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MITSUBISHI ELECTRIC
Changes for the Better

MITSUBISHI ELECTRIC SERVO SYSTEM CONTROLLER

Migration Guide from Positioning Module to Simple Motion Module [QD74MH ⇒ RD77MS]

● 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 MELSEC iQ-R Module Configuration Manual 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) Emergency stop circuits, protection circuits, and protective interlock circuits for conflicting operations (such as forward/reverse rotations or upper/lower limit positioning) must be configured external to the programmable controller.
  (2) When the programmable controller detects an abnormal condition, it stops the operation and all outputs are:
  • 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) 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 "General Safety Requirements" in the MELSEC iQ-R Module Configuration Manual.
  (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.
- 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.

[Design Precautions]

⚠WARNING

- 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 proximity 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 rapidly 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 the module 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.)

[Design Precautions]

⚠WARNING

- 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 reset the CPU module while the settings are being written. Doing so will make the data in the flash ROM and SD memory card undefined. The values need to be set in the buffer memory and written to the flash ROM and SD memory card again. Doing so also may cause malfunction or failure of the module.
- When changing the operating status of the CPU module from external devices (such as the remote RUN/STOP functions), select "Do Not Open in Program" for "Opening Method Setting" in the module parameters. If "Open in Program" is selected, an execution of the remote STOP function causes the communication line to close. Consequently, the CPU module cannot reopen the communication line, and external devices cannot execute the remote RUN functions.

[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 Safety Guidelines included with 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 interconnection may cause malfunction, failure, or drop of the module.
- To mount a module with no module fixing hook, place the concave part(s) located at the bottom onto the guide(s) of the base unit, push in the module, and fix it with screw(s). Incorrect interconnection 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 malfunction.
- When using an SD memory card, fully insert it into the SD 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 the 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 can 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 cause the module to fail or malfunction.
- 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 ohms 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 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. Doing so may change the characteristics of the cables, resulting in malfunction.
- 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.
- 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 user's manual for the module used. 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 will cause the battery to produce heat, explode, ignite, or leak, resulting in injury and 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.

[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 theentire 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 Handy-phone System) more than 25 cm away in all directions from the programmable controller. Failure to do so may cause malfunction.

[Startup and Maintenance Precautions]

⚠CAUTION

- 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 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 of the module.
- Do not touch the integrated circuits on the circuit board of an extended SRAM cassette. Doing so may cause malfunction or failure of the module.
- 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.
- 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 position 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 and SD memory card undefined. The values need to be set in the buffer memory and written to the flash ROM and SD memory card again. Doing so also may 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.

REVISIONS

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INTRODUCTION

Please read this manual carefully so that equipment is used to its optimum.

CONTENTS

MEMO

1. OVERVIEW OF MIGRATION FROM QD74MH TO RD77MS

1.1 Benefits of Migration

Migrating from the existing system using QD74MH Positioning modules to a new system using MELSEC iQ-R series Simple Motion module RD77MS16/RD77MS8 (hereinafter called RD77MS) is recommended. We also recommend migrating servo amplifiers to the MR-J4 series at the same time.
Migrating not only allows the system to run for longer periods, but also has the following advantages.

(1) High functionality of Positioning module (Simple Motion module)
The Simple Motion module achieves further advanced motion control with a wide variety of motion control functions such as synchronous control, in addition to positioning control.
The replaced model offers various new auxiliary features including cam detection function and cam auto generation function, helping to reduce programming time further.
→ Increased productivity from higher functionality of the controller

(2) High-speed communication by SSCNETIII/H
Speeding up and improving noise tolerance of servo system network communications are achieved by optical communication. A long distance cable of 100 m can be also used.
→ Increased speeds over the entire facility

(3) Servo amplifier MR-J4 and servo motor
The MR-J4 series achieves high performance operation with a variety of functions including one-touch tuning, a 22-bit high resolution encoder (4194304 pulse/rev), and 2.5 kHz speed frequency response. The product lineup includes multi-axis servo amplifiers that contribute to energy saving, space saving, and reduced wiring of a machine. The MR-J4 series compatible rotary servo motor, HG series enables to output high torque at high speed. Linear servo motors and direct drive motors are also available. Select the motor type according to your application from our extensive product lineup.
→ Increase of applications, improved performance, energy saving, downsizing, and reduced wiring of drive systems

(4) Reliable monitoring functions
With our engineering software, the system status is easily monitored just by selecting monitoring items that your system needs from its wealth of monitoring information.
In addition, operation is checked through waveforms and each device data collected by digital oscilloscope and GX Logviewer
→ A strong support for troubleshooting

(5) Lower maintenance cost
After 5 years of usage, the products will need maintenance, such as replacement of the whole circuit board due to the life of components including electrolytic capacitors and memories.
To use the system the longest possible, an early migration to the latest model is recommended in terms of performance and quality.
→ Increased equipment longevity

1.2 Main Target Models for Migration

The main target models for replacement described in this section are as follows.

(1) Positioning modules

Product name	Model before migration		Model after migration
SSCNETIII compatible Positioning module	QD74MH8	→	RD77MS8
	QD74MH16		RD77MS16

(2) Servo amplifiers and servo motors

The existing MR-J3 series servo amplifiers can be used in the migrated system with RD77MS, however, it is strongly recommended to replace them with the MR-J4 series.

(a) Servo amplifiers and rotary servo motors

Before migration from QD74MH				After migration to RD77MS		
Servo amplifier		Rotary servo motor	→	Servo amplifier		Rotary servo motor
MR-J3 series	MR-J3-□B	HF-KP□		MR-J4 series	MR-J4-□B(-RJ)	HG-KR□
	MR-J3W-□B	HF-MP□			MR-J4W2-□B	HG-MR□
	MR-J3-□BS	HF-SP□			MR-J4W3-□B	HG-SR□
	MR-J3-□B-RJ006	HF-JP□				HG-RR□
		HC-LP□				HG-UR□
		HC-RP□				HG-JR□
		HC-UP□				
		HA-LP□				

(b) Servo amplifiers and linear servo motors

Before migration from QD74MH				After migration to RD77MS		
Servo amplifier		Linear servo motor	→	Servo amplifier		Linear servo motor
MR-J3 series	MR-J3-□B-RJ004	LM-H2□		MR-J4 series	MR-J4-□B(-RJ)	LM-H3□
		LM-F□			MR-J4W2-□B	LM-F□
		LM-K2□			MR-J4W3-□B	LM-K2□
		LM-U2□				LM-U2□

(3) Servo system network

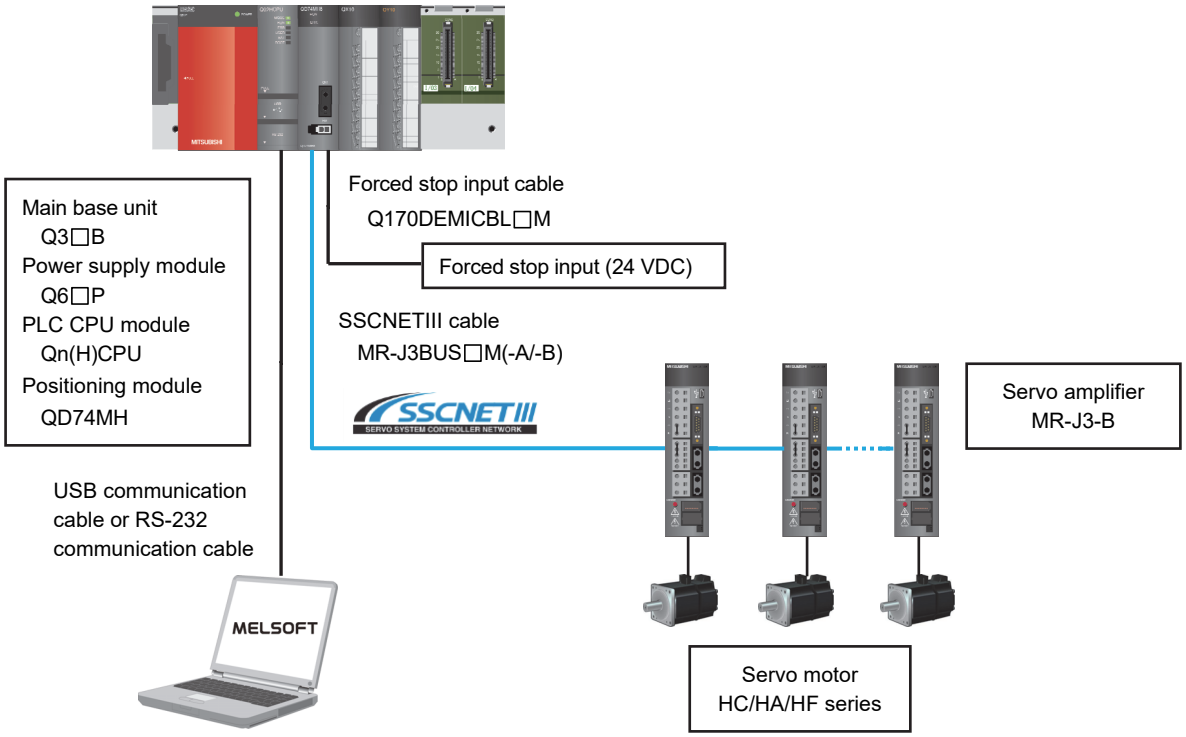
Item		SSCNETIII		SSCNETIII/H
Communications medium		Optical fiber cable		← (same as SSCNETIII)
Communications speed		50 Mbps		150 Mbps
Communications cycle	Send	0.44 ms/0.88 ms		0.222 ms/0.444 ms/0.888 ms
	Receive	0.44 ms/0.88 ms		0.222 ms/0.444 ms/0.888 ms
Number of control axes		Up to 16 axes/line		← (same as SSCNETIII)
Transmission distance		[Standard code for inside panel] Up to 3 m between stations Maximum overall distance: 48 m (3 m × 16 axes) [Standard cable for outside panel] Up to 20 m between stations Maximum overall distance: 320 m (20 m × 16 axes)		[Standard code for inside panel and standard cable for outside panel] Up to 20 m between stations Maximum overall distance: 320 m (20 m × 16 axes)
		[Long distance cable] Up to 50 m between stations Maximum overall distance: 800 m (50 m × 16 axes)		[Long distance cable] Up to 100 m between stations Maximum overall distance: 1600 m (100 m × 16 axes)

(4) Engineering environment (required)

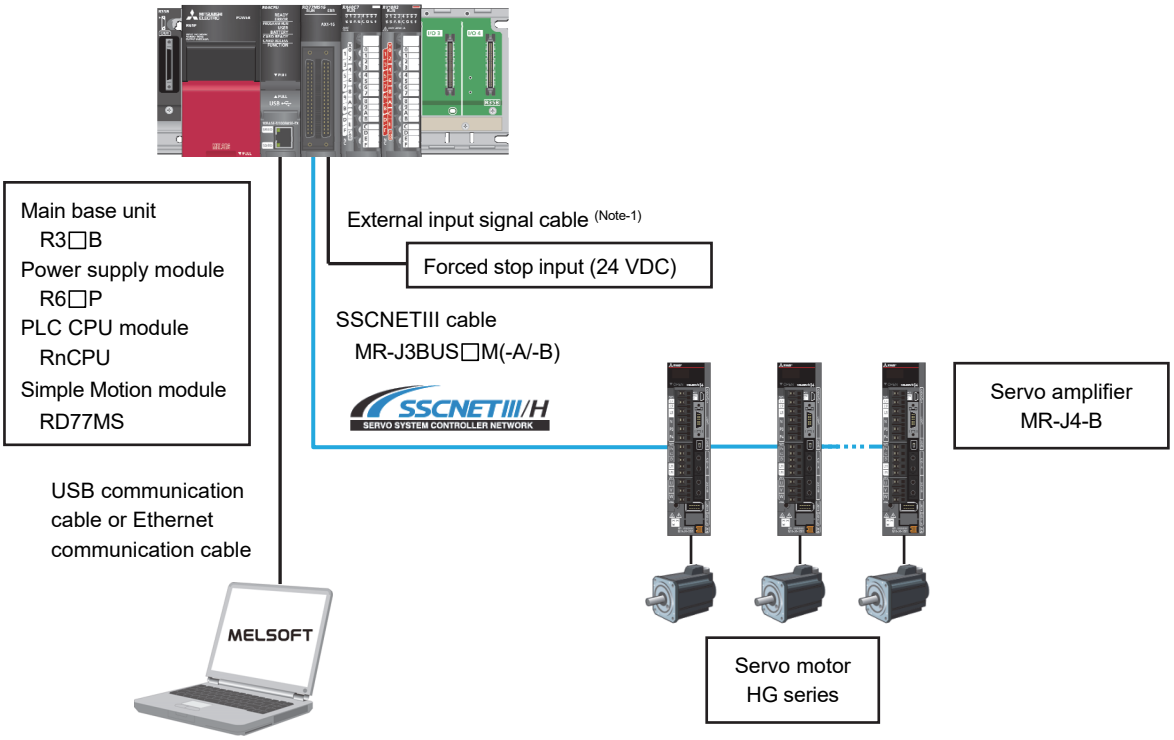
Product name	Model	Version
MELSOFT GX Works3	SW1DND-GXW3-E	Ver.1.046Y or later
MELSOFT MR Configurator2	SW1DNC-MRC2-E	Ver.1.27D or later

1.3 System Configuration

1.3.1 System configuration using QD74MH before migration



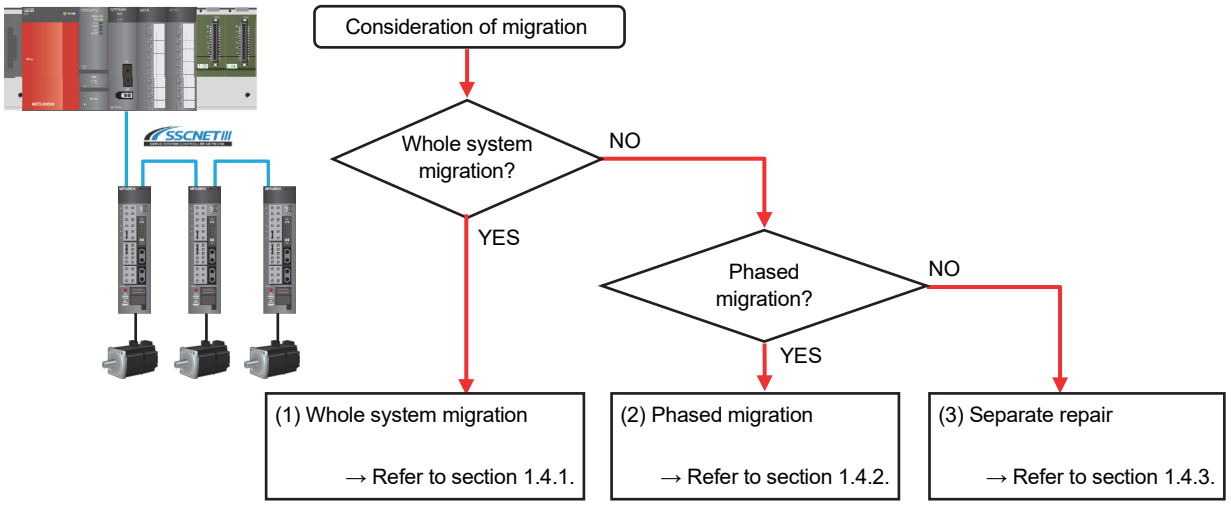
1.3.2 System configuration using RD77MS after migration



(Note-1): Replace the forced stop input cable for the new controller. (Refer to section 1.4.2.)

1.4 Case Study on Migration

The following describes a case study for migrating the existing system using QD74MH.



(1) Whole system migration (recommended)

The controller, servo amplifiers, servo motors, and servo system network are replaced simultaneously. Although a large-scale installation is required, the whole system migration allows the system to operate for longer periods. (Refer to section 1.4.1.)

(2) Phased migration (When the whole system migration is difficult due to the installation period and cost.)

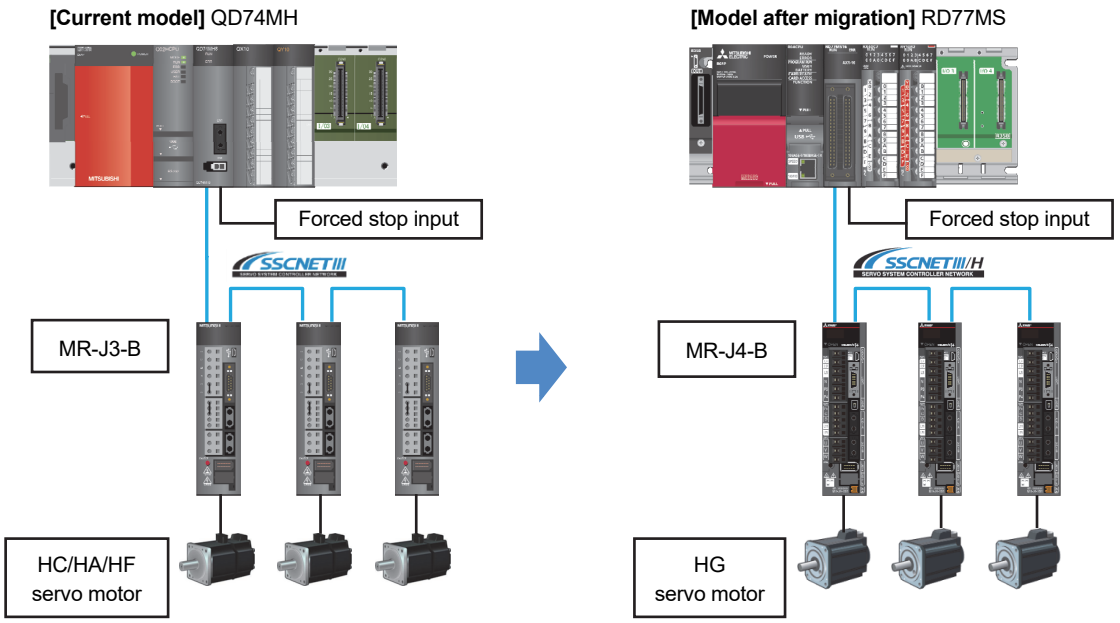
The controller is replaced with RD77MS in the first phase, and then the MR-J3-B servo amplifiers are gradually replaced with MR-J4-B.
(Refer to section 1.4.2.)

(3) Separate repair

This is a replacement method for when the controller, the servo amplifier, or the servo motor malfunctions.
(Refer to section 1.4.3.)

1.4.1 Whole system migration (recommended)

The following shows the system when the whole system migration takes place.

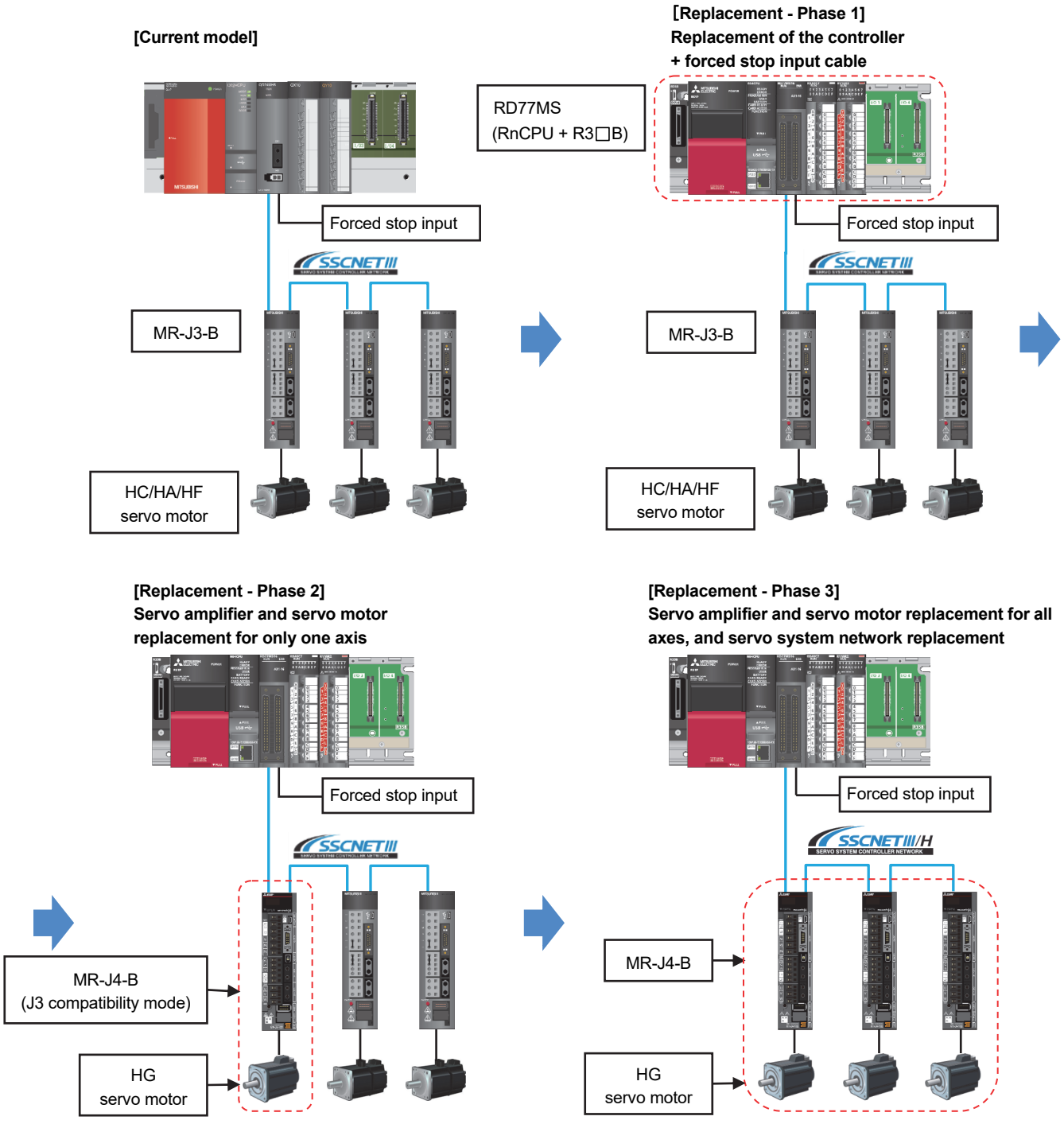


[Changes in the system]

Product name	Model before migration		Model after migration
Main base unit	Q3□B		R3□B
PLC CPU module	Qn(H)CPU		RnCPU
Positioning module	QD74MH		RD77MS
Servo amplifier	MR-J3-B		MR-J4-B
Servo motor	HC/HA/HF series		HG series
Forced stop input cable	Q170DEMICBL□M		Fabricate the cable with A6CON□ connector. (Refer to section 2.3.)

1.4.2 Phased migration

The following shows the procedure for the phased migration in which the controller is replaced with RD77MS in the first phase, and then the MR-J3-B servo amplifiers are gradually replaced with MR-J4-B in the following phases.



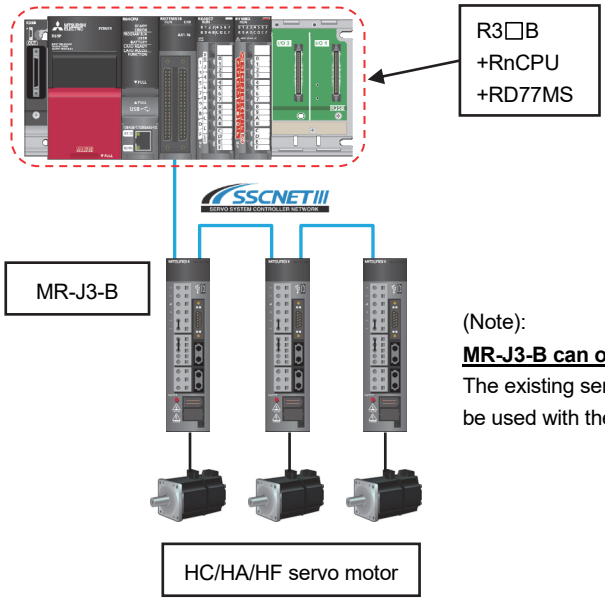
(Note): For replacing only the servo amplifier or the servo motor, refer to "1.4.3 Separate repair".
(Note): For details of the J3 compatibility mode, refer to "Transition from MELSERVO-J3/J3W Series to J4 Series Handbook".

(Note): When replacing all the servo amplifiers with MR-J4-B, the operation mode can be switched from "J3 compatibility mode" to "J4 mode".
The servo system network is also changed from SSCNETIII to SSCNETIII/H.

1.4.3 Separate repair

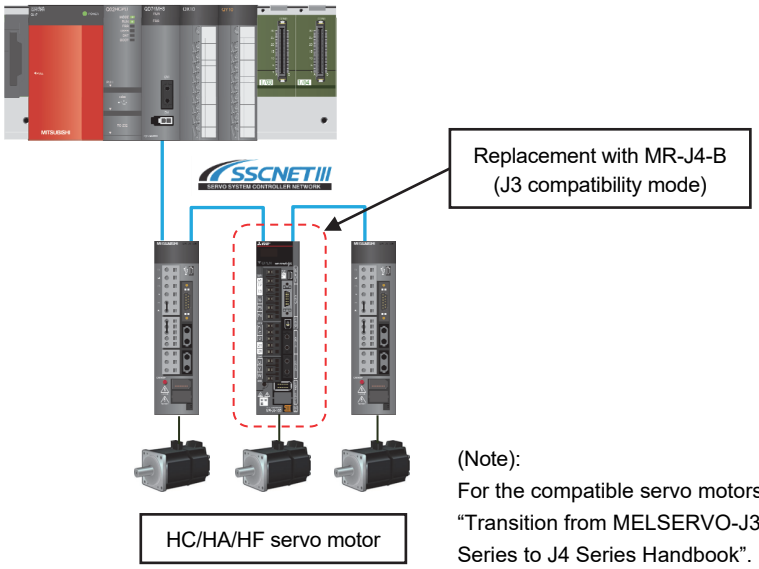
The following shows the procedure for the separate repair.

(1) When the controller has malfunctioned.
Replace only the controller.



(Note):
MR-J3-B can operate with the replaced controller
The existing servo amplifiers and servo motors can be used with the new controller.

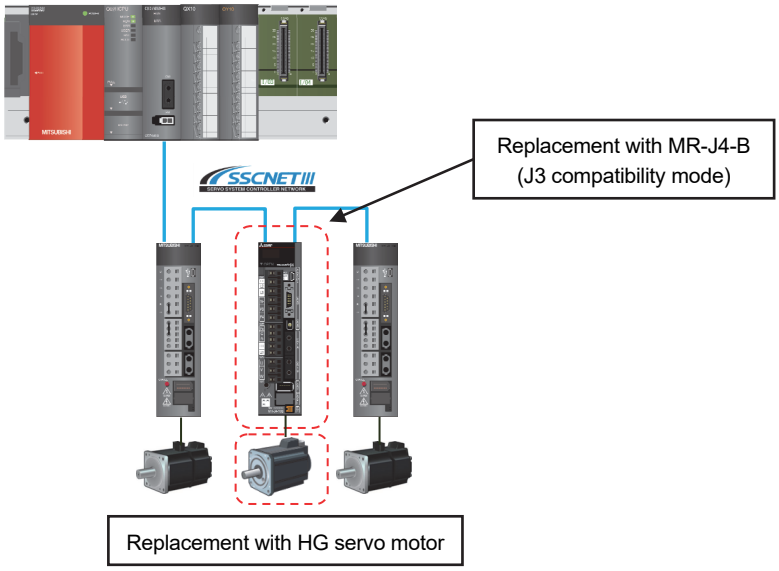
(2) When the MR-J3-B servo amplifier has malfunctioned.
Replace only the servo amplifier.



(Note):
For the compatible servo motors, refer to "Transition from MELSERVO-J3/J3W Series to J4 Series Handbook".

(3) When the HC/HA/HF servo motor has malfunctioned

Simultaneously replace the servo amplifier and the malfunctioned servo motor.



1.5 Project Diversion

The following describes about the project diversion for Qn(H)CPU and QD74MH setting software.

(1) PLC CPU projects

Be sure to recreate sequence programs for the migrated system because the structure of the buffer memory and the control method differs between QD74MH and RD77MS.
Refer to relevant manuals for details.

(2) Projects of QD74MH setting software (Japanese version only)

Projects in QD74MH setting software are partially divertible.
Refer to "2.4 Project diversion" for the procedure for project diversion.

1.6 Relevant Documents

Refer to the following relevant documents for the replacement.

1.6.1 Relevant catalogs

Servo System Controllers MELSEC iQ-R/MELSEC iQ-F Series  L(NA)03100	SERVO AMPLIFIERS & MOTORS MELSERVO-J4  L(NA)03058
Transition from MELSERVO-J3/J3W Series to J4 Series Handbook  L(NA)03127	

1.6.2 Relevant manuals

(1) Simple Motion module

Manual title	Manual No.
MELSEC iQ-R Simple Motion Module User's Manual (Startup)	IB-0300245
MELSEC iQ-R Simple Motion Module User's Manual (Application)	IB-0300247
MELSEC iQ-R Simple Motion Module User's Manual (Advanced Synchronous Control)	IB-0300249
RD77MS Before Using the Product	BCN-B62008-335E

(2) Servo amplifier

Manual title	Manual No.
MR-J4-_B_(-RJ) SERVO AMPLIFIER INSTRUCTION MANUAL	SH-030106
MR-J4 Servo amplifier Instructions and Cautions for Safe Use of AC Servos	IB-0300175E
MELSERVO-J4 Servo amplifier INSTRUCTION MANUAL TROUBLE SHOOTING	SH-030109
MR-J4W2-_B/MR-J4W3-_B/MR-J4W2-0303B6 SERVO AMPLIFIER INSTRUCTION MANUAL	SH-030105

MEMO

MEMO

2. DETAILS OF MIGRATION FROM QD74MH TO RD77MS

2.1 Table of Components and Software

Prepare Positioning modules, servo amplifiers, and an engineering environment according to the following tables in this section.

Product name	Model before migration		Model after migration
Positioning module	QD74MH8 QD74MH16		[Simple Motion module] RD77MS8 RD77MS16
Forced stop input cable	Q170DEMICBL□M		A6CON1, A6CON2, A6CON4
Connector for forced stop input cable	Q170DEMICON		
SSCNETIII cable(Note-1)	MR-J3BUS□M MR-J3BUS□M-A MR-J3BUS□M-B(Note-2)		←(same as the left)

(Note-1): "□" indicates the cable length.
(015: 0.15m, 03: 0.3m, 05: 0.5m, 1: 1m, 5: 5m, 10: 10m, 20: 20m, 30: 30m, 40: 40m, 50: 50m)

(Note-2): For a long distance cable of up to 100 m or an ultra-long bending life cable, contact Mitsubishi Electric System & Service Co., Ltd.
[Sales office] FA PRODUCT DIVISION mail: osb.webmaster@melsc.jp

2.1.1 Servo amplifiers and servo motors

The servo system network is changed from SSCNETIII to SSCNETIII/H.
Select a SSCNETIII/H compatible servo amplifier and a servo motor connectable to the selected servo amplifier.

(1) Servo amplifiers/Rotary servo motors

Before migration from QD74MH				After migration to RD77MS		
Servo amplifier		Rotary servo motor		Servo amplifier		Rotary servo motor
MR-J3 series	MR-J3-□B MR-J3W-□B MR-J3-□BS MR-J3-□B-RJ006	HF-KP□ HF-MP□ HF-SP□ HF-JP□ HC-LP□ HC-RP□ HC-UP□ HA-LP□	→	MR-J4 series	MR-J4-□B(-RJ) MR-J4W2-□B MR-J4W3-□B	HG-KR□ HG-MR□ HG-SR□ HG-RR□ HG-UR□ HG-JR□

(2) Servo amplifiers/Linear servo motors

Before migration from QD74MH				After migration to RD77MS		
Servo amplifier		Linear servo motor		Servo amplifier		Linear servo motor
MR-J3 series	MR-J3-□B-RJ004	LM-H2□ LM-F□ LM-K2□ LM-U2□	→	MR-J4 series	MR-J4-□B(-RJ) MR-J4W2-□B MR-J4W3-□B	LM-H3□ LM-F□ LM-K2□ LM-U2□

(3) Comparison of servo system network

Item		SSCNETIII	SSCNETIII/H
Communications medium		Optical fiber cable	← (same as SSCNETIII)
Communications speed		50 Mbps	150 Mbps
Communications cycle	Send	0.44 ms/0.88 ms	0.222ms/0.444ms/0.888ms
	Receive	0.44 ms/0.88 ms	0.222ms/0.444ms/0.888ms
Number of control axes		Up to 16 axes/line	← (same as SSCNETIII)
Transmission distance		[Standard code for inside panel] Up to 3 m between stations Maximum overall distance: 48 m (3 m × 16 axes) [Standard cable for outside panel] Up to 20 m between stations Maximum overall distance: 320 m (20 m × 16 axes)	[Standard code for inside panel and standard cable for outside panel] Up to 20 m between stations Maximum overall distance: 320 m (20 m × 16 axes)
		[Long distance cable] Up to 50 m between stations Maximum overall distance: 800 m (50 m × 16 axes)	[Long distance cable] Up to 100 m between stations Maximum overall distance: 1600 m (100 m × 16 axes)

2.1.2 Engineering environment (required)

The engineering environment that supports RD77MS is as follows.

Product name	Model	Version
MELSOFT GX Works3	SW1DND-GXW3-E	Ver.1.046Y or later
MELSOFT MR Configurator2	SW1DNC-MRC2-E	Ver.1.27D or later

2.2 Differences Between QD74MH and RD77MS

(1) Performance and specifications

►An item that requires a setting change at migration.
♦: An item in which the axis movement will be changed after migration.

Item \ Model		QD74MH8	QD74MH16	RD77MS8	RD77MS16	Points for migration
Number of control axes		8	16	8	16	−
Operation cycle		0.88ms		0.444ms/0.888ms/1.777ms/ 3.555ms		► The default value differs. Set Pr.96 to "0000H".
Control method	Synchronous	Not provided		Provided		−
Starting time (1 axis linear interpolation)	Trapezoidal acceleration/ deceleration	6.0ms		1.46ms (Operation cycle 0.888ms) 1.59ms (Operation cycle 1.777ms) 1.52ms (Operation cycle 3.555ms)		−
	S-curve acceleration/ deceleration	6.5ms				
Servo system network		SSCNETIII		SSCNETIII/H or SSCNETIII		►Select a servo system network which is compatible with the devices to be connected such as servo amplifiers. Pr.97 0: SSCNETIII 1: SSCNETIII/H
Servo amplifier		MR-J3-□B/MR-J3W-□B/ MR-J3-□BS/MR-J3W-□B-RJ006/ MR-J3-□B-RJ004		MR-J4-□B(-RJ)/ MR-J4W2-□B/MR-J4W3-□B		−
Machine home position return (Home position return method)		6 types (Proximity dog method, Data set method, Stopper type, Dog cradle type, Limit switch combined type, Scale origin signal detection type)		6 types (Proximity dog method, Count method1, Count method2, Data set method, Scale home position signal detection method, Driver home position return method (Note-1))		Stopper type, dog cradle type, and limit switch combined type are not available with RD77MS (Note-2).
HP shift function		• The speed during HP shift: the value set in "Pr.56 Creep speed". • Move for the set amount without deceleration, even at zero point signal.		• The speed during HP shift: Select the value with either "Pr.46 HPR speed" or "Pr.47 Creep speed". • Decelerate to a stop at zero point signal, and then accelerate again to the specified speed to move for the set shift distance.		►♦ Set "Pr.56 Speed designation during HP shift" to "1" (Pr.47 Creep speed).
OP search limit function		Provided		Not provided		♦ The OP search limit function is not available with RD77MS (Note-2).
Incremental feed operation		Provided		Provided (Inching operation)		The operation name has been changed.

(Continued)

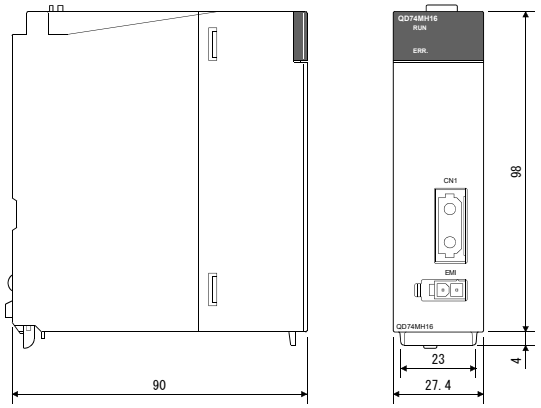
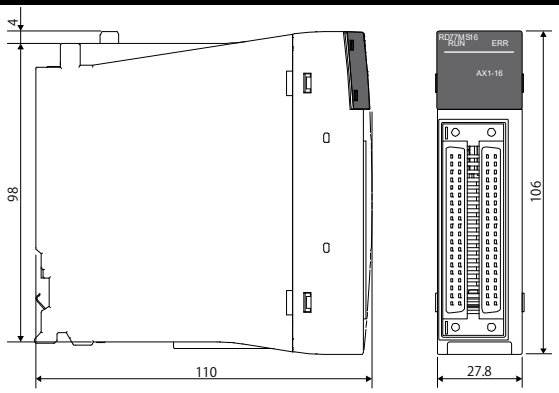
Item \ Model	QD74MH8	QD74MH16	RD77MS8	RD77MS16	Points for migration
Linear interpolation control	Speed: Combined-speed only		Select the command speed with "Pr.20 Interpolation speed designation method" 0: Composite speed 1: Reference axis speed		♦ Composite speed cannot be designated for 4-axis linear interpolation (Note-2).
Speed limit value	[Linear interpolation control] Composite speed: Pr.26 Linear interpolation speed limit value Speed for each axis: The limits are set with Pr.10 Speed limit value. [Manual control] The limits are set with Pr.10 Speed limit value.		[Linear interpolation control] Speed for each axis: The limits are set with Pr.8 Speed limit value. [Manual control] The limits are set with Pr.31 JOG speed limit value.		♦ The composite speed cannot be used for limiting speed (Note-2).
Acceleration/deceleration control	Pr.16 S-curve acceleration/deceleration time constant		Not provided		♦ The S-curve acceleration/deceleration time constant is not available with RD77MS (Note-2).
Sudden-stop control	Cd.4 Axis sudden stop		Not provided		♦ The sudden-stop control is not available with RD77MS (Note-2).
Forced stop control	Forced stop is executed by the signal (Y2) from PLC CPU. 0: Forced stop release 1: Forced stop		Cd.158 Forced stop input 0000H: Forced stop ON (Forced stop) 0001H: Forced stop OFF (Forced stop release)		► When the buffer memory executes the forced stop control, set "Pr.82 Forced stop valid/invalid selection" to "2". ► Cannot be used with the forced stop by 24 VDC external input signal.
Pausing function	Cd.5 Pausing		Not provided		♦ The pausing function is not available with RD77MS (Note-2).
Parameter change request	Provided		Not provided		♦ The parameter change function is not available with RD77MS (Note-2).
Torque limit function	Torque limit value: 0.1% unit Controlled by the motor maximum torque.		Torque limit value: 0.1% unit Controlled by the value set in "Pr.17 Torque limit setting value" or "Cd.101 Torque output setting value" However, when a home position return is being executed, the value set in "Pr.54 HPR torque limit value" is applied.		►♦ The default value of "Pr.17 Torque limit setting value" is 3000[0.1%]. Review the value according to the motor to be used.

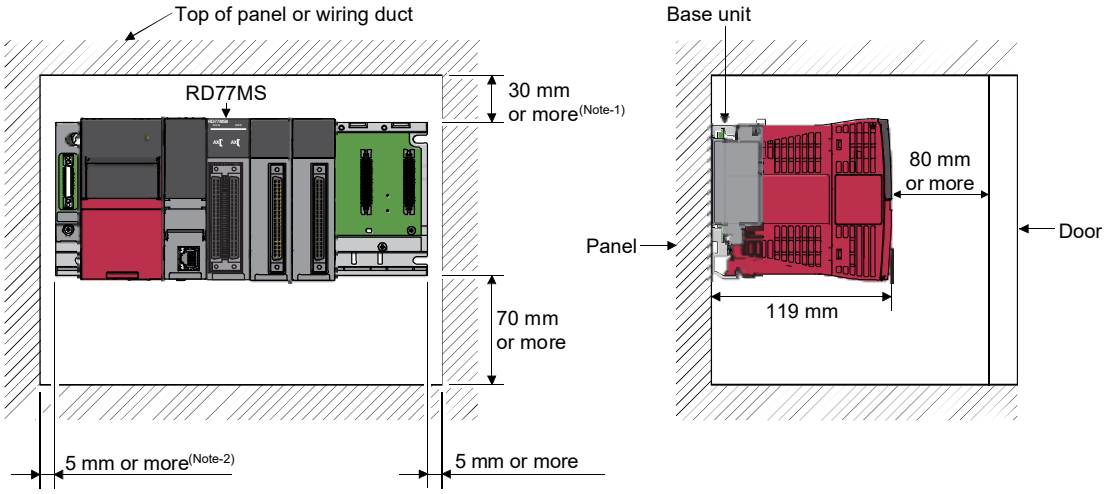
(Continued)

Item \ Model	QD74MH8	QD74MH16	RD77MS8	RD77MS16	Points for migration
Torque change function	Torque limit value: 0.1% unit Forward/reverse torque limit value individual setting Cd.11 Torque limit request Cd.12 Forward rotation torque limit value Cd.13 Reverse rotation torque limit value		Torque limit value: 0.1% unit Forward/reverse torque limit value same setting/individual setting Cd.112 Torque change function switching request 0: Forward/reverse torque limit value same setting 1: Forward/reverse torque limit value individual setting Cd.22 New torque value/forward new torque value Cd.113 New reverse torque value		Set "Cd.112 Torque change function switching request" to "1".
Acceleration/deceleration time change function	Cd.18 Acceleration time change request Cd.20 Deceleration time change request		Cd.12 Acceleration/deceleration time change value during speed change, enable/disable 1: Enables modifications to acceleration/deceleration time		►♦The acceleration/deceleration time can be changed by setting Cd.12 .
Engineering environment	MELSOFT GX Works2 QD74MH setting software(Note-3)		MELSOFT GX Works3 (Simple Motion Module Setting Function)		−

(Note-1): The home position return set in driver (servo amplifier) is used.
(Note-2): Contact your local sales office for details.
(Note-3): Only Japanese version is available for QD74MH setting software.

(2) Exterior dimensions/mass/installation

	QD74MH8	QD74MH16	RD77MS8	RD77MS16
Exterior dimensions [mm]			 (Note) The connector for SSCNETIII cable is at the bottom of the module.	
	98.0[H]×27.4[W]×90.0[D]		106.0[H]×27.8[W]×110.0[D]	
Mass [kg]	0.15		0.23	
Internal current consumption (5 VDC) [A]	0.70		1.0	



(Note-1): For wiring duct with 50mm or less height. For other cases, 40mm or more.

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

(3) Operation cycle

The operation cycle settings of QD74MH can be imported to RD77MS when the projects of QD74MH are diverted to RD77MS in MELSOFT GX Works3.
(Refer to section 2.4.1 for details of project diversion.)
However, if the operation cycle is set as default (automatic), the operation cycle will be changed. Set an operation cycle where necessary by following the table below because the change in the operation cycle may change program execution timing.

[Control axes and operation cycle at default]

Item \ Model	QD74MH	RD77MS
Number of control axes	Up to 16	Up to 16
Operation cycle (default)	0.88ms	0.444ms/1 to 4 axes 0.888ms/5 to 8 axes 1.777ms/9 to 16 axes

[Settable operation cycle]

QD74MH	RD77MS
0.88ms	0.444ms 0.888ms 1.777ms 3.555ms

(4) Parameter setting

Review the existing settings and sequence programs for the parameters, monitor data, control data which do not exist in RD77MS.

Refer to manuals of each module for details.

(a) Parameter

▶An item that requires a setting change at migration

QD74MH	RD77MS	Points for migration
Pr.0 Electronic gear numerator (AP) 1 to 32768	Pr.2 Number of pulses per rotation (AP) 1 to 200000000	The setting range has been changed.
Pr.2 Electronic gear denominator (AL) 1 to 32768	Pr.3 Movement amount per rotation (AL) 1 to 200000000	
Pr.4 Software stroke limit upper limit value	Pr.12 Software stroke limit upper limit value	−
Pr.6 Software stroke limit lower limit value	Pr.13 Software stroke limit lower limit value	−
Pr.8 Backlash compensation amount	Pr.11 Backlash compensation amount	−
Pr.10 Speed limit value 1 to 2147 (Unit:×10^6[PLS/s])	Pr.8 Speed limit value 1 to 1000000000	▶Set the value multiplied by 10^6. The setting range has been changed.
	Pr.31 JOG speed limit value 1 to 1000000000	▶Set the same value as Pr.8.
Pr.15 Acceleration/deceleration method 0: Linear acceleration/deceleration 1: S-curve acceleration/deceleration	Pr.34 Acceleration/deceleration process selection 0: Trapezoid acceleration/deceleration process 1: S-curve acceleration/deceleration process	−
Pr.16 S-curve acceleration/deceleration time constant	−	−
Pr.17 Sudden stop deceleration time 0 to 20000	Pr.36 Rapid stop deceleration time 1 to 8388608	▶If “0” is set, change it to “1”.
Pr.20 Command in-position range 0 to 2147483647	Pr.16 Command in-position width 1 to 2147483647	▶If “0” is set, change it to “1”.
Pr.23 Target position change overrun processing selection	−	−
Pr.25 Interpolation group	−	−
Pr.26 Linear interpolation speed limit value	−	−
Pr.31 External input signal logic selection b0: Upper hardware stroke limit b4: Lower hardware stroke limit b8: Proximity dog	Pr.22 Input signal logic selection b0: Lower limit b1: Upper limit b6: Proximity dog signal	▶The layout of signals has been changed.
Pr.50 OPR method 0: Proximity dog 2: Data set 6: Scale origin signal detection	Pr.43 HPR method 0: Proximity dog method 6: Data set method 7: Scale origin signal detection method	▶If “Data set method” or “Scale origin signal detection method” are set, change the setting.
Pr.51 OPR direction	Pr.44 HPR direction	−
Pr.52 OP address	Pr.45 HP address	−

(Continued)

QD74MH	RD77MS	Points for migration
Pr.54 OPR speed 5 to 2147000000	Pr.46 HPR speed 1 to 1000000000	▶If the current setting is outside of the settable range of RD77MS, review the setting.
Pr.56 Creep speed 5 to 32767	Pr.47 Creep speed 1 to 1000000000	The setting range has been changed.
Pr.58 OPR acceleration time	−	−
Pr.59 OPR deceleration time	−	−
Pr.60 OP shift amount	Pr.53 HP shift amount	−
Pr.62 OP search limit	−	−
Pr.64 Incremental linear scale setting	−	−
Pr.66 Operation setting for incompletion of OPR 0: Not executed 1: Executed	Pr.55 Operation setting for incompletion of HPR 0: Positioning control is not executed 1: Positioning control is executed.	−
Pr.80 JOG speed	−	−
Pr.82 JOG operation acceleration time	−	−
Pr.83 JOG operation deceleration time	−	−
Pr.84 Incremental feedrate	−	−
Pr.101 External forced stop selection	Pr.82 Forced stop valid/invalid selection	−

(b) Monitor data

►An item that requires a setting change at migration

QD74MH	RD77MS	Points for migration
Md.0 Current feed value	Md.20 Feed current value	−
Md.2 Feedrate	Md.22 Feedrate	−
Md.4 External input signal b0: Upper hardware stroke limit b4: Lower hardware stroke limit b8: Proximity dog	Md.30 External input signal b0: Lower limit signal b1: Upper limit signal b6: Proximity dog signal	The layout of input signals has been changed.
Md.5 Positioning data No. being executed	Md.44 Positioning data No. being executed	−
Md.6 Error code	Md.23 Axis error No.	−
Md.7 Error details	−	−
Md.8 Warning code	Md.24 Axis warning No.	−
Md.9 Status 1 b0: OPR request b1: OPR complete	Md.31 Status b2 : Command in-position flag b3 : HPR request flag b4 : HPR complete flag b15: Positioning complete	"Md.31 Status" is 16-bit data.
Md.10 Status 2 b0: Positioning complete b1: Command in-position		
Md.26 Real current value	Md.101 Real current value	−
Md.28 Deviation counter value	Md.102 Deviation counter value	−
Md.31 Motor current	Md.104 Motor current value	−
Md.32 Motor rotation speed	Md.103 Motor rotation speed	−
Md.34 Regenerative load ratio	Md.109 Regenerative load ratio/Optional data monitor output 1	−
Md.35 Effective load torque ratio	Md.110 Effective load torque/Optional data monitor output 2	−
Md.36 Peak torque ratio	Md.111 Peak torque ratio/Optional data monitor output 3	−
Md.40 Servo status 1 b0: READY ON b1: Servo ON b7: Servo error (Servo alarm) b12: In-position b13: Torque limit b14: Absolute position lost b15: Servo warning	Md.108 Servo status 1 b0: READY ON b1: Servo ON b7: Servo alarm b12: In-position b13: Torque limit b14: Absolute position lost b15: Servo warning	The servo status is 32-bit data
Md.41 Servo status 2 b0: Zero point pass b3: Zero speed	Md.119 Servo status 2 b0 : Zero point pass b3 : Zero speed	
Md.100 Axis error status	−	−
Md.101 Axis warning status	−	−
Md.102 Number of write accesses to flash ROM	Md.19 Number of write accesses to flash ROM	−
Md.103 Forced stop input status 0: Forced stop 1: Forced stop release	Md.50 Forced stop input 0: Forced stop input ON (Forced stop) 1: Forced stop input OFF (Forced stop release)	−

(c) Control data

▶An item that requires a setting change at migration

QD74MH	RD77MS	Points for migration
Cd.0 Axis error reset 0: Not commanded 1: Commanded	Cd.5 Axis error reset 1: Axis error is reset.	Only “1: Axis error is reset” is valid.
Cd.1 Parameter change request	–	–
Cd.2 Start method	–	–
Cd.3 Axis stop 0: Not commanded 1: Commanded	Cd.180 Axis stop 1: Axis stop requested Other than 1: Axis stop not requested	Only “1: Axis stop requested” is valid.
Cd.4 Axis sudden stop	–	–
Cd.5 Pausing	–	–
Cd.8 Forward rotation JOG start 0: Stop 1: Start	Cd.181 Forward run JOG start 1: JOG started Other than 1: JOG not started	Only “1: JOG started” is valid.
Cd.9 Reverse rotation JOG start 0: Stop 1: Start	Cd.182 Forward run JOG start 1: JOG started Other than 1: JOG not started	
Cd.11 Torque limit request	–	–
Cd.12 Forward rotation torque limit value	–	–
Cd.13 Reverse rotation torque limit value	–	–
Cd.15 Speed change request 0: Not requested 1: Requested	Cd.15 Speed change request 1: Executes speed change	Only “1: Change the speed is” valid.
Cd.16 New speed value 5 to 2147000000	Cd.14 New speed value 0 to 1000000000	▶If the current setting is outside of the settable range of RD77MS, review the setting.
Cd.18 Acceleration time change request 0: Not requested 1: Requested	Cd.12 Acceleration/deceleration time change value during speed change, enable/disable 1: Enables modifications to acceleration/deceleration time Other than 1: Disables modifications to acceleration/deceleration time	▶Set this data to select whether acceleration/deceleration time is allowed to be modified or not when a speed change is executed.
Cd.19 New acceleration time value 0 to 20000	Cd.10 New acceleration time value 0 to 8388608	The setting range has been changed.
Cd.20 Deceleration time change request 0: Not requested 1: Requested	Cd.12 Acceleration/deceleration time change value during speed change, enable/disable 1: Enables modifications to acceleration/deceleration time Other than 1: Disables modifications to acceleration/deceleration time	▶Set this data to select whether acceleration/deceleration time is allowed to be modified or not when a speed change is executed.

(Continued)

QD74MH	RD77MS	Points for migration
Cd.21 New deceleration time value 0 to 20000	Cd.11 New deceleration time value 0 to 8388608	The setting range has been changed.
Cd.23 Target position change request 0: Not requested 1: Requested	Cd.29 Target position change request flag 1: Requests a change in the target position	Only “1: requests a change in the target position” is valid.
Cd.24 New target position value	Cd.27 Target position change value (New address)	−
Cd.28 New current value	Cd.9 New current value	−
Cd.30 Each axis servo OFF 0: Not commanded 1: Commanded	Cd.100 Servo OFF command 0: Servo ON 1: Servo OFF Valid only during “servo ON for all axes”.	−
Cd.45 Semi/Fully closed loop switching request (When MR-J3-□B-RJ006 is used)	Cd.133 Semi/Fully closed loop switching request	−
Cd.46 Gain changing request 0: Not requested 1: Requested	Cd.108 Gain switching command flag 0: Gain switching command OFF 1: Gain switching command ON	−
Cd.100 Flash ROM write request 0: Not requested 1: Requested	Cd.1 Flash ROM write request 1: Requests write access to flash ROM.	−
Cd.101 Parameter initialization request 0: Not requested 1: Requested	Cd.2 Parameter initialization request 1: Requests parameter initialization	−

(5) I/O signals

(a) Signal direction: Positioning module (Simple Motion module) → PLC CPU

<table>
<tr><th></th><th colspan="2">QD74MH</th><th colspan="2">RD77MS</th></tr>
<tr><th>Device No.</th><th colspan="2">Signal name</th><th colspan="2">Signal name</th></tr>
<tr><td>X0</td><td colspan="2">Unit READY</td><td colspan="2">RD77MS READY</td></tr>
<tr><td>X1</td><td colspan="2">Error detection(Note-1)</td><td colspan="2">Synchronization flag</td></tr>
<tr><td>X2</td><td colspan="2">Warning detection(Note-1)</td><td colspan="2" rowspan="14">Use prohibited(Note-2)</td></tr>
<tr><td>X3</td><td colspan="2">Synchronization flag</td></tr>
<tr><td>X4</td><td colspan="2" rowspan="13">Unusable</td></tr>
<tr><td>X5</td></tr>
<tr><td>X6</td></tr>
<tr><td>X7</td></tr>
<tr><td>X8</td></tr>
<tr><td>X9</td></tr>
<tr><td>XA</td></tr>
<tr><td>XB</td></tr>
<tr><td>XC</td></tr>
<tr><td>XD</td></tr>
<tr><td>XE</td></tr>
<tr><td>XF</td></tr>
<tr><td>X10</td><td>Axis 1</td><td rowspan="16">BUSY</td><td>Axis 1</td><td rowspan="16">BUSY</td></tr>
<tr><td>X11</td><td>Axis 2</td><td>Axis 2</td></tr>
<tr><td>X12</td><td>Axis 3</td><td>Axis 3</td></tr>
<tr><td>X13</td><td>Axis 4</td><td>Axis 4</td></tr>
<tr><td>X14</td><td>Axis 5</td><td>Axis 5</td></tr>
<tr><td>X15</td><td>Axis 6</td><td>Axis 6</td></tr>
<tr><td>X16</td><td>Axis 7</td><td>Axis 7</td></tr>
<tr><td>X17</td><td>Axis 8</td><td>Axis 8</td></tr>
<tr><td>X18</td><td>Axis 9</td><td>Axis 9</td></tr>
<tr><td>X19</td><td>Axis 10</td><td>Axis 10</td></tr>
<tr><td>X1A</td><td>Axis 11</td><td>Axis 11</td></tr>
<tr><td>X1B</td><td>Axis 12</td><td>Axis 12</td></tr>
<tr><td>X1C</td><td>Axis 13</td><td>Axis 13</td></tr>
<tr><td>X1D</td><td>Axis 14</td><td>Axis 14</td></tr>
<tr><td>X1E</td><td>Axis 15</td><td>Axis 15</td></tr>
<tr><td>X1F</td><td>Axis 16</td><td>Axis 16</td></tr>
</table>

(Note-1): These signals are included in the buffer memory "Md.31 Status" in RD77MS.

(Note-2): There are some devices that will become "Use prohibited" after replacing the existing model with RD77MS. The device No. with "Use prohibited" are used by system. Therefore, a user cannot use them. In the case of using them, the operation is not guaranteed.

RD77MS buffer memory "Md.31 Status"		
Buffer memory address		Signal name
2417+100n	b9	Axis warning detection
	b13	Error detection

n: Axis No.-1

(b) Signal direction: PLC CPU → Positioning module (Simple Motion module)

<table>
<tr><th></th><th colspan="2">QD74MH</th><th colspan="2">RD77MS</th></tr>
<tr><th>Device No.</th><th colspan="4">Signal name</th></tr>
<tr><td>Y0</td><td colspan="4">PLC READY</td></tr>
<tr><td>Y1</td><td colspan="4">All axis servo ON</td></tr>
<tr><td>Y2</td><td colspan="2">Forced stop input(Note-1)</td><td colspan="2" rowspan="14">Use prohibited(Note-2)</td></tr>
<tr><td>Y3</td><td colspan="2" rowspan="14">Unusable</td></tr>
<tr><td>Y4</td></tr>
<tr><td>Y5</td></tr>
<tr><td>Y6</td></tr>
<tr><td>Y7</td></tr>
<tr><td>Y8</td></tr>
<tr><td>Y9</td></tr>
<tr><td>YA</td></tr>
<tr><td>YB</td></tr>
<tr><td>YC</td></tr>
<tr><td>YD</td></tr>
<tr><td>YE</td></tr>
<tr><td>YF</td></tr>
<tr><td>Y10</td><td>Axis 1</td><td rowspan="16">Positioning start</td><td>Axis 1</td><td rowspan="16">Positioning start</td></tr>
<tr><td>Y11</td><td>Axis 2</td><td>Axis 2</td></tr>
<tr><td>Y12</td><td>Axis 3</td><td>Axis 3</td></tr>
<tr><td>Y13</td><td>Axis 4</td><td>Axis 4</td></tr>
<tr><td>Y14</td><td>Axis 5</td><td>Axis 5</td></tr>
<tr><td>Y15</td><td>Axis 6</td><td>Axis 6</td></tr>
<tr><td>Y16</td><td>Axis 7</td><td>Axis 7</td></tr>
<tr><td>Y17</td><td>Axis 8</td><td>Axis 8</td></tr>
<tr><td>Y18</td><td>Axis 9</td><td>Axis 9</td></tr>
<tr><td>Y19</td><td>Axis 10</td><td>Axis 10</td></tr>
<tr><td>Y1A</td><td>Axis 11</td><td>Axis 11</td></tr>
<tr><td>Y1B</td><td>Axis 12</td><td>Axis 12</td></tr>
<tr><td>Y1C</td><td>Axis 13</td><td>Axis 13</td></tr>
<tr><td>Y1D</td><td>Axis 14</td><td>Axis 14</td></tr>
<tr><td>Y1E</td><td>Axis 15</td><td>Axis 15</td></tr>
<tr><td>Y1F</td><td>Axis 16</td><td>Axis 16</td></tr>
</table>

(Note-1): These signals are included in the buffer memory "Cd.158 Forced stop input" in RD77MS.

(Note-2): There are some devices that will become "Use prohibited" after replacing the existing model with RD77MS. The device No. with "Use prohibited" are used by system. Therefore, a user cannot use them. In the case of using them, the operation is not guaranteed.

RD77MS buffer memory "Cd.158 Forced stop input"	
Buffer memory address	Setting value
5945	Set the forced stop information to the buffer memory. 0: Forced stop ON (Forced stop) 1: Forced stop OFF (Forced stop release) A value other than "1" is regarded as "0".

(6) Items that need a review or a change following the servo system network change

Items	Differences		Change/revision
	QD74MH	RD77MS	
Electronic gear	−	−	Change "Pr.2 Number of pulses per rotation" and "Pr.3 Movement amount per rotation" of the basic parameter 1 according to the resolution per the connected servo motor rotation.
Positioning data	−	−	Review the positioing data while taking into account the differences in resolution per the connected servo motor rotation and the setting changes in the electronic gear above.

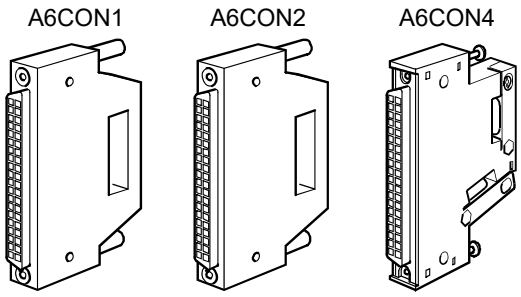
2.3 Forced Stop Input Cable

The forced stop input cable needs to be replaced along with the controller replacement.

(1) Cable replacement (recommended)

The existing forced stop cable (Q170DEMICBL□M) for QD74MH is not compatible with the external input connection connector for RD77MS. To use the forced stop function with RD77MS, fabricate the cable with the following connectors and cables.

(a) Appearance



(b) Connector type

Type	Model
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

(c) Specifications of the connector

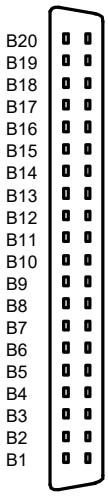
Part name	Specification	
Applicable connector	A6CON1, A6CON4	A6CON2
Applicable wire size	0.3 mm^2	AWG28 to 24

(Note): The external input wiring connector is not included. Please purchase them by customer.

[Specialized tool]

- Pressure-bonding tool for A6CON2 (Fujitsu component LTD.):
  Model name: FCN-363T-T005/H
  Contact: http://www.fujitsu.com/jp/group/fcl/en/

The signal layout for the external input connection connector of RD77MS is shown below.

Pin layout	Pin No.	Signal name	Pin No.	Signal name	Pin No.	Signal name	Pin No.	Signal name
 Front view of the module	2B20	No connect (Note-5)	2A20	No connect (Note-5)	1B20	HB(Note-1, 2, 3)	1A20	5V(Note-7)
	2B19		2A19		1B19	HA(Note-1, 2, 3)	1A19	5V(Note-7)
	2B18		2A18		1B18	HBL(Note-1, 2, 4)	1A18	HBH(Note-1, 2, 4)
	2B17		2A17		1B17	HAL(Note-1, 2, 4)	1A17	HAH(Note-1, 2, 4)
	2B16		2A16		1B16	No connect (Note-5)	1A16	No connect (Note-5)
	2B15		2A15		1B15	5V(Note-7)	1A15	5V(Note-7)
	2B14		2A14		1B14	SG(Note-7)	1A14	SG(Note-7)
	2B13		2A13		1B13	No connect (Note-5)	1A13	No connect (Note-5)
	2B12		2A12		1B12		1A12	
	2B11		2A11		1B11		1A11	
	2B10		2A10		1B10		1A10	
	2B9		2A9		1B9		1A9	
	2B8		2A8		1B8	EMI.COM	1A8	EMI
	2B7	COM	2A7	COM	1B7	COM	1A7	COM
	2B6	COM	2A6	COM	1B6	COM	1A6	COM
	2B5	SIN20(Note-6)	2A5	SIN15(Note-6)	1B5	SIN10(Note-6)	1A5	SIN5(Note-6)
	2B4	SIN19(Note-6)	2A4	SIN14(Note-6)	1B4	SIN9(Note-6)	1A4	SIN4(Note-6)
	2B3	SIN18(Note-6)	2A3	SIN13(Note-6)	1B3	SIN8(Note-6)	1A3	SIN3(Note-6)
	2B2	SIN17(Note-6)	2A2	SIN12(Note-6)	1B2	SIN7(Note-6)	1A2	SIN2(Note-6)
	2B1	SIN16(Note-6)	2A1	SIN11(Note-6)	1B1	SIN6(Note-6)	1A1	SIN1(Note-6)

(Note-1): 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)

(Note-2): Set the signal input form in "Pr.24 Manual pulse generator/Incremental synchronous encoder input selection".

(Note-3): Voltage-output/open-collector type
Connect the A-phase/PLS signal to HA, and the B-phase/SIGN signal to HB.

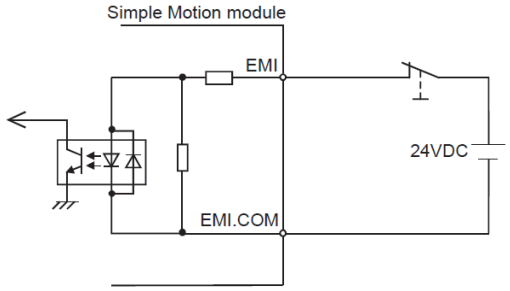
(Note-4): Differential-output type
Connect the A-phase/PLS signal to HAH, and the A-phase/PLS inverse signal to HAL.
Connect the B-phase/SIGN signal to HBH, and the B-phase/SIGN inverse signal to HBL.

(Note-5): Do not connect to any of the terminal explained as "No connect".

(Note-6): Set the external command signal [DI, FLS, RLS, DOG, STOP] in "Pr.80 External input signal selection" and "Pr.95 External command signal selection" at RD77MS use.

(Note-7): Do not use 1A20, 1A19, 1A(B)15, and 1A(B)14 for other than the power supply of manual pulse generator.

When using the forced stop function, wire the terminals of the Simple Motion module forced stop input (1A08/1B08) as shown below. As for the 24VDC power supply, the direction of current can be switched.



(2) Conversion connector

When using the forced stop input cable (Q170DEMICBL□M) for RD77MS, fabricate the conversion cable with the A6CON connector and the receptacle below.
Use the cable whose wire size is AWG24.

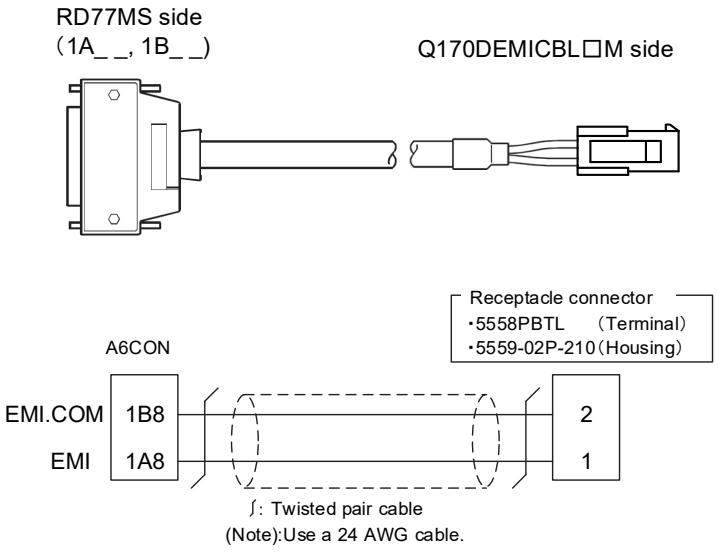
(a) A6CON connector (RD77MS side)

Use the connector in "(1) Cable replacement (recommended)".

(b) Receptacle (Forced stop input cable side)

Fabricate the receptacle by combining the following housing and terminal.

Housing	: 5559-02P-210	(Manufacturer: Molex Incorporated)
Terminal	: 5558PBTL	(Manufacturer: Molex Incorporated)



2.4 Project Diversion

2.4.1 Project diversion procedures by engineering environment

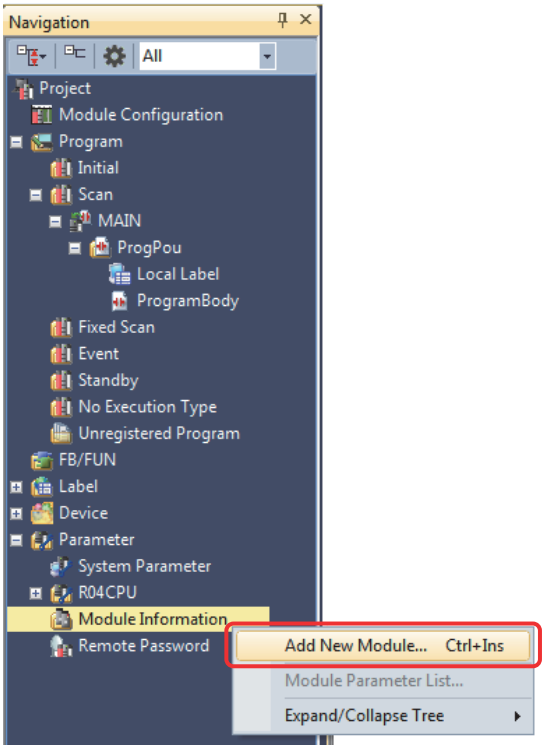
(1) Procedures for diversion of QD74MH setting software data by MELSOFT GX Works3

The following shows the diversion procedure.

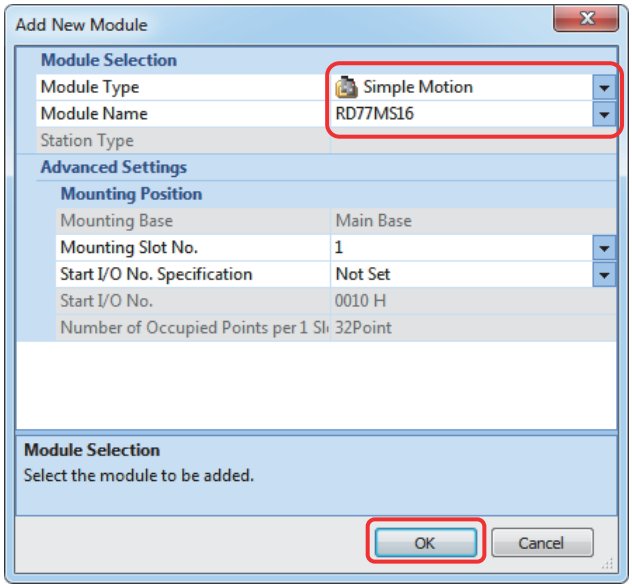
1) Start MELSOFT GX Works3.

2) Select “New” in “Project” menu to create a new MELSEC iQ-R series project.

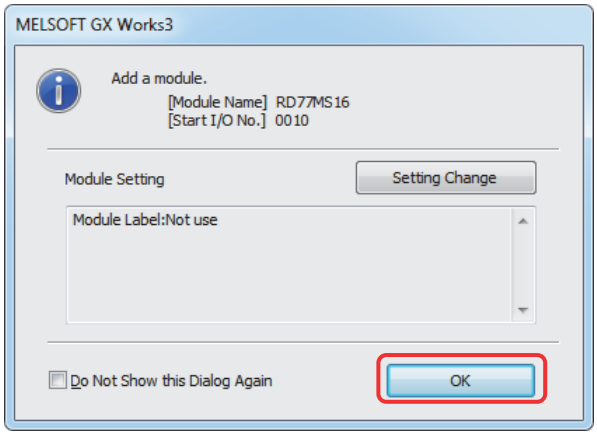
3) Select “Add New Module” from “Module Information” under “Parameter” in the navigation tree. A new module can also be added on “Module Configuration” screen from the navigation tree.



4) On the “Add New Module” screen, select “Simple Motion” for [Module Type], the replaced Simple Motion module model for [Module Name] (the setting example below: RD77MS16), and then set each item in "Mounting Position" of "Advanced Settings" according to your system.
Click “OK”.

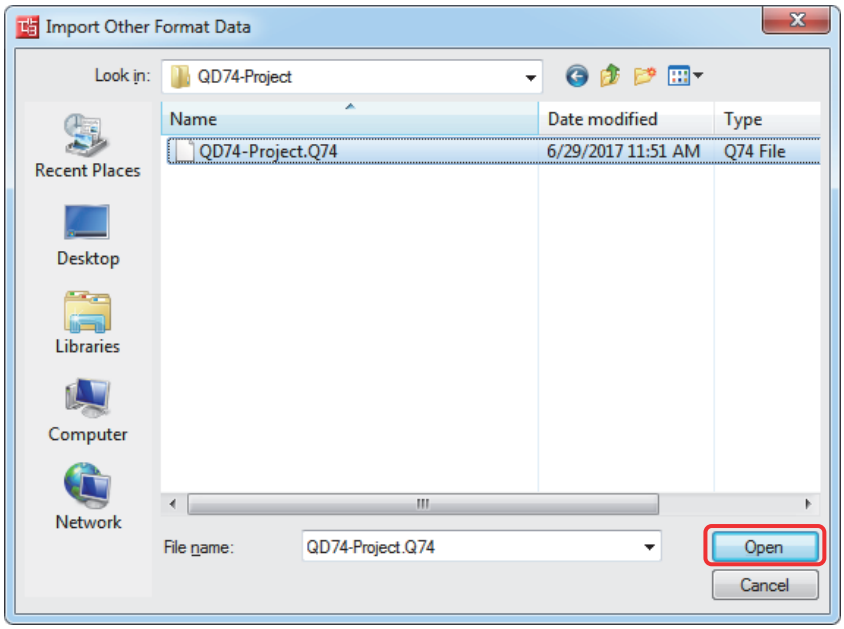


5) The module label setting confirmation screen will appear. Change the setting where necessary and click "OK".

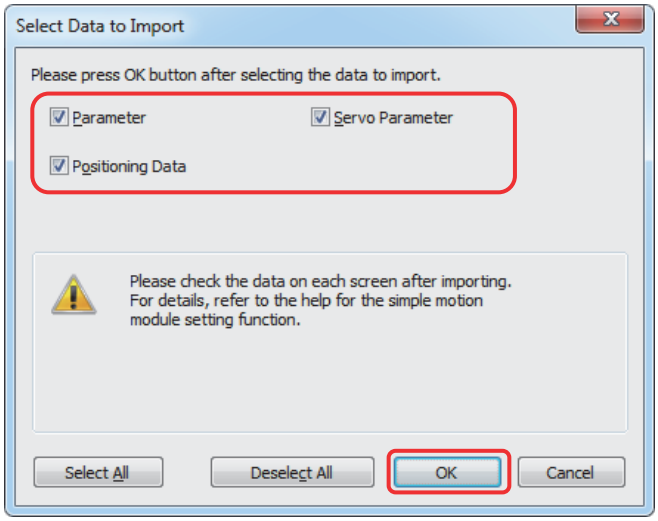


6) Right-click on the new module name (in this example, “RD77MS16” set in 4)) in “Module Information” in the navigation tree, and select [Import Other Format Data].

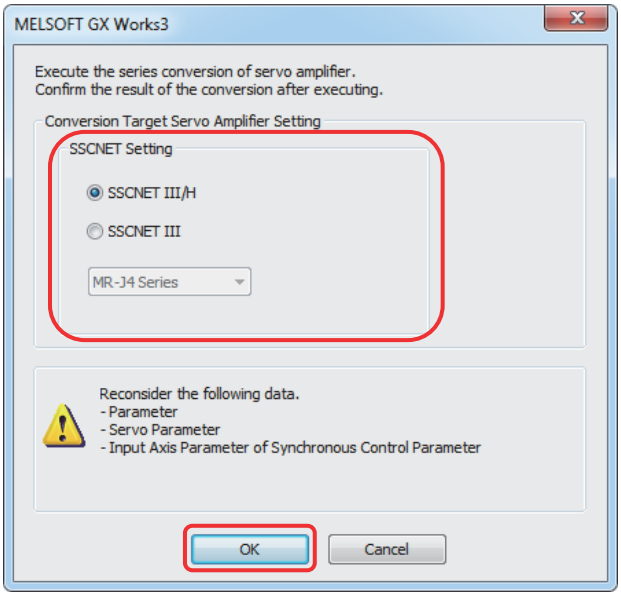
7) Select the project files to be diverted in QD74MH setting software, and click “Open”.



8) Select data to import on “Select Data to Import” screen, and click “OK”.

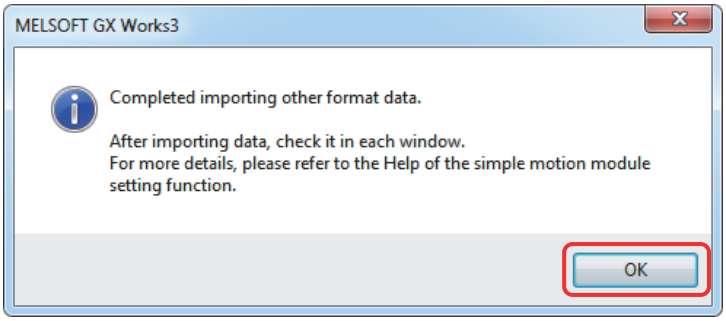


9) Execute the series conversion of the servo amplifier. Select the network to be used for the replaced servo amplifiers (for RD77MS), and click [OK].



(Note): When servo parameters settings are changed from “MR-J3 series” to “MR-J4 series”, the parameter conversion is carried out based on conversion rules.
Refer to “Simple Motion Module Setting Help [Appendix] - [Servo parameter conversion]” for the conversion rules.

10) When the project diversion completion message appears, click “OK”. Be sure to check the imported data.



The diversion is completed.
Before writing to the Simple Motion module, be sure to confirm the validity of the diverted parameters.

(2) Sequence programs

The structure of buffer memory and the control method differs between QD74MH and RD77MS.
Be sure to recreate sequence programs for the new system.

2.4.2 List of divertible/not divertible data

(1) Module parameters

The initial values are set for parameters not listed in the table below.

Data name		Divertible or not divertible	Remarks
QD74MH	RD77MS		
	Common parameters		
Pr.101 External forced stop selection	Pr.82 Forced stop valid/invalid selection	○	−
−	Pr.96 Operation cycle setting	−	"0000H: 0.888ms" is set.
−	Pr.97 SSCNET setting	−	The value selected in SSCNET setting at replacement will be set.
Pr.102 Error and warning history selection	−	×	Error and warning histories are automatically saved.
	Basic parameters 1		
−	Pr.1 Unit setting	−	"3: pulse" is set.
Pr.0 Electronic gear numerator (AP)	Pr.2 Number of pulses per rotation (AP)	○	−
Pr.2 Electronic gear denominator (AL)	Pr.3 Movement amount per rotation (AL)	○	−
	Basic parameters 2		
Pr.10 Speed limit value	Pr.8 Speed limit value	○	The value that multiplies QD74MH setting value by 1000000 is set.
−	Pr.9 Acceleration time 0	○	These acceleration/deceleration time values come from the positioning data. (Refer to (2) in this section)
−	Pr.10 Deceleration time 0	○	

(Continued)

Data name		Divertible or not divertible	Remarks
QD74MH	RD77MS		
	Detailed parameters 1		
Pr.8 Backlash compensation amount	Pr.11 Backlash compensation amount	○	−
Pr.20 Command in-position range	Pr.16 Command in-position width	○	−
Pr.16 S-curve acceleration/deceleration time constant	−	×	−
Pr.23 Target position change overrun processing selection	−	×	−
Pr.25 Interpolation group	−	×	−
Pr.26 Linear interpolation speed limit value	−	×	−
Pr.28 Feed current value update selection during speed-torque control	−	×	−
Pr.31 External input signal logic selection: Lower limit	Pr.22 Input signal logic selection: Lower limit	○	−
Pr.31 External input signal logic selection: Upper limit	Pr.22 Input signal logic selection: Upper limit	○	−
Pr.31 External input signal logic selection: Proximity dog	Pr.22 Input signal logic selection: Proximity dog signal	○	−

(Continued)

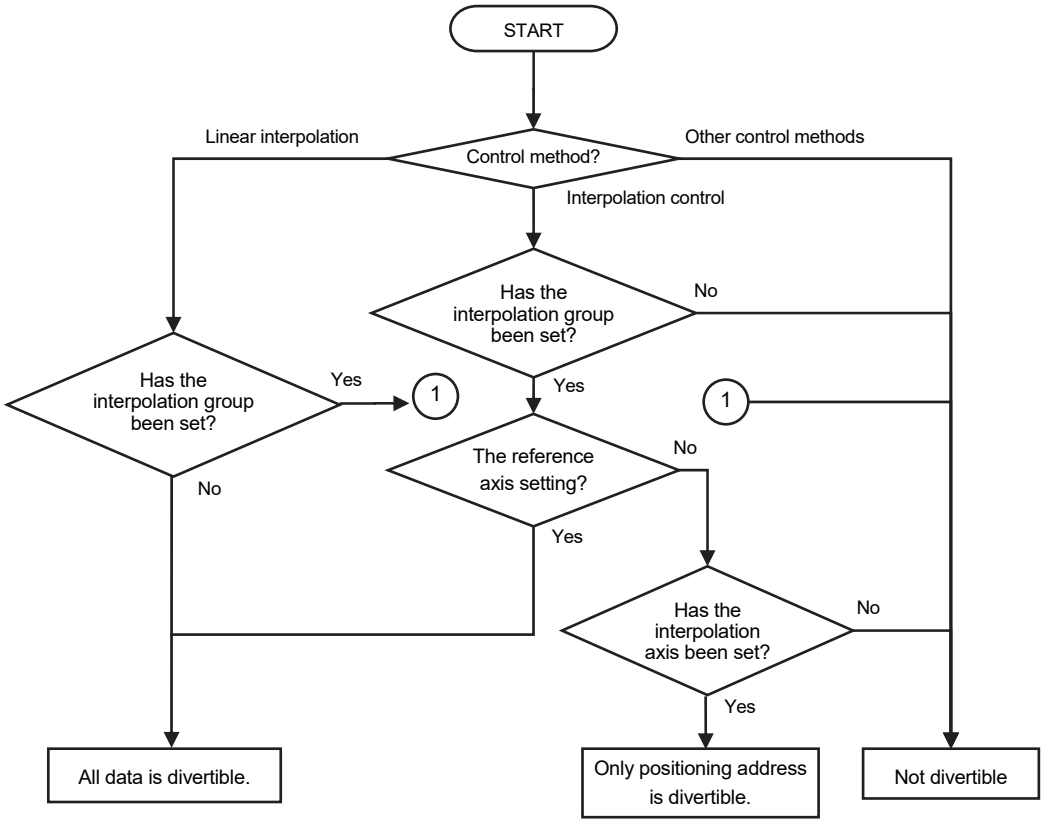
Data name		Divertible or not divertible	Remarks
QD74MH	RD77MS		
	Detailed parameters 2		
–	Pr.25 Acceleration time 1	○	The acceleration time value comes from positioning data. (Refer to (2) in this section)
Pr.82 JOG operation acceleration time	Pr.26 Acceleration time 2	○	–
Pr.58 OPR acceleration time	Pr.27 Acceleration time 3	○	–
–	Pr.28 Deceleration time 1	○	The deceleration time value comes from positioning data. (Refer to (2) in this section)
Pr.83 JOG operation deceleration time	Pr.29 Deceleration time 2	○	–
Pr.59 OPR deceleration time	Pr.30 Deceleration time 3	○	–
Pr.10 Speed limit value	Pr.31 JOG speed limit value	○	The value that multiplies QD74MH setting value by 1000000 is set.
–	Pr.32 JOG operation acceleration time selection	–	"2" is set.
–	Pr.33 JOG operation deceleration time selection	–	
Pr.15 Acceleration/deceleration method	Pr.34 Acceleration/deceleration process selection	○	–
Pr.17 Sudden stop deceleration time	Pr.36 Rapid stop deceleration time	○	–
–	Pr.37 Stop group 1 rapid stop selection	–	"1: Rapid stop" is set.
Pr.80 JOG speed	–	×	–
Pr.84 Incremental feedrate	–	×	–

(Continued)

Data name		Divertible or not divertible	Remarks
QD74MH	RD77MS		
	HPR basic parameters		
Pr.50 OPR method	Pr.43 HPR method	○	The current values are converted as follow. "0"→"0" "2"→"6" "3"→"0" "4"→"0" "5"→"0" "6"→"7" "7"→"0" (Note): The initial values are set for values other than above.
Pr.51 OPR direction	Pr.44 HPR direction	○	−
Pr.52 OP address	Pr.45 HP address	○	−
Pr.54 OPR speed	Pr.46 HPR speed	○	−
Pr.56 Creep speed	Pr.47 Creep speed	○	−
−	Pr.48 HPR retry	−	The OPR settings of QD74MH are diverted as follows according to the value set in "Pr.50 OPR method" "0" or "4" has been set: "1: Retry HPR with limit switch" Other than above: "0: Do not retry HPR with limit switch"
	HPR detailed parameters		
−	Pr.51 HPR acceleration time selection	−	"3" is set.
−	Pr.52 HPR deceleration time selection	−	
Pr.60 OP shift amount	Pr.53 HP shift amount	○	−
Pr.66 Operation setting for incompletion of OPR	Pr.55 Operation setting for incompletion of HPR	○	−
−	Pr.56 Speed designation during HP shift	−	"1: Creep speed" is set.
Pr.62 OP search limit	−	×	−
Pr.64 Incremental linear scale setting	−	×	−

(2) Positioning data

(a) Although QD74MH positioning data is not compatible with RD77MS, some data can be converted for the new system.
However, **make sure that it is not fully diverted for the new system. The positioning data needs to be reviewed and revised.**



(b) The following shows the details of positioning data diversion.

1) The existing acceleration/deceleration time settings are diverted to "Pr.9 Acceleration time 0", "Pr.25 Acceleration time 1"/"Pr.10 : Deceleration time 0", "Pr.28 Deceleration time 1".

2) The control method "6: Speed-torque" is not divertible. Create a sequence program by referring to "MELSEC iQ-R Simple Motion Module User's Manual (Application)".

3) When the control method is set as either "2: ABS linear interpolation" or "3: INC linear interpolation", the lowest axis No. in the interpolation group will be set as the reference axis.

4) Among the positioning data of axes specified in "Pr.25 interpolation group", only the ones in which "2: ABS linear interpolation" or "3: INC linear interpolation" is set can be diverted.

However, if the control methods do not match among the axes, the positioning data will not be diverted.

Data name		Divertible or not divertible	Remarks
QD74MH	RD77MS		
Operation pattern	Operation pattern	○	−
Control method	Control method	○	0:ABS linear 1 → 01h:ABS linear 1 1:INC linear 1 → 02h:INC linear 1 2:ABS linear interpolation → (Note-1) 3:INC linear interpolation → (Note-1) 6:Speed-torque → Not diverted
−	Interpolation axes	−	
−	Acceleration time No.	−	Refer to (b)-1) above.
Acceleration time/torque time constant	−	×	−
−	Deceleration time No.		Refer to (b)-1) above.
Deceleration time	−	×	−
Positioning address/ torque command value	Positioning address	○	−
−	Arc address	−	The initial value is set.
Command speed/speed limit value	Command speed	○	−
Dwell time	Dwell time	○	−
−	M-code	−	The initial value is set.
−	M code ON signal output timing	−	
−	ABS direction in degrees	−	
−	Interpolation speed designation method	−	
−	Comments in positioning data	−	
Positioning data No.2 to No.32	Positioning data No.2 to No.32	○	−

○: Divertible, ×: Not divertible, −: No equivalent parameter exists

(Note-1): These settings are diverted as follows according to the number of axes set in "Pr.25 Interpolation group".
In addition, the interpolation axis No. is diverted to "Axis to be interpolated No." in RD77MS.

The number of axes in the same interpolation group	Setting value	
	ABS linear interpolation	INC linear interpolation
0 or 1	01h ABS linear 1	02h INC linear 1
2	0Ah ABS linear 2	0Bh INC linear 2
3	15h ABS linear 3	16h INC linear 3
4	1Ah ABS linear 4	1Bh INC linear 4

The following shows the example of interpolation control settings.

[Example 1] • Pr.25 Interpolation group (Axis 1 to Axis 3): 1: Group 1
• The control method: the same setting for all axes

Axis No.	Control method	Reference axis	Diversion
Axis 1	2: ABS linear interpolation control	○	○
Axis 2	2: ABS linear interpolation control	−	○
Axis 3	2: ABS linear interpolation control	−	○

[Example 2] • Pr.25 Interpolation group (Axis 1 to Axis 3): 1: Group 1
• The control method: A different setting only for axis 1

Axis No.	Control method	Reference axis	Diversion
Axis 1	3: INC linear interpolation control	−	×
Axis 2	2: ABS linear interpolation control	○	○
Axis 3	2: ABS linear interpolation control	−	○

[Example 3] • Pr.25 Interpolation group (Axis 1 to Axis 3): 1: Group 1
• No common settings among the axes

Axis No.	Control method	Reference axis	Diversion
Axis 1	2: ABS linear interpolation control	−	×
Axis 2	6: Speed-torque	−	×
Axis 3	3: INC linear interpolation control	−	×

[Example 4] • Pr.25 Interpolation group (Axis 1 to Axis 3): 1: Group 1
• Positioning data control method: No interpolation control setting

Axis No.	Control method	Reference axis	Diversion
Axis 1	0: ABS linear 1	−	×
Axis 2	0: ABS linear 1	−	×
Axis 3	0: ABS linear 1	−	×

MEMO

MEMO

WARRANTY

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

1. Gratis Warranty Term and Gratis Warranty Range

If any faults or defects (hereinafter "Failure") found to be the responsibility of Mitsubishi occurs during use of the product within the gratis warranty term, the product shall be repaired at no cost via the sales representative or Mitsubishi Service Company.

However, if repairs are required onsite at domestic or overseas location, expenses to send an engineer will be solely at the customer's discretion. Mitsubishi shall not be held responsible for any re-commissioning, maintenance, or testing on-site that involves replacement of the failed module.

[Gratis Warranty Term]

The gratis warranty term of the product shall be for one year after the date of purchase or delivery to a designated place. Note that after manufacture and shipment from Mitsubishi, the maximum distribution period shall be six (6) months, and the longest gratis warranty term after manufacturing shall be eighteen (18) months. The gratis warranty term of repair parts shall not exceed the gratis warranty term before repairs.

[Gratis Warranty Range]

(1) The range shall be limited to normal use within the usage state, usage methods and usage environment, etc., which follow the conditions and precautions, etc., given in the instruction manual, user's manual and caution labels on the product.

(2) Even within the gratis warranty term, repairs shall be charged for in the following cases.

1. Failure occurring from inappropriate storage or handling, carelessness or negligence by the user. Failure caused by the user's hardware or software design.
2. Failure caused by unapproved modifications, etc., to the product by the user.
3. When the Mitsubishi product is assembled into a user's device, Failure that could have been avoided if functions or structures, judged as necessary in the legal safety measures the user's device is subject to or as necessary by industry standards, had been provided.
4. Failure that could have been avoided if consumable parts (battery, backlight, fuse, etc.) designated in the instruction manual had been correctly serviced or replaced.
5. Failure caused by external irresistible forces such as fires or abnormal voltages, and Failure caused by force majeure such as earthquakes, lightning, wind and water damage.
6. Failure caused by reasons unpredictable by scientific technology standards at time of shipment from Mitsubishi.
7. Any other failure found not to be the responsibility of Mitsubishi or that admitted not to be so by the user.

2. Onerous repair term after discontinuation of production

(1) Mitsubishi shall accept onerous product repairs for seven (7) years after production of the product is discontinued. Discontinuation of production shall be notified with Mitsubishi Technical Bulletins, etc.

(2) Product supply (including repair parts) is not available after production is discontinued.

3. Overseas service

Overseas, repairs shall be accepted by Mitsubishi's local overseas FA Center. Note that the repair conditions at each FA Center may differ.

4. Exclusion of loss in opportunity and secondary loss from warranty liability

Regardless of the gratis warranty term, Mitsubishi shall not be liable for compensation to:

(1) Damages caused by any cause found not to be the responsibility of Mitsubishi.

(2) Loss in opportunity, lost profits incurred to the user by Failures of Mitsubishi products.

(3) Special damages and secondary damages whether foreseeable or not, compensation for accidents, and compensation for damages to products other than Mitsubishi products.

(4) Replacement by the user, maintenance of on-site equipment, start-up test run and other tasks.

5. Changes in product specifications

The specifications given in the catalogs, manuals or technical documents are subject to change without prior notice.

6. Precautions for Choosing the Products

(1) For the use of our Simple Motion module, its applications should be those that may not result in a serious damage even if any failure or malfunction occurs in Simple Motion module, and a backup or fail-safe function should operate on an external system to Simple Motion module when any failure or malfunction occurs.

(2) Our Simple Motion module is designed and manufactured as a general purpose product for use at general industries. Therefore, applications substantially influential on the public interest for such as atomic power plants and other power plants of electric power companies, and also which require a special quality assurance system, including applications for railway companies and government or public offices are not recommended, and we assume no responsibility for any failure caused by these applications when used. In addition, applications which may be substantially influential to human lives or properties for such as airlines, medical treatments, railway service, incineration and fuel systems, man-operated material handling equipment, entertainment machines, safety machines, etc. are not recommended, and we assume no responsibility for any failure caused by these applications when used. We will review the acceptability of the abovementioned applications, if you agree not to require a specific quality for a specific application. Please contact us for consultation.

The company names, system names and product names mentioned in this document are either registered trademarks or trademarks of their respective companies.
In some cases, trademark symbols such as ' ™ ' or '®' are not specified in this manual.

Migration Guide from Positioning Module to Simple Motion Module [QD74MH ⇒ RD77MS]

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