

Mitsubishi Programmable Controller

MELSEC iQ-R
series

MELSEC iQ-R Simple Motion Module User's Manual (Startup)

RD77MS2
RD77MS4
RD77MS8
RD77MS16



SAFETY PRECAUTIONS

(Read these precautions before using this product.)

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

The precautions given in this manual are concerned with this product only. Refer to the user's manual of the CPU module to use for a description of the PLC system safety precautions.

In this manual, the safety precautions are classified into two levels: "⚠ WARNING" and "⚠ CAUTION".

| | |
|--|---|
|  WARNING | 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 minor or moderate injury or property damage. |

Under some circumstances, failure to observe the precautions given under "⚠ CAUTION" may lead to serious consequences.

Observe the precautions of both levels because they are important for personal and system safety.

Make sure that the end users read this manual and then keep the manual in a safe place for future reference.

[Design Precautions]

WARNING

- Configure safety circuits external to the programmable controller to ensure that the entire system operates safely even when a fault occurs in the external power supply or the programmable controller. Failure to do so may result in an accident due to an incorrect output or malfunction.
 - (1) Configure external safety circuits, such as an emergency stop circuit, protection circuit, and protective interlock circuit for forward/reverse operation or upper/lower limit positioning.
 - (2) The programmable controller stops its operation upon detection of the following status, and the output status of the system will be as shown below.
 - Turned off if the overcurrent or overvoltage protection of the power supply module is activated.
 - Held or turned off according to the parameter setting if the self-diagnostic function of the CPU module detects an error such as a watchdog timer error.
 - (3) Also, all outputs may be turned on if an error occurs in a part, such as an I/O control part, where the CPU module cannot detect any error. To ensure safety operation in such a case, provide a safety mechanism or a fail-safe circuit external to the programmable controller. For a fail-safe circuit example, refer to the user's manual of the CPU module to use.
 - (4) Outputs may remain on or off due to a failure of a component such as a relay and transistor in an output circuit. Configure an external circuit for monitoring output signals that could cause a serious accident.
- In an output circuit, when a load current exceeding the rated current or an overcurrent caused by a load short-circuit flows for a long time, it may cause smoke and fire. To prevent this, configure an external safety circuit, such as a fuse.
- Configure a circuit so that the programmable controller is turned on first and then the external power supply. If the external power supply is turned on first, an accident may occur due to an incorrect output or malfunction.
- For the operating status of each station after a communication failure, refer to manuals relevant to the network. Incorrect output or malfunction due to a communication failure may result in an accident.

WARNING

- When connecting an external device with a CPU module or intelligent function module to modify data of a running programmable controller, configure an interlock circuit in the program to ensure that the entire system will always operate safely. For other forms of control (such as program modification, parameter change, forced output, or operating status change) of a running programmable controller, read the relevant manuals carefully and ensure that the operation is safe before proceeding. Improper operation may damage machines or cause accidents.
 - Especially, when a remote programmable controller is controlled by an external device, immediate action cannot be taken if a problem occurs in the programmable controller due to a communication failure. To prevent this, configure an interlock circuit in the program, and determine corrective actions to be taken between the external device and CPU module in case of a communication failure.
 - Do not write any data to the "system area" and "write-protect area" of the buffer memory in the module. Also, do not use any "use prohibited" signals as an output signal from the CPU module to each module. Doing so may cause malfunction of the programmable controller system. For the "system area", "write-protect area", and the "use prohibited" signals, refer to the user's manual for the module used.
 - If a communication cable is disconnected, the network may be unstable, resulting in a communication failure of multiple stations. Configure an interlock circuit in the program to ensure that the entire system will always operate safely even if communications fail. Failure to do so may result in an accident due to an incorrect output or malfunction.
 - To maintain the safety of the programmable controller system against unauthorized access from external devices via the network, take appropriate measures. To maintain the safety against unauthorized access via the Internet, take measures such as installing a firewall.
 - Configure safety circuits external to the programmable controller to ensure that the entire system operates safely even when a fault occurs in the external power supply or the programmable controller. Failure to do so may result in an accident due to an incorrect output or malfunction.
 - (1) Machine home position return is controlled by two kinds of data: a home position return direction and a home position return speed. Deceleration starts when the near-point dog signal turns on. If an incorrect home position return direction is set, motion control may continue without deceleration. To prevent machine damage caused by this, configure an interlock circuit external to the programmable controller.
 - (2) When the module detects an error, the motion slows down and stops or the motion suddenly stops, depending on the stop group setting in parameter. Set the parameter to meet the specifications of a positioning control system. In addition, set the home position return parameter and positioning data within the specified setting range.
 - (3) Outputs may remain on or off, or become undefined due to a failure of a component such as an insulation element and transistor in an output circuit, where the module cannot detect any error. In a system that the incorrect output could cause a serious accident, configure an external circuit for monitoring output signals.
 - If safety standards (ex., robot safety rules, etc.) apply to the system using the module, servo amplifier and servomotor, make sure that the safety standards are satisfied.
 - Construct a safety circuit externally of the module or servo amplifier if the abnormal operation of the module or servo amplifier differs from the safety directive operation in the system.
 - Do not remove the SSCNETⅢ cable while turning on the control circuit power supply of Multiple CPU system and servo amplifier. Do not see directly the light generated from SSCNETⅢ connector of the module or servo amplifier and the end of SSCNETⅢ cable. When the light gets into eyes, you may feel something wrong with eyes. (The light source of SSCNETⅢ complies with class1 defined in JISC6802 or IEC60825-1.)
-

CAUTION

- Do not install the control lines or communication cables together with the main circuit lines or power cables. Keep a distance of 100 mm or more between them. Failure to do so may result in malfunction due to noise.
 - During control of an inductive load such as a lamp, heater, or solenoid valve, a large current (approximately ten times greater than normal) may flow when the output is turned from off to on. Therefore, use a module that has a sufficient current rating.
 - After the CPU module is powered on or is reset, the time taken to enter the RUN status varies depending on the system configuration, parameter settings, and/or program size. Design circuits so that the entire system will always operate safely, regardless of the time.
 - Do not power off the programmable controller or do not reset the CPU module during the setting registration. Doing so will make the data in the flash ROM undefined. The data need to be set in the buffer memory and to be written to the flash ROM again. Doing so may cause malfunction or failure of the module.
 - Reset the CPU module after changing the parameters. Failure to do so may cause malfunction because the previous parameter settings remain in the module.
 - When changing the operating status of the CPU module from external devices (such as remote RUN/STOP), select "Do Not Open by Program" for "Opening Method" in the module parameters. If "Open by Program" is selected, an execution of remote STOP causes the communication line to close. Consequently, the CPU module cannot reopen the communication line, and external devices cannot execute the remote RUN.
-

[Installation Precautions]

WARNING

- Shut off the external power supply (all phases) used in the system before mounting or removing the module. Failure to do so may result in electric shock or cause the module to fail or malfunction.
-

[Installation Precautions]

CAUTION

- Use the programmable controller in an environment that meets the general specifications in the manual "Safety Guidelines" included in the base unit. Failure to do so may result in electric shock, fire, malfunction, or damage to or deterioration of the product.
 - To mount a module, place the concave part(s) located at the bottom onto the guide(s) of the base unit, and push in the module until the hook(s) located at the top snaps into place. Incorrect mounting may cause malfunction, failure, or drop of the module.
 - When using the programmable controller in an environment of frequent vibrations, fix the module with a screw.
 - Tighten the screws within the specified torque range. Undertightening can cause drop of the screw, short circuit, or malfunction. Overtightening can damage the screw and/or module, resulting in drop, short circuit, or malfunction.
 - When using an extension cable, connect it to the extension cable connector of the base unit securely. Check the connection for looseness. Poor contact may cause incorrect input or output.
 - When using an SD memory card, fully insert it into the memory card slot. Check that it is inserted completely. Poor contact may cause malfunction.
 - Securely insert an extended SRAM cassette into the cassette connector of a CPU module. After insertion, close the cassette cover and check that the cassette is inserted completely. Poor contact may cause malfunction.
 - Do not directly touch any conductive parts and electronic components of the module, SD memory card, extended SRAM cassette, or connector. Doing so may cause malfunction or failure of the module.
-

[Wiring Precautions]

WARNING

- Shut off the external power supply (all phases) used in the system before installation and wiring. Failure to do so may result in electric shock or damage to the product.
 - After installation and wiring, attach the included terminal cover to the module before turning it on for operation. Failure to do so may result in electric shock.
-

[Wiring Precautions]

CAUTION

- Individually ground the FG and LG terminals of the programmable controller with a ground resistance of 100 ohm or less. Failure to do so may result in electric shock or malfunction.
 - Use applicable solderless terminals and tighten them within the specified torque range. If any spade solderless terminal is used, it may be disconnected when the terminal screw comes loose, resulting in failure.
 - Check the rated voltage and signal layout before wiring to the module, and connect the cables correctly. Connecting a power supply with a different voltage rating or incorrect wiring may cause fire or failure.
 - Connectors for external devices or coaxial cables must be crimped or pressed with the tool specified by the manufacturer, or must be correctly soldered. Incomplete connections may cause short circuit, fire, or malfunction.
 - Securely connect the connector to the module. Poor contact may cause malfunction.
 - Do not install the control lines or communication cables together with the main circuit lines or power cables. Keep a distance of 100 mm or more between them. Failure to do so may result in malfunction due to noise.
 - Place the cables in a duct or clamp them. If not, dangling cable may swing or inadvertently be pulled, resulting in damage to the module or cables or malfunction due to poor contact. Do not clamp the extension cables with the jacket stripped.
 - Check the interface type and correctly connect the cable. Incorrect wiring (connecting the cable to an incorrect interface) may cause failure of the module and external device.
 - Tighten the terminal screws or connector screws within the specified torque range. Undertightening can cause drop of the screw, short circuit, fire, or malfunction. Overtightening can damage the screw and/or module, resulting in drop, short circuit, fire, or malfunction.
 - When disconnecting the cable from the module, do not pull the cable by the cable part. For the cable with connector, hold the connector part of the cable. For the cable connected to the terminal block, loosen the terminal screw. Pulling the cable connected to the module may result in malfunction or damage to the module or cable.
 - Prevent foreign matter such as dust or wire chips from entering the module. Such foreign matter can cause a fire, failure, or malfunction.
 - A protective film is attached to the top of the module to prevent foreign matter, such as wire chips, from entering the module during wiring. Do not remove the film during wiring. Remove it for heat dissipation before system operation.
 - Mitsubishi programmable controllers must be installed in control panels. Connect the main power supply to the power supply module in the control panel through a relay terminal block. Wiring and replacement of a power supply module must be performed by qualified maintenance personnel with knowledge of protection against electric shock. For wiring, refer to the MELSEC iQ-R Module Configuration Manual.
 - For Ethernet cables to be used in the system, select the ones that meet the specifications in the MELSEC iQ-R Ethernet/CC-Link IE User's Manual (Startup). If not, normal data transmission is not guaranteed.
-

[Startup and Maintenance Precautions]

WARNING

- Do not touch any terminal while power is on. Doing so will cause electric shock or malfunction.
 - Correctly connect the battery connector. Do not charge, disassemble, heat, short-circuit, solder, or throw the battery into the fire. Also, do not expose it to liquid or strong shock. Doing so may cause the battery to generate heat, explode, ignite, or leak, resulting in injury or fire.
 - Shut off the external power supply (all phases) used in the system before cleaning the module or retightening the terminal screws, connector screws, or module fixing screws. Failure to do so may result in electric shock or cause the module to fail or malfunction.
-

[Startup and Maintenance Precautions]

CAUTION

- When connecting an external device with a CPU module or intelligent function module to modify data of a running programmable controller, configure an interlock circuit in the program to ensure that the entire system will always operate safely. For other forms of control (such as program modification, parameter change, forced output, or operating status change) of a running programmable controller, read the relevant manuals carefully and ensure that the operation is safe before proceeding. Improper operation may damage machines or cause accidents.
- Especially, when a remote programmable controller is controlled by an external device, immediate action cannot be taken if a problem occurs in the programmable controller due to a communication failure. To prevent this, configure an interlock circuit in the program, and determine corrective actions to be taken between the external device and CPU module in case of a communication failure.
- Do not disassemble or modify the modules. Doing so may cause failure, malfunction, injury, or a fire.
- Use any radio communication device such as a cellular phone or PHS (Personal Handyphone System) more than 25 cm away in all directions from the programmable controller. Failure to do so may cause malfunction.
- Shut off the external power supply (all phases) used in the system before mounting or removing the module. Failure to do so may cause the module to fail or malfunction.
- Tighten the screws within the specified torque range. Undertightening can cause drop of the component or wire, short circuit, or malfunction. Overtightening can damage the screw and/or module, resulting in drop, short circuit, or malfunction.
- After the first use of the product, do not mount/remove the module to/from the base unit, and the terminal block to/from the module, and do not insert/remove the extended SRAM cassette to/from the CPU module more than 50 times (IEC 61131-2 compliant) respectively. Exceeding the limit of 50 times may cause malfunction.
- After the first use of the product, do not insert/remove the SD memory card to/from the CPU module more than 500 times. Exceeding the limit may cause malfunction.
- Do not touch the metal terminals on the back side of the SD memory card. Doing so may cause malfunction or failure.
- Do not touch the integrated circuits on the circuit board of an extended SRAM cassette. Doing so may cause malfunction or failure.
- Do not drop or apply shock to the battery to be installed in the module. Doing so may damage the battery, causing the battery fluid to leak inside the battery. If the battery is dropped or any shock is applied to it, dispose of it without using.

CAUTION

- Startup and maintenance of a control panel must be performed by qualified maintenance personnel with knowledge of protection against electric shock. Lock the control panel so that only qualified maintenance personnel can operate it.
 - Before handling the module, touch a conducting object such as a grounded metal to discharge the static electricity from the human body. Failure to do so may cause the module to fail or malfunction.
 - Before testing the operation, set a low speed value for the speed limit parameter so that the operation can be stopped immediately upon occurrence of a hazardous condition.
 - Confirm and adjust the program and each parameter before operation. Unpredictable movements may occur depending on the machine.
 - When using the absolute position system function, on starting up, and when the module or absolute value motor has been replaced, always perform a home position return.
 - Before starting the operation, confirm the brake function.
 - Do not perform a megger test (insulation resistance measurement) during inspection.
 - After maintenance and inspections are completed, confirm that the position detection of the absolute position detection function is correct.
 - Lock the control panel and prevent access to those who are not certified to handle or install electric equipment.
-

[Operating Precautions]

CAUTION

- When changing data and operating status, and modifying program of the running programmable controller from an external device such as a personal computer connected to an intelligent function module, read relevant manuals carefully and ensure the safety before operation. Incorrect change or modification may cause system malfunction, damage to the machines, or accidents.
 - Do not power off the programmable controller or reset the CPU module while the setting values in the buffer memory are being written to the flash ROM in the module. Doing so will make the data in the flash ROM undefined. The values need to be set in the buffer memory and written to the flash ROM again. Doing so also can cause malfunction or failure of the module.
 - Note that when the reference axis speed is specified for interpolation operation, the speed of the partner axis (2nd, 3rd, or 4th axis) may exceed the speed limit value.
 - Do not go near the machine during test operations or during operations such as teaching. Doing so may lead to injuries.
-

[Disposal Precautions]

CAUTION

- When disposing of this product, treat it as industrial waste.
 - When disposing of batteries, separate them from other wastes according to the local regulations. For details on battery regulations in EU member states, refer to the MELSEC iQ-R Module Configuration Manual.
-

[Transportation Precautions]

CAUTION

- When transporting lithium batteries, follow the transportation regulations. For details on the regulated models, refer to the MELSEC iQ-R Module Configuration Manual.
 - The halogens (such as fluorine, chlorine, bromine, and iodine), which are contained in a fumigant used for disinfection and pest control of wood packaging materials, may cause failure of the product. Prevent the entry of fumigant residues into the product or consider other methods (such as heat treatment) instead of fumigation. The disinfection and pest control measures must be applied to unprocessed raw wood.
-

CONDITIONS OF USE FOR THE PRODUCT

(1) Mitsubishi programmable controller ("the PRODUCT") shall be used in conditions;

- i) where any problem, fault or failure occurring in the PRODUCT, if any, shall not lead to any major or serious accident; and
- ii) where the backup and fail-safe function are systematically or automatically provided outside of the PRODUCT for the case of any problem, fault or failure occurring in the PRODUCT.

(2) The PRODUCT has been designed and manufactured for the purpose of being used in general industries.

MITSUBISHI SHALL HAVE NO RESPONSIBILITY OR LIABILITY (INCLUDING, BUT NOT LIMITED TO ANY AND ALL RESPONSIBILITY OR LIABILITY BASED ON CONTRACT, WARRANTY, TORT, PRODUCT LIABILITY) FOR ANY INJURY OR DEATH TO PERSONS OR LOSS OR DAMAGE TO PROPERTY CAUSED BY the PRODUCT THAT ARE OPERATED OR USED IN APPLICATION NOT INTENDED OR EXCLUDED BY INSTRUCTIONS, PRECAUTIONS, OR WARNING CONTAINED IN MITSUBISHI'S USER, INSTRUCTION AND/OR SAFETY MANUALS, TECHNICAL BULLETINS AND GUIDELINES FOR the PRODUCT.

("Prohibited Application")

Prohibited Applications include, but not limited to, the use of the PRODUCT in;

- Nuclear Power Plants and any other power plants operated by Power companies, and/or any other cases in which the public could be affected if any problem or fault occurs in the PRODUCT.
- Railway companies or Public service purposes, and/or any other cases in which establishment of a special quality assurance system is required by the Purchaser or End User.
- Aircraft or Aerospace, Medical applications, Train equipment, transport equipment such as Elevator and Escalator, Incineration and Fuel devices, Vehicles, Manned transportation, Equipment for Recreation and Amusement, and Safety devices, handling of Nuclear or Hazardous Materials or Chemicals, Mining and Drilling, and/or other applications where there is a significant risk of injury to the public or property.

Notwithstanding the above, restrictions Mitsubishi may in its sole discretion, authorize use of the PRODUCT in one or more of the Prohibited Applications, provided that the usage of the PRODUCT is limited only for the specific applications agreed to by Mitsubishi and provided further that no special quality assurance or fail-safe, redundant or other safety features which exceed the general specifications of the PRODUCTS are required. For details, please contact the Mitsubishi representative in your region.

INTRODUCTION

Thank you for purchasing the Mitsubishi MELSEC iQ-R series programmable controllers.

This manual describes the specifications, procedures before operation and wiring of the relevant products listed below. Before using this product, please read this manual and the relevant manuals carefully and develop familiarity with the functions and performance of the MELSEC iQ-R series programmable controller to handle the product correctly.

When applying the program examples provided in this manual to an actual system, ensure the applicability and confirm that it will not cause system control problems.

Please make sure that the end users read this manual.

Relevant products

RD77MS2, RD77MS4, RD77MS8, RD77MS16

Point


In this manual, buffer memories are classified using the following symbols. Each area name can represent the buffer memories corresponding to each axis.


- [Pr.**]: Symbols indicating positioning parameter or home position return parameter items
 - [Da.**]: Symbols indicating positioning data or block start data items
 - [Md.**]: Symbols indicating monitor data items
 - [Cd.**]: Symbols indicating control data items
-

COMPLIANCE WITH EMC AND LOW VOLTAGE DIRECTIVES

Method of ensuring compliance

To ensure that Mitsubishi programmable controllers maintain EMC and Low Voltage Directives when incorporated into other machinery or equipment, certain measures may be necessary. Please refer to one of the following manuals.


 MELSEC iQ-R Module Configuration Manual


 Safety Guidelines (This manual is included with the base unit.)

The CE mark on the side of the programmable controller indicates compliance with EMC and Low Voltage Directives.

Additional measures

To ensure that this product maintains EMC and Low Voltage Directives, please refer to one of the following manuals.

 MELSEC iQ-R Module Configuration Manual

 Safety Guidelines (This manual is included with the base unit.)

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RELEVANT MANUALS

| Manual name [manual number] | Description | Available form |
|---|--|---------------------------------------|
| MELSEC iQ-R Simple Motion Module User's Manual (Startup) [IB-0300245] (This manual) | Specifications, procedures before operation, system configuration, wiring, and operation examples of the Simple Motion module | Print book e-Manual EPUB PDF |
| MELSEC iQ-R Simple Motion Module User's Manual (Application) [IB-0300247] | Functions, input/output signals, buffer memories, parameter settings, programming, and troubleshooting of the Simple Motion module | Print book e-Manual EPUB PDF |
| MELSEC iQ-R Simple Motion Module User's Manual (Advanced Synchronous Control) [IB-0300249] | Functions and programming for the synchronous control of the Simple Motion module | Print book e-Manual EPUB PDF |

This manual does not include detailed information on the followings:

- General specifications
- Available CPU modules and the number of mountable modules
- Installation

For details, refer to the following.

 MELSEC iQ-R Module Configuration Manual

This manual does not include information on the module function blocks.

For details, refer to the Function Block Reference for the module used.



e-Manual refers to the Mitsubishi FA electronic book manuals that can be browsed using a dedicated tool.

e-Manual has the following features:

- Required information can be cross-searched in multiple manuals.
- Other manuals can be accessed from the links in the manual.
- The hardware specifications of each part can be found from the product figures.
- Pages that users often browse can be bookmarked.

TERMS

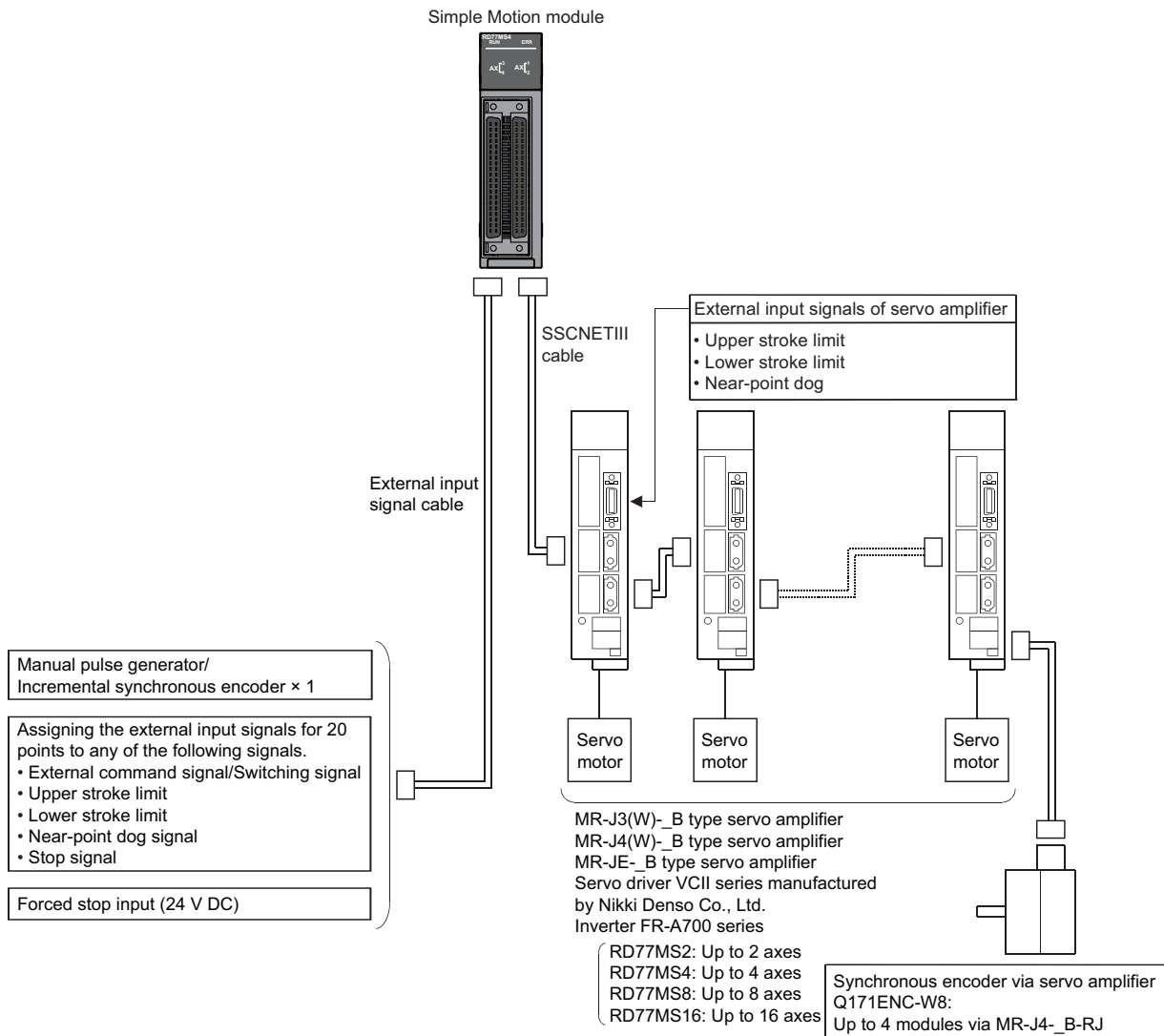
Unless otherwise specified, this manual uses the following terms.

| Term | Description |
|-----------------------------|--|
| CPU module | Abbreviation for the MELSEC iQ-R series CPU module. |
| Simple Motion module | Abbreviation for the MELSEC iQ-R series Simple Motion module. |
| RD77MS | Another term for the MELSEC iQ-R series Simple Motion module. |
| Servo amplifier | Abbreviation for SSCNETⅢ/H and SSCNETⅢ compatible servo amplifier. |
| MR-J4(W)-B | MR-J4-_B/MR-J4W-_B Servo amplifier series |
| MR-J3(W)-B | MR-J3-_B/MR-J3W-_B Servo amplifier series |
| MR-JE-B | MR-JE-_B Servo amplifier series |
| Engineering tool | Generic term for GX Works3 and MR Configurator2. |
| GX Works3 | Product name of the software package for the MELSEC programmable controllers. |
| MR Configurator2 | Product name of the setup software for the servo amplifier (Version 1.27D or later). |
| Intelligent function module | A MELSEC iQ-R series module that has functions other than input or output, such as A/D converter module and D/A converter module |
| Manual pulse generator | Abbreviation for manual pulse generator (prepared by user). |
| SSCNETⅢ/H ^{*1} | High speed synchronous communication network between RD77MS and servo amplifier. |
| SSCNETⅢ ^{*1} | |
| SSCNETⅢ(/H) | |
| Servo network | Generic term for SSCNETⅢ/H, SSCNETⅢ. |
| 2-axis module | Generic term for RD77MS2. |
| 4-axis module | Generic term for RD77MS4. |
| 8-axis module | Generic term for RD77MS8. |
| 16-axis module | Generic term for RD77MS16. |

*1 SSCNET: Servo System Controller NETwork

PERIPHERALS

The following figure shows the peripherals when the RD77MS is used.

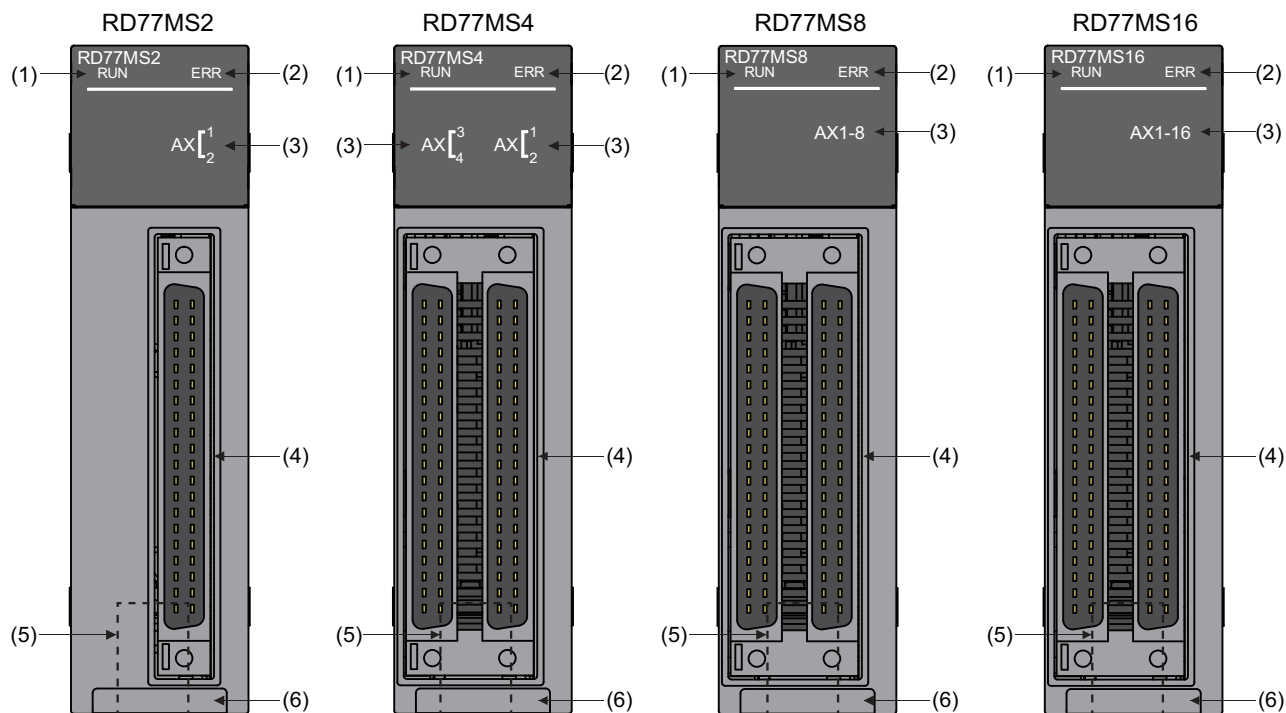


*1 The external input signal cannot be used depending on the connected device. Confirm the specification of the connected device.

*2 When using RD77MS2, the external input signals that can be assigned are for 10 points.

1 PART NAMES

This chapter describes the part names of the Simple Motion module.



| No. | Name | Description |
|-----|-------------------------------------|--|
| (1) | RUN LED | For details, refer to the following. ☞ Page 17 LED Display Specifications |
| (2) | ERR LED | |
| (3) | Axis display LED | |
| (4) | External input connection connector | Connects to a mechanical system input, manual pulse generator/incremental synchronous encoder, or forced stop input. For the signal layout, refer to the following. ☞ Page 20 Specifications of Interfaces with External Devices |
| (5) | SSCNETIII cable connector | Connects to a servo amplifier. |
| (6) | Serial number marking | Shows the serial number printed on the rating plate. |

1.1 LED Display Specifications

This section lists LED display specifications.

□: OFF, ■: ON, ●: Flashing

| Simple Motion module status | LED display | | Description |
|-----------------------------|----------------|----------------------------------|---|
| Normal operation | RUN ■ ERR □ | AX1 □ AX2 □ AX3 □ AX4 □ | The axes stopped The axes on standby |
| | | AX1-8 □ ^{*1} | |
| | | AX1-16 □ ^{*1} | |
| | RUN ■ ERR □ | AX1 ■ AX2 □ AX3 □ AX4 □ | The axis in operation |
| | | AX1-8 ■ ^{*2} | |
| | | AX1-16 ■ ^{*2} | |
| Operation failure | RUN ■ ERR ■ | AX1 ● AX2 □ AX3 □ AX4 □ | Minor error |
| | | AX1-8 ● ^{*3} | |
| | | AX1-16 ● ^{*3} | |
| | RUN ■ ERR ● | AX1 □ AX2 □ AX3 □ AX4 □ | Moderate error Watchdog timer error |
| | | AX1-8 □ | |
| | | AX1-16 □ | |
| Online module change | RUN ● ERR □ | AX1 □ AX2 □ AX3 □ AX4 □ | Module remove selection in operation |
| | | AX1-8 □ | |
| | | AX1-16 □ | |
| | RUN □ ERR □ | AX1 □ AX2 □ AX3 □ AX4 □ | Module change in operation |
| | | AX1-8 □ | |
| | | AX1-16 □ | |

*1 When all axes are stopped or on standby, the AX LED turns OFF.

*2 When any of the axes is in operation, the AX LED turns ON.

*3 When an error occurs in any of the axes, the AX LED is flashing.

2 SPECIFICATIONS

This chapter describes the performance specifications of the RD77MS.

2.1 Performance Specifications

This section lists the performance specifications of the RD77MS.

| Item | | RD77MS2 | RD77MS4 | RD77MS8 | RD77MS16 |
|--------------------------------|-----------------------------------|--|---|---------|----------|
| Number of controlled axes | | 2 axes | 4 axes | 8 axes | 16 axes |
| Operation cycle | | 0.444 ms/0.888 ms/1.777 ms/3.555 ms | | | |
| Interpolation function | | 2-axis linear interpolation, 2-axis circular interpolation | 2-, 3-, or 4-axis linear interpolation, 2-axis circular interpolation, 3-axis helical interpolation | | |
| Control system | | PTP (Point To Point) control, path control (linear, arc, and helix can be set), speed control, speed-position switching control, position-speed switching control, speed-torque control | | | |
| Control unit | | mm, inch, degree, pulse | | | |
| Positioning data | | 600 data/axis | | | |
| Execution data backup function | | Parameters, positioning data, and block start data can be saved on flash ROM. (battery-less backup) | | | |
| Positioning | Positioning system | PTP control: Incremental system/absolute system Speed-position switching control: Incremental system/absolute system Position-speed switching control: Incremental system Path control: Incremental system/absolute system | | | |
| | Positioning range | In absolute system • -214748364.8 to 214748364.7 (μm) • -21474.83648 to 21474.83647 (inch) • 0 to 359.99999 (degree) • -2147483648 to 2147483647 (pulse) In incremental system • -214748364.8 to 214748364.7 (μm) • -21474.83648 to 21474.83647 (inch) • -21474.83648 to 21474.83647 (degree) • -2147483648 to 2147483647 (pulse) In speed-position switching control (INC mode)/position-speed switching control • 0 to 214748364.7 (μm) • 0 to 21474.83647 (inch) • 0 to 21474.83647 (degree) • 0 to 2147483647 (pulse) In speed-position switching control (ABS mode)* ¹ 0 to 359.99999 (degree) | | | |
| | Speed command | 0.01 to 20000000.00 (mm/min) 0.001 to 2000000.000 (inch/min) 0.001 to 2000000.000 (degree/min)* ² 1 to 1000000000 (pulse/s) | | | |
| | Acceleration/deceleration process | Trapezoidal acceleration/deceleration, S-curve acceleration/deceleration | | | |
| | Acceleration/deceleration time | 1 to 8388608 (ms) (Four patterns can be set for each of acceleration time and deceleration time.) | | | |
| | Sudden stop deceleration time | 1 to 8388608 (ms) | | | |

| Item | | | RD77MS2 | RD77MS4 | RD77MS8 | RD77MS16 |
|--|-------------------------------|------------------------------------|---|---------|---------|----------|
| Starting time ^{*3} | Operation cycle 0.444 ms | Maximum number of axes: 1 axis | 0.7 ms | | | |
| | | Maximum number of axes: 2 axes | 0.7 ms | | | |
| | | Maximum number of axes: 4 axes | 0.74 ms | | | |
| | Operation cycle 0.888 ms | Maximum number of axes: 4 axes | 1.1 ms | | | |
| | | Maximum number of axes: 8 axes | 1.32 ms | | | |
| | | Maximum number of axes: 12 axes | 1.46 ms | | | |
| | Operation cycle 1.777 ms | Maximum number of axes: 8 axes | 1.1 ms | | | |
| | | Maximum number of axes: 12 axes | 1.46 ms | | | |
| | | Maximum number of axes: 16 axes | 1.59 ms | | | |
| | Operation cycle 3.555 ms | Maximum number of axes: 8 axes | 0.92 ms | | | |
| | | Maximum number of axes: 12 axes | 1.12 ms | | | |
| | | Maximum number of axes: 16 axes | 1.52 ms | | | |
| External wiring connection system | | | 40-pin connector | | | |
| Applicable wire size ^{*4} | When A6CON1 or A6CON4 is used | | 0.088 to 0.3 mm ² (28 to 22 AWG) stranded wire | | | |
| | When A6CON2 is used | | 0.088 to 0.24 mm ² (28 to 24 AWG) stranded wire | | | |
| External input wiring connector | | | A6CON1, A6CON2, A6CON4 (sold separately) | | | |
| Manual pulse generator/ Incremental synchronous encoder input maximum frequency | | Differential-output type | Up to 1 Mpulses/s | | | |
| | | Open-collector type | Up to 200 kpulses/s | | | |
| Manual pulse generator 1 pulse input magnification | | | 1 to 10000 times | | | |
| Flash ROM write count | | | Max. 100000 times | | | |
| Number of occupied I/O points | | | 32 points (I/O assignment: Intelligent function module 32 points) | | | |
| Internal current consumption (5 V DC) | | | 1.0 A | | | |
| External dimensions | Height | | 106 mm (4.17 inch) | | | |
| | Width | | 27.8 mm (1.09 inch) | | | |
| | Depth | | 110 mm (4.33 inch) | | | |
| Mass | | | 0.22 kg | 0.23 kg | | |

*1 The speed-position switching control (ABS mode) can be used only when the control unit is "degree".

*2 When "Speed control 10 times multiplier setting for degree axis function" is valid, the setting range is 0.01 to 20000000.00 (degree/min).

*3 Time from accepting the positioning start signal until BUSY signal turns ON.

*4 Use cables with outside diameter of 1.3 mm (0.05 inch) or shorter to connect 40 cables to the connector. In addition, consider the amount of current to be used and select appropriate cables.

2.2 Specifications of Interfaces with External Devices

Electrical specifications of input signals

External input signal

■ Specifications of external input signal

| Item | | Specifications |
|----------------------------------|----------|--|
| Signal name | | Input signal (SIN) |
| Number of input points | | RD77MS2: 10 points, RD77MS4/RD77MS8/RD77MS16: 20 points |
| Input method | | Positive common/Negative common shared |
| Common terminal arrangement | | 4 points/common (Common contact: COM) |
| Isolation method | | Photocoupler |
| Rated input voltage | | 24 V DC |
| Rated input current (I_{IN}) | | Approx. 5 mA |
| Operating voltage range | | 19.2 to 26.4 V DC (24 V DC+10/-20%, ripple ratio 5% or less) |
| ON voltage/current | | 17.5 V DC or more/3.5 mA or more |
| OFF voltage/current | | 7 V DC or less/1 mA or less |
| Input resistance | | Approx. 6.8 k Ω |
| Response time | OFF → ON | 1 ms or less |
| | ON → OFF | |

Forced stop input

■ Specifications of forced stop input signal

| Item | | Specifications |
|----------------------------------|----------|--|
| Number of input points | | 1 point |
| Input method | | Positive common/Negative common shared |
| Common terminal arrangement | | 1 point/common (Common contact: EMI.COM) |
| Isolation method | | Photocoupler |
| Rated input voltage | | 24 V DC |
| Rated input current (I_{IN}) | | Approx. 5 mA |
| Operating voltage range | | 19.2 to 26.4 V DC (24 V DC+10/-20%, ripple ratio 5% or less) |
| ON voltage/current | | 17.5 V DC or more/3.5 mA or more |
| OFF voltage/current | | 7 V DC or less/1 mA or less |
| Input resistance | | Approx. 6.8 k Ω |
| Response time | OFF → ON | 4 ms or less |
| | ON → OFF | |

Manual pulse generator/Incremental synchronous encoder input

■ Specifications of manual pulse generator/incremental synchronous encoder

| Item | | Specifications |
|--|---------------------------------|--|
| Signal input form ^{*1} | | Phase A/Phase B (Magnification by 4/Magnification by 2/Magnification by 1), PULSE/SIGN |
| Differential-output type (26LS31 or equivalent) | Maximum input pulse frequency | 1 Mpulses/s (After magnification by 4, up to 4 Mpulses/s) ^{*2} |
| | Pulse width | 1 μ s or more |
| | Leading edge/trailing edge time | 0.25 μ s or less |
| | Phase difference | 0.25 μ s or more |
| | Rated input voltage | 5.5 V DC or less |
| | High-voltage | 2.0 to 5.25 V DC |
| | Low-voltage | 0 to 0.8 V DC |
| | Differential voltage | ± 0.2 V |
| | Cable length | Up to 30 m (98.43 ft.) |
| | Example of waveform | <p>(Note): Duty ratio 50%</p> |
| Voltage-output type/Open-collector type (5 V DC) | Maximum input pulse frequency | 200 kpulses/s (After magnification by 4, up to 800 kpulses/s) ^{*2} |
| | Pulse width | 5 μ s or more |
| | Leading edge/trailing edge time | 1.2 μ s or less |
| | Phase difference | 1.2 μ s or more |
| | Rated input voltage | 5.5 V DC or less |
| | High-voltage | 3.0 to 5.25 V DC/2 mA or less |
| | Low-voltage | 0 to 1.0 V DC/5 mA or more |
| | Cable length | Up to 10 m (32.81 ft.) |
| | Example of waveform | <p>(Note): Duty ratio 50%</p> |

^{*1} Set the signal input form in "[Pr.24] Manual pulse generator/Incremental synchronous encoder input selection".

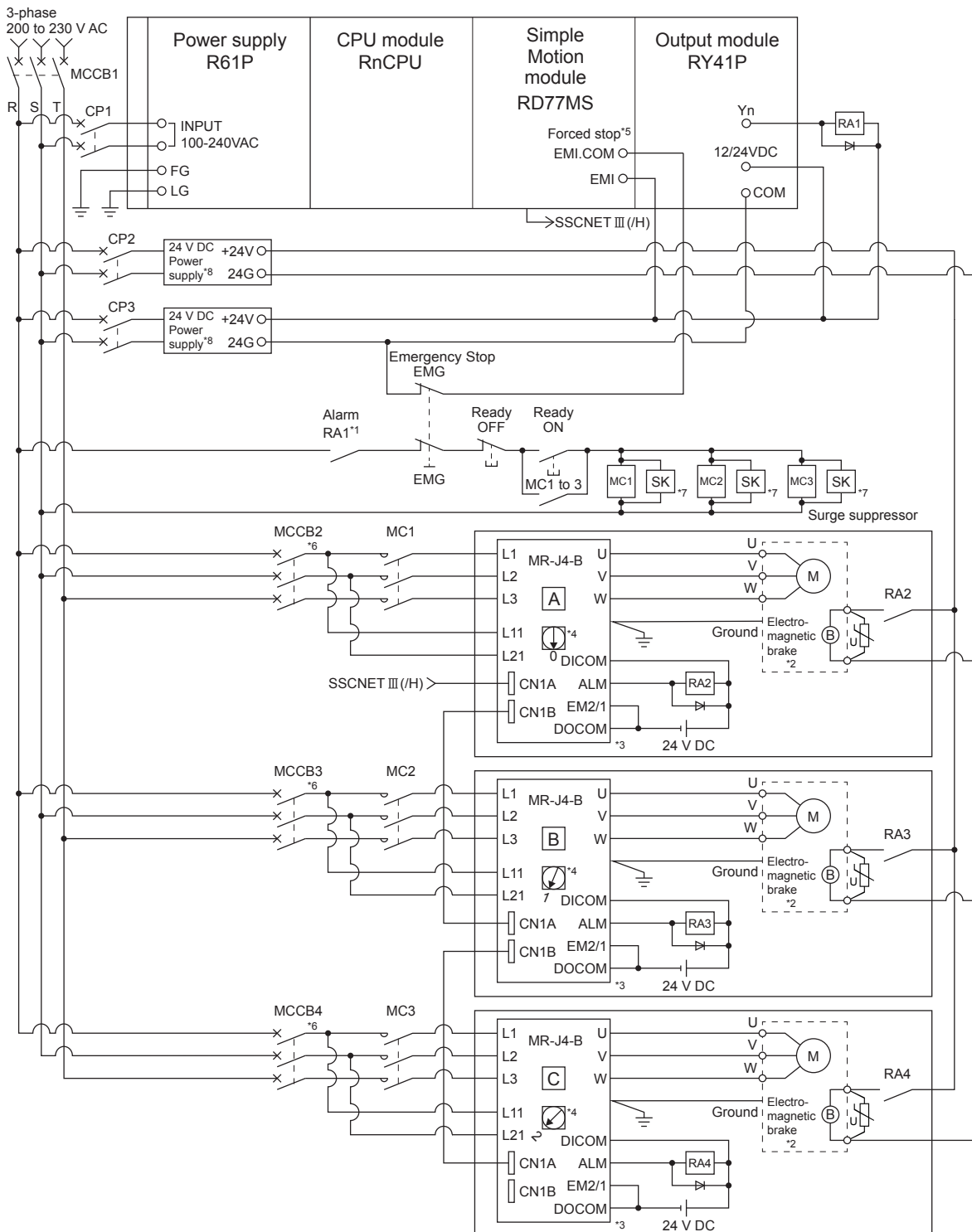
| [Pr.24] Manual pulse generator/Incremental synchronous encoder input selection | [Pr.151] Manual pulse generator/Incremental synchronous encoder input logic selection | |
|--|---|--|
| | Positive logic | Negative logic |
| Phase A/Phase B | <p>Forward run Reverse run</p> | <p>Forward run Reverse run</p> |
| PULSE/SIGN | <p>Forward run Reverse run</p> <p>HIGH LOW</p> | <p>Forward run Reverse run</p> <p>LOW HIGH</p> |

^{*2} Maximum input pulse frequency is magnified by 4, when "A-phase/B-phase Magnification by 4" is set in "[Pr.24] Manual pulse generator/Incremental synchronous encoder input selection".

2.3 External Circuit Design

Configure up the power supply circuit and main circuit which turn off the power supply after detection alarm occurrence and servo forced stop. When designing the main circuit of the power supply, make sure to use a circuit breaker (MCCB). The outline diagrams for the external device connection interface are shown below.

Example when using the forced stop of the Simple Motion module (For MR-J4-B)



- *1 Configure up the power supply circuit which switches off the electromagnetic contactor (MC) after detecting the alarm occurrence on the CPU module.
- *2 It is also possible to use a full wave rectified power supply as the power supply for the electromagnetic brake.
- *3 It is also possible to perform the forced stop using a forced stop terminal of the servo amplifier.
- *4 Set the axis selection rotary switch of servo amplifier as follows to set the axis No. of servo amplifier.

| Axis No. | Setting value | Axis No. | Setting value | Axis No. | Setting value | Axis No. | Setting value |
|----------|---------------|----------|---------------|----------|---------------|----------|---------------|
| Axis 1 | 0 | Axis 5 | 4 | Axis 9 | 8 | Axis 13 | C |
| Axis 2 | 1 | Axis 6 | 5 | Axis 10 | 9 | Axis 14 | D |
| Axis 3 | 2 | Axis 7 | 6 | Axis 11 | A | Axis 15 | E |
| Axis 4 | 3 | Axis 8 | 7 | Axis 12 | B | Axis 16 | F |

- *5 The status of forced stop input signal can be confirmed with "[Md.50] Forced stop input". Be sure that the forced stop 24 V DC power supply is not used with the electromagnetic brake of the motor or the electromagnetic valve power supply.
- *6 Refer to the servo amplifier instruction manual for selection of the circuit breaker and electromagnetic contactor.
- *7 The surge suppressor is recommended to be used for an AC relay or electromagnetic contactor (MC) near the servo amplifier. Refer to the servo amplifier instruction manual for selection of the surge suppressor.
- *8 Wire the electromagnetic brake power supply and the control power supply using a separate power supply.

Precautions

- Be sure to shut off the both of main circuit power supply L1/L2/L3 and control power supply L11/L21 after disconnection of SSCNET communication by the connect/disconnect function of SSCNET communication at the time of exchange of servo amplifier. At this time, it is not possible to communicate between the servo amplifier and Simple Motion module. Therefore, be sure to exchange the servo amplifier after stopping the operating of machine beforehand.
- If the emergency stop signal of Simple Motion module turns OFF when setting of "[Pr.82] Forced stop valid/invalid selection" to "0: Valid", servomotor is stopped with dynamic brake. (The LED display of servo amplifier indicates "E7.1" (Controller forced stop input warning).)
- When the control power supply of servo amplifier is shut off, it is not possible to communicate with the servo amplifier after that.

Ex.

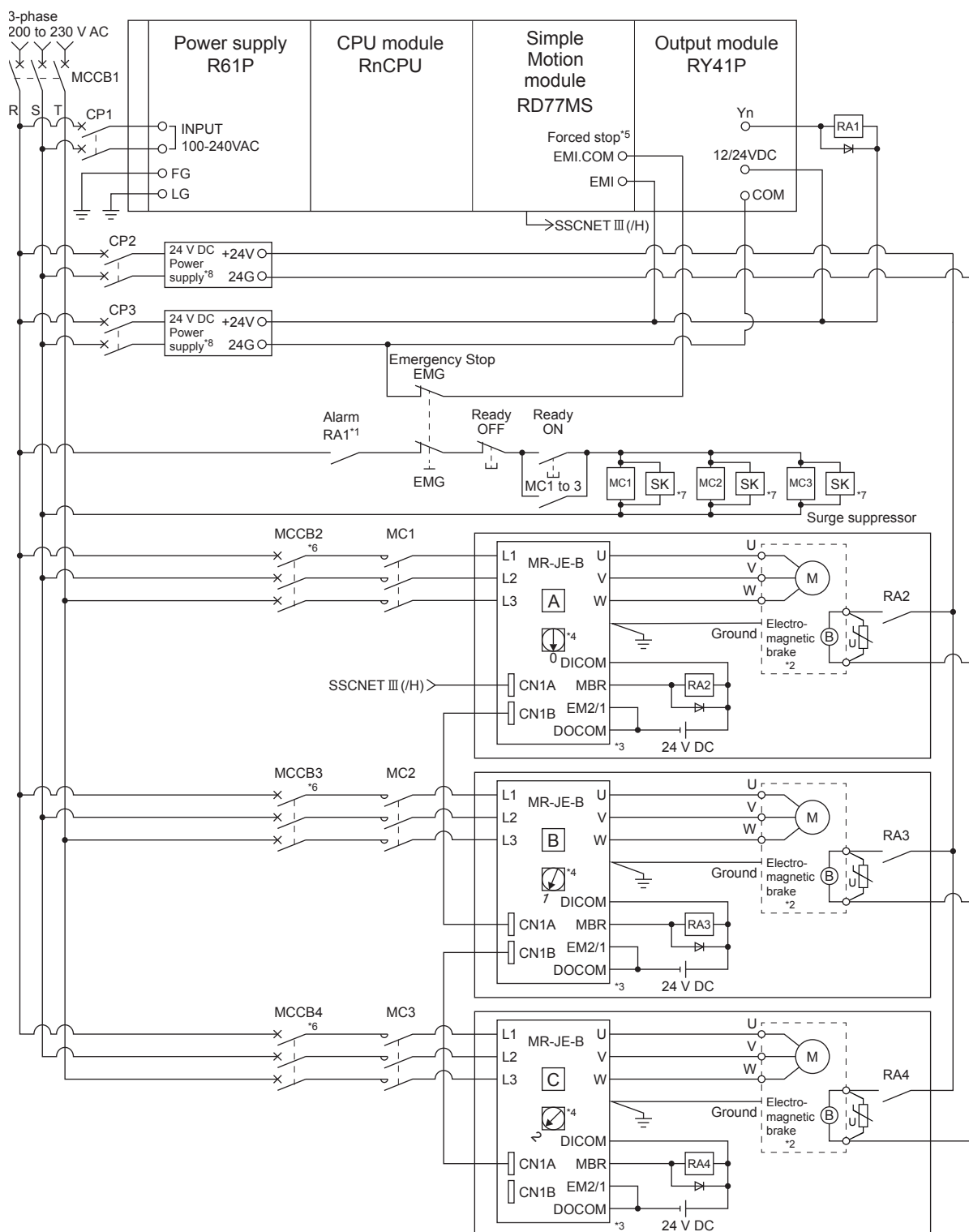
When the control power supply L11/L21 of the servo amplifier B in the figure is shut off, it is also not possible to communicate with the servo amplifier C.

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

Example when using the forced stop of the Simple Motion module (For MR-JE-B)



- The hot line forced stop function is enabled at the MR-JE-B factory-set. (Only MR-JE-B)
- This function is used to execute deceleration stop for all axes by outputting the hot line forced stop signal to all axes and generating "E7.1" (Controller forced stop input warning) at the alarm occurrence.
- This function can be disabled by the servo parameter (PA27).
- For using the MR-JE-B, configure up the power supply circuit which switches off the all axes electromagnetic contactor (MC) from the CPU module after detecting the alarm occurrence on the CPU module.



- *1 Configure up the power supply circuit which switches off the electromagnetic contactor (MC) after detecting the alarm occurrence on the CPU module.
- *2 It is also possible to use a full wave rectified power supply as the power supply for the electromagnetic brake.
- *3 It is also possible to perform the forced stop using a forced stop terminal of the servo amplifier.
- *4 Set the axis selection rotary switch of servo amplifier as follows to set the axis No. of servo amplifier.

| Axis No. | Setting value | Axis No. | Setting value | Axis No. | Setting value | Axis No. | Setting value |
|----------|---------------|----------|---------------|----------|---------------|----------|---------------|
| Axis 1 | 0 | Axis 5 | 4 | Axis 9 | 8 | Axis 13 | C |
| Axis 2 | 1 | Axis 6 | 5 | Axis 10 | 9 | Axis 14 | D |
| Axis 3 | 2 | Axis 7 | 6 | Axis 11 | A | Axis 15 | E |
| Axis 4 | 3 | Axis 8 | 7 | Axis 12 | B | Axis 16 | F |

- *5 The status of forced stop input signal can be confirmed with "[Md.50] Forced stop input". Be sure that the forced stop 24 V DC power supply is not used with the electromagnetic brake of the motor or the electromagnetic valve power supply.
- *6 Refer to the servo amplifier instruction manual for selection of the circuit breaker and electromagnetic contactor.
- *7 The surge suppressor is recommended to be used for an AC relay or electromagnetic contactor (MC) near the servo amplifier. Refer to the servo amplifier instruction manual for selection of the surge suppressor.
- *8 Wire the electromagnetic brake power supply and the control power supply using a separate power supply.

Precautions

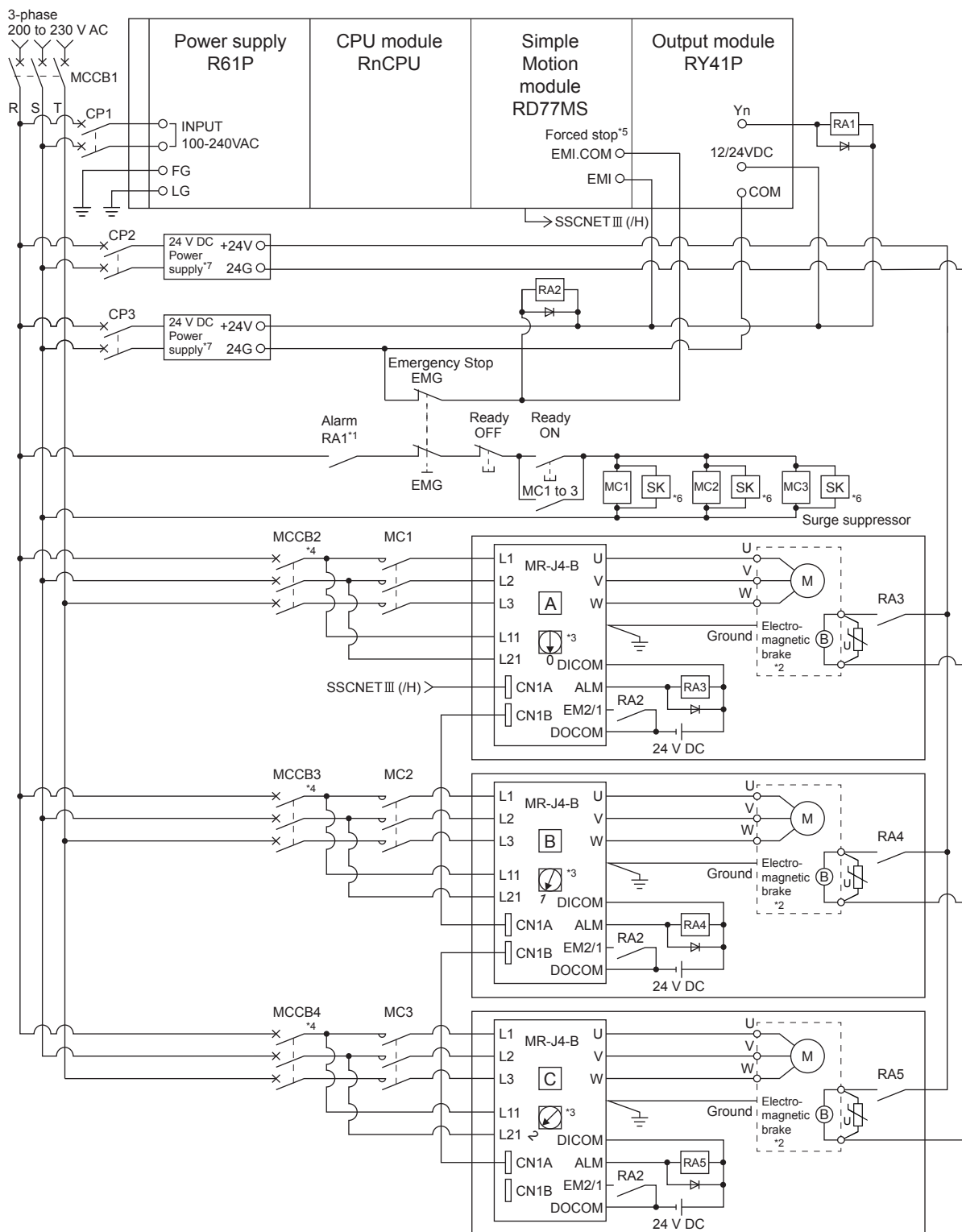
- Be sure to shut off the both of main circuit power supply L1/L2/L3 and control power supply L11/L21 after disconnection of SSCNET communication by the connect/disconnect function of SSCNET communication at the time of exchange of servo amplifier. At this time, it is not possible to communicate between the servo amplifier and Simple Motion module. Therefore, be sure to exchange the servo amplifier after stopping the operating of machine beforehand.
- If the emergency stop signal of Simple Motion module turns OFF when setting of "[Pr.82] Forced stop valid/invalid selection" to "0: Valid", servomotor is stopped with dynamic brake. (The LED display of servo amplifier indicates "E7.1" (Controller forced stop input warning).)
- When the control power supply of servo amplifier is shut off, it is not possible to communicate with the servo amplifier after that.

Ex.

When the control power supply L11/L21 of the servo amplifier B in the figure is shut off, it is also not possible to communicate with the servo amplifier C.

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

Example when using the forced stop of the Simple Motion module and MR-J4-B



- *1 Configure up the power supply circuit which switches off the electromagnetic contactor (MC) after detecting the alarm occurrence on the CPU module.
- *2 It is also possible to use a full wave rectified power supply as the power supply for the electromagnetic brake.
- *3 Set the axis selection rotary switch of servo amplifier as follows to set the axis No. of servo amplifier.

| Axis No. | Setting value | Axis No. | Setting value | Axis No. | Setting value | Axis No. | Setting value |
|----------|---------------|----------|---------------|----------|---------------|----------|---------------|
| Axis 1 | 0 | Axis 5 | 4 | Axis 9 | 8 | Axis 13 | C |
| Axis 2 | 1 | Axis 6 | 5 | Axis 10 | 9 | Axis 14 | D |
| Axis 3 | 2 | Axis 7 | 6 | Axis 11 | A | Axis 15 | E |
| Axis 4 | 3 | Axis 8 | 7 | Axis 12 | B | Axis 16 | F |

- *4 Refer to the servo amplifier instruction manual for selection of the circuit breaker and electromagnetic contactor.
- *5 The status of forced stop input signal can be confirmed with "[Md.50] Forced stop input". Be sure that the forced stop 24 V DC power supply is not used with the electromagnetic brake of the motor or the electromagnetic valve power supply.
- *6 The surge suppressor is recommended to be used for an AC relay or electromagnetic contactor (MC) near the servo amplifier. Refer to the servo amplifier instruction manual for selection of the surge suppressor.
- *7 Wire the electromagnetic brake power supply and the control power supply using a separate power supply.

Precautions

- Be sure to shut off the both of main circuit power supply L1/L2/L3 and control power supply L11/L21 after disconnection of SSCNET communication by the connect/disconnect function of SSCNET communication at the time of exchange of servo amplifier. At this time, it is not possible to communicate between the servo amplifier and Simple Motion module. Therefore, be sure to exchange the servo amplifier after stopping the operating of machine beforehand.
- The dynamic brake operates and servomotor occurs to the free run when EM1 (forced stop) of the servo amplifier is turned OFF. At the time, the display shows "E6.1" (Forced stop warning). During ordinary operation, do not use EM1 (forced stop) of the servo amplifier to alternate stop and run. The service life of the servo amplifier may be shortened.
- When the control power supply of servo amplifier is shut off, it is not possible to communicate with the servo amplifier after that.

Ex.

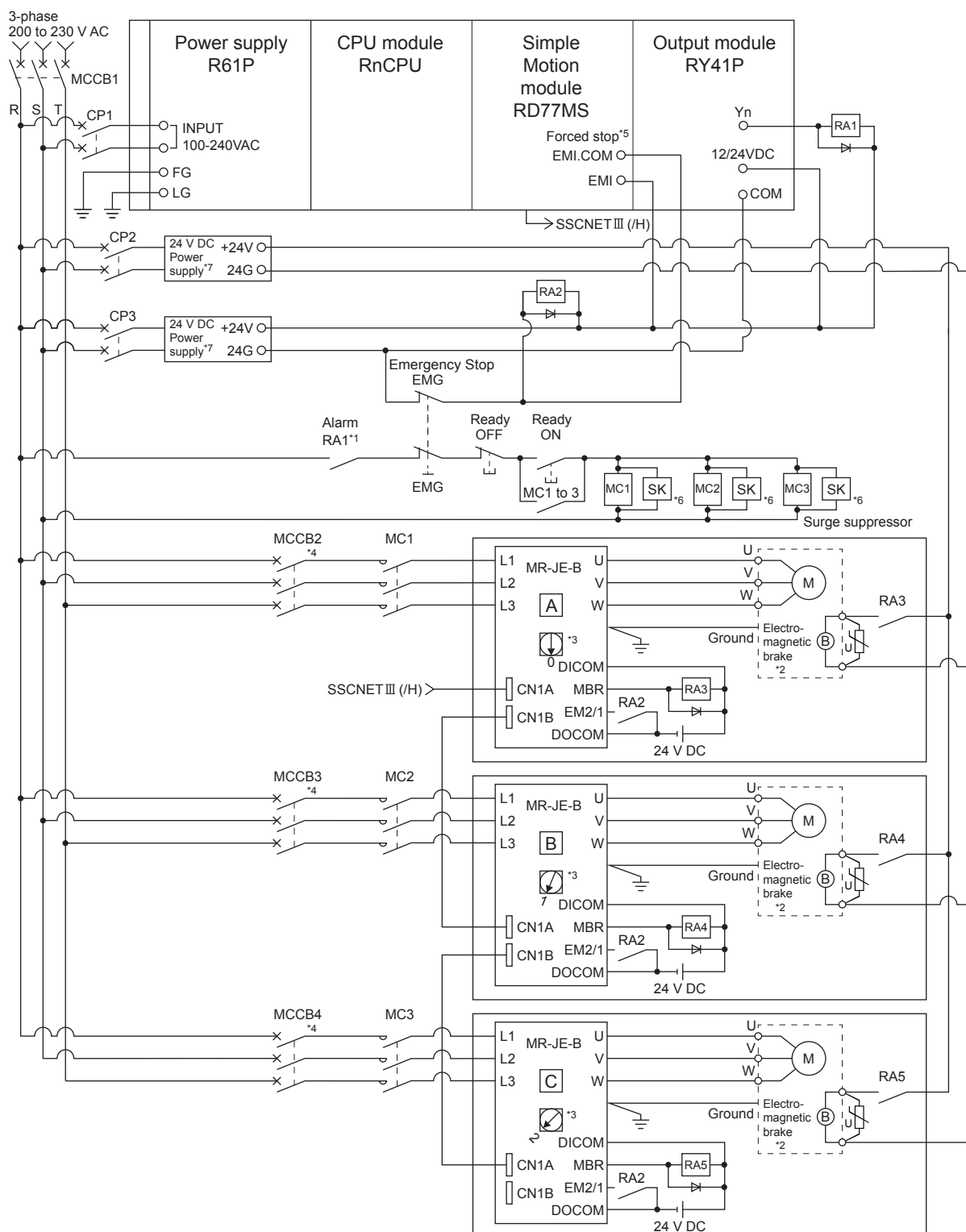
When the control power supply L11/L21 of the servo amplifier B in the figure is shut off, it is also not possible to communicate with the servo amplifier C.

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

Example when using the forced stop of the Simple Motion module and MR-JE-B



- The hot line forced stop function is enabled at the MR-JE-B factory-set. (Only MR-JE-B)
- This function is used to execute deceleration stop for all axes by outputting the hot line forced stop signal to all axes and generating "E7.1" (Controller forced stop input warning) at the alarm occurrence.
- This function can be disabled by the servo parameter (PA27).
- For using the MR-JE-B, configure up the power supply circuit which switches off the all axes electromagnetic contactor (MC) from the CPU module after detecting the alarm occurrence on the CPU module.



- *1 Configure up the power supply circuit which switches off the electromagnetic contactor (MC) after detecting the alarm occurrence on the CPU module.
- *2 It is also possible to use a full wave rectified power supply as the power supply for the electromagnetic brake.
- *3 Set the axis selection rotary switch of servo amplifier as follows to set the axis No. of servo amplifier.

| Axis No. | Setting value | Axis No. | Setting value | Axis No. | Setting value | Axis No. | Setting value |
|----------|---------------|----------|---------------|----------|---------------|----------|---------------|
| Axis 1 | 0 | Axis 5 | 4 | Axis 9 | 8 | Axis 13 | C |
| Axis 2 | 1 | Axis 6 | 5 | Axis 10 | 9 | Axis 14 | D |
| Axis 3 | 2 | Axis 7 | 6 | Axis 11 | A | Axis 15 | E |
| Axis 4 | 3 | Axis 8 | 7 | Axis 12 | B | Axis 16 | F |

- *4 Refer to the servo amplifier instruction manual for selection of the circuit breaker and electromagnetic contactor.
- *5 The status of forced stop input signal can be confirmed with "[Md.50] Forced stop input". Be sure that the forced stop 24 V DC power supply is not used with the electromagnetic brake of the motor or the electromagnetic valve power supply.
- *6 The surge suppressor is recommended to be used for an AC relay or electromagnetic contactor (MC) near the servo amplifier. Refer to the servo amplifier instruction manual for selection of the surge suppressor.
- *7 Wire the electromagnetic brake power supply and the control power supply using a separate power supply.

Precautions

- Be sure to shut off the both of main circuit power supply L1/L2/L3 and control power supply L11/L21 after disconnection of SSCNET communication by the connect/disconnect function of SSCNET communication at the time of exchange of servo amplifier. At this time, it is not possible to communicate between the servo amplifier and Simple Motion module. Therefore, be sure to exchange the servo amplifier after stopping the operating of machine beforehand.
- The dynamic brake operates and servomotor occurs to the free run when EM1 (forced stop) of the servo amplifier is turned OFF. At the time, the display shows "E6.1" (Forced stop warning). During ordinary operation, do not use EM1 (forced stop) of the servo amplifier to alternate stop and run. The service life of the servo amplifier may be shortened.
- When the control power supply of servo amplifier is shut off, it is not possible to communicate with the servo amplifier after that.

Ex.

When the control power supply L11/L21 of the servo amplifier B in the figure is shut off, it is also not possible to communicate with the servo amplifier C.

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

3 FUNCTION LIST

3.1 Control Functions

The Simple Motion module has several functions. Refer to the following for details on each function.

📖 MELSEC iQ-R Simple Motion Module User's Manual (Application)

In this manual, the Simple Motion module functions are categorized and explained as follows.

Main functions

■Home position return control

"Home position return control" is a function (Fast home position return) that established the start point for carrying out positioning control (Machine home position return), and carries out positioning toward that start point. This is used to return a workpiece, located at a position other than the home position when the power is turned ON or after positioning stop, to the home position. The "home position return control" is pre-registered in the Simple Motion module as the "Positioning start data No. 9001 (Machine home position return)", and "Positioning start data No. 9002 (Fast home position return)".

■Major positioning control

This control is carried out using the "Positioning data" stored in the Simple Motion module. Positioning control, such as position control and speed control, is executed by setting the required items in this "positioning data" and starting that positioning data. An "operation pattern" can be set in this "positioning data", and with this whether to carry out control with continuous positioning data (ex.: positioning data No. 1, No. 2, No. 3, etc.) can be set.

■High-level positioning control

This control executes the "positioning data" stored in the Simple Motion module using the "block start data". The following types of applied positioning control can be carried out.

- Random blocks, handling several continuing positioning data items as "blocks", can be executed in the designated order.
- "Condition judgment" can be added to position control and speed control.
- The operation of the positioning data that is set for multiple axes can be started simultaneously. (Command is output simultaneously to multiple servo amplifiers.)
- The designated positioning data can be executed repeatedly, etc.

■Manual control

The Simple Motion module executes the random positioning operation by inputting a signal into the Simple Motion module from an external device.

Use this manual control to move the workpiece to a random position (JOG operation), and to finely adjust the positioning (inching operation, manual pulse generator operation), etc.

■Expansion control

The following controls other than the positioning control can be executed.

- Speed control and torque control not including position loop for the command to servo amplifier (Speed-torque control).
- Synchronous control with gear, shaft, change gear and cam not by mechanical, but by software use "synchronous control parameter", and is synchronized with input axis (Synchronous control).

Sub functions

When the main functions are executed, this function compensates and limits controls, or adds functions.

Common functions

Common control using the Simple Motion module for "Parameter initialization function" or "Execution data backup function" can be carried out.

3.2 Main Functions

The outline of the main functions for positioning control with the Simple Motion module is described below.

| Main functions | | Details |
|--------------------------------|--------------------------------------|--|
| Home position return control | Machine home position return control | Mechanically establishes the positioning start point using a near-point dog, etc. In the data setting method, no axis movement occurs since the current position is set as the home position. (Positioning start No. 9001) |
| | Fast home position return control | Positions a target to the home position address ([Md.21] Machine feed value) stored in the Simple Motion module using machine home position return. (Positioning start No. 9002) |
| Major positioning control | Position control | Linear control (1-axis linear control) (2-axis linear interpolation control) (3-axis linear interpolation control) (4-axis linear interpolation control) |
| | | Fixed-feed control (1-axis fixed-feed control) (2-axis fixed-feed control) (3-axis fixed-feed control) (4-axis fixed-feed control) |
| | | 2-axis circular interpolation control |
| | | 3-axis helical interpolation control |
| | Speed control | Speed control (1-axis speed control) (2-axis speed control) (3-axis speed control) (4-axis speed control) |
| | | Speed-position switching control |
| | Position-speed switching control | |
| | Other control | Current value changing |
| | | NOP instruction |
| | | JUMP instruction |
| | | LOOP |
| | | LEND |
| High-level positioning control | Block start (Normal start) | |
| | Condition start | |
| | Wait start | |
| | Simultaneous start | |
| | Repeated start (FOR loop) | |
| | Repeated start (FOR condition) | |

| Main functions | | Details |
|---------------------------------------|----------------------------------|--|
| Manual control | JOG operation | Outputs a command to servo amplifier while the JOG start signal is ON. |
| | Inching operation | Outputs commands corresponding to minute movement amount by manual operation to servo amplifier. (Performs fine adjustment with the JOG start signal.) |
| | Manual pulse generator operation | Outputs pulses commanded with the manual pulse generator to servo amplifier. |
| Inter-module synchronization function | | This function can synchronize the control timings among multiple modules on the same base. |
| Expansion control | Speed-torque control | Carries out the speed control or torque control that does not include the position loop for the command to servo amplifier by switching control mode. |
| | Synchronous control | Carries out the synchronous control that synchronizes with input axis by setting the system such as gear, shaft, change gear and cam to the "synchronous control parameter". |

In "major positioning control" ("high-level positioning control"), "Operation pattern" can be set to designate whether to continue executing positioning data. Outlines of the "operation patterns" are given below.

| [Da.1] Operation pattern | Details |
|--|---|
| Independent positioning control (positioning complete) | When "independent positioning control" is set for the operation pattern of the started positioning data, only the designated positioning data will be executed, and then the positioning will end. |
| Continuous positioning control | When "continuous positioning control" is set for the operation pattern of the started positioning data, after the designated positioning data is executed, the program will stop once, and then the next following positioning data will be executed. |
| Continuous path control | When "continuous path control" is set for the operation pattern of the started positioning data, the designated positioning data will be executed, and then without decelerating, the next following positioning data will be executed. |

3.3 Sub Functions and Common Functions

Sub functions

The outline of the functions that assist positioning control using the Simple Motion module is described below.


| Sub function | | Details |
|--|--|---|
| Functions characteristic to machine home position return | Home position return retry function | This function retries the home position return with the upper/lower limit switches during the machine home position return. This allows machine home position return to be carried out even if the axis is not returned to before the near-point dog with JOG operation, etc. |
| | Home position shift function | After returning to the machine home position, this function compensates the position by the designated distance from the machine home position and sets that position as the home position address. |
| Functions that compensate control | Backlash compensation function | This function compensates the mechanical backlash amount. Feed commands equivalent to the set backlash amount are output each time the movement direction changes. |
| | Electronic gear function | By setting the movement amount per pulse, this function can freely change the machine movement amount per commanded pulse. When the movement amount per pulse is set, a flexible positioning system that matches the machine system can be structured. |
| | Near pass function ^{*1} | This function suppresses the machine vibration when the speed is changed during continuous path control in the interpolation control. |
| Functions that limit control | Speed limit function | If the command speed exceeds "[Pr.8] Speed limit value" during control, this function limits the commanded speed to within the "[Pr.8] Speed limit value" setting range. |
| | Torque limit function | If the torque generated by the servomotor exceeds "[Pr.17] Torque limit setting value" during control, this function limits the generated torque to within the "[Pr.17] Torque limit setting value" setting range. |
| | Software stroke limit function | If a command outside of the upper/lower limit stroke limit setting range, set in the parameters, is issued, this function will not execute positioning for that command. |
| | Hardware stroke limit function | This function carries out deceleration stop with the hardware stroke limit switch. |
| | Forced stop function | This function stops all axes of the servo amplifier with the forced stop input signal connected to the external input connection connector on the Simple Motion module. |
| Functions that change control details | Speed change function | This function changes the speed during positioning. Set the new speed in the speed change buffer memory ([Cd.14] New speed value), and change the speed with the speed change request ([Cd.15]). |
| | Override function | This function changes the speed within a percentage of 0 to 300% during positioning. This is executed using "[Cd.13] Positioning operation speed override". |
| | Acceleration/deceleration time change function | This function changes the acceleration/deceleration time during speed change. |
| | Torque change function | This function changes the "torque limit value" during control. |
| | Target position change function | This function changes the target position during positioning. Position and speed can be changed simultaneously. |
| Functions related to positioning start | Pre-reading start function | This function shortens the virtual start time. |
| Absolute position system | | This function restores the absolute position of designated axis. |
| Functions related to positioning stop | Stop command processing for deceleration stop function | Function that selects a deceleration curve when a stop cause occurs during deceleration stop processing to speed 0. |
| | Continuous operation interrupt function | This function interrupts continuous operation. When this request is accepted, the operation stops when the execution of the current positioning data is completed. |
| | Step function | This function temporarily stops the operation to confirm the positioning operation during debugging, etc. The operation can be stopped at each "automatic deceleration" or "positioning data". |

| Sub function | | Details |
|-----------------|---|--|
| Other functions | Skip function | This function stops (decelerates to a stop) the positioning being executed when the skip signal is input, and carries out the next positioning. |
| | M code output function | This function issues a command for a sub work (clamp or drill stop, tool change, etc.) corresponding to the M code No. (0 to 65535) that can be set for each positioning data. The M code output timing can be set for each positioning data. |
| | Teaching function | This function stores the address positioned with manual control into the "[Da.6] Positioning address/movement amount" having the designated positioning data No. ([Cd.39]). |
| | Command in-position function | This function calculates the remaining distance for the Simple Motion module to reach the positioning stop position. When the value is less than the set value, the "command in-position flag" is set to "1". When using another auxiliary work before ending the control, use this function as a trigger for the sub work. |
| | Acceleration/deceleration processing function | This function adjusts the acceleration/deceleration. |
| | Deceleration start flag function | Function that turns ON the flag when the constant speed status or acceleration status switches to the deceleration status during position control, whose operation pattern is "Positioning complete", to make the stop timing known. |
| | Follow up function | This function monitors the motor rotation amount with the servo turned OFF, and reflects it on the current feed value. |
| | Speed control 10 times multiplier setting for degree axis function | This function executes the positioning control by the 10 times speed of the command speed and the speed limit value when the setting unit is "degree". |
| | Operation setting for incompletion of home position return function | This function is provided to select whether positioning control is operated or not, when the home position return request flag is ON. |

*1 The near pass function is featured as standard and is valid only for position control. It cannot be set to be invalid with parameters.

Common functions

The outline of the functions executed as necessary is described below.

| Common functions | Details |
|---|---|
| Parameter initialization function | This function returns the setting data stored in the buffer memory/internal memory and flash ROM/internal memory (nonvolatile) of Simple Motion module to the default values. The following two methods can be used. <ul style="list-style-type: none"> • Method using a program • Method using an engineering tool |
| Execution data backup function | This function writes the execution data being used in the control into the flash ROM/internal memory (nonvolatile). The following two methods can be used. <ul style="list-style-type: none"> • Method using a program • Method using an engineering tool |
| External input signal select function | This function sets the input type, input terminal, signal logic and input filter for each external input signal of each axis (upper/lower stroke limit signal (FLS/RLS), near-point dog signal (DOG), and stop signal (STOP)). The function enables the assignment of external input signal of each axis to any terminals of 20 points of the external input connection connector on the Simple Motion module. |
| History monitor function | This function monitors start history and current value history of all axes. |
| Amplifier-less operation function | This function executes the positioning control of Simple Motion module without connecting to the servo amplifiers. It is used to debug the program at the start-up of the device or simulate the positioning operation. |
| Virtual servo amplifier function | This function executes the operation as the axis (virtual servo amplifier axis) that operates only command (instruction) virtually without servo amplifiers. |
| Driver communication function | This function uses the "Master-slave operation function" of servo amplifier. The Simple Motion module controls the master axis and the slave axis is controlled by data communication between servo amplifiers (driver communication) without Simple Motion module. |
| Mark detection function | This function is used to latch any data at the input timing of the mark detection signal (DI). |
| Optional data monitor function | This function is used to store the data selected by user up to 4 data per axis to buffer memory and monitor them. |
| Event history function | This function collects errors and event information occurred in the Simple Motion module in the CPU module, and saves them to an SD memory card. This function enables to check the error history even after the power OFF or reset by holding the error contents in the CPU module. |
| Connect/disconnect function of SSCNET communication | Temporarily connect/disconnect of SSCNET communication is executed during system's power supply ON. This function is used to exchange the servo amplifiers or SSCNET III cables. |
| Online module change | Allows to replace a module without stopping the system. For procedures for the online module change, refer to the following.  MELSEC iQ-R Online Module Change Manual |
| Hot line forced stop function | This function is used to execute deceleration stop safety for other axes when the servo alarm occurs in the servo amplifier MR-JE-B. |

3.4 Combination of Main Functions and Sub Functions

With positioning control using the Simple Motion module, the main functions and sub functions can be combined and used as necessary. A list of the main function and sub function combinations is given below.

Combination of main functions and operation patterns

○: Combination possible

△: Combination limited

×: Combination not possible

| Main functions | | | Combination with operation pattern*1 | |
|----------------------------------|--------------------------------------|--|---|---|
| Home position return control | Machine home position return control | | × | |
| | Fast home position return control | | × | |
| Major positioning control | Position control | 1-axis linear control | ○ | |
| | | 2-, 3-, or 4-axis linear interpolation control | | ○ |
| | | 1-axis fixed-feed control | | △ (Continuous path control cannot be set) |
| | | 2-, 3-, or 4-axis fixed-feed control (interpolation) | | △ (Continuous path control cannot be set) |
| | | 2-axis circular interpolation control | | ○ |
| | | 3-axis helical interpolation control | | ○ |
| | Speed control (1- to 4-axis) | | △ (Only independent positioning control can be set) | |
| | Speed-position switching control | | △ (Continuous path control cannot be set) | |
| | Position-speed switching control | | △ (Only independent positioning control can be set) | |
| | Other control | Current value changing | △ (Continuous path control cannot be set) | |
| | | NOP instruction | × | |
| | | JUMP instruction | × | |
| | | LOOP to LEND | | |
| | Manual control | JOG operation, inching operation | | × |
| Manual pulse generator operation | | × | | |
| Expansion control | Speed-torque control | | × | |

*1 The operation pattern is one of the "positioning data" setting items.

Combination of main functions and sub functions

○: Combination possible

△: Combination limited

×: Combination not possible

| Main functions | | | Functions characteristic to machine home position return | | Functions that compensate control | | |
|------------------------------|--------------------------------------|--|--|------------------------------|-----------------------------------|--------------------------|--------------------|
| | | | Home position return retry function | Home position shift function | Backlash compensation function | Electronic gear function | Near pass function |
| Home position return control | Machine home position return control | | △*1 | ○ | ○ | ○ | *2 |
| | Fast home position return control | | × | × | ○ | ○ | |
| Major positioning control | Position control | 1-axis linear control | × | × | ○ | ○ | |
| | | 2-, 3-, or 4-axis linear interpolation control | × | × | ○ | ○ | |
| | | 1-axis fixed-feed control | × | × | ○ | ○ | |
| | | 2-, 3-, or 4-axis fixed-feed control (interpolation) | × | × | ○ | ○ | |
| | | 2-axis circular interpolation control | × | × | ○ | ○ | |
| | | 3-axis helical interpolation control | × | × | ○ | ○ | |
| | Speed control (1- to 4-axis) | | × | × | ○ | ○ | |
| | Speed-position switching control | | × | × | ○ | ○ | |
| | Position-speed switching control | | | | | | |
| | Other control | Current value changing | × | × | × | × | |
| | | NOP instruction | | | | | |
| | | JUMP instruction | × | × | × | × | |
| | | LOOP to LEND | | | | | |
| Manual control | JOG operation, inching operation | | × | × | ○ | ○ | × |
| | Manual pulse generator operation | | × | × | ○ | ○ | × |
| Expansion control | Speed-torque control | | × | × | × | ○ | × |

*1 Home position return retry function cannot be used during the scale origin signal detection method machine home position return.

*2 The near pass function is featured as standard and is valid only for setting continuous path control for position control.

- ◎: Always combine
 ○: Combination possible
 ×: Combination not possible

| Main functions | | | Functions that limit control | | | | |
|------------------------------|--------------------------------------|--|------------------------------|-----------------------|--------------------------------|--------------------------------|----------------------|
| | | | Speed limit function | Torque limit function | Software stroke limit function | Hardware stroke limit function | Forced stop function |
| Home position return control | Machine home position return control | | ○ | ○ | × | ◎ | ○ |
| | Fast home position return control | | ○ | ○ | × | ◎ | ○ |
| Major positioning control | Position control | 1-axis linear control | ○ | ○ | ○ | ◎ | ○ |
| | | 2-, 3-, or 4-axis linear interpolation control | ○ | ○ | ○ | ◎ | ○ |
| | | 1-axis fixed-feed control | ○ | ○ | ○ | ◎ | ○ |
| | | 2-, 3-, or 4-axis fixed-feed control (interpolation) | ○ | ○ | ○ | ◎ | ○ |
| | | 2-axis circular interpolation control | ○ | ○ | ○ | ◎ | ○ |
| | | 3-axis helical interpolation control | ○ | ○ | ○ | ◎ | ○ |
| | Speed control (1- to 4-axis) | | ○ | ○ | ○ | ◎ | ○ |
| | Speed-position switching control | | ○ | ○ | ○ | ◎ | ○ |
| | Position-speed switching control | | | | | | |
| | Other control | Current value changing | × | × | ○ | ◎ | ○ |
| | | NOP instruction | | | × | × | |
| | | JUMP instruction | × | × | × | × | ○ |
| | | LOOP to LEND | | | | | |
| Manual control | JOG operation, inching operation | | ○ | ○ | ○ | ◎ | ○ |
| | Manual pulse generator operation | | × | ○ | ○ | ◎ | ○ |
| Expansion control | Speed-torque control | | ○ | ○ | ○ | ◎ | ○ |

○: Combination possible
△: Combination limited
×: Combination not possible

| Main functions | | | Functions that change control details | | | | |
|------------------------------|--------------------------------------|--|---------------------------------------|-------------------|---|------------------------|---------------------------------|
| | | | Speed change function | Override function | Acceleration/ deceleration time change function | Torque change function | Target position change function |
| Home position return control | Machine home position return control | | △ ^{*1} | △ ^{*1} | △ ^{*1} | ○ | × |
| | Fast home position return control | | ○ | ○ | ○ | ○ | × |
| Major positioning control | Position control | 1-axis linear control | ○ | ○ | ○ | ○ | △ ^{*2} |
| | | 2-, 3-, or 4-axis linear interpolation control | ○ | ○ | ○ | ○ | × |
| | | 1-axis fixed-feed control | ○ | ○ | ○ | ○ | × |
| | | 2-, 3-, or 4-axis fixed-feed control (interpolation) | ○ | ○ | ○ | ○ | × |
| | | 2-axis circular interpolation control | ○ | ○ | ○ | ○ | × |
| | | 3-axis helical interpolation control | ○ | ○ | ○ | ○ | × |
| | Speed control (1- to 4-axis) | | ○ | ○ | ○ | ○ | × |
| | Speed-position switching control | | ○ | ○ | ○ | ○ | × |
| | Position-speed switching control | | | | | | |
| | Other control | Current value changing | × | × | × | × | × |
| | | NOP instruction | | | | | |
| | | JUMP instruction | × | × | × | × | × |
| | | LOOP to LEND | | | | | |
| Manual control | JOG operation, inching operation | | △ ^{*3} | △ ^{*3} | △ ^{*3} | ○ | × |
| | Manual pulse generator operation | | × | × | × | ○ | × |
| Expansion control | Speed-torque control | | × | × | × | ○ | × |

*1 Invalid during creep speed.

*2 Invalid during continuous path control.

*3 Combination with the inching operation is not available. (Inching operation does not perform acceleration/deceleration processing.)

○: Combination possible

△: Combination limited

×: Combination not possible

| Main functions | | | Functions related to positioning start | Functions related to positioning stop | | Other functions | |
|------------------------------|--------------------------------------|--|--|---------------------------------------|--|-----------------|------------------------|
| | | | Pre-reading start function | Step function | Stop command processing for deceleration stop function | Skip function | M code output function |
| Home position return control | Machine home position return control | | × | × | ○ | × | × |
| | Fast home position return control | | × | × | ○ | × | × |
| Major positioning control | Position control | 1-axis linear control | ○ | ○ | ○ | ○ | ○ |
| | | 2-, 3-, or 4-axis linear interpolation control | ○ | ○ | ○ | ○ | ○ |
| | | 1-axis fixed-feed control | ○ | ○ | ○ | ○ | ○ |
| | | 2-, 3-, or 4-axis fixed-feed control (interpolation) | ○ | ○ | ○ | ○ | ○ |
| | | 2-axis circular interpolation control | ○ | ○ | ○ | ○ | ○ |
| | | 3-axis helical interpolation control | ○ | ○ | ○ | ○ | ○ |
| | Speed control (1- to 4-axis) | | ○ | × | ○ | × | ○ |
| | Speed-position switching control | | ○ | ○ | ○ | ○ | ○ |
| | Position-speed switching control | | | | | × | |
| | Other control | Current value changing | × | ○ | × | ○ | △ ^{*1} |
| | | NOP instruction | | × | | × | |
| | | JUMP instruction | × | × | × | × | × |
| | | LOOP to LEND | | | | | |
| Manual control | JOG operation, inching operation | | × | × | × | × | × |
| | Manual pulse generator operation | | × | × | × | × | × |
| Expansion control | Speed-torque control | | × | × | × | × | × |

*1 Change the current value using the positioning data. Disabled for a start of positioning start No. 9003.

- : Combination possible
 △: Combination limited
 ×: Combination not possible

| Main functions | | | Other functions | | | | | |
|------------------------------|--------------------------------------|--|-------------------|------------------------------|--|----------------------------------|--|---|
| | | | Teaching function | Command in-position function | Acceleration/ deceleration processing function | Deceleration start flag function | Speed control 10 times multiplier setting for degree axis function | Operation setting for incompletion of home position return function |
| Home position return control | Machine home position return control | | × | × | ○ | × | ○ | × |
| | Fast home position return control | | × | ○ | ○ | × | ○ | × |
| Major positioning control | Position control | 1-axis linear control | × | ○ | ○ | ○ | ○ | ○ |
| | | 2-, 3-, or 4-axis linear interpolation control | × | ○ | ○ | △ ^{*1} | ○ | ○ |
| | | 1-axis fixed-feed control | × | ○ | ○ | ○ | ○ | ○ |
| | | 2-, 3-, or 4-axis fixed-feed control (interpolation) | × | ○ | ○ | △ ^{*1} | ○ | ○ |
| | | 2-axis circular interpolation control | × | ○ | ○ | × | × | ○ |
| | | 3-axis helical interpolation control | × | ○ | ○ | × | × | ○ |
| | Speed control (1- to 4-axis) | | × | × | ○ | × | ○ | ○ |
| | Speed-position switching control | | × | ○ | ○ | △ ^{*2} | ○ | ○ |
| | Position-speed switching control | | | | | | | |
| | Other control | Current value changing | × | × | × | × | × | △ ^{*3} |
| | | NOP instruction | | | | | | × |
| | | JUMP instruction | × | × | × | × | × | × |
| | | LOOP to LEND | | | | | | |
| Manual control | JOG operation, inching operation | | ○ | × | △ ^{*4} | × | ○ | × |
| | Manual pulse generator operation | | ○ | × | × | × | △ ^{*5} | × |
| Expansion control | Speed-torque control | | × | × | △ ^{*6} | × | ○ | ○ |

*1 Valid for the reference axis only.

*2 Valid for only the case where a deceleration start is made during position control.

*3 Valid for a start of positioning start No.9003, but invalid for a start of positioning data (No. 1 to 600).

*4 Combination with the inching operation is not available. (Inching operation does not perform acceleration/deceleration processing.)

*5 Valid for "[Md.22] Feedrate" and "[Md.28] Axis feedrate".

*6 Refer to the following for acceleration/deceleration processing in the speed-torque control.


📖 MELSEC iQ-R Simple Motion Module User's Manual (Application)

4 PROCEDURES BEFORE OPERATIONS

This chapter describes the procedures before operation.

1. Mounting the module

Mount the Simple Motion module to the main base unit or extension base unit. For details, refer to the following.

 MELSEC iQ-R Module Configuration Manual

2. Wiring

Connect the Simple Motion module to external devices.

3. Adding the module

Add the RD77MS to the module map of the project using an engineering tool.

4. Module setting

Set values for the module setting using an engineering tool. For details, refer to the following.

 MELSEC iQ-R Simple Motion Module User's Manual (Application)

5. Auto refresh setting

Set values for the refresh settings using an engineering tool. For details, refer to the following.

 MELSEC iQ-R Simple Motion Module User's Manual (Application)

6. Checking connection

Check that the Simple Motion module is connected to external devices correctly.

7. Programming

Create programs. For details, refer to the following.

 MELSEC iQ-R Simple Motion Module User's Manual (Application)

8. Test operation

Check that the positioning is correctly carried out as designed.

5 WIRING

5.1 Precautions for Wiring

The precautions for wiring the Simple Motion module are shown below. Execute the work following the precautions below.

Warning for wiring

WARNING

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

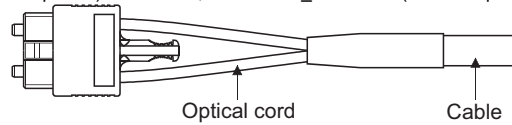
Caution for wiring

CAUTION

- Check the layout of the terminals and then properly route the wires to the module.
- The external input wiring connector must be crimped or pressured with the tool specified by the manufacturer, or must be correctly soldered. Insufficient connections may cause short circuit, fire, or malfunction.
- Be careful not to let foreign matter such as sawdust or wire chips get inside the module. These may cause fires, failure or malfunction.
- The top surface of the module is covered with protective films to prevent foreign objects such as cable off cuts from entering the module when wiring. Do not remove this film until the wiring is complete. Before operating the system, be sure to remove the film to provide adequate ventilation.
- Securely connect the connector for SSCNETⅢ cable to the bottom connector on the module.
- When removing the cable from the module, do not pull the cable. Hold the connector that is connected to the module. Pulling the cable that is still connected to the module may cause malfunction or damage to the module or cable.
- The external input/output signal cable and the communication cable should not be routed near or bundled with the main circuit cable, power cable and/or other such load - carrying cables other than those for the PLC. These cables should be separated by at least 100 mm (3.94 inch) or more. They can cause electrical interference, surges and inductance that can lead to mis-operation.
- The shielded cable for connecting Simple Motion module can be secured in place. If the shielded cable is not secured, unevenness or movement of the shielded cable or careless pulling on it could result in damage to the Simple Motion module, servo amplifier or shielded cable or defective cable connections could cause mis-operation of the unit.
- If the cable connected to the Simple Motion module and the power line must be adjacently laid (less than 100 mm (3.94 inch)), use a shielded cable. Ground the shield of the cable securely to the control panel on the Simple Motion module side.
- Forcibly removal the SSCNETⅢ cable from the Simple Motion module will damage the Simple Motion module and SSCNETⅢ cables.
- 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.
- Do not remove the SSCNETⅢ cable while turning on the power supply of Simple Motion module and servo amplifier. Do not see directly the light generated from SSCNETⅢ connector and the end of SSCNETⅢ cable. When the light gets into eye, may feel something wrong with eyes.(The light source of SSCNETⅢ cable complies with class1 defined in JISC6802 or IEC60825-1.)
- If a power such as a major shock, lateral pressure, haul, sudden bending or twist is added to the SSCNETⅢ cable, it distorts or breaks inside and optical transmission is not be available. Note that the short SSCNETⅢ cable can be twisted easily.
- Be sure to use the SSCNETⅢ cable within the range of operating temperature described in each servo amplifier instruction manual. Especially, as optical fiber for MR-J3BUS_M and MR-J3BUS_M-A are made of synthetic resin, it melts down if being left near the fire or high temperature. Therefore, do not make it touched the part which becomes high temperature, such as radiator or regenerative option of servo amplifier, or servomotor.
- When laying the SSCNETⅢ cable, be sure to secure the minimum cable bend radius or more.
- Put the SSCNETⅢ cable in the duct or fix the cable at the closest part to the Simple Motion 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. If adhesive tape for bundling the cable is used, fire resistant acetate cloth adhesive tape 570F (Teraoka Seisakusho Co., Ltd) is recommended.

CAUTION

- Migrating plasticizer is used for vinyl tape. Keep the MR-J3BUS_M, and MR-J3BUS_M-A cables away from vinyl tape because the optical characteristic may be affected. Generally, soft polyvinyl chloride (PVC), polyethylene resin (PE) and fluorine resin contain non-migrating plasticizer and they do not affect the optical characteristic of SSCNET III cable. However, some wire sheaths and cable ties, which contain migrating plasticizer (phthalate ester), may affect MR-J3BUS_M and MR-J3BUS_M-A cables (made of plastic). In addition, MR-J3BUS_M-B cable (made of quartz glass) is not affected by plasticizer.



○: Normally, cable is not affected by plasticizer.


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

| SSCNET III cable | Cord | Cable |
|------------------|------|-------|
| MR-J3BUS_M | △ | |
| MR-J3BUS_M-A | △ | △ |
| MR-J3BUS_M-B | ○ | ○ |

- If the adhesion of solvent and oil to the cord part of SSCNET III cable may lower the optical characteristic and machine characteristic. To use the cable in that environment, be sure to do the protection measures to the cord part.
- When keeping the Simple Motion module or servo amplifier, be sure to attach a cap to the connector part so that a dirt should not adhere to the end of SSCNET III connector.
- To protect a light device inside a connector from dust, a cap is attached to the SSCNET III connector for the SSCNET III cable. Therefore, do not remove a cap until just before connecting the SSCNET III cable. Also, when removing the SSCNET III cable, make sure to attach a cap.
- Keep the cap and the tube for protecting light cord end of SSCNET III cable in a plastic bag with a zipper included with the SSCNET III cable to prevent them from becoming dirty.
- When exchanging the Simple Motion module or servo amplifier, make sure to attach a cap to the SSCNET III connector. When asking repair of Simple Motion module or servo amplifier for some troubles, make also sure to attach a cap to the SSCNET III connector. When a cap is not attached, the light device may be damaged at the transit. In this case, exchange or repair of the light device is required.

Precautions for wiring

- Use separate cables for connecting to the Simple Motion module and for the power cable that creates surge and inductance.
- The cable for connecting the Simple Motion module should be placed in the duct or secured in place by clamps. If the cable is not placed in the duct or secured by clamps, unevenness or movement of the cable or careless pulling on it could result in damage to the unit or cable or defective cable connections could cause mis-operation of the unit.
- If a duct is being used, separate the cables to connect the Simple Motion module from the power line duct, or use metal piping. Ground the pipes securely after metal piping.
- Use the twisted pair shielded cable (wire size 0.3 mm² or more). The shielded must be grounded on the Simple Motion module side.
- Use separate shielded cables for the external input signal, forced stop input, and manual pulse generator/incremental synchronous encoder input for connecting to the Simple Motion module. They can cause electrical interference, surges and inductance that can lead to mis-operation.
- For wiring, refer to the following and each servo amplifier instruction manual.

 MELSEC iQ-R Module Configuration Manual

Precautions for 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 option of servo amplifier and servomotor. Be sure to use optical fiber within the range of operating temperature described in each servo amplifier instruction manual. Read described item of this section carefully and handle it with caution.

■Minimum bend radius

Make sure to lay the cable with greater radius than the minimum bend radius.

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

| Model name of SSCNETⅢ cable | Minimum bend radius [mm] ([inch]) |
|-----------------------------|--|
| MR-J3BUS_M | 25 (0.98) |
| MR-J3BUS_M-A | Enforced covering cord: 50 (1.97), Cord: 25 (0.98) |
| MR-J3BUS_M-B | Enforced covering cord: 50 (1.97), Cord: 30 (1.18) |

■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 each servo amplifier instruction manual for the tension strength of SSCNETⅢ cable.)

■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 SSCNETⅢ 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.

■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 SSCNETⅢ cable may occur at worst.

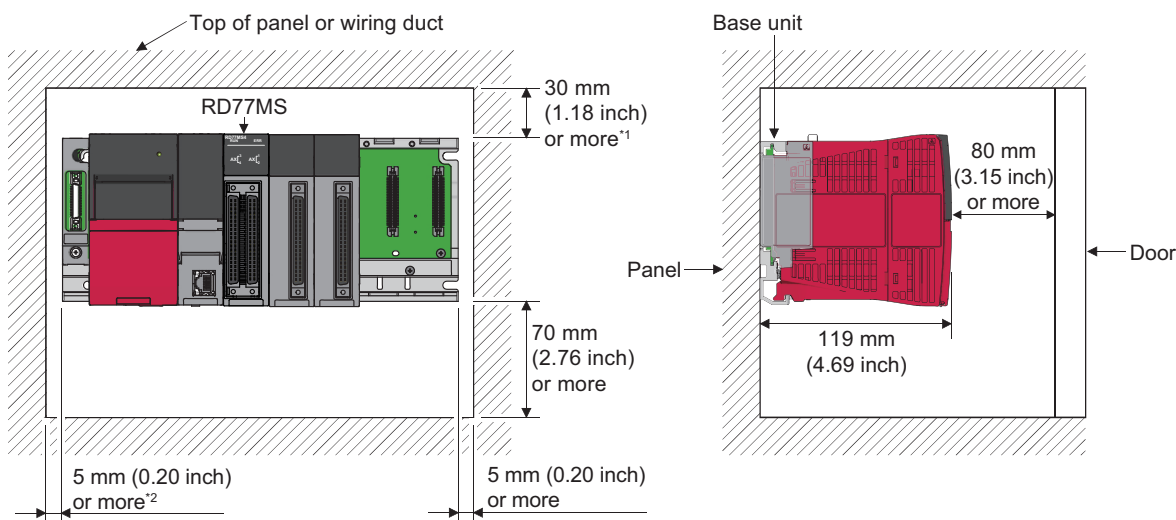
■Disposal

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

■Wiring process of SSCNETⅢ cable

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

- Putting in the duct

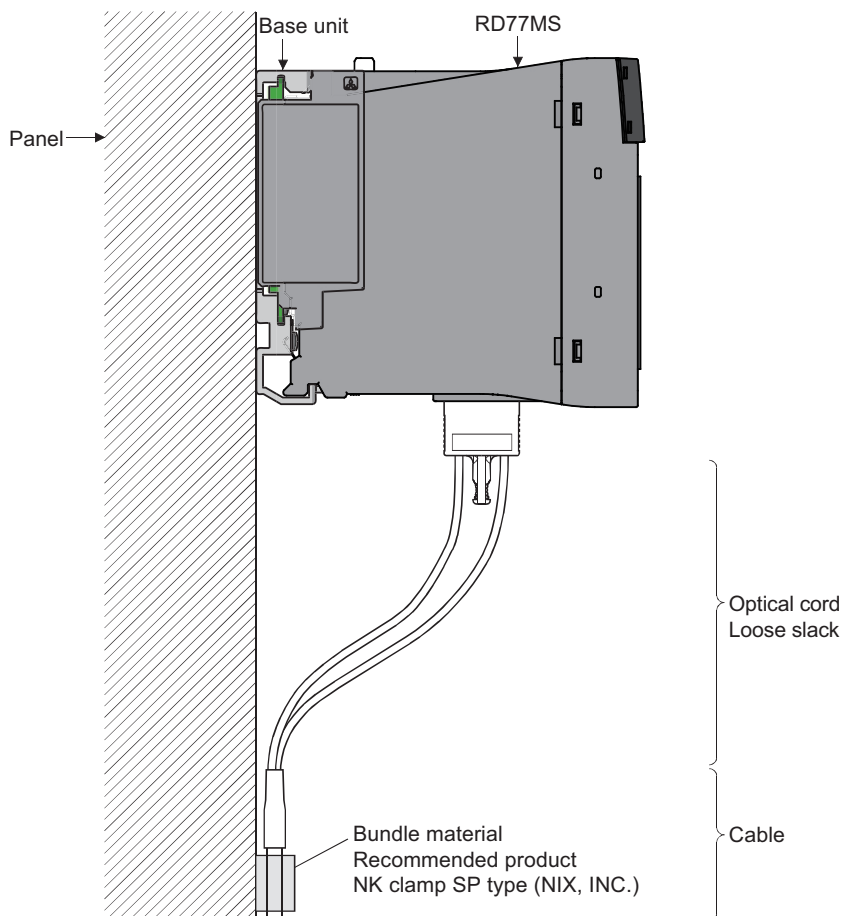


*1 For wiring duct with 50 mm (1.97 inch) or less height. For other cases, 40 mm (1.58 inch) or more.

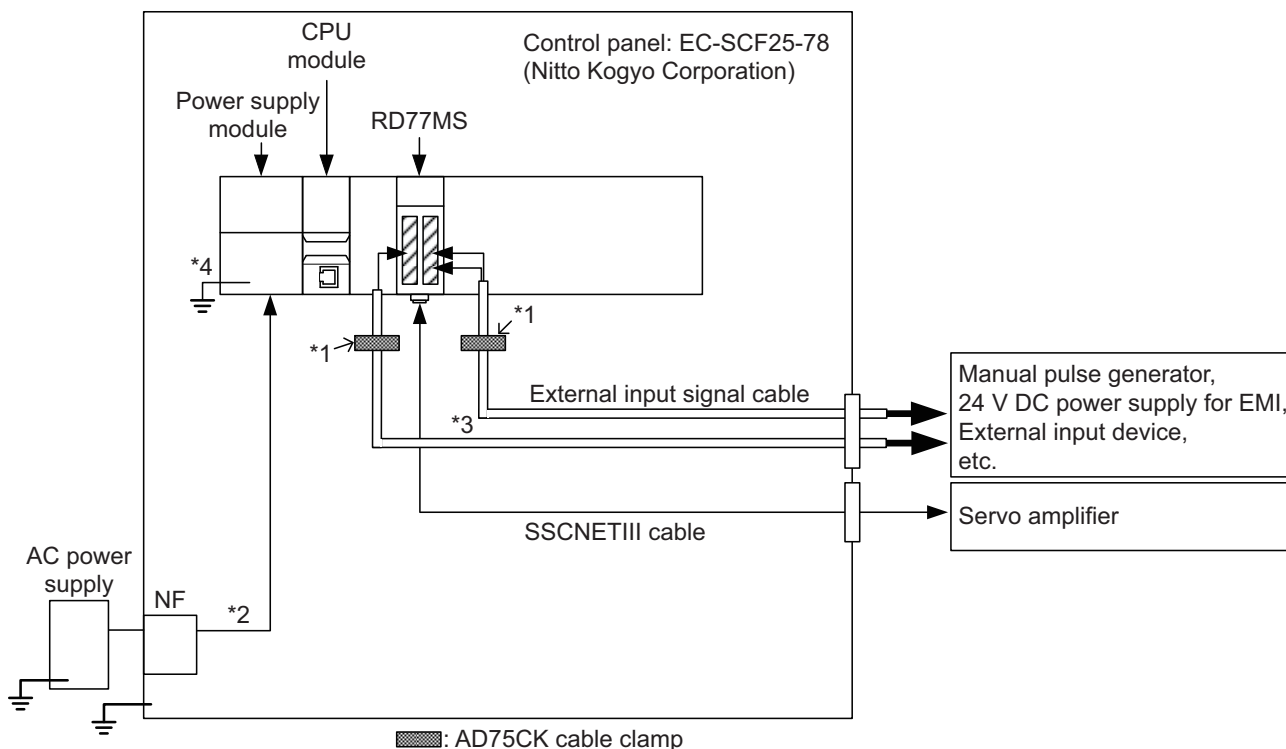
*2 20 mm (0.79 inch) or more when the adjacent module is not removed and the extension cable is connected.

- 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.



Example of measure against noise for compliance with the EMC directive



- *1 Ground the cables at a position within 30 cm (11.82 inch) from the module with the cable clamp.
- *2 Wire the power supply cable as short as possible using the twisted cable (2 mm² or more).
- *3 Use the shielded twisted cable (cable length: 30 m (98.43 ft.) or less) for the external input signal cable.
(Manual pulse generator cable (open-collector type): 10 m or less)
- *4 Wire the power supply module as short as possible using the cable of approx. 2 mm², and ground to the control panel from the FG/LG terminal.
- Refer to this chapter or "EMC and Low Voltage Directives" of the following manuals for basic wire. We examined RD77MS by the above example.

MELSEC iQ-R Module Configuration Manual

Safety Guidelines (This manual is included with the base unit.)

- In wiring inside the panel, the power line connected to the power or servo amplifier and the communication cable such as an expansion cable or a network cable must not be mixed. In the duct, leave 10 cm (3.94 inch) or more between the power line and the communication cable, and separate using a separator (made of metal), etc. It is required in the same control panel as well. Mixing the power line and communication cable may cause increase of noise or malfunction due to noise influence.

5.2 External Input Connection Connector

Signal layout for external input connection connector

The signal layout for the external input connection connector of Simple Motion module is shown below.

| Pin layout (Front view of the module) | Pin No. | Signal name | Pin No. | Signal name | Pin No. | Signal name | Pin No. | Signal name | | | | | |
|---|---------|--------------------------|---------|--------------------------|---------|--------------------------|---------|---------------------|------|---------------------------|------|---------------------------|------|
| <div><div>2B20 2B19 2B18 2B17 2B16 2B15 2B14 2B13 2B12 2B11 2B10 2B9 2B8 2B7 2B6 2B5 2B4 2B3 2B2 2B1</div><div><div><div>□ □</div><div>□ □</div><div>□ □</div><div>□ □</div><div>□ □</div><div>□ □</div><div>□ □</div><div>□ □</div><div>□ □</div><div>□ □</div><div>□ □</div><div>□ □</div><div>□ □</div><div>□ □</div><div>□ □</div><div>□ □</div><div>□ □</div><div>□ □</div><div>□ □</div><div>□ □</div><div>□ □</div></div><div><div>2A20 2A19 2A18 2A17 2A16 2A15 2A14 2A13 2A12 2A11 2A10 2A9 2A8 2A7 2A6 2A5 2A4 2A3 2A2 2A1</div><div><div>1B20 1B19 1B18 1B17 1B16 1B15 1B14 1B13 1B12 1B11 1B10 1B9 1B8 1B7 1B6 1B5 1B4 1B3 1B2 1B1</div><div><div>□ □</div><div>□ □</div><div>□ □</div><div>□ □</div><div>□ □</div><div>□ □</div><div>□ □</div><div>□ □</div><div>□ □</div><div>□ □</div><div>□ □</div><div>□ □</div><div>□ □</div><div>□ □</div><div>□ □</div><div>□ □</div><div>□ □</div><div>□ □</div><div>□ □</div><div>□ □</div><div>□ □</div></div></div></div></div></div> | 2B20 | No connect ^{*6} | 2A20 | No connect ^{*6} | 1B20 | HB ^{*2, *3, *4} | 1A20 | 5 V ^{*8} | | | | | |
| | 2B19 | | 2A19 | | 1B19 | HA ^{*2, *3, *4} | 1A19 | 5 V ^{*8} | | | | | |
| | 2B18 | | 2A18 | | 1B18 | 1A18 | 2B17 | 2A17 | 1B17 | HAL ^{*2, *3, *5} | 1A17 | HAH ^{*2, *3, *5} | |
| | 2B17 | | 2A17 | | 1B16 | 1A16 | 2B16 | 2A16 | 1B16 | No connect ^{*6} | 1A16 | No connect ^{*6} | |
| | 2B16 | | 2A16 | | 1B15 | 1A15 | 2B15 | 2A15 | 1B15 | 5 V ^{*9} | 1A15 | 5 V ^{*9} | |
| | 2B15 | | 2A15 | | 1B14 | 1A14 | 2B14 | 2A14 | 1B14 | SG ^{*9} | 1A14 | SG ^{*9} | |
| | 2B14 | | 2A14 | | 1B13 | 1A13 | 2B13 | 2A13 | 1B13 | No connect ^{*6} | 1A13 | No connect ^{*6} | |
| | 2B13 | | 2A13 | | 1B12 | 1A12 | 2B12 | 2A12 | | | 1B12 | | 1A12 |
| | 2B12 | | 2A12 | | 1B11 | 1A11 | 2B11 | 2A11 | | | 1B11 | | 1A11 |
| | 2B11 | | 2A11 | | 1B10 | 1A10 | 2B10 | 2A10 | | | 1B10 | | 1A10 |
| | 2B10 | | 2A10 | | 1B9 | 1A9 | 2B9 | 2A9 | | | 1B9 | | 1A9 |
| | 2B9 | | 2A9 | | 1B8 | 1A8 | 2B8 | 2A8 | 1B8 | EMI. COM | 1A8 | EMI | |
| | 2B8 | | 2A8 | | 1B7 | 1A7 | 2B7 | COM | 1B7 | COM | 1A7 | COM | |
| | 2B7 | | 2A7 | | 1B6 | 1A6 | 2B6 | COM | 1B6 | COM | 1A6 | COM | |
| | 2B6 | | 2A6 | | 1B5 | 1A5 | 2B5 | SIN20 ^{*7} | 1B5 | SIN10 ^{*7} | 1A5 | SIN5 ^{*7} | |
| | 2B5 | | 2A5 | | 1B4 | 1A4 | 2B4 | SIN19 ^{*7} | 1B4 | SIN9 ^{*7} | 1A4 | SIN4 ^{*7} | |
| | 2B4 | | 2A4 | | 1B3 | 1A3 | 2B3 | SIN18 ^{*7} | 1B3 | SIN8 ^{*7} | 1A3 | SIN3 ^{*7} | |
| | 2B3 | | 2A3 | | 1B2 | 1A2 | 2B2 | SIN17 ^{*7} | 1B2 | SIN7 ^{*7} | 1A2 | SIN2 ^{*7} | |
| | 2B2 | | 2A2 | | 1B1 | 1A1 | 2B1 | SIN16 ^{*7} | 1B1 | SIN6 ^{*7} | 1A1 | SIN1 ^{*7} | |

*1 RD77MS2 does not have the connector of 2A20 to 2A1 and 2B20 to 2B1.

*2 Input type from manual pulse generator/incremental synchronous encoder is switched in "[Pr.89] Manual pulse generator/Incremental synchronous encoder input type selection". (Only the value specified against the axis 1 is valid.)

- 0: Differential-output type
- 1: Voltage-output/open-collector type (Default value)

*3 Set the signal input form in "[Pr.24] Manual pulse generator/Incremental synchronous encoder input selection".

*4 Voltage-output/open-collector type

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

*5 Differential-output type

Connect the A-phase/PULSE signal to HAH, and the A-phase/PULSE inverse signal to HAL.

Connect the B-phase/SIGN signal to HBH, and the B-phase/SIGN inverse signal to HBL.

*6 Do not connect to any terminals explained as "No connect".

*7 Set the external command signal [DI, FLS, RLS, DOG, STOP] in "[Pr.116] FLS signal selection", "[Pr.117] RLS signal selection", "[Pr.118] DOG signal selection", "[Pr.119] STOP signal selection" and "[Pr.95] External command signal selection".

*8 Do not connect wires other than the signal wires of the manual pulse generator to 1A20 and 1A19.

*9 Do not use 1A(B)15 and 1A(B)14 for other than the power supply of manual pulse generator.

List of input signal details

| Signal name | | Pin No. | Signal details |
|---|---|----------|---|
| Differential-output type | Manual pulse generator/ Incremental synchronous encoder A phase/PULSE | HAH (A+) | 1A17 |
| | | | <p>(1) Phase A/Phase B</p> <ul style="list-style-type: none"> Input the pulse signal from the manual pulse generator/incremental synchronous encoder A phase and B phase. If the A phase leads the B phase, the positioning address will increase at the rising and falling edges of each phase. If the B phase leads the A phase, the positioning address will decrease at the rising and falling edges of each phase. <p>(a) Magnification by 4</p> <div> <div> <p>[When increased]</p> <p>Positioning address: +1 +1 +1 +1 +1 +1 +1 +1</p> </div> <div> <p>[When decreased]</p> <p>Positioning address: -1 -1 -1 -1 -1 -1 -1 -1</p> </div> </div> |
| | | HAL (A-) | 1B17 |
| | Manual pulse generator/ Incremental synchronous encoder B phase/SIGN | HBH (B+) | 1A18 |
| | | | <p>(b) Magnification by 2</p> <div> <div> <p>[When increased]</p> <p>Positioning address: +1 +1 +1 +1 +1 +1 +1 +1</p> </div> <div> <p>[When decreased]</p> <p>Positioning address: -1 -1 -1 -1 -1 -1 -1 -1</p> </div> </div> |
| Voltage-output type/open-collector type | Manual pulse generator/ Incremental synchronous encoder B phase/SIGN | HBL (B-) | 1B18 |
| | | | <p>(c) Magnification by 1</p> <p>1) Positive logic</p> <div> <div> <p>[When increased]</p> <p>Positioning address: +1 +1 +1 +1</p> </div> <div> <p>[When decreased]</p> <p>Positioning address: -1 -1 -1 -1</p> </div> </div> <p>2) Negative logic</p> <div> <div> <p>[When increased]</p> <p>Positioning address: +1 +1 +1 +1</p> </div> <div> <p>[When decreased]</p> <p>Positioning address: -1 -1 -1 -1</p> </div> </div> |
| | Manual pulse generator/ Incremental synchronous encoder A phase/PULSE | HA (A) | 1B19 |
| | | | <p>(2) PULSE/SIGN</p> <p>Input the pulse signal for counting the increased/decreased pulse in the pulse input (PULSE). Input the signal for controlling forward run and reverse run in the direction sign (SIGN).</p> <p>1) "[Pr.151] Manual pulse generator/Incremental synchronous encoder input logic selection" is positive logic</p> <ul style="list-style-type: none"> The motor will forward run when the direction sign is HIGH. The motor will reverse run when the direction sign is LOW. <p>2) "[Pr.151] Manual pulse generator/Incremental synchronous encoder input logic selection" is negative logic</p> <ul style="list-style-type: none"> The motor will forward run when the direction sign is LOW. The motor will reverse run when the direction sign is HIGH. |
| | Manual pulse generator/ Incremental synchronous encoder B phase/SIGN | HB (B) | 1B20 |
| | | | <div> <div> <p>[When increased]</p> <p>Positioning address: +1 +1 +1 +1 +1 +1 +1 +1</p> </div> <div> <p>[When decreased]</p> <p>Positioning address: -1 -1 -1 -1 -1 -1 -1 -1</p> </div> </div> |

| Signal name | Pin No. | Signal details | |
|---|---|--|--|
| Manual pulse generator power supply output (+ 5 V DC) (5 V) | 1A20 1A19 | <ul style="list-style-type: none"> Power supply for manual pulse generator. (+ 5 V DC) Do not connect wires other than the signal wires of the manual pulse generator. | |
| Input signal (SIN) | 1A1 to 1A5, 1B1 to 1B5, 2A1 to 2A5, 2B1 to 2B5 | Upper limit signal (FLS) | <ul style="list-style-type: none"> This signal is input from the limit switch installed at the upper limit position of the stroke. Positioning will stop when this signal turns OFF. When the home position return retry function is valid, this will be the upper limit for finding the near-point dog signal. |
| | | Lower limit signal (RLS) | <ul style="list-style-type: none"> This signal is input from the limit switch installed at the lower limit position of the stroke. Positioning will stop when this signal turns OFF. When the home position return retry function is valid, this will be the lower limit for finding the near-point dog signal. |
| | | Near-point dog signal (DOG) | <ul style="list-style-type: none"> This signal is used for detecting the near-point dog during the home position return. The near-point dog OFF → ON is detected at the rising edge. The near-point dog ON → OFF is detected at the falling edge. |
| | | Stop signal (STOP) | <ul style="list-style-type: none"> Input this signal to stop positioning. When this signal turns ON, the RD77MS will stop the positioning being executed. After that, even if this signal is turned from ON to OFF, the system will not start. |
| | | External command/ Switching signal (DI) | <ul style="list-style-type: none"> Input a control switching signal during speed-position or position-speed switching control. Use this signal as the input signal of positioning start, speed change request, skip request and mark detection from an external device. Set the function to use this signal in "[Pr.42] External command function selection". Set the signal in "[Pr.95] External command signal selection". |
| Common (COM) | 1A6 1A7 1B6 1B7 2A6 2A7 2B6 2B7 | <ul style="list-style-type: none"> Common for upper/lower limit, near-point dog, stop, and external command/switching signals. | |
| Forced stop input signal (EMI) | 1A8 | <ul style="list-style-type: none"> This signal is input when batch forced stop is available for all axes of servo amplifier. | |
| Forced stop input signal common (EMI.COM) | 1B8 | EMI ON (Opened): Forced stop EMI OFF (24 V DC input): Forced stop release | |
| Manual pulse generator power supply output (+ 5 V DC) (5 V) | 1A15 1B15 | <ul style="list-style-type: none"> Power supply for manual pulse generator (+ 5 V DC) This power supply is used for manual pulse generator. It must not be used except for the manual pulse generator power supply. | |
| Manual pulse generator power supply output (GND) (SG) | 1A14 1B14 | <ul style="list-style-type: none"> Power supply for manual pulse generator (GND) This power supply is used for manual pulse generator. It must not be used except for the manual pulse generator power supply. | |

*1 There are no signals of 2A_ and 2B_ at RD77MS2 use.

Interface internal circuit

The outline diagrams of the internal circuits for the external device connection interface (for the Simple Motion module, axis 1) are shown below.

Interface between external input signals/forced stop input signals

| Input or Output | Signal name | Pin No. | Wiring example | Description |
|-----------------|--|---------------------|----------------|--|
| Input | External input signal ^{*1} (Upper/Lower limit signal ^{*2}) | SIN (FLS, RLS) | | Upper-limit signal, Lower-limit signal, Near-point dog signal, Stop signal, External command signal, Switching signal, Forced stop input signal |
| | External input signal ^{*1} (Near-point dog ^{*2} , Stop, External command/Switching signal) | SIN (DOG, STOP, DI) | | |
| | Common | COM | | |
| | Forced stop input signal | EMI | | |
| | | EMI.COM | 1B8 | |

*1 When using external input signal of servo amplifier, set "1" with "[Pr.116] FLS signal selection", "[Pr.117] RLS signal selection", and "[Pr.118] DOG signal selection".

*2 Refer each servo amplifier instruction manual for wiring of the input/output signals of servo amplifier.

*3 " _ " indicates "1A", "1B", "2A", or "2B".

*4 As for the 24 V DC sign, both "+" and "-" are possible.

Manual pulse generator/Incremental synchronous encoder input

■Interface between manual pulse generator/incremental synchronous encoder (Differential-output type)

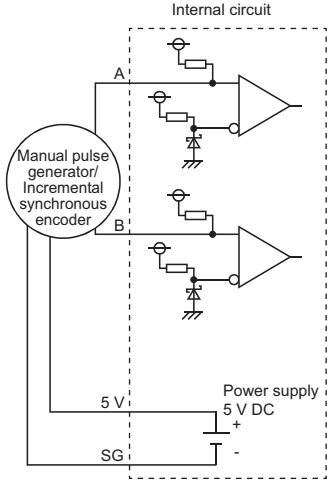
| Input or Output | Signal name | Pin No. | Wiring example |
|------------------------|---------------------------------------|--------------|----------------|
| Input ^{*1,*2} | Manual pulse generator, phase A/PULSE | HAH (A+) | |
| | | HAL (A-) | |
| | Manual pulse generator, phase B/SIGN | HBH (B+) | |
| | | HBL (B-) | |
| Power supply | 5 V ^{*3} | 1A15 1B15 | |
| | SG | 1A14 1B14 | |

*1 Set "0: Differential-output type" in "[Pr.89] Manual pulse generator/Incremental synchronous encoder input type selection" if the manual pulse generator/Incremental synchronous encoder of differential-output type is used.
The default value is "1: Voltage-output/open-collector type".

*2 Set the signal input form in "[Pr.24] Manual pulse generator/Incremental synchronous encoder input selection".

*3 The 5 V DC power supply from the Simple Motion module must not be used if a separate power supply is applied to the manual pulse generator/incremental synchronous encoder. If a separate power supply is used, use a stabilized power supply of voltage 5 V DC.
Anything else may cause a failure.

■Interface between manual pulse generator/Incremental synchronous encoder (Voltage-output type/open-collector type)

| Input or Output | Signal name | Pin No. | Wiring example |
|-------------------------|---------------------------------------|--------------|--|
| Input ^{*1, *2} | Manual pulse generator, phase A/PULSE | HA (A) | 1B19 |
| | Manual pulse generator, phase B/SIGN | HB (B) | |
| Power supply | 5 V ^{*3} | 1A15 1B15 |  |
| | SG | 1A14 1B14 | |

- *1 Set "1: Voltage-output/open-collector type" in "[Pr.89] Manual pulse generator/Incremental synchronous encoder input type selection" if the manual pulse generator/Incremental synchronous encoder of voltage-output/open-collector type is used.
The default value is "1: Voltage-output/open-collector type".
- *2 Set the signal input form in "[Pr.24] Manual pulse generator/Incremental synchronous encoder input selection".
- *3 The 5 V DC power supply from the Simple Motion module must not be used if a separate power supply is applied to the manual pulse generator/Incremental synchronous encoder. If a separate power supply is used, use a stabilized power supply of voltage 5 V DC.
Anything else may cause a failure.

Wiring example for manual pulse generator/incremental synchronous encoder

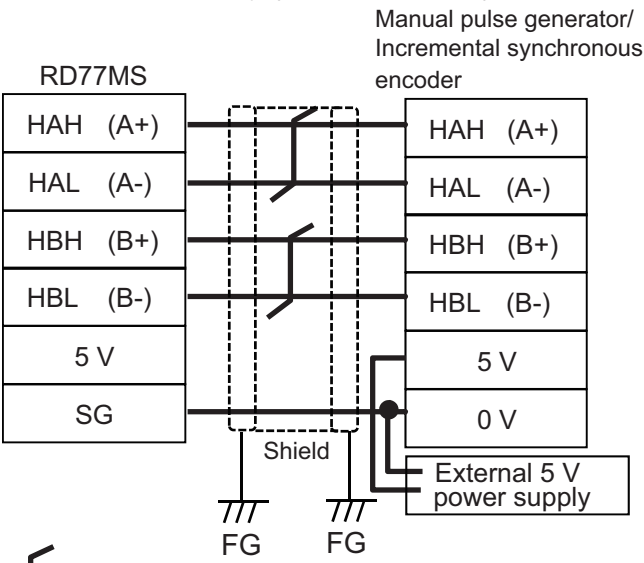
Wire the manual pulse generator/incremental synchronous encoder of differential output type and voltage output type/open-collector type as follows.

Switch the input type of RD77MS by "[Pr.89] Manual pulse generator/Incremental synchronous encoder input type selection". It is recommended to use the external 5 V power supply (5 V DC±5%) for the power supply of the manual pulse generator/incremental synchronous encoder. When using the external power supply, do not connect with the 5 V terminal of RD77MS. When using the internal power supply, connect the 5 V terminal of RD77MS and the 5 V (+) of the manual pulse generator/incremental synchronous encoder.

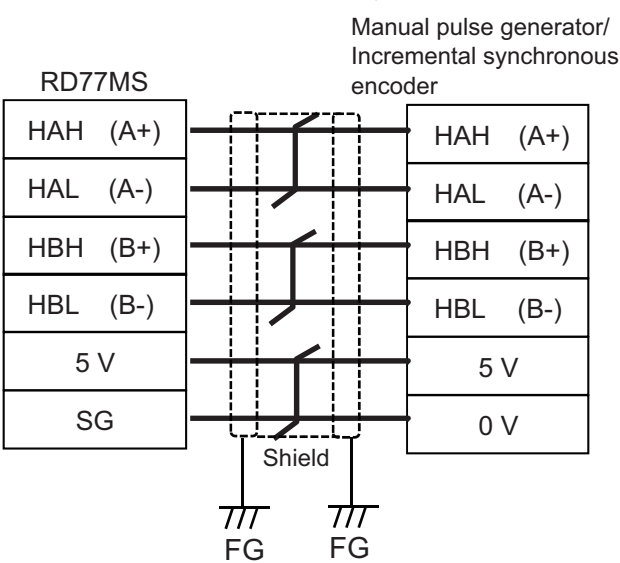
In either case, connect the 0 V (-) of the manual pulse generator/incremental synchronous encoder and the SG of RD77MS. Do not use the 5 V terminal of RD77MS except for connecting the manual pulse generator/incremental synchronous encoder. It may cause a failure. Also, do not connect the manual pulse generator/incremental synchronous encoder whose current consumption exceeds 200 mA.

■Manual pulse generator/Incremental synchronous encoder of differential output type

When using the external power supply (Recommended)



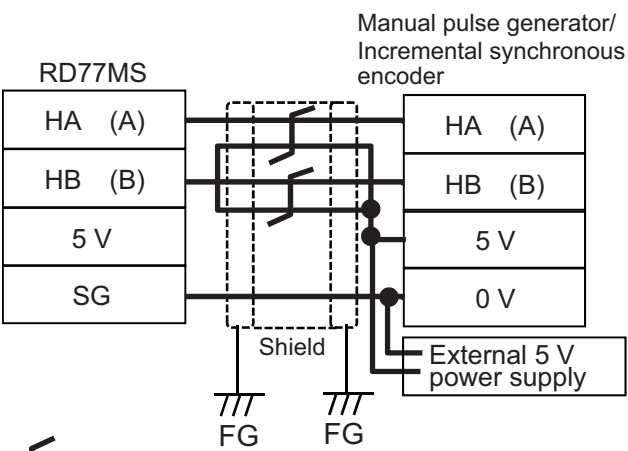
When using the internal power supply



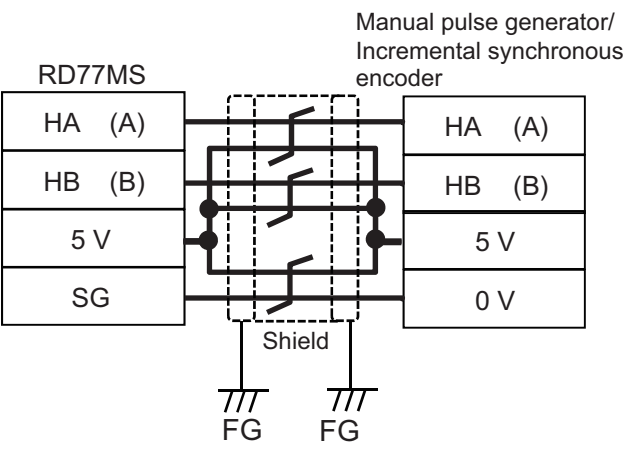
Twisted pair

■Manual pulse generator/Incremental synchronous encoder of voltage output type/open-collector type

When using the external power supply (Recommended)



When using the internal power supply



Twisted pair

6 OPERATION EXAMPLES

This chapter describes the programming procedure and the basic program of the Simple Motion module. When applying the program examples provided in this manual to an actual system, properly verify the applicability and reliability of the control on the system.

Overall configuration

The program examples show the programs of the following operations.



- Machine home position return execution
- Execution of 1-axis linear control using axis 1
- JOG operation execution

The following table shows the overall configuration of the positioning control operation examples. Note that the programs in the list are the ones using the axis 1 only.

| No. | Program name | Description |
|-----|---------------------------------------|--|
| 1 | PLC READY signal [Y0] ON program | Notifies the Simple Motion module that the CPU module is normal before the start of positioning control. |
| 2 | All axis servo ON program | Enables the servo amplifier to operate. |
| 3 | Positioning start No. setting program | Sets the positioning data that are executed with a positioning start program. The operation example is the case when the start No. is for machine home position return or the positioning data No.1 of the axis 1 is used. |
| 4 | Positioning start program | Starts the machine home position return or the positioning control using positioning data. |
| 5 | JOG operation setting program | Sets the JOG operation speed. |
| 6 | JOG operation execution program | Starts the JOG operation. |

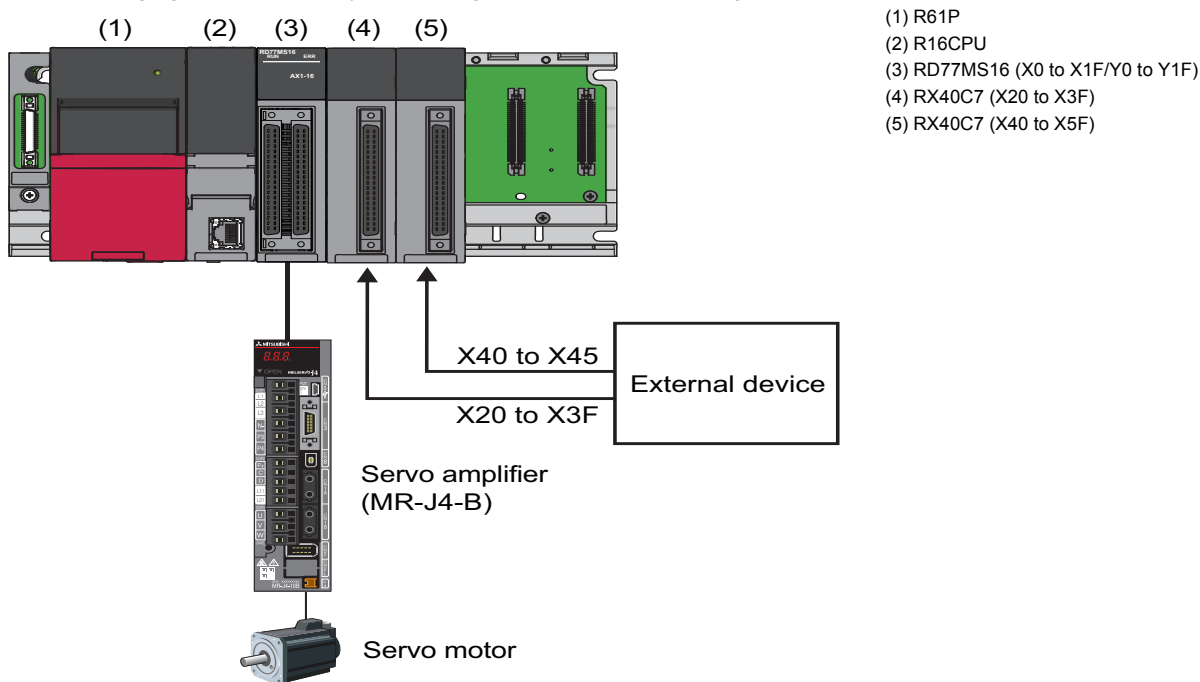
Programming procedure

Take the following steps to create a program for the motion control:

1. Set the system structure setting and parameter setting of the Simple Motion module setting for the initial setting.
 Page 55 System setting, Page 56 Parameters
2. Set the positioning data of the Simple Motion module setting.
 Page 56 Positioning data
3. Program examples of each control

System configuration

The following figure shows the system configuration used for the program examples in this section.



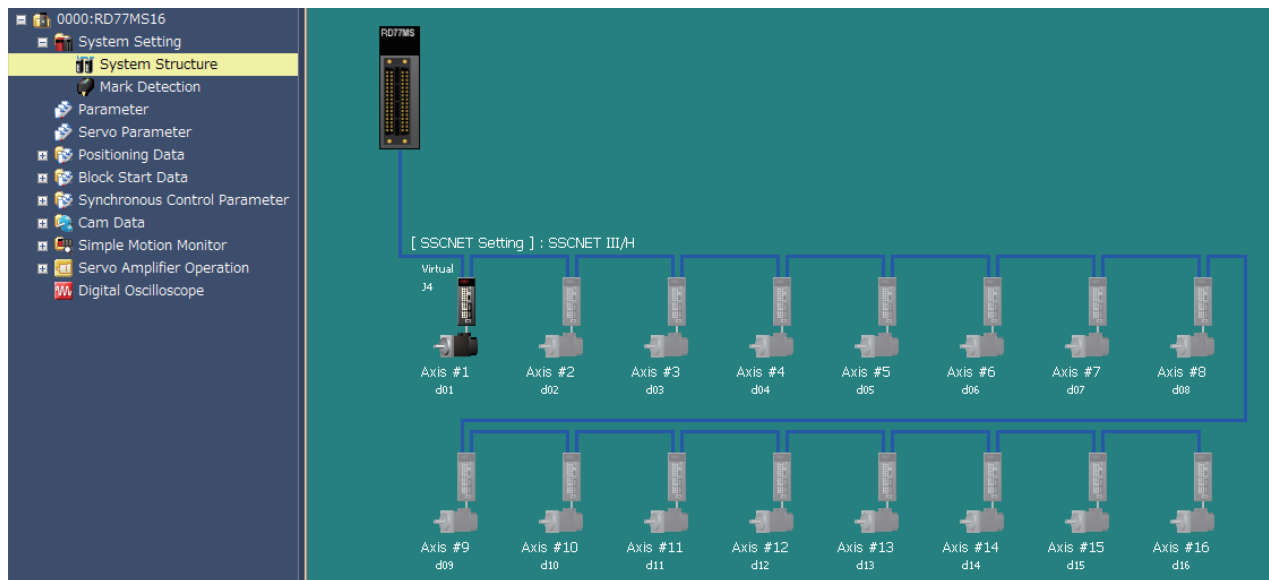
6

Initial setting details

Set the system setting, parameters and positioning data using the engineering tool.

■System setting

The system setting is shown below.



Parameters

The following table lists parameters. Use the default values for the setting items not listed here or the setting items for the axes not described here.

| Setting item | | Setting value (Axis 1) |
|---------------------------------------|---|---|
| Common parameters | [Pr.82] Forced stop valid/invalid selection | 1: Invalid |
| Basic parameters 1 | [Pr.1] Unit setting | 0: mm |
| | [Pr.2] Number of pulses per rotation | 4194304 pulses |
| | [Pr.3] Movement amount per rotation | 250000.0 μ m |
| Detailed parameters 1 | [Pr.22] Input signal logic selection: Lower limit | 1: Positive logic |
| | [Pr.22] Input signal logic selection: Upper limit | 1: Positive logic |
| | [Pr.116] FLS signal selection: input type | 2: Buffer memory |
| | [Pr.117] RLS signal selection: input type | 2: Buffer memory |
| | [Pr.118] DOG signal selection: input type | 2: Buffer memory |
| Home position return basic parameters | [Pr.46] Home position return speed | 50.00 mm/min |
| | [Pr.47] Creep speed | 15.00 mm/min |
| | [Pr.48] Home position return retry | 1: Retry home position return with limit switch |

Positioning data

The following table lists positioning data. Use the default values for the setting items not listed here or the setting items for the axes not described here.

| Setting item (Axis 1 Positioning data) | Setting value (Positioning data No.1) | Setting value (Positioning data No.2) | Setting value (Positioning data No.3) |
|--|--|---|---|
| Operation pattern | 0: Positioning complete | | |
| Control system | 01h: ABS Linear 1 1-axis linear control (ABS) | 06h: FWD V/P Speed-position switching control (forward run) | 08h: FWD P/V Position-speed switching control (forward run) |
| Axis to be interpolated | — | | |
| Acceleration time No. | 0: 1000 | | |
| Deceleration time No. | 0: 1000 | | |
| Positioning address | -10000.0 μ m | 2500.0 μ m | 2000.0 μ m |
| Arc address | — | | |
| Command speed | 20.00 mm/min | 180.00 mm/min | 180.00 mm/min |
| Dwell time | 300 ms | 0 ms | 300 ms |
| M code | 9843 | 0 | 0 |
| M code ON signal output timing | 0: Use the setting value of M code ON signal output timing | | |
| ABS direction in degrees | 0: Use the setting value of ABS direction setting at degree | | |
| Interpolation speed designation method | 0: Use the setting value of interpolation speed designation method | | |

List of labels to be used

The following table lists the labels used for the program examples in this section. I/O signals or buffer memory areas of the modules shown in the system configuration are described in the programs using the labels.

For details on the global labels, refer to the following.

📖 MELSEC iQ-R Programming Manual (Program Design)

■Module label

The following table lists the module labels of the Simple Motion module used for the program examples in this section.

| Device name | Device | Label name | Signal name |
|---------------------------|------------|--|---|
| | Axis 1 | | |
| I/O signals of the RD77 | X1 | RD77_1.bSynchronizationFlag | Synchronization flag |
| | DX1 | RD77_1.bSynchronizationFlag_D | Synchronization flag |
| | Y0 | RD77_1.bPLC_Ready | PLC READY |
| | Y1 | RD77_1.bAllAxisServoOn | All axis servo ON |
| Buffer memory of the RD77 | U0\G2417.3 | RD77_1.stnAxMntr_D[0].uStatus_D.3 | Axis 1 Home position return request flag |
| | U0\G2417.D | RD77_1.stnAxMntr_D[0].uStatus_D.D | Axis 1 Start complete |
| | U0\G2417.F | RD77_1.stnAxMntr_D[0].uStatus_D.F | Axis 1 Positioning complete |
| | U0\G4328 | RD77_1.stnAxCtrl1_D[0].uPV_NewSpeed_D | Axis 1 Speed-position switching enable flag |
| | U0\G4330 | RD77_1.stnAxCtrl1_D[0].uEnablePV_Switching_D | Axis 1 Position-speed switching control speed change register |
| | U0\G4332 | RD77_1.stnAxCtrl1_D[0].uEnableVP_Switching_D | Axis 1 Position-speed switching enable flag |

■Global label

The following table lists the global labels, which are created by a user if necessary, used for the program examples in this section. Set the following in the global label of the engineering tool.

| Device name | Setting details | | | | Application |
|--------------------------|--|-----------|------------|-----------------------|--|
| | Label name | Data type | Class | Assign (Device/Label) | |
| External input (command) | bInputOPRStartReq | Bit | VAR_GLOBAL | X23 | Machine home position return command |
| | bInputFastOPRStartReq | | | X24 | Fast home position return command |
| | bInputSetStartPositioningNoReq | | | X25 | Positioning start No. setting command |
| | bInputSpeedPositionSwitchingReq | | | X26 | Speed-position switching operation command |
| | bInputSpeedPositionSwitchingEnableReq | | | X27 | Speed-position switching enable command |
| | bInputSpeedPositionSwitchingDisableReq | | | X28 | Speed-position switching prohibit command |
| | bInputStartAdvancedPositioningReq | | | X2A | High-level positioning control start command |
| | bInputStartPositioningReq | | | X2B | Positioning start command |
| | bInputSetJogSpeedReq | | | X2D | JOG operation speed setting command |
| | bInputForwardJogStartReq | | | X2E | Forward run JOG |
| | bInputReverseJogStartReq | | | X2F | Reverse run JOG |
| | bInputPositionSpeedSwitchingReq | | | X40 | Position-speed switching operation command |
| | bInputPositionSpeedSwitchingEnableReq | | | X41 | Position-speed switching enable command |
| | bInputPositionSpeedSwitchingDisableReq | | | X42 | Position-speed switching prohibit command |
| | bInputChangePositionSpeedSwitchingSpeedReq | | | X43 | Speed change command |
| | bAllAxisServoOnReq | | | X4F | All axis servo ON command |

| Device name | Setting details | | | | Application |
|---|----------------------------|---|------------|-----------------------|---|
| | Label name | Data type | Class | Assign (Device/Label) | |
| Internal relay, data device ^{*1} | bABRSTReq | Bit | VAR_GLOBAL | — | Absolute position restoration command |
| | bBasicParamSetComp | | | | Basic parameter 1 setting complete |
| | bDuringJogInchingOperation | | | | In-JOG/Inching operation flag |
| | bDuringMPGOperation | | | | Manual pulse generator operating flag |
| | bFastOPRStartReq | | | | Fast home position return command |
| | bFastOPRStartReq_H | | | | Fast home position return command storage |
| | bInitializeParameterReq | | | | Parameter initialization command |
| | bJOG_bENO | | | | Execution status (JOG/Inching FB) |
| | bJOG_bErr | | | | Error completion (JOG/Inching FB) |
| | bJOG_bOK | | | | Normal termination (JOG/Inching FB) |
| | bOPRParamSetComp | | | | Home position return basic parameter setting complete |
| | bPositioningStartReq | | | | Positioning start command |
| | bStartPositioning_bENO | | | | Execution status (Positioning start FB) |
| | bStartPositioning_bErr | | | | Error completion (Positioning start FB) |
| | bStartPositioning_bOK | | | | Normal termination (Positioning start FB) |
| | bWriteFlashReq | | | | Flash ROM write command |
| | udJogOperationSpeed | Double Word [Unsigned]/ Bit String [32-bit] | | | JOG operation speed |
| | udMovementAmount | | | | Speed-position switching control movement amount |
| | udSpeed | Double Word [Signed] | | | Position-speed switching control speed |
| | uInchingMovementAmount | Double Word [Unsigned]/ Bit String [32-bit] | | | Inching movement amount |
| | uJOG_uErrId | | | | Error code (JOG/Inching FB) |
| | uPositioningStartNo | | | | Positioning start No. |
| | uStartPositioning_uErrId | | | | Error code (Positioning start FB) |

*1 The settings of Assign (Device/Label) are not required because the unused internal relay and data device are automatically assigned.

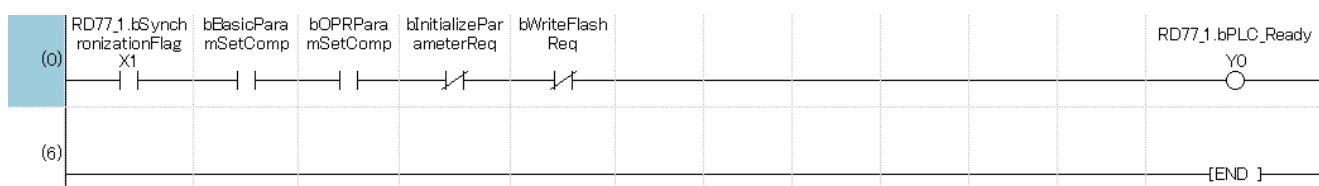
Program example

The program examples use the module function blocks (FBs) and module labels displayed in "Module POU".

For details on module function blocks, refer to the following.

📖 MELSEC iQ-R Simple Motion Module Function Block Reference

■PLC READY signal [Y0] ON program



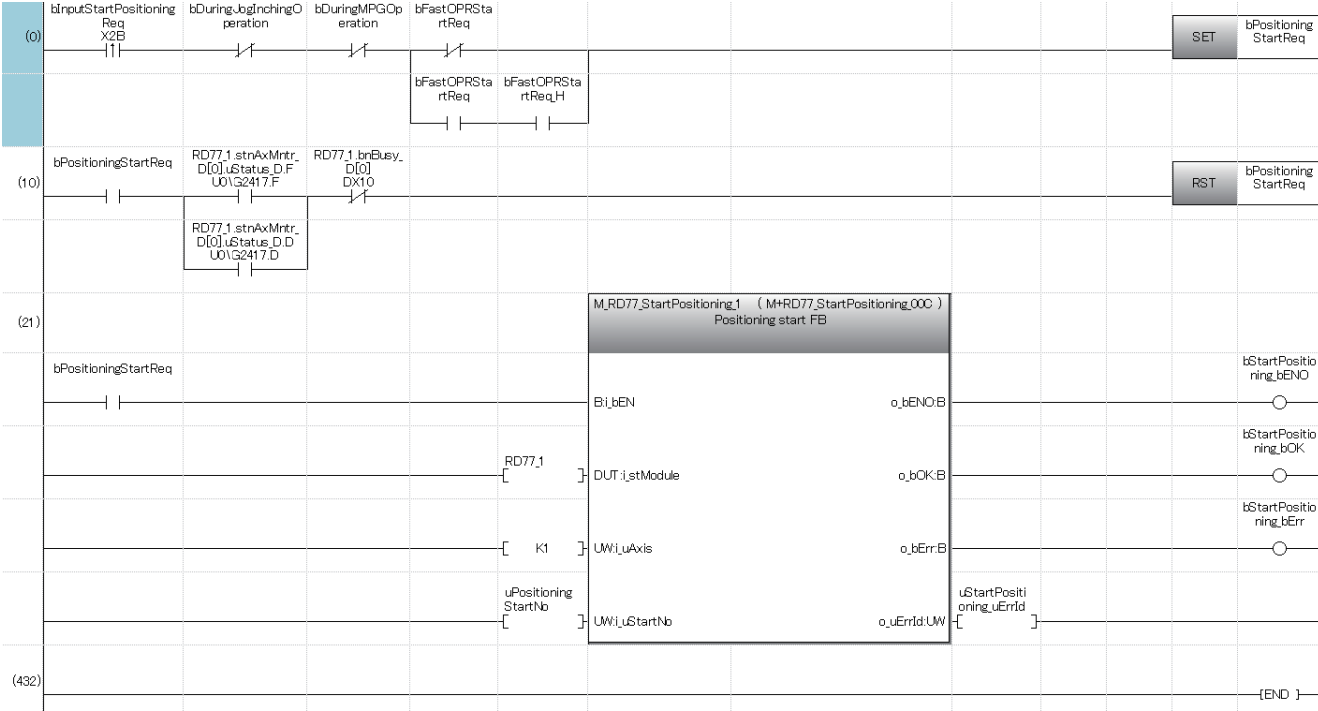
■All axis servo ON signal [Y1] ON program



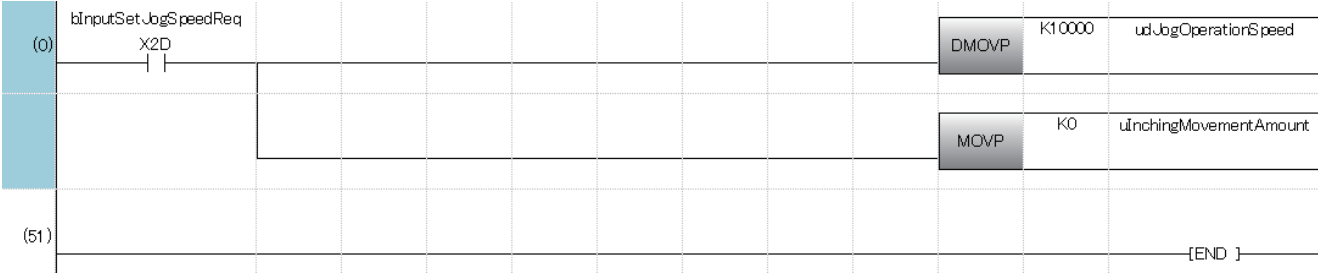
■Positioning start No. setting program

| Address | Input | Output | Function | Parameter |
|---------|--|-------------------------------|----------|--|
| (0) | blInputOPRStartReq X23 | | MOV | K9001 uPositioningStartNb |
| (34) | blInputFastOPRStartReq X24 | RD77.1.stnAxMntr[0].uStatus.3 | SET | bFastOPRStartReq |
| | | | MOV | K9002 uPositioningStartNb |
| | | | SET | bFastOPRStartReq.H |
| (91) | blInputSetStartPositioningNbReq X25 | | MOV | K1 uPositioningStartNb |
| (112) | blInputSpeedPositionSwitchingReq X26 | | MOV | K2 uPositioningStartNb |
| (133) | blInputSpeedPositionSwitchingEnable Req X27 | | MOV | K1 RD77.1.stnAxCtrl1_D[0].uEnableVP_Switching_D UC\G4328 |
| (157) | blInputSpeedPositionSwitchingDisable Req X28 | | MOV | K0 RD77.1.stnAxCtrl1_D[0].uEnableVP_Switching_D UC\G4328 |
| (181) | blInputChangeSpeedPositionSwitching MovementAmount X29 | | DMOV | uMovementAmount RD77.1.stnAxCtrl1_D [0].uVP_NewMovementAmount_D UC\G4326 |
| (200) | blInputPositionSpeedSwitchingReq X40 | | MOV | K3 uPositioningStartNb |
| (221) | blInputPositionSpeedSwitchingEnable Req X41 | | MOV | K1 RD77.1.stnAxCtrl1_D[0].uEnablePV_Switching_D UC\G4332 |
| (245) | blInputPositionSpeedSwitchingDisable Req X42 | | MOV | K0 RD77.1.stnAxCtrl1_D[0].uEnablePV_Switching_D UC\G4332 |
| (269) | blInputChangePositionSpeedSwitching SpeedReq X43 | | DMOV | uSpeed RD77.1.stnAxCtrl1_D[0].uPV_NewSpeed_D UC\G4330 |
| (286) | blInputStartAdvancedPositioningReq X2A | | MOV | K7000 uPositioningStartNb |
| (311) | blInputOPRStartReq X23 | | RST | bFastOPRStartReq |
| | blInputSetStartPositioningNbReq X25 | | RST | bFastOPRStartReq.H |
| | blInputSpeedPositionSwitchingReq X26 | | | |
| | blInputPositionSpeedSwitchingReq X40 | | | |
| | blInputStartAdvancedPositioningReq X2A | | | |
| | bPositioningStartReq | | | |
| (351) | | | | [END] |

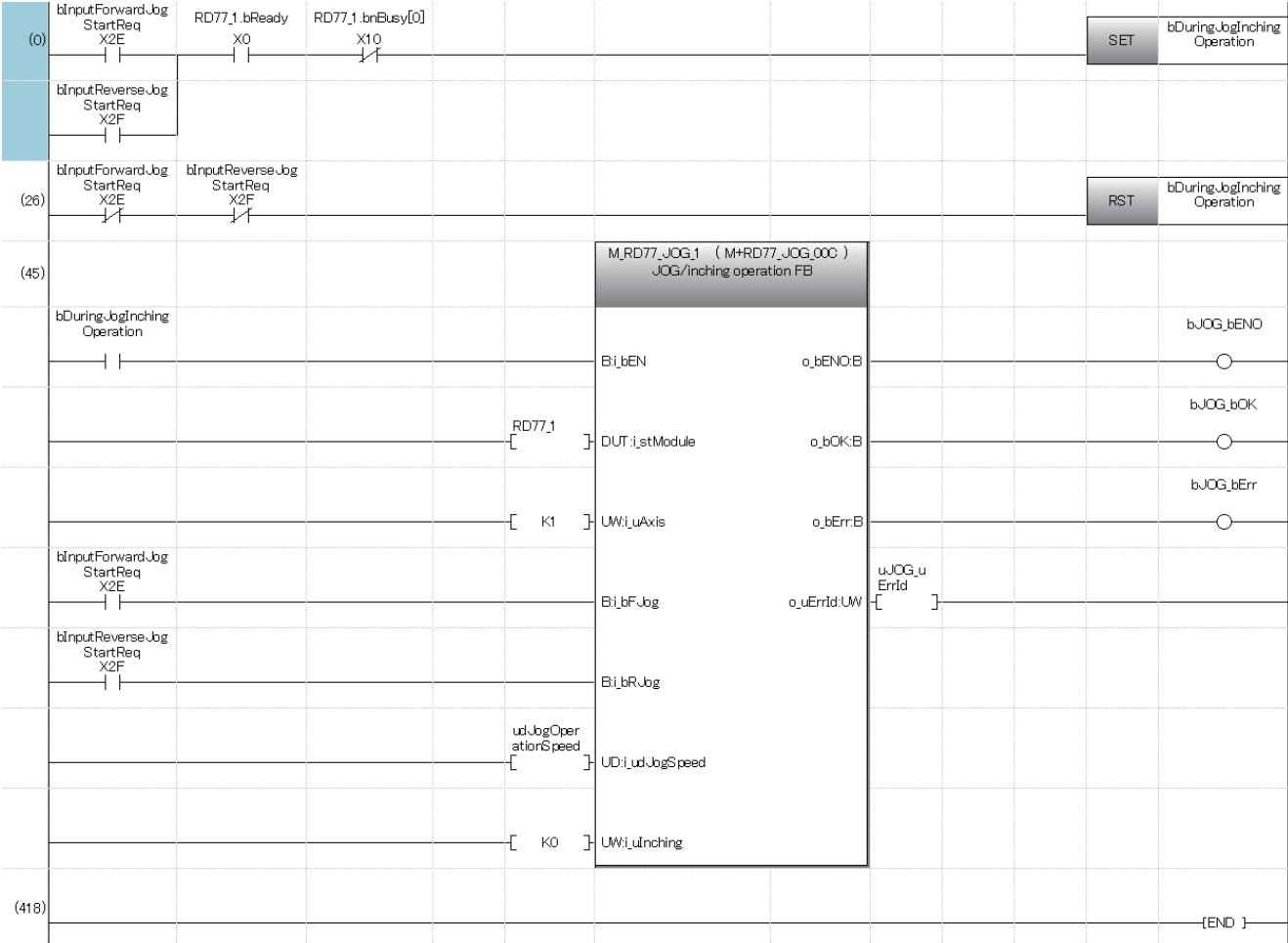
■Positioning start program



■JOG operation setting program



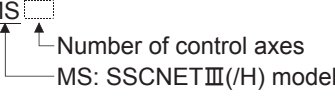
JOG operation execution program



APPENDICES

Appendix 1 Component List

The positioning system using the Simple Motion module is configured of the following devices.

| No. | Part name | Type | Remarks |
|-----|-----------------------------|----------|--|
| 1 | Simple Motion module | RD77MS2 |  |
| | | RD77MS4 | |
| | | RD77MS8 | |
| | | RD77MS16 | |
| 2 | Servo amplifier | — | — |
| 3 | Manual pulse generator | — | Recommended: MR-HDP01 (Manufactured by Mitsubishi Electric Corporation) Operation has been checked: UFO-M2-0025-2Z1-B00E (Manufactured by Nemicon Corporation) RE45BA2R5C (Manufactured by Tokyo Sokuteikizai Co., Ltd.) |
| 4 | SSCNETⅢ cable | — | Cables are needed for connecting the Simple Motion module with a servo amplifier, or between servo amplifiers. (☞ Page 62 Reference product) |
| 5 | External input signal cable | — | Cables are needed for connecting the Simple Motion module with an external device. (Prepare them referring to the manuals for the connected devices and information given in the following. ☞ Page 48 Signal layout for external input connection connector) |

Reference product

Connection cable

The cables for connecting between the Simple Motion module and servo amplifiers. Refer to each servo amplifier instruction manual for details.

[SSCNETⅢ cable]

_ = Cable length

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

| Model name | | Cable length [m (ft.)] | Description |
|--|---------------|---------------------------|---|
| MR-J3BUS_M (Standard cord for inside panel) | MR-J3BUS015M | 0.15 (0.49) | • Simple Motion module ↔ MR-J4(W)-B/MR-JE-B/MR-J3(W)-B • MR-J4(W)-B/MR-JE-B/MR-J3(W)-B ↔ MR-J4(W)-B/MR-JE-B/MR-J3(W)-B |
| | MR-J3BUS03M | 0.3 (0.98) | |
| | MR-J3BUS05M | 0.5 (1.64) | |
| | MR-J3BUS1M | 1 (3.28) | |
| | MR-J3BUS3M | 3 (9.84) | |
| MR-J3BUS_M-A (Standard cable for outside panel) | MR-J3BUS5M-A | 5 (16.40) | |
| | MR-J3BUS10M-A | 10 (32.81) | |
| | MR-J3BUS20M-A | 20 (65.62) | |
| MR-J3BUS_M-B (Long distance cable) | MR-J3BUS30M-B | 30 (98.43) | |
| | MR-J3BUS40M-B | 40 (131.23) | |
| | MR-J3BUS50M-B | 50 (164.04) | |

Connection connector

The connector for the external input wiring.

[External input wiring connector]

| Part name | Specification |
|----------------------|---|
| Applicable connector | A6CON1, A6CON2, A6CON4 (Sold separately) |
| Applicable wire size | 0.3 mm ² (When A6CON1 and A6CON4 are used), 28 AWG to 24 AWG (When A6CON2 is used) |

Specifications of recommended manual pulse generator

| Item | Specification |
|---------------------------|--|
| Model name | MR-HDP01 |
| Ambient temperature | -10 to 60°C (14 to 140 °F) |
| Pulse resolution | 25 pulses/rev (100 pulses/rev after magnification by 4) |
| Output method | Voltage-output, Output current Max. 20 mA |
| Power supply voltage | 4.5 to 13.2 V DC |
| Current consumption | 60 mA |
| Output level | "H" level: Power supply voltage ^{*1} - 1 V or more (in no load) "L" level: 0.5 V or less (with maximum leading-in) |
| Life time | 1000000 revolutions (at 200 r/min) |
| Permitted axial loads | Radial load: Max. 19.6 N Thrust load: Max. 9.8 N |
| Weight | 0.4 [kg] |
| Number of max. revolution | Instantaneous Max. 600 r/min. normal 200 r/min |
| Pulse signal status | 2 signals: A phase, B phase, 90° phase difference |
| Start friction torque | 0.06 N·m (20°C (68°F)) |

*1 If a separate power supply is used, use a stabilized power supply of voltage 5 V DC \pm 0.25 V.

Manual pulse generator that the operation has been checked

| Manufacturer | Model name |
|--|----------------------|
| Nemicon Corporation ^{*1} | UFO-M2-0025-2Z1-B00E |
| Tokyo Sokuteikizai Co., Ltd. ^{*2} | RE45BA2R5C |

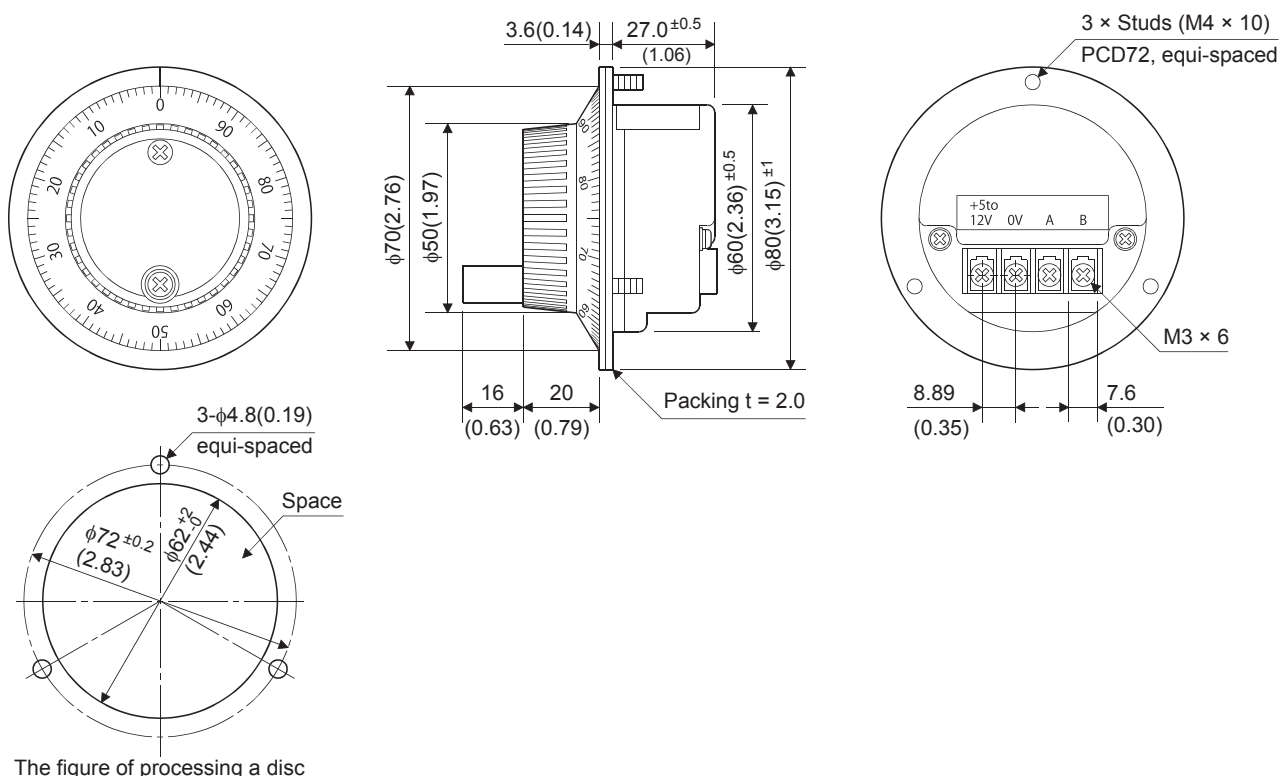
*1 Contact: <http://www.nemicon.co.jp/nemicon/>

*2 Contact: <http://www.tosoku-inc.co.jp/>

External dimension drawing of manual pulse generator

MR-HDP01 (Manufactured by Mitsubishi Electric Corporation)

[Unit: mm (inch)]



Serial absolute synchronous encoder specifications

| Item | Specifications |
|--|---|
| Model name | Q171ENC-W8* ¹ |
| Ambient temperature | -5 to 55°C (23 to 131°F) |
| Resolution | 4194304 pulses/rev |
| Transmission method | Serial communications (Connected to MR-J4-_B-RJ) |
| Direction of increasing addresses | CCW (viewed from end of shaft) |
| Protective construction | Dustproof/Waterproof (IP67: Except for the shaft-through portion.) |
| Permitted speed at power ON | 3600 r/min |
| Permitted speed at power OFF* ² | 500 r/min |
| Permitted axial loads | Radial load: Up to 19.6 N, Thrust load: Up to 9.8 N |
| Runout at input shaft tip | 0.02 mm (0.00079 inch) or less, (15 mm (0.59 inch) from tip) |
| Start friction torque | 0.04 N•m (20°C (68°F)) |
| Recommended coupling | Bellows coupling |
| Permitted angular acceleration | 40000 rad/s ² |
| Vibration resistance | 5 G (50 to 200 Hz) |
| Shock resistance | 50 G (11 ms or less) |
| Internal current consumption [A] | 0.2 |
| Mass [kg] | 0.6 |
| Connecting cable [m (ft.)] | Q170ENCCBL_M (_ = Cable length: 2 (6.56), 5 (16.40), 10 (32.81), 20 (65.62), 30 (98.43), 50 (164.04)) |
| Communications method | Differential driver/receiver |
| Transmission distance | Up to 50 m (164.04 ft.) |

*1 When "o-ring" is required, please purchase separately by a customer.

*2 If it exceeds a permitted speed at power OFF, a position displacement is generated.

Specifications of serial absolute synchronous encoder input (CN2L) of servo amplifier

| Item | Specifications |
|--|--|
| Applicable types | Q171ENC-W8 |
| 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 | 2.5 Mbps |
| Position detection method | Absolute (ABS) method |
| Resolution | 4194304 pulses/rev (22 bit) |
| Number of modules | 1/module (MR-J4-_B-RJ) |
| External connector type | 20 pin connector |
| Applicable connector for the external connection | MR-J3CN2 (Optional) |
| Applicable wire | J14B103715-00 12 pairs |
| Connecting cable [m (ft.)] | Q170ENCCBL_M-A (_ = Cable length: 2 (6.56), 5 (16.40), 10 (32.81), 20 (65.62), 30 (98.43), 50 (164.04)) |
| Cable length | Up to 50 m (164.04 ft.) |
| Back up the absolute position. | Depends on the battery (MR-BAT6V1SET). |
| Battery service life time (value in actual) | 10000 [h] (When MR-BAT6V1SET is used while the device is turned OFF at the ambient temperature of 25°C (77°F)) |

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 by a customer side.

■ Selection

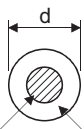
The following table indicates the serial absolute synchronous encoder cables used with the serial absolute synchronous encoder. Connector sets (MR-J3CN2) are also available for your fabrication.

| Cable model | Cable length [m (ft.)] | Wire model |
|----------------|---|--------------------------------|
| Q170ENCCBL_M-A | 2 (6.56), 5 (16.40), 10 (32.81), 20 (65.62), 30 (98.43), 50 (164.04) | J14B103715-00 12 pairs (BLACK) |

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

| Connector sets type | | Description | | | | |
|--------------------------------|------------------------------|---------------------------|--------------------------------|--------------------------------------|---|--------------------------------|
| MR-J3CN2 | | Servo amplifier connector | | | | |
| Wire model | Core size [mm ²] | Number of cores | Characteristics of one core | | | Finished OD [mm] ^{*2} |
| | | | Structure [Number of wires/mm] | Conductor resistance [Ω /km] | Insulating sheath OD d [mm] ^{*1} | |
| J14B103715-00 12 pairs (BLACK) | 0.2 | 24 (12 pairs) | 40/0.08 | 105 or less | 0.88 | 9.0 |

*1 d is as shown below.



Conductor Insulation sheath

*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.

■Q170ENCCBL_M-A

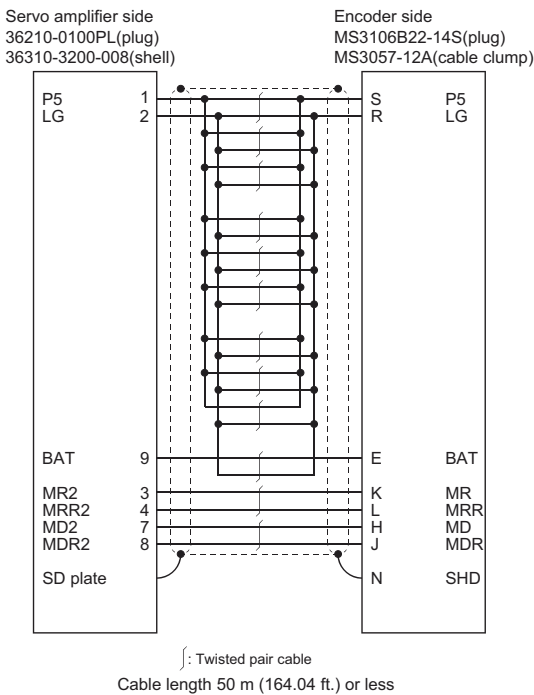
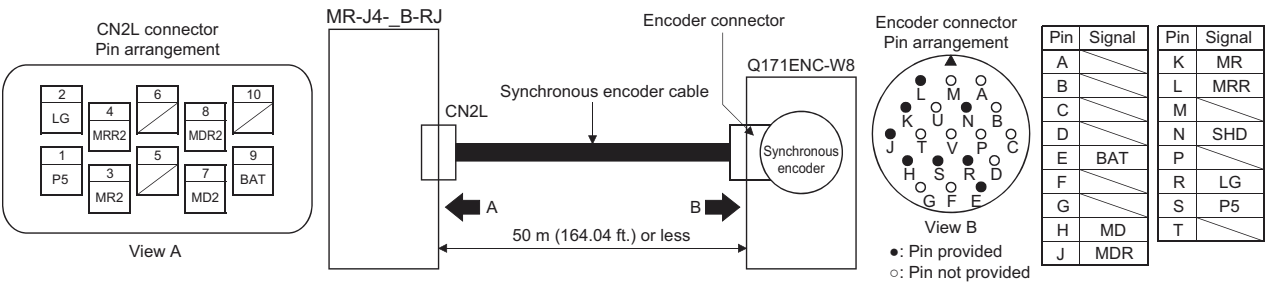
- Model explanation

Type: Q170ENCCBL_M - A

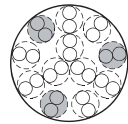
| Symbol | Cable length [m (ft.)] |
|--------|------------------------|
| 2 | 2 (6.56) |
| 5 | 5 (16.40) |
| 10 | 10 (32.81) |
| 20 | 20 (65.62) |
| 30 | 30 (98.43) |
| 50 | 50 (164.04) |

- Connection diagram

When fabricating a cable, use the recommended wire and connector set MR-J3CN2 for encoder cable given above, and make the cable as shown in the following connection diagram. Maximum cable length is 50 m (164.04 ft.).



*: Layout twisted pair for signal to avoid contact.



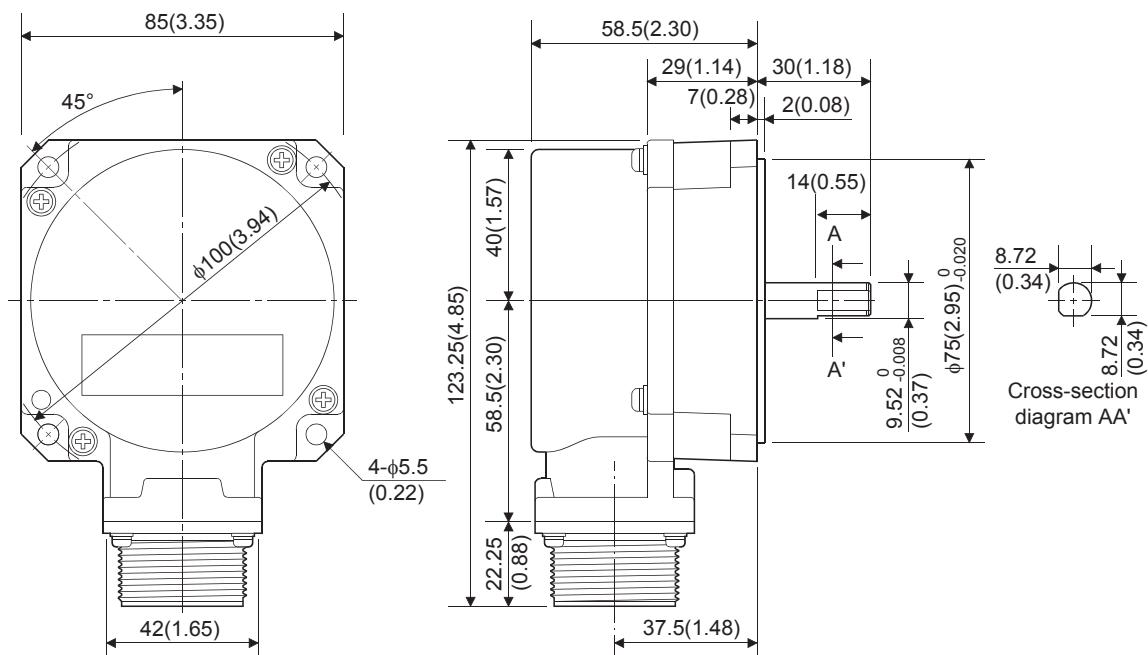
- : Twisted pair for signal (BAT/LG, MR/MRR, MD/MDR)
- : Twisted pair (P5/LG)

Cable cross-section diagram

External dimension drawing of serial absolute synchronous encoder

■Serial absolute synchronous encoder (Q171ENC-W8)

[Unit: mm (inch)]



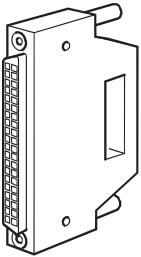
Appendix 2 Connection with External Devices

Connector

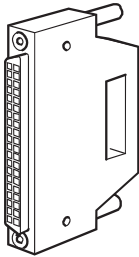
Mounted onto an external input connection connector of the Simple Motion module and used for wiring an external device. The "external device connector" includes the following 3 types.

Appearance

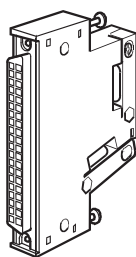
A6CON1



A6CON2



A6CON4



Connector type

| Type | Model |
|---|-----------|
| | Connector |
| Soldering type, useable for straight out | A6CON1 |
| Crimp-contact type, useable for straight out | A6CON2 |
| Soldering type, useable for straight out and diagonal out | A6CON4 |

Specifications of the connector

| Part name | Specification | |
|----------------------|---------------------|------------------|
| Applicable connector | A6CON1, A6CON4 | A6CON2 |
| Applicable wire size | 0.3 mm ² | 28 AWG to 24 AWG |

*1 The external input wiring connector has been prepared. Please purchase them by a customer.

Specialized tool

- Pressure-bonding tool for A6CON2

Model name:

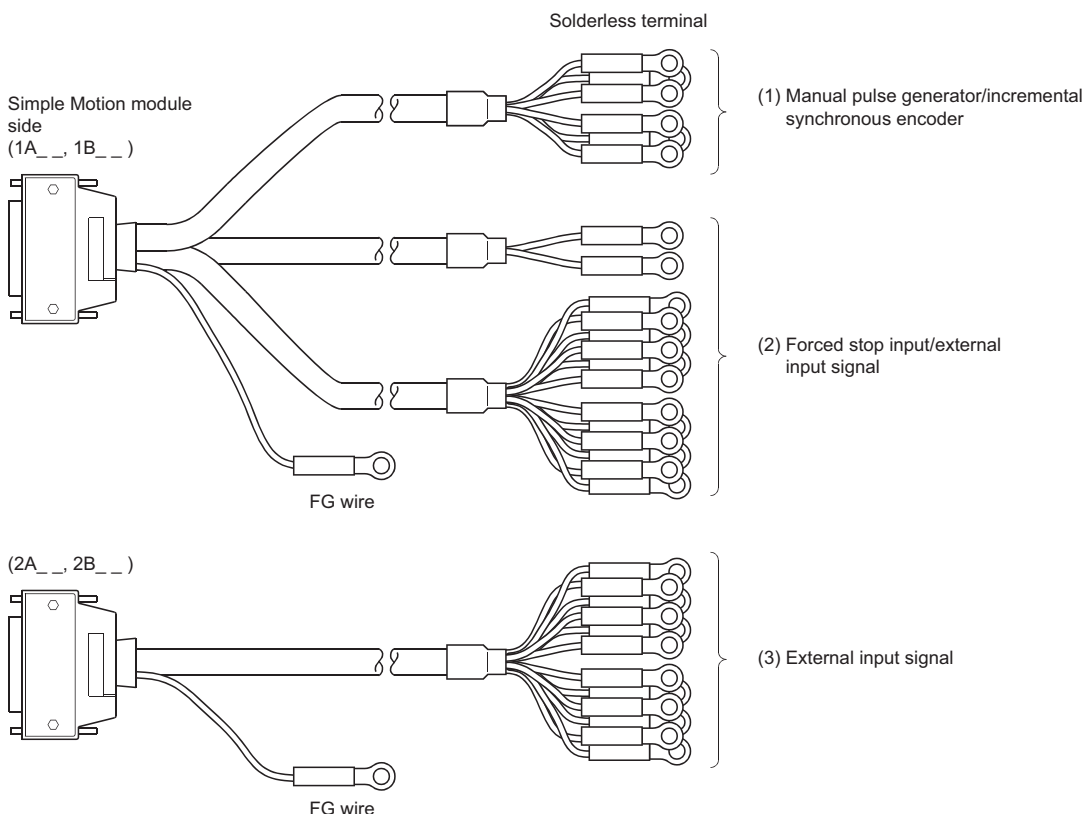
FCN-363T-T005/H

- Contact for the specialized tool

Fujitsu component LTD.: <http://www.fcl.fujitsu.com/>

External input signal cable

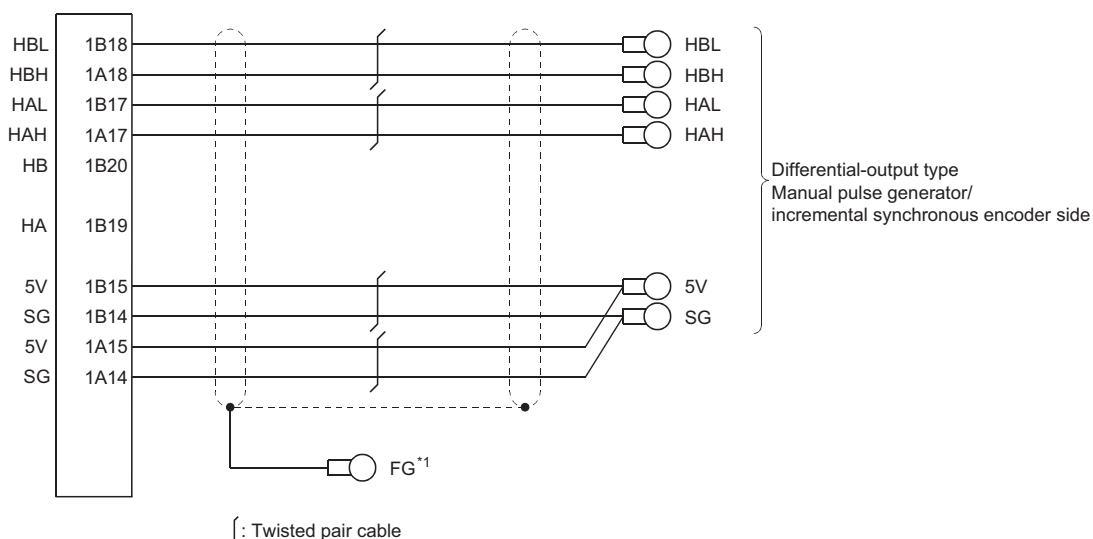
The external input signal cable is not prepared as an option. Fabricate the cable on the customer side.
Make the cable as shown in the following connection diagram.



Manual pulse generator/incremental synchronous encoder

■Differential-output type

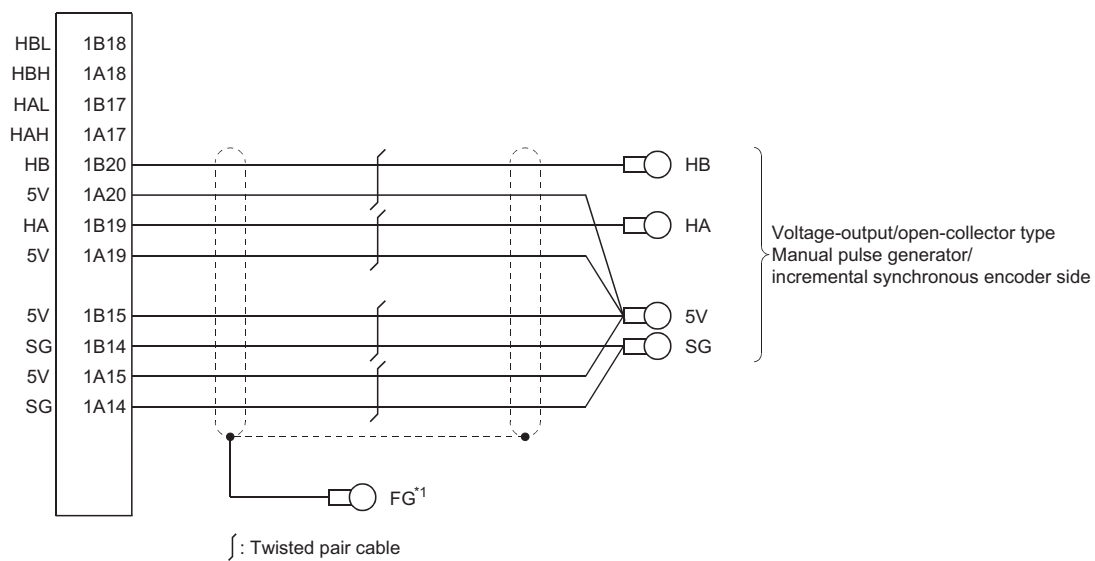
Make the cable within 30 m (98.43 ft.).



*1 Ground FG terminal on the used equipment side. Also, connect it to the shell of connector side.

■ Voltage-output/Open-collector type

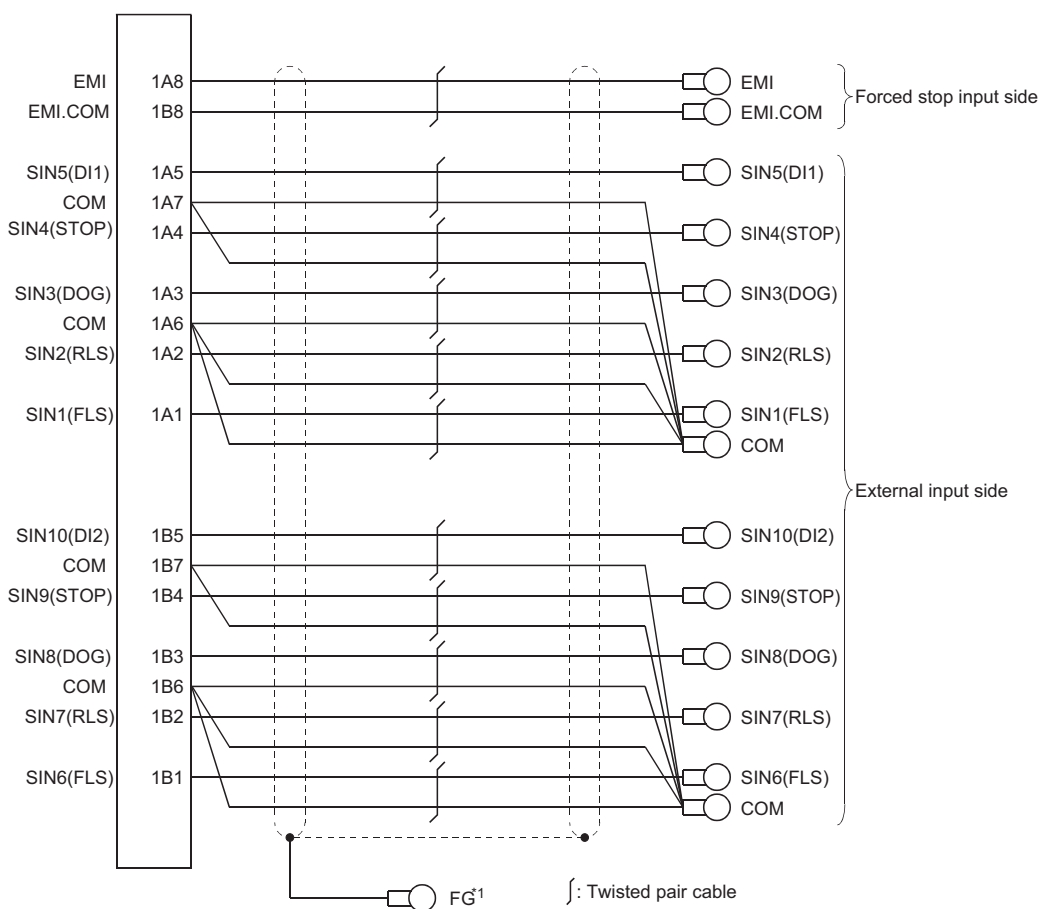
Make the cable within 10 m (32.81 ft.).



Forced stop input/ External input signal

The following connection diagram shows an example using the assignment below. The assignment can be changed arbitrarily.

| Input signal | External input signal |
|--------------|-----------------------|
| SIN1 | FLS |
| SIN2 | RLS |
| SIN3 | DOG |
| SIN4 | STOP |
| SIN5 | DI1 |
| SIN6 | FLS |
| SIN7 | RLS |
| SIN8 | DOG |
| SIN9 | STOP |
| SIN10 | DI2 |

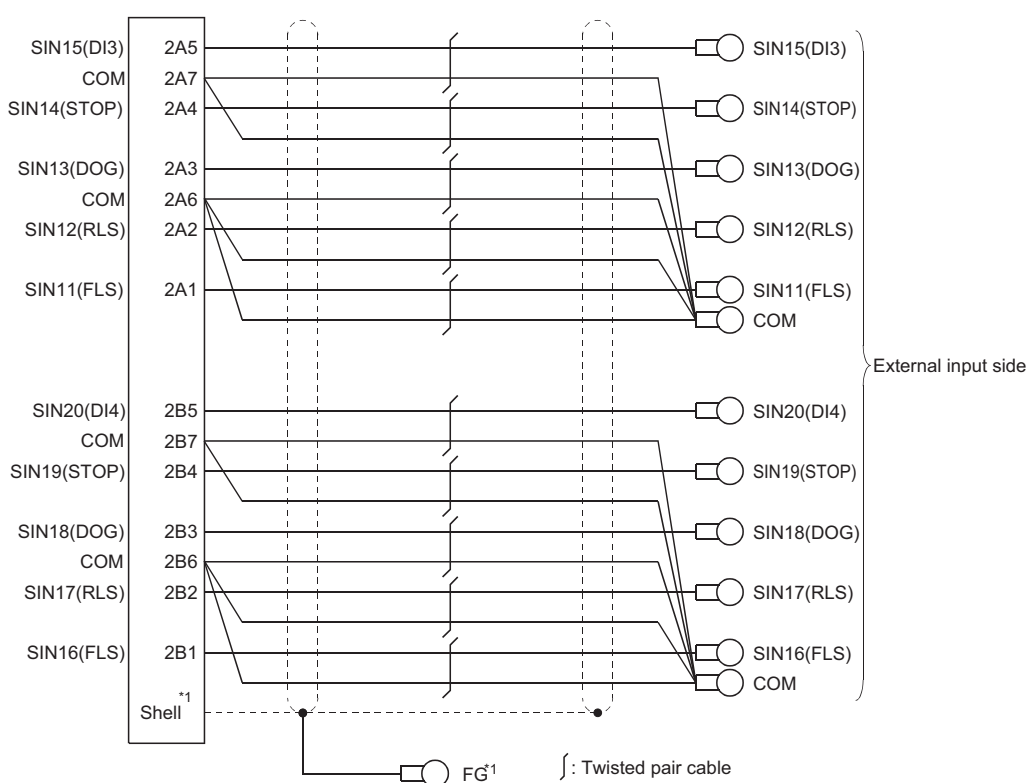


*1 Ground FG terminal on the used equipment side. Also, connect it to the shell of connector side.

External input signal

The following connection diagram shows an example using the assignment below. The assignment can be changed arbitrarily.

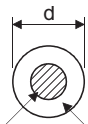
| Input signal | External input signal |
|--------------|-----------------------|
| SIN11 | FLS |
| SIN12 | RLS |
| SIN13 | DOG |
| SIN14 | STOP |
| SIN15 | DI3 |
| SIN16 | FLS |
| SIN17 | RLS |
| SIN18 | DOG |
| SIN19 | STOP |
| SIN20 | DI4 |



- The following table indicates the external input wiring connector cables. Make selection according to your operating conditions.

| Wire model | Core size [mm ²] | Number of cores | Characteristics of one core | | | Finish OD [mm] ^{*2} |
|----------------------------|------------------------------|-----------------|--------------------------------|--------------------------------------|---|------------------------------|
| | | | Structure [Number of wires/mm] | Conductor resistance [Ω /km] | Insulating sheath OD d [mm] ^{*1} | |
| 17/0.16 1P SRV-SV(2464)-K | 0.3 | 2 (1 pairs) | 17/0.16 | 57.5 | 0.77 | 5.3 |
| 17/0.16 4P SRV-SV(2464)-K | 0.3 | 8 (4 pairs) | 17/0.16 | 57.5 | 0.77 | 7.6 |
| 17/0.16 10P SRV-SV(2464)-K | 0.3 | 20 (10 pairs) | 17/0.16 | 57.5 | 0.77 | 10.0 |

*1 d is as shown below.



Conductor Insulation sheath

*2 Standard OD. Max. OD is about 10% larger.



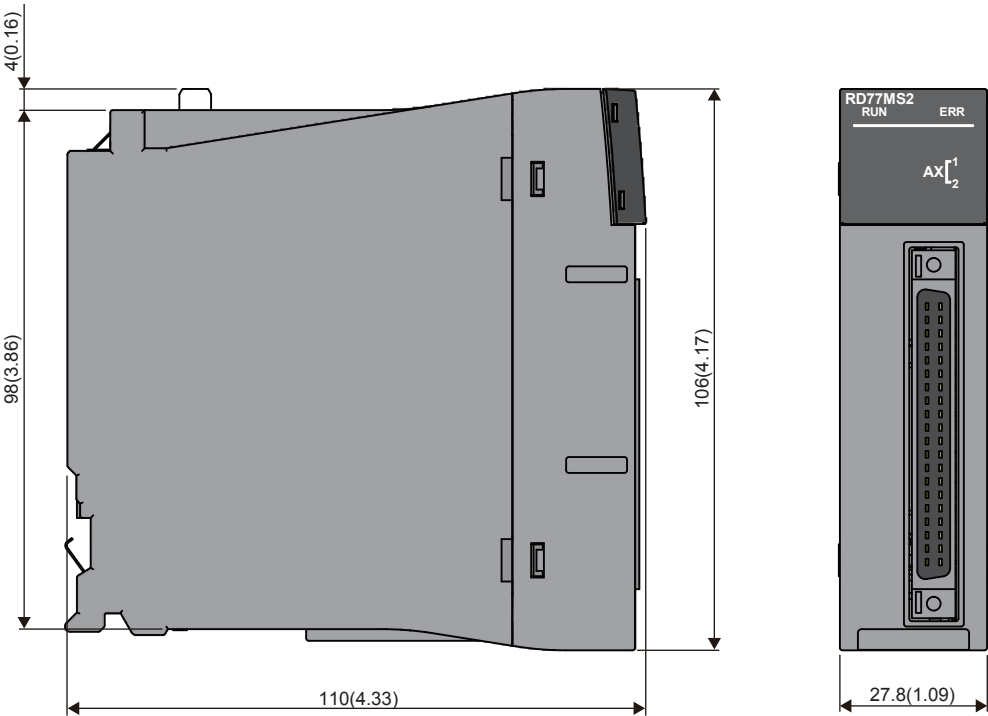
CAUTION

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

Appendix 3 External Dimensions

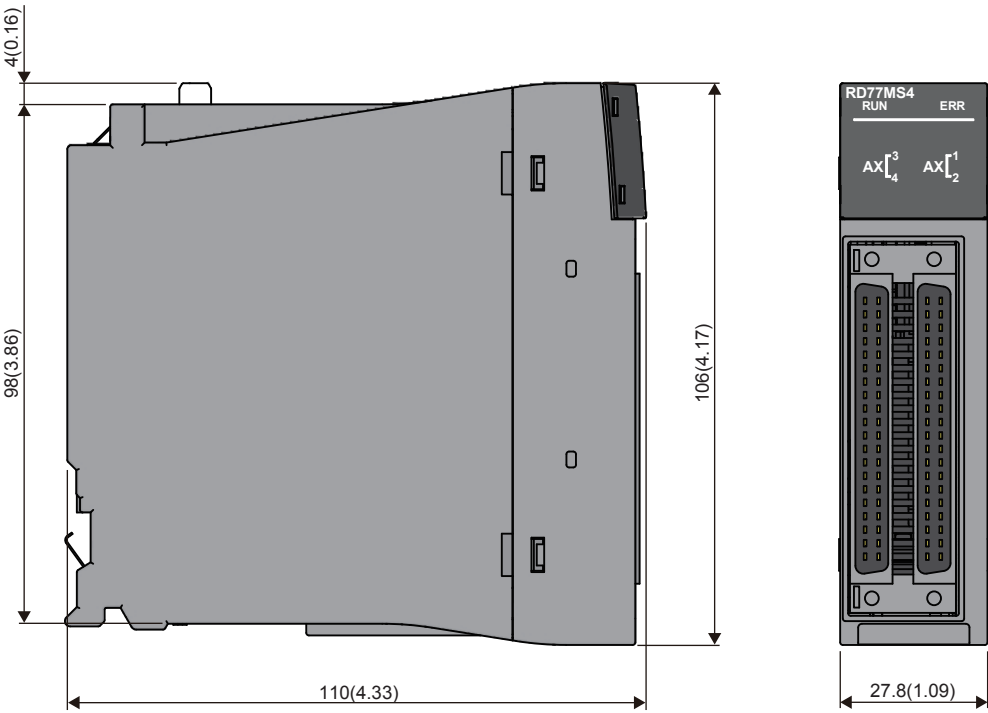
RD77MS2

[Unit: mm(inch)]



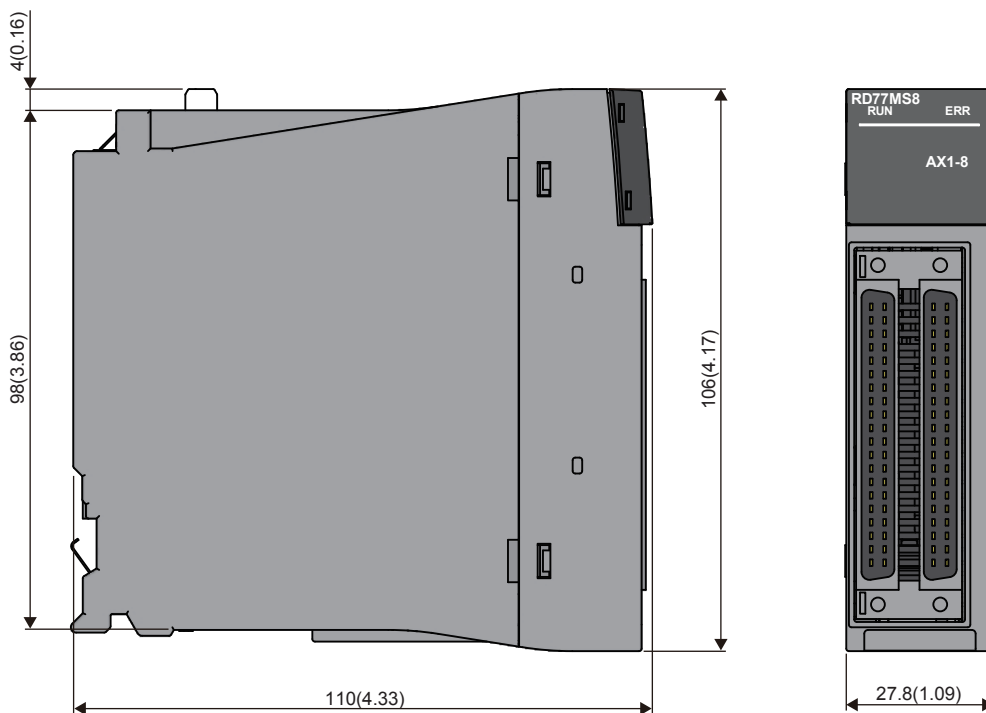
RD77MS4

[Unit: mm(inch)]

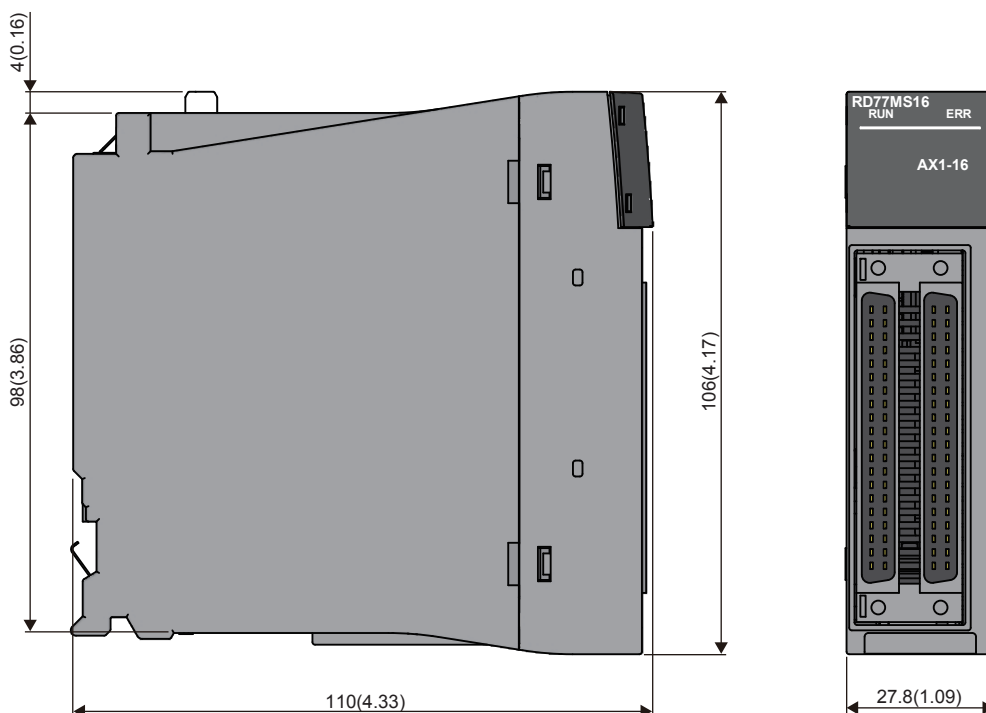


RD77MS8

[Unit: mm(inch)]

**RD77MS16**

[Unit: mm(inch)]



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REVISIONS

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

| Revision date | *Manual number | Description |
|---------------|------------------|--|
| June 2014 | IB(NA)-0300245-A | First edition |
| February 2015 | IB(NA)-0300245-B | ■Added functions 3-axis helical interpolation control, Inter-module synchronization function, Online module change, Hot line forced stop function ■Added or modified parts RELEVANT MANUALS, TERMS, PERIPHERALS, Section 1.1, 2.1, 2.2, 2.3, 3.2, 3.3, 3.4, Chapter 4, Section 5.1, 5.2, Chapter 6, Appendix 1, 2 |

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