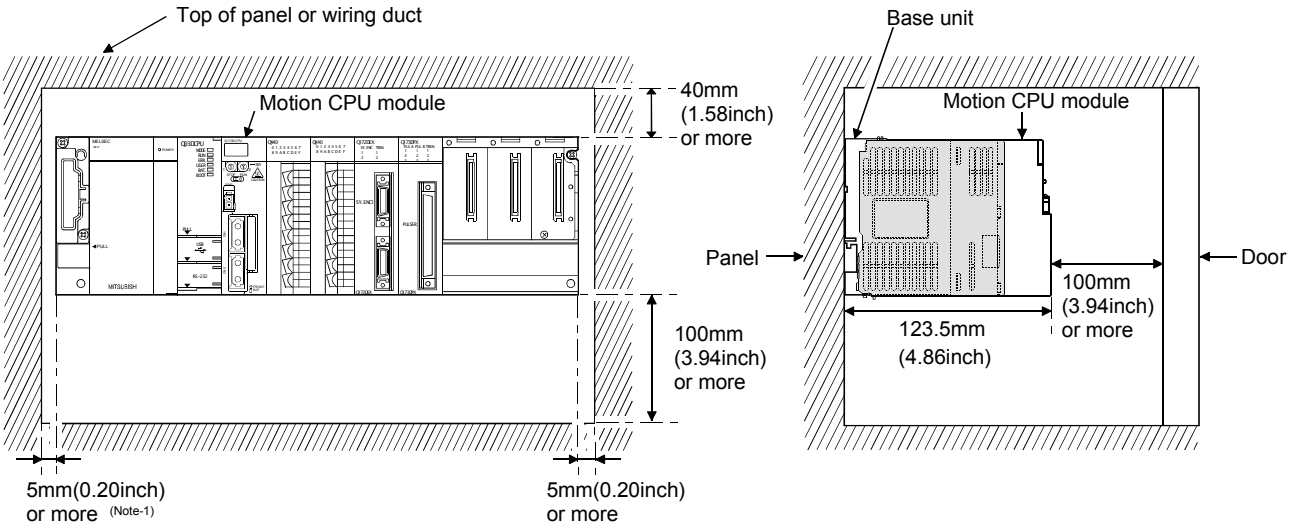
	Q38DB	Q312DB	Q63B	Q65B	Q68B	Q612B
W	328 (12.91)	439 (17.28)	189 (7.44)	245 (9.65)	328 (12.91)	439 (17.28)
Ws1	15.5 (0.61)					
Ws2	170 ± 0.3 (6.69 ± 0.01)	170 ± 0.3 (6.69 ± 0.01)	167 ± 0.3 (6.57 ± 0.01)	222.5 ± 0.3 (8.76 ± 0.01)	190 ± 0.3 (7.48 ± 0.01)	190 ± 0.3 (7.48 ± 0.01)
Ws3	138 ± 0.3 (5.43 ± 0.01)	249 ± 0.3 (9.80 ± 0.01)			116 ± 0.3 (4.57 ± 0.01)	227 ± 0.3 (8.93 ± 0.01)
H	98 (3.86)					
Hs1	7 (0.28)					
Hs2	80 ± 0.3 (3.15 ± 0.01)					

[Unit: mm (inch)]

(2) Module mounting position

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

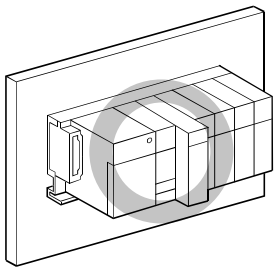
(Note): It is impossible to mount the main base unit by DIN rail.



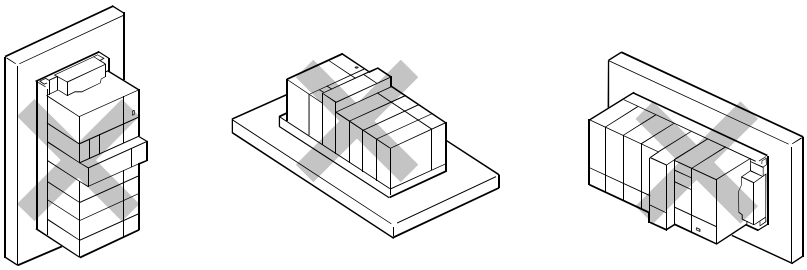
(Note-1) : 20mm (0.79 inch) or more when the adjacent module is not removed and the extension cable is connected.

(3) Module mounting orientation

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



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



Vertical Flat Upside down

(4) Mounting surface

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

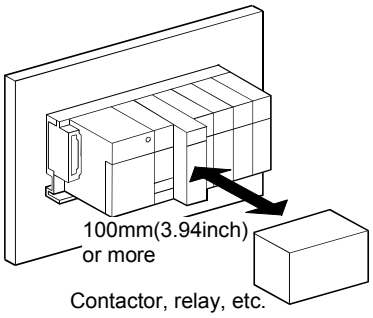
(5) Mounting of unit in an area where the other devices are mounted

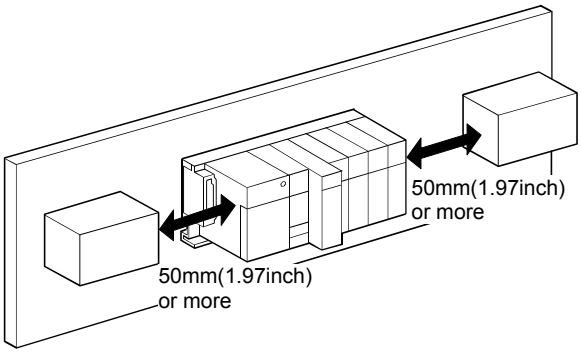
Avoid mounting base unit in proximity to vibration sources such as large magnetic contractors and no-fuse circuit breakers; mount those on a separate panel or at a distance).

(6) Distances from the other devices

In order to avoid the effects of radiated noise and heat, provide the clearances indicated below between the Motion controller and devices that generate noise or heat (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



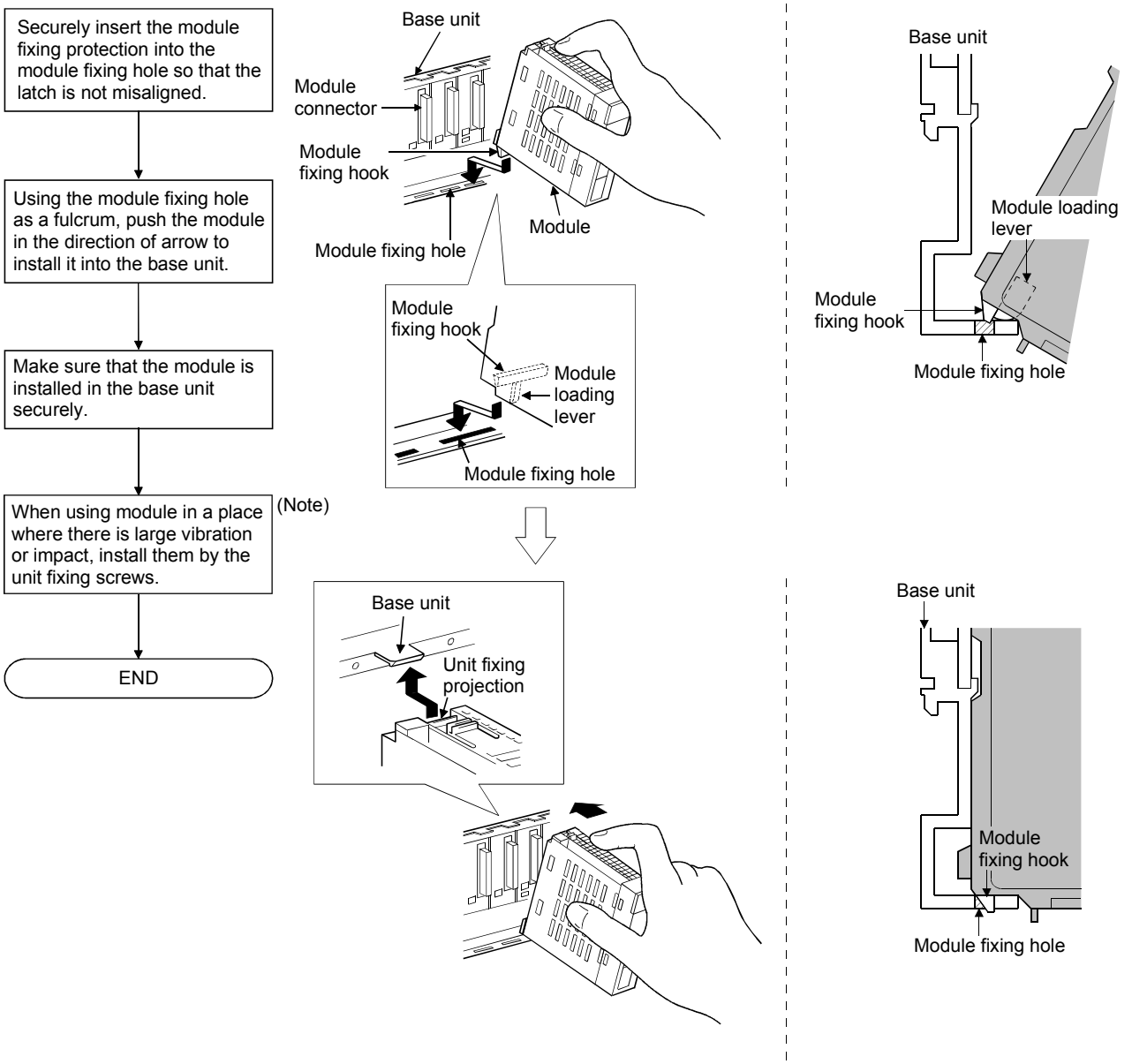


4.1.3 Installation and removal of module

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□DB,Q6□B

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



(Note): Screw the Motion CPU module to the main base unit.

POINTS

(1) When installing the module, always insert the module fixing projection into the module fixing hole of the base unit.
At that time, securely insert the module fixing projection so that it does not come off from the module fixing hole.
If the module is forcibly installed without the latch being inserted, the module connector and module will be damaged.

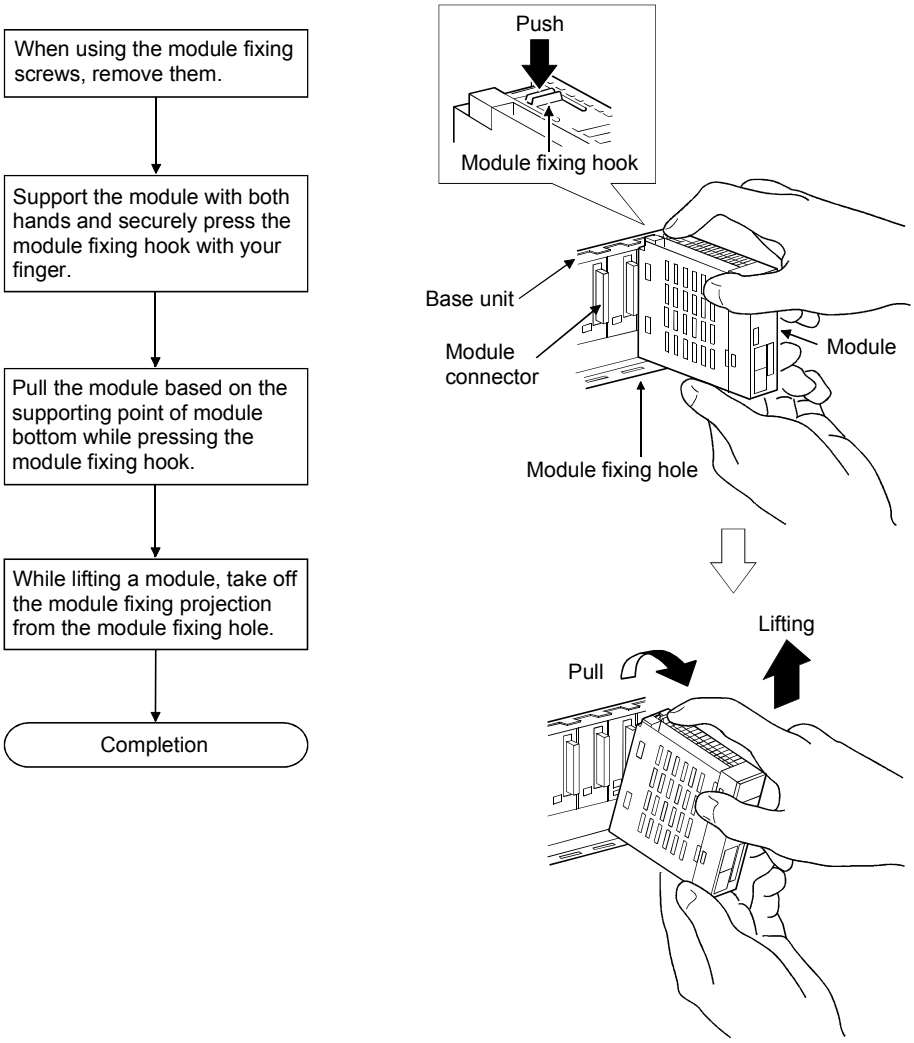
(2) When using the modules in a place where there is large vibration or impact, screw the module to the base unit.
Module fixing screw : M3×12 (user-prepared)
Screw the Motion CPU module to the main base unit using supplied fixing screws.

(3) Do not install/remove the module onto/from base unit or terminal block more than 50 times, after the first use of the product. Failure to do so may cause the module to malfunction due to poor contact of connector.

⚠CAUTION

● Insert the module fixing projection into the fixing hole in the base unit to install the module.
Incorrect installation could result in malfunction, failure, or a drop of the module.
When using the modules in a place where there is large vibration or impact, screw the module to the base unit.
Tighten the screws within the specified torque range.
If the screw is too loose, it may cause a drop of the module, a short circuit or malfunctions.
If too tight, it may cause damage to the screws and/or module, resulting in an accidental drop of the module, short circuit or malfunctions.

(b) Removal from Q3□DB 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 latch off the module fixing hole of the base unit.
Attempting to remove the module by force may damage the module fixing latch.

⚠CAUTION

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

4.1.4 Instructions for mounting of the battery holder unit

When mounting the battery holder unit (Q170DBATC) to an enclosure or similar, fully consider its mounting position and orientation.

(1) Module mounting position

Mount the battery holder unit within 50cm(1.64ft.) or less (Battery cable length: 50cm(1.64ft.)) from the Motion controller.

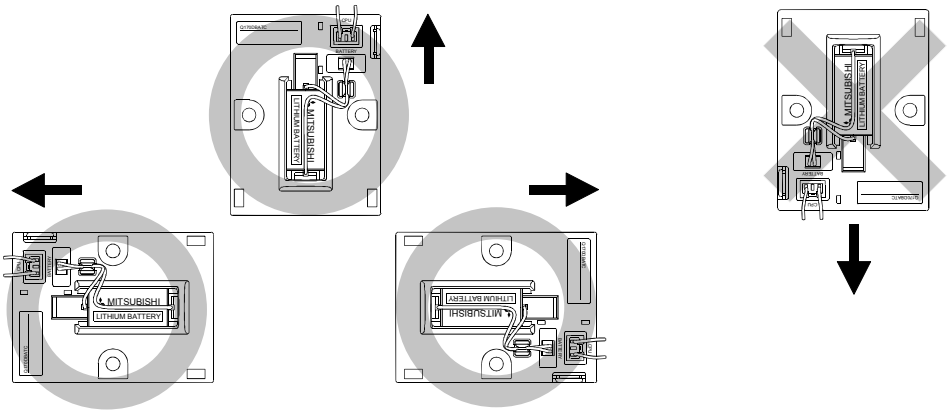
(2) Mounting surface

Mount the battery holder unit on a flat surface.

(3) Module mounting orientation

Do not mount the battery holder unit downward. Doing so may lead to battery liquid to leak at damage to the battery.

(Correct) (Wrong)



4.2 Connection and disconnection of Cable

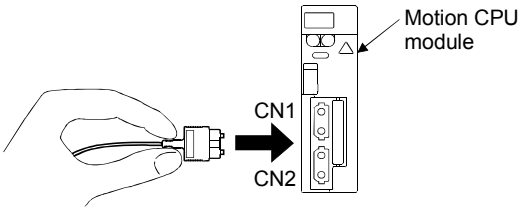
4.2.1 SSCNETⅢ cable

(1) Precautions for handling the SSCNETⅢ cable

- Do not stamp the SSCNETⅢ cable.
- When laying the SSCNETⅢ cable, be sure to secure the minimum cable bend radius or more. If the bend radius is less than the minimum cable bend radius, it may cause malfunctions due to characteristic deterioration, wire breakage, etc.

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

- For connection and disconnection of SSCNETⅢ cable, hold surely a tab of cable connector.
- Refer to Section 4.4.3. for wiring precautions.



(2) Connection of SSCNETⅢ cable

- For connection of SSCNETⅢ cable to the Motion CPU module, connect it to the SSCNETⅢ connector CN1 or CN2 of Motion CPU module while holding a tab of SSCNETⅢ cable connector. Be sure to insert it until it clicks.
- If the code tip for the SSCNETⅢ cable is dirty, optical transmission is interrupted and it may cause malfunctions. If it becomes dirty, wipe with a bonded textile, etc. Do not use solvent such as alcohol.

(3) Disconnection of SSCNETⅢ cable

- For disconnection of SSCNETⅢ cable, pull out it while holding a tab of SSCNETⅢ cable connector or the connector.
- After disconnection of SSCNETⅢ cable, be sure to put a cap (attached to Motion CPU module or servo amplifier) to the Motion CPU module and servo amplifier.
- For SSCNETⅢ cable, attach the tube for protection optical code's end face on the end of connector.

POINTS

(1) Forcibly removal the SSCNETⅢ cable from the Motion CPU module will damage the Motion CPU modules and SSCNETⅢ cables.

(2) After removal of the SSCNETⅢ cable, be sure to put a cap on the SSCNETⅢ connector. Otherwise, adhesion of dirt deteriorates in characteristic and it may cause malfunctions.

(3) Do not remove the SSCNETⅢ cable while turning on the power supply of Multiple CPU system and servo amplifier.
Do not see directly the light generated from SSCNETⅢ connector of Motion CPU module or servo amplifier and the end of SSCNETⅢ cable. When the light gets into eye, may feel something is wrong for eye. (The light source of SSCNETⅢ cable complies with class1 defined in JISC6802 or IEC60825-1.)

(4) If the SSCNETⅢ cable is added a power such as a major shock, lateral pressure, haul, sudden bending or twist, its inside distorts or brakes, and optical transmission will mot be available.
Be sure to take care enough so that the short SSCNETⅢ cable is added a twist easily.

(5) Be sure to use the SSCNETⅢ cable within the range of operating temperature described in this manual. Especially, as optical fiber for MR-J3BUS□M and MR-J3BUS□M-A are made of synthetic resin, it melts down if being left near the fire or high temperature. The cable part and code part melt down if being left near the fire or high temperature. Therefore, do not make it touched the part which becomes high temperature, such as radiator or regenerative brake option of servo amplifier, or servomotor.

(6) When laying the SSCNETⅢ cable, be sure to secure the minimum cable bend radius or more.

(7) SSCNETⅢ cable is used a optical cables or optical codes little affected by plasticizer. However, come migrating plasticizer may affect the optical characteristic of SSCNETⅢ cable as shown below.

SSCNETⅢ cable	Code	Cable
MR-J3BUS□M	△	
MR-J3BUS□M-A	△	△
MR-J3BUS□M-B	○	○

○ Cable is not affected by plasticizer.

△ Phthalate ester plasticizer such as DBP and DOP may affect optical characteristic of cable.

POINTS

(8) Put the SSCNETⅢ cable in the duct or fix the cable at the closest part to the Motion CPU module with bundle material in order to prevent SSCNETⅢ cable from putting its own weight on SSCNETⅢ connector.
When laying cable, the optical cord should be given loose slack to avoid from becoming smaller than the minimum bend radius, and it should not be twisted. Also, fix and hold it in position with using cushioning such as sponge or rubber which does not contain plasticizing material.

(9) If the adhesion of solvent and oil to the code part of SSCNETⅢ cable may lower the optical characteristic and machine characteristic. If it is used such an environment, be sure to do the protection measures to the cord part.

(10) When keeping the Motion CPU or servo amplifier, be sure to put on a cap to connector part so that a dirt should not adhere to the end of SSCNETⅢ connector.

(11) SSCNETⅢ connector is put a cap to protect light device inside connector from dust. For this reason, do not remove a cap until just before connecting SSCNETⅢ cable. Then, when removing SSCNETⅢ cable, make sure to put a cap.

(12) Be sure to keep a cap and the tube for protecting light code end of SSCNETⅢ cable in a plastic bag with a zipper of SSCNETⅢ cable to prevent them from becoming dirty.

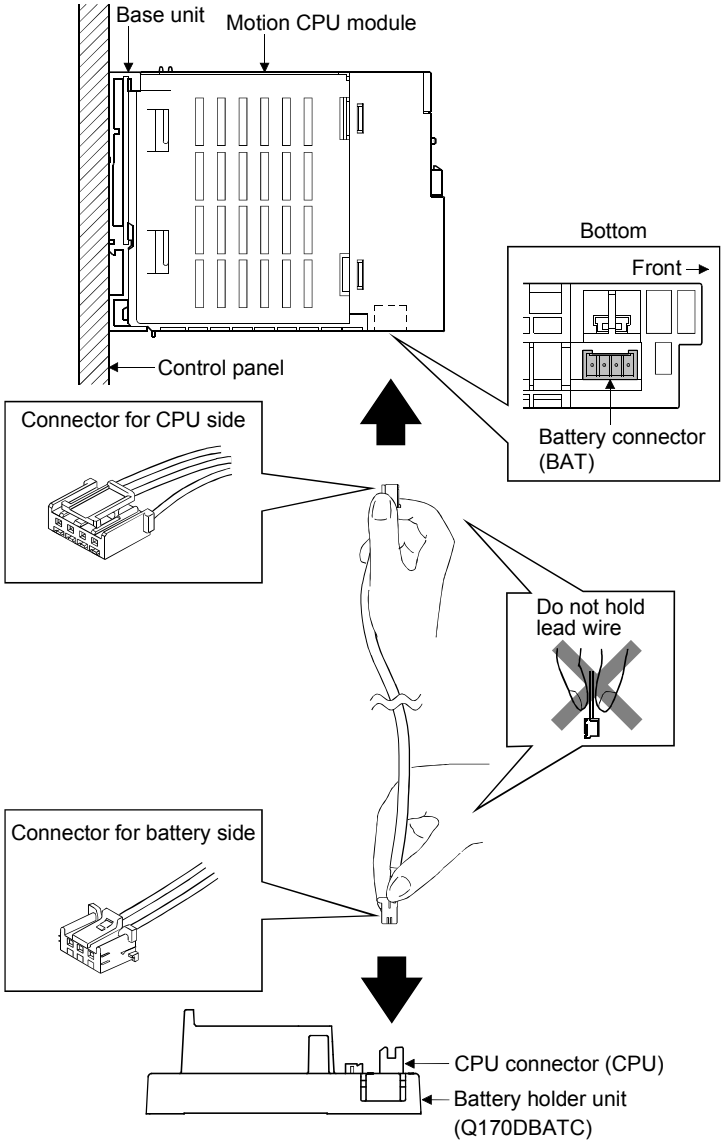
(13) When exchanging the servo amplifier or Motion controller, make sure to put a cap on SSCNETⅢ connector. When asking repair of servo amplifier or Motion controller for some troubles, make also sure to put a cap on SSCNETⅢ connector. When the connector is not put a cap, the light device may be damaged at the transit. In this case, exchange and repair of light device is required.

4.2.2 Battery cable

(1) Handling the battery cable

(a) Precautions for handling the battery cable

• For connection or removal of the battery cable, do it surely while holding a connector.



(b) Connection of the battery cable

• For connection of a connector to the Motion CPU module, connect it surely to the battery connector (BAT) of Motion CPU module while holding a connector. Be sure to insert it until it clicks.

• For connection of a connector to the battery holder unit, connect it surely to the CPU connector (CPU) of battery holder while holding a connector. Be sure to insert it until it clicks

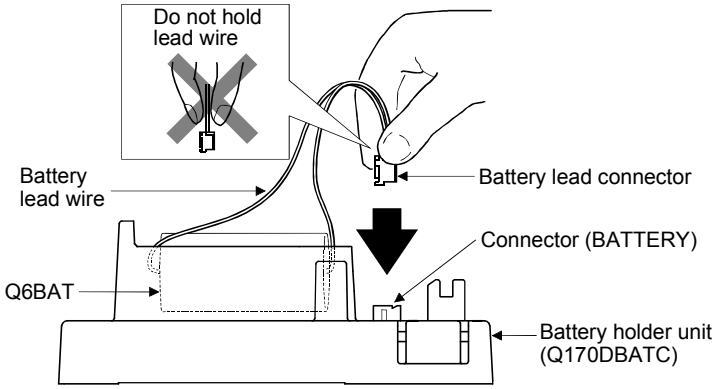
(c) Removal of the battery cable

• For removal of the battery cable, pull out it while holding a connector.

(2) Handling the battery lead wire

(a) Precautions for handling the battery lead wire

• For connection or removal of the battery lead wire, do it surely while holding a battery lead connector.



(b) Connection of the battery lead wire

• For connection of a battery (Q6BAT) to the battery holder unit, connect it surely to a connector (BATTERY) of battery holder unit while holding a battery lead connector. Be sure to insert it until it clicks.

(c) Removal of the battery lead wire

• For removal of the battery lead wire, pull out it while holding a battery lead connector.

POINT

(1) Forcibly removal the battery cable or battery lead wire from the battery holder unit will damage the battery holder unit, battery cable or battery lead wire.

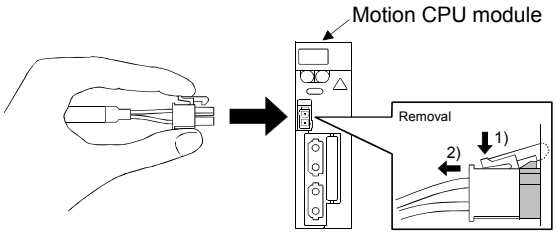
(2) As for the battery cable, the shape of connector is different on Motion CPU side and battery holder side. Be sure to connect after confirming shape.

(3) The programs, parameters, absolute position data, and latch data of SRAM built-in Motion CPU module are backed up if the battery connector is not connect correctly.

4.2.3 Forced stop input cable

(1) Precautions for handling the forced stop input cable

• For connection or removal of the forced stop input cable, do it surely while holding a connector of forced stop input cable.



(2) Connection of the forced stop input cable

• For connection of a forced stop input cable to the Motion CPU module, connect it surely to a EMI connector of Motion CPU module while holding a connector. Be sure to insert it until it clicks.

(3) Removal of the forced stop input cable

• For removal of the forced stop input cable, pull out it while holding a connector.

POINTS
Forcibly removal the forced stop input cable from the CPU module will damage the Motion CPU unit or forced stop input cable.

4.3 Mounting of Serial Absolute Synchronous Encoder

This section describes precautions for handling the serial absolute synchronous encoder (Q170ENC).

(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 Q170ENC through a coupling. Ensure that excessive force (greater than the permitted shaft load) is not applied to the shaft of Q170ENC.

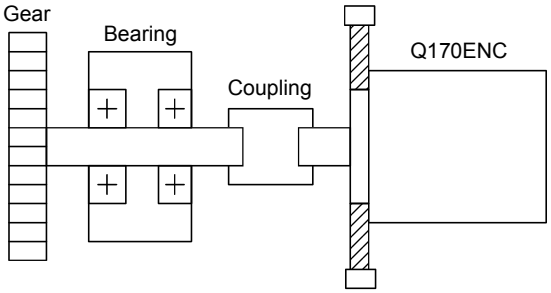


Fig. 4.1 Example of Encoder Linked to a Gear

Table 4.1 Permitted Shaft Loads

	Radial direction	Thrust direction
Permitted shaft load	Up to 19.6N	Up to 9.8N

(2) Excessive load is applied to the shaft of Q170ENC by the large mounting errors in eccentricity and angle of deviation As a result, it might damage the machine or shorten extremely the life.
Minimize loads applied to the shaft such that they make within the permitted shaft load range.

⚠CAUTION

- The Q170ENC 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 Q170ENC directly to machine side rotary shaft. Always after connecting the shaft of Q170ENC to another bearing once, connect the shaft through a flexible coupling.

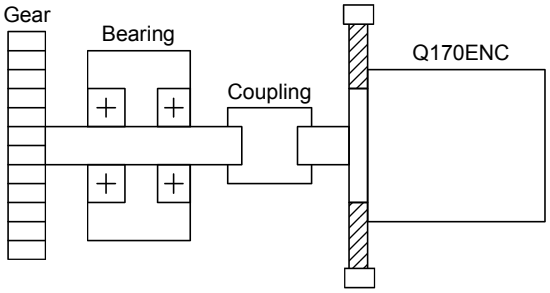


Fig 4.2 Connecting the shaft of Q170ENC to a machine side rotary shaft.

- Never hit the end of the Q170ENC coupling shaft with a hammer when connecting the coupling to it. The large loads applied to Q170ENC will damage it.
- The Q170ENC uses optical parts. Mount it in an atmosphere where there are extremely few water drops and little oil and dust.
- In any place where the Q170ENC 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 Q170ENC. When it is inevitable to mount the Q170ENC vertically or obliquely, trap for the cable.
- Use the Q170ENC within the specified temperature range (-5 to 55°C (23 to 131°F)).

4.4 Wiring

4.4.1 Instructions for wiring

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

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

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

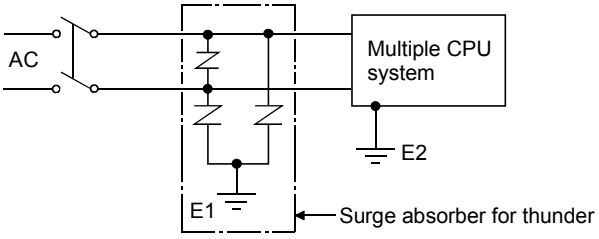
(1) Power supply wiring

(a) 100VAC, 200VAC and 24VDC wires should be twisted as dense as possible respectively. Connect the modules with the shortest distance.
Also, to reduce the voltage drop to the minimum, use the thickest wires (Up to 2.0mm^2) possible.
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	0.3 to 0.75mm^2 (Outside diameter 2.8mm (0.11inch) or less)
Ground wire	2.0mm^2 or more

(b) Do not bundle the 100VAC and 24VDC wires with, or run them close to, the main circuit (high voltage, large current) and I/O signal lines (including common line).
Reserve a distance of at least 100mm (3.94inch) from adjacent wires.

(c) As measures against serge caused by lightening, connect a surge absorber for lightening as shown below.



POINTS

(1) Separate the ground of the surge absorber for lighting (E1) from that of the Multiple CPU system (E2).

(2) Select a surge absorber for lighting whose power supply voltage does no exceed the maximum allowable circuit voltage even at the time of maximum power supply voltage elevation.

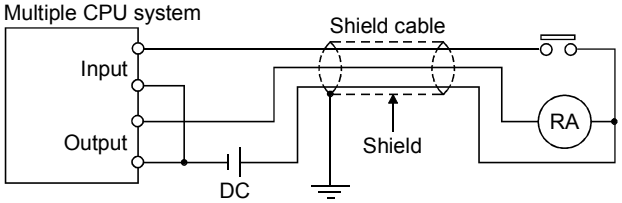
(2) Wiring of I/O equipment

(a) Insulation-sleeved crimping terminals cannot be used with the terminal block.
It is recommended to cover the wire connections of the crimping terminals with mark or insulation tubes.

(b) The wires used for connection to the terminal block should be 0.3 to 0.75mm^2 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.

(g) Wiring of 200m (656.17ft.) or longer distance will give rise to leakage currents due to the line capacity, resulting in a fault.
Refer to the troubleshooting chapter of the I/O Module User's Manual.

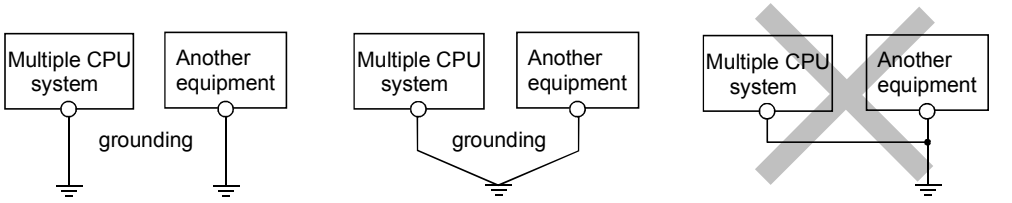
(h) As a countermeasure against the power surge due to lightning, separate the AC wiring and DC wiring and connect a surge absorber for lightning (Refer to Section 4.4.1(1)).
Failure to do so increases the risk of I/O device failure due to lightning.

(3) Grounding

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

(a) Use a dedicated grounding wire as far as possible.
(Ground resistance: 100Ω or less)

(b) When a dedicated grounding cannot be performed, use (2) Common Grounding shown below.

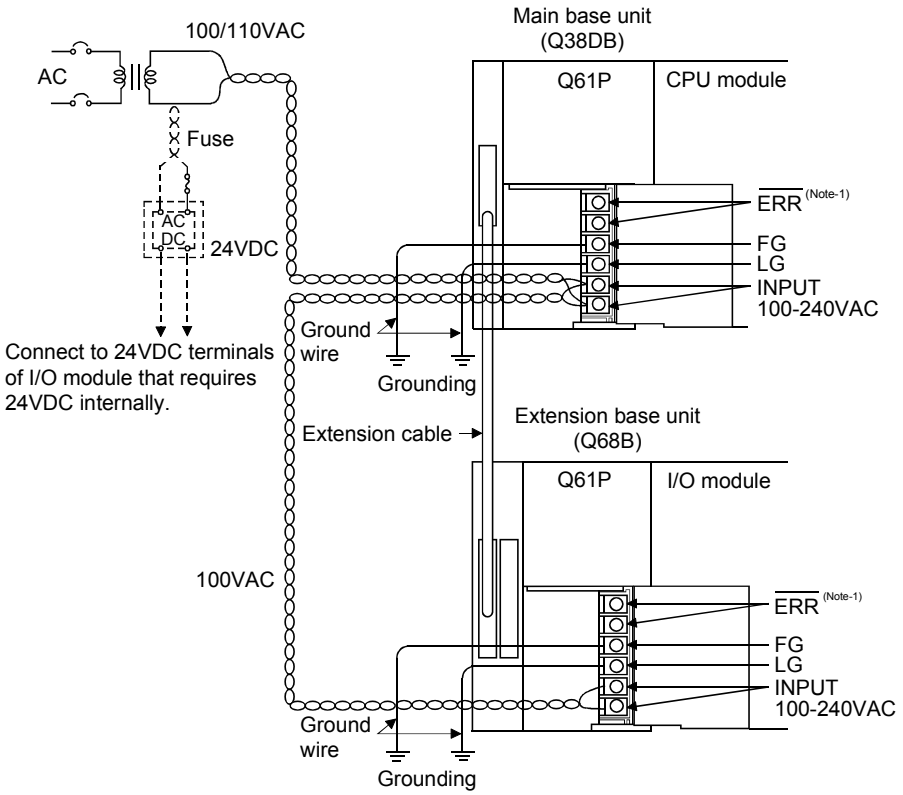


(1) Independent grounding.....Best (2) Common grounding.....Good (3) Joint grounding.....Not allowed

(c) For grounding a cable, use the cable of 2 mm^2 or more.
Position the ground-contact point as nearly to the Multiple CPU system as possible, and reduce the length of the grounding cable as much as possible.

4.4.2 Connecting to the power supply module

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



(Note) : The operation of the $\overline{\text{ERR}}$ terminal is as follows.

<When the power supply module is installed on the main base unit>

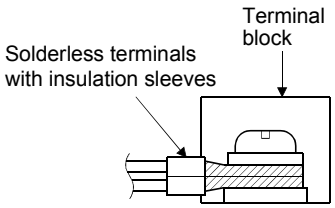
The terminal turns OFF (opens) when the AC power is not input, a CPU module stop error (including a reset) occurs, or the fuse of the power supply module is blown.

<When the power supply module is installed on the extension base unit>

The terminal is always OFF(open).

POINT

(1) Use the thickest possible (up to 2mm^2) 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 solderless terminals with insulation sleeves of 0.8 mm (0.03 inch) or less.
Also, only two solderless terminals can be connected per terminal block.



(2) Ensure that the earth terminals LG and FG are grounded.
(Ground resistance : 100 Ω or loss)
Since the LG terminal has a half of the input voltage, touching this terminal may result in an electric shock.

(3) No system error can be detected by the $\overline{\text{ERR}}$ terminal of an extension base unit. (The $\overline{\text{ERR}}$ terminal is always set off.)

4.4.3 Precautions of SSCNETⅢ cable wiring

SSCNETⅢ cable is made from optical fiber. If optical fiber is added a power such as a major shock, lateral pressure, haul, sudden bending or twist, its inside distorts or breaks, and optical transmission will not be available. Especially, as optical fiber for MR-J3BUS□M, MR-J3BUS□M-A is made of synthetic resin, it melts down if being left near the fire or high temperature. Therefore, do not make it touched the part, which becomes high temperature, such as radiator or regenerative brake option of servo amplifier.
Be sure to use optical fiber within the range of operating temperature described in this manual.
Read described item of this section carefully and handle it with caution.

(1) Minimum bend radius

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

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

(2) Tension

If tension is added on the SSCNETⅢ cable, the increase of transmission loss occurs because of external force which concentrates on the fixing part of SSCNETⅢ cable or the connecting part of SSCNETⅢ connector. At worst, the breakage of SSCNETⅢ cable or damage of SSCNETⅢ connector may occur. For cable laying, handle without putting forced tension. (Refer to "APPENDIX1.1 SSCNETⅢ cables" for the tension strength.)

(3) Lateral pressure

If lateral pressure is added on the SSCNETⅢ cable, the cable itself distorts, internal optical fiber gets stressed, and then transmission loss will increase. At worst, the breakage of optical cable may occur. As the same condition also occurs at cable laying, do not tighten up SSCNETⅢ cable with a thing such as nylon band (TY-RAP).
Do not trample it down or tuck it down with the door of control box or others.

(4) Twisting

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

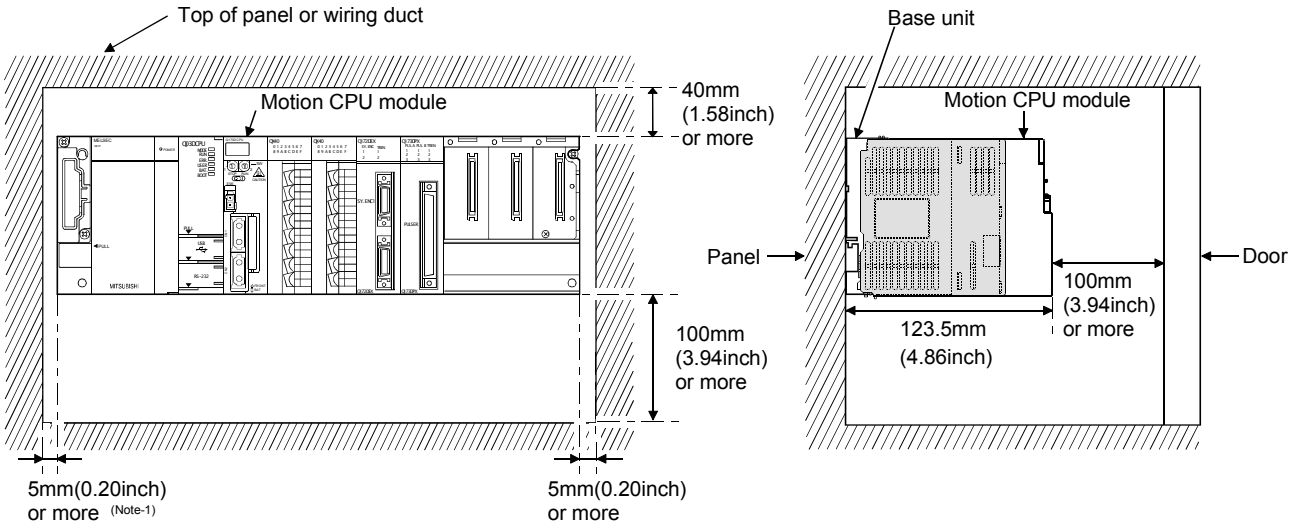
(5) Disposal

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

(6) Wiring process of SSCNETⅢ cable

Put the SSCNETⅢ cable in the duct or fix the cable at the closest part to the Motion CPU module with bundle material in order to prevent SSCNETⅢ cable from putting its own weight on SSCNETⅢ connector.
Leave the following space for wiring.

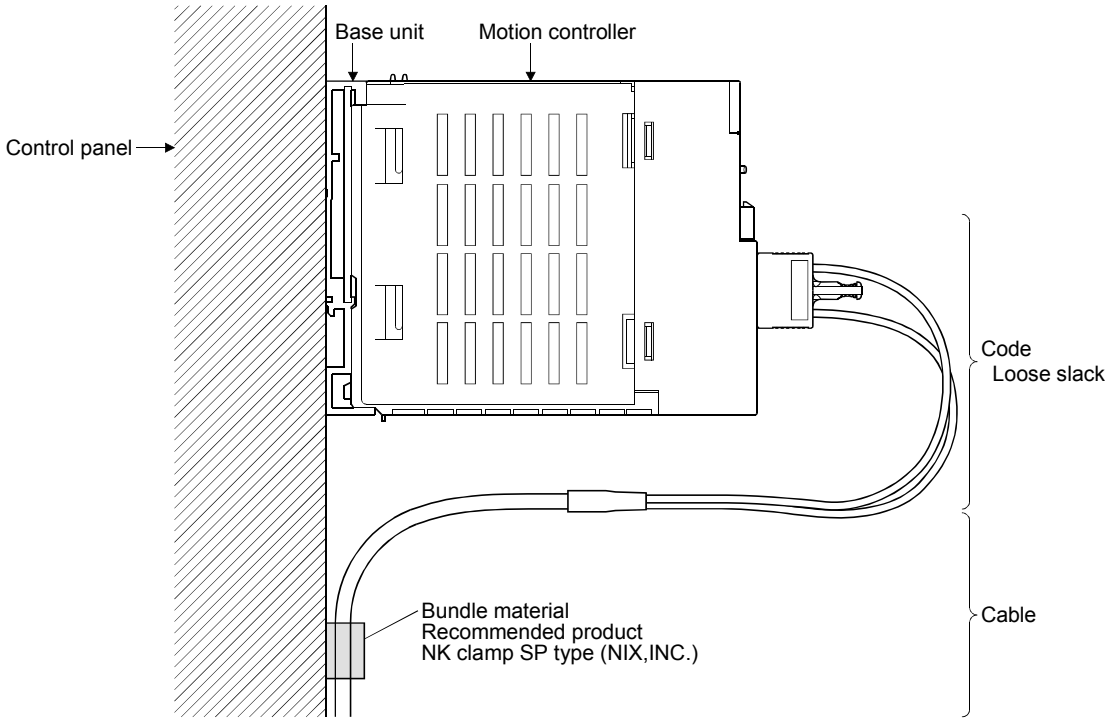
• Putting in the duct



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

• Bundle fixing

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



MEMO

5. TRIAL OPERATION AND ADJUSTMENT

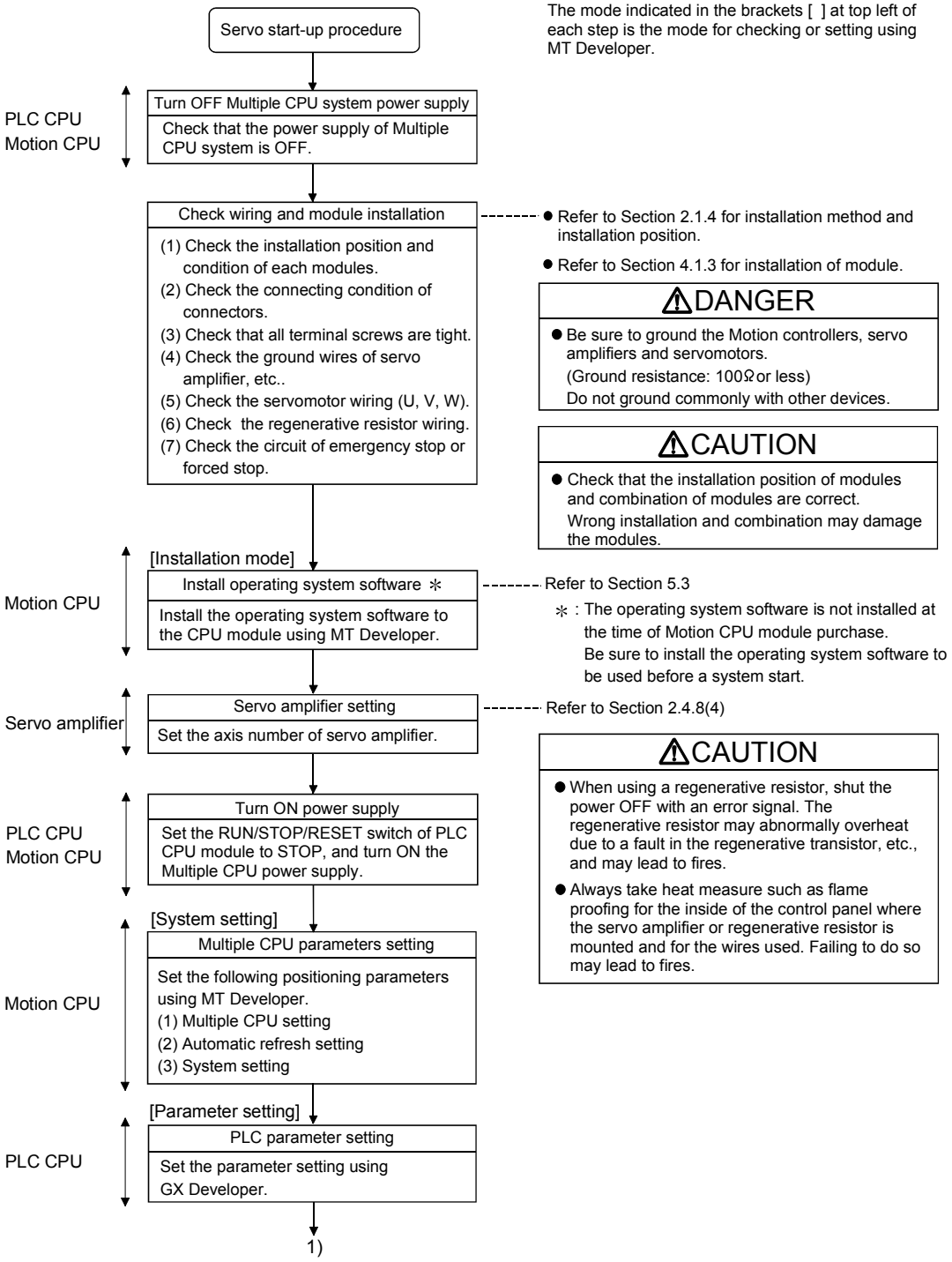
5.1 Checklist before Trial Operation

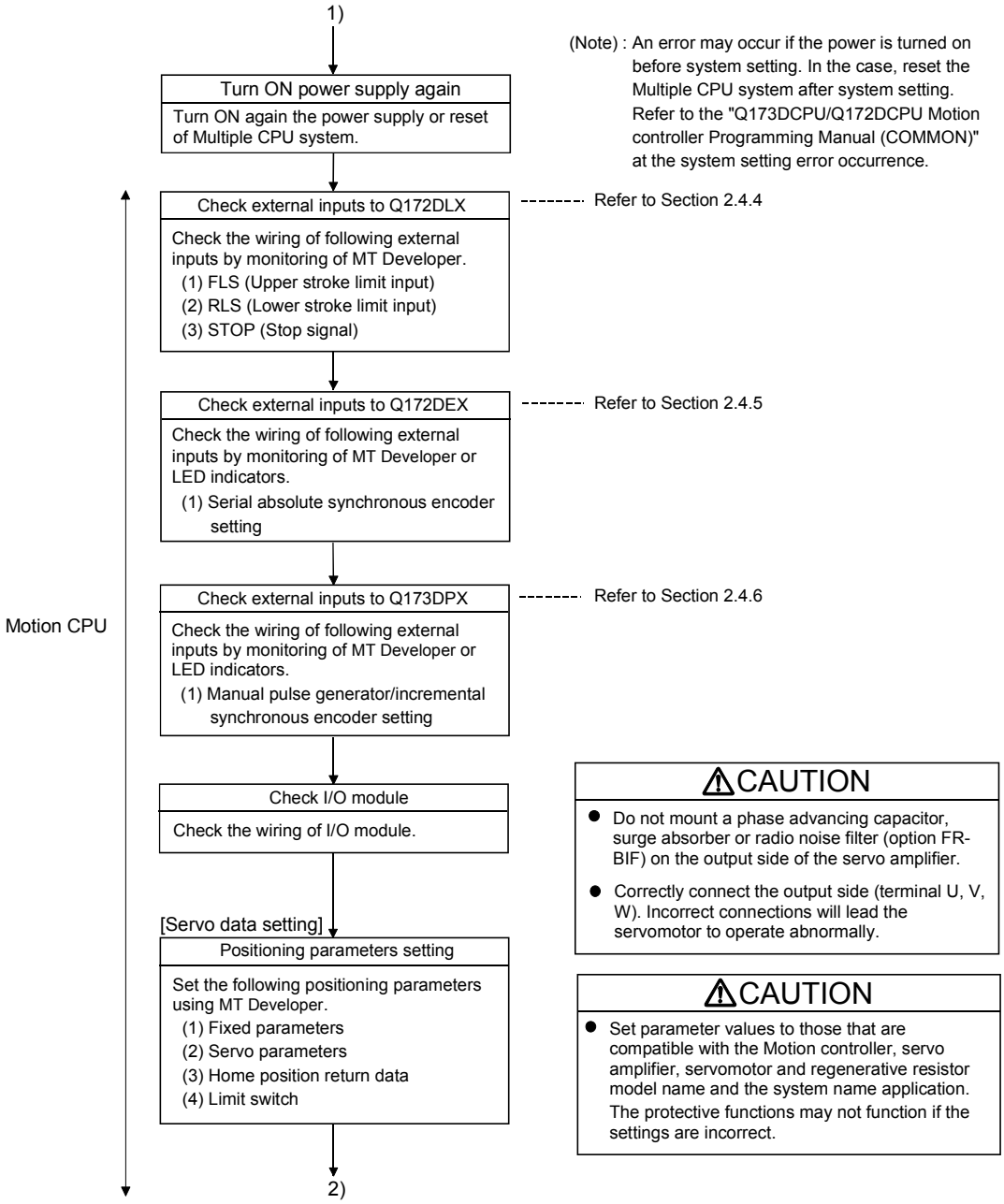
Table 5.1 Checklists before Trial Operation

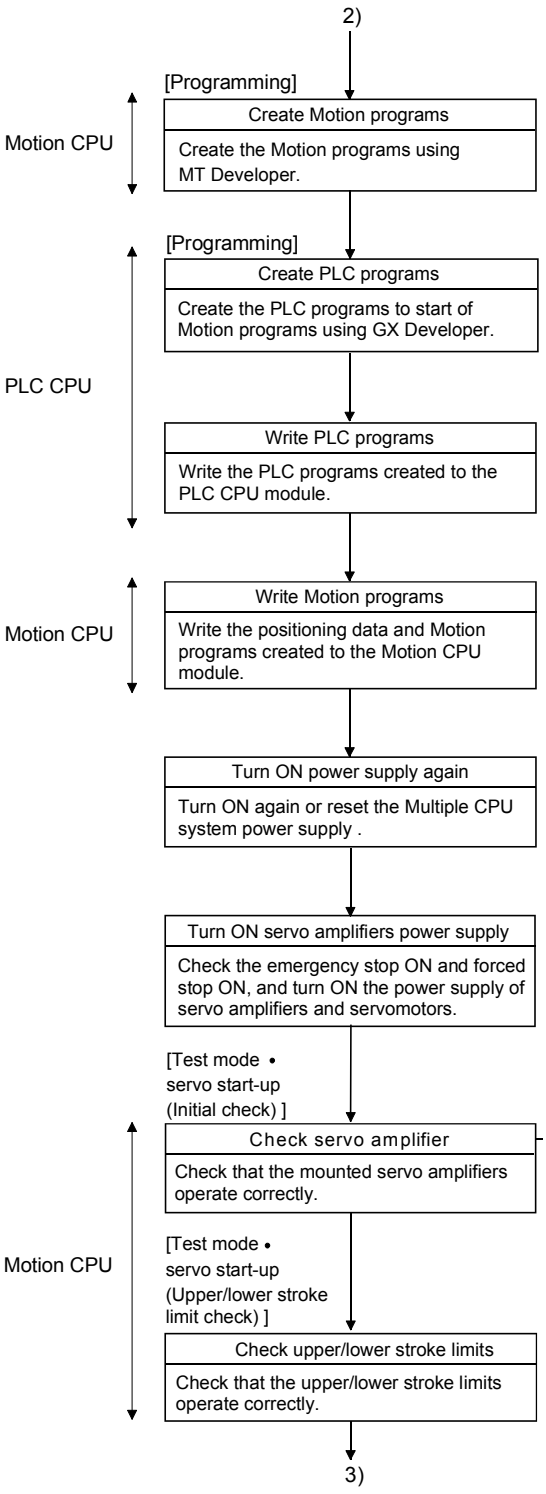
Model name	Confirmation Items	Check	Reference
Main base unit/ Extension base unit	(1) Check that the main base unit is Q38DB or Q312DB.	☐	2.4.3
	(2) Check that the model name of module is correct.	☐	2.2
	(3) Check that the installation order is correct.	☐	2.1.4
	(4) Check that the damage for installed modules.	☐	
	(5) Check that the modules are installed correctly.	☐	4.1.3
	(6) Check for looseness, rattling or distorted installation.	☐	4.1.1
	(7) Check that the module fixing screw tightening torque is as specified.	☐	4.1.1
	(8) Check that the total I/O points of I/O modules and intelligent function modules do not exceed the I/O points of the CPU module.	☐	Refer to the "Q173DCPU/ Q172DCPU" Motion controller Programming Manual(COMMON)"
Power supply module	(1) Check that the model name of power supply modules is correct.	☐	2.4.2
	(2) Check that the wire sizes of cables are correct.	☐	4.4.1
	(3) Check that the power line is wired correctly.	☐	4.4.1
	(4) Check that FG and LG are wired correctly.	☐	4.4.2
	(5) Check that the terminal screws are tightened correctly.	☐	
	(6) Check that the terminal screws are tightening torque is as specified.	☐	4.1.1
	(7) Check that the 100VAC, 200VAC and 24VDC wires are twisted as closely as possible respectively and run in the shortest distance.	☐	4.4.1
	(8) Check that the 100VAC, 200VAC and 24VDC wires are not bind the cable together with and run close to the power wires.	☐	4.4.1
	(9) Check that grounding of the earth terminal FG and LG.	☐	4.4.2
PLC CPU module	(1) Check that the model name of PLC CPU modules is correct.	☐	2.1.4 2.2
	(2) Check that the modules are installed to CPU slot or I/O slot 0 to 2 of the main base unit.	☐	2.1.4
Q173DCPU/Q172DCPU Motion CPU module	(1) Check that the Q173HCPU(-T)/Q172HCPU(-T)/Q173CPUN(-T)/ Q173CPUN(-T)/Q173CPU/Q172CPU is not used.	☐	2.1.4
	(2) Check that the modules are installed to I/O slot 0 to 2 of the main base unit.	☐	2.1.4
	(3) Check that the module fixing screws are tightened correctly.	☐	4.1.1
	(4) Check that the EMI forced stop input is wired correctly.	☐	3.2
	(5) Check that the external battery is installed.	☐	
	(6) Check that the battery cables are connected correctly.	☐	4.2.2
I/O module	(1) Check that the wire size of cable is correct.	☐	Refer to the I/O Module Type Building Block User's Manual
	(2) Check that the terminal block screws are tightened correctly.	☐	
	(3) Check that the cables connected to each terminal of terminal block correspond to the signal names.	☐	
	(4) Check that the external power supply are connected correctly. (24VDC, 5 VDC)	☐	
	(5) Check that the 100VAC, 200VAC and 24VDC wires are twisted as closely as possible respectively and run in the shortest distance.	☐	4.4.1
	(6) Check that the 100VAC, 200VAC and 24VDC wires are not bind the cable together with and run close to the I/O wires.	☐	4.4.1
	(7) Check that the I/O wires are wired correctly.	☐	4.4.1

Model name	Confirmation Items	Check	Reference
Q172DLX Servo external signals interface module/ Q172DEX synchronous encoder interface module/ Q173DPX Manual pulse generator interface module	(1) Check that the Q172DEX is installed to I/O slot 3 to 11 of the main base unit.	☐	2.1.4
	(2) Check that the Q172DLX/Q173DPX is installed to I/O slot 3 to 11 when installation to the main base unit.	☐	2.1.4
	(3).Check that the installation position of modules correspond to the system setting.	☐	Refer to the programming manual of operating system software.
	(4) Check that the connection with external equipments is correct.	☐	2.4.4 2.4.5 2.4.6
	(5) Check that the battery is connected to connector of Q172DEX correctly.	☐	6.4.2
SSCNETⅢ cable	(1) Check that the model name of SSCNETⅢ cables is correct.	☐	2.4.8
	(2) Check that the connecting position for connector of SSCNETⅢ cables are correct.		
	(3) Check that the SSCNETⅢ cables are connected correctly.	☐	4.2.1
	(4) Check for looseness, rattling or distorted connection.	☐	4.4.3
	(5) Check that the minimum bend radius or more secured.	☐	4.4.3
	(6) Check that the codes do not come in contact with wires/ cables that use materials where the plasticizing material is contained.	☐	4.2.1
Battery holder unit (Q170DBATC)	(1) Check that the lead connector of Q6BAT is connected to the connector (BATTERY) correctly.	☐	4.2.2
	(2) Check that the mounting orientation is correct. (Do not mount it downward.)	☐	4.1.4
	(3) Check that the battery cable is connected correctly.	☐	4.2.2
	(4) Check for looseness, rattling or distorted mounting.	☐	4.1.4
	(5) Check that the module fixing screw tightening torque is as specified.	☐	4.1.1
Serial absolute synchronous encoder unit (Q170ENC)	(1) Check that the amplitude, eccentricity and axial displacement relative to the machine side rotary shaft are within the permissible values.	☐	4.3
	(2) Check that a flexible coupling is used for coupling with the machine side rotary shaft.	☐	4.3
	(3) Check that the damage for units.	☐	
	(4) Check that the forcible impact is given on modules.	☐	4.3

5.2 Trial Operation and Adjustment Procedure




1)
Turn ON power supply again
Turn ON again the power supply or reset of Multiple CPU system.
(Note) : An error may occur if the power is turned on before system setting. In the case, reset the Multiple CPU system after system setting. Refer to the "Q173DCPU/Q172DCPU Motion controller Programming Manual (COMMON)" at the system setting error occurrence.
Motion CPU
Check external inputs to Q172DLX
Refer to Section 2.4.4
Check the wiring of following external inputs by monitoring of MT Developer.
(1) FLS (Upper stroke limit input)
(2) RLS (Lower stroke limit input)
(3) STOP (Stop signal)
Check external inputs to Q172DEX
Refer to Section 2.4.5
Check the wiring of following external inputs by monitoring of MT Developer or LED indicators.
(1) Serial absolute synchronous encoder setting
Check external inputs to Q173DPX
Refer to Section 2.4.6
Check the wiring of following external inputs by monitoring of MT Developer or LED indicators.
(1) Manual pulse generator/incremental synchronous encoder setting
Check I/O module
Check the wiring of I/O module.
CAUTION
Do not mount a phase advancing capacitor, surge absorber or radio noise filter (option FR-BIF) on the output side of the servo amplifier.
Correctly connect the output side (terminal U, V, W). Incorrect connections will lead the servomotor to operate abnormally.
[Servo data setting]
Positioning parameters setting
Set the following positioning parameters using MT Developer.
(1) Fixed parameters
(2) Servo parameters
(3) Home position return data
(4) Limit switch
CAUTION
Set parameter values to those that are compatible with the Motion controller, servo amplifier, servomotor and regenerative resistor model name and the system name application.
The protective functions may not function if the settings are incorrect.
2)



Axis No. and error description of servo amplifier which detected errors are displayed on initial check screen.

⚠DANGER

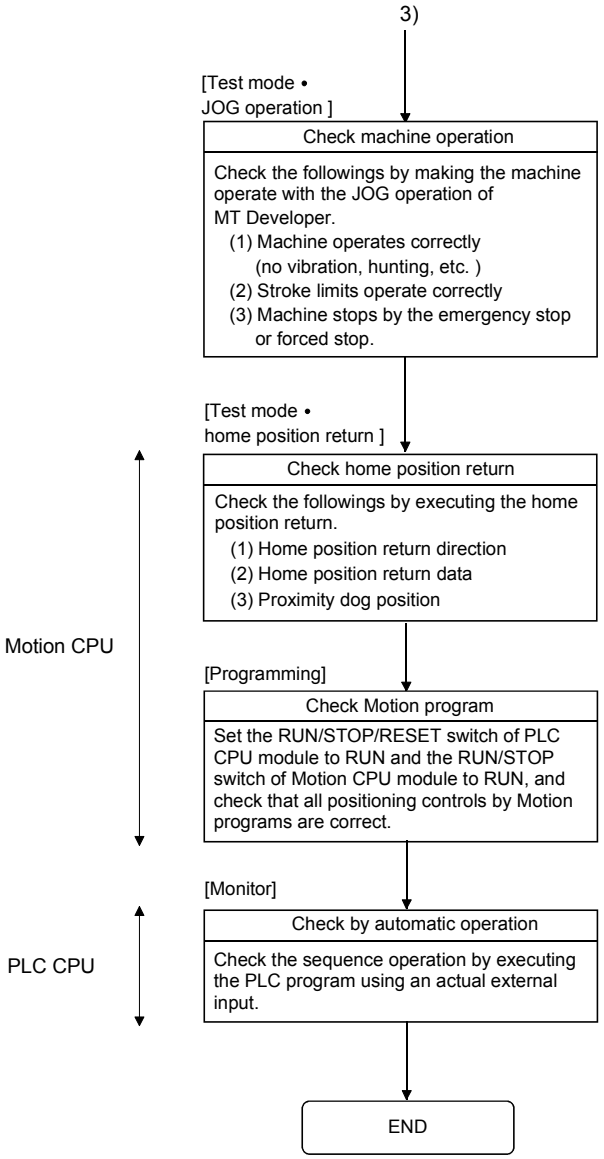
- Never open the front case or terminal cover at times other than wiring work or periodic inspections even if the power is OFF. The insides of the Motion controller and servo amplifier are charged and may lead to electric shocks.
- When performing wiring work or inspections, turn the power OFF, wait 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 mounting the Motion controller, servo amplifier and servomotor. Failing to do so may lead to electric shocks or damage.

⚠CAUTION

- Always mount 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.



⚠CAUTION

- The system must have a mechanical allowance so that the machine itself can stop even if the stroke limits switch is passed through at the max. speed.
- Execute the test operation in the system that it is low-speed as much as possible and put forced stop, and confirm the operation and safety.

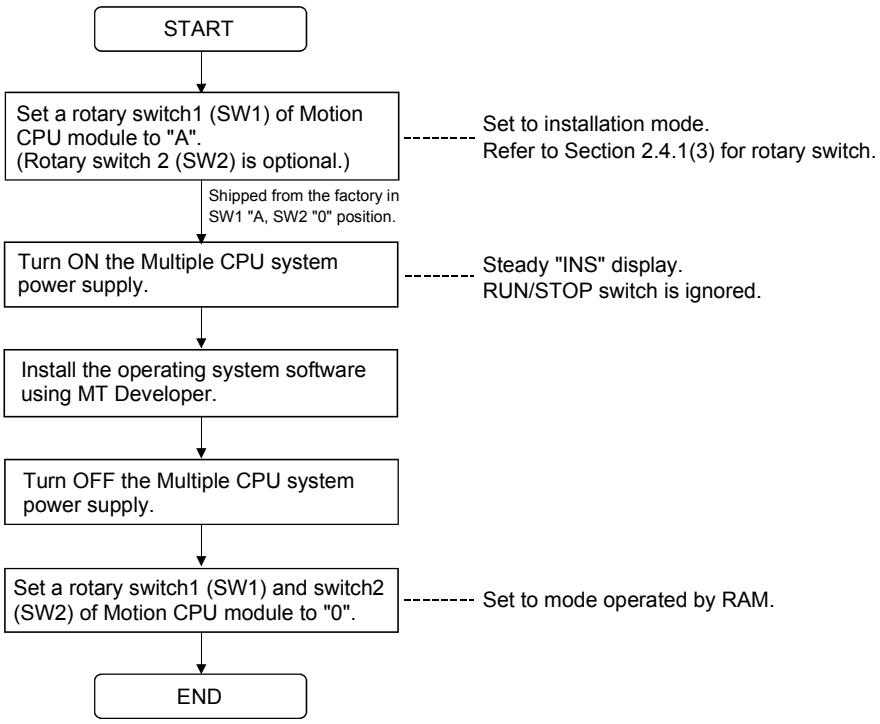
POINTS

(1) Make note of motor module names before the motor is mounted on a machine. The motor name plate may not be visible after the motor is mounted.

(2) When the servo amplifier, servomotor is first turned on, check the operation before the servomotor is mounted on a machine to avoid an unexpected accidents such as machine breakage.

5.3 Operating System Software Installation Procedure

The operating system software must be installed to the Motion CPU module by using the peripheral device and MT Developer.
The installation procedure is shown below.



POINTS

(1) The operating system software was not installed at the time of Motion CPU module purchase. Be sure to install the operating system software to be used before a system start.

(2) Be sure to change a rotary switch after turning off the power supply.

(3) Even if the operating system software is installed, the programs, parameters and absolute position data written in the Motion CPU module does not be rewritten.

(4) Do not turn off the power supply during installation. Doing so could result damage the Motion CPU module.

(5) When the operating system software is installed at set the multiple Motion CPU modules not installed in one base unit, be sure to set to installation mode (set a rotary switch1 (SW1) to "A" position.) of all not installed Motion CPU modules to install.
(Note): If the power supply is turned ON without setting all Motion CPU module not installed to installation mode, it does not operate normally.
Be sure to install the operating system software before system start.

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 supply ON	Installation of unit/module and basic wiring	Check that the each module is installed correctly.	☐
		Check that the each connector is connected correctly.	☐
		Check the each terminal screw for looseness.	☐
		Check that the earth wires of power supply module or servo amplifiers, etc. are correct.	☐
		Check that the servomotor wiring is correct.	☐
		Check that the regenerative option wiring is correct.	☐
		Check that the circuit of emergency stop and forced stop are correct.	☐
		Check that the wiring of each power supply and I/O are correct.	☐
		Check that the rotary switch setting is correct.	☐
Power supply ON/ Motion CPU module in STOP status/ PLC CPU module in STOP status	Installation of OS	Check that the operating system software is compatible.	☐
	System setting	Check that the system setting is correct.	☐
	Q172LX external signal	Check that the upper/lower stroke limit inputs are correct.	☐
		Check that the STOP signal input is correct.	☐
		Check that the proximity dog and speed/position switching signal input are correct.	☐
	Program/ positioning data	Check that the Motion program, PLC program and positioning data are stored in the PLC/Motion CPU module correctly.	☐
	Basic axis operations (Check each axis)	Check the communications with servo amplifiers.	☐
		Check that the rotation direction for JOG operation is correct.	☐
		Check that the upper/lower limit switches operate correctly.	☐
Motion CPU module in RUN status/ PLC CPU module in STOP status		Check that the rotation at maximum command speed is motor rating or less.	☐
		Check that the machine operates correctly by the JOG operation.	☐
		Check that the machine stops by the upper/lower stroke limit.	☐
		Check that the machine stops by the emergency stop or forced stop.	☐
		Check that the home position return is executed correctly.	☐
		Check that each positioning control of Motion program is operates correctly.	☐
Motion CPU module in RUN status/ PLC CPU module in RUN status	Manual operation	Check the each operation in manual operation mode of system during Motion program execution.	
		Check that the machine operation stops immediately by the emergency stop or forced stop.	☐
		Check the operation of each actuator and confirmation limit switch.	☐
		Check that the emergency stop, forced stop and equipment alarm signals are correct.	☐
		Checks in compliance with control specifications specific to system and equipment.	☐
	Automatic operation	Check the each operation in manual operation mode of system during Motion program execution.	
		Check that the automatic operation motions.	☐
		Check that the machine operation stops immediately by the emergency stop or forced stop.	☐
		Check that the module or equipment alarm causes an immediate stop or cycle stop.	☐
		Check that the restoring operation can be performed after an alarm stop.	☐
		Make other checks in compliance with control specifications specific to system and equipment.	☐
	Torque check	Check that the acceleration/deceleration torque is maximum torque or less.	☐
		Check that the continuous effective load torque is rated torque or less.	☐

6. INSPECTION AND MAINTENANCE

⚠DANGER

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

⚠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.
- Use any radio communication device such as a cellular phone or a PHS phone more than 25cm (9.85 inch) away in all directions of the Motion controller.
  Failure to do so may cause a malfunction.
- Completely turn off the externally supplied power used in the system before installation or removing the module. Not doing so could result in damage to the product.
- Do not install/remove the module on to/from base unit or terminal block more than 50 times, after the first use of the product. Failure to do so may cause the module to malfunction due to poor contact of connector.
- Do not drop or impact the battery installed to the module. Doing so may damage the battery, causing battery liquid to leak in the battery.
  Do not use the dropped or impacted battery, but dispose of it.
- Before touching the module, always touch grounded metal, etc. to discharge static electricity from human body. Failure to do so may cause the module to fail or malfunction.
- Do not directly touch the module's conductive parts and electronic components. Touching them could cause an operation failure or give damage to the module.

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

6.1 Maintenance Works

6.1.1 Instruction of inspection works

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

⚠DANGER

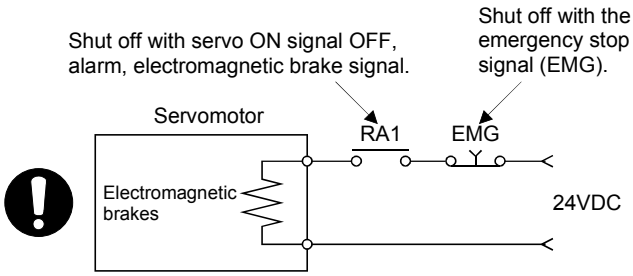
- Never open the front case or terminal covers while the power is ON or the unit is running, as this may lead to electric shocks.
- Never run the unit with the front case or terminal cover removed. The high voltage terminal and charged sections will be exposed and may lead to electric shocks.
- Never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

⚠CAUTION

- 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 mounting the Motion controller, servo amplifier and servomotor. Failing to do so may lead to electric shocks or damage.
- Perform the daily and periodic inspections according to the instruction manual.
- Perform maintenance and inspection after backing up the program and parameters for the Motion controller and servo amplifier.
- Do not place fingers or hands in the clearance when opening or closing any opening.
- Periodically replace consumable parts such as batteries according to the instruction manual.
- Do not touch the lead sections such as ICs or the connector contacts.
- Do not place the Motion controller or servo amplifier on metal that may cause a power leakage or wood, plastic or vinyl that may cause static electricity buildup.
- Do not perform a megger test (insulation resistance measurement) during inspection.
- When replacing the Motion controller or servo amplifier, always set the new unit settings correctly.
- After maintenance and inspections are completed, confirm that the position detection of the absolute position detector function is correct.

⚠CAUTION

- Do not short circuit, charge, overheat, incinerate or disassemble the batteries.
- The electrolytic capacitor will generate gas during a fault, so do not place your face near the Motion controller or servo amplifier.
- The electrolytic capacitor and fan will deteriorate. Periodically change these to prevent secondary damage from faults. Replacements can be made by our sales representative.
- If an error occurs in the self diagnosis of the Motion controller or servo amplifier, confirm the check details according to the instruction manual, and restore the operation.
- If a dangerous state is predicted in case of a power failure or product failure, in order to prevent that state, use a servomotor with electromagnetic brakes for maintenance or mount a brake mechanism externally.
- Use a double circuit construction so that the electromagnetic brake operation circuit can be operated by emergency stop signals set externally.



- If an error occurs, remove the cause, secure the safety and then resume operation after alarm release.
- The unit may suddenly restart after a power failure is restored, so do not go near the machine. (Design the machine so that personal safety can be ensured even if the machine restarts suddenly.)
- Confirm and adjust the program and each parameter before operation. Unpredictable movements may occur depending on the machine.
- Extreme adjustments and changes may lead to unstable operation, so never make them.
- Do not apply a voltage other than that specified in the instruction manual on any terminal.
  Doing so may lead to destruction or damage.
- Do not mistake the terminal connections, as this may lead to destruction or damage.
- Do not mistake the polarity (+ / -), as this may lead to destruction or damage.
- Do not touch the heat radiating fins of controller or servo amplifier, regenerative resistor and 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 lay them closely. 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.

6.2 Daily Inspection

The items that must be inspected daily are shown below.

Table 6.1 Daily Inspection

Item	Inspection item			Inspection	Criterion	Action
1	Mounting of base unit			Check that the fixing screws are not loose and the cover is not dislocated.	The screws and cover must be mounted securely.	Retighten the screws.
2	Installation of I/O module			Check that the module is not dislocated and the unit fixing hook is engaged securely.	The module fixing hook must be engaged and installed correctly.	Securely engaged the module fixing hook.
3	Connecting conditions			Check for loose terminal screws.	Screws should not be loose.	Retighten the terminal screws.
				Check for distance between solderless terminals.	The proper clearance should be provided between solderless terminals.	Correct.
				Check the connector part of the cable.	Connections should not be loose.	Retighten the connector fixing screws.
4	Module indication LED	Power supply module	[POWER] LED	Check that the LED is ON.	The LED must be ON (green). (Abnormal if the LED is OFF or ON (red)).	Refer to "QCPU User's Manual (Function Explanation, Program Fundamentals)".
		PLC CPU module	[MODE] LED	Check that the LED is ON.	The LED must be ON (green). (Abnormal if the LED is OFF or flickering.)	
			[RUN] LED	Check that the LED is ON in RUN status.	The LED must be ON. (Abnormal if the LED is OFF.)	
			[ERR.] LED	Check that the LED is OFF.	The LED must be OFF. (Abnormal if the LED is ON or flickering.)	
			[BAT.] LED	Check that the LED is OFF.	The LED must be OFF. (Abnormal if the LED is ON.)	
		Motion CPU module	Normal		Steady "RUN" display. (Abnormal if "RUN" does not display or incorrect display.)	Refer to Section 2.4.1(2)
					Steady "STP" display. (Abnormal if "STP" does not display or incorrect display.)	
			Battery error warning (2.7V or less)		"BT1" does not display. (Abnormal if steady "BT1" display.)	Refer to Section 6.5
			Battery error warning (2.5V or less)		"BT2" does not display. (Abnormal if steady "BT2" display.)	
			WDT error		" . . . " does not display. (Abnormal if steady " . . ." display.)	Refer to Section 2.4.1(2)
			Others		" AL" does not flash. (Abnormal if " . . ." flashes.)	
	Module indication LED	I/O module	Input LED	Check that the LED is ON/OFF.	The LED must be ON when the input power is turned ON. The LED must be OFF when the input power is turned OFF. (Abnormal if the LED does not turn ON or turn OFF as indicated above.)	Refer to "I/O Module Type Building Block User's Manual".
			Output LED	Check that the LED is ON/OFF.	The LED must be ON when the input power is turned ON. The LED must be OFF when the input power is turned OFF. (Abnormal if the LED does not turn ON or turn OFF as indicated above.)	

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	Judgment criteria	Remedy
1	Ambient environment	Ambient temperature	Measure with a thermometer and a hygrometer. Measure corrosive gas.	0 to 55 °C (32 to 131 °F)	When the controller is used in the board, the ambient temperature in the board becomes the 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	Change the power supply.
				170 to 264VAC	
				15.6 to 31.2VDC	
3	Installation	Looseness, rattling	Move the module to check for looseness and rattling.	The module must be installed solidly.	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	Connection	Looseness of terminal screws	Try to further tighten screws with a screwdriver.	Screws must not be loose.	Retighten the terminal screws.
		Proximity of solderless terminals to each other	Check visually.	Solderless 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		Check the 7-segment LED at the front side of CPU module.	Must be turned OFF "BT1" or "BT2" display.	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.
			Check the length of term after purchasing the battery	Must not be used more than 5 years.	
			Check that SM51 or SM58 is turned OFF using MT Developer in monitor.	Must be turned OFF.	Replace the battery with a new one when SM51 or SM58 is ON.

6.4 Life

The following parts must be changed periodically as listed below.
However, if any part is found faulty, it must be changed immediately even when it has not yet reached the end of its life, which depends on the operating method and environmental conditions.
For parts replacement, please contact your sales representative.

Table 6.3 Life

Module name	Part name	Life guideline	Remark
Motion CPU module	Super capacitor	10 years	Life guideline is reference time. It must be changed immediately even when it has not yet reached the life guideline.
Motion module	Electrolytic capacitor		
Synchronous encoder	Super capacitor	2 to 3 years	
	Bearings		

(1) The life of the capacitor greatly depends on ambient temperature and operating conditions. The capacitor will reach the end of its in 10 years of continuous operation in normal air-conditioned environment.

(2) Change the bearings in 20,000 to 30,000 hours as a guideline under rated speed. This differs on the operating conditions, The bearings must also be changed if unusual noise or vibration is found during inspection.

6.5 External Battery

The battery installed in the Motion CPU module is used for data retention during the power failure of the program memory and latch device. Special relays SM51 or SM58 turn on due to the decrease of battery voltage. Even if the special relays turn on, the program and retained data are not erased immediately.
However, if these relays are overlooked, the contents may be erased.
After relay SM51 or SM58 turns on, replace the battery quickly within the data retention time for power failure (3 minutes).

POINT

(1) SM51 or SM58 turns on when the battery voltage falls below the specified value, and remains ON even after the voltage is recovered to the normal value. SM51 or SM58 turns off by power supply on again or reset.

(2) After SM51 or SM52 turns on, replace the battery quickly.
- SM51 turns on at the battery voltage 2.5V or less.
- SM58 turns on at the battery voltage 2.7V or less.

(3) If SM51 turns on, the details of the programs, parameters and absolute position data cannot be guaranteed.
It is recommended to back-up the battery periodically.

6.5.1 Battery life

(1) Q173DCPU/Q172DCPU, Q172DEX module battery life

The battery life is shown below.

Module type	Battery type		Battery life (Total power failure time) [h] (Note-1)				
			Power-on time ratio (Note-2)	Guaranteed value (Note-3) (MIN) (75°C (167°F))	Guaranteed value (Note-4) (TYP) (40°C (104°F))	Actual service value (Note-5) (Reference value) (TYP) (25°C (77°F))	Backup time after alarm
Q173DCPU/ Q172DCPU	External battery (Q6BAT) (Note-7)		0%	20000	43800	43800	90 (After SM51/SM52 ON)
			30%	27000			
			50%	31000			
			70%	36000			
			100%	43800			
Q172DEX	Internal battery (A6BAT/ MR-BAT)	Q170ENC×1	0%	3000	8000	24000	40 (After Error code 1152 occurrence)
			30%	4000	11000	34000	
			50%	6000	16000	43800	
			70%	10000	26000	43800	
			100%	43800	43800	43800	
		Q170ENC×2	0%	1500	4000	12000	
			30%	2000	5500	17000	
			50%	3000	8000	21900	
			70%	5000	13000	21900	
			100%	43800	43800	43800	

(Note-1) : The actual service value indicates the average value, and the guaranteed time indicates the minimum time.

(Note-2) : The power-on time ratio indicates the ratio of Multiple CPU system power-on time to one day (24 hours).
(When the total power-on time is 17 hours and the total power-off time is 7 hours, the power-on time ratio is 70%.)

(Note-3) : The guaranteed value (MIN) ; equivalent to the total power failure time that is calculated based on the characteristics value of the memory (SRAM) supplied by the manufacturer and under the storage ambient temperature range of -25°C to 75°C (-13 to 167°F) (operating ambient temperature of 0°C to 55°C (32 to 131°F)).

(Note-4) : The guaranteed value (TYP) ; equivalent to the total power failure time that is calculated based on the normal air-conditioned environment (40°C (104°F)).

(Note-5) : The actual service value (Reference value) ; equivalent to the total power failure time that is calculated based on the measured value and under the storage ambient temperature of 25°C (77°F). This value is intended for reference only, as it varies with characteristics of the memory.

(Note-6) : In the following status, the backup time after power OFF is 3 minutes.
- The battery connector/Q6BAT lead connector is disconnected.
- The battery cable/lead wire of Q6BAT is broken.

(Note-7) : Set the battery (Q6BAT) to battery holder unit (Q170DBATC).

POINT

(1) Do not use the battery exceeding its guaranteed life.

(2) When the battery hours (total power failure time) may exceed its guaranteed value, take the following measure.
- Perform ROM operation to protect a program even if the battery dies at the Multiple CPU system power-OFF.
- If SM51 or SM52 turns on, the contents of programs, parameters and absolute position data cannot be guaranteed.
  It is recommended to back-up the battery periodically.

(3) When the battery-low special relay SM52 turns on, immediately change the battery. Even if the alarm has not yet occurred, it is recommended to replace the battery periodically according to the operating condition

(4) The self-discharge influences the life of battery without the connection to Q173DCPU/Q172DCPU/Q172DEX. The external battery should be exchanged approximately every 4 or 5 years.
And, exchange the battery with a new one in 4 to 5 years even if a total power failure time is guaranteed value or less.

6.5.2 Battery replacement procedure

(1) Battery replacement procedure of the Battery holder unit

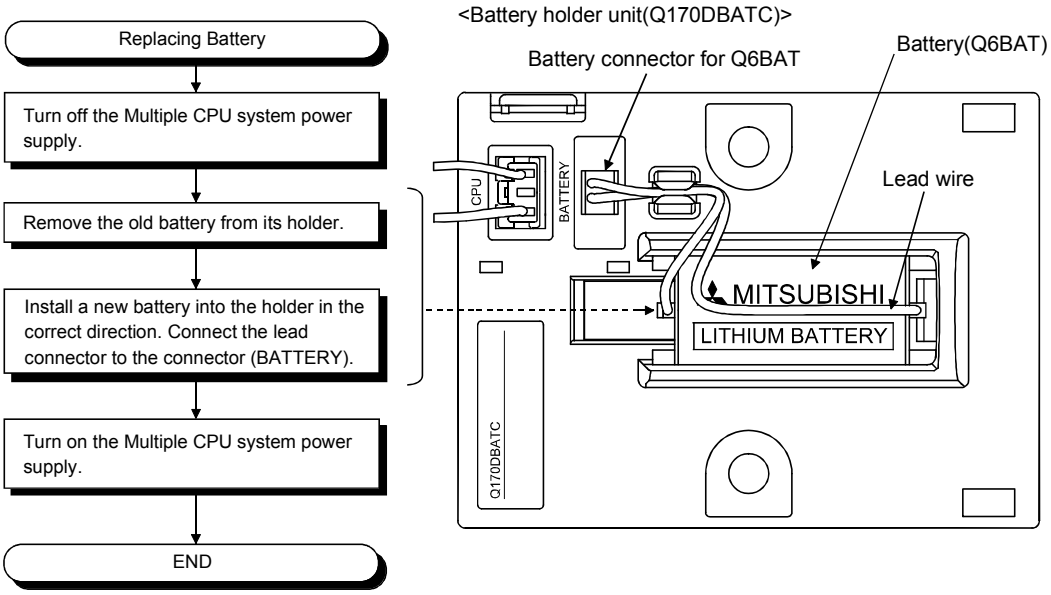
When the battery has been exhausted, replace the battery with a new one in accordance with the procedure shown below.

POINTS

When replacing the battery, pay attention to the following.

(1) Back up the data using MT Developer before starting replacement.

(2) Firstly back up the data stored in the Motion CPU to the personal computer which is installed MT Developer then replace the battery with a new one. After setting the battery in the Battery holder unit, verify the backing up the data to the personal computer which is installed MT Developer and the data in the Motion CPU module, confirm the data is not changing.
In the following status, the backup time after power OFF is 3 minutes.
- The battery connector/Q6BAT lead connector is disconnected.
- The battery cable/lead wire of Q6BAT is broken.



(2) Q172DEX module battery replacement procedure

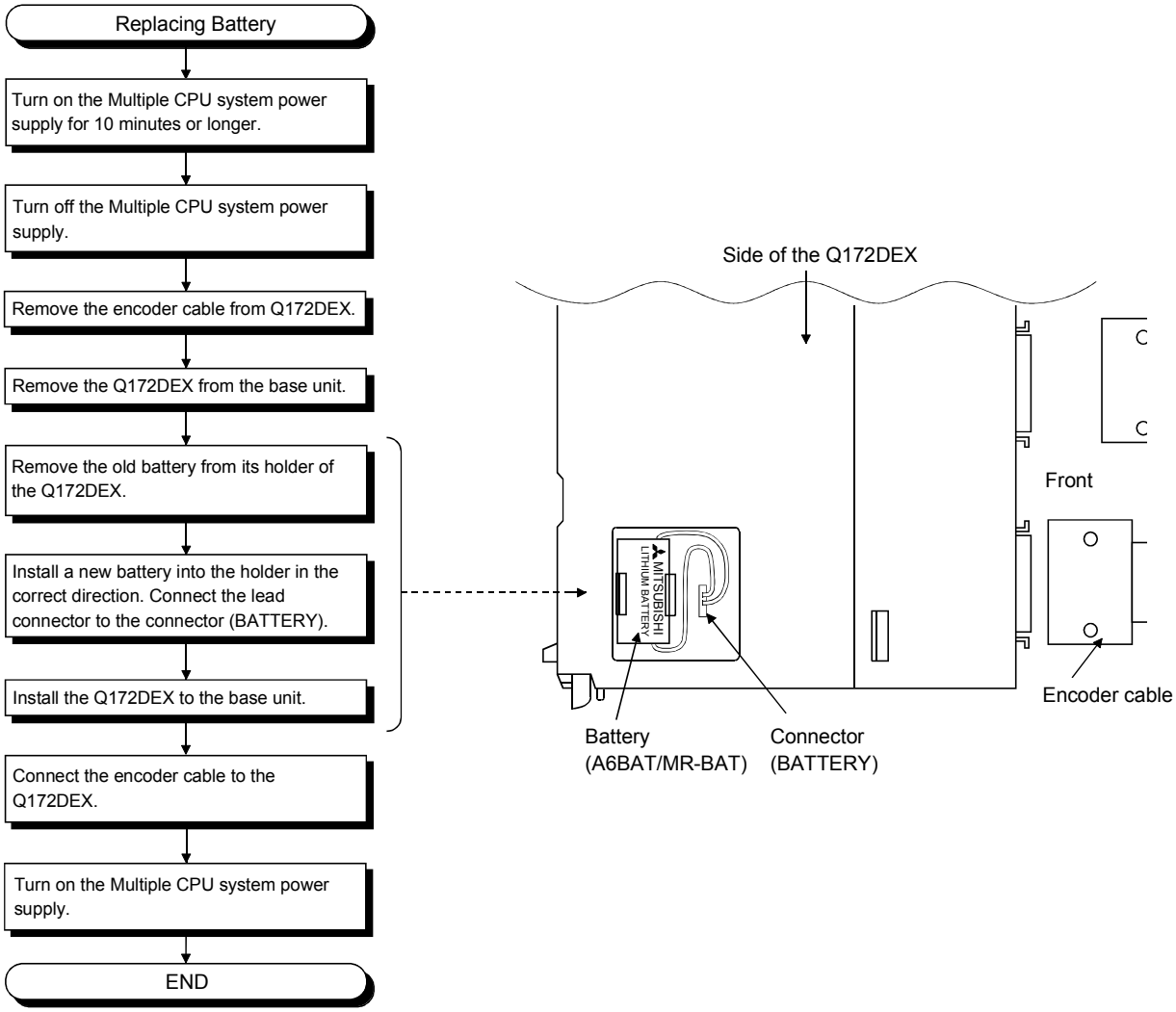
When the battery has been exhausted, replace the battery with a new one in accordance with the procedure shown below.

POINT

When replacing the battery, pay attention to the following.

(1) The Multiple CPU power supply must be on for 10 minutes or longer before dismounting the battery.

(2) Encoder data in the memory are backed up for a while by a capacitor even after the battery is removed. However, since data in the memory may be erased if the time for replacement exceeds the backup time shown the following guaranteed value, replace the battery quickly.
• Backup time by capacitor : 3 minutes



6.5.3 Resuming operation after storing the Motion controller

When the operation is to be resumed after being stored with the battery removed or the battery has gone flat during storage, the contents of programs, parameters, absolute position data and latch data cannot be guaranteed.
Before resuming operation, write the contents of programs, parameters, absolute position data and latch data backed up prior to storage to SRAM built-in Motion CPU module.

POINT
Before storing the Motion controller, always back up the contents of programs, parameters, absolute position data and latch data to SRAM built-in Motion CPU module.

6.6 Troubleshooting

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

6.6.1 Troubleshooting basics

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

(1) Visual inspection

Visually check the following.

(a) Movement of machine (stopped condition, operating condition)
(b) Power supply on/off
(c) Status of input/output devices
(d) Installation condition of the Power supply module, Motion CPU module, PLC CPU module, I/O module, Q172DLX/Q172DEX/Q173DPX Motion module, SSCNETⅢ cable, Synchronous encoder cable.
(e) State of wiring (I/O cables, cables)
(f) Display states of various types of indicators
PLC CPU module : MODE LED, RUN LED, ERR. LED, I/O LED, etc.
Motion CPU module : 7-segment LED (Installation mode, Operation mode, Battery error, STOP/RUN, etc.)
(g) Status of setting of various types of switches (Setting of No. of stages of extension base unit, power interrupt hold-on status).

After checking (a) to (g), monitor the operating conditions of servomotors and error code using MT Developer and GX Developer.

(2) Check of trouble

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

(a) Set the RUN/STOP switch of Motion CPU module to STOP.
(b) Reset the trouble with the RUN/STOP/RESET switch of PLC CPU module.
(c) Turn ON and OFF the Multiple CPU system power supply.

(3) Narrowing down the range of trouble occurrence causes

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

(a) Multiple CPU system or external devices
(b) Motion CPU or PLC CPU
(c) I/O module or others
(d) Servo program or Motion SFC program
(e) PLC program

6.6.2 Troubleshooting of Motion CPU module

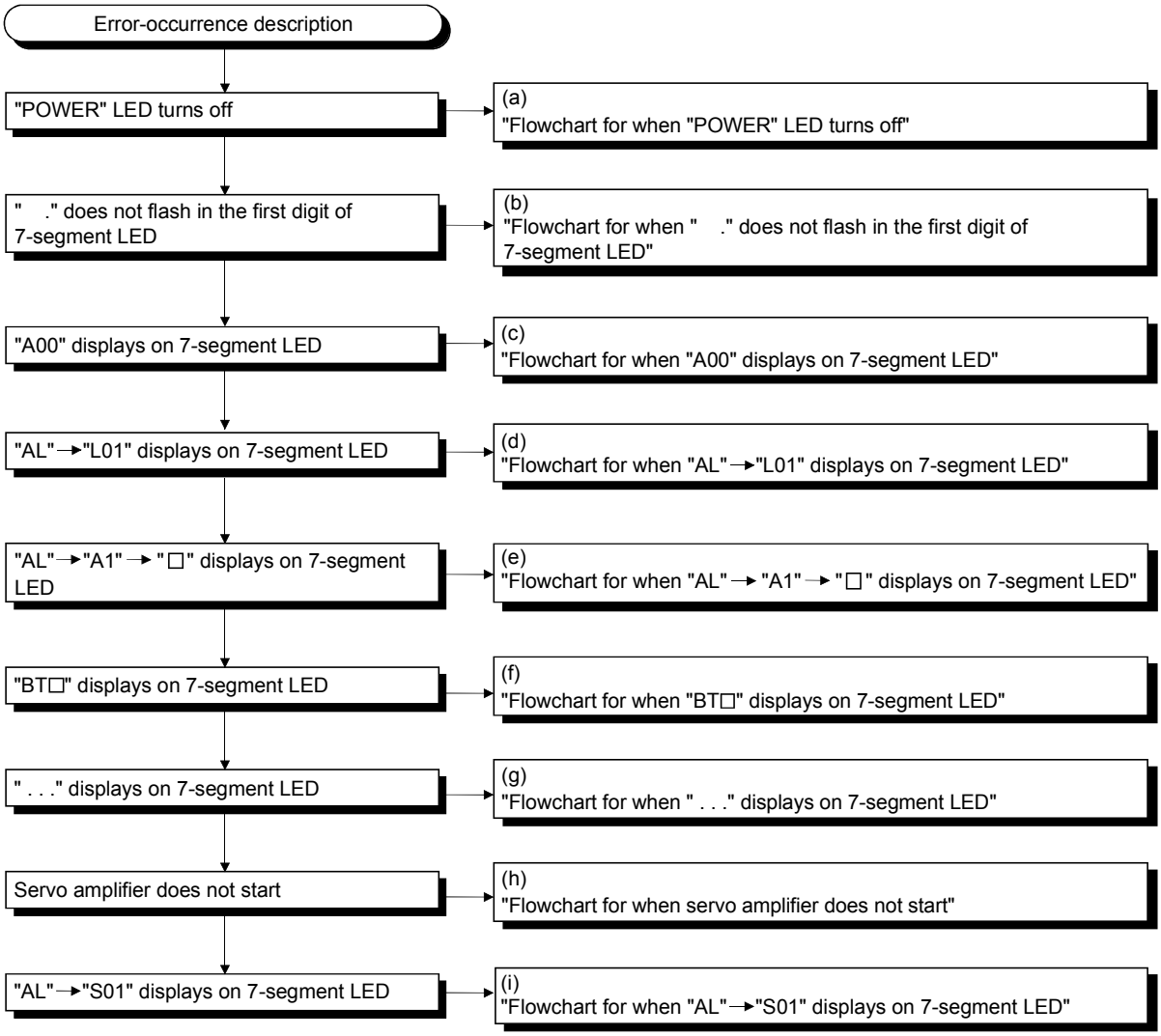
This section describes the contents of troubles for the error codes and corrective actions of the troubles.
As for troubleshooting of PLC CPU, refer to the QCPU User's Manual (Hardware Design, Maintenance and Inspection) of their respective modules.

POINT

Check that the operating system software is installed before starting the Motion CPU module.

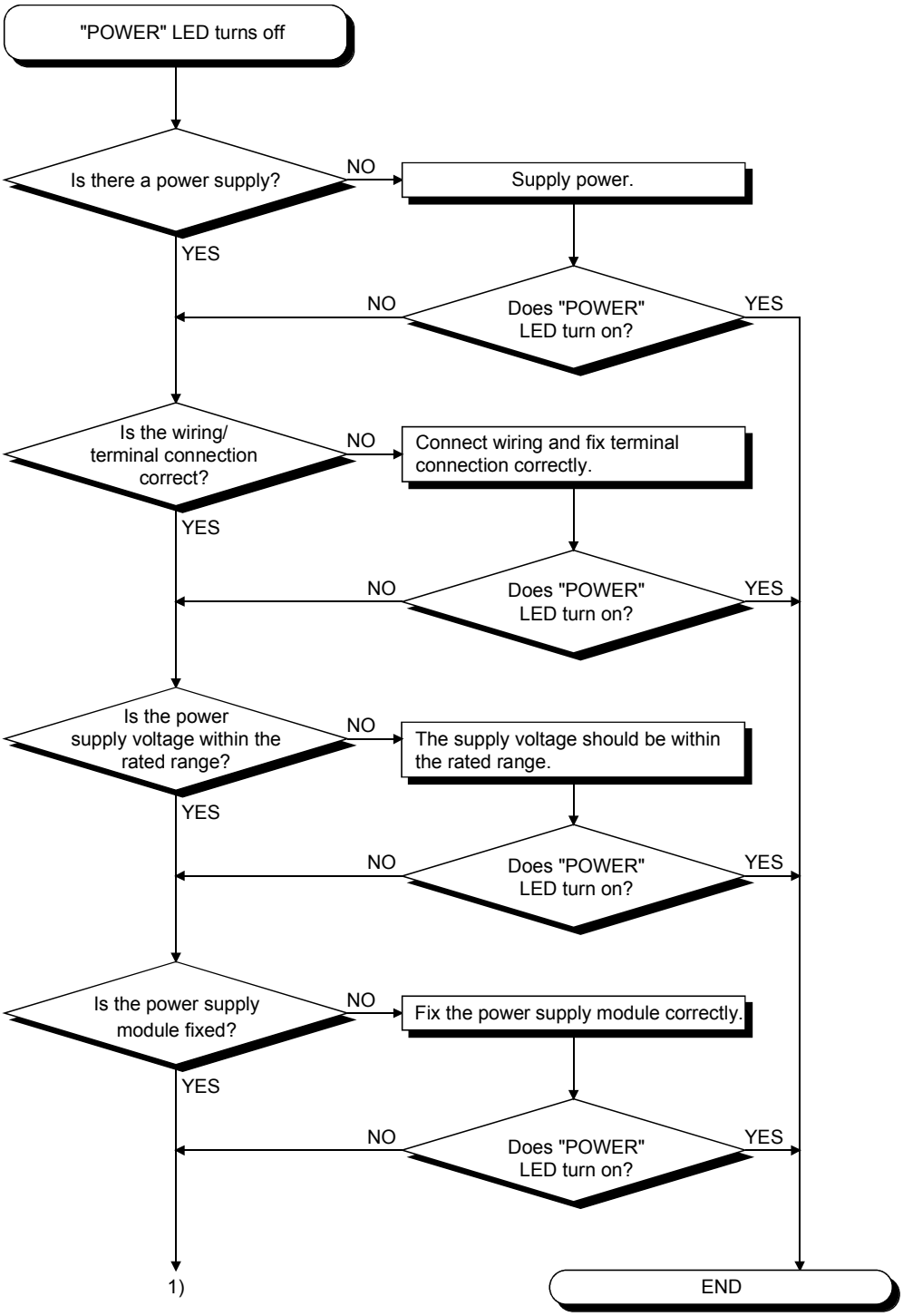
(1) Troubleshooting flowchart

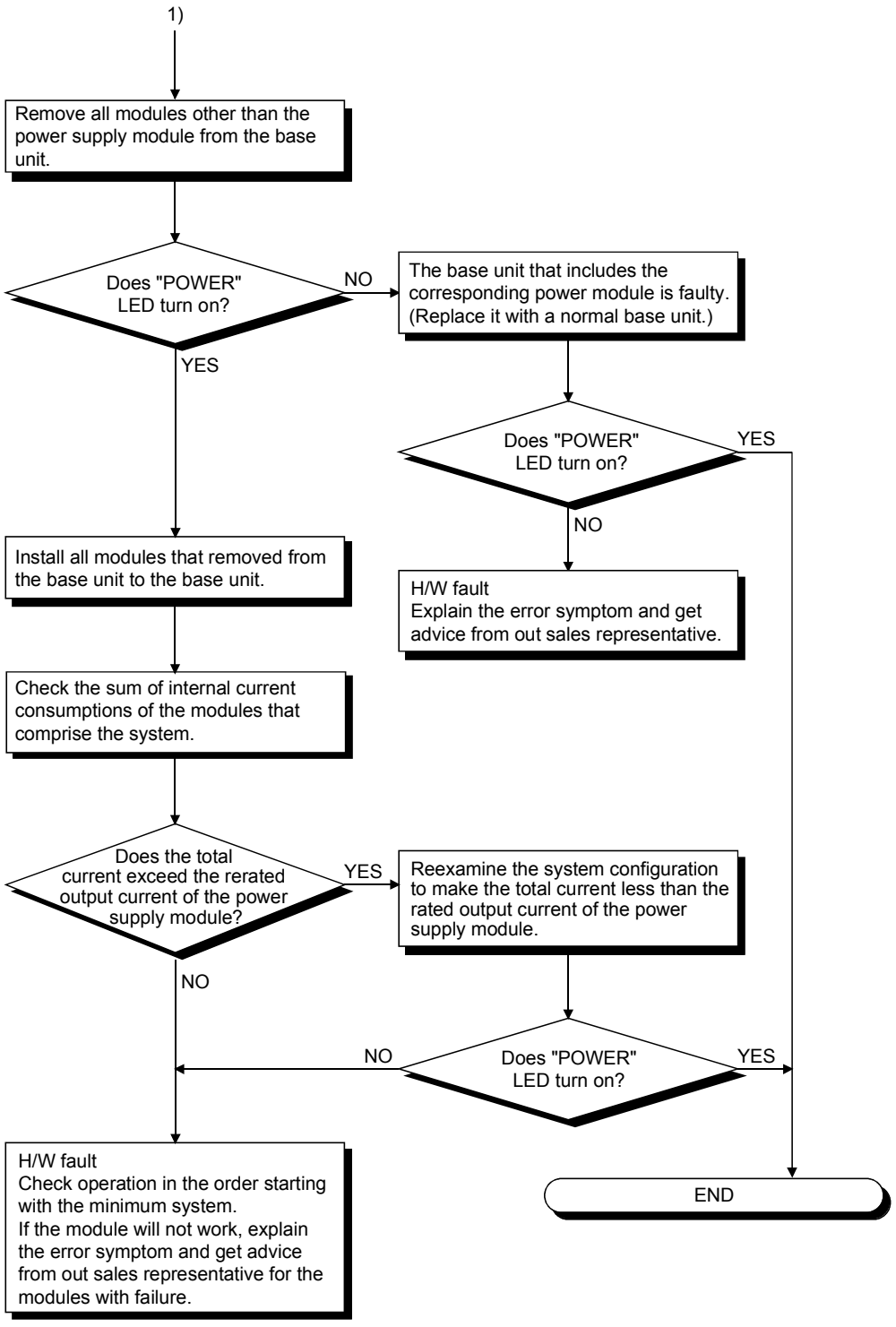
The followings show the contents of the troubles classified into a variety of groups according to the types of events.



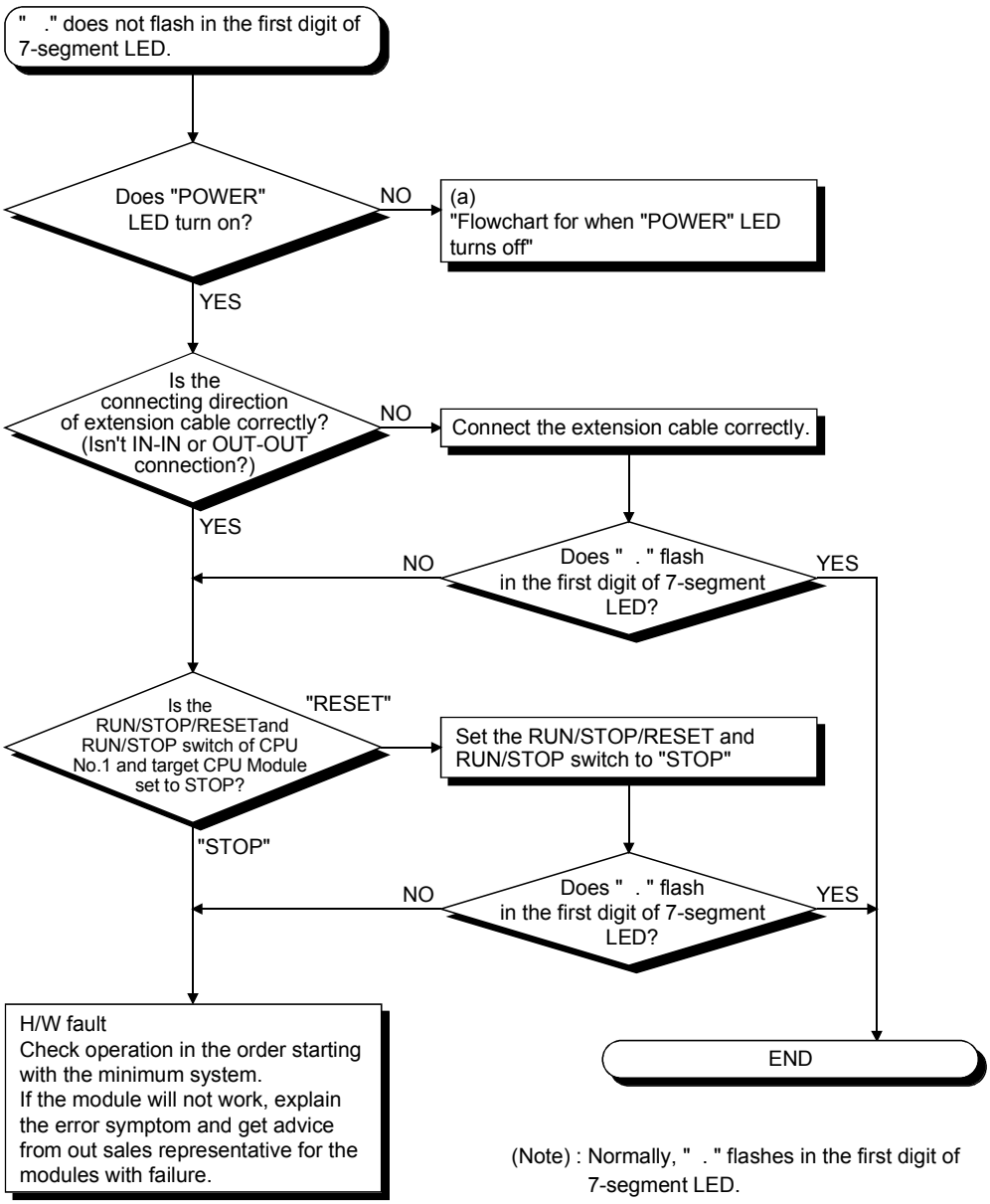
(a) Flowchart for when "POWER" LED turns off

The following shows the flowchart when "POWER" LED of the power supply module turns off at the power supply ON or during operation.




1)
Remove all modules other than the power supply module from the base unit.
Does "POWER" LED turn on?
NO
The base unit that includes the corresponding power module is faulty. (Replace it with a normal base unit.)
YES
Does "POWER" LED turn on?
YES
NO
H/W fault
Explain the error symptom and get advice from out sales representative.
Install all modules that removed from the base unit to the base unit.
Check the sum of internal current consumptions of the modules that comprise the system.
Does the total current exceed the rerated output current of the power supply module?
YES
Reexamine the system configuration to make the total current less than the rated output current of the power supply module.
NO
Does "POWER" LED turn on?
NO
YES
H/W fault
Check operation in the order starting with the minimum system.
If the module will not work, explain the error symptom and get advice from out sales representative for the modules with failure.
END

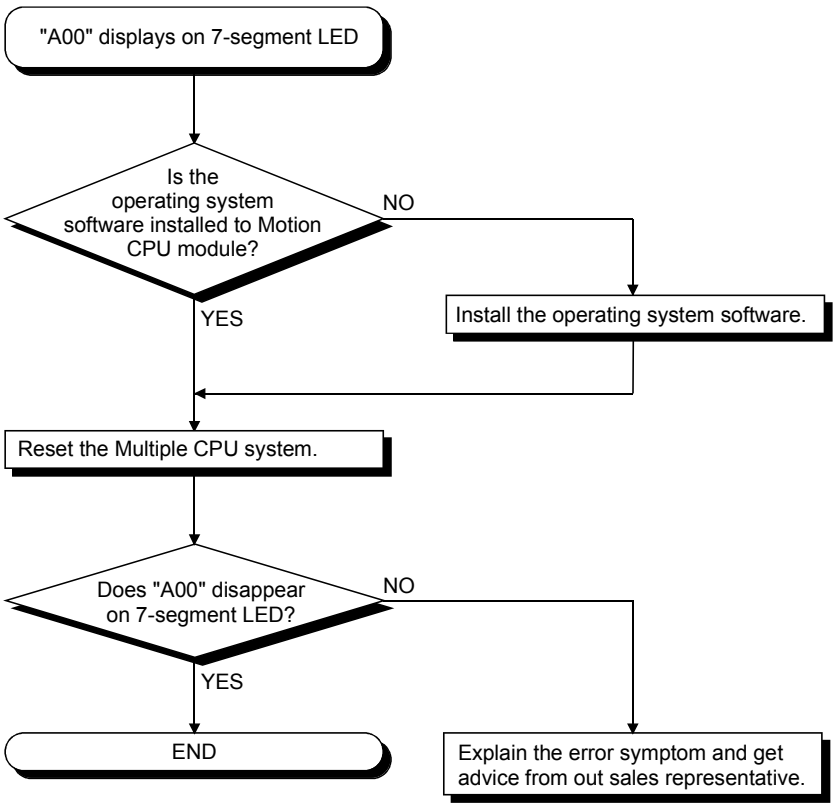
(b) Flowchart for when " ." does not flash in the first digit of 7-segment LED



(Note) : Normally, " . " flashes in the first digit of 7-segment LED.

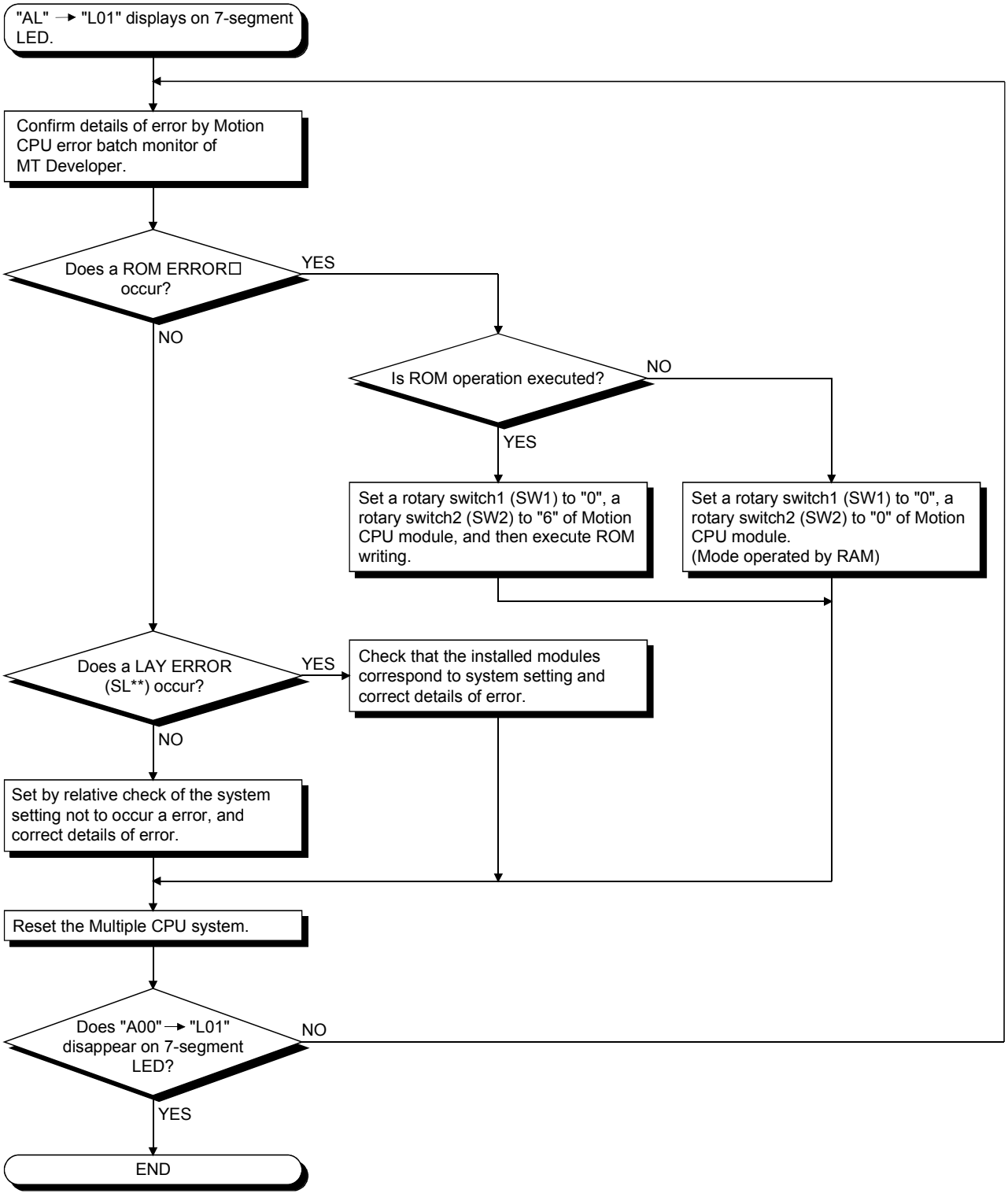
(c) Flowchart for when "A00" displays on 7-segment LED

"A00" displays when the operating system software is not installed.
The following shows the flowchart when the "A00" displays at the power supply ON or operation start.



(d) Flowchart for when "AL" → "L01" displays on 7-segment LED

""AL" (flashes 3 times) → Steady "L01" display" displays at the system setting error occurrence.
The following shows the flowchart when the ""AL" (flashes 3 times) → Steady "L01" display" displays during operation.

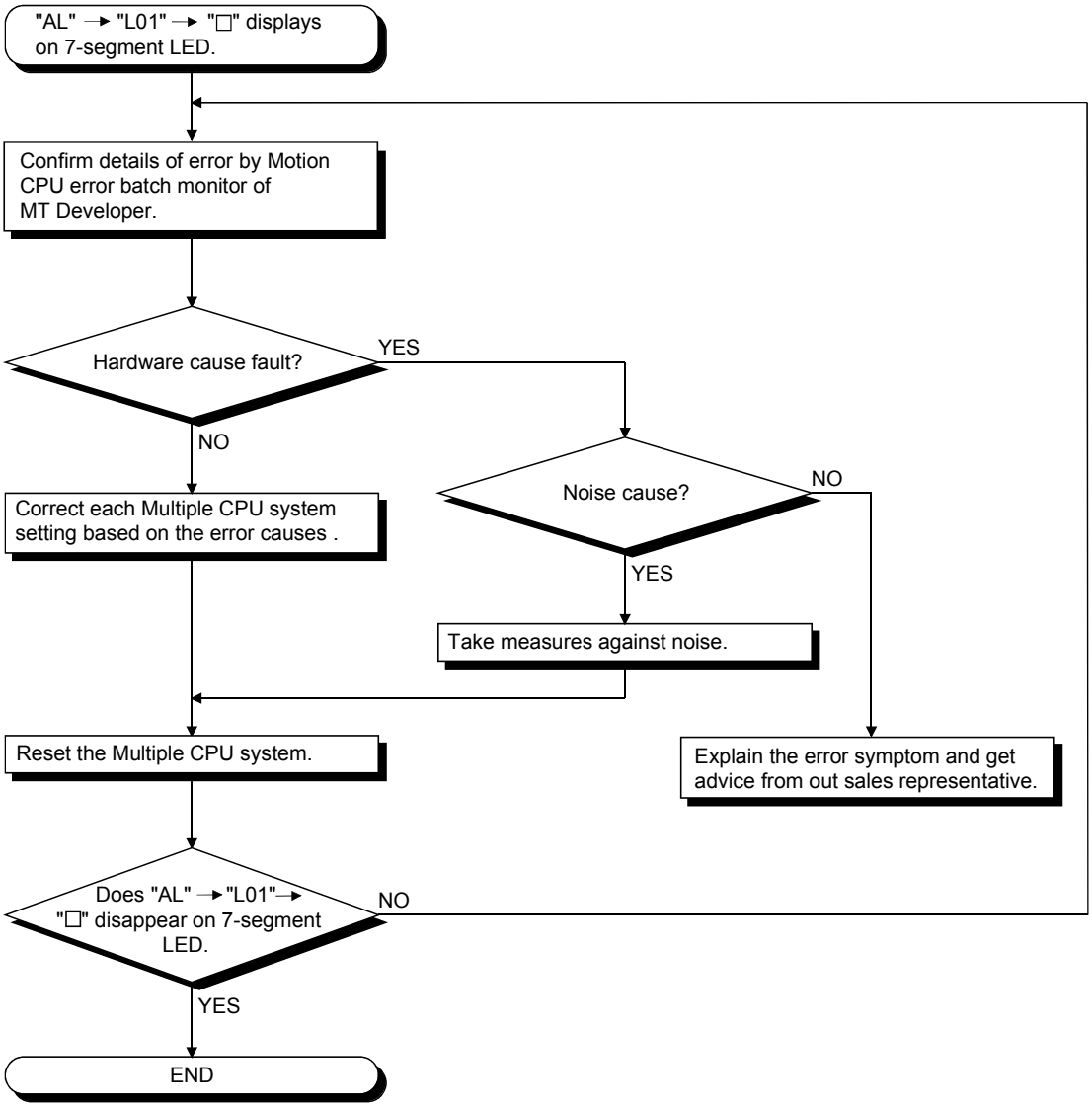


(e) Flowchart for when "AL" → "A1" → "□" displays on 7-segment LED.

""AL" (flashes 3 times) → Steady "A1" display → "□"" displays at the self-diagnosis error occurrence.

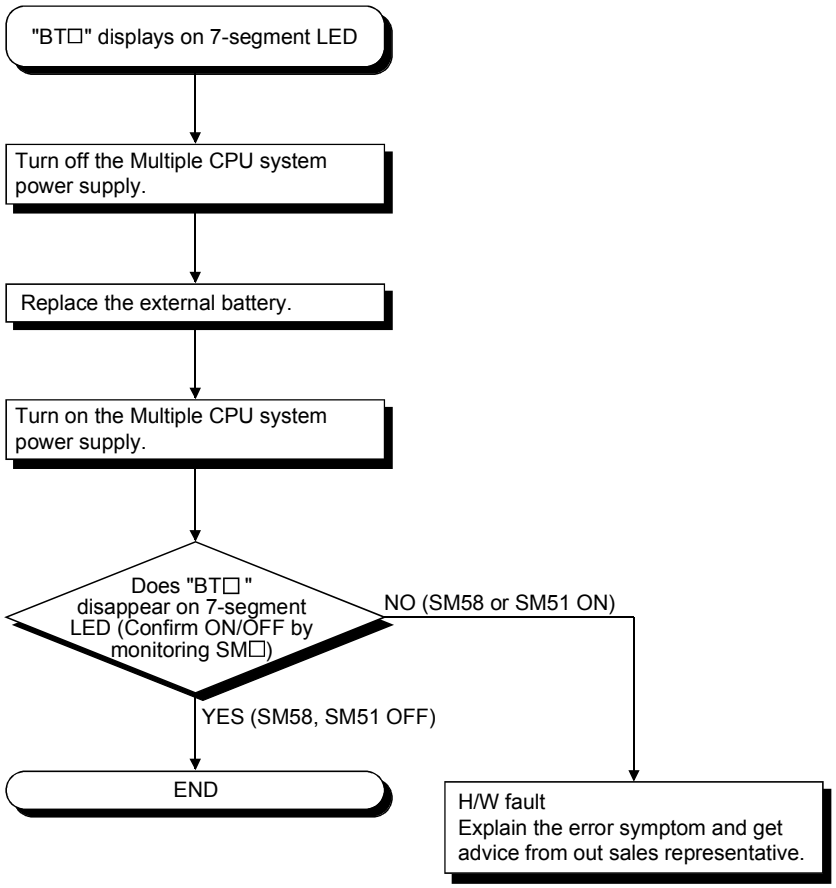
The following shows the flowchart when the ""AL" (flashes 3 times) → Steady "L01" display → "□"" display" displays during operation.

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



(f) Flowchart for when "BT□" displays on 7-segment LED

"BT1" or "BT1" displays when the external battery voltage of battery holder unit is lowered.
"BT1" or "BT1" displays at the following cases.
• BT1: Battery voltage 2.7V or less
• BT2: Battery voltage 2.5V or less
The following shows the flowchart when the "BT□" displays.

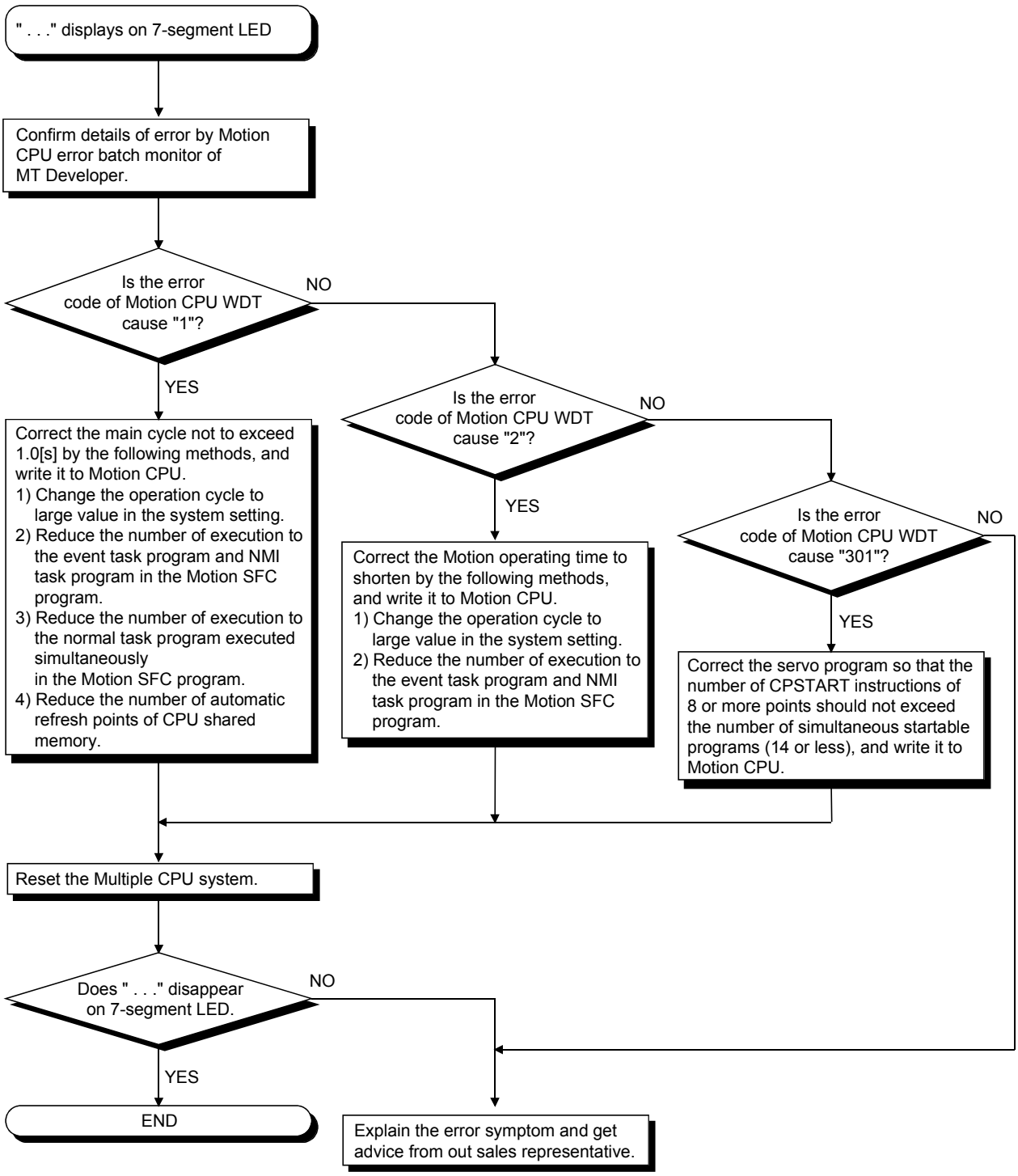


REMARK

If SM51,SM58 turns on, the details of the programs, parameters, absolute position data and latch data cannot be guaranteed.
It is recommended to back-up the battery periodically.

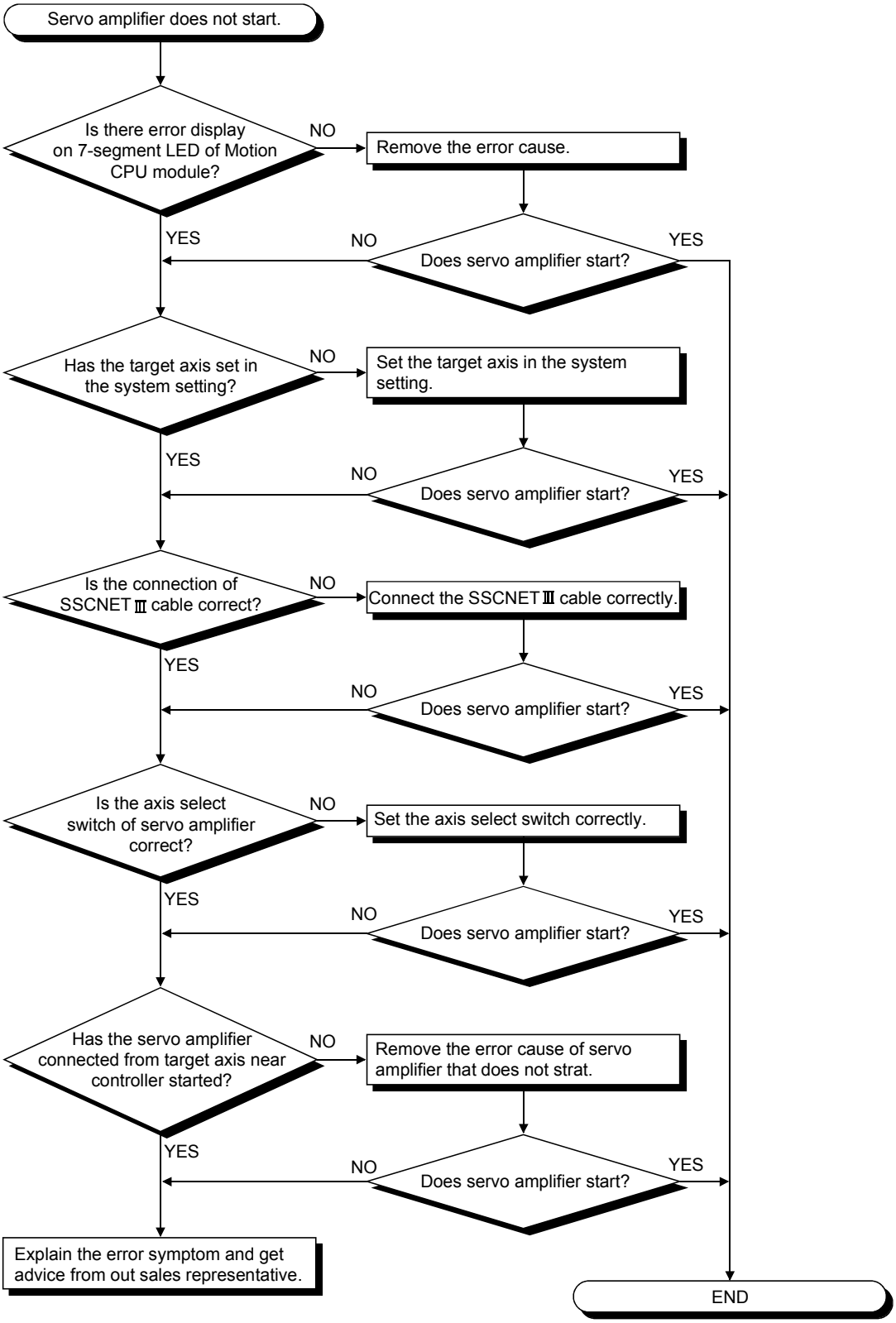
(g) Flowchart for when " . . ." displays on 7-segment LED

" . . ." displays at the WDT error occurrence.
The following shows the flowchart when the " . . ." displays during operation.



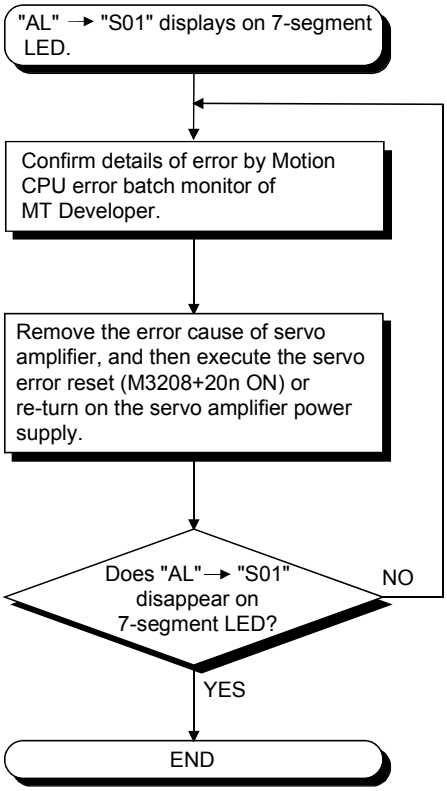
(h) Flowchart for when servo amplifier does not start

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



(i) Flowchart for when "AL" → "S01" displays on 7-segment LED

""AL" (flashes 3 times) → Steady "S01" display" displays at the servo error occurrence.
The following shows the flowchart when the ""AL" (flashes 3 times) → Steady "S01" display" displays during operation.



6.6.3 Confirming error code

The error code and error message can be read using MT Developer.
The procedure for reading error is as follows.

(1) Connect the PLC CPU module to personal computer (IBM PC/AT).
(2) Start MT Developer.
(3) Select [Online] - [Read from CPU] Menu of MT Developer, and read the project data from Motion CPU.
(4) Start the monitor screen of MT Developer and select [Motion CPU error batch monitor] menu.
(5) Confirm the error codes and error messages displayed on screen.

Refer to help of MT Developer for details of operating method.

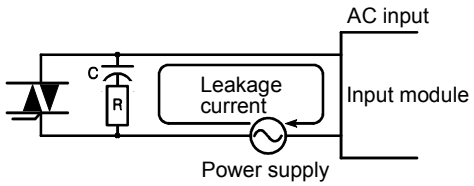
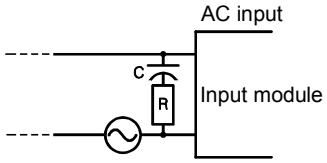
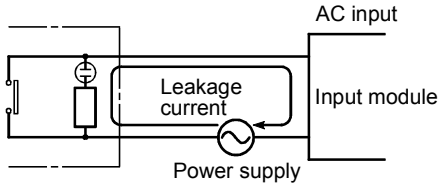
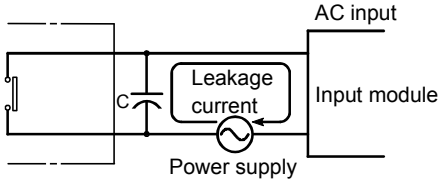
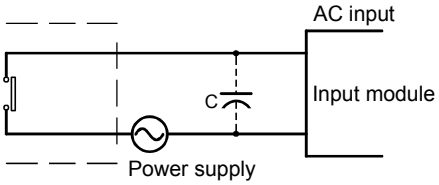
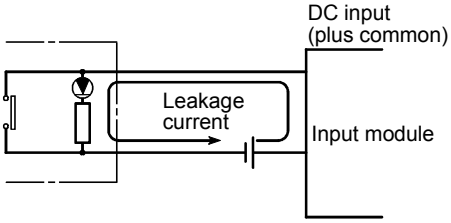
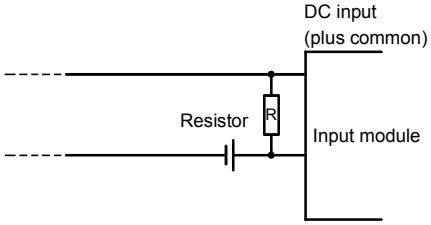
6.6.4 I/O module troubleshooting

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

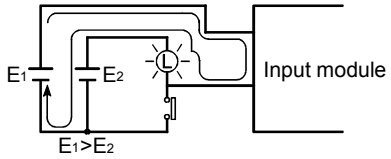
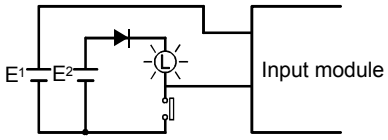
(1) Input circuit troubleshooting

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

Input Circuit Troubleshooting and Corrective Action

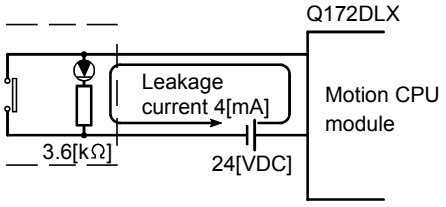
	Condition	Cause	Corrective action
Example 1	Input signal is not turned OFF.	• Leakage current of input switch (e.g. drive by non-contact switch). 	• Connect an appropriate resistor which will make the voltage across the terminals of the input module lower than the OFF voltage value.  It is recommended to use 0.1 to 0.47 [μF] + 47 to 120 [Ω] (1/2W) for the CR constant.
Example 2	Input signal is not turned OFF.	• Drive by a limit switch with neon lamp. 	• Same as Example 1. • Provide an independent display circuit separately.
Example 3	Input signal is not turned OFF.	• Leakage current due to line capacity of wiring cable. (Line capacity C of twisted pair wire is approx. 100 pF/m). 	• 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.	• Drive by switch with LED indicator. 	• Connect a register which will make the voltage between the input module terminal and common lower than the OFF voltage value, as shown below.  (Note-1) : A calculation example of a value for a connected resistor is given on the following page.

Input Circuit Troubleshooting and Corrective Action (Continued)

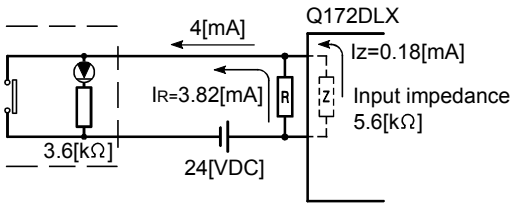
	Condition	Cause	Corrective action
Example 5	Input signal is not turned OFF.	• Sneak path due to the use of two power supplies.  	• Use only one power supply. • Connect a sneak path prevention diode. (Figure below) 
Example 6	False input due to noise	Depending on response time setting, noise is imported as input.	Change the response time setting. Example : 1 [ms] → 5[ms] (When excessive noise is cyclic, shorter response time setting may produce a higher effect.) When the above action does not have an effect, take measures against noise to block excessive noise, e.g. avoid tying the power cables and control cables in a bundle, and add surge absorbers to the noise sources such as the relays and contactors used with the same power supply.

<Calculation example of Example 4>

If a switch with LED display is connected to Q172DLX, and current of 4 [mA] is leaked.



(a) Because the condition for OFF voltage (18[mA]) of Q172DLX 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 Q172DLX, the resistor R to be connected may be the one where 3.82 [mA] or more will flow.

I_R: I_Z=Z(Input impedance): R

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

R<264 [Ω].

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

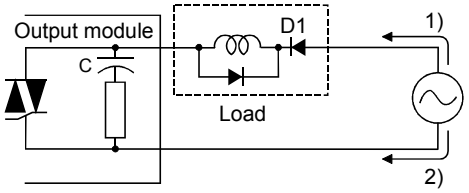
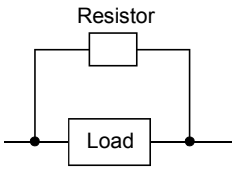
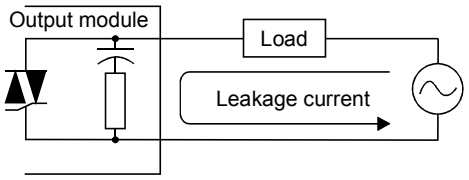
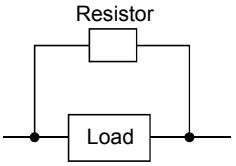
W = (Input voltage)^2 ÷ R = 26.4^2 ÷ 220 = 3.168 [W]

(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

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

Output Circuit Troubleshooting and Corrective Action

	Condition	Cause	Corrective action
Example 1	Excessive voltage is applied to load when output turns OFF	• When load is half-wave rectified (This is typical some solenoids).  • When the polarity of the power supply is [1], the capacitor C is charged. When the polarity is [2], the voltage charged in C plus the power supply voltage is applied to across D1. The maximum value of the voltage is approx. 2.2E. (This usage does not pose problems to the output components but may deteriorate the diode built in the load, causing burnout, etc.) .	• Connect a resistor of several ten kΩ to several hundred k across the load. 
Example 2	Load does not turn OFF (Triac output).	• Leakage current due to built-in surge suppressor. 	• Connect a resistor across the load. (If the wiring from the output module to the load is long, be careful since there may be a leakage current due to the line capacity.) 

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 SSCNETⅢ cables

Generally use the SSCNETⅢ cables available as our products.

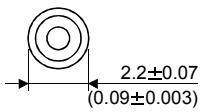
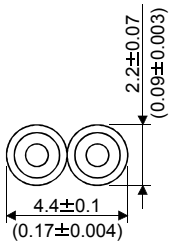
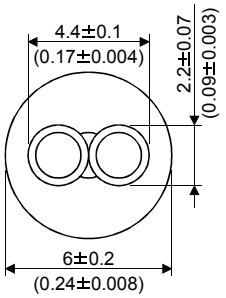
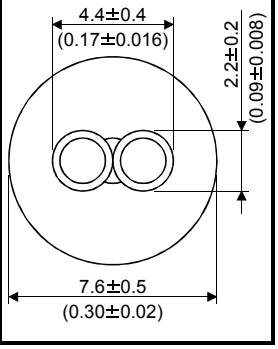
(1) Model explanation

Numeral in the column of cable length on the table is a symbol put in the "□" part of cable model. Cables of which symbol exists are available.

Cable model	Cable length [m(ft.)]											Flex life	Application/ remark
	0.15 (0.49)	0.3 (0.98)	0.5 (1.64)	1 (3.28)	3 (9.84)	5 (16.40)	10 (32.81)	20 (65.62)	30 (98.43)	40 (131.23)	50 (164.04)		
MR-J3BUS□M	015	03	05	1	3							Standard	Standard code for inside panel
MR-J3BUS□M-A						5	10	20				Standard	Standard cable for outside panel
MR-J3BUS□M-B (Note-1)									30	40	50	Long flex	Long distance cable

(Note-1) : For the cable of less than 30[m](98.43[ft.]), contact your nearest Mitsubishi sales representative.

(2) Specifications

		Description			
SSCNETⅢ cable model		MR-J3BUS□M		MR-J3BUS□M-A	MR-J3BUS□M-B
SSCNETⅢ cable length [m(ft.)]		0.15 (0.49)	0.3 to 3 (0.98 to 9.84)	5 to 20 (16.40 to 65.62)	30 to 50 (98.43 to 164.04)
Optical cable (Code)	Minimum bend radius [mm(inch)]	25(0.98)		Reinforcing coat cable: 50 (1.97) Code: 25 (0.98)	Reinforcing coat cable: 50 (1.97) Code : 30(1.18)
	Tension strength [N]	70	140	420 (Enforced covering cord)	980 (Enforced covering cord)
	Temperature range for use [°C(°F)] (Note-1)	-40 to 80 (-40 to 176)			-20 to 70 (-4 to 158)
	Ambient	Indoors (no direct sunlight), No solvent or oil			
	External appearance [mm(inch)]				

(Note-1): This temperature range for use is the value for optical cable (cord) only.

App.

POINTS

(1) If the end face of code tip for the SSCNETⅢ cable is dirty, optical transmission is interrupted and it may cause malfunctions. If it becomes dirty, wipe with a bonded textile, etc. Do not use solvent such as alcohol.

(2) If the end face of code tip for SSCNETⅢ cable is dirty, optical transmission is interrupted and it may cause malfunctions. If it becomes dirty, wipe with a bonded textile, etc. Do not use solvent such as alcohol.

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

(a) MR-J3BUS□M

1) Model explanation

Type: MR-J3BUS□M-∗

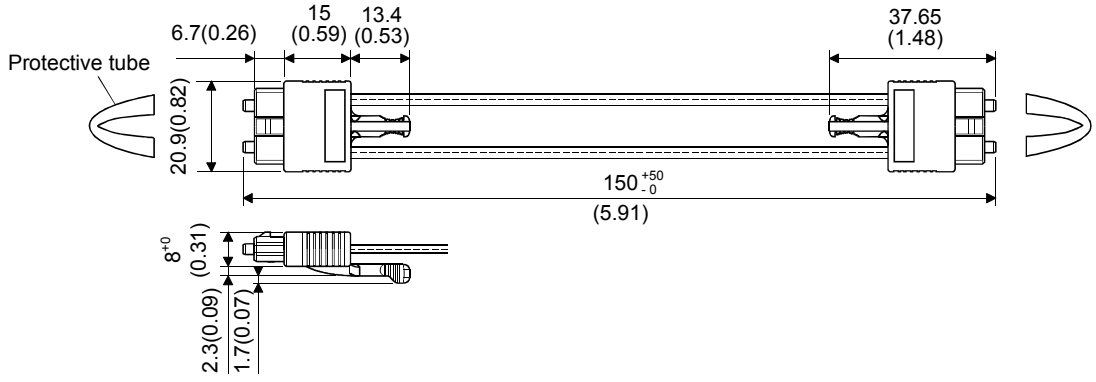
Symbol	Cable type
None	Standard code for inside panel
A	Standard cable for outside panel
B	Long distance cable

Symbol	Cable length [m(ft.)]
015	0.15(0.49)
03	0.3(0.98)
05	0.5(1.64)
1	1(3.28)
3	3(9.84)
5	5(16.40)
10	10(32.81)
20	20(65.62)
30	30(98.43)
40	40(131.23)
50	50(164.04)

2) Exterior dimensions

• MR-J3BUS015M

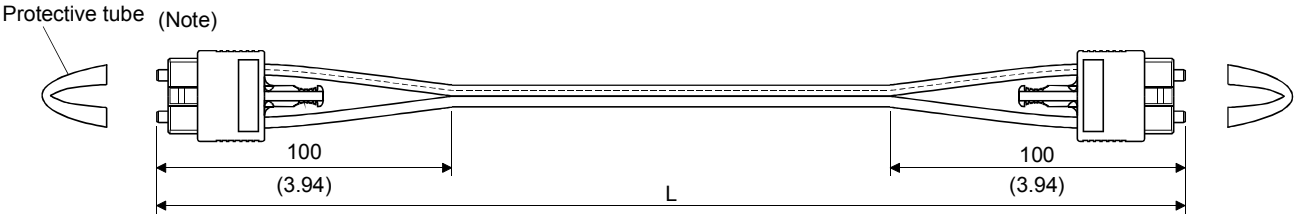
[Unit: mm(inch)]



• MR-J3BUS03M to MR-J3BUS3M

[Unit: mm(inch)]

Refer to the table of this section (1) for cable length (L).



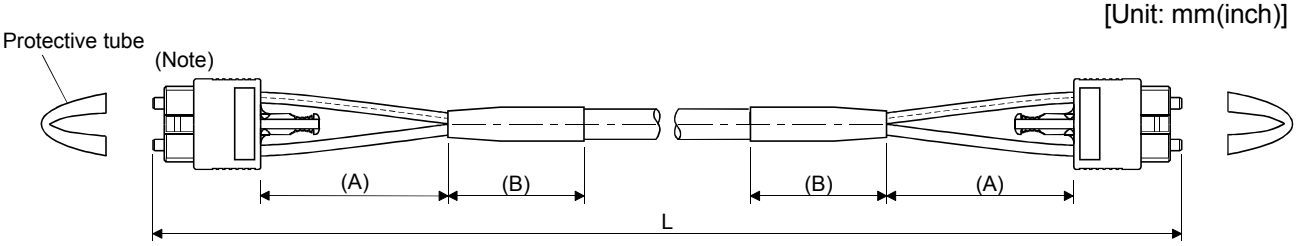
(Note) : Dimension of connector part is the same as that of MR-J3BUS015M.

• MR-J3BUS5M-A to MR-J3BUS20M-A,MR-J3BUS30M-B to MR-J3BUS50M-B

Refer to the table of this section (1) for cable length (L).

SSCNETⅢ cable	Variation [mm(inch)]	
	A	B
MR-J3BUS5M-A to MR-J3BUS20M-A	100(3.94)	30(1.18)
MR-J3BUS30M-B to MR-J3BUS50M-B	150(5.91)	50(1.97)

[Unit: mm(inch)]



(Note) : Dimension of connector part is the same as that of MR-J3BUS015M.

POINTS

Keep the cap and the tube for protecting light code end of SSCNETⅢ cable in a plastic bag with a zipper of SSCNETⅢ cable to prevent them from becoming dirty.

APPENDIX 1.2 Serial absolute synchronous encoder cable

Generally use the serial absolute synchronous encoder cables available as our products. If the required length is not found in our products, fabricate the cable on the customer side.

(1) Selection

The following table indicates the serial absolute synchronous encoder cables used with the serial absolute synchronous encoder.
Connector sets (Q170ENCCNS) are also available for your fabrication.

Table 1 Wire models

Type	Length [m(ft.)]	Wire model
Q170ENCCBL□M	2(6.56), 5(16.40), 10(32.81), 20(65.62), 30(98.43), 50(164.04)	M14B0023 12 pair (BLACK)

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

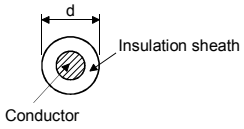
Table 2 Connector sets

Connector sets type	Description
Q170ENCCNS	• Connector shell kits • Plug cable clump

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)	
M14B0023 12 pair (BLACK)	0.2	24(12 pair)	40/0.08	105 or less	0.88	11.0

(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) Q170ENCCBL□M

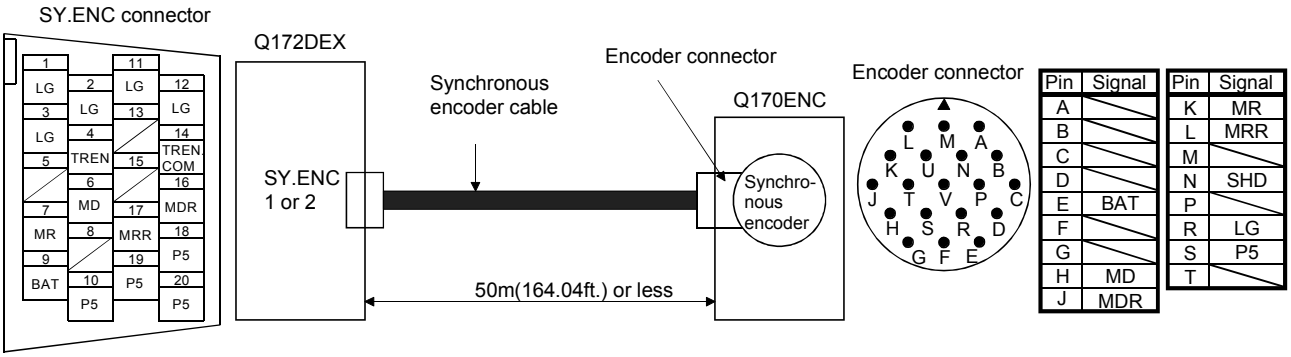
(a) Model explanation

Type: Q170ENCCBL□M

Symbol	Cable length [m(ft.)]
2	2(6.56)
5	5(16.40)
10	10(32.81)
20	20(65.62)
30	30(98.43)
50	50(164.04)

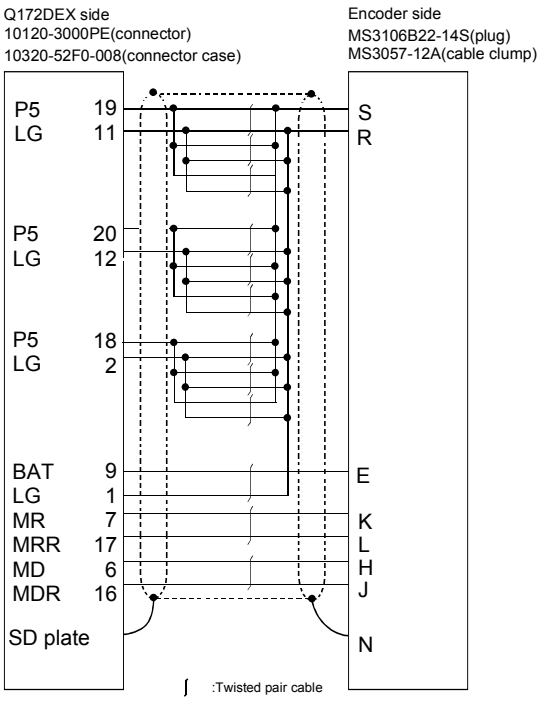
(b) Connection diagram

When fabricating a cable, use the recommended wire and connector set Q170ENCCNS for encoder cable given on APPENDIX 1.2, and make the cable as show in the following connection diagram. Maximum cable length is 50m(164.04ft.).



Pin	Signal
A	
B	
C	
D	
E	BAT
F	
G	
H	MD
J	MDR

Pin	Signal
K	MR
L	MRR
M	
N	SHD
P	
R	LG
S	P5
T	



Cable length 50m(164.04[ft.]) or less

APPENDIX 1.3 Battery cable

Generally use the battery cable available as our products. If the required length is not found in our products, fabricate the cable on the customer side. Make the battery cable within 0.5m(1.64ft.).

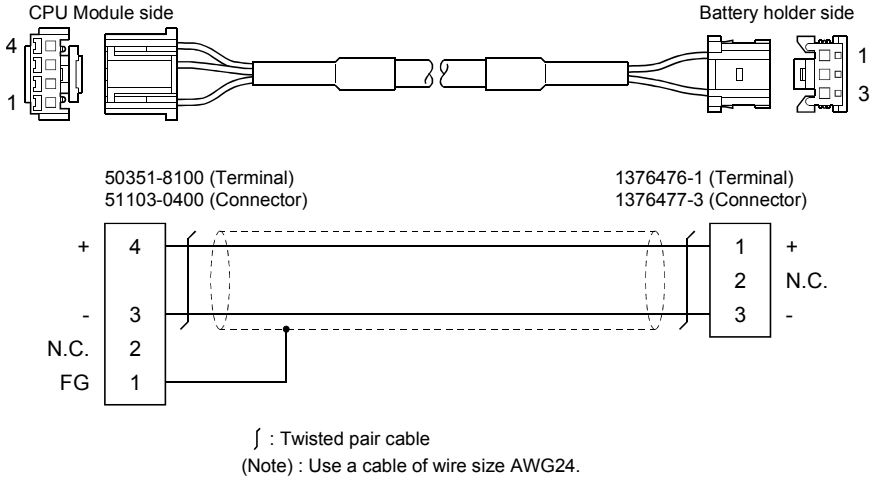
(1) Q170DBATCBL☐M

(a) Model explanation

Type : Q170DBATCBL☐M

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

(b) Connection diagram



∫ : Twisted pair cable

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

APPENDIX 1.4 Forced stop input cable

Generally use the forced stop input cable available as our products. If the required length is not found in our products, fabricate the cable on the customer side. Make the forced stop input cable within 30m(98.43ft.).

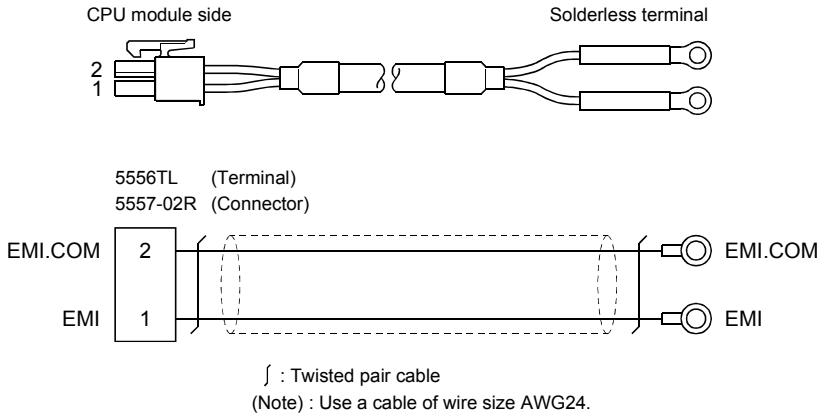
(1) Q170DEMICBL□M

(a) Model explanation

Type : Q170DEMICBL□M

Symbol	Cable length [m(ft.)]
05	0.5(1.64)
1	1(3.28)
3	3(9.84)
5	5(16.40)
10	10(32.81)
15	15(49.21)
20	20(65.62)
25	25(82.02)
30	30(98.43)

(b) Connection diagram



∫ : Twisted pair cable

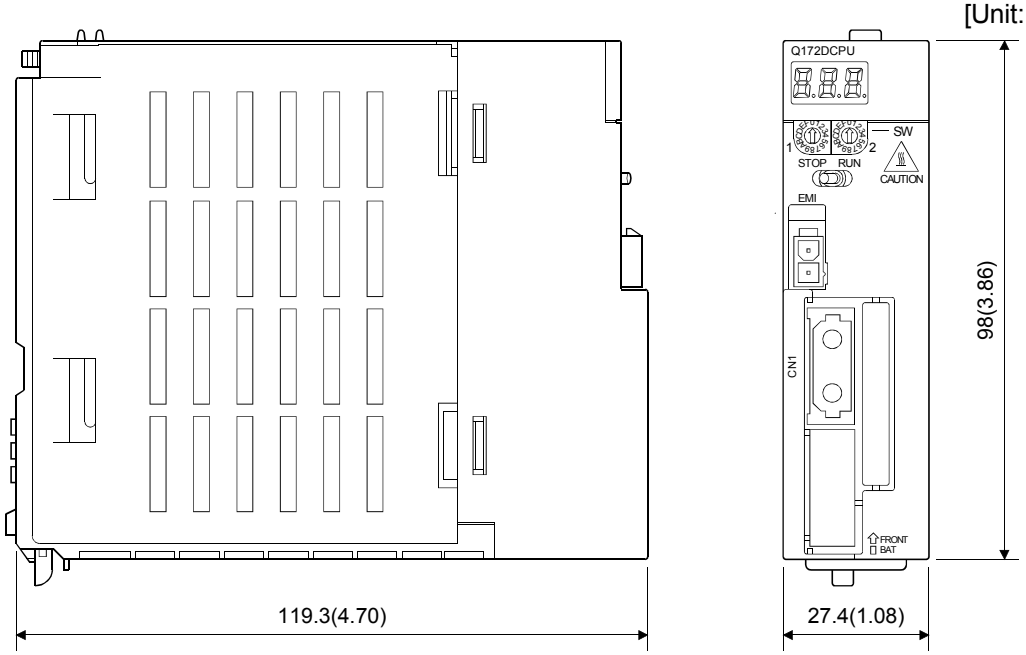
(Note) : Use a cable of wire size AWG24.

APPENDIX 2 Exterior Dimensions

APPENDIX 2.1 CPU module

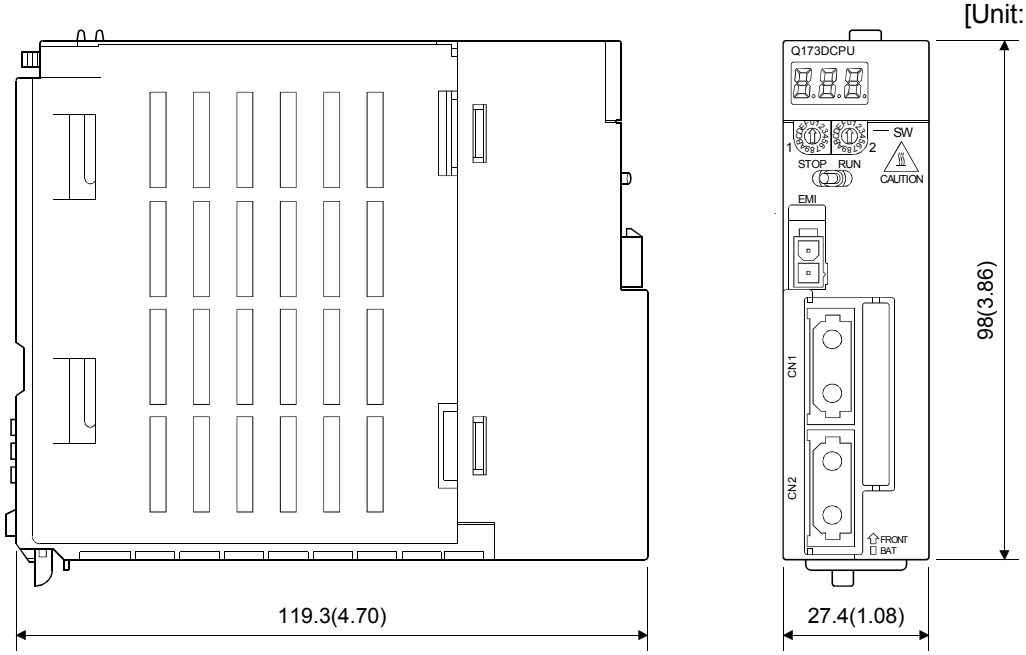
(1) Q172DCPU Module

[Unit: mm (inch)]



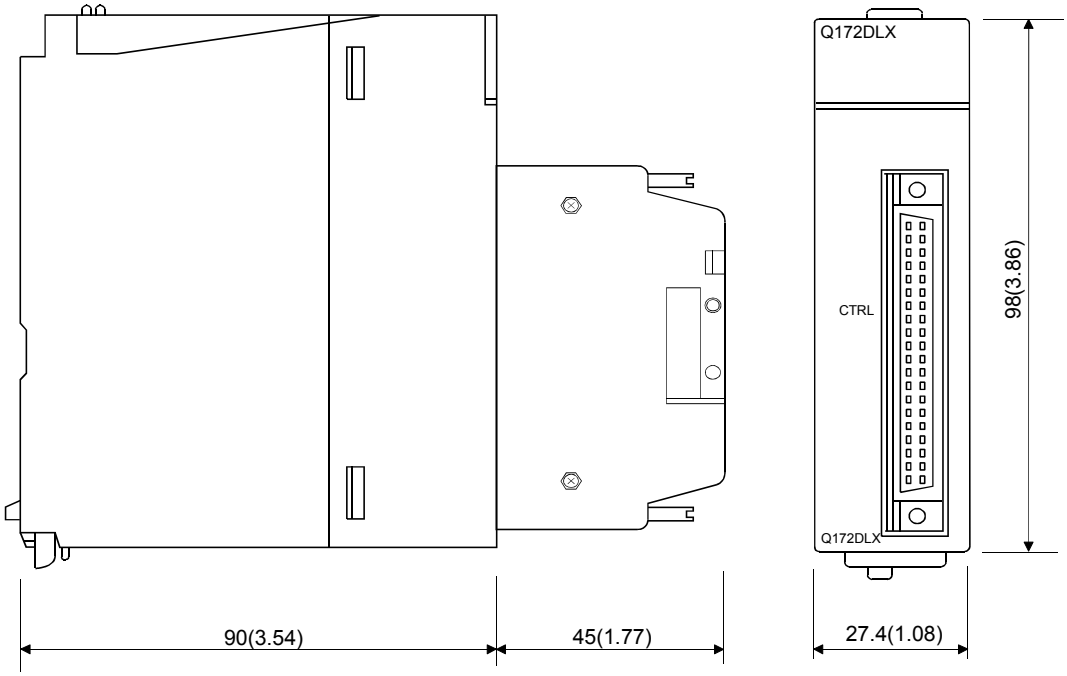
(2) Q173DCPU Module

[Unit: mm (inch)]



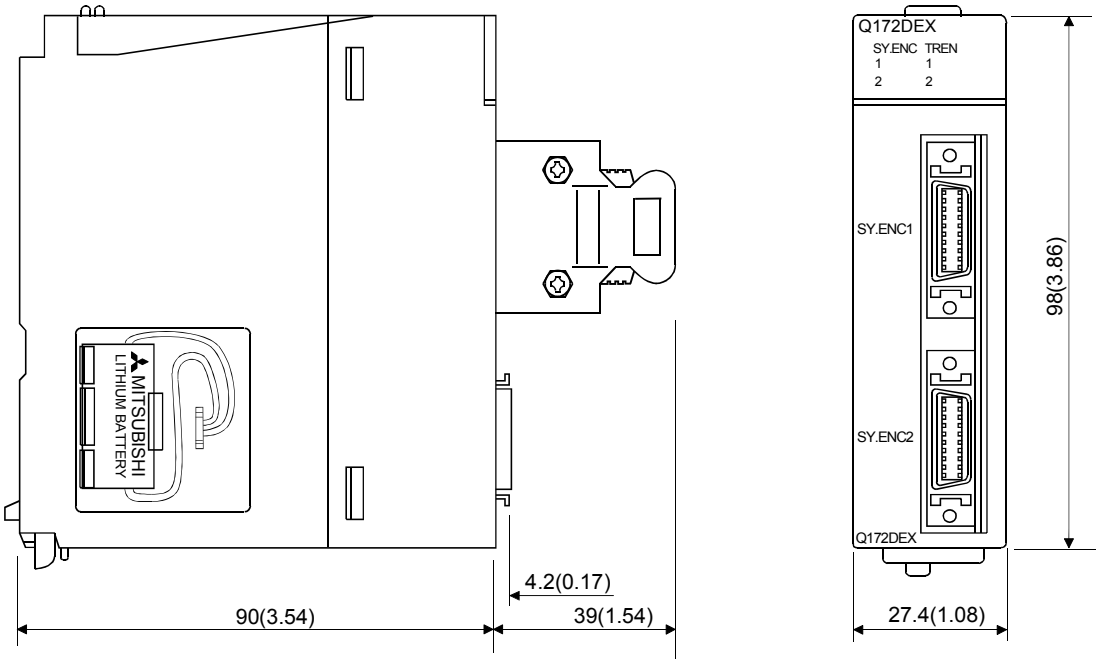
APPENDIX 2.2 Servo external signals interface module (Q172DLX)

[Unit: mm (inch)]



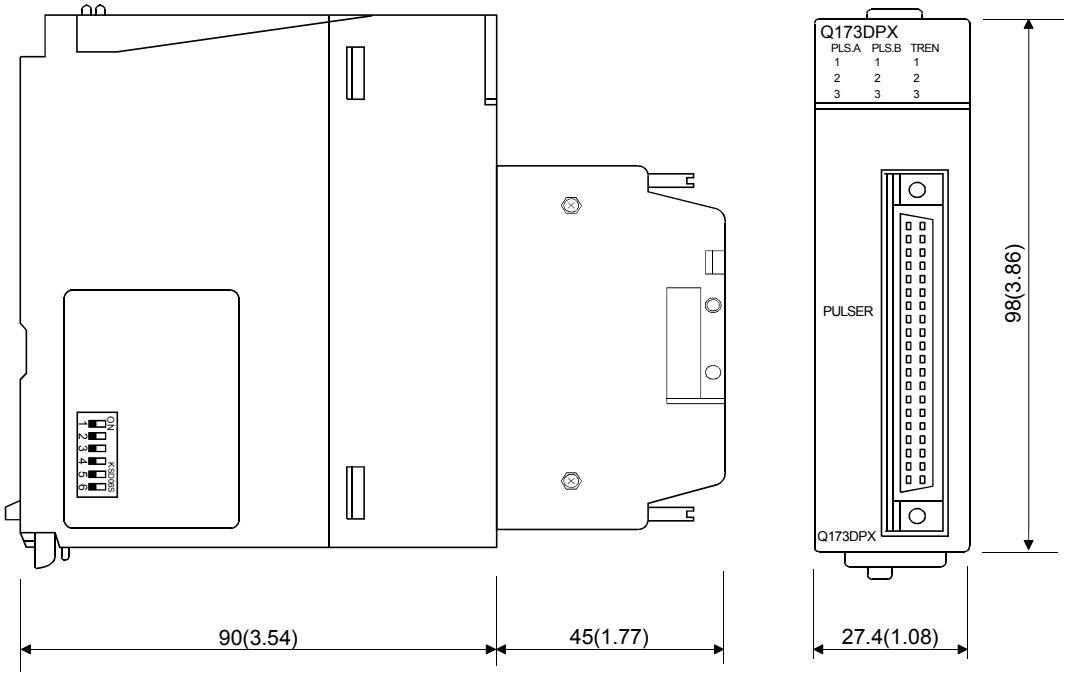
APPENDIX 2.3 Synchronous encoder interface module (Q172DEX)

[Unit: mm (inch)]



APPENDIX 2.4 Manual pulse generator interface module (Q173DPX)

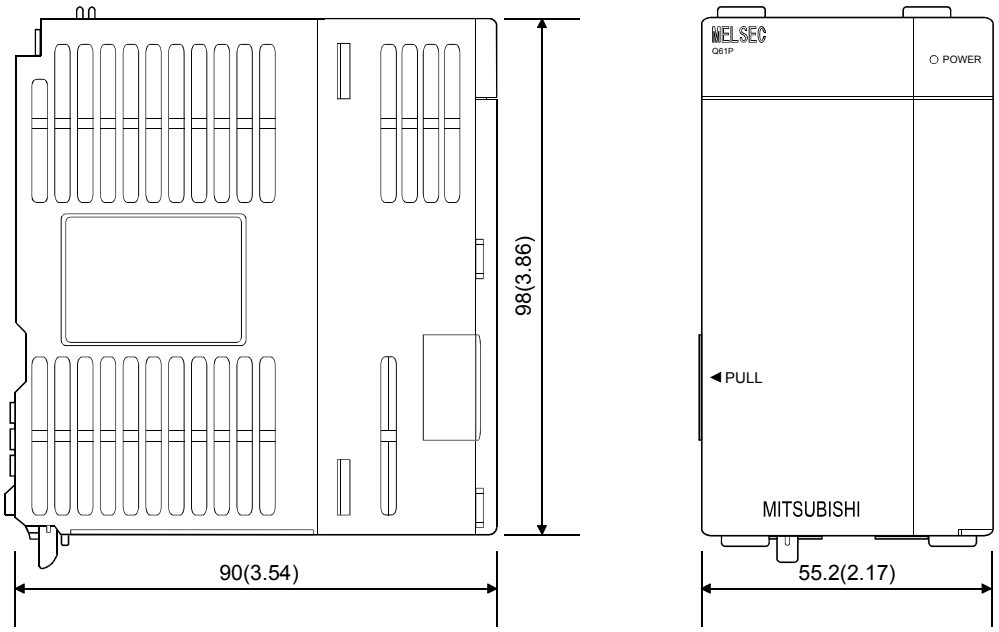
[Unit: mm (inch)]



APPENDIX 2.5 Power supply module (Q61P-A1, Q61P-A2, Q61P, Q62P, Q63P, Q64P)

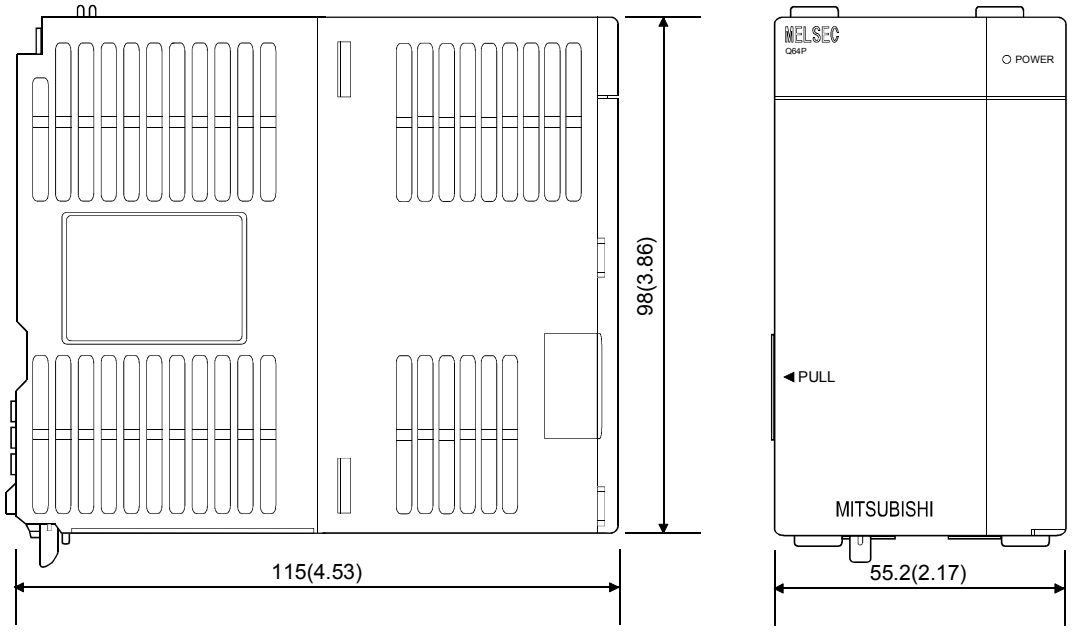
[Unit: mm (inch)]

(1) Q61P-A1, Q61P-A2, Q61P, Q62P, Q63P



(2) Q64P

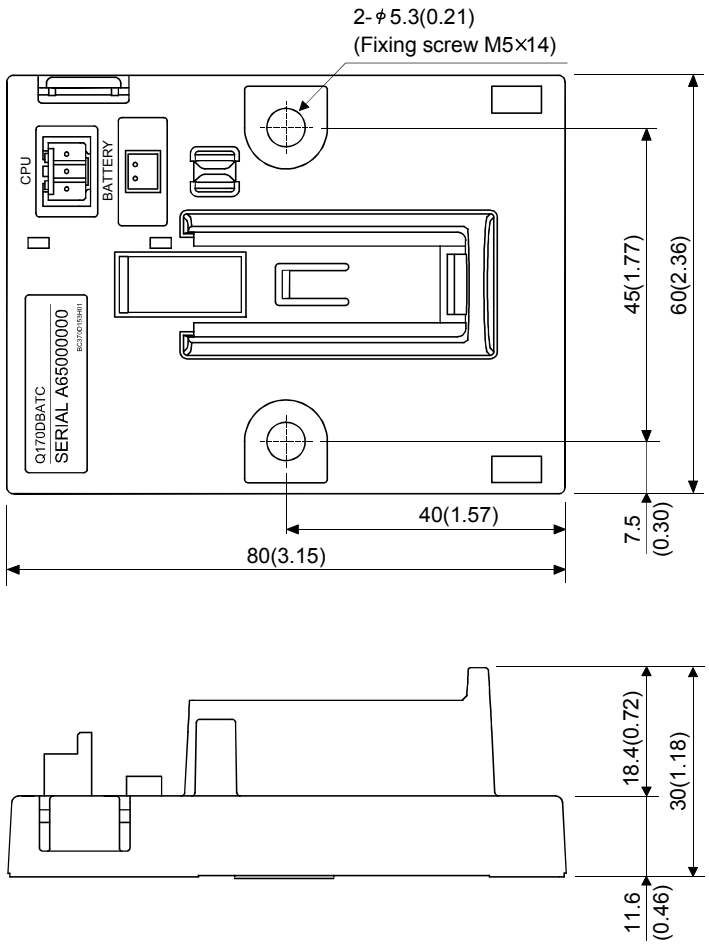
[Unit: mm (inch)]



APPENDIX 2.6 Battery holder unit (Q170DBATC)

(1) Battery holder unit (Q170DBATC)

[Unit: mm (inch)]



APPENDIX 2.7 Connector

(1) Cable connector for serial absolute synchronous encoder (Sumitomo 3M make (MDR type))

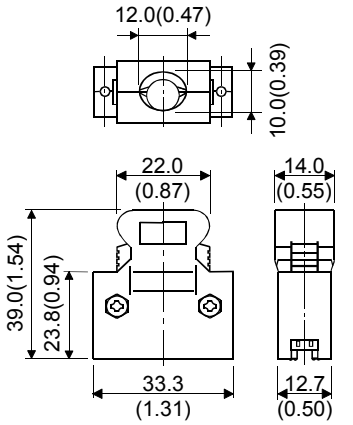
Number of pins	Type	Type	
		Connector	Connector case
20	Solder connection type (Quick release metal latch type)	10120-3000PE	10320-52F0-008
	Solder connection type (Threaded type)	10120-3000PE	10320-52A0-008
	Insulation displacement type (Quick release metal latch type)	10120-6000EL(Note)	10320-3210-000(Note)

(Note): These connectors are not options. Please purchase them by customer.

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

Type Connector : 10120-3000PE
Connector case: 10320-52F0-008

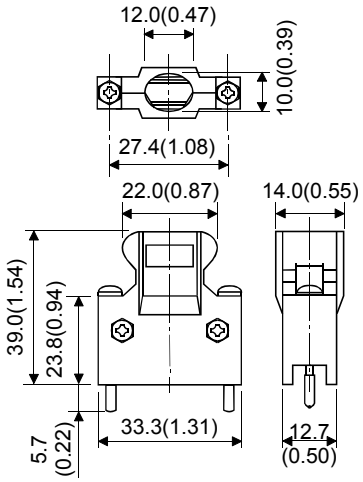
[Unit: mm (inch)]



(b) Solder connection type(Threaded type)

Type Connector : 10120-3000PE
Connector case: 10320-52A0-008

[Unit: mm (inch)]

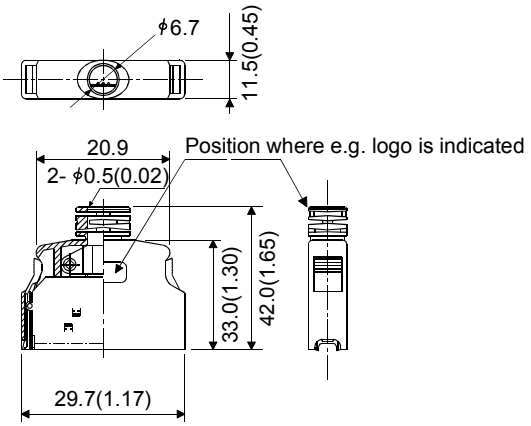


(c) Insulation displacement type(Quick release metal latch type)

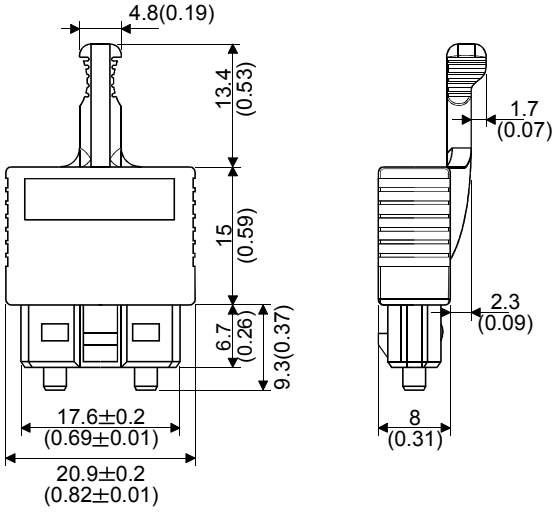
Type Connector : 10120-6000EL

Connector case: 10320-3210-000

[Unit: mm (inch)]



(2) SSCNETⅢ cable connector



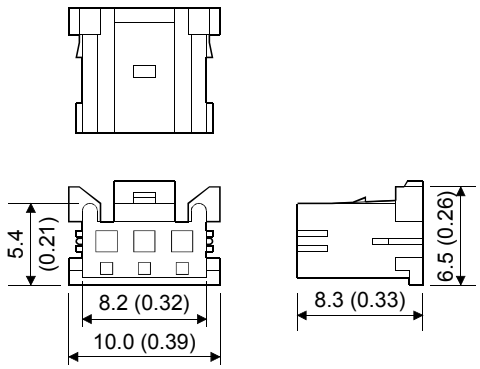
(3) Battery cable connector

(a) Battery holder side (Tyco Electronics AMP K.K make)

Type Connector : 1376477-3

Terminal : 1376476-1

[Unit: mm (inch)]

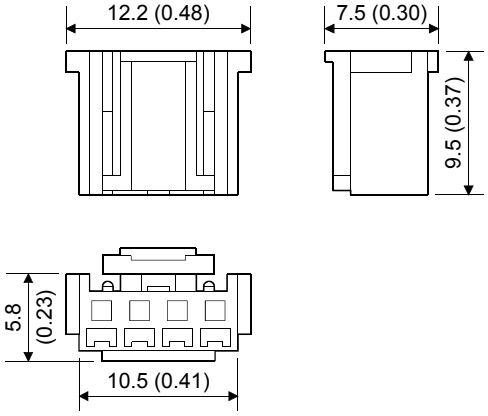


(b) CPU module side (Molex Incorporated make)

Type Connector : 51103-0400

Terminal : 50351-8100

[Unit: mm (inch)]

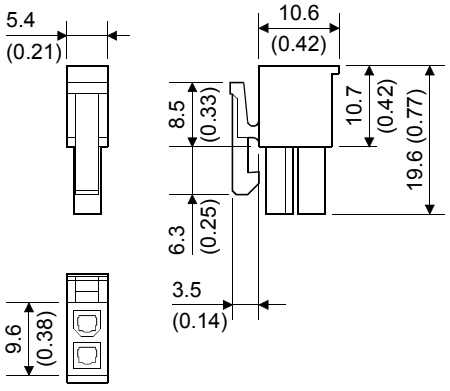


(4) Forced stop input connector (Molex Incorporated make)

Type Connector : 5557-02R-210

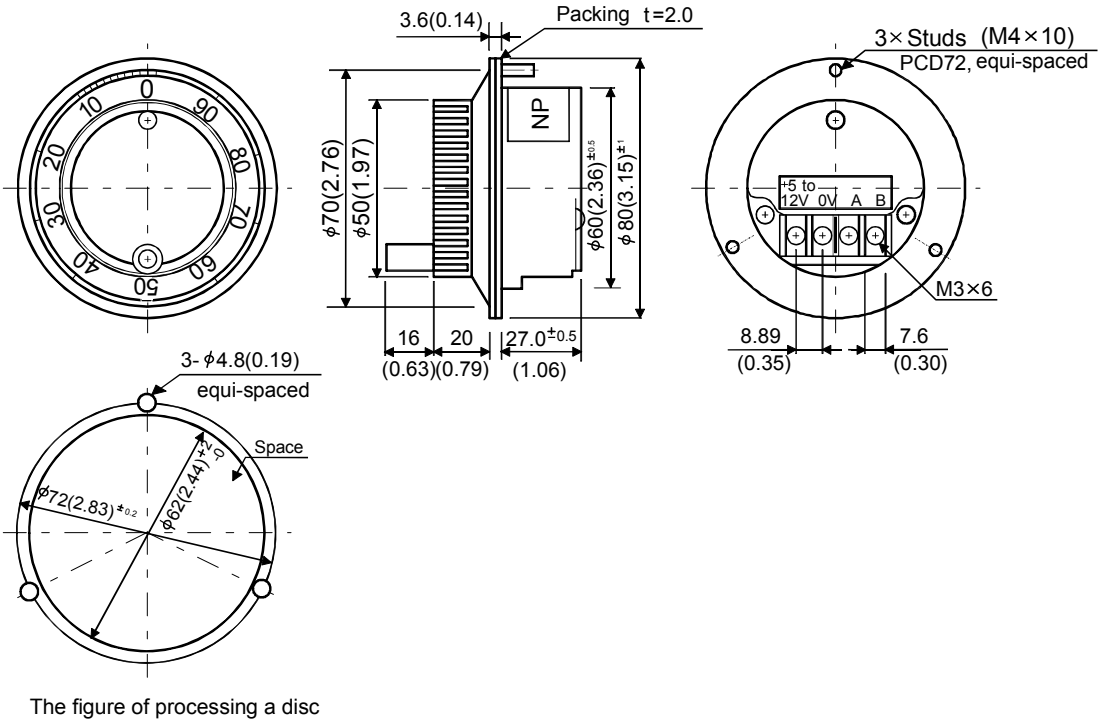
Terminal : 5556TLPBTL

[Unit: mm (inch)]



APPENDIX 2.8 Manual pulse generator (MR-HDP01)

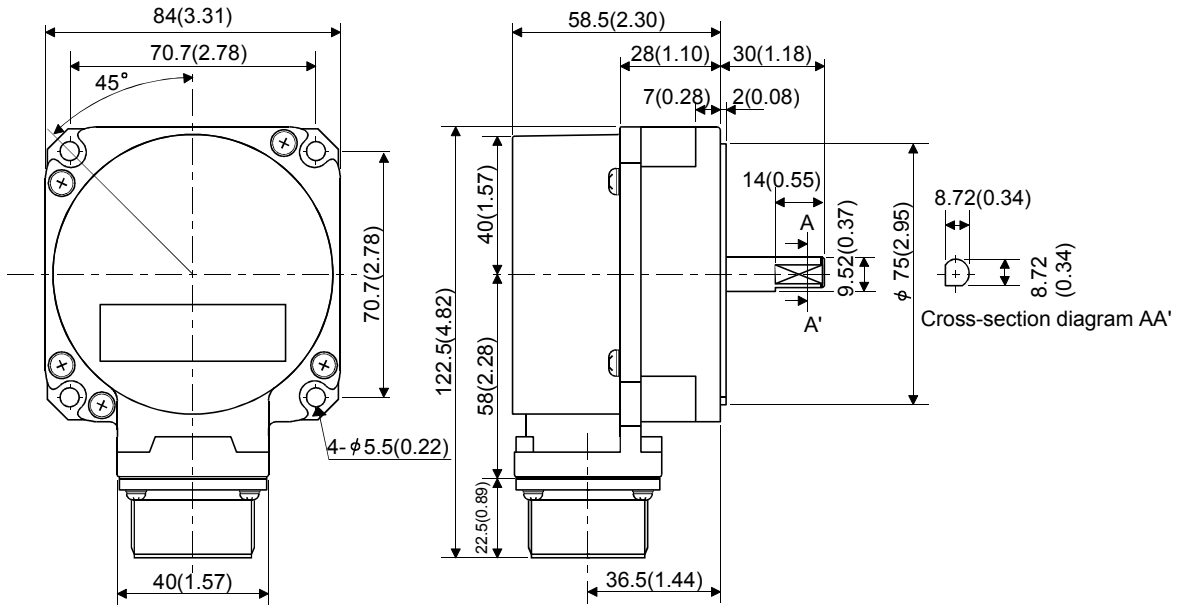
[Unit: mm (inch)]



The figure of processing a disc

APPENDIX 2.9 Serial absolute synchronous encoder (Q170ENC)

[Unit: mm (inch)]



Cross-section diagram AA'

MEMO

WARRANTY

Please confirm the following product warranty details before using this product.

1. Gratis Warranty Term and Gratis Warranty Range

If any faults or defects (hereinafter "Failure") found to be the responsibility of Mitsubishi occurs during use of the product within the gratis warranty term, the product shall be repaired at no cost via the sales representative or Mitsubishi Service Company.
However, if repairs are required onsite at domestic or overseas location, expenses to send an engineer will be solely at the customer's discretion. Mitsubishi shall not be held responsible for any re-commissioning, maintenance, or testing on-site that involves replacement of the failed module.

[Gratis Warranty Term]

Note that an installation period of less than one year after installation in your company or your customer's premises or a period of less than 18 months (counted from the date of production) after shipment from our company, whichever is shorter, is selected.

[Gratis Warranty Range]

(1) Diagnosis of failure

As a general rule, diagnosis of failure is done on site by the customer.
However, Mitsubishi or Mitsubishi service network can perform this service for an agreed upon fee upon the customer's request.
There will be no charges if the cause of the breakdown is found to be the fault of Mitsubishi.

(2) Breakdown repairs

There will be a charge for breakdown repairs, exchange replacements and on site visits for the following four conditions, otherwise there will be a charge.

1) Breakdowns due to improper storage, handling, careless accident, software or hardware design by the customer
2) Breakdowns due to modifications of the product without the consent of the manufacturer
3) Breakdowns resulting from using the product outside the specified specifications of the product
4) Breakdowns that are outside the terms of warranty

Since the above services are limited to Japan, diagnosis of failures, etc. are not performed abroad.
If you desire the after service abroad, please register with Mitsubishi. For details, consult us in advance.

2. Exclusion of Loss in Opportunity and Secondary Loss from Warranty Liability

Mitsubishi will not be held liable for damage caused by factors found not to be the cause of Mitsubishi; opportunity loss or lost profits caused by faults in the Mitsubishi products; damage, secondary damage, accident compensation caused by special factors unpredictable by Mitsubishi; damages to products other than Mitsubishi products; and to other duties.

3. Onerous Repair Term after Discontinuation of Production

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

4. Delivery Term

In regard to the standard product, Mitsubishi shall deliver the standard product without application settings or adjustments to the customer and Mitsubishi is not liable for on site adjustment or test run of the product.

5. Precautions for Choosing the Products

(1) These products have been manufactured as a general-purpose part for general industries, and have not been designed or manufactured to be incorporated in a device or system used in purposes related to human life.
(2) Before using the products for special purposes such as nuclear power, electric power, aerospace, medicine, passenger movement vehicles or under water relays, contact Mitsubishi.
(3) These products have been manufactured under strict quality control. However, when installing the product where major accidents or losses could occur if the product fails, install appropriate backup or failsafe functions in the system.
(4) When exporting any of the products or related technologies described in this catalogue, you must obtain an export license if it is subject to Japanese Export Control Law.

MOTION CONTROLLER Qseries

User's Manual (Q173DCPU/Q172DCPU)

MITSUBISHI ELECTRIC CORPORATION

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

MODEL	Q173D-U-E
MODEL CODE	1XB927
IB(NA)-0300133-A(0801)MEE	