MELSEC System Q

Programmable Controllers

Quick-Start Guide

Motion Controller
Q170MCPU
Q172DCPU
Q173DCPU

Art. No.:
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Version A

Quick-Start Guide
Motion controller Q170MCPU/Q172DCPU/Q173DCPU
Art. no.:

Version			Revisions/Additions/Corrections	
A	09/2009	pdp - rw	—	

About This Manual

The texts, illustration, diagrams and examples in this manual are provided for information purposes only. They are intended as aids to help explain the installation, operation, programming and use of the Mitsubishi motion controllers.

If you have any questions about the installation and operation of any of the products described in this manual please contact your local sales office or distributor (see back cover). You can find the latest information and answers to frequently asked questions on our website at www.mitsubishi-automation.com.

MITSUBISHI ELECTRIC EUROPE BV reserves the right to make changes to this manual or the technical specifications of its products at any time without notice.

Related Manuals

The following manuals are also related to this Quick-Start Guide. These can be obtained free of charge from our website at www.mitsubishi-automation.com.

Device	Manual Name	Manual Number/ Art. No.
Motion controller	Q170MCPU Motion controller User's Manual This manual explains specifications of the Q170MCPU Motion controller, Q172DLX Servo external signal interface module, Q173DPX Manual pulse generator interface module, Servo amplifiers, SSCNET cables, and the maintenance/inspection for the system, trouble shooting and others.	IB-0300156
	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.	IB-0300134
	Q173DCPU/Q172DCPU Motion controller (SV13/SV22) Programming Manual (Motion SFC) This manual explains the functions, programming, debugging, error lists for Motion SFC and others.	IB-0300135
	Q173DCPU/Q172DCPU Motion controller (SV13/SV22) Programming Manual (REAL MODE) This manual explains the servo parameters, positioning instructions, device lists, error lists and others.	IB-0300136
	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.	IB-0300137
	Motion controller Setup Guidance (MT Developer2 Version1) This manual explains the items related to the setup of the Motion controller programming software MT Developer2.	IB-0300142
PLC	QCPU User's Manual (Hardware Design, Maintenance and Inspection) This manual explains the specifications of the QCPU modules, power supply modules, base units, extension cables, memory card battery, and the maintenance/inspection for the system, trouble shooting, error codes and others.	SH-080483ENG
	QnUCPU User's Manual (Function Explanation, Program Fundamentals) This manual explains the functions, programming methods and devices and others to create programs with the QCPU.	SH-080807ENG
	QCPU User's Manual (Multiple CPU System) This manual explains the Multiple CPU system overview, system configuration, I/O modules, communication between CPU modules and communication with the I/O modules or intelligent function modules.	SH-080485ENG
	QCPU Programming Manual (Common Instructions) This manual explains how to use the sequence instructions, basic instructions, application instructions and micro computer program.	SH-080809ENG
	QCPU (Q Mode)/QnACPU Programming Manual (PID Control Instructions) This manual explains the dedicated instructions used to exercise PID control.	SH-080040
	QCPU (Q Mode)/QnACPU Programming Manual (SFC) This manual explains the system configuration, performance specifications, functions, programming, debugging, error codes and others of MELSAP3.	SH-080041
	I/O Module Type Building Block User's Manual This manual explains the specifications of the I/O modules, connector, connector/terminal block conversion modules and others.	SH-080042
Servo amplifier	SSCNET III Compatible MR-J3-□B Servo amplifier Instruction Manual This manual explains the I/O signals, parts names, parameters, start-up procedure and others for MR-J3-□B Servo amplifier.	SH-030051
	SSCNET III Compatible Linear Servo MR-J3-□B-RJ004 Servo amplifier Instruction Manual This manual explains the I/O signals, parts names, parameters, start-up procedure and others for Linear Servo MR-J3-□B-RJ004 Servo amplifier.	SH-030054
	SSCNET III Compatible Fully Closed Loop Control MR-J3-□B-RJ006 Servo amplifier Instruction Manual This manual explains the I/O signals, parts names, parameters, start-up procedure and others for Fully Closed Loop Control MR-J3-□B-RJ006 Servo amplifier.	SH-030056
	SSCNET III Compatible, STO Function Compatible MR-J3-□BSafety Servo amplifier Instruction Manual This manual explains the I/O signals, parts names, parameters, start-up procedure and others for safety servo MR-J3-□BSafety Servo amplifier.	SH-030084

Safety Guidelines

General safety information and precautions

For use by qualified staff only

This manual is only intended for use by properly trained and qualified electrical technicians who are fully acquainted with the relevant automation technology safety standards. All work with the hardware described, including system design, installation, configuration, maintenance, service and testing of the equipment, may only be performed by trained electrical technicians with approved qualifications who are fully acquainted with all the applicable automation technology safety standards and regulations. Any operations or modifications to the hardware and/or software of our products not specifically described in this manual may only be performed by authorised MITSUBISHI ELECTRIC staff.

Proper use of the products

The motion controllers are only intended for the specific applications explicitly described in this manual. All parameters and settings specified in this manual must be observed. The products described have all been designed, manufactured, tested and documented in strict compliance with the relevant safety standards. Unqualified modification of the hardware or software or failure to observe the warnings on the products and in this manual may result in serious personal injury and/or damage to property. Only peripherals and expansion equipment specifically recommended and approved by MITSUBISHI ELECTRIC may be used in combination with programmable controllers of MELSEC System Q.

All and any other uses or application of the products shall be deemed to be improper.

Relevant safety regulations

All safety and accident prevention regulations relevant to your specific application must be observed in the system design, installation, configuration, maintenance, servicing and testing of these products. The regulations listed below are particularly important in this regard.

This list does not claim to be complete, however; you are responsible for being familiar with and conforming to the regulations applicable to you in your location.

- VDE Standards
  - VDE 0100
    Regulations for the erection of power installations with rated voltages below 1000 V
  - VDE 0105
    Operation of power installations
  - VDE 0113
    Electrical installations with electronic equipment
  - VDE 0160
    Electronic equipment for use in power installations
  - VDE 0550/0551
    Regulations for transformers
  - VDE 0700
    Safety of electrical appliances for household use and similar applications
  - VDE 0860
    Safety regulations for mains-powered electronic appliances and their accessories for household use and similar applications.

- Fire safety regulations
- Accident prevention regulations
  - VBG Nr.4
    Electrical systems and equipment

Safety warnings in this manual

In this manual warnings that are relevant for safety are identified as follows:

DANGER:

Failure to observe the safety warnings identified with this symbol can result in health and injury hazards for the user.

WARNING:

Failure to observe the safety warnings identified with this symbol can result in damage to the equipment or other property.

Specific safety information and precautions

The following safety precautions are intended as a general guideline for using PLC systems together with other equipment. These precautions must always be observed in the design, installation and operation of all control systems.

DANGER:

- ***Observe all safety and accident prevention regulations applicable to your specific application. Always disconnect all power supplies before performing installation and wiring work or opening any of the assemblies, components and devices.***
- ***Assemblies, components and devices must always be installed in a shockproof housing fitted with a proper cover and fuses or circuit breakers.***
- ***Devices with a permanent connection to the mains power supply must be integrated in the building installations with an all-pole disconnection switch and a suitable fuse.***
- ***Check power cables and lines connected to the equipment regularly for breaks and insulation damage. If cable damage is found immediately disconnect the equipment and the cables from the power supply and replace the defective cabling.***
- ***Before using the equipment for the first time check that the power supply rating matches that of the local mains power.***
- ***Take appropriate steps to ensure that cable damage or core breaks in the signal lines cannot cause undefined states in the equipment.***
- ***You are responsible for taking the necessary precautions to ensure that programs interrupted by brownouts and power failures can be restarted properly and safely. In particular, you must ensure that dangerous conditions cannot occur under any circumstances, even for brief periods.***
- ***EMERGENCY OFF facilities conforming to EN 60204/IEC 204 and VDE 0113 must remain fully operative at all times and in all PLC operating modes. The EMERGENCY OFF facility reset function must be designed so that it cannot ever cause an uncontrolled or undefined restart.***
- ***You must implement both hardware and software safety precautions to prevent the possibility of undefined control system states caused by signal line cable or core breaks.***
- ***When using modules always ensure that all electrical and mechanical specifications and requirements are observed exactly.***
- ***Residual current protective devices pursuant to DIN VDE Standard 0641 Parts 1-3 are not adequate on their own as protection against indirect contact for installations with PLC systems. Additional and/or other protection facilities are essential for such installations.***
- ***Do not install/remove the module onto/from base unit or terminal block more than 50 times, after the first use of the product (conforming to IEC 61131-2). Failure to do so may cause the module to malfunction due to poor contact of connector.***

Precautions to prevent damages by electrostatic discharge

Electronic devices and modules can be damaged by electrostatic charge, which is conducted from the human body to components of the PLC. Always take the following precautions, when handling the PLC:

WARNING:

- ***Before touching a module of the PLC, always touch grounded metal, etc. to discharge static electricity from human body.***
- ***Wear isolating gloves when touching the powered PLC, e. g. at maintenance during visual check.***
- ***You shouldn't wear clothing made of synthetic fibre at low humidity. This clothing gets a very high rate of electrostatic charge.***

Screenshots and Software version

All screenshots in this manual were captured with versions of the programming software listed in section 4.2.1 running under Windows XP.

Slight modifications could occur in case of newer software versions.

Typographic Conventions

Use of notes

Notes containing important information are clearly identified as follows:

NOTE | Note text

Use of examples

Examples containing important information are clearly identified as follows:

Example ▽ Example text △

Numbering in figures and illustrations

Reference numbers in figures and illustrations are shown with white numbers in a black circle and the corresponding explanations shown beneath the illustrations are identified with the same numbers, like this:

❶ ❷ ❸ ❹

Procedures

In some cases the setup, operation, maintenance and other instructions are explained with numbered procedures. The individual steps of these procedures are numbered in ascending order with black numbers in a white circle, and they must be performed in the exact order shown:

① Text.

② Text.

③ Text.

Footnotes in tables

Footnote characters in tables are printed in superscript and the corresponding footnotes shown beneath the table are identified by the same characters, also in superscript.

If a table contains more than one footnote, they are all listed below the table and numbered in ascending order with black numbers in a white circle, like this:

① Text
② Text
③ Text

Table of Contents

1 Introduction

This english document is the original instruction.

This start-up guidance is intended for those who use the Q170MCPU standalone motion controller and QD-Motion controller for the first time. How to use programming tool MT Works2 for motion CPU and programming tool GX (IEC) Developer for sequencer CPU will be explained.

Refer to our QD-Motion controller/Q170MCPU manuals for further information.
(For manual numbers see preamble of this quick start guide.)

1.1 What is motion control?

A Motion control system comes from the combination of a Motion CPU and a PLC CPU.

While the Motion CPU controls complex servo movements by synchronizing the connected servo axes, the PLC CPU is responsible for machine's general control and communication.

With a motion control system you are able to solve different positioning applications from positioning with one axis in small production lines up to multi-axis positioning in large-scale systems.

The Motion CPU controls different more or less complex motion sequences via the connected servo amplifiers and motors.

Typical applications of a motion control systems are:

- Plastics and textile processing,
- Packaging,
- Printing and paper converting,
- Forming,
- Wood and glass working,
- Production of semiconductors.

1.1.1 Block diagram of a motion control system

The following diagram shows the components of a motion control system with CPUs, modules, servo amplifiers and motors.

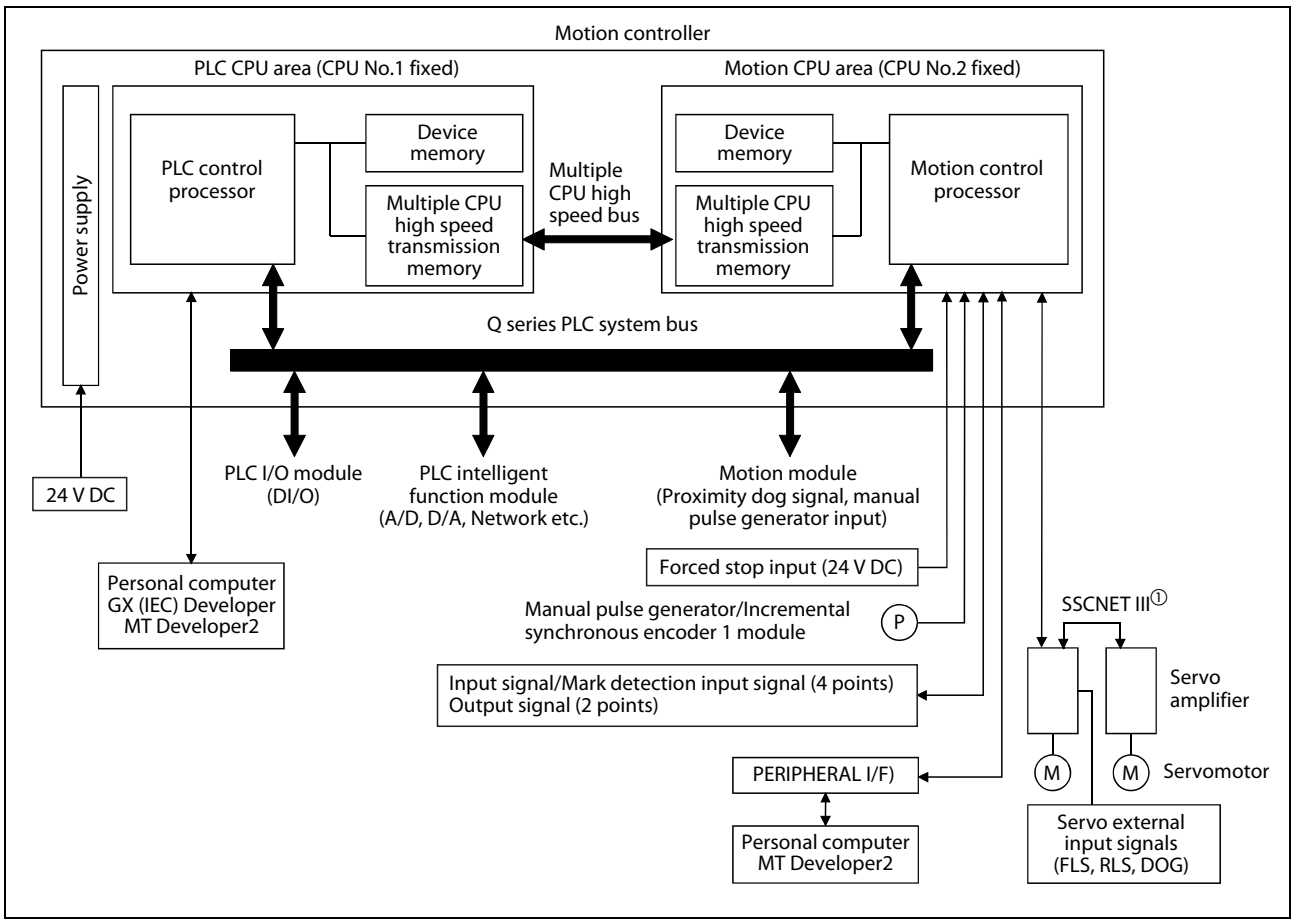


Fig. 1-1: *Block diagram of a motion control system*

① All of Mitsubishi motion controllers exploit the potentiality of the proprietary high-speed motion network SSCNET III.

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

The Multiple CPU high speed transmission memory between the PLC CPU area and Motion CPU area can communicate at a rate of 0.88 ms.

1.1.2 Difference between Q170MCPU and QD Motion controllers

With the motion controller Q170MCPU, the functionality of the PLC CPU and the Motion CPU is integrated in one compact housing. That means, compared to the modules Q172DCPU and Q173DCPU, there is no need of an additional PLC and base unit for the configuration of a motion system.

Synchronous encoder interface is included as standard, enabling multiple axes synchronization with an external encoder.

Applications as labelling, packaging and material handling do not require any other optional module.

1.2 Specification

1.2.1 Q170MCPU

Item	Specification
Power Supply	24 V DC +/-10 %, ripple ratio 5 % or less
Mass [kg]	0.9
Dimensions [mm]	178 (H) x 52 (W) x 135 (D)
Digital Inputs (Mark detection)	4
Digital Outputs	2
Synchronous Encoder	• A/B-phase pulse train • Open-collector-type: up to 800 kpps, up to 10 m • Differential-type: up to 1 Mpps, up to 30 m
Peripheral Interface	100/10 Mbps Ethernet, USB, RS-232
Connectable servo amplifier	MR-J3-□B servo amplifiers over SSCNET III (Rotational, Linear and Fully closed loop compatible)
Compatible extension base unit	Q52B/Q55B
Compatible motion modules	Q172DLX/Q172DEX/Q173DPX
Memory back up	Q6BAT (included with Q170MCPU)

Tab. 1-1: *Q170MCPU General specifications*

Item	Specification
Number of controlled axes	Up to 16
Operation Cycle - SV13 OS *(SW8DNC-SV13QG)*	0.44 ms/1 to 6 axes 0.88 ms/7 to 16 axes
Operation Cycle - SV22 OS *(SW8DNC-SV22QF)*	0.44 ms/1 to 4 axes 0.88 ms/5 to 12 axes 1.77 ms/13 to 16 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)
CAM function	• Up to 256 CAM profiles can be stored internally • Resolution per cycle 256, 512, 1 024 or 2 048 points • Stroke resolution 32 767 • Two-way CAM and Feed CAM
Programming language	Motion SFC, Dedicated instruction, Mechanical support language (SV22)

Tab. 1-2: *Q170MCPU Motion Control specifications*

Item	Specification
Processing speed (sequence instruction)	LD instruction: 0.02 µs MOV instruction: 0.04 µs
Program capacity	20k steps (80 kbyte)
Programming language	Ladder, IL, SFC, ST, MELSAP-L (IEC61131-3 programming compatible)

Tab. 1-3: *Q170MCPU PLC control specifications*

1.2.2 Q172DCPU, Q173DCPU

Item	Q172DCPU	Q173DCPU
Internal current consumption (5 V DC) [A]	1.14	1.25
Mass [kg]	0.33	
Dimensions [mm]	98 (H) x 27.4 (W) x 119.3 (D)	
Compatible motion modules	Q172DLX/Q172DEX/Q173DPX	
Connectible Servo amplifiers	MR-J3-B□ Servo amplifiers over SSCNET III (Rotational, Linear and fully closed loop compatible)	

Tab. 1-4: *Q172DCPU/Q173DCPU general specifications*

Item		Q172DCPU	Q173DCPU
Number of control axes		Up to 8 axes	Up to 32 axes
Operation cycle (default)	SV13	0.44 ms/1 to 6 axes 0.88 ms/7 to 8 axis	0.44 ms/1 to 6 axes 0.88 ms/7 to 18 axis 1.77 ms/19 to 32 axes
	SV22	0.44 ms/1 to 4 axes 0.88 ms/5 to 8 axis	0.44 ms/1 to 4 axes 0.88 ms/5 to 12 axis 1.77 ms/13 to 28 axes 3.55 ms/29 to 32 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		3 200 points (Positioning data can be designated directly)	
Peripheral IF		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 retry function provided, home position shift function provided)	

Tab. 1-5: *Q172DCPU/Q173DCPU Motion control specifications*

1.3 Terminology

The terms and abbreviations below are important for motion controllers and are used frequently in this guide.

Direction of rotation of electric motors

The direction (or sense) of rotation of electric motors is defined looking at the end of the motor shaft.

Direction of rotation is described as:

- Clockwise/Reverse

or

- Counterclockwise/Forward

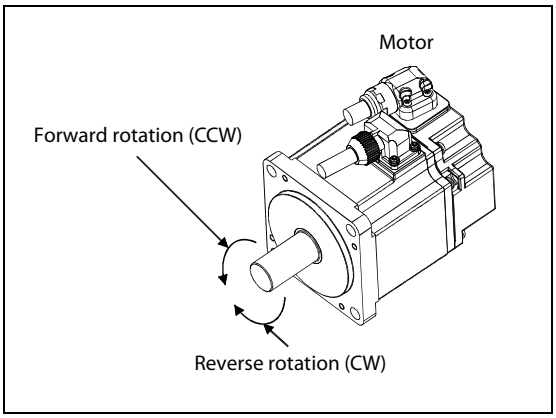


Fig. 1-2: *Direction of rotation*

Abbreviations

–	FLS	Upper stroke limit
–	RLS	Lower stroke limit
–	STOP	Stop signal
–	DOG	Proximity dog
–	EMI	Emergency signal input
–	CW	Clockwise
–	CCW	Counterclockwise
–	SSCNET III	Optical bus system for data communication

2 Details of the modules

2.1 Q170MCPU

2.1.1 Frontview and partnames

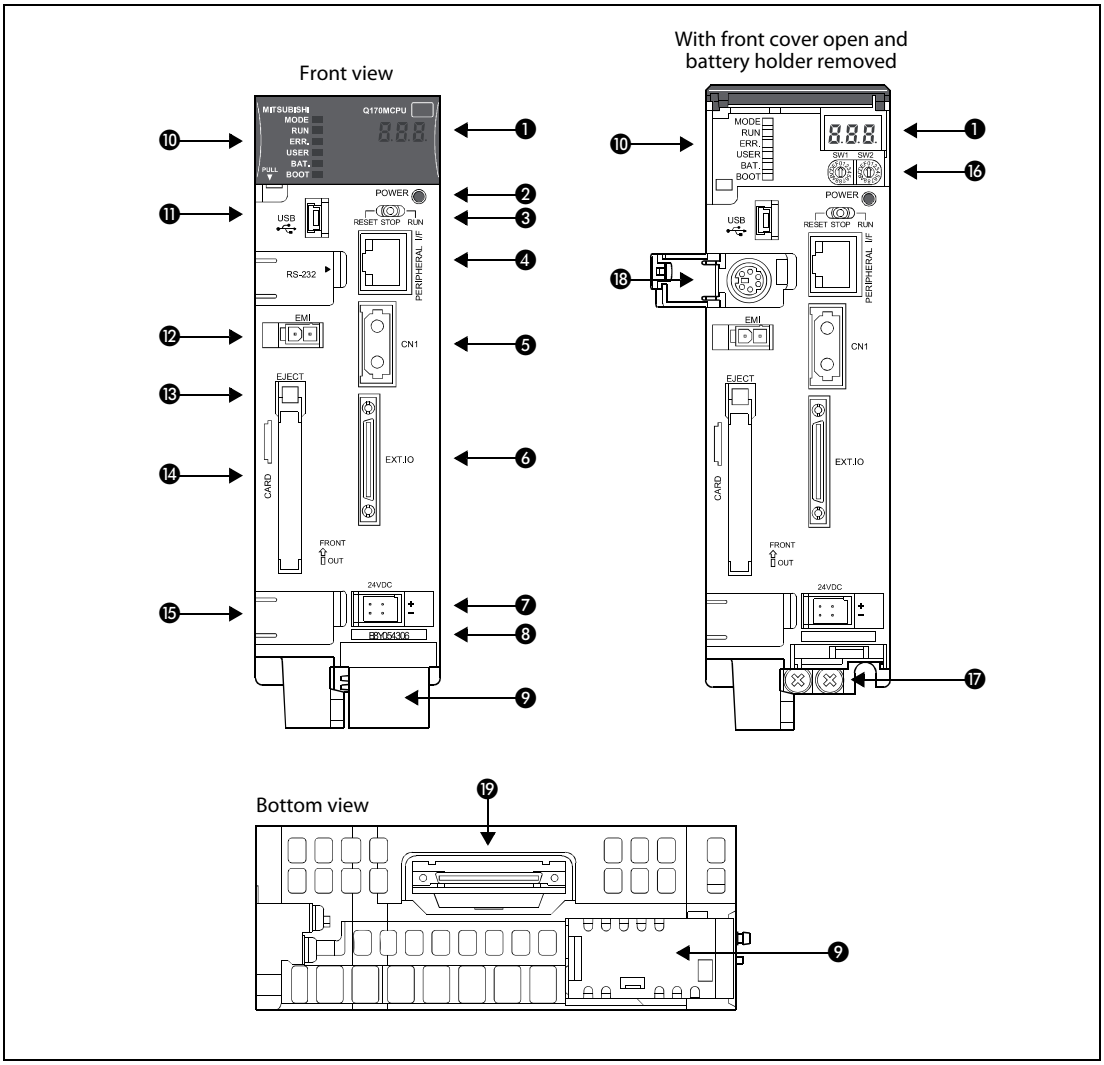


Fig. 2-1: *Q170MCPU*

No.	Name	Application
❶	7-segment LED	Displays operation status and error information.
❷	POWER LED	ON (Red): The internal power (5 V DC) is ON. OFF: The internal power (5 V DC) is OFF.
❸	RUN/STOP/RESET switch	RUN: Sequence-/Motion SFC program started STOP: Sequence-/Motion SFC program stopped RESET: Reset of the hardware (momentary switch, set minimum for 1 sec)
❹	PERIPHERAL I/F connector	For Ethernet-communication with peripheral devices. Data transmission speed: 10 Mbps/100 Mbps
❺	SSCNET III connector CN1	Connector to connect the servo amplifiers via optical bus cable.
❻	EXT. IO connector	Connector for manual pulse generator/incremental synchronous encoder/digital I/O signals. (Voltage-output/open-collector type, Differential-output type)

Tab. 2-1: *Description of the partnames in fig. 2-1.*

No.	Name		Application
❼	24VDC connector		Connector for 24 V DC power supply
❽	Serial number		Shows the serial number, printed on the rating plate
❾	Battery holder		Battery holder to set the Q6BAT/Q7BAT
❿	Status LED	MODE	Displays the mode of the PLC CPU ON (green): Q mode
		RUN	Diplays the operating status of the PLC CPU ON: The operating status is "RUN" OFF: The operating status was set to "STOP" or operation has been halted due to an error. Flashing: Failure during writing of parameters or programs
		ERR.	Diplays the operating status of the PLC CPU ON: Detection of an error during self-diagnosis OFF: Normal operation Flashing: The detected error stops operation. (Resetting with the RUN/STOP/RESET switch becomes valid.)
		USER	Diplays the operating status of the PLC CPU ON: Annunciator turned ON OFF: Normal operation
		BAT.	Diplays the operating status of the PLC CPU ON (yellow): Low battery voltage at memory card ON (green for 5 sec): Restoring of data backup to the standard ROM by the latch data backup is completed ON (green): Backup of data to the standard ROM by latch data backup is completed OFF: Normal operation
		BOOT	Diplays the operating status of the PLC CPU ON: Start of boot operation OFF: No boot operation
⓫	USB connector		Connector to connect the peripheral devices for USB connection (Connector type mini B)
⓬	Forced stop input connector (EMI)		Input to stop all axis at once Open: Forced stop (EMI ON) 24 V DC: Forced stop release (EMI OFF)
⓭	Eject button for memory card		Used to eject the memory card from the Motion controller
⓮	Memory card loading connector		Connector used to load the memory card to the Motion controller
⓯	—		Not usable
⓰	Rotary switch SW1, SW2		• Setting of the operation mode (Normal operation mode, Installation mode, Mode operated by ROM, etc.) • Each switch setting is from 0 to F (Factory default setting: SW1: A, SW2: 0)
⓱	FG terminal		Frame ground: Ground terminal connected with the shield pattern of the printed circuit board
⓲	RS-232 connector		Connector to connect the peripheral devices for RS-232 connection (Connect with the dedicated cable QC30R2)
⓳	Extension cable connector		Connector for transfer of signals to/from the extension base unit

Tab. 2-1: *Description of the partnames in fig. 2-1.*

NOTE

For more details of the partnames and status LEDs please refer to the user's manual of the motion controller Q170MCPU.

2.1.2 System configuration

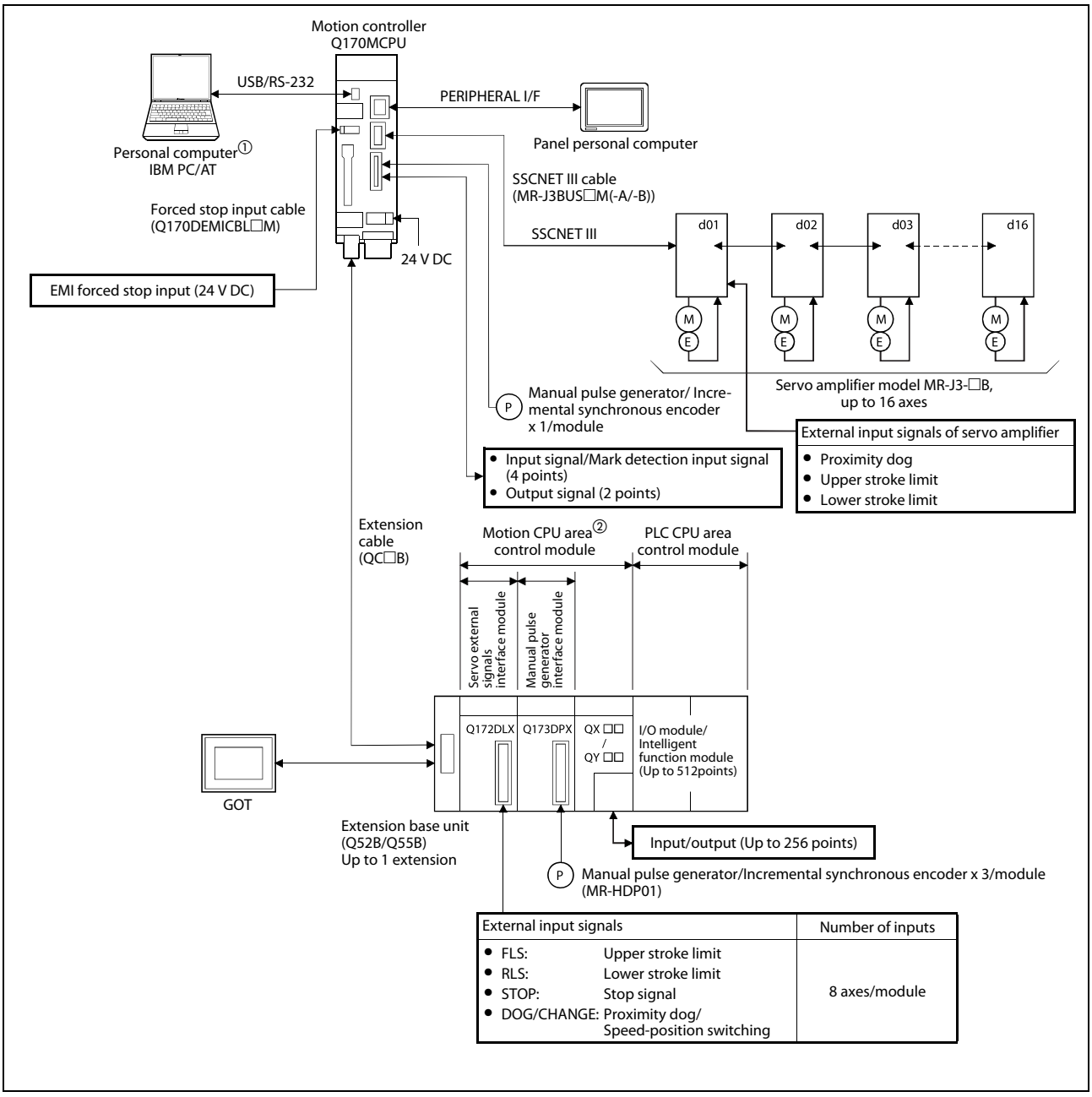
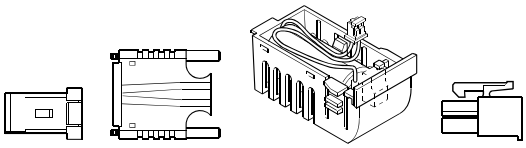


Fig. 2-2: *System configuration*

① GX (IEC) Developer and MT Works2 can be used simultaneously on one personal computer.

② Interrupt module (QI60) and analog I/O module (Q6□AD/Q6□DA) can also be used as the Motion CPU area control module.

2.1.3 Minimum equipment

Product		Details
Controller		
Q170MCPU		Standalone motion controller, 16 axes, SSCNETIII① 
Software		
MT Developer2-E		Programming software for Q-/QH-/QD-/Q170MCPU motion controller (Windows 2000/XP/Vista)
MT Developer OS Systems		Operating systems for Q-/QH-/QD-/Q170MCPU motion controller
MR Configurator (Setup221)		Servo setup software
GX (IEC) Developer		PLC programming software

Tab. 2-2: *Minimum equipment for Q170MCPU*

① 24V connector, DI/O connector, SRAM backup battery, EMI connector included

2.2 Q172DCPU/Q173DCPU

2.2.1 Frontview and partnames

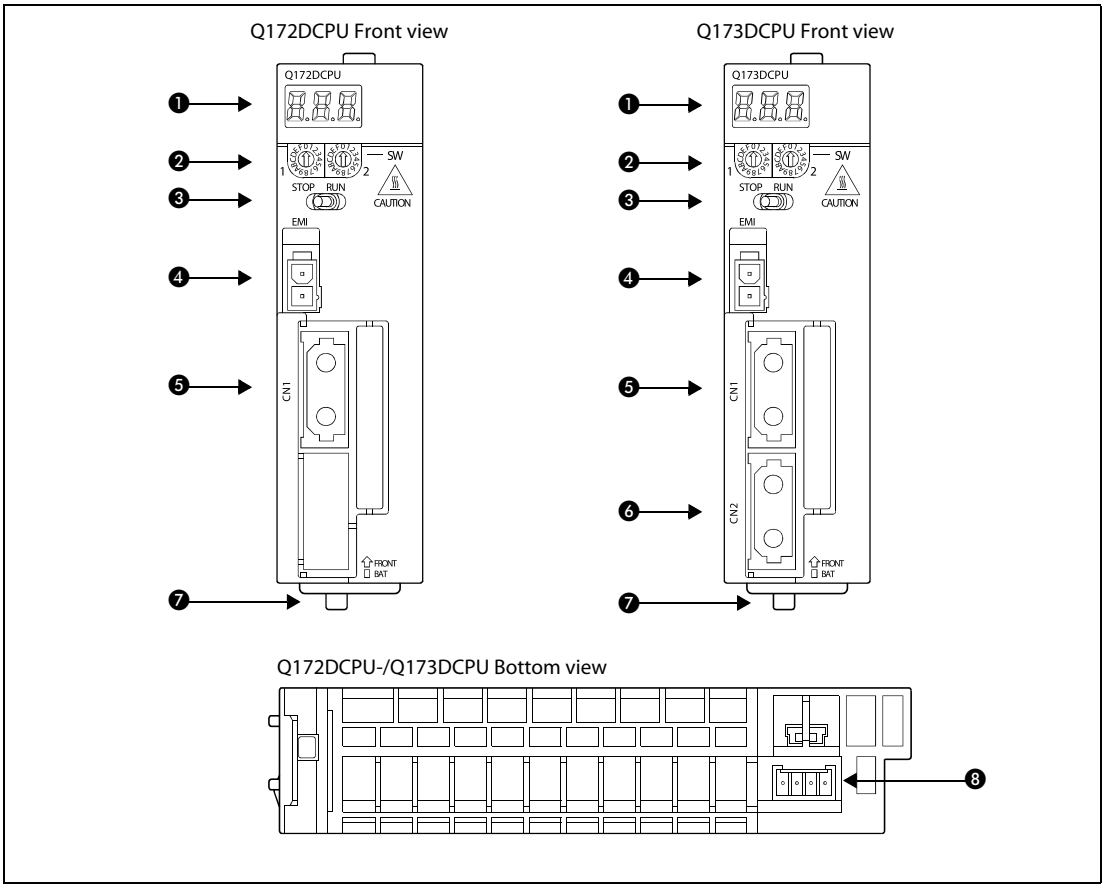


Fig. 2-3: *Q172DCPU, Q173DCPU*

No.	Name	Application
❶	7-segment LED	Displays operation status and error information
❷	Rotary switch SW1, SW2	• Setting of the operation mode (Normal operation mode, Installation mode, Mode operated by ROM, etc.) • Each switch setting is from 0 to F (Factory default setting: SW1: A, SW2: 0)
❸	RUN/STOP switch	RUN: Motion SFC program started STOP: Motion SFC program stopped (Factory default setting is STOP)
❹	Forced stop input connector (EMI)	Input to stop all axis at once Open: Forced stop (EMI ON) 24 V DC: Forced stop release (EMI OFF)
❺	SSCNET III connector CN1	Connector to connect the servo amplifiers of system 1 (channel 1) via optical bus cable (Q172DCPU: up to 8 axes; Q173DCPU: up to 16 axes)
❻	SSCNET III connector CN2①	Connector to connect the servo amplifiers of system 2 (channel 2) via optical bus cable (up to 16 axes)
❼	Module loading lever	Used to install the module on the base unit
❽	Battery connector (BAT)	Connector to connect the battery holder unit Q170DBATC

Tab. 2-3: *Description of the partnames in fig. 2-3.*

① Q173DCPU only

NOTE For more details of the partnames please refer to the user's manual of the motion controllers Q172DCPU and Q173DCPU.

2.2.2 System configuration

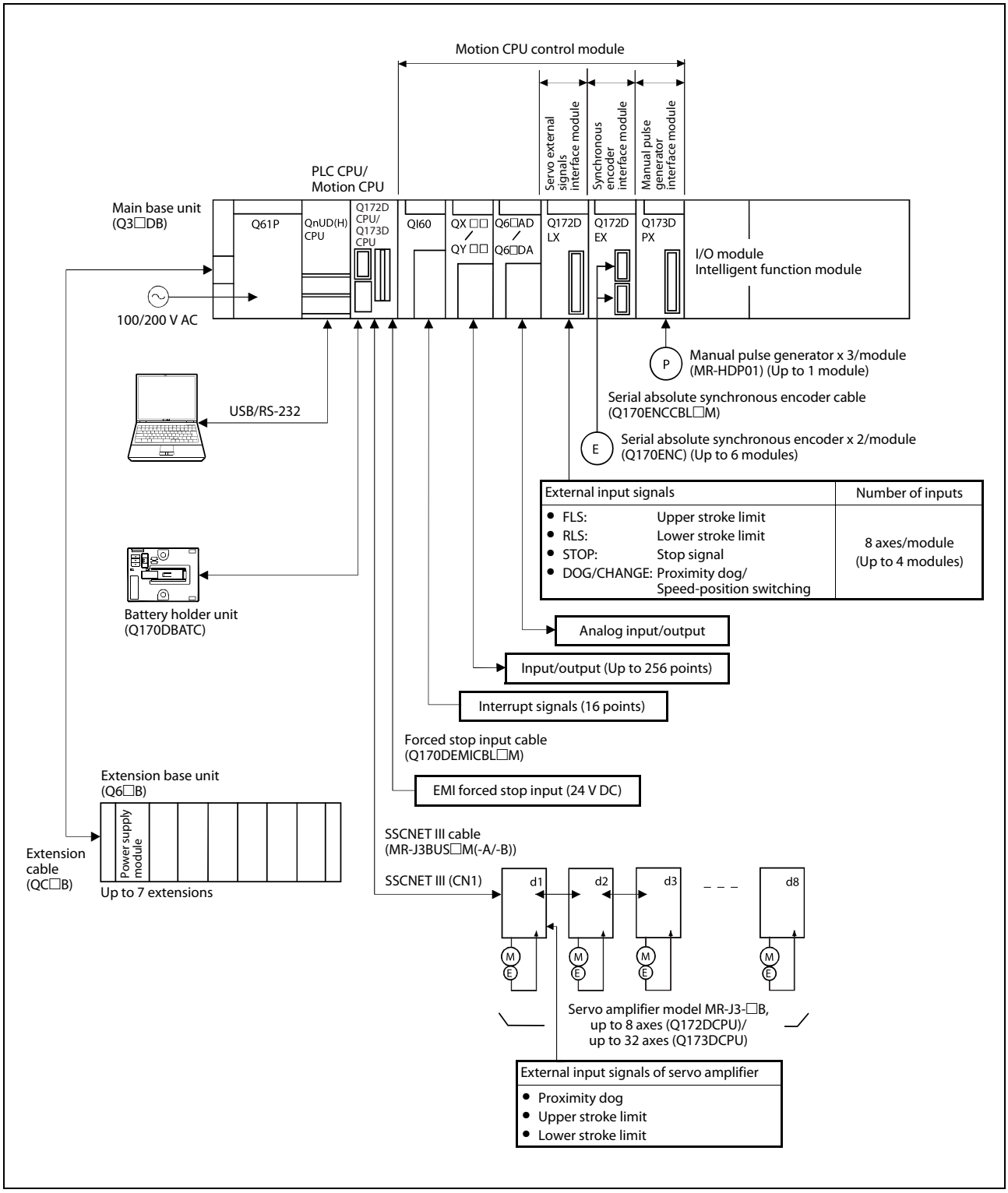


Fig. 2-4: *System configuration*

2.2.3 Minimum equipment

Product		Details
Controller		
Q38DB		8 slot base unit
Q61P or similar		Power supply module Input: 100–240 V AC Output: 5 V DC/6 A
QnUD(E)(H)CPU		PLC CPU Module; 4096 I/O
Q172DCPU/ Q173DCPU		Motion controller CPU module, 8/32 axes, SSCNET III①
Software		
MT Developer2-E		Programming software for Q-/QH-/QD-/Q170MCPU motion controller (Windows 2000/XP/Vista)
MT Developer OS Systems		Operating systems for Q-/QH-/QD-/Q170MCPU motion controller
MR Configurator (Setup221)		Servo setup software
GX (IEC) Developer		PLC programming software

Tab. 2-4: *Minimum equipment for Q172DCPU/Q173DCPU*

① EMI connector/cable is sold separately. The Forced stop input cannot be invalidated by internal parameter.

3 Mounting and wiring

3.1 Module mounting into cabinet

3.1.1 Mounting of Q170MCPU

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.

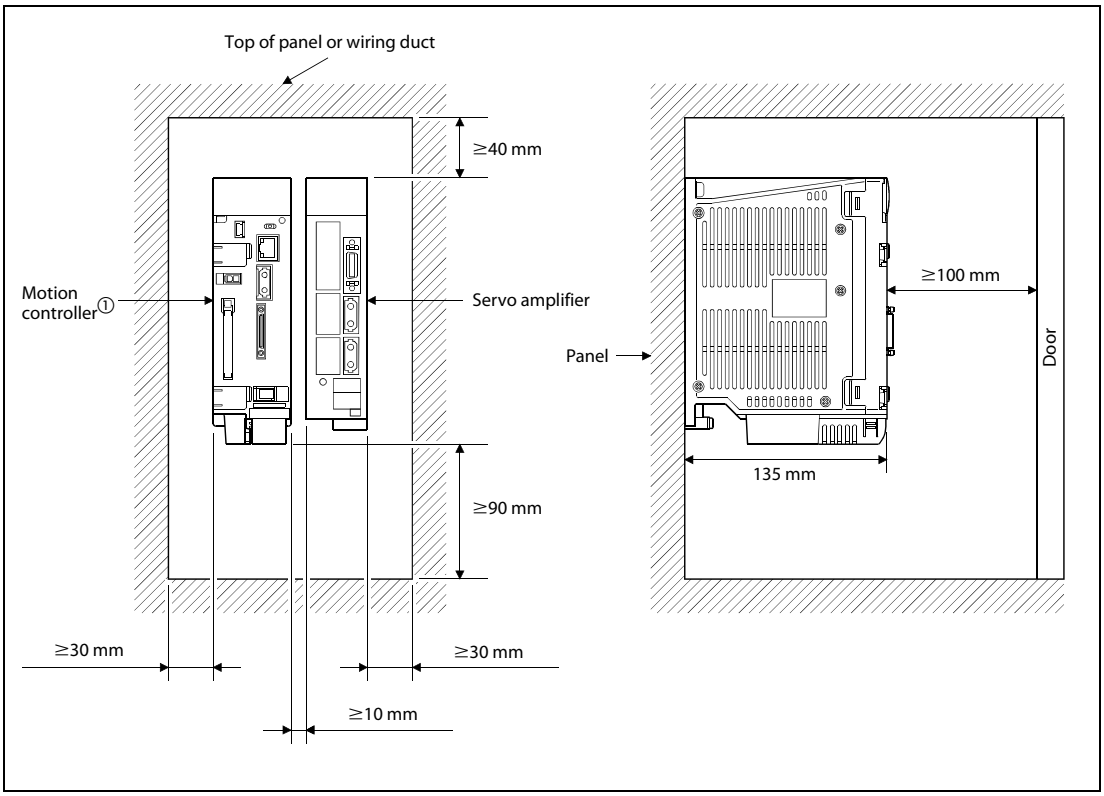


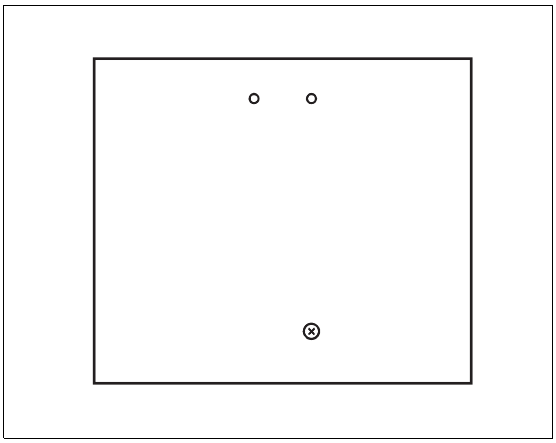
Fig. 3-1: *Module mounting position*

① Fit the Motion controller at the left side of the servo amplifier.

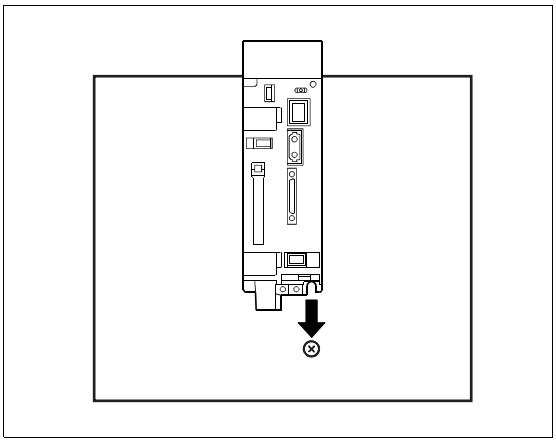
Mounting method for the motion controller

WARNING:

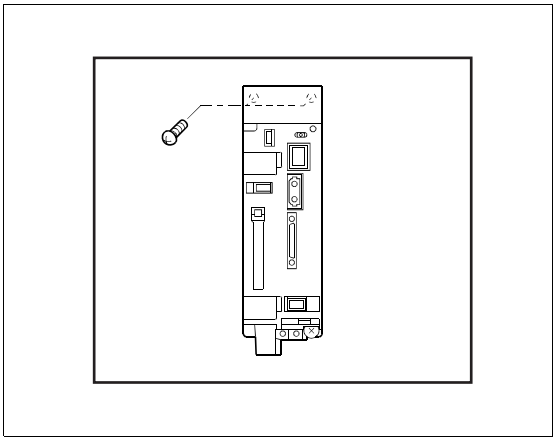
Completely turn off the externally supplied power used in the system before installation or removing the module. Not doing so could result in electric shock or damage to the product.



① Fit the holes for the bottom mounting screws of the Motion controller into the panel.



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



③ Fit the mounting screws into the holes at the top of the Motion controller and then retighten the all mounting screws using the allowed torque.

3.1.2 Mounting of Q172DCPU/Q173DCPU

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.

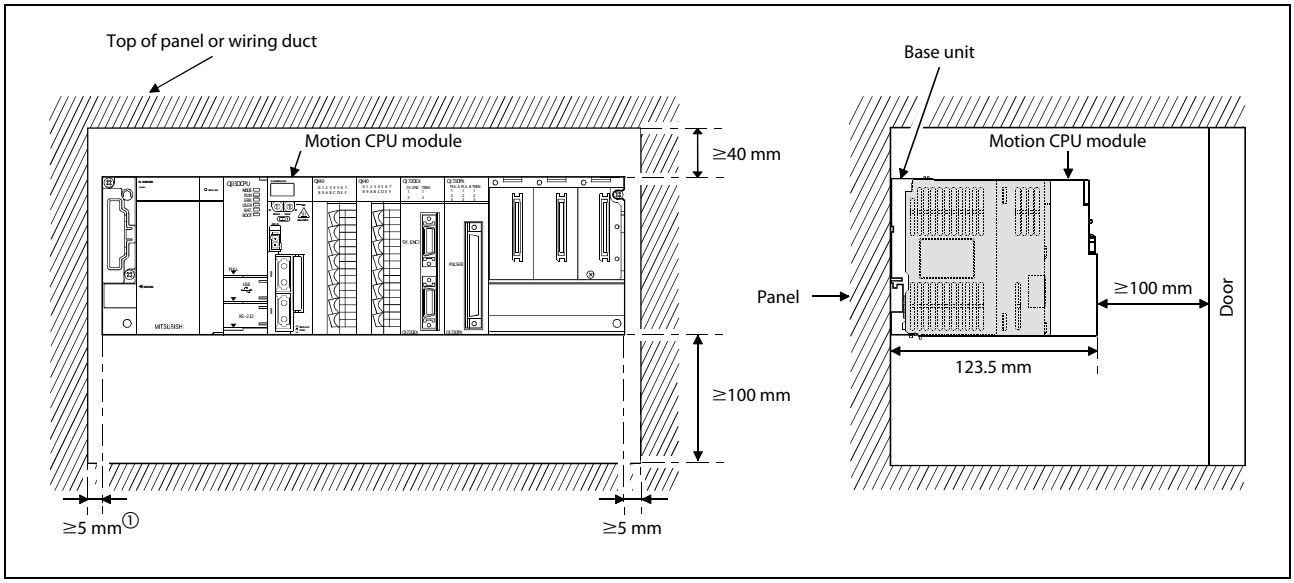


Fig. 3-2: *Module mounting position*

① ≥20 mm when the adjacent module is not removed and the extension cable is connected.

NOTE It is not possible to mount the main base unit by DIN rail.

Installation of the module on Q3□B and Q6□B

WARNING:

- ***Completely turn off the externally supplied power used in the system before installing the module. Not doing so could result in electric shock or damage to the product.***
- ***When installing the module, always insert the module fixing projection into the module fixing hole of the base unit. If the module is forcibly installed without the latch being inserted, the module connector and module will be damaged.***

① Securely insert the module fixing protection into the module fixing hole so that the latch is not misaligned.

② Using the module fixing hole as a fulcrum, push the module in the direction of arrow to install it into the base unit.

③ Make sure that the module is installed in the base unit securely.

④ When using module in a place where there is large vibration or impact, install it by the unit fixing screws (M3 x 12).

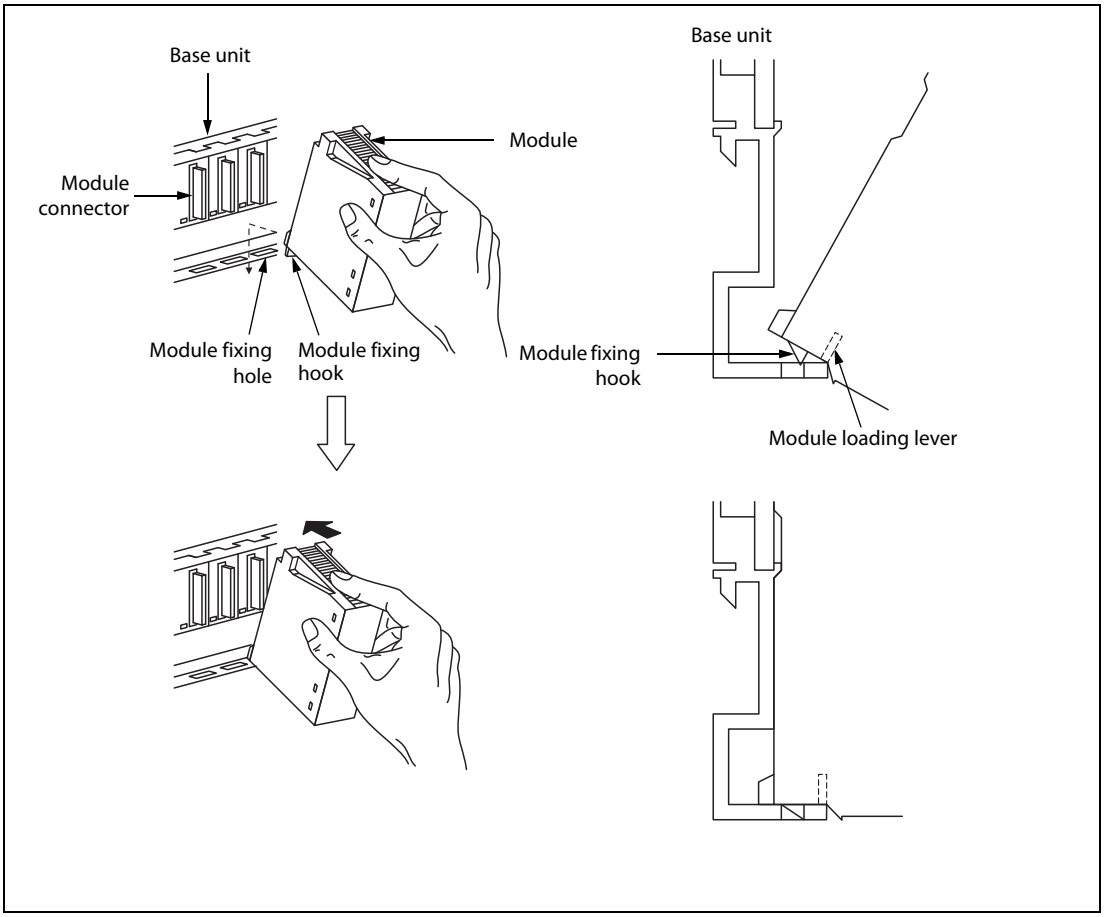
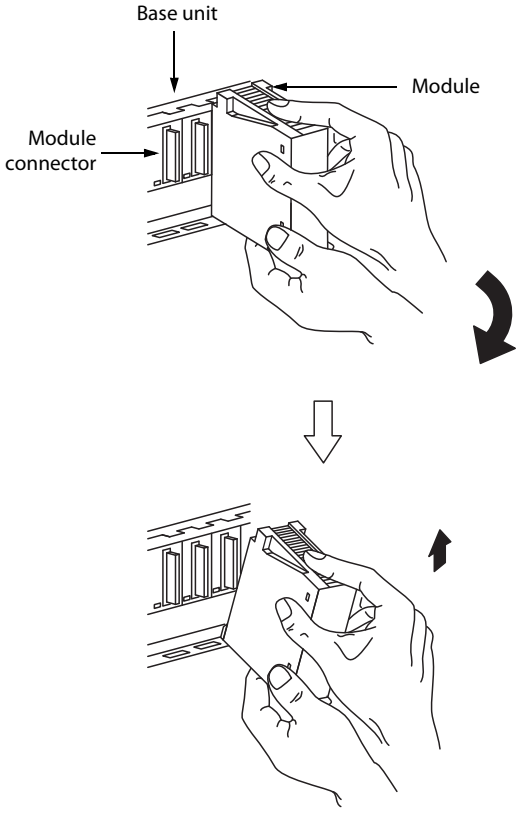


Fig. 3-3: *Installation of the module*

Removal of the module from Q3□B and Q6□B

WARNING:

- ***Completely turn off the externally supplied power used in the system before removing the module. Not doing so could result in electric shock or damage to the product.***
- ***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.***



Support the module with both hands and securely press the module fixing hook with your finger.

Pull the module based on the supporting point of module bottom while pressing the module fixing hook.

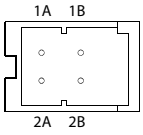
While lifting a module, take off the module fixing projection from the module fixing hole.

Fig. 3-4: *Removal of the module*

3.2 Wiring

3.2.1 Wiring for Q170MCPU

Power supply and EMI

Connector layout	Pin No.	Signal name	Pin No.	Signal name
	1A①	24V(+)	1B	24V(+)
	2A①	24G	2B	24G

Tab. 3-1: *Power supply 24 V*

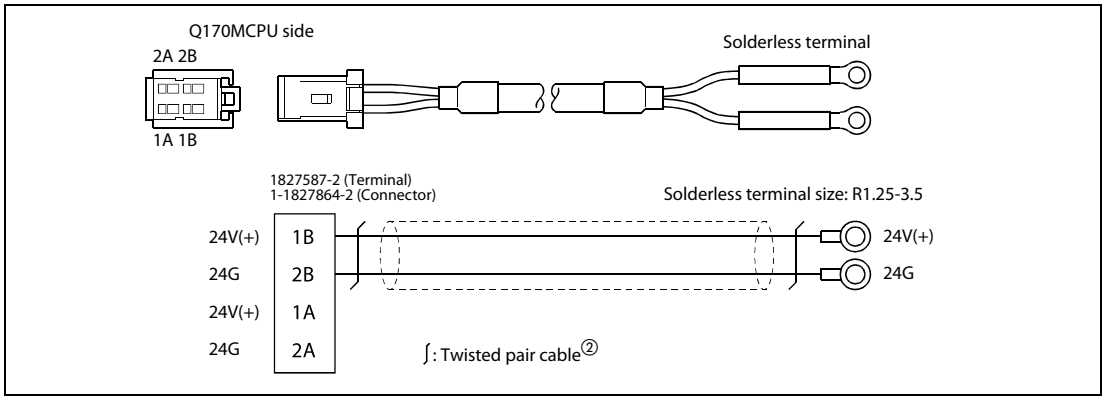


Fig. 3-5: *24 V DC power supply cable without EMI connector*

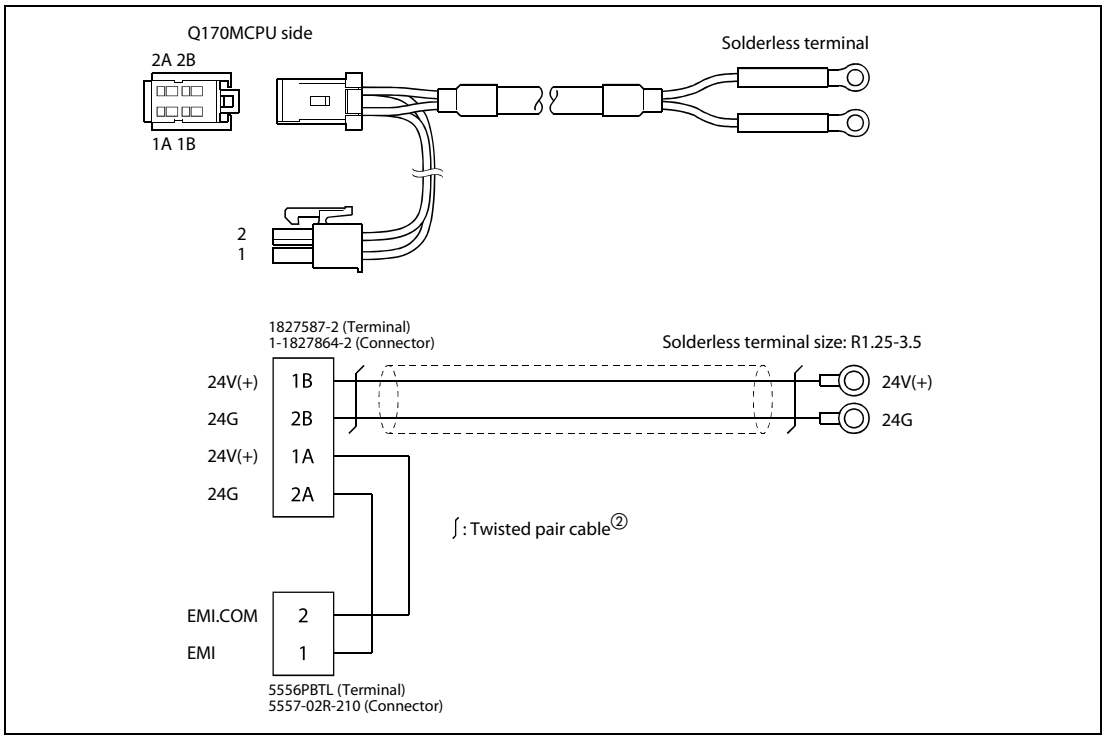


Fig. 3-6: *24 V DC power supply cable with EMI connector*

① Use "1A" and "2A" when the 24 V DC voltage is applied on EMI terminal and the forced stop input of EMI terminal is invalidated.

② Use a cable of wire size AWG22.

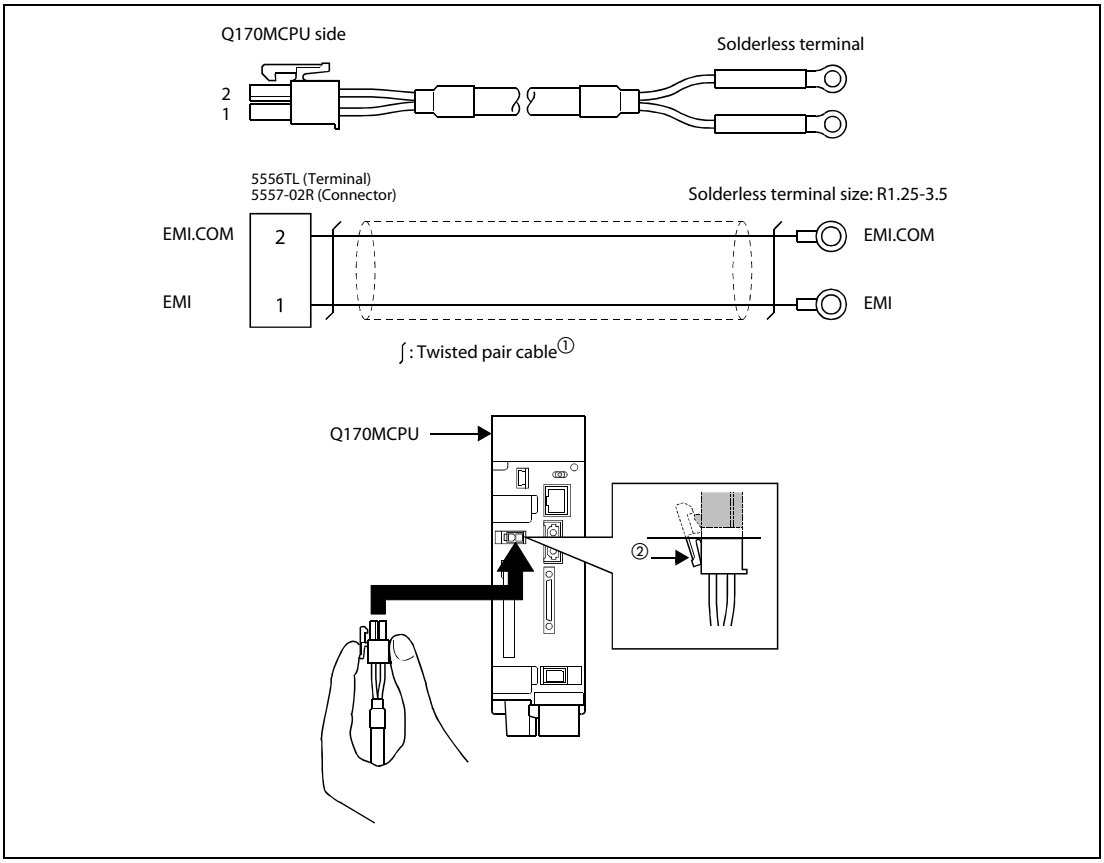


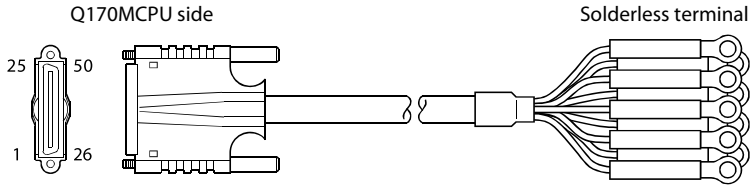
Fig. 3-7: *Forced stop input cable for EMI*

① Use a cable of wire size AWG22.

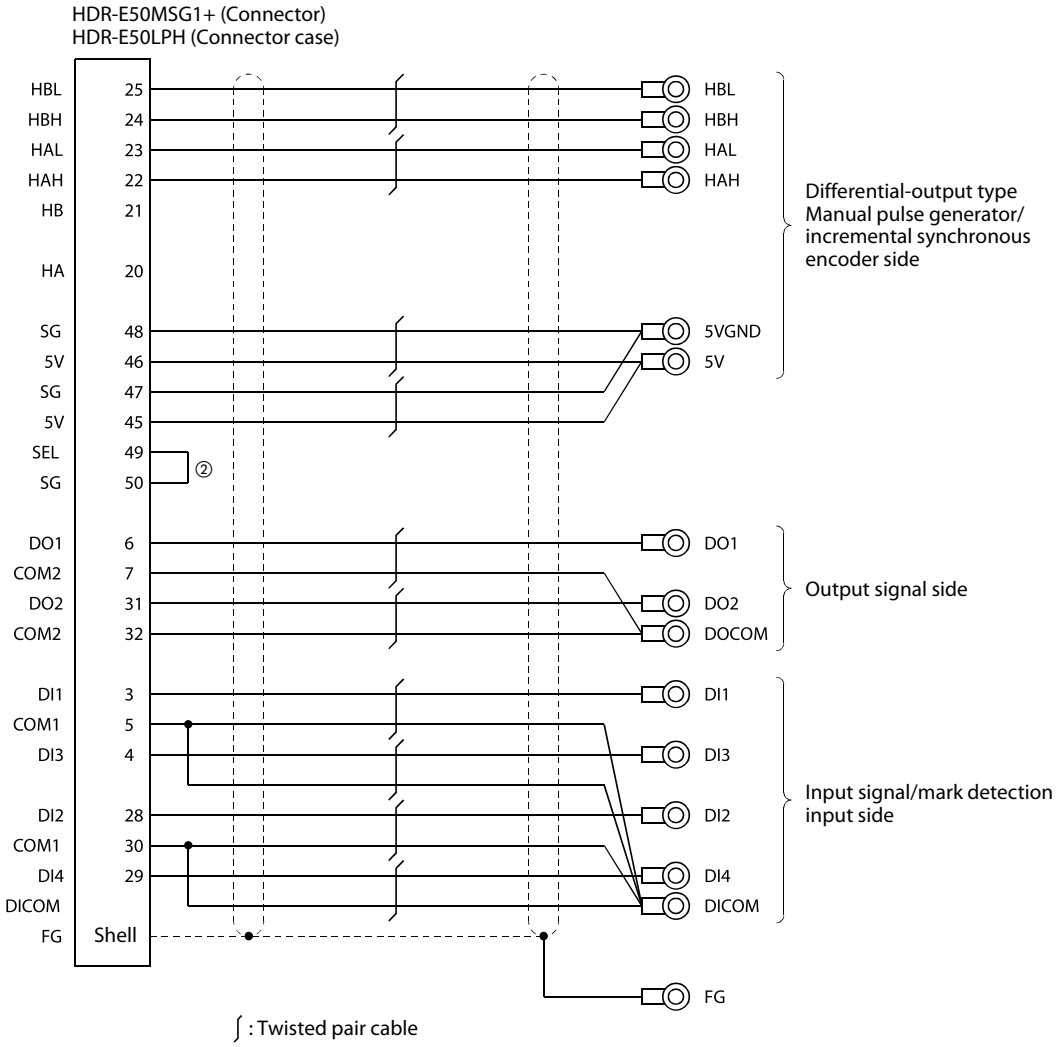
② Tab

Digital I/O

Cable①



Connection diagram

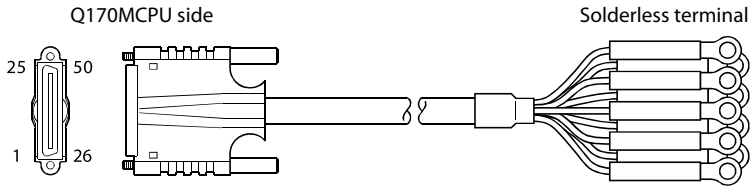


Tab. 3-2: *Differential-output type cable for internal I/F connector*

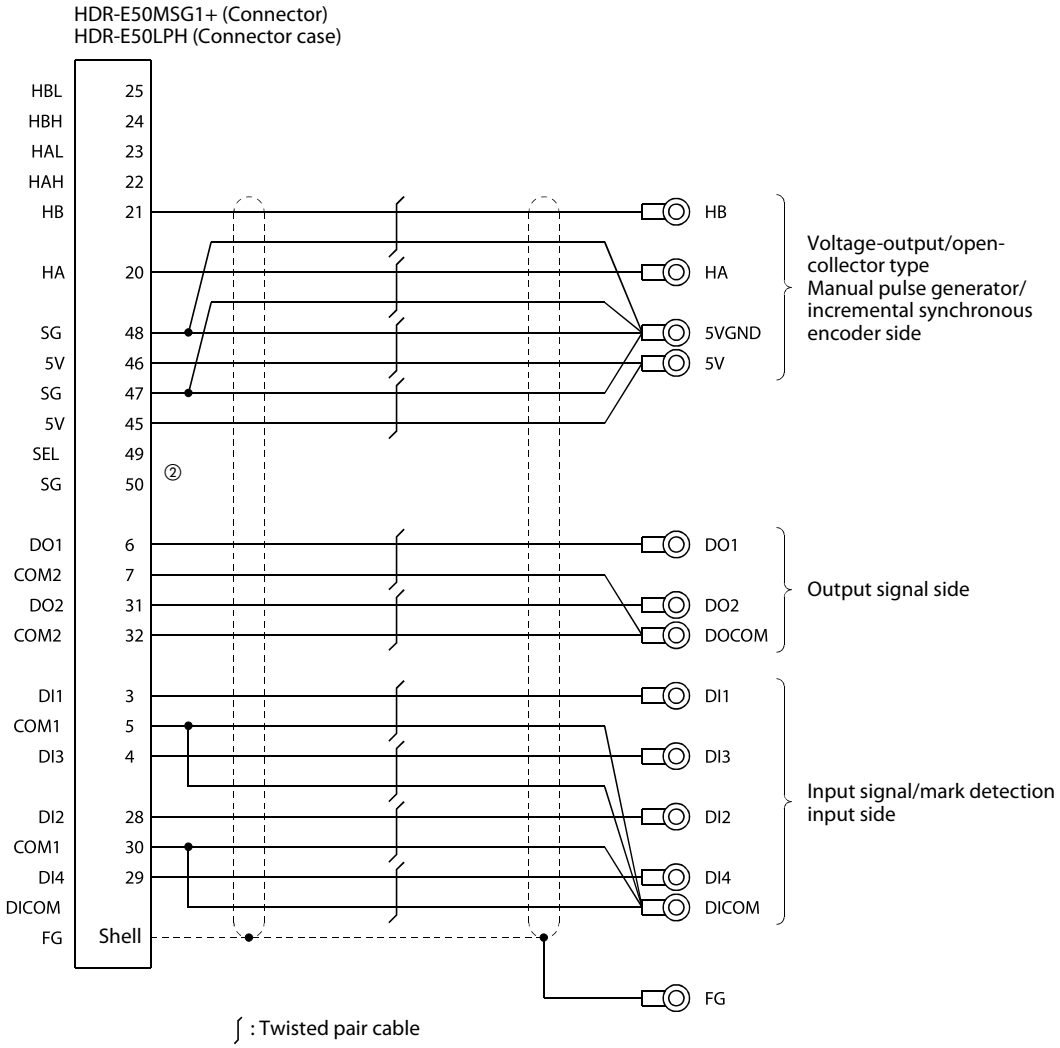
① The maximum length of the cable should be 30 m.

② Connect SEL to the SG terminal if differential-output type is used.

Cable①



Connection diagram



Tab. 3-3: *Voltage-output/open-collector type cable for internal I/F connector*

① The maximum length of the cable should be 10 m.

② When voltage-output/open-collector type is used, open between SEL and SG.

3.2.2 Wiring for QD Motion controller

Power supply and EMI

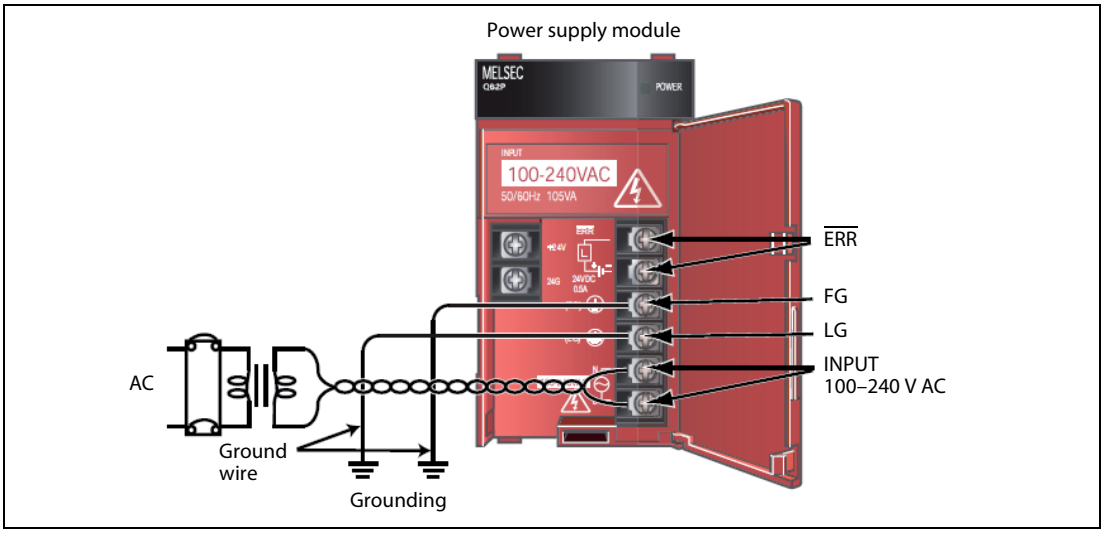


Fig. 3-8: *Power supply module for QD motion controller (example with Q62P)*

Terminal(s)	Function
FG	Ground terminal connected to the shield pattern of the printed circuit board.
LG	Grounding for the power supply filter. The potential of Q61P-A1, Q61P-A2, Q61P, Q62P, Q64P and Q61SP is half of the input voltage.
$\overline{\text{ERR}}$	The following functions of the $\overline{\text{ERR}}$ termials are only availible, when the power supply module is mounted on a main base unit. When mounted on an extension base unit the terminals are always OFF (open). • The terminals are ON (connected) when the whole system operates normally. • The terminals turn OFF (open) 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 the terminals turn OFF (open) when a stop error occurs in any of the CPU modules.

Tab. 3-4: *Explanation of the terminals in fig. 3-8*

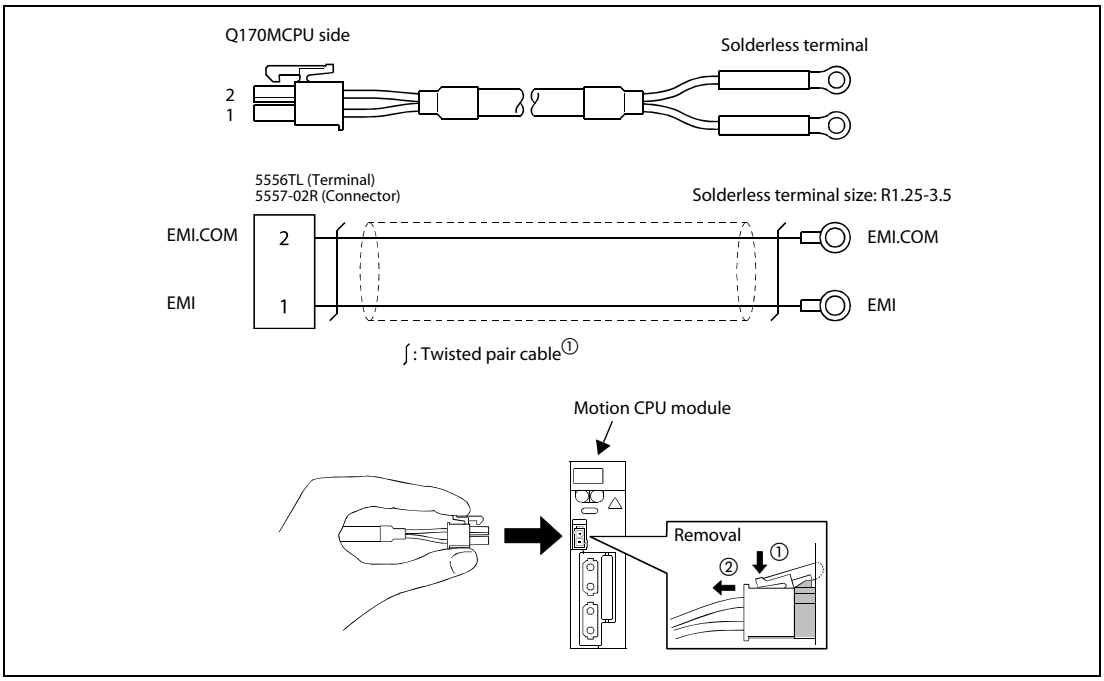


Fig. 3-9: *Forced stop input cable for EMI*

① Use a cable of wire size AWG22.

3.3 SSCNET III connection

3.3.1 SSCNET III cable

The cables in the following table are applicable for the connection between the Q170MCPU/QD-Motion controllers and the servo amplifier MR-J3-□B and between the servo amplifiers MR-J3-□B.

Cable	Symbol for cable length (□)										
	0,15 m	0,3 m	0,5 m	1 m	3 m	5 m	10 m	20 m	30 m	40 m	50 m
MR-J3BUS□M	015	03	05	1	3	—	—	—	—	—	—
MR-J3BUS□M-A	—	—	—	—	—	5	10	20	—	—	—
MR-J3BUS□M-B	—	—	—	—	—	—	—	—	30	40	50

Tab. 3-5: *SSCNET III cable identification*

3.3.2 Connection between the Q170MCPU and servo amplifiers

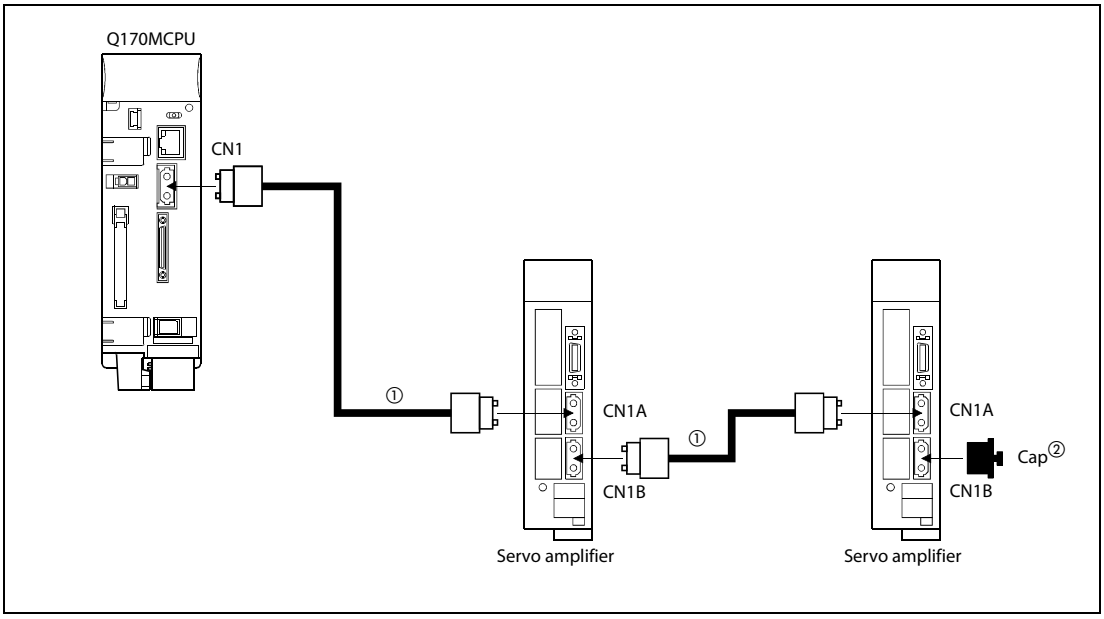


Fig. 3-10: *SSCNET III connection method with Q170MCPU*

① Chose the right SSCNET III cable type in tab. 3-5 depending on the cable length for your system configuration.

② Attach a cap to the SSCNET III connectors of the system not being used.

NOTE If the connectors CN1A und CN1B are mixed up at the servo amplifiers, no communication is possible.

3.3.3 Connection between the Q172DCPU and servo amplifiers

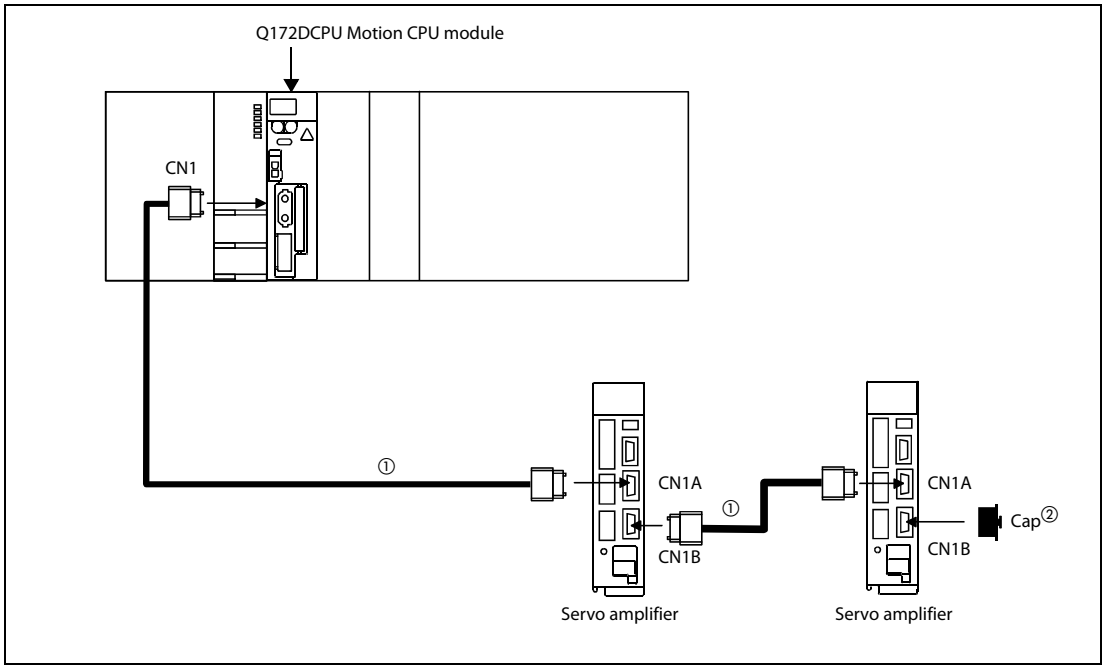


Fig. 3-11: *SSCNET III connection method with Q172DCPU*

① Chose the right SSCNET III cable type in tab. 3-5 depending on the cable length for your system configuration.

② Attach a cap to the SSCNET III connectors of the system not being used.

NOTE If the connectors CN1A und CN1B are mixed up at the servo amplifiers, no communication is possible.

3.3.4 Connection between the Q173DCPU and servo amplifiers

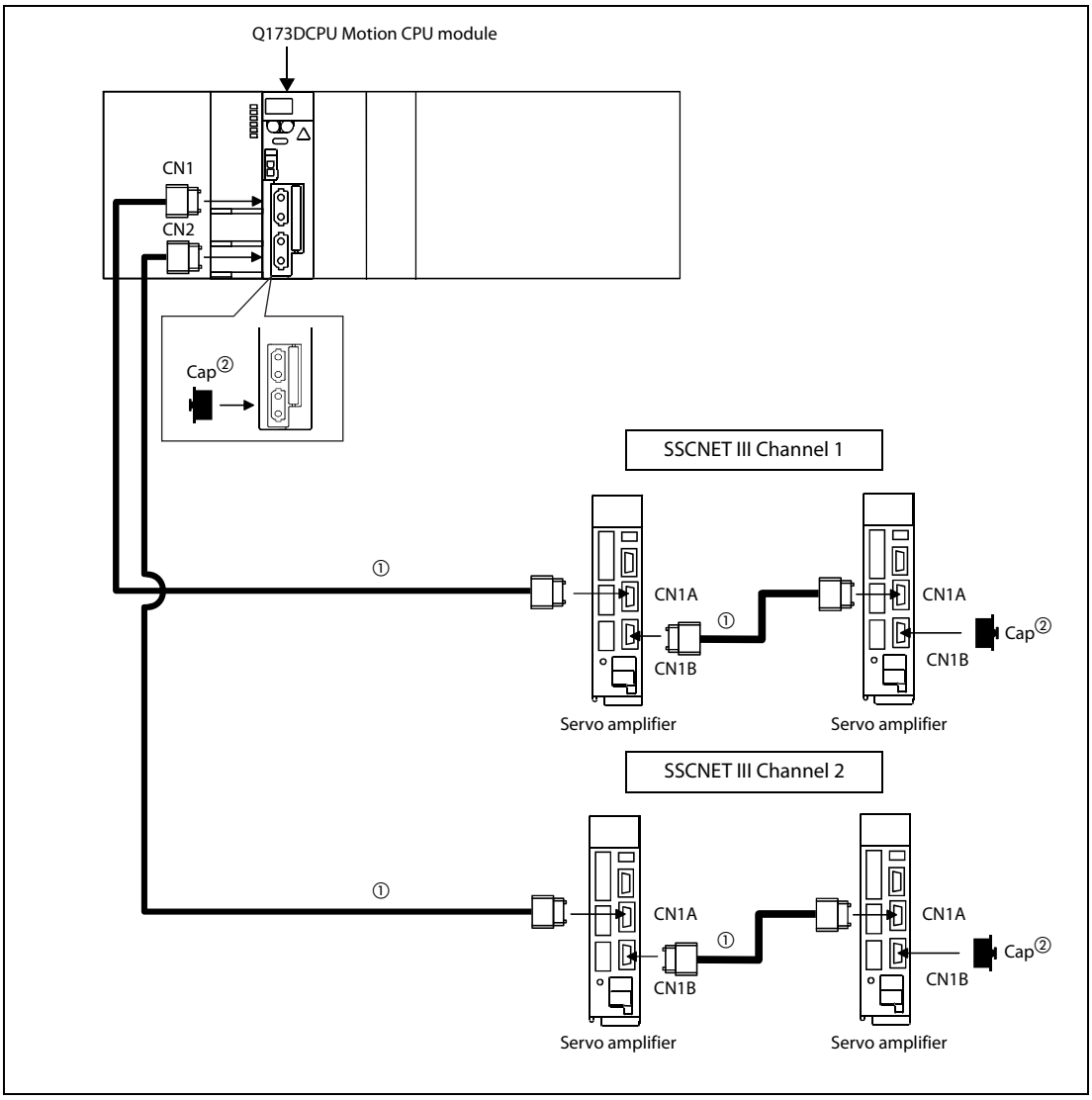


Fig. 3-12: *SSCNET III connection method with Q173DCPU*

① Chose the right SSCNET III cable type in tab. 3-5 depending on the cable length for your system configuration.

② Attach a cap to the SSCNET III connectors of the system not being used.

NOTE If the connectors CN1A und CN1B are mixed up at the servo amplifiers, no communication is possible.

3.3.5 Setting the axis No. and axis select switch of servo amplifier

Axis No. is used to set the axis number of servo amplifiers connected to SSCNET III motion bus in the program. Axis No. of 1 to 16 can be set.

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

Since the axis number (d01 to d16) of servo amplifier on the system setting screen corresponds to axis select rotary switch (0 to F) of servo amplifier, set the axis select rotary switch referring to the table below (Tab. 3-6).

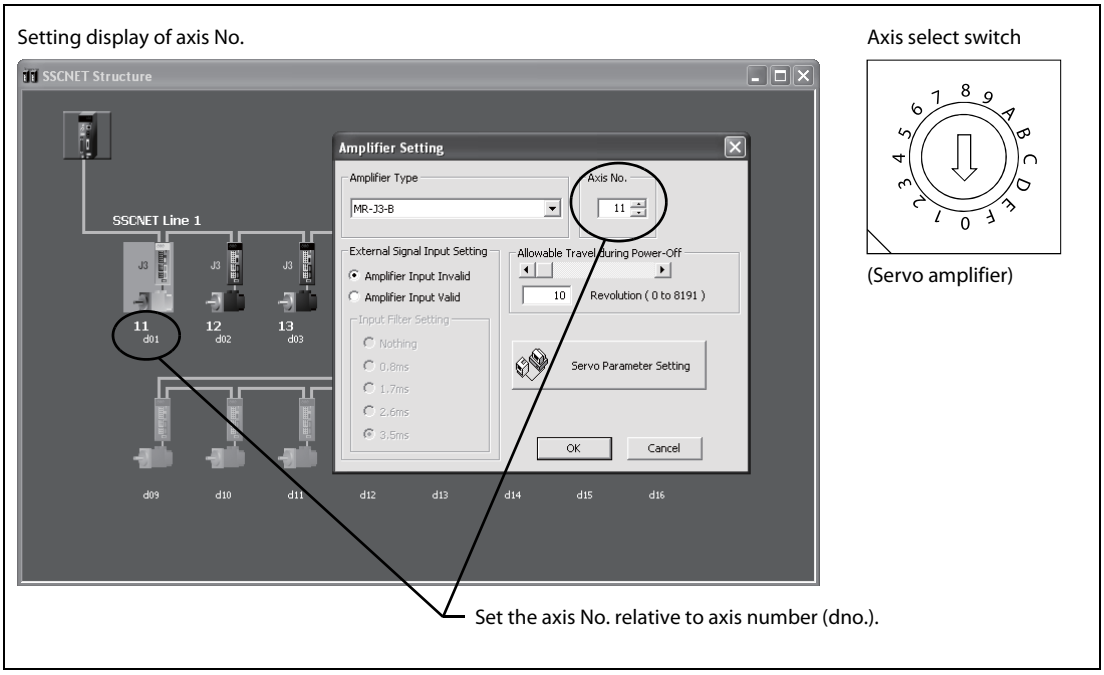


Fig. 3-13: *Setting the axis No.*

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

Tab. 3-6: *Correspondence between dno.s and axis select switches of servo amplifier*

NOTE The dno. represents the station number, which is set by the rotary switch at the servo amplifier.

4 Start-up and trial operation

DANGER:

- ***Be sure to ground the Motion controllers, servo amplifiers and servomotors (Ground resistance: 100 Ω or less). Do not ground commonly with other devices.***
- ***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.***

WARNING:

- ***Check that the combination of modules are correct. Wrong combination may damage the modules.***
- ***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 fires.***
- ***Always take heat measure 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 fires.***
- ***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 servo motor to operate abnormally.***
- ***Set parameter values to those that are compatible with the Motion controller, servo amplifier, servo motor and regenerative resistor model name and the system name application. The protective functions may not function if the settings are incorrect.***
- ***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.***
- ***If safety standards (ex., robot safety rules, etc.,) apply to the system using the Motion controller, servo amplifier and servo motor, make sure that the safety standards are satisfied.***
- ***Construct a safety circuit externally of the Motion controller or servo amplifier if the abnormal operation of the Motion controller or servo amplifier differ from the safety directive operation in the system.***
- ***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.***

4.1 Start-up procedure

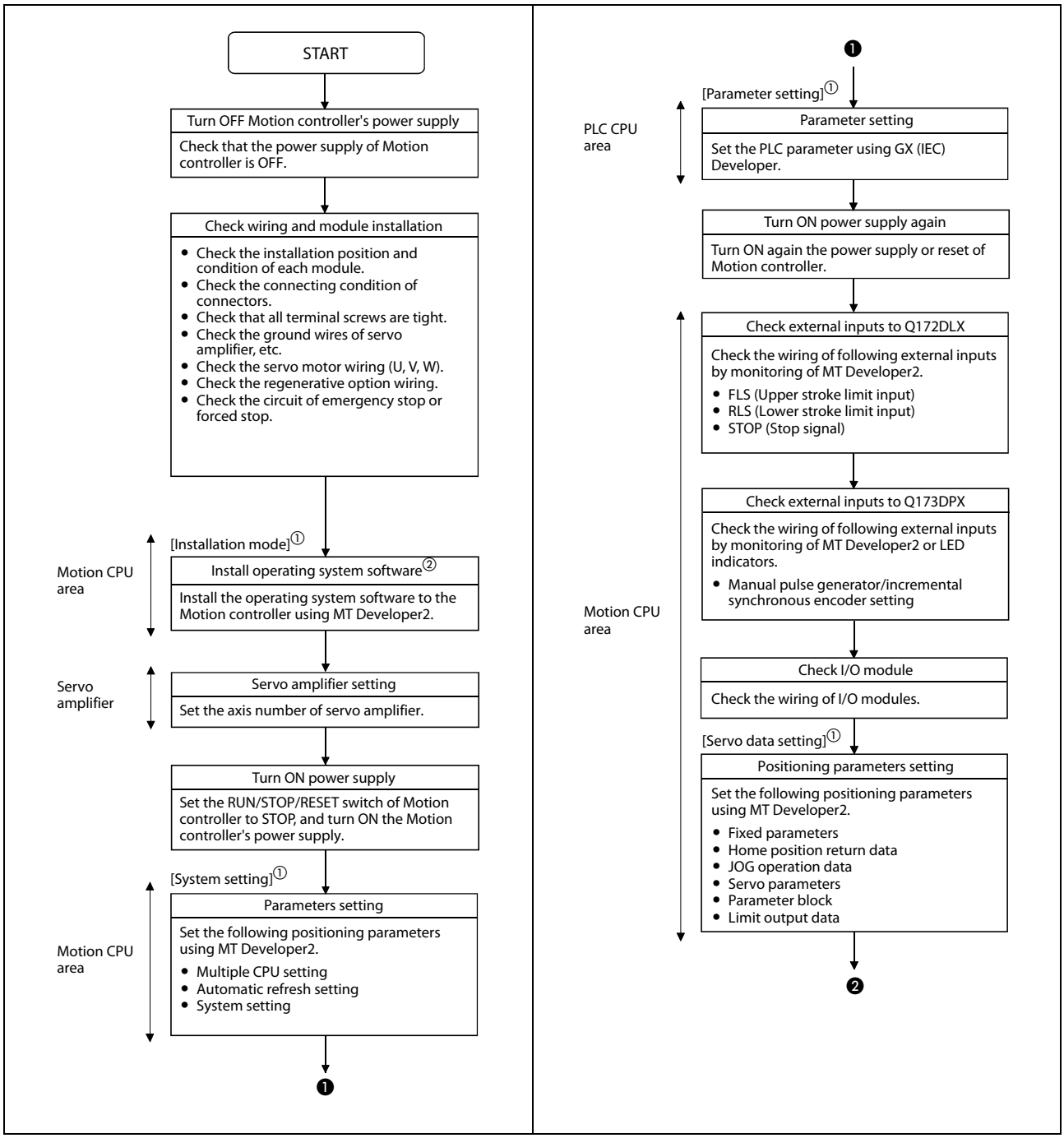


Fig. 4-1: *Start-up procedure (1)*

① The mode indicated in the brackets [ ] at top left of each step is the mode for checking or setting using MT Developer2/GX (IEC) Developer.

② The operating system software is 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.

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.

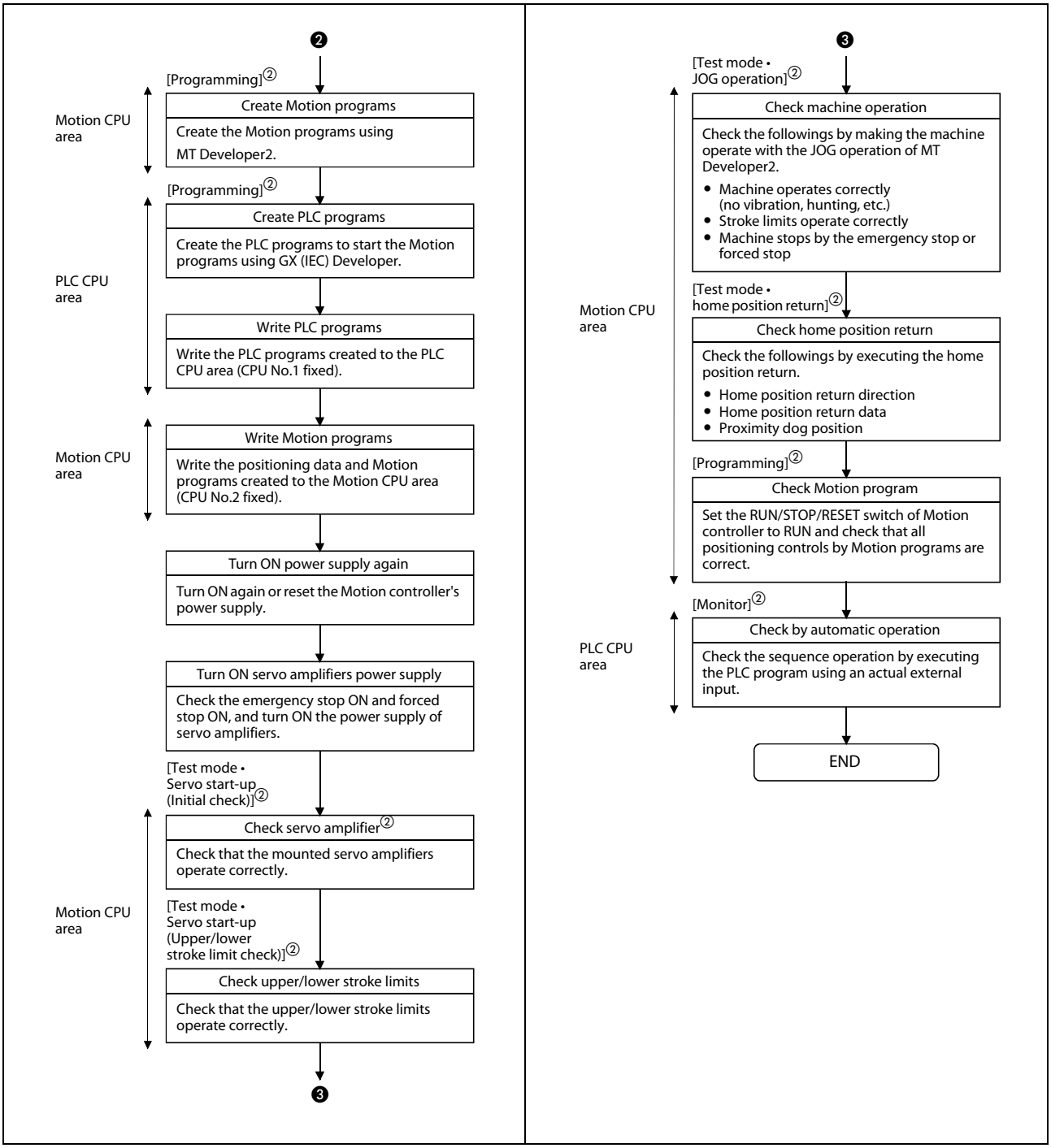


Fig. 4-1: *Start-up procedure (2)*

① The mode indicated in the brackets [ ] at top left of each step is the mode for checking or setting using MT Developer2/GX (IEC) Developer.

② Axis No. and error description of servo amplifier which detected errors are displayed on initial check screen.

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.

4.2 Software installation

4.2.1 Programming software

Install all of the software listed in the table below.

Product	Detail
MELSOFT MT Works2 (MT Developer2)	Ver. 1.05F or later
GX Developer2)	Ver. 8.48A or later
MR Configurator (optional)	Ver. C2 or later

Tab. 4-1: *Software*

4.2.2 Operating system (OS)

As the OS software is not pre-installed, the first step before using the system is installing it into Motion CPU.

This section explains the method for displaying the installation screen and install the OS.

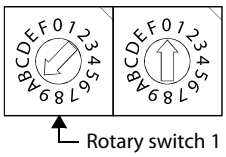
Install one of the following OS.

Motion CPU	Operating system	Detail
Q170MCPU	SV13 (SW8DNC-SV13QG)	Conveyor assembly use
	SV22 (SW8DNC-SV22QF)	Automatic machinery use
Q172DCPU	SV13 (SW8DNC-SV13QD)	Conveyor assembly use
	SV22 (SW8DNC-SV22QC)	Automatic machinery use
Q173DCPU	SV13 (SW8DNC-SV13QB)	Conveyor assembly use
	SV22 (SW8DNC-SV22QA)	Automatic machinery use

Tab. 4-2: *Assignment of operating system to motion controller*

Operating system installation

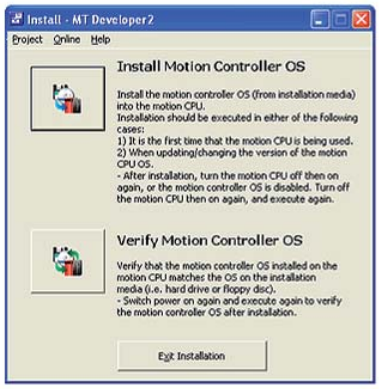
① Power off the motion controller.



② Set the rotary switch 1 (on the motion controller) to "A" to set the installation mode.

③ Power on the motion CPU. After the power is turned on, the 7-segment LED displays "INS", and the motion CPU gets into the installation mode.

④ Select "Start" - "All Programs" - "MELSOFT Application" - "MT Works2" - "Install".



⑤ The installation screen appears.
Select "Online" - "Transfer Setup" to set the communication setup screen. Further details in the section "Transfer setup" (section 5.2.1) of this quick-start guide.

⑥ Click the button ***Install Motion Controller OS***. When the motion controller OS has already been installed, the version is displayed in addition to the CPU type.

⑦ Insert the CD-ROM with the motion controller OS into the CD-ROM drive of the personal computer.

⑧ Click the button ***Browse*** and specify the OS's source folder. The CPU type and OS version appear.

⑨ Click the button ***Execution***. The installation is started.

⑩ Once the installation is finished, power off the motion CPU. Set the rotary switch 1 (SW1) to "0" and the rotary switch 2 (SW2) to "0" to set the motion CPU to the RAM operation mode.

⑪ Power on the motion CPU. When the power is turned on, "." in the first digit on the 7-segment LED flashes.

5 Project creation

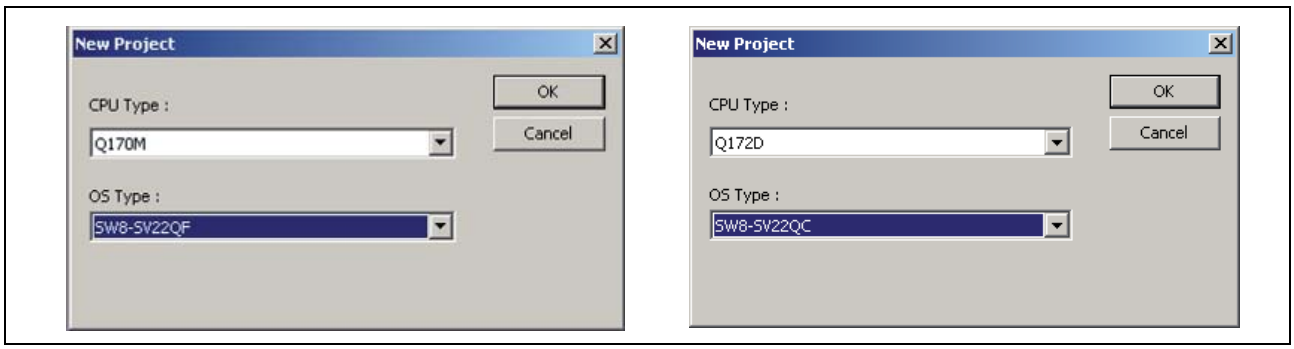
NOTE

The sample programs, described in this manual can be downloaded free of charge through the website www.mitsubishi-automation.com/mymitsubishi/mymitsubishi_content.html.

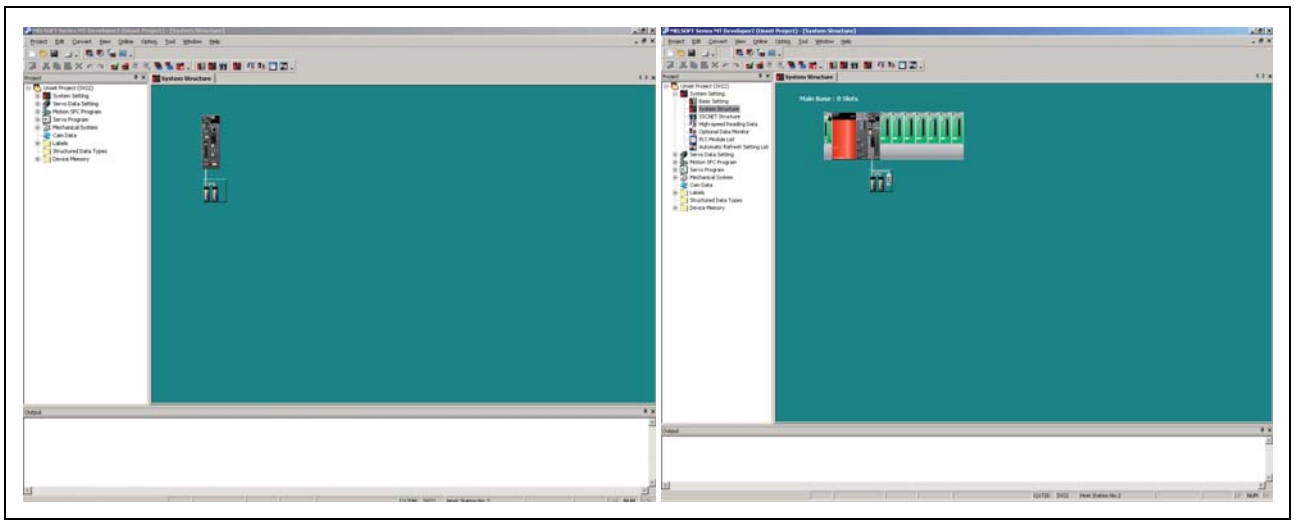
5.1 Sample project creation with MT Developer2 and GX Developer

① New project creation

Start MT Developer2 and create a new project with CPU and OS Type selected as shown below.

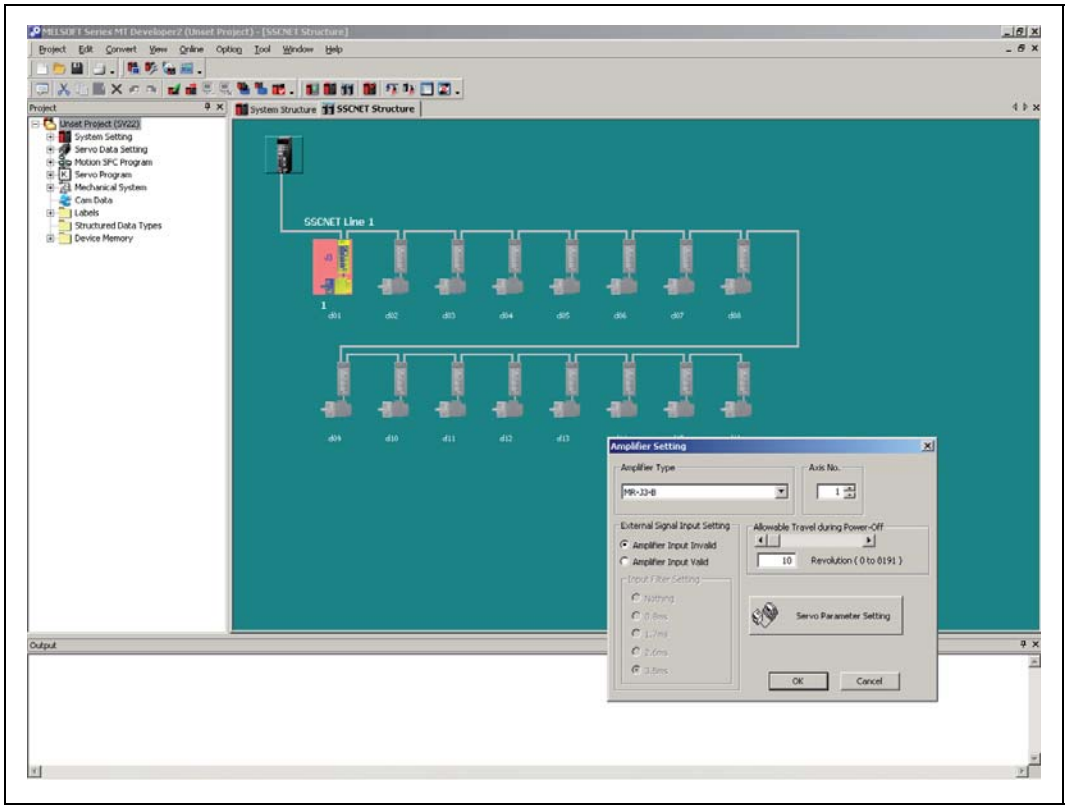


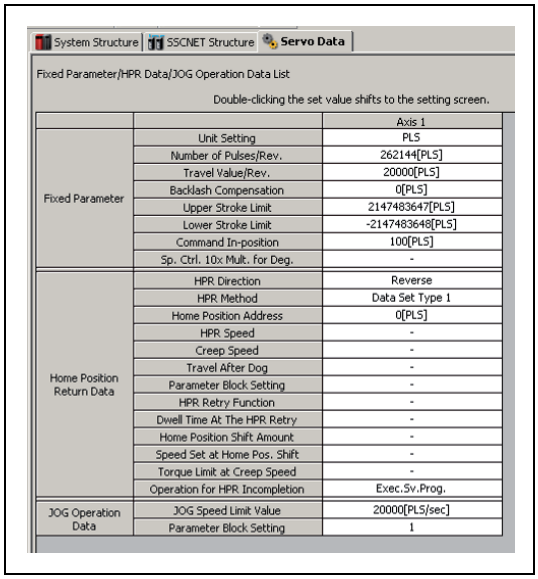
After clicking ***OK*** in the New Project Window, the MT Developer2 project window will appear, as shown below.



② System Structure Settings

Double-click the amplifier icon (SSCNET Structure) to confirm the set amplifier type is correct. If any I/O are wired to the amp, such as home or limit sensors, select the ***Detail Setting*** tab and set the ***External Signal Input Setting*** to ***Amplifier Input Valid***.





System Structure | SSCNET Structure | Servo Data

Fixed Parameter/HPR Data/JOG Operation Data List

Double-clicking the set value shifts to the setting screen.

		Axis 1
Fixed Parameter	Unit Setting	PLS
	Number of Pulses/Rev.	262144[PLS]
	Travel Value/Rev.	20000[PLS]
	Backlash Compensation	0[PLS]
	Upper Stroke Limit	2147483647[PLS]
	Lower Stroke Limit	-2147483648[PLS]
	Command In-position	100[PLS]
	Sp. Ctrl. 10x Mult. for Deg.	-
Home Position Return Data	HPR Direction	Reverse
	HPR Method	Data Set Type 1
	Home Position Address	0[PLS]
	HPR Speed	-
	Creep Speed	-
	Travel After Dog	-
	Parameter Block Setting	-
	HPR Retry Function	-
	Dwell Time At The HPR Retry	-
	Home Position Shift Amount	-
	Speed Set at Home Pos. Shift	-
	Torque Limit at Creep Speed	-
	Operation for HPR Incompletion	Exec.Sv.Prog.
JOG Operation Data	JOG Speed Limit Value	20000[PLS/sec]
	Parameter Block Setting	1

③ Servo Data Settings and Parameter Block

In the "MT Developer2 Project Window Menu", double-click ***Servo Data*** to bring up the "Servo Data" tab.

Edit the settings so that they match the screenshot shown in the left figure.

– "Travel Value/Rev." should represent how far the load moves for every rotation of the motor.

Example ▽ The ball screw lead is 5 mm and the mechanical gear ratio is 1/5.

Servomotor:	HF-KP43
Unit setting:	mm
Number of Pulses/Rev.:	262 144 [PULSES]
Travel Value/Rev.:	1/5 x 5 000.0 = 1 000.0 [µm]

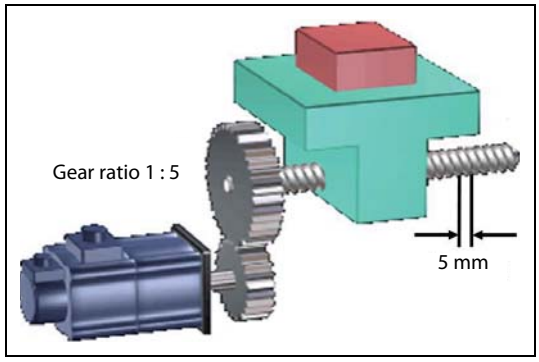


Fig. 5-1: *Mechanical configuration of the example*

△

– "Upper stroke limit" and "Lower stroke limit" enable software stroke limits.

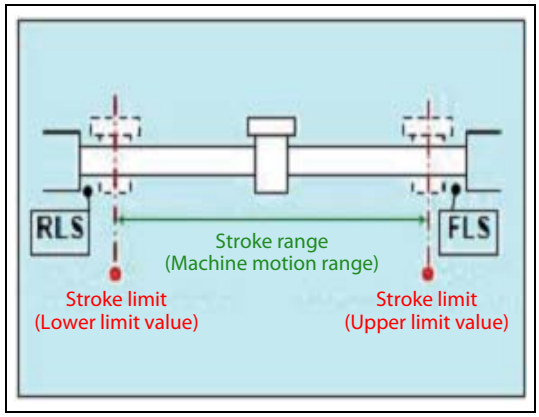
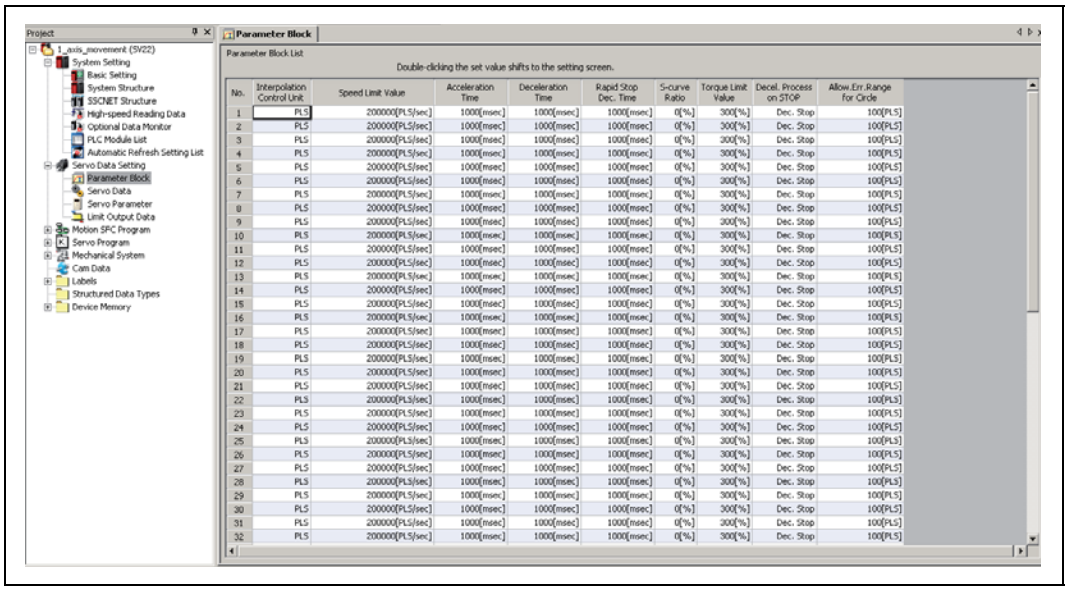


Fig. 5-2: *Stroke limits*

– "Exec.Sv.Prog." will allow the servo programs to be executed even if the servo motor has not yet been homed. If "Not Exec.Sv.Prog." is selected and the servo has not been homed, the servo programs will stop and an error will occur.

– The Parameter Blocks, accessible by the "Servo Data" menu, serve to make setting changes easy by allowing data such as the acceleration/deceleration control to be set for each positioning processing.
A maximum of 64 blocks can be set as parameter blocks.



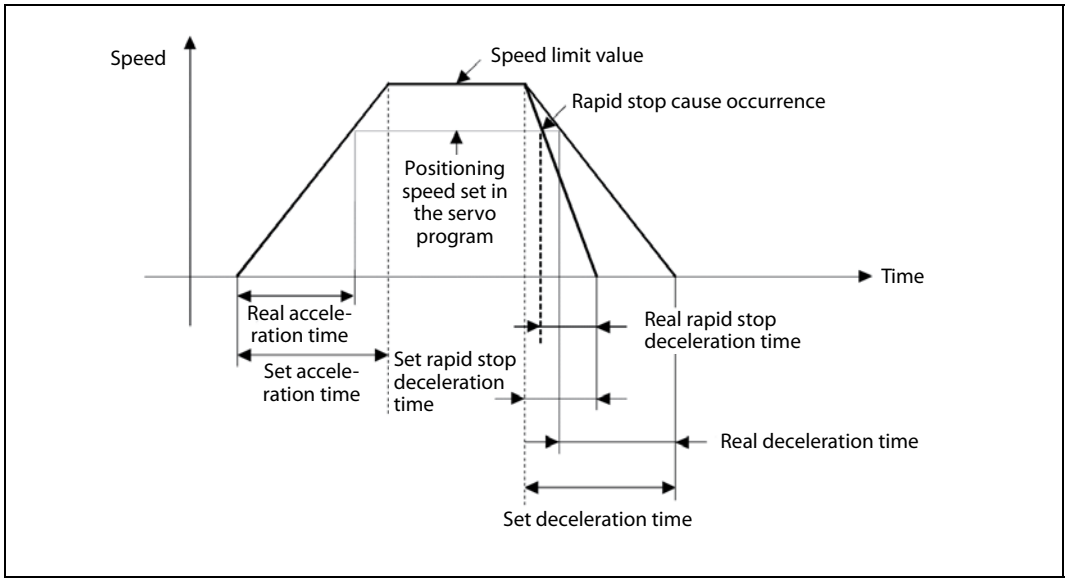
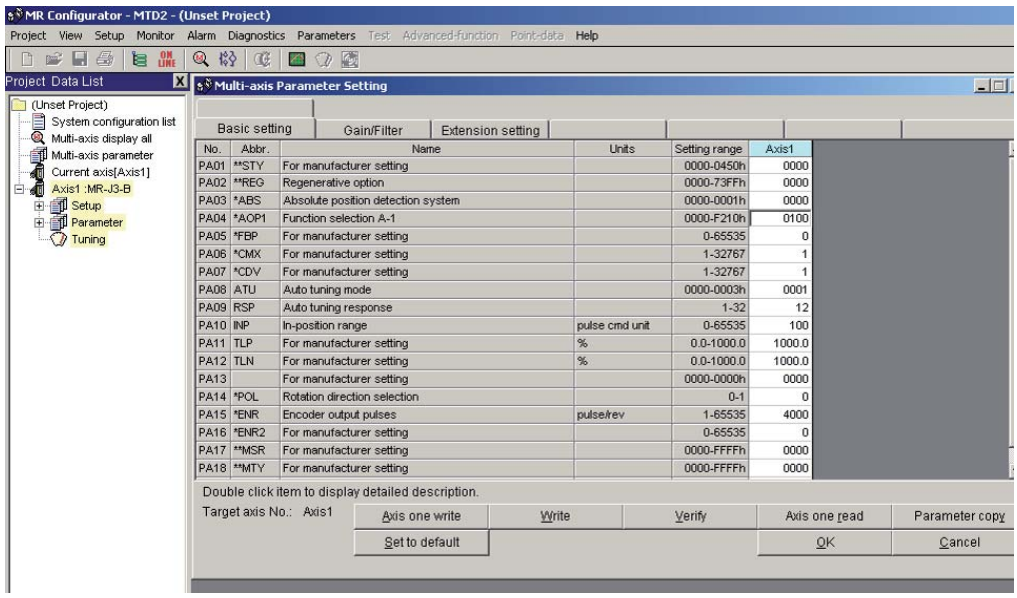


Fig. 5-3: *Time diagram for setting of parameter blocks*

④ Servo Parameter Settings

In the "Project Window Menu", double-click ***Servo Parameter***. This will launch the servo setup software called MR Configurator.



Please change the following parameter in the "Basic setting":

- PA04: 0100
  (Disabling the EMG input on servo amplifier. This will allow the amplifier to operate regardless of forced stop input status.)
- PA14: 0 or 1 according to the motor rotation direction (CW or CCW)

and click ***OK***.

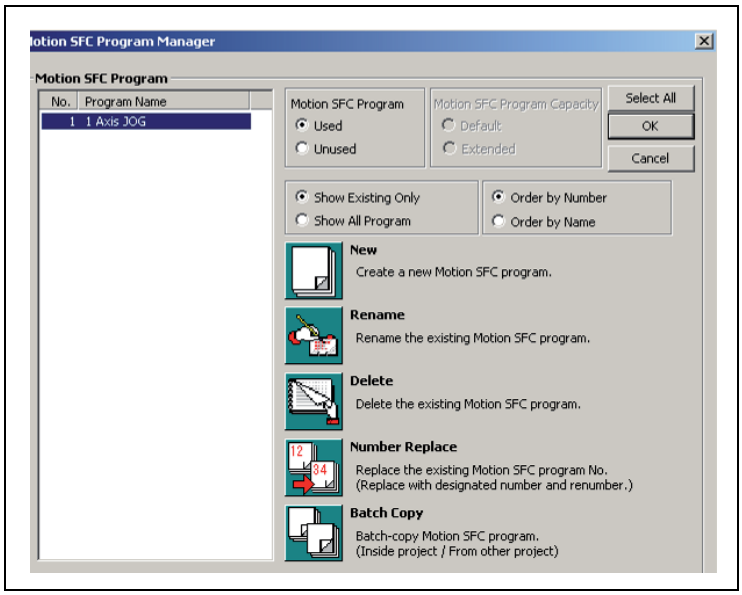
Note

Launching MR Configurator from within MT Developer2 is not the same as launching MR Configurator from the Windows Start Menu. Opening from within MTD2 allows changes to servo parameters to be saved within the MTD2 project files.

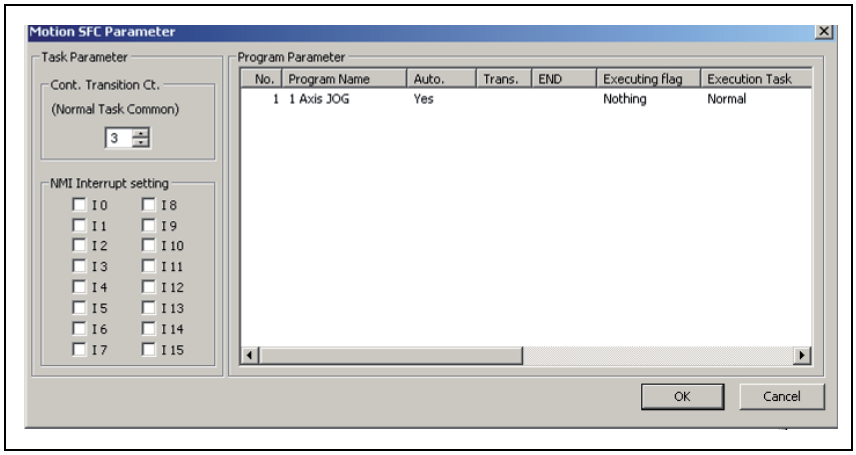
⑤ Motion SFC Program Creation

In the "Project Window Menu" under "Motion SFC Program", double-click ***Motion SFC Program Manager***. This open the "Motion SFC Program Manager" pop-up window.

Click the icon ***New*** which opens up the "New Motion SFC Program" window. Set the Motion SFC Program No. to "1", enter "1 Axis JOG" as the program name and then click ***OK***.

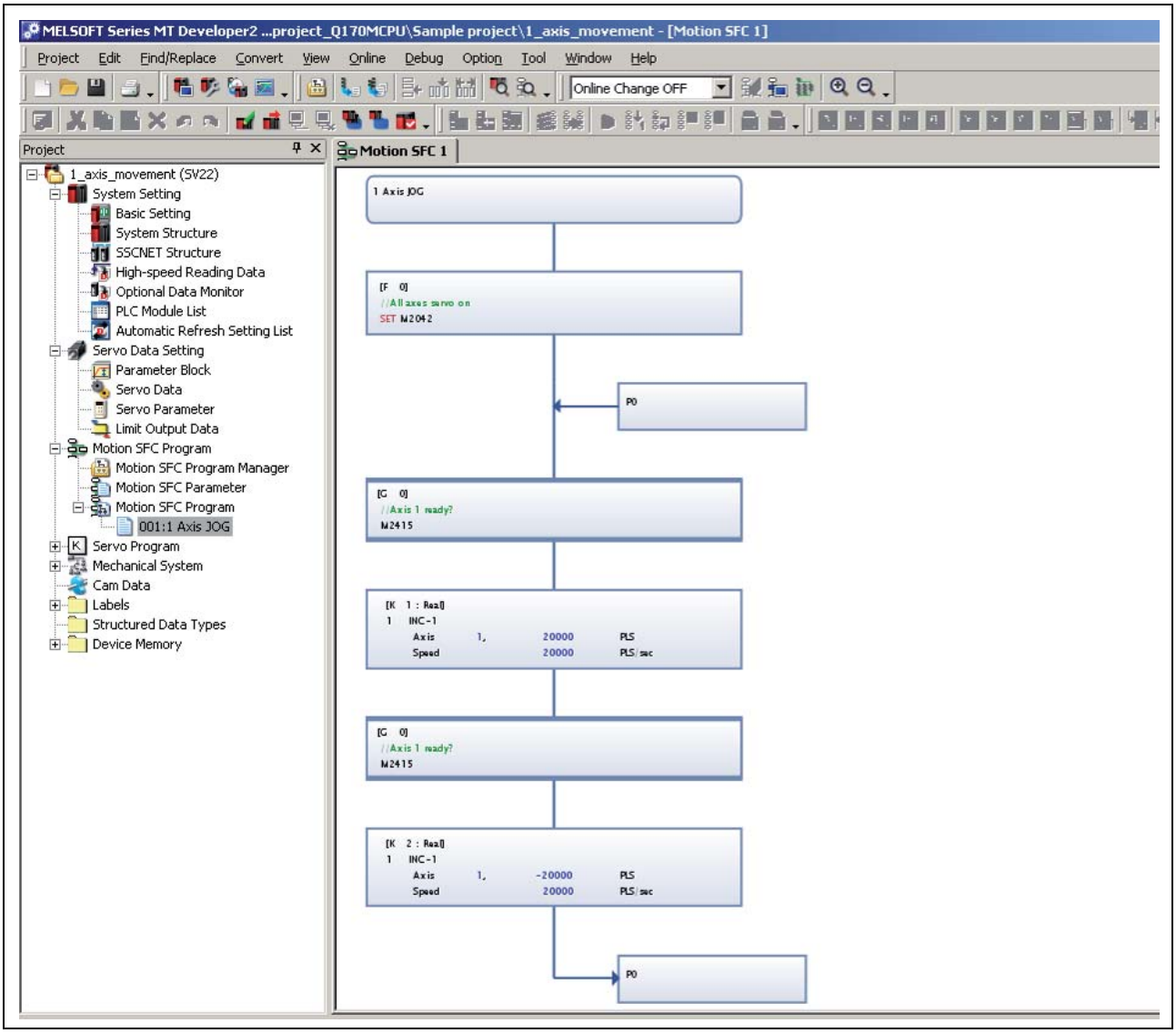


In the "Project Window Menu" under “Motion SFC Program”, double-click ***Motion SFC Parameter***. This open the “Motion SFC Parameter” pop-up window.



Double-click ***program 1*** and then change the Start Setting to "Automatic Start". Then close this window.

Prepare an SFC program. The sample program below allows a simple forward and backward movement of Axis 1.

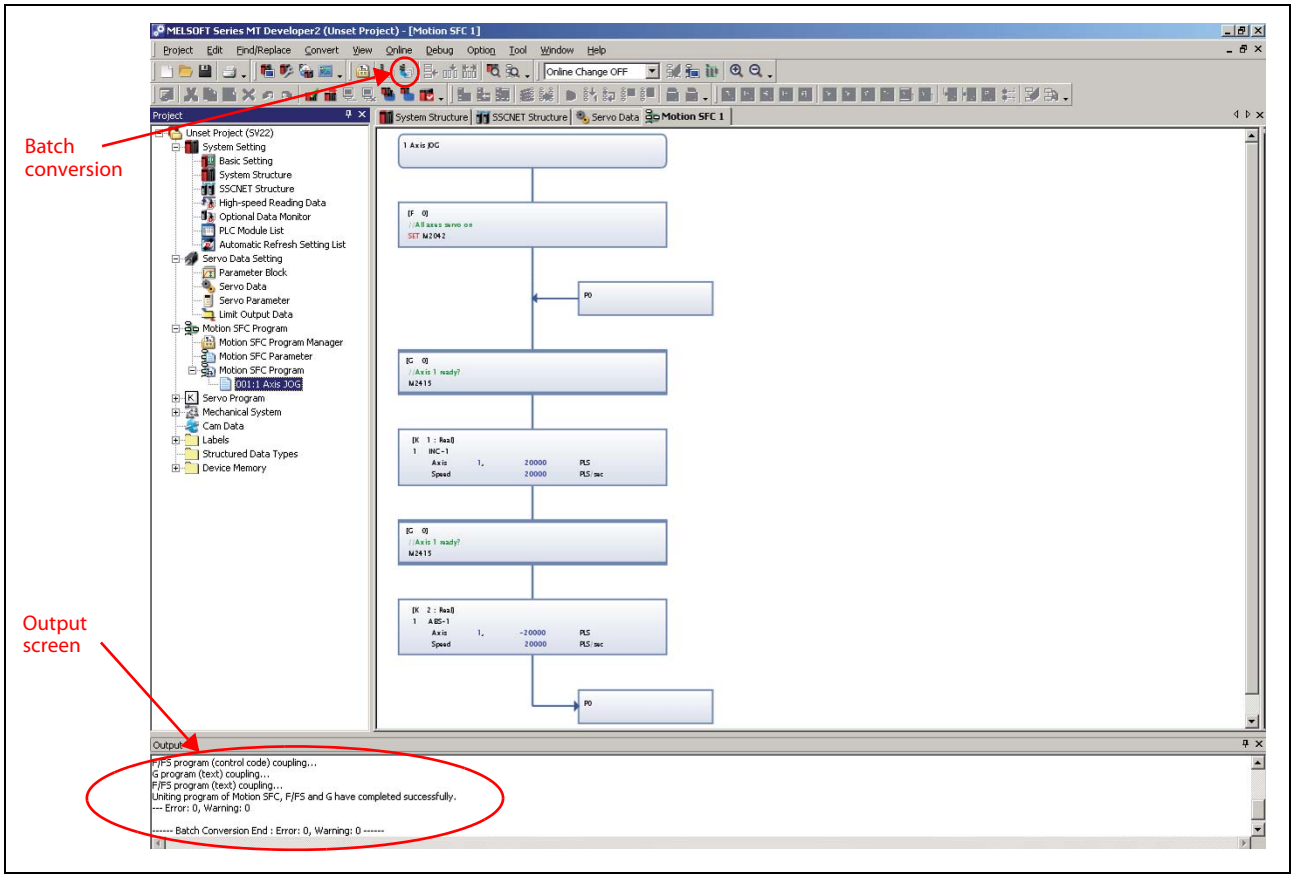


Step	Description
5a	Add an F-block, 2 x G-block, 2 x K-block, a Jump, and a Pointer to the program by left-clicking the respective button on the menu bar and left-clicking in the program workspace. Press the ***Esc*** key (or right click) after adding each block to the workspace.
5b	Double-click the ***F-block***, enter "0" for the program number. Next, press ***Enter*** or click the ***Edit*** button. In the Program Editor window, type "SET M2402". The common system device M2402 enables "Servo On" for all axes when set.
5c	Double-click the ***G-block***, enter "0" for the program number. Next, press ***Enter*** and then input the text "M2415". The axis status device M2415 shows if axis 1 is ready. We are telling the controller to wait until the axis is fully initialized before moving on to the next step. Without such a delay in front of a motion command (K-block), an error is likely to occur.
5d	Double-click the ***K-block***, enter "1" for the program number. Next, press ***Enter*** and select "Linear Interpol." as the Command Class and "INC-1" as the Servo Command. Click ***OK***. The Servo Program Editor window will now open. In the Servo Program Editor window, set the Axis to 1 and the travel amount to 20000 PLS. Then set the Speed to 20000 PLS/s.
5e	Repeat step 5c.
5f	Repeat step 5d changing the travel amount to -20000 PLS.
5g	Connect each function block to the one after it by clicking the ***Connect*** button from the menu bar and then left-clicking on one block and dragging to the next box.

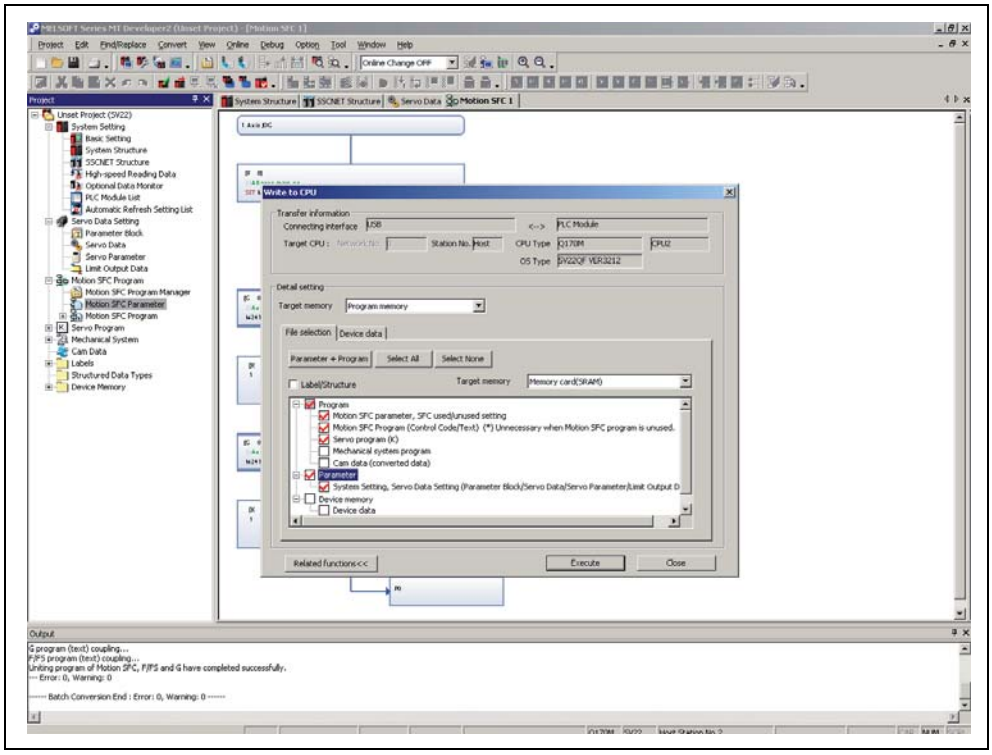
Tab. 5-1: *Detailed procedure for preparing the SFC program*

⑥ File Conversion, Download and Program Run

Click the ***Batch Conversion*** button from the menu bar. If all steps were followed correctly, you should receive a "Complete successfully" message in the output bar at the bottom of the screen.



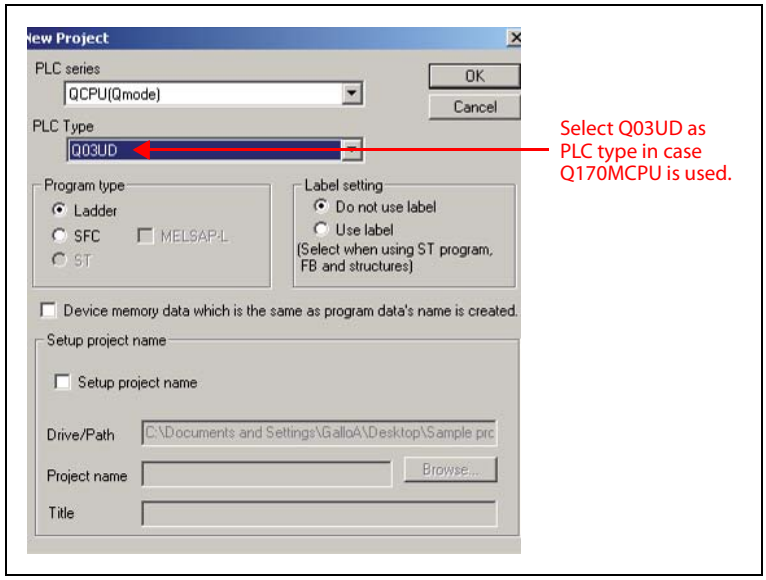
Transfer programs and parameters to the Motion controller using the setting in the screenshot below.



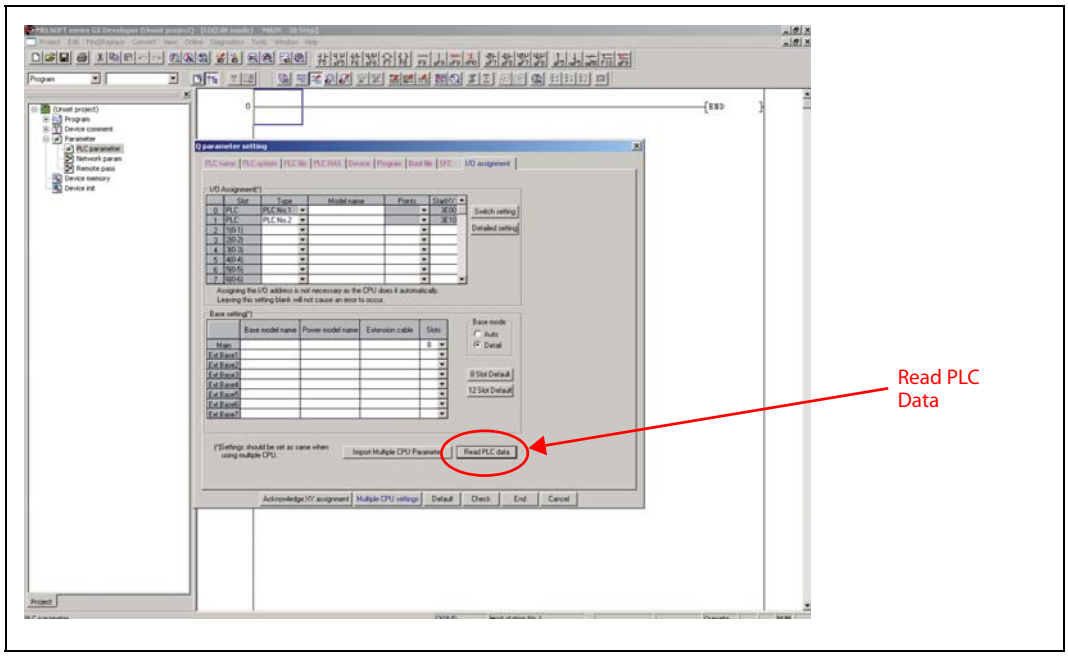
Please refer to the "Writing project to the Motion/PLC CPU" section of this quick-start guide for further details on writing/reading programs (section 5.2.3).

⑦ PLC program creation and download to PLC CPU

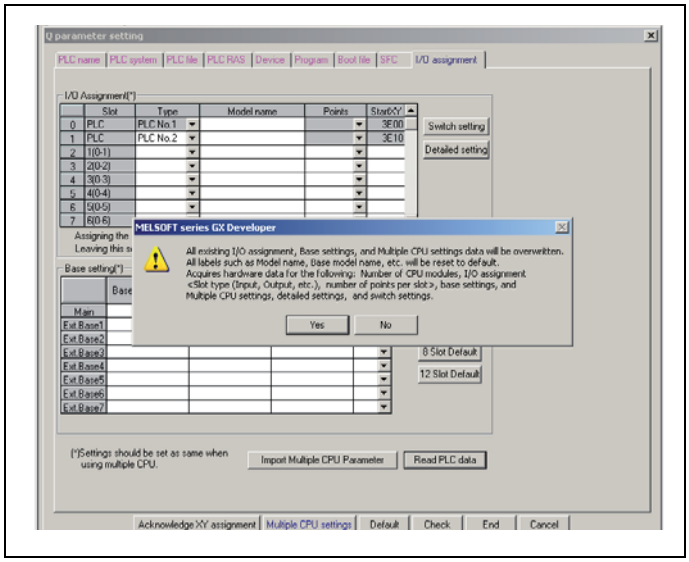
Start GX Developer and create a new project with the correct PLC series and PLC type as shown below.



In the "Project Window Menu" under "Parameter", double-click ***PLC parameter***. This opens the "Q parameter setting" pop-up window.
Click ***I/O assignment*** and afterwards ***Read PLC data***.

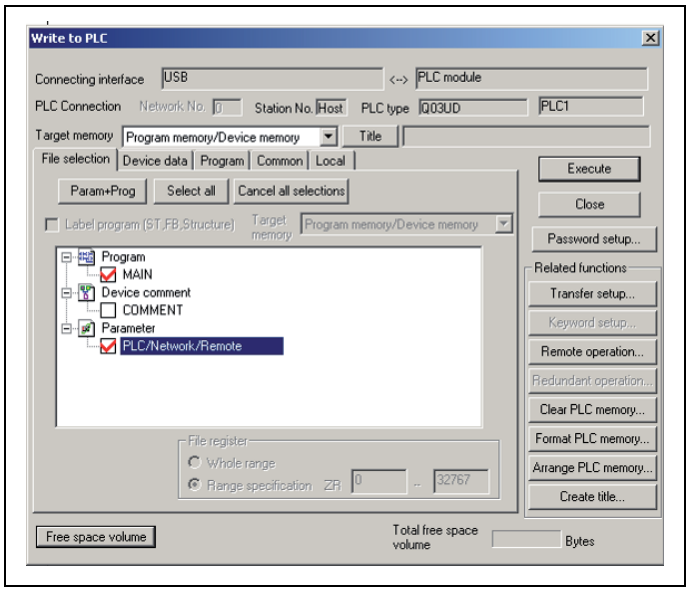


The pop-up warning windows shown below will appear:



Click ***Yes***. Then close the "Q parameter setting" windows by clicking ***End*** confirming the chosen setting.

Transfer programs and parameters to the PLC controller using the setting in the screenshot below.



Please refer to "Transfer setup" (section 5.2.1) for further information on transfer setup setting and to "Writing project to the Motion/PLC CPU" (section 5.2.3) of this quick-start guide for further information on writing/reading programs.

⑧ Enjoy your program!

Cycle the power supply of Q170MCPU and MR-J3 servo both.

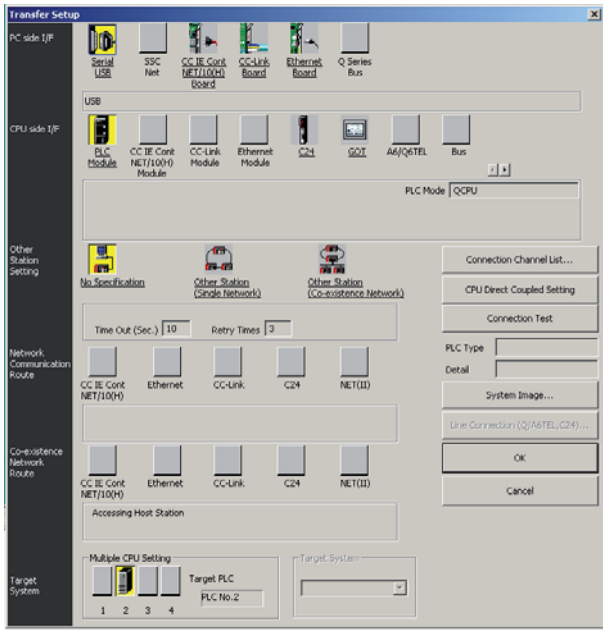
According to the program, you created, the motor will automatically rotate 1 revolution in both directions. The movement will be stopped by using RUN/STOP switch at the Q170MCPU front panel.

5.2 Additional procedures

5.2.1 Transfer setup

This section explains how to set the communication between PC and Q170MCPU/Q172DCPU by the Transfer Setup screen.

For the sake of simplicity, it will be explained how to configure the communication by using a direct connection with an USB cable.



Operating Procedure (Motion CPU access)

① Double-click on ***Serial/USB*** button in the "PC side I/F" selection.

② Select ***USB*** and close the pop-up window.

③ Select ***PLC module*** in the "CPU side I/F".

④ Select ***No specification*** in the "Other Station" setting.

⑤ Select ***PLC No.2*** as "Target System".

Operating Procedure (PLC CPU access)

① Double-click on ***Serial/USB*** button in the "PC side I/F" selection.

② Select ***USB*** and close the pop-up window.

③ Select ***PLC module*** in the "CPU side I/F".

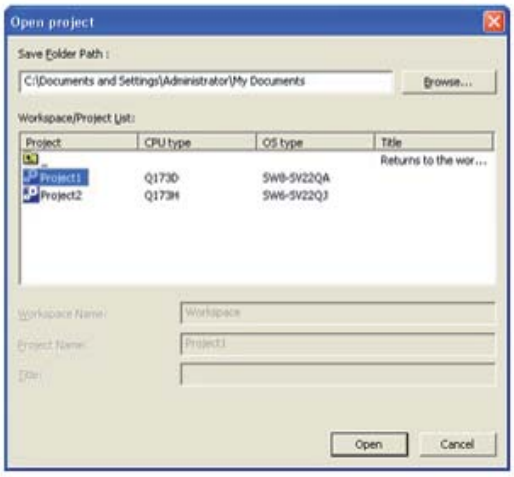
④ Select ***No specification*** in the "Other Station" setting.

⑤ Select ***PLC No.1*** as "Target System".

5.2.2 Project opening

This section explains the method for reading a project saved in the hard disk or other memory media of the personal computer.

Operating Procedure (MT Developer2 project)



① Select "Project" - "Open Project". The "Open Project" window appears.

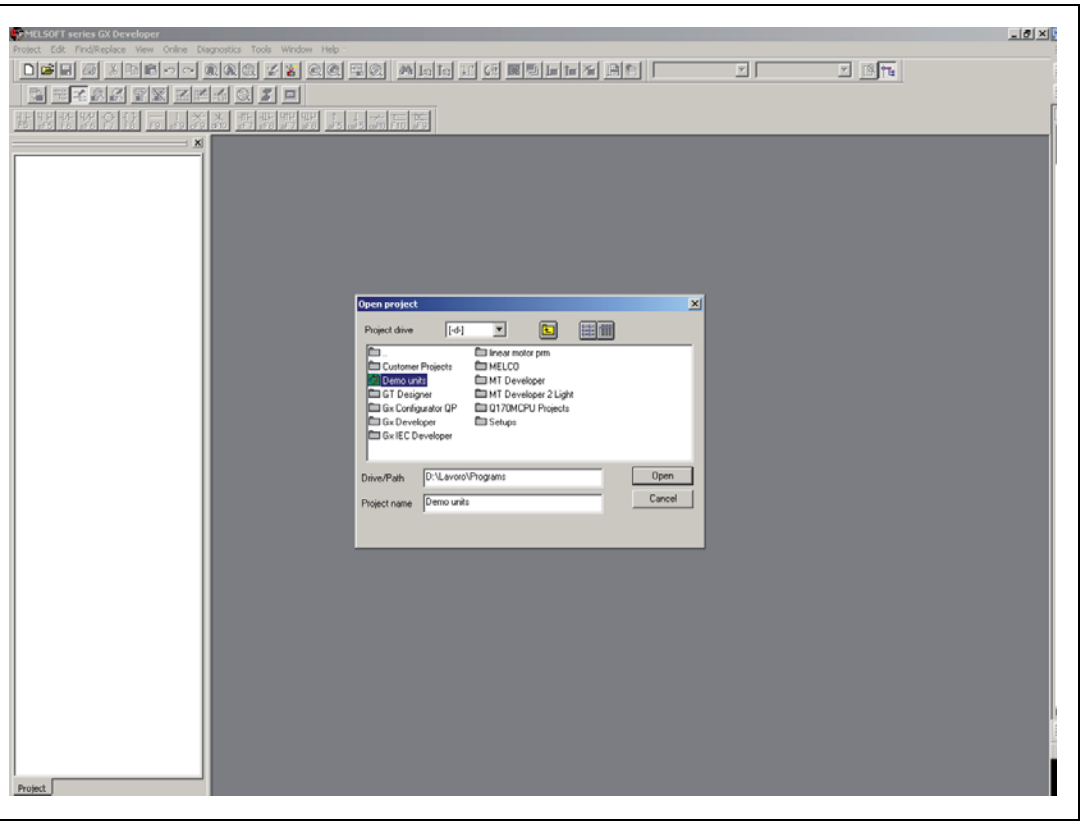
② Enter the folder (drive/path), where the workspace is saved, in the Folder field.

③ Double click ***Workspace*** in the "Workspace/ Project List".

④ Select the project data. Details of the specified project data are displayed in the "Project Name" and "Title" columns.

⑤ Click the ***Open*** button.

Operating Procedure (GX Developer project)



① Select "Project" - "Open Project". The Open Project window appears.

② Enter the folder (drive/path), where the workspace is saved, in the "Folder" field.

③ Select the project data.

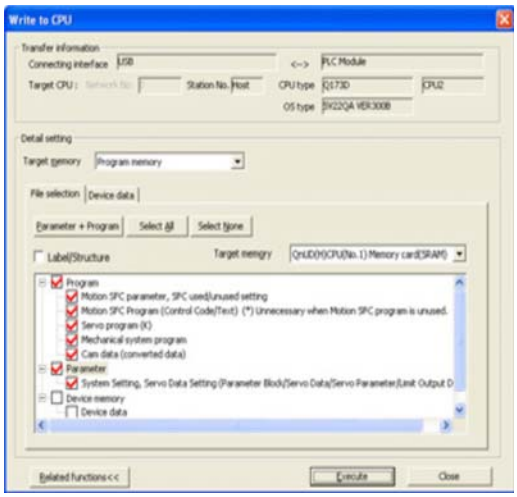
④ Click the ***Open*** button.

5.2.3 Writing project to the Motion/PLC CPU

This section explains the method for writing a project saved in the hard disk or other memory media of the personal computer to the Motion/PLC controller internal memory.

Operating Procedure (MT Developer2)

① Select "Online" - "Write to CPU". The "Write to CPU" screen appears.



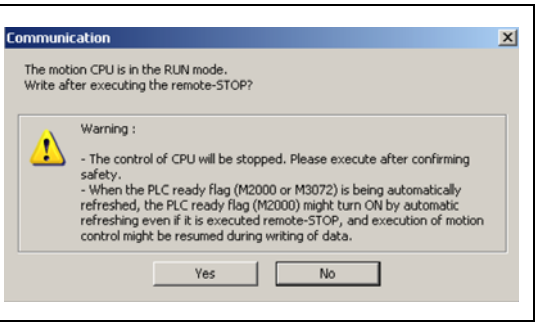
② Select ***Program memory*** as target memory to write to.

③ Click on ***Parameter+ Program*** to select the data to be written.

④ Click the ***Execute*** button.

When a password is registered, the Password Check dialog box appears.

When program write is to be executed, a message appears if there are programs that have not been converted.



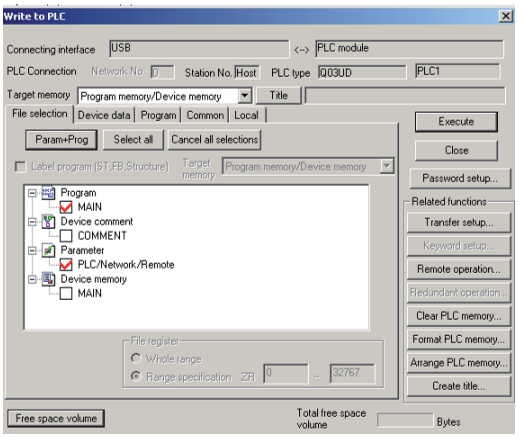
⑤ The screen on the left appears if the motion controller is in RUN mode.
Click the ***OK*** button.

⑥ Once download is complete, another message will appear asking if you would like to place the controller back in Run mode. Again, select ***Yes*** and then ***Close***.

⑦ The specified data is written to the target memory. When writing is completed, the dialog box appears notifying the process completion.

Operating Procedure (GX Developer)

① Select "Online" - "Write to PLC". The "Write to PLC" screen appears.

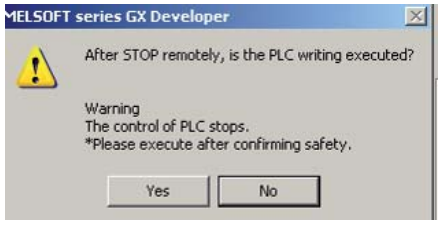


② Select ***Program memory/Device memory*** as target memory to write to.

③ Click on ***Parameter+ Program*** to select the data to be written.

④ Click the ***Execute*** button.

When program write is to be executed, a message appears if there are programs that have not been converted.



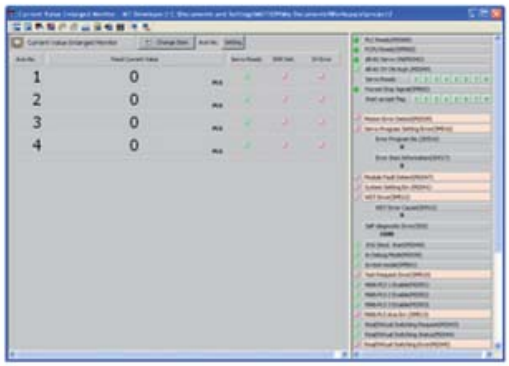
⑤ The screen on the left appears if the motion controller is in RUN mode.
Click the ***Yes*** button.

⑥ The specified data is written to the target memory. When writing is completed, the dialog box appears notifying the process completion.

5.2.4 Monitoring function

Operating Procedure

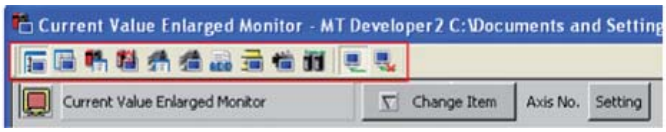
① Click the monitor icon of the application jump toolbar on the main frame.



② Monitor is started.

③ Clicking on the buttons in the shown toolbar is possible to select the devices to be monitored:

- Current value monitor
- Motion error
- Axis monitor
- Servo Monitor
- Positioning monitor
- …



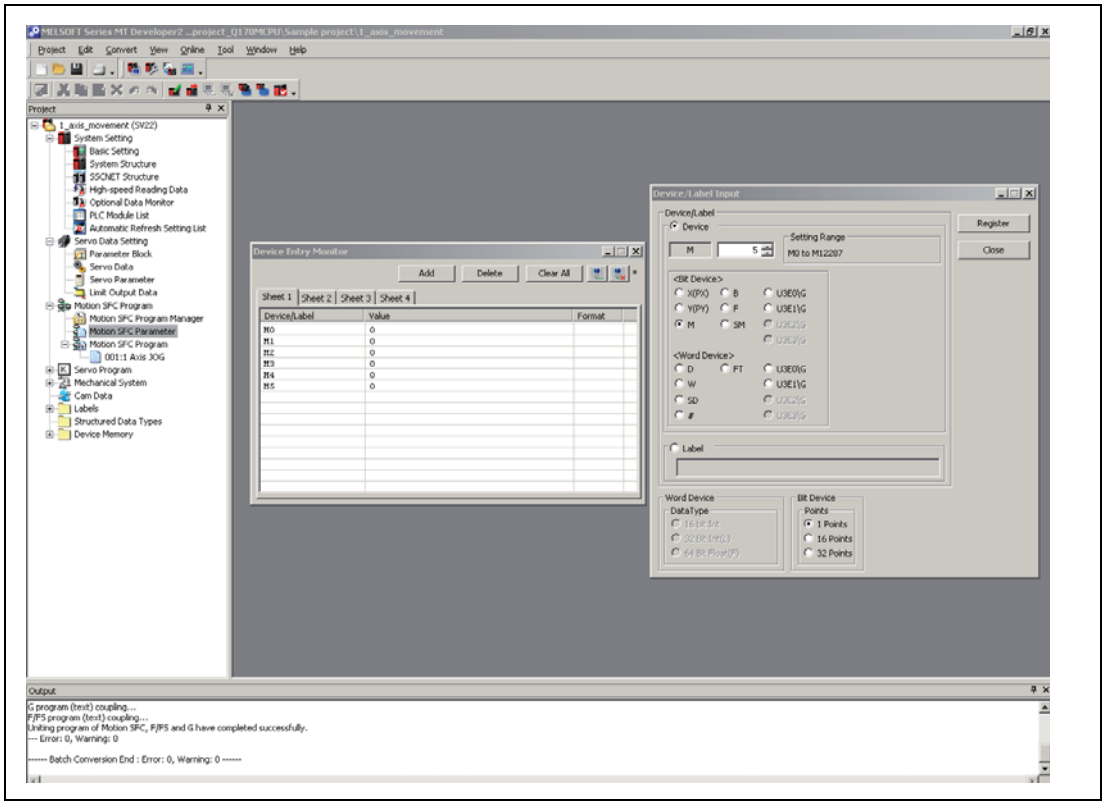
NOTE

Refer to MT Developer2 Help for further information.
Tip: Press function key "F1" for immediate help on displayed function.

5.2.5 Device monitoring and testing

Operating Procedure (MT Developer2)

① Select "Online" - "Monitor" - "Commons" - "Entry Device Monitor".
The "Device Entry Monitor" screen appears.

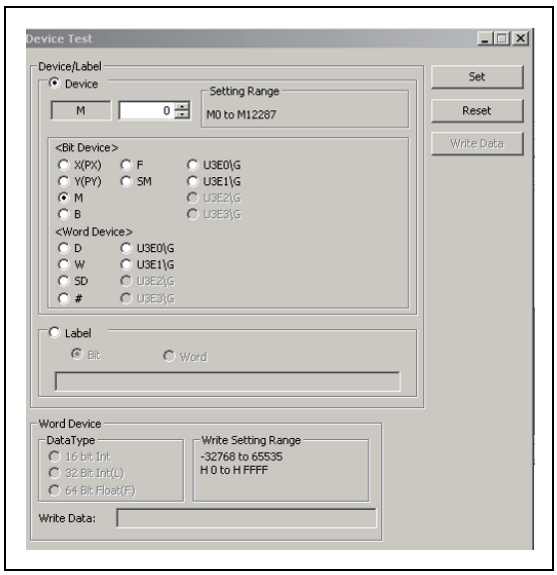


② Click ***Add***. The "Device"/"Label" windows appears.

③ Select the device to be monitored and then push ***Register*** button.
The chosen devices will be displayed in the "Device Entry Monitor".

④ Click ***Close***.

⑤ Click ***Start Monitoring*** button. The actual values of the registered devices will be displayed in the column "Value".



⑥ Double-click the value of the Device to be tested. The "Device Test" window appears.

⑦ Click ***Set*** or ***Reset*** to test the selected bit device or ***Write Data*** to write a value into the selected register.

5.2.6 Motion CPU change

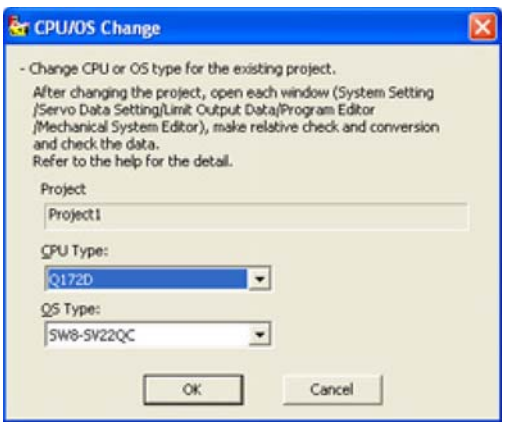
This section explains the method for changing the CPU and OS types of the open project.

Operating Procedure

① Open a project to change its CPU and OS types.

Opening existing projects.

② Select "Project" - "Change CPU/OS Type".

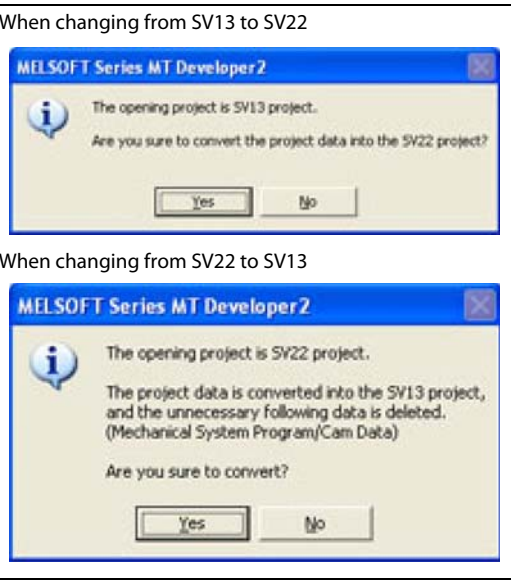


③ The "CPU/OS Change" screen appears. Select a CPU type and OS type.
Click the ***OK*** button.

When the CPU type is changed from Q17nCPU to Q17nDCPU/Q170MCPU/Q17nHCPU, the following screen appears.

Click the ***Yes*** button to change the CPU or OS type.
Click the ***No*** button to stop the change of the CPU or OS type.

When changing from SV13 to SV22



④ The confirmation screen appears asking wether to change the OS type.
Click the ***Yes*** button.

⑤ A dialog box appears notifying the CPU and OS types have been changed.
Click the ***OK*** button.

6 Sample programs

6.1 Sample program with OS SV22: 2_axes_motion

6.1.1 System configuration

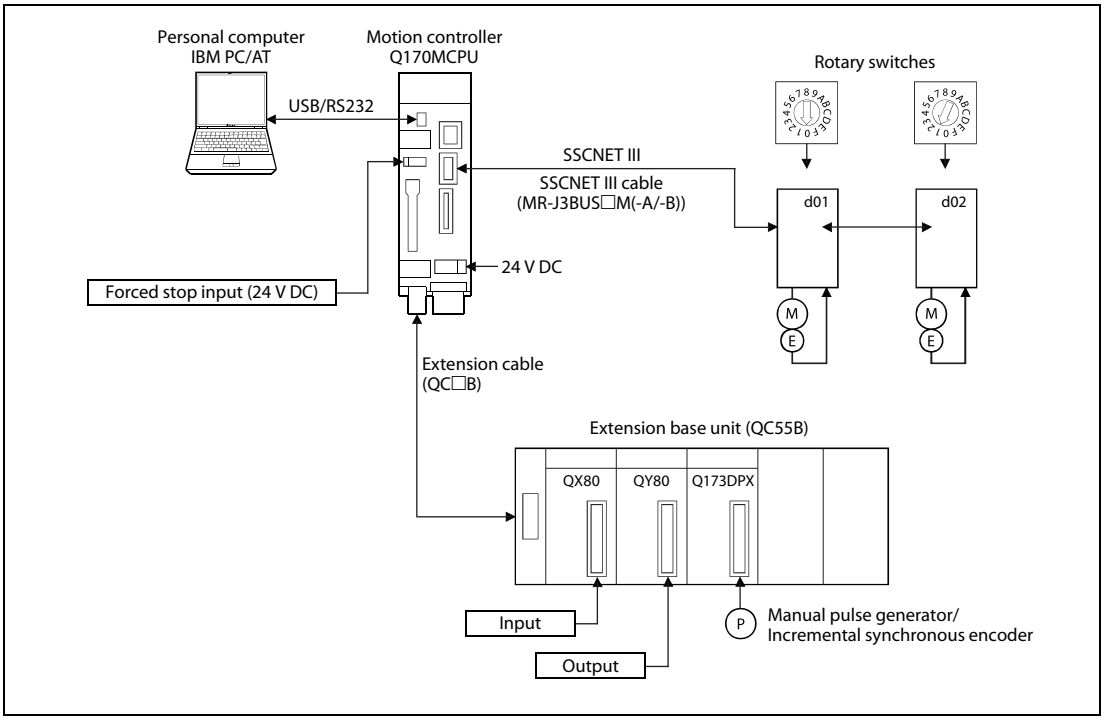


Fig. 6-1: *System configuration with Q170MCPU, two axes and extension base unit*

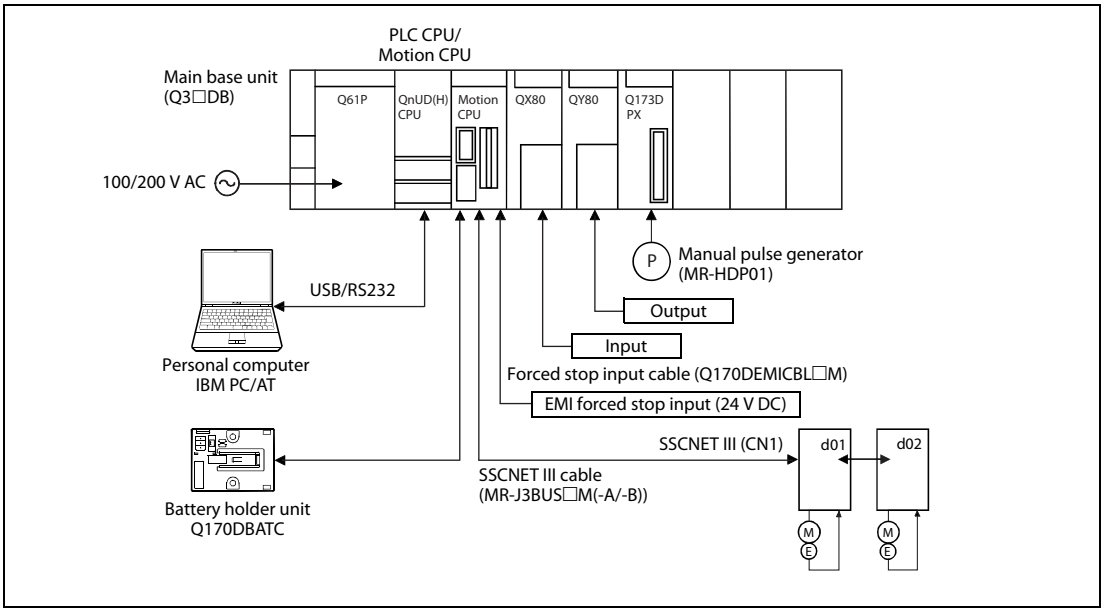


Fig. 6-2: *System configuration with Q172DCPU and two axes*

6.1.2 Functions

Input	Function	Details			
PX0	Forced stop	When PX0 turns off, servomotors are forced to stop and motion control is suspended (E7 warning).			
PX1 and PX2 and PX7	Motion selection input	**PX2**	**PX1**	**PX7**	**Motion mode**
		OFF	OFF	OFF	JOG mode
		OFF	ON	OFF	Man. pulse generator mode
		ON	OFF	OFF	Home position return mode
		ON	ON	OFF	Operation mode (Real)
		ON	ON	ON	Operation mode (Virtual)

Tab. 6-1: *Functions of the inputs*

Motion mode	Details	
JOG mode	PX3:	Axis 1 JOG forward rotation
	PX4:	Axis 1 JOG reverse rotation
	PX5:	Axis 2 JOG forward rotation
	PX6:	Axis 2 JOG reverse rotation
Man. pulse generator mode	Manual pulse generator operation of axis 1 is executed with the manual pulse generator P1. Manual pulse generator operation of axes 1 and 2 is executed with the manual pulse generator P2.	
Home position return mode	PX3: OFF → ON	Home position return of axis 1 is executed.
	PX4: OFF → ON	Home position return of axis 2 is executed
Operation mode (Real)	PX3: OFF → ON	Sample movement (point-to-point)
	PX4: OFF → ON	Sample movement (linear interpolation)
Operation mode (Virtual)	2 synchronized cams movement automatically started. NOTE: Home position required beforehand	

Tab. 6-2: *Details of motion mode*

6.1.3 System setting data of the motion CPU

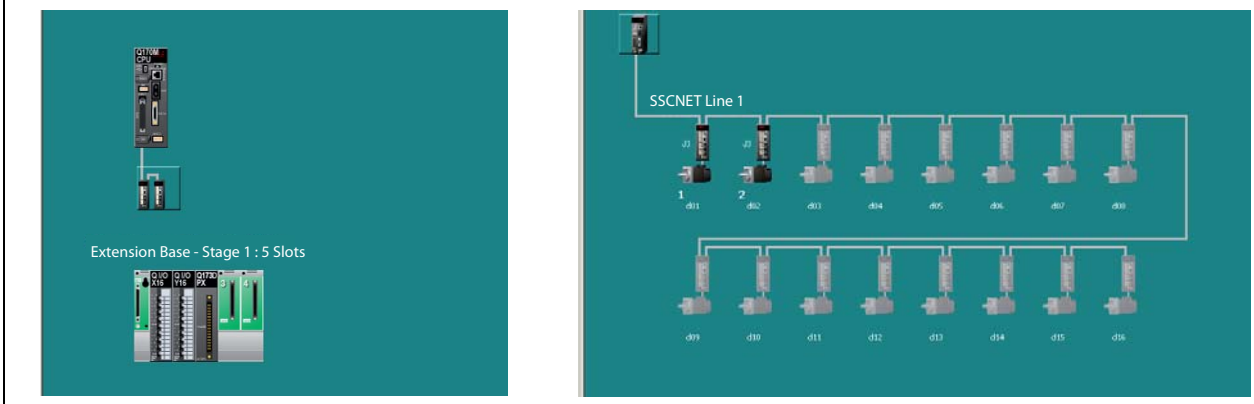


Fig. 6-3: *Structure of the system (left) and of SSCNET III (right) with Q170MCPU*

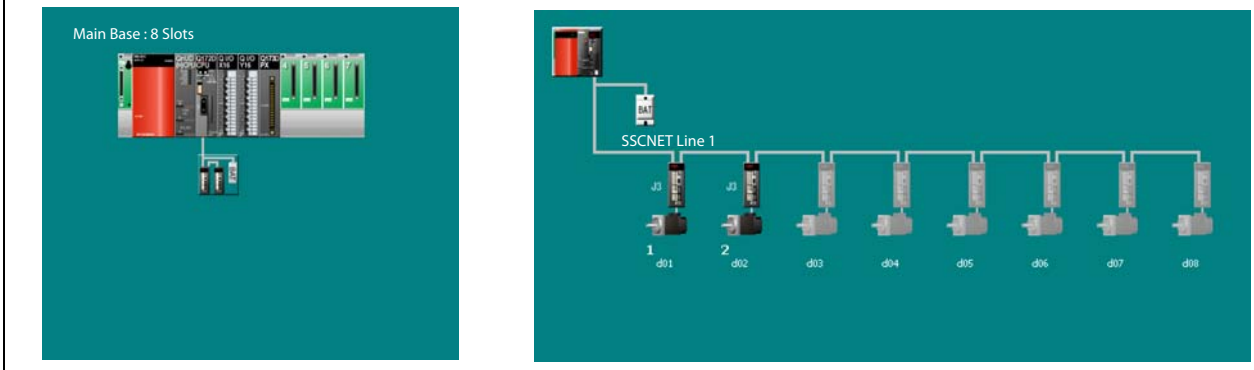


Fig. 6-4: *Structure of the system (left) and of SSCNET III (right) with QD motion controller*

PLC	CPU specific send range							
			User setting area			Auto refresh		
	point (K)	I/O No.	point	Start	End	point	Start	End
CPU No. 1	7	U3E0	7168	G10000	G17167	0	—	—
CPU No. 2	7	U3E1	6468	G10000	G16467	700	G16468	G17167

PLC No. 1					
No.	Auto refresh			CPU specific send range	
	point	Start	End	Start	End
1	—	—	—	—	—
2	—	—	—	—	—
3	—	—	—	—	—

PLC No. 2					
No.	Auto refresh			CPU specific send range	
	point	Start	End	Start	End
1	20	M2000	M2319	G16468	G16487
2	40	M2400	M3039	G16488	G16527
3	640	D0	D639	G16528	G17167

Tab. 6-3: *Multiple CPU setting - Auto refresh setting*

6.1.4 Axis Data Setting

		Axis 1	Axis 2
Fixed Parameter	Unit Setting	PLS	PLS
	Number of Pulses/Rev.	20000[PLS]	20000[PLS]
	Travel Value/Rev.	20000[PLS]	20000[PLS]
	Backlash Compensation	0[PLS]	0[PLS]
	Upper Stroke Limit	2147483647[PLS]	2147483647[PLS]
	Lower Stroke Limit	-2147483648[PLS]	-2147483648[PLS]
	Command In-position	100[PLS]	100[PLS]
	Sp. Ctrl. 10x Mult. for Deg.	-	-
Home Position Return Data	HPR Direction	Reverse	Reverse
	HPR Method	Data Set Type 1	Data Set Type 1
	Home Position Address	0[PLS]	0[PLS]
	HPR Speed	-	-
	Creep Speed	-	-
	Travel After Dog	-	-
	Parameter Block Setting	-	-
	HPR Retry Function	-	-
	Dwell Time At The HPR Retry	-	-
	Home Position Shift Amount	-	-
	Speed Set at Home Pos. Shift	-	-
	Torque Limit at Creep Speed	-	-
	Operation for HPR Incompletion	Exec.Sv.Prog.	Exec.Sv.Prog.
JOG Operation Data	JOG Speed Limit Value	200000[PLS/sec]	200000[PLS/sec]
	Parameter Block Setting	1	1

Fig. 6-5: *Setting of the axis data*

6.1.5 Motion SFC Program

No.	Program Name	Task	Auto.	END	Cont. Trans.	Executing Flag	Cycle	Interrupt
20	Main	Normal	Yes	—	—	Nothing	—	—
110	Motion control	Normal	No	—	—	Nothing	—	—
120	JOG	Normal	No	—	—	Nothing	—	—
130	Manual pulse gen	Normal	No	—	—	Nothing	—	—
140	Home position re	Normal	No	—	—	Nothing	—	—
150	Programming oper	Normal	No	—	—	Nothing	—	—
160	Virtual mode	Normal	No	—	—	Nothing	—	—

Tab. 6-4: *Program overview*

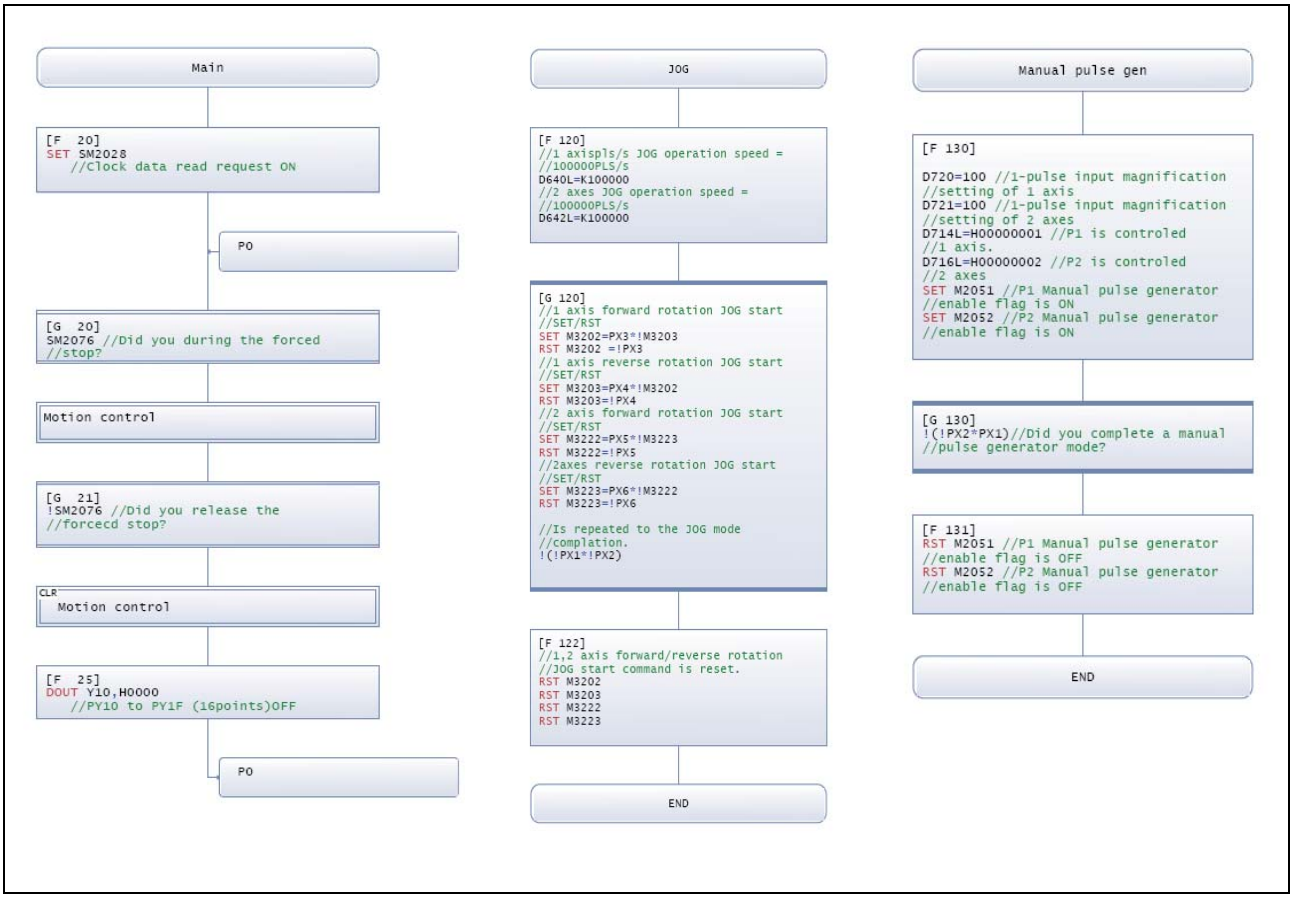


Fig. 6-6: *Motion SFC Programs "Main", "JOG" and "Manual pulse generator"*

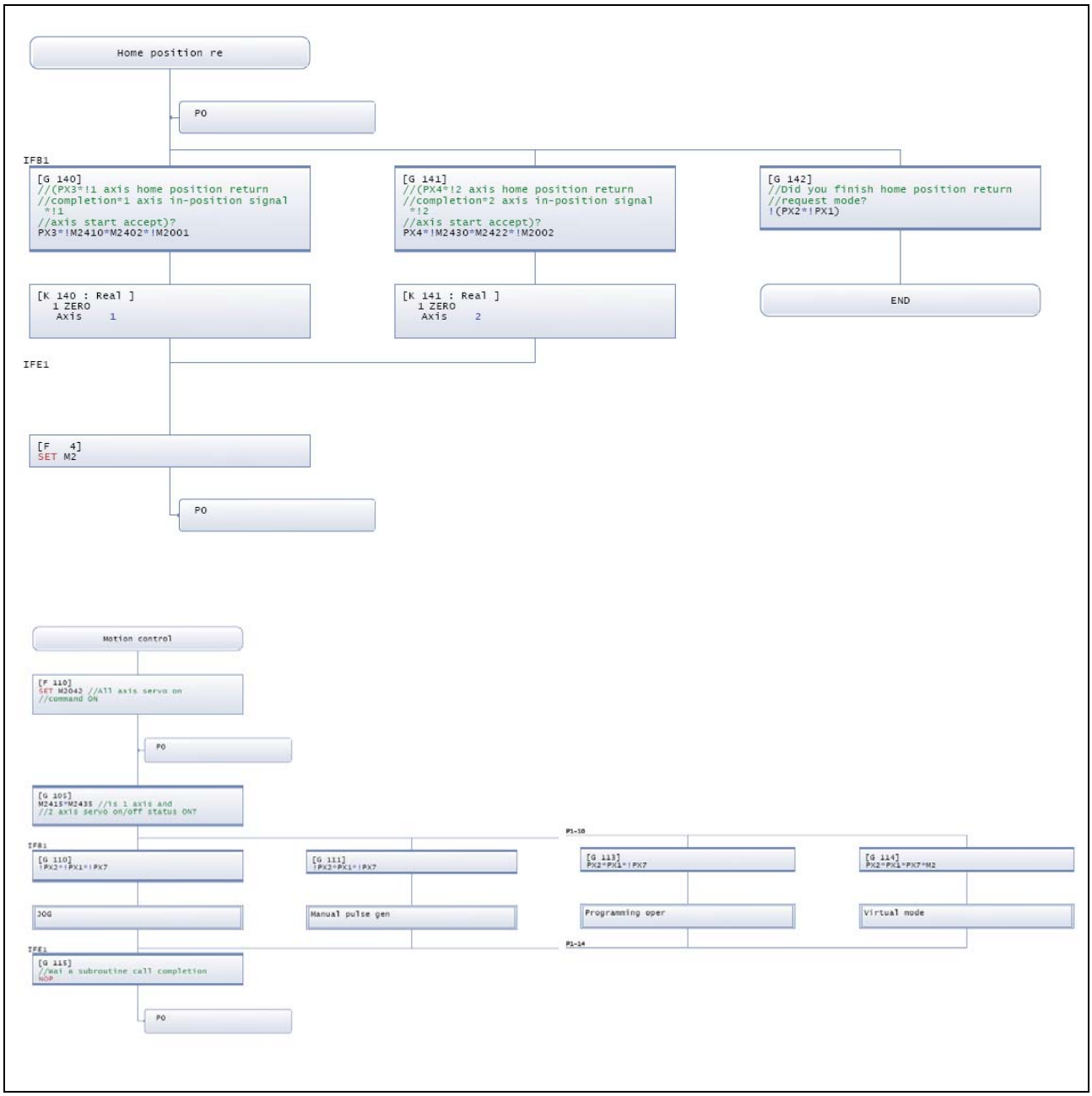


Fig. 6-7: *Motion SFC Programs "Home position return" and "Motion control"*

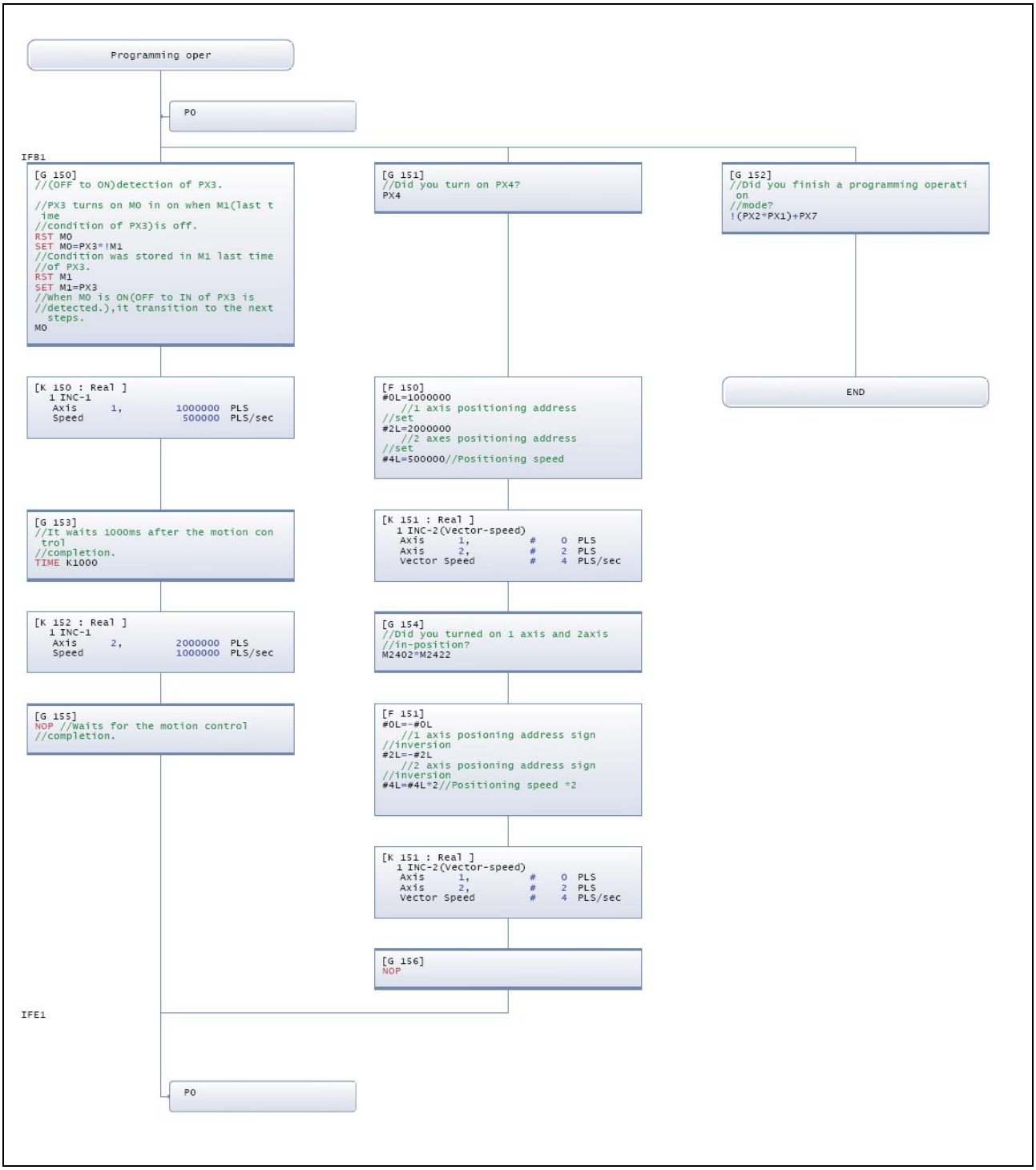


Fig. 6-8: *Motion SFC Program "Programming operation"*

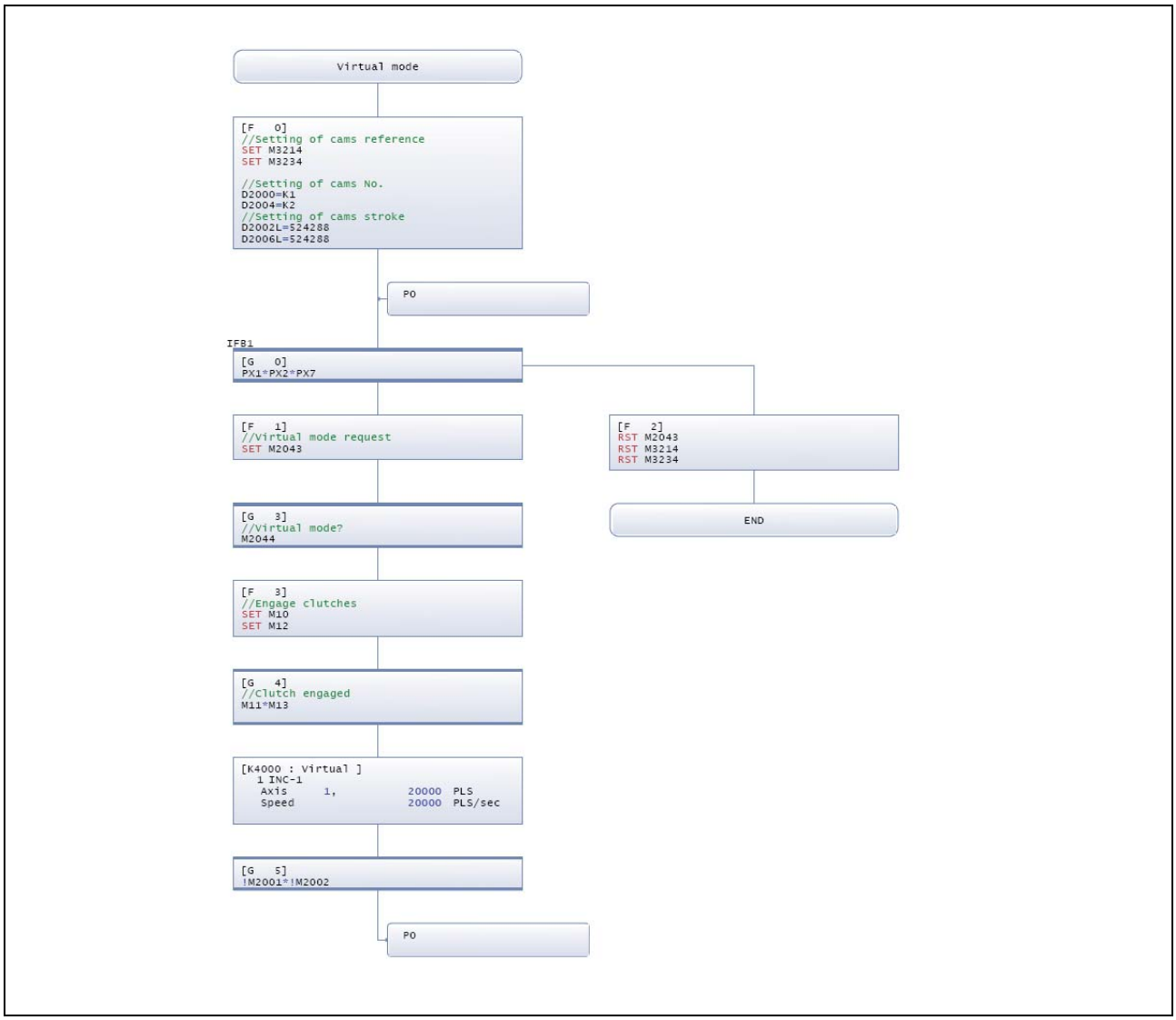


Fig. 6-9: *Motion SFC Program "Virtual mode"*

6.1.6 Mechanical system program

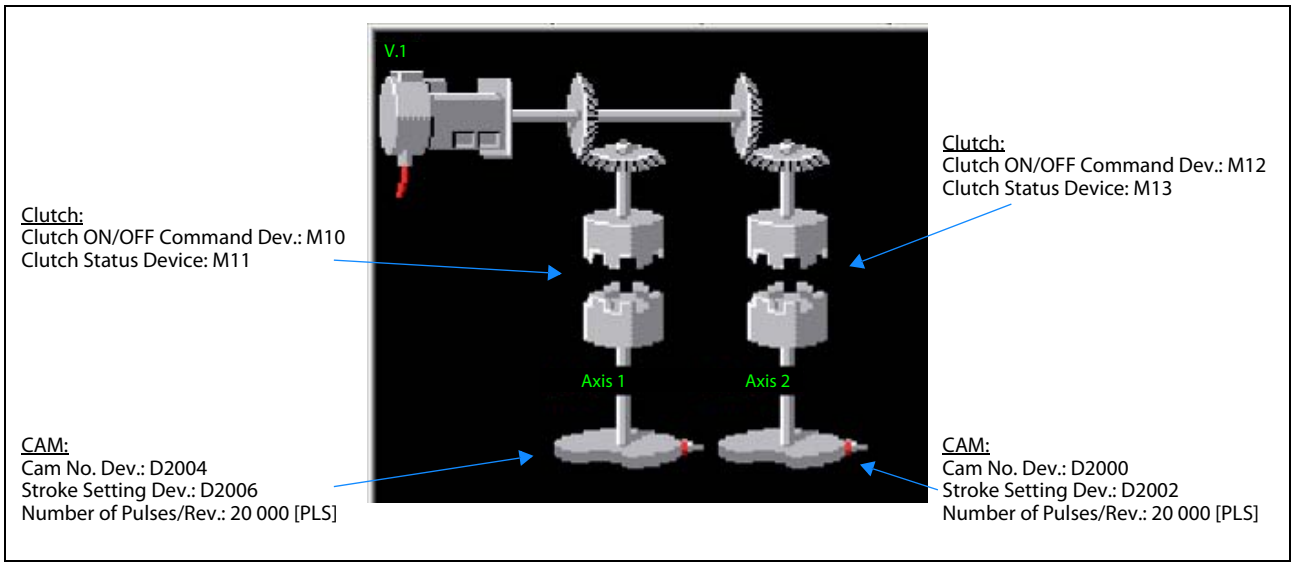


Fig. 6-10: *Mechanical system*

6.1.7 CAMs

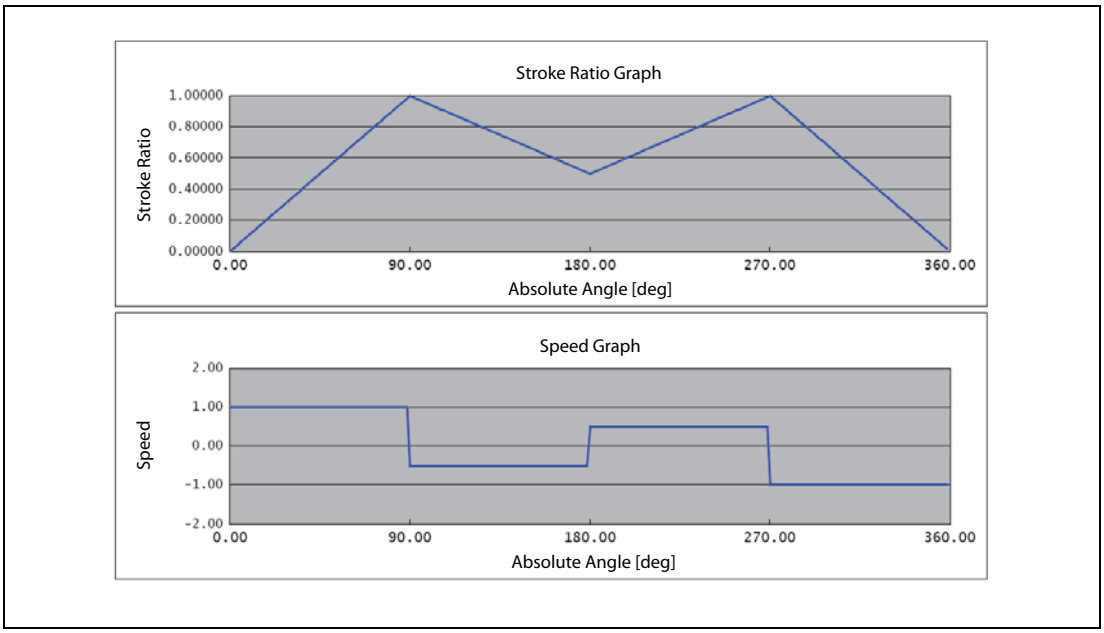


Fig. 6-11: *CAM 1 (Axis 1)*

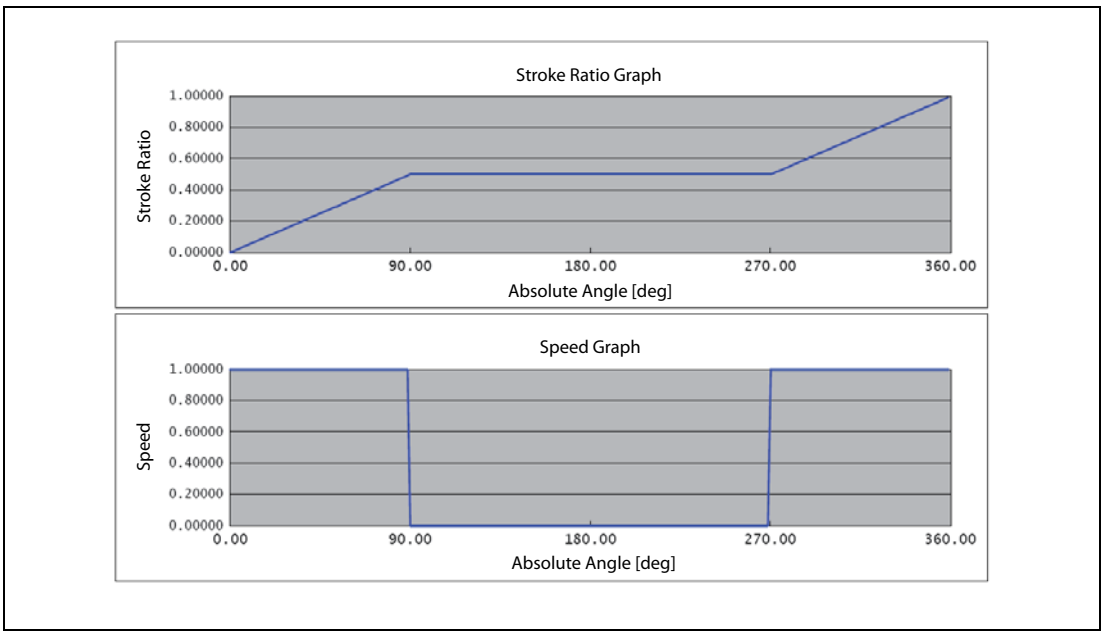


Fig. 6-12: *CAM 2 (Axis 2)*

6.2 Sample program with OS SV22: 2_axes_motion_no_inputs

This second sample program is mainly similar to the first one in section 6.1. The only difference is, that the hard wired inputs have been replaced by internal bit devices.

6.2.1 System configuration

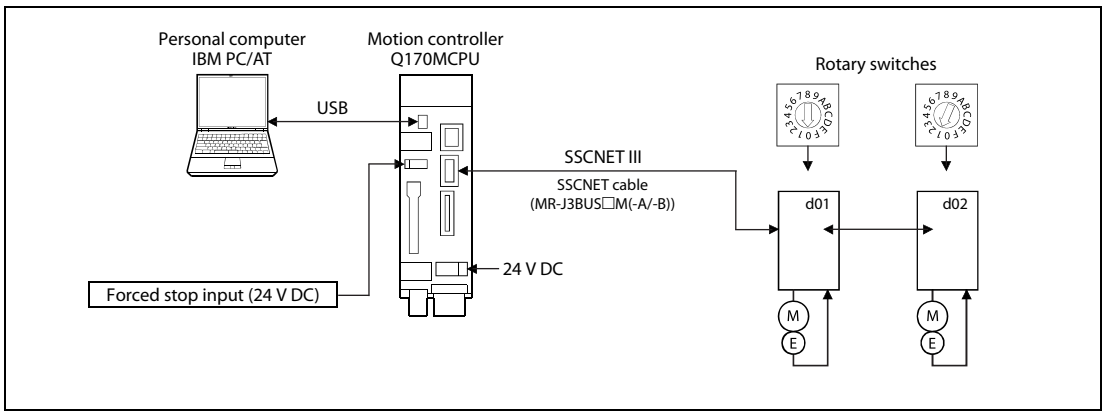


Fig. 6-13: *System configuration with Q170MCPU and two axes*

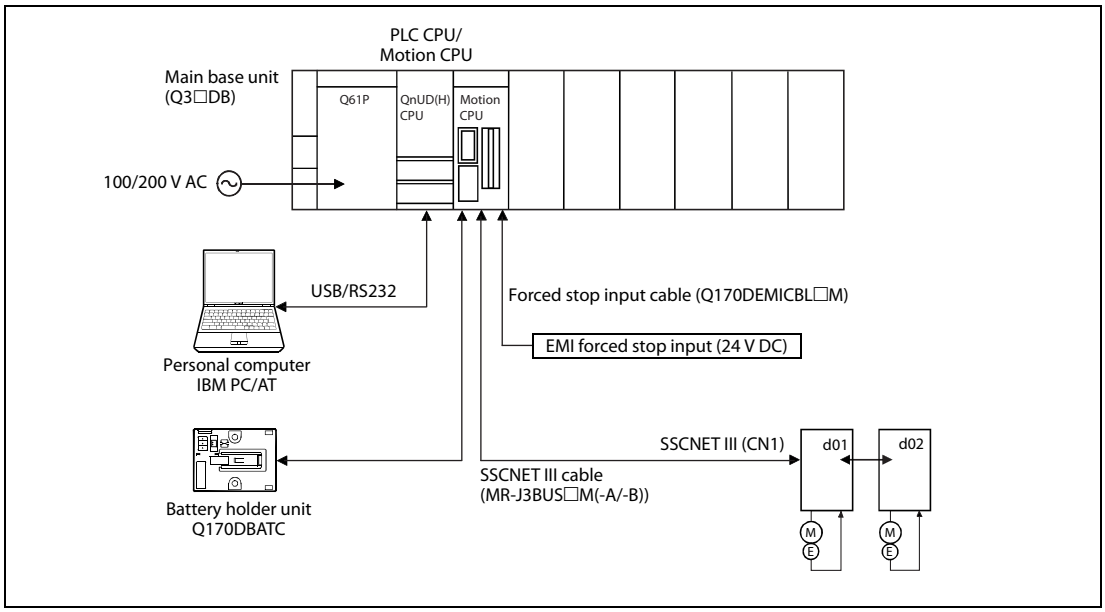


Fig. 6-14: *System configuration with Q172DCPU and two axes*

6.2.2 Functions

Bit Devices	Function	Details			
M100	Forced stop	When M100 turns off, servomotors are forced to stop and motion control is suspended (E7 warning).			
M101 and M102 and M107	Motion selection input	**M102**	**M101**	**M107**	**Motion mode**
		OFF	OFF	OFF	JOG mode
		ON	OFF	OFF	Home position return mode
		ON	ON	OFF	Operation mode (Real)
		ON	ON	ON	Operation mode (Virtual)

Tab. 6-5: *Functions of bit devices*

Motion mode	Details	
JOG mode	M103:	Axis 1 JOG forward rotation
	M104:	Axis 1 JOG reverse rotation
	M105:	Axis 2 JOG forward rotation
	M106:	Axis 2 JOG reverse rotation
Home position return mode	M103: ON	Home position return of axis 1 is executed.
	M104: ON	Home position return of axis 2 is executed
Operation mode (Real)	M103: OFF → ON	Sample movement 1 (point-to-point)
	M104: ON	Sample movement 2 (linear interpolation)
Operation mode (Virtual)	2 synchronized cams movement automatically started. NOTE: Home position required beforehand	

Tab. 6-6: *Details of motion mode*

NOTE

Refer to the section "Device monitor and testing" (section 5.2.5) of this quick-start guide for further details of bit devices setting/resetting.

A Appendix

A.1 Exterior Dimensions

A.1.1 Motion controller Q170MCPU

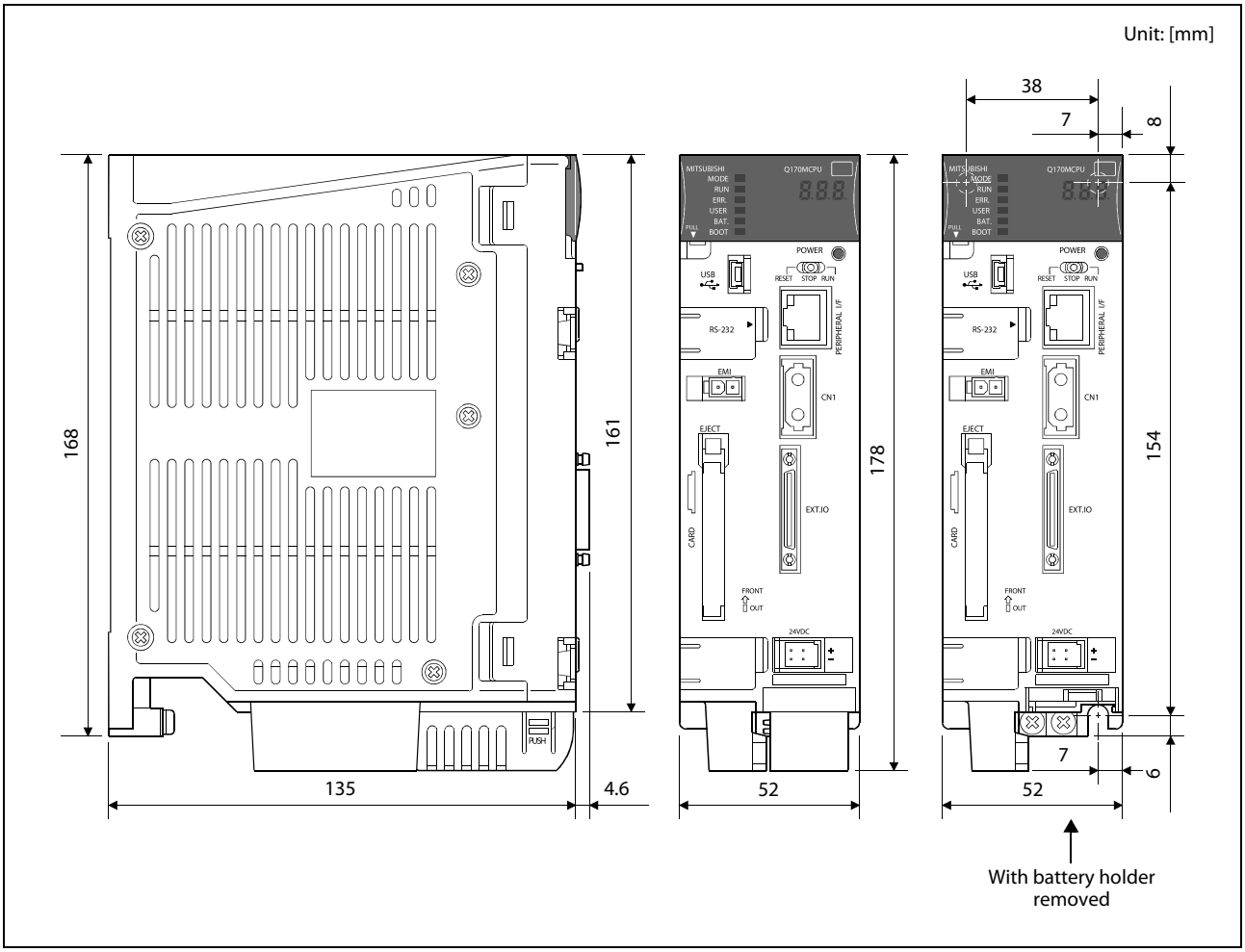


Fig. A-1: *Dimensions of Q170MCPU*

A.1.2 Motion controller Q172DCPU and Q173DCPU

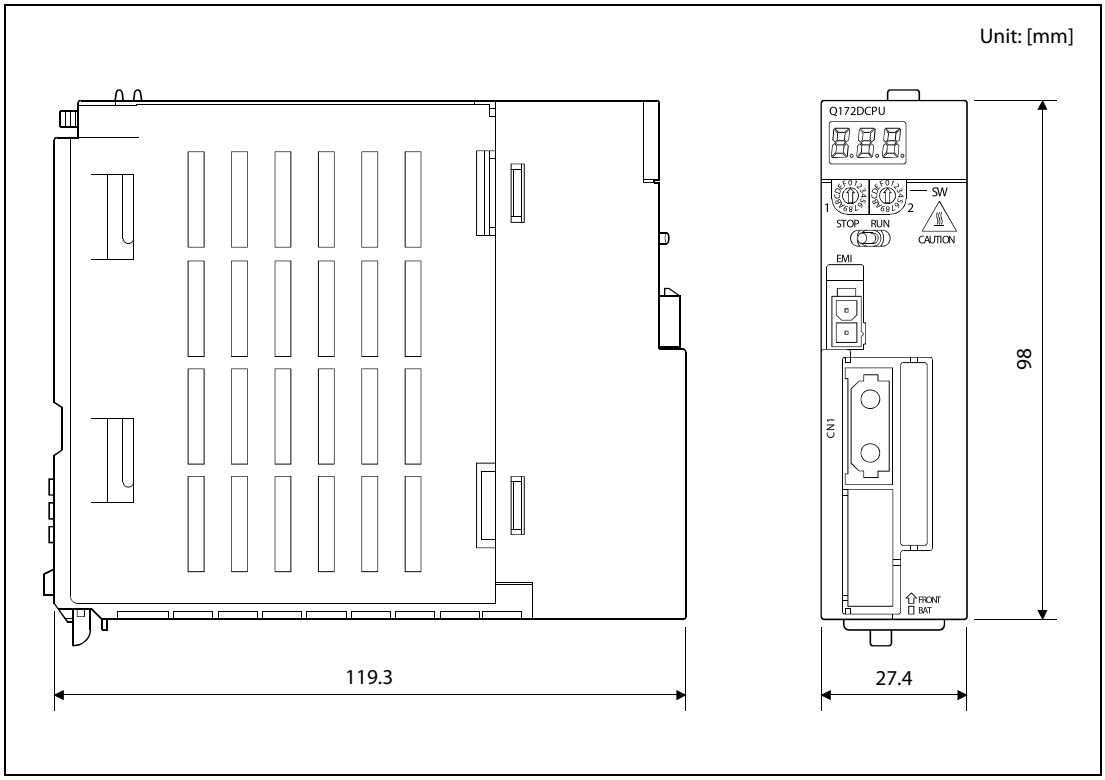


Fig. A-2: *Dimensions of Q172DCPU*

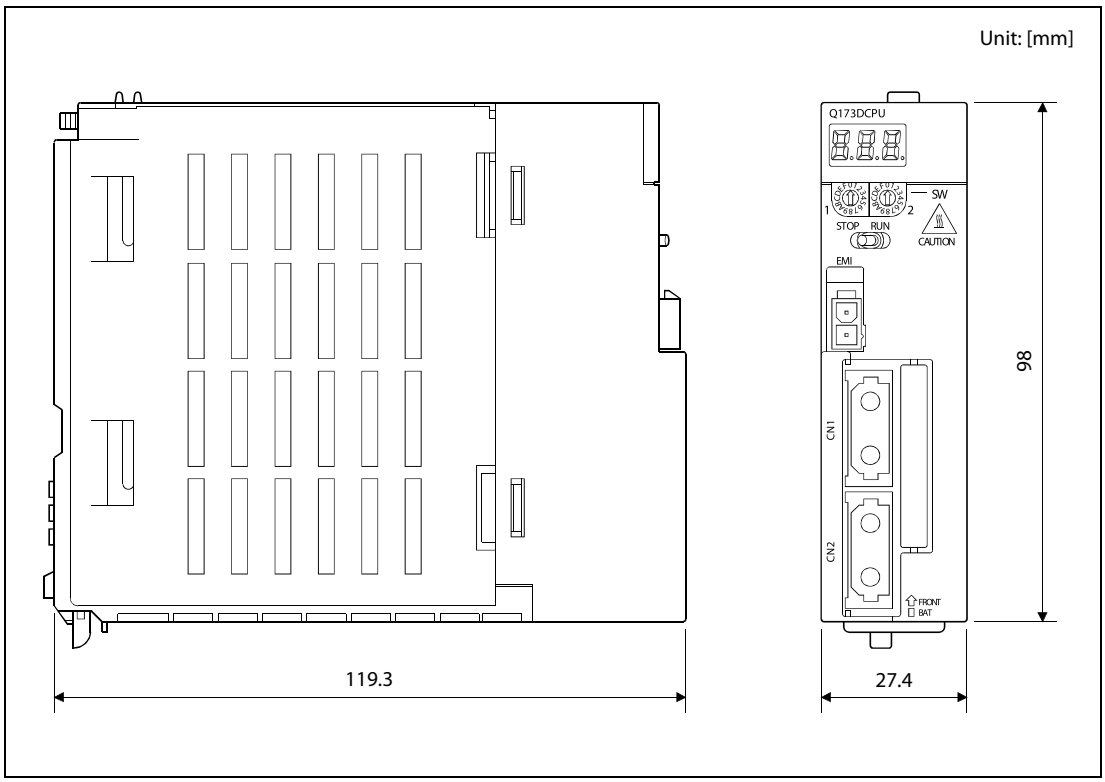


Fig. A-3: *Dimensions of Q173DCPU*

A.2 Troubleshooting

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

A.2.1 Q170MCPU

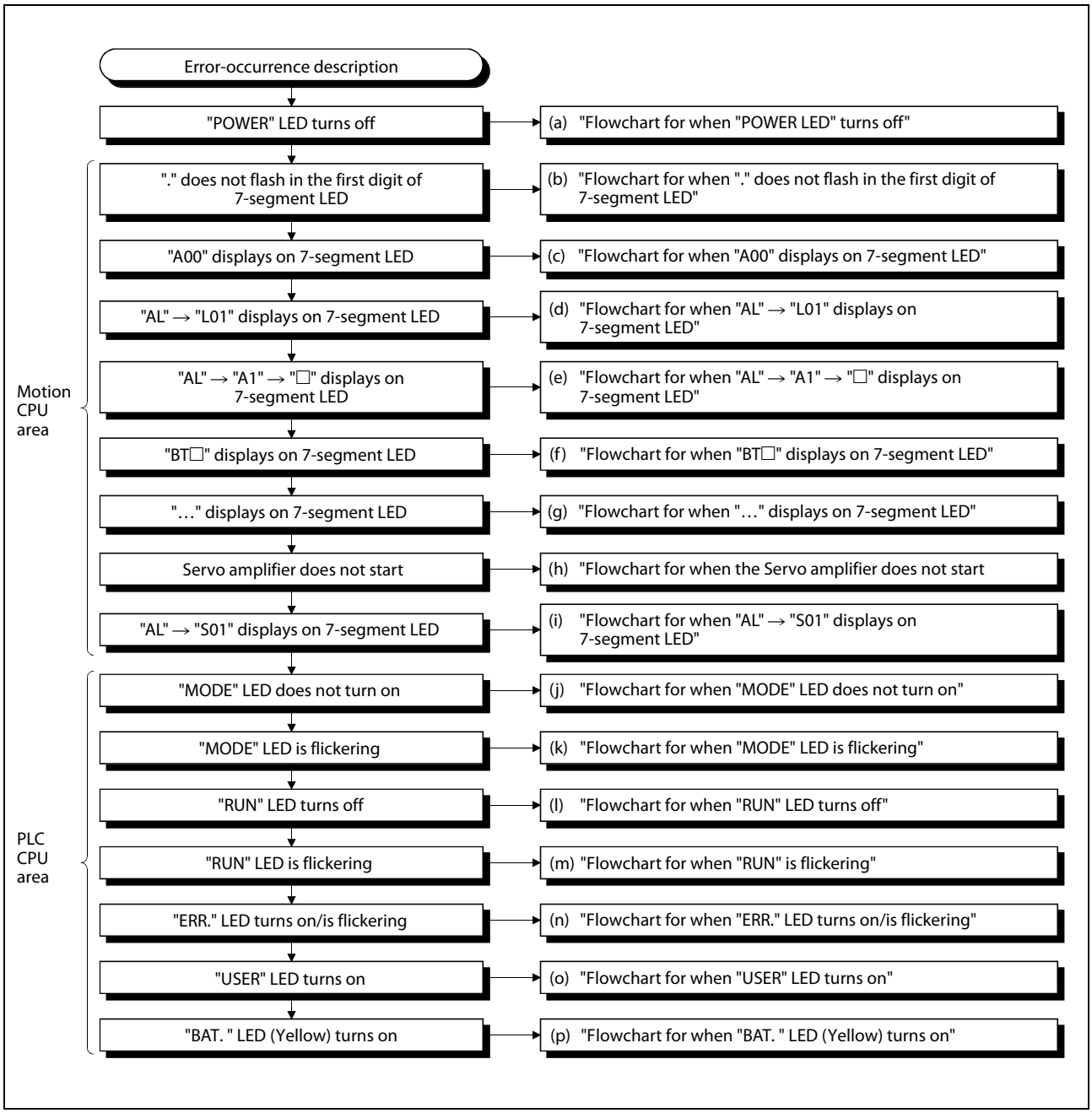


Fig. A-4: *Troubleshooting flowchart for Q170MCPU*

NOTE The procedure of fault finding for each event group (a) to (p), mentioned on the right side of the above flowchart, is described in chapter 6 of the user's manual of the motion controller Q170MCPU.

A.2.2 QD-Motion controller

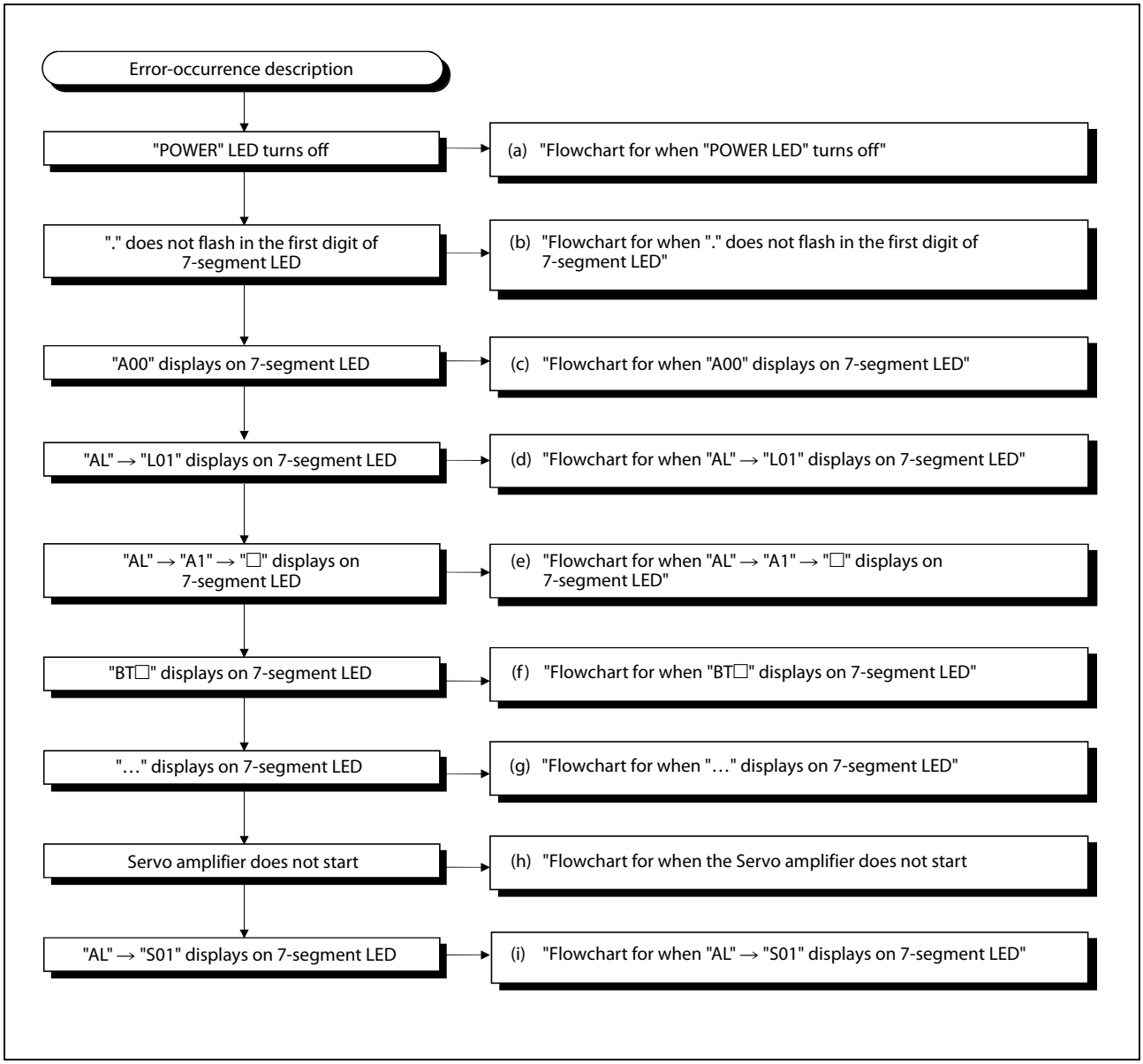


Fig. A-5: *Troubleshooting flowchart for Q172DCPU and Q173DCPU*

NOTE The procedure of fault finding for each event group (a) to (i), mentioned on the right side of the above flowchart, is described in chapter 6 of the user's manual of the motion controllers Q172DCPU and Q173DCPU.

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HEADQUARTERS

MITSUBISHI ELECTRIC EUROPE B.V. **EUROPE**
German Branch
Gothaer Straße 8
D-40880 Ratingen
Phone: +49 (0)2102 / 486-0
Fax: +49 (0)2102 / 486-1120

MITSUBISHI ELECTRIC EUROPE B.V. **CZECH REPUBLIC**
Czech Branch
Avenir Business Park, Radlická 714/113a
CZ-158 00 Praha 5
Phone: +420 (0)251 551 470
Fax: +420 (0)251-551-471

MITSUBISHI ELECTRIC EUROPE B.V. **FRANCE**
French Branch
25, Boulevard des Bouvets
F-92741 Nanterre Cedex
Phone: +33 (0)1 / 55 68 55 68
Fax: +33 (0)1 / 55 68 57 57

MITSUBISHI ELECTRIC EUROPE B.V. **IRELAND**
Irish Branch
Westgate Business Park, Ballymount
IRL-Dublin 24
Phone: +353 (0)1 4198800
Fax: +353 (0)1 4198890

MITSUBISHI ELECTRIC EUROPE B.V. **ITALY**
Italian Branch
Viale Colleoni 7
I-20041 Agrate Brianza (MB)
Phone: +39 039 / 60 53 1
Fax: +39 039 / 60 53 312

MITSUBISHI ELECTRIC EUROPE B.V. **POLAND**
Poland Branch
Krakowska 50
PL-32-083 Balice
Phone: +48 (0)12 / 630 47 00
Fax: +48 (0)12 / 630 47 01

MITSUBISHI ELECTRIC EUROPE B.V. **SPAIN**
Spanish Branch
Carretera de Rubí 76-80
E-08190 Sant Cugat del Vallés (Barcelona)
Phone: 902 131121 // +34 935653131
Fax: +34 935891579

MITSUBISHI ELECTRIC EUROPE B.V. **UK**
UK Branch
Travellers Lane
UK-Hatfield, Herts. AL10 8XB
Phone: +44 (0)1707 / 27 61 00
Fax: +44 (0)1707 / 27 86 95

MITSUBISHI ELECTRIC CORPORATION **JAPAN**
Office Tower "Z" 14 F
8-12,1 chome, Harumi Chuo-Ku
Tokyo 104-6212
Phone: +81 3 622 160 60
Fax: +81 3 622 160 75

MITSUBISHI ELECTRIC AUTOMATION, Inc. **USA**
500 Corporate Woods Parkway
Vernon Hills, IL 60061
Phone: +1 847 478 21 00
Fax: +1 847 478 22 53

EUROPEAN REPRESENTATIVES

GEVA **AUSTRIA**
Wiener Straße 89
AT-2500 Baden
Phone: +43 (0)2252 / 85 55 20
Fax: +43 (0)2252 / 488 60

TEHNIKON **BELARUS**
Oktyabrskaya 16/5, Off. 703-711
BY-220030 Minsk
Phone: +375 (0)17 / 210 46 26
Fax: +375 (0)17 / 210 46 26

ESCO DRIVES & AUTOMATION **BELGIUM**
Culliganlaan 3
BE-1831 Diegem
Phone: +32 (0)2 / 717 64 30
Fax: +32 (0)2 / 717 64 31

Koning & Hartman b.v. **BELGIUM**
Woluwelaan 31
BE-1800 Vilvoorde
Phone: +32 (0)2 / 257 02 40
Fax: +32 (0)2 / 257 02 49

INEA BH d.o.o. **BOSNIA AND HERZEGOVINA**
Aleja Lipa 56
BA-71000 Sarajevo
Phone: +387 (0)33 / 921 164
Fax: +387 (0)33/ 524 539

AKHNATON **BULGARIA**
4 Andrej Ljapchev Blvd. Pb 21
BG-1756 Sofia
Phone: +359 (0)2 / 817 6004
Fax: +359 (0)2 / 97 44 06 1

INEA CR d.o.o. **CROATIA**
Losinjska 4 a
HR-10000 Zagreb
Phone: +385 (0)1 / 36 940 - 01/ -02/ -03
Fax: +385 (0)1 / 36 940 - 03

AutoCont C.S. s.r.o. **CZECH REPUBLIC**
Technologická 374/6
CZ-708 00 Ostrava-Pustkovec
Phone: +420 595 691 150
Fax: +420 595 691 199

B:ELECTRIC, s.r.o. **CZECH REPUBLIC**
Mladoboleslavská 812
CZ-197 00 Praha 19 - Kbely
Phone: +420 286 850 848, +420 724 317 975
Fax: +420 286 850 850

Beijer Electronics A/S **DENMARK**
Lykkegårdsvej 17, 1.
DK-4000 Roskilde
Phone: +45 (0)46/ 75 76 66
Fax: +45 (0)46 / 75 56 26

Beijer Electronics Eesti OÜ **ESTONIA**
Pärnu mnt.160i
EE-11317 Tallinn
Phone: +372 (0)6 / 51 81 40
Fax: +372 (0)6 / 51 81 49

Beijer Electronics OY **FINLAND**
Jaakonkatu 2
FIN-01620 Vantaa
Phone: +358 (0)207 / 463 500
Fax: +358 (0)207 / 463 501

UTECO A.B.E.E. **GREECE**
5, Mavrogenous Str.
GR-18542 Piraeus
Phone: +30 211 / 1206 900
Fax: +30 211 / 1206 999

MELTRADE Ltd. **HUNGARY**
Fertő utca 14.
HU-1107 Budapest
Phone: +36 (0)1 / 431-9726
Fax: +36 (0)1 / 431-9727

Beijer Electronics SIA **LATVIA**
Vestienas iela 2
LV-1035 Riga
Phone: +371 (0)784 / 2280
Fax: +371 (0)784 / 2281

Beijer Electronics UAB **LITHUANIA**
Savanoriu Pr. 187
LT-02300 Vilnius
Phone: +370 (0)5 / 232 3101
Fax: +370 (0)5 / 232 2980

EUROPEAN REPRESENTATIVES

ALFATRADE Ltd. **MALTA**
99, Paola Hill
Malta- Paola PLA 1702
Phone: +356 (0)21 / 697 816
Fax: +356 (0)21 / 697 817

INTEHSIS srl **MOLDOVA**
bld. Traian 23/1
MD-2060 Kishinev
Phone: +373 (0)22 / 66 4242
Fax: +373 (0)22 / 66 4280

HIFLEX AUTOM.TECHNIEK B.V. **NETHERLANDS**
Wolweverstraat 22
NL-2984 CD Ridderkerk
Phone: +31 (0)180 – 46 60 04
Fax: +31 (0)180 – 44 23 55

Koning & Hartman b.v. **NETHERLANDS**
Haarlerbergweg 21-23
NL-1101 CH Amsterdam
Phone: +31 (0)20 / 587 76 00
Fax: +31 (0)20 / 587 76 05

Beijer Electronics AS **NORWAY**
Postboks 487
NO-3002 Drammen
Phone: +47 (0)32 / 24 30 00
Fax: +47 (0)32 / 84 85 77

Sirius Trading & Services srl **ROMANIA**
Aleea Lacul Morii Nr. 3
RO-060841 Bucuresti, Sector 6
Phone: +40 (0)21 / 430 40 06
Fax: +40 (0)21 / 430 40 02

Craft Con. & Engineering d.o.o. **SERBIA**
Bulevar Svetog Cara Konstantina 80-86
SER-18106 Nis
Phone: +381 (0)18 / 292-24-4/5
Fax: +381 (0)18 / 292-24-4/5

INEA SR d.o.o. **SERBIA**
Izletnicka 10
SER-113000 Smederevo
Phone: +381 (0)26 / 617 163
Fax: +381 (0)26 / 617 163

AutoCont Control s.r.o. **SLOVAKIA**
Radlinského 47
SK-02601 Dolny Kubin
Phone: +421 (0)43 / 5868210
Fax: +421 (0)43 / 5868210

CS MTrade Slovensko, s.r.o. **SLOVAKIA**
Vajanskeho 58
SK-92101 Piestany
Phone: +421 (0)33 / 7742 760
Fax: +421 (0)33 / 7735 144

INEA d.o.o. **SLOVENIA**
Stegne 11
SI-1000 Ljubljana
Phone: +386 (0)1 / 513 8100
Fax: +386 (0)1 / 513 8170

Beijer Electronics AB **SWEDEN**
Box 426
SE-20124 Malmö
Phone: +46 (0)40 / 35 86 00
Fax: +46 (0)40 / 35 86 02

Econotec AG **SWITZERLAND**
Hinterdorfstr. 12
CH-8309 Nürensdorf
Phone: +41 (0)44 / 838 48 11
Fax: +41 (0)44 / 838 48 12

GTS **TURKEY**
Bayraktar Bulvari Nutuk Sok. No:5
TR-34775 Yukari Dudullu-Umraniye-ISTANBUL
Phone: +90 (0)216 526 39 90
Fax: +90 (0)216 526 3995

CSC Automation Ltd. **UKRAINE**
4-B, M. Raskovoyi St.
UA-02660 Kiev
Phone: +380 (0)44 / 494 33 55
Fax: +380 (0)44 / 494-33-66

EURASIAN REPRESENTATIVES

Kazpromautomatics Ltd. **KAZAKHSTAN**
Mustafina Str. 7/2
KAZ-470046 Karaganda
Phone: +7 7212 / 50 11 50
Fax: +7 7212 / 50 11 50

MIDDLE EAST REPRESENTATIVES

ILAN & GAVISH Ltd. **ISRAEL**
24 Shenkar St., Kiryat Arie
IL-49001 Petah-Tiqva
Phone: +972 (0)3 / 922 18 24
Fax: +972 (0)3 / 924 0761

TEXEL ELECTRONICS Ltd. **ISRAEL**
2 Ha´umanut, P.O.B. 6272
IL-42160 Netanya
Phone: +972 (0)9 / 863 39 80
Fax: +972 (0)9 / 885 24 30

CEG INTERNATIONAL **LEBANON**
Cebaco Center/Block A Autostrade DORA
Lebanon - Beirut
Phone: +961 (0)1 / 240 430
Fax: +961 (0)1 / 240 438

AFRICAN REPRESENTATIVE

CBI Ltd. **SOUTH AFRICA**
Private Bag 2016
ZA-1600 Isando
Phone: + 27 (0)11 / 928 2000
Fax: + 27 (0)11 / 392 2354