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MITSUBISHI ELECTRIC SERVO SYSTEM CONTROLLER

Migration Guide of Motion Controller [Q17nHCPU(-T) ⇒ RnMTCPU]

● 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.
- 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 modules 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 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.
- 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.
- 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).
- 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 circuiA-5t, 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. 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 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 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 Handyphone 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 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.
- 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 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.

REVISIONS

Print Date	Manual No.	Revision
Dec., 2017	L(NA)03157-A	First edition

INTRODUCTION

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

CONTENTS

MEMO

1. OVERVIEW OF MIGRATION FROM Q17nHCPU(-T) TO RnMTCPU

1.1 Benefits of Migration

Migrating from the existing system using Q173HCPU(-T)/Q172HCPU(-T) Motion controllers to a new system using MELSEC iQ-R series Motion controllers R32MTCPU/R16MTCPU (hereinafter called RnMTCPU), which support the programs on the Q173HCPU(-T)/Q172HCPU(-T), 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-speed operation and high functionality of the Motion controller
The Motion controller RnMTCPU achieves the maximum operation cycle of 0.222 ms/2 axes, enabling a dramatically fast operation.
The controller also achieves further advanced motion control with a wide variety of motion control functions.
→ Increased productivity from higher speeds and functionality of the Motion 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 latest 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) 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 and operating system software for replacement described in this section are as follows.
If you are using special operating system software or application-specific operating system software, contact your local sales office.

(1) Modules/Cables

Product name	Model before migration		Model after migration
Motion CPU module	Q172HCPU		R16MTCPU(Note-1)
	Q173HCPU		R32MTCPU(Note-2)
	Q172HCPU-T		R16MTCPU(Note-1), (Note-3)
	Q173HCPU-T		R32MTCPU(Note-2), (Note-3)
Battery holder unit	Q170HBATC (Order if necessary)		−
Servo external signals interface module	Q172LX		MELSEC iQ-R series Input module
Serial absolute synchronous encoder interface module	Q172EX		[Synchronous encoder compatible servo amplifier] MR-J4-□B-RJ(Note-4)
	Q172EX-S1		
	Q172EX-S2		
	Q172EX-S3		
Manual pulse generator interface module	Q173PX		MELSEC iQ-R series High-speed counter module
	Q173PX-S1		
Serial absolute synchronous encoder	MR-HENC		Q171ENC-W8
	Q170ENC		
Serial absolute synchronous encoder cable	MR-JHSCBL□M-H,L (For MR-HENC)		Q170ENCCBL□M-A
	Q170ENCCBL□M (For Q170ENC)		
Manual pulse generator	MR-HDP01		MR-HDP01(Note-5)
SSC I/F board	A10BD-PCF		−
	A30BD-PCF		−
SSC I/F card	A30CD-PCF		−
SSCNETIII cable(Note-6)	MR-J3BUS□M MR-J3BUS□M-A MR-J3BUS□M-B(Note-7)		← (Same as the left)
SSC I/F board cable	Q170BDCBL□M		−
SSC I/F card cable	Q170CDCBL□M		−

(Continued)

Product name	Model before migration		Model after migration
Teaching unit	A31TU-D3K13		–
	A31TU-DNK13		
Cable for teaching unit	Q170TUD3CBL3M		–
	Q170TUDNCBL3M		
	Q170TUDNCBL03M-A		
Short-circuit connector for teaching unit	Q170TUTM		–
	A31TUD3TM		

(Note-1): The number of control axes is increased from 8 to 16.

(Note-2): If the number of axes used in the system with Q173HCPU(-T) is 16 or less, R16MTCPU can be also selected.

(Note-3): RnMTCPU does not support teaching units.

(Note-4): The synchronous encoder is connected via the servo amplifier.

(Note-5): The existing MR-HDP01 can be used continuously with RnMTCPU.
When a manual pulse generator is used with RnMTCPU, prepare a power supply separately.
In addition, Mitsubishi Electric has confirmed the operation of the following manual pulse generator.
Contact the manufacturer for details.

Product name	Model name	Description	Manufacturer
Manual pulse generator	UFO-M2-0025-2Z1-B00E	Number of pulses per revolution: 25 pulse/rev (100 pulse/rev after magnification by 4)	Nemicon Corporation

(Note-6): "□" 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-7): 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) Operating system software

Before migration				After migration	
CPU model	OS Type	OS model		CPU model	OS model
Q173HCPU(-T)	SV13	SW6RN-SV13QK		R32MTCPU R16MTCPU	SW10DNC-RMTFW (installed before shipment)
Q172HCPU(-T)		SW6RN-SV13QM			
Q173HCPU(-T)	SV22	SW6RN-SV22QJ			
Q172HCPU(-T)		SW6RN-SV22QL			

(3) Servo amplifiers/Rotary servo motors

Before migration from Q17nHCPU(-T)				After migration to RnMTCPU		
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□

(4) Servo amplifiers/Linear servo motors

Before migration from Q17nHCPU(-T)				After migration to RnMTCPU		
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□

(5) Servo amplifiers/Direct drive motors

Before migration from Q17nHCPU(-T)				After migration to RnMTCPU		
Servo amplifier		Direct drive motor		Servo amplifier		Direct drive motor
MR-J3 series	MR-J3-□B-RJ080W	TM-RFM□	→	MR-J4 series	MR-J4-□B(-RJ) MR-J4W2-□B MR-J4W3-□B	TM-RFM□

(6) Servo system network

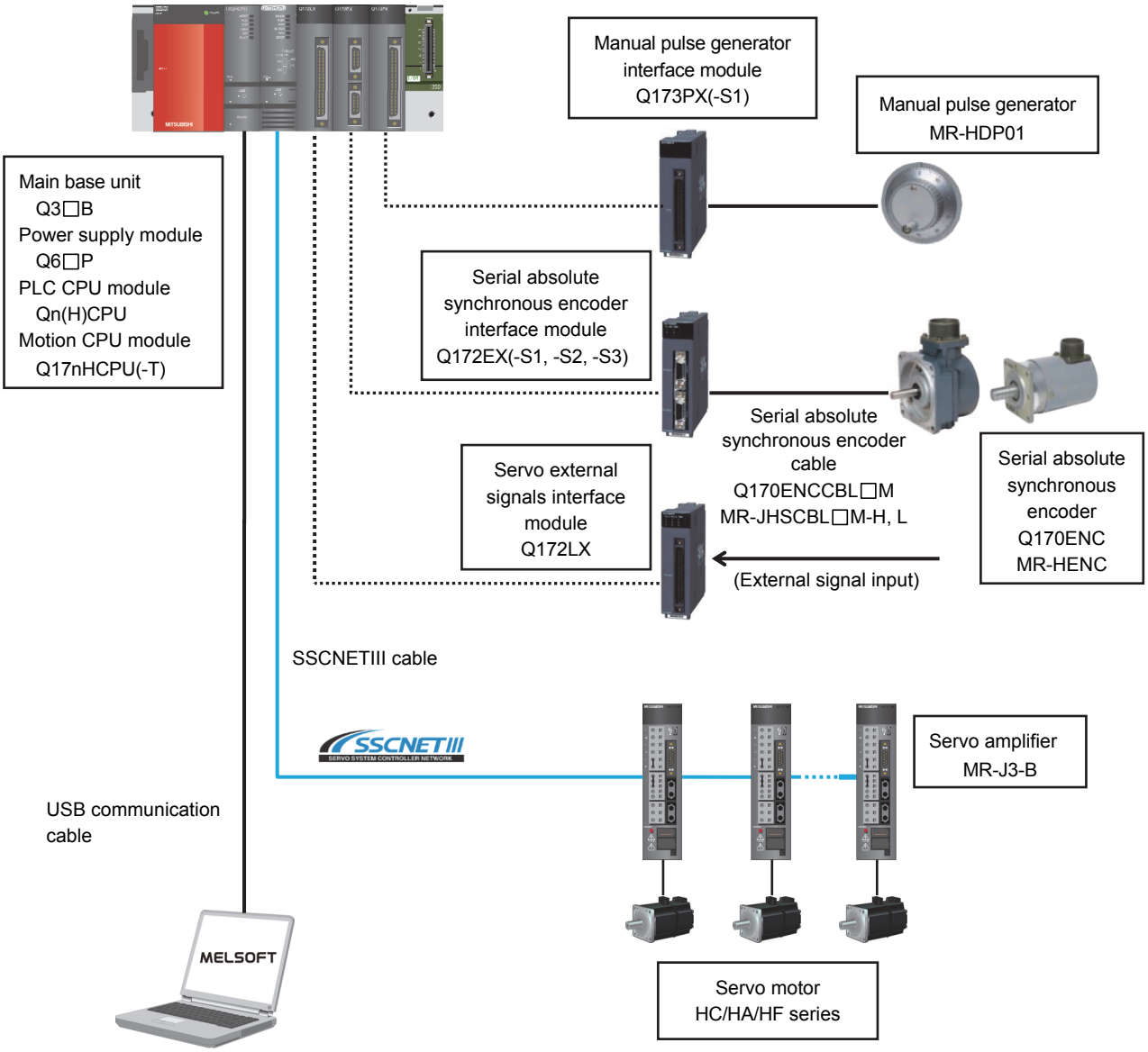
Item		SSCNETIII		SSCNETIII/H
Communications medium		Optical fiber cable		← (same as SSCNETIII)
Communications speed		50 Mbps		150 Mbps
Communications cycle	Send	0.44 ms/0.88 ms		0.222 ms/0.444 ms/0.888 ms
	Receive	0.44 ms/0.88 ms		0.222 ms/0.444 ms/0.888 ms
Number of control axes		Up to 16 axes/line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

(7) Engineering environment (required)

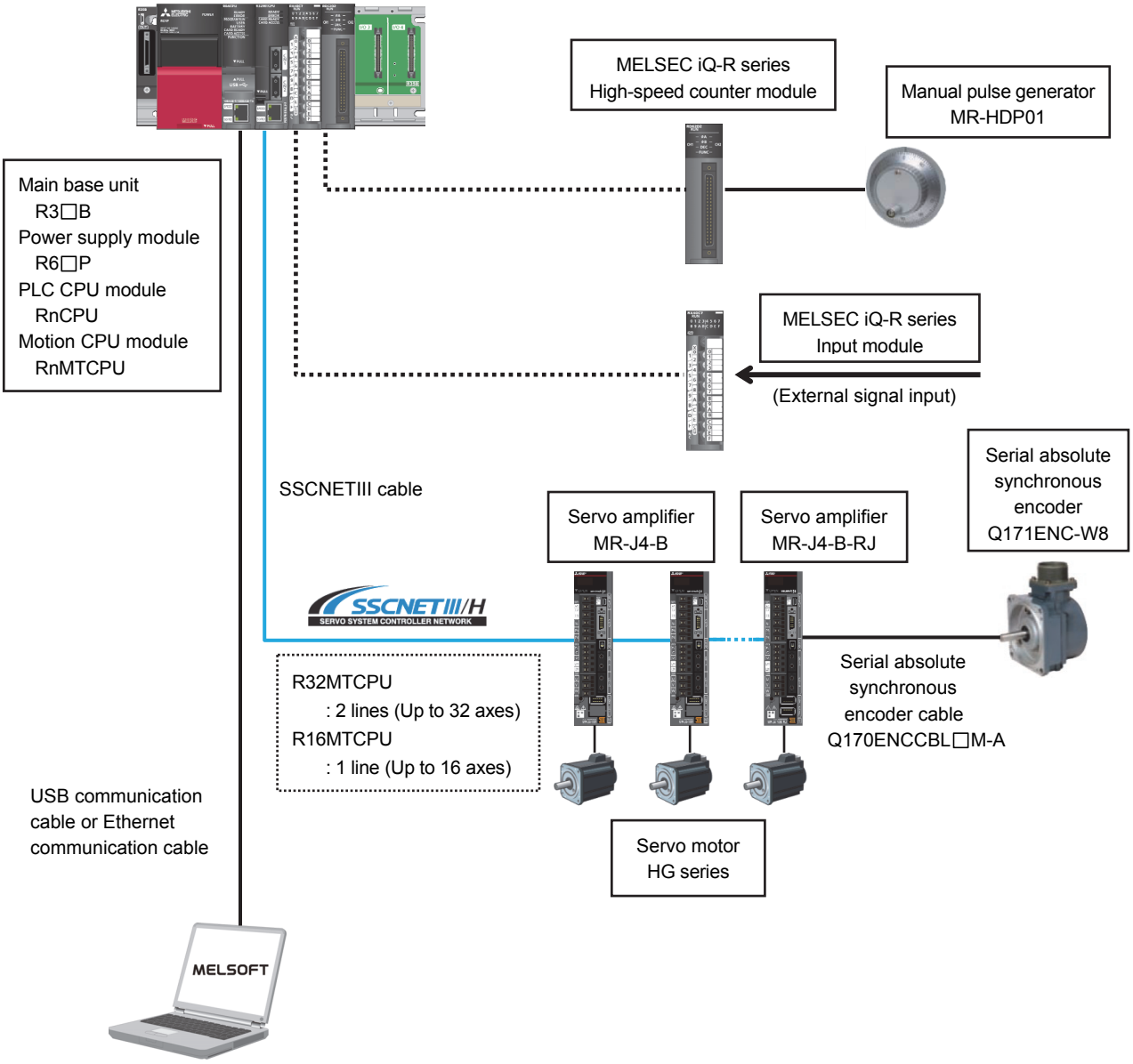
Product name	Model	Version
MELSOFT MT Works2	SW1DND-MTW2-E	Ver.1.100E or later
MELSOFT GX Works3	SW1DND-GXW3-E	Ver.1.000A or later
MELSOFT MR Configurator2	SW1DNC-MRC2-E	Ver.1.27D or later

1.3 System Configuration

1.3.1 System configuration using Q17nHCPU(-T) before migration

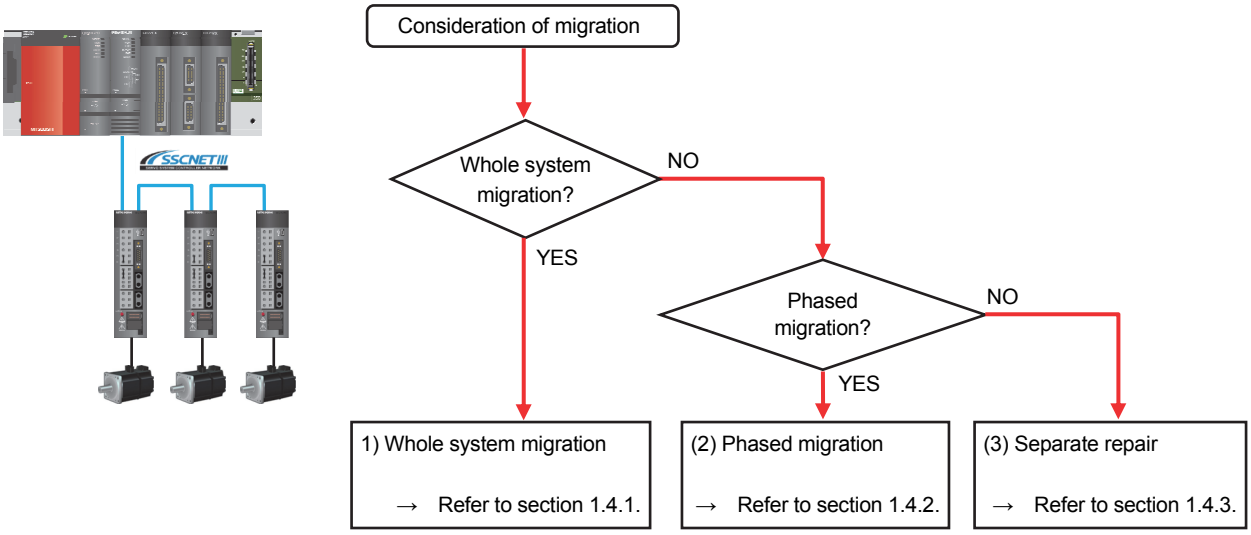


1.3.2 System configuration using RnMTCPU after migration



1.4 Case Study on Migration

The following describes a standard case study of migrating the existing system using Q17nHCPU(-T).



(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.)

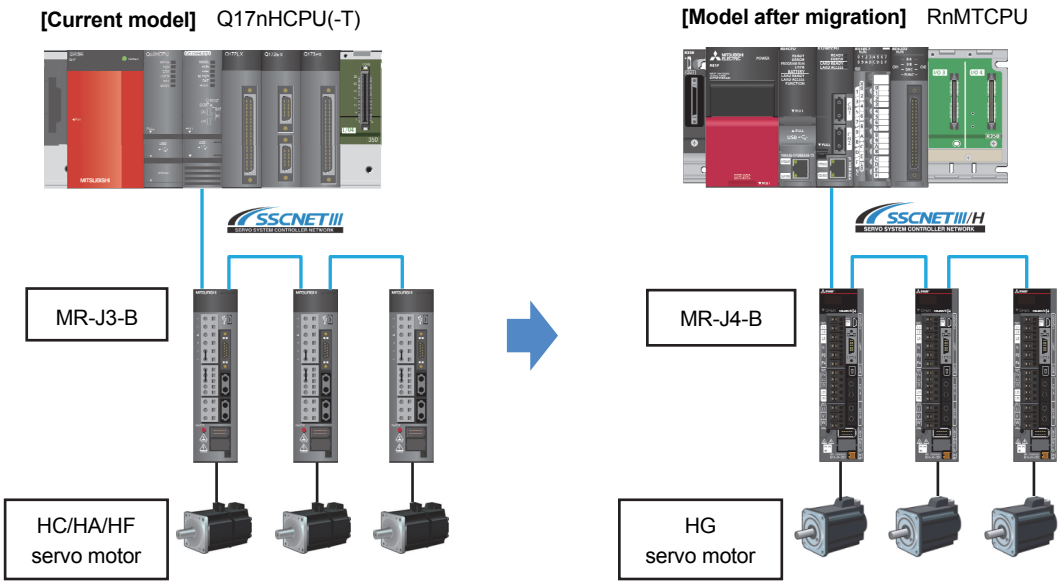
The controller is replaced with RnMTCPU in the first phase, and then the MR-J3-B servo amplifiers are gradually replaced with MR-J4-B.
(Refer to section 1.4.2.)

(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.



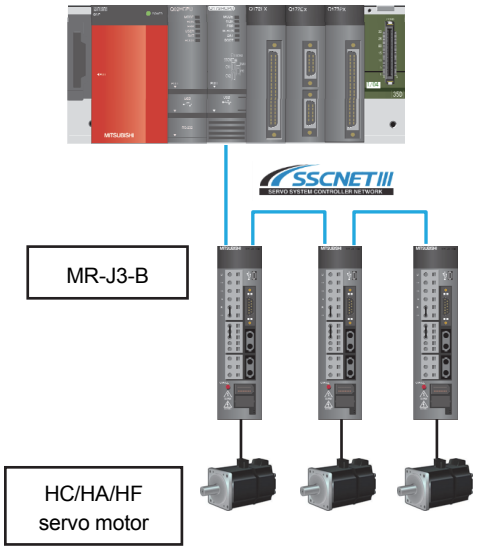
[Changes in the system]

Product name	Model before migration		Model after migration
Main base unit	Q3□B		R3□B
PLC CPU module	Qn(H)CPU		RnCPU
Motion CPU module	Q17nHCPU(-T)		RnMTCPU
Motion modules	Q172LX		MELSEC iQ-R series Input module
	Q172EX(-S1,-S2,-S3)		[Synchronous encoder compatible servo amplifier] MR-J4-□B-RJ
	Q173PX(-S1)		MELSEC iQ-R series High-speed counter module
Servo amplifier	MR-J3-B		MR-J4-B
Servo motor	HC/HA/HF series		HG series

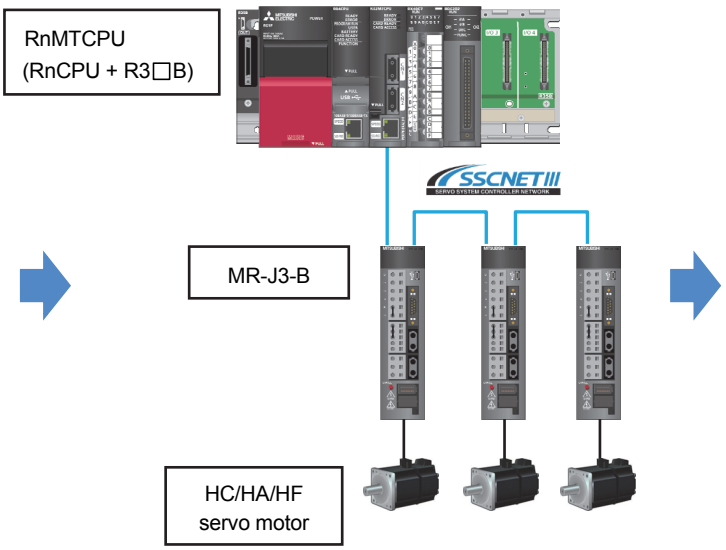
1.4.2 Phased migration

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

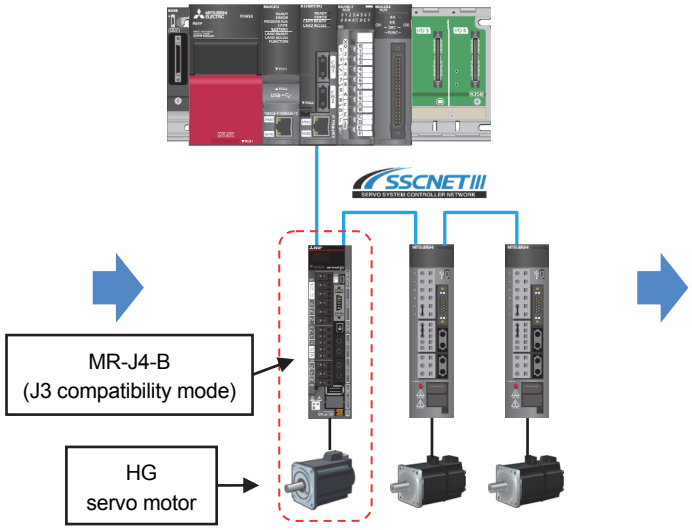
[Current model]



[Replacement - Phase 1]
Replacement of the controller

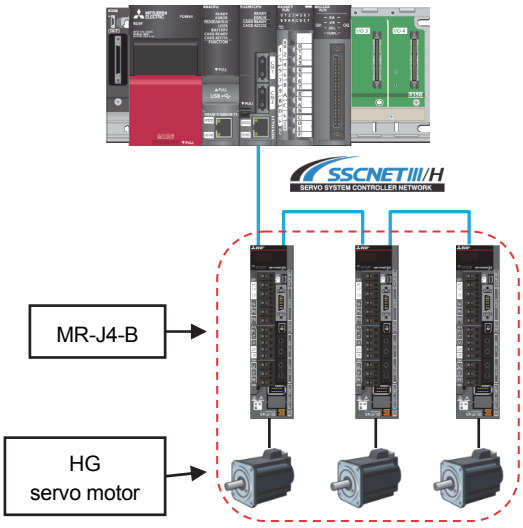


[Replacement - Phase 2]
Servo amplifier and servo motor replacement for only one axis



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

[Replacement - Phase 3]
Servo amplifier and servo motor replacement for all axes, and servo system network replacement

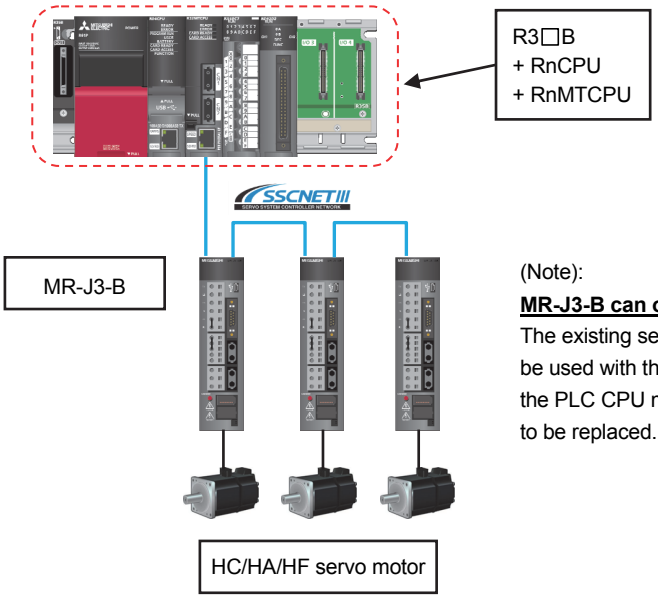


(Note): When replacing all the servo amplifiers with MR-J4-B, the operation mode can be switched from “J3 compatibility mode” to “J4 mode”.
The servo system network is also changed from SSCNETIII to SSCNETIII/H.

1.4.3 Separate repair

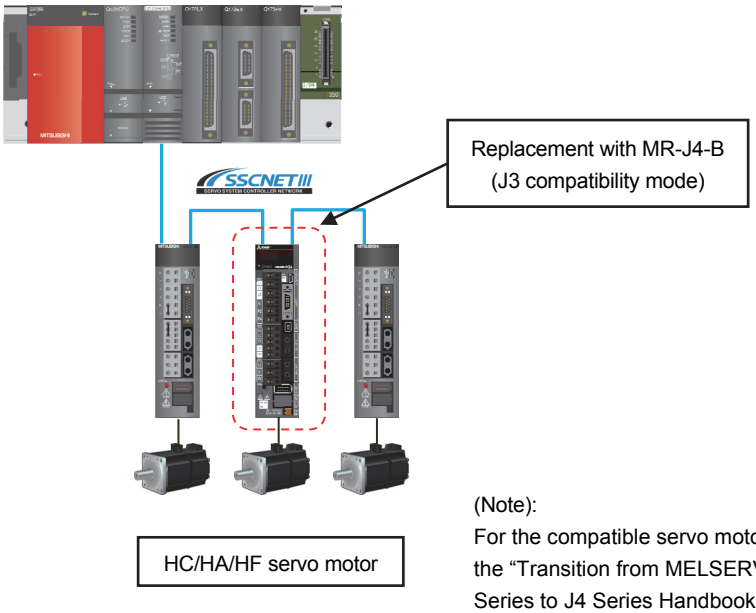
The following shows the procedure for the separate repair.

(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, however, note that the PLC CPU module and the main base unit needs to be replaced.

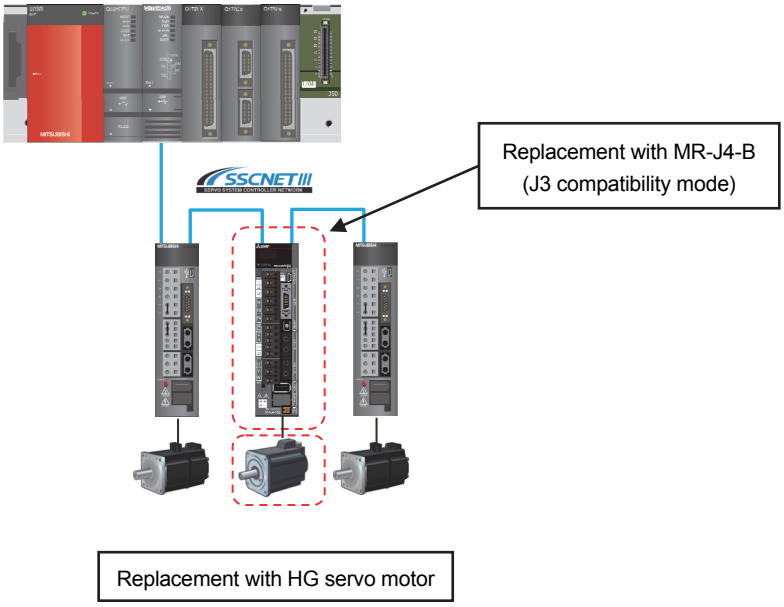
(2) When the MR-J3-B servo amplifier has malfunctioned.
Replace only the servo amplifier.



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

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

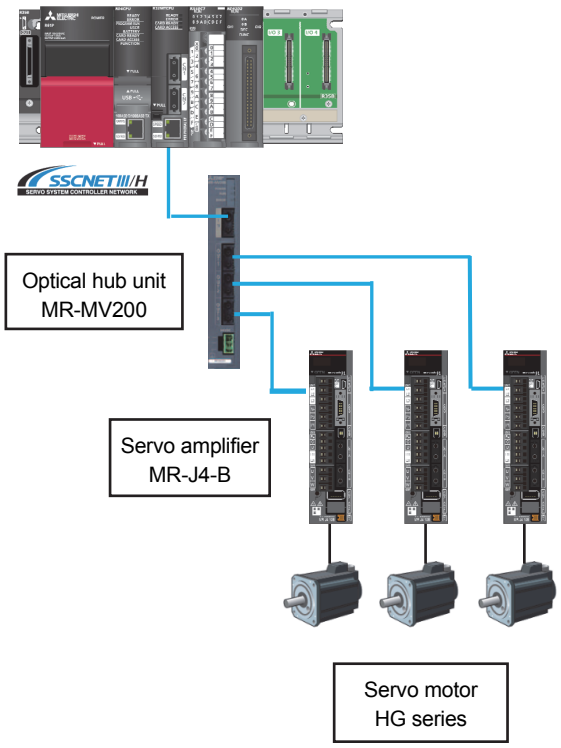
Simultaneously replace the servo amplifier and the malfunctioned servo motor.



1.4.4 Precautions for powering off only a desired servo amplifier

Use the SSCNETIII/H compatible MR-MV200 optical hub unit for powering off only a desired servo amplifier.
Refer to section 1.4.5 for details of the MR-MV200 optical hub unit.

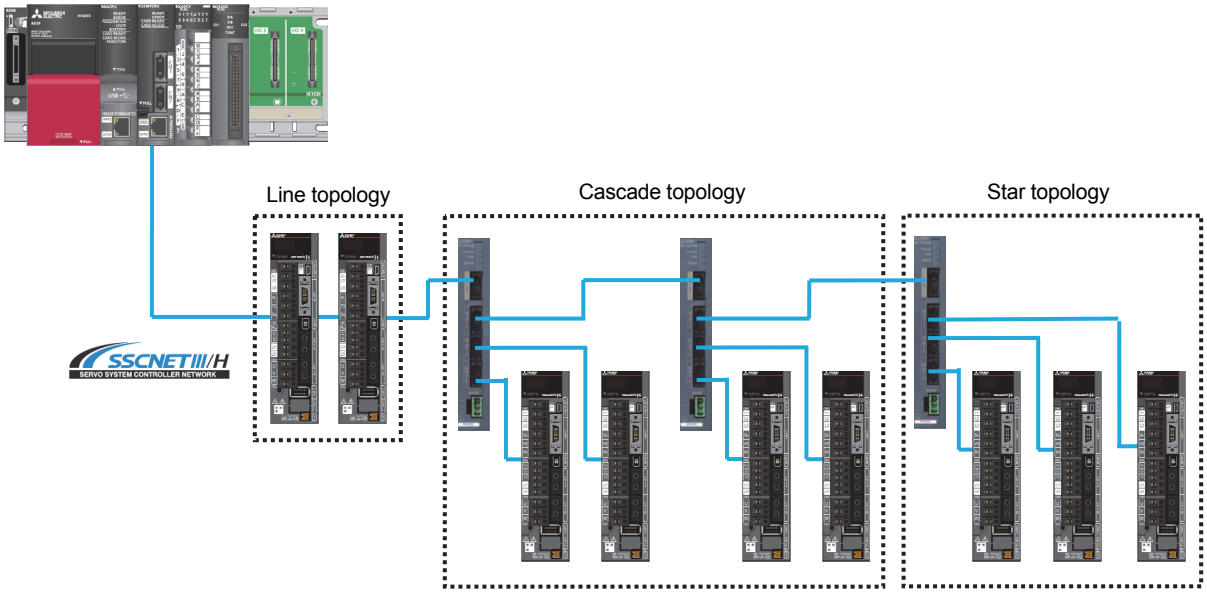
The system with the MR-MV200 is shown below.



1.4.5 Configuration when the MR-MV200 optical hub unit is used

The MR-MV200 can branch a single SSCNETIII/H network line in three separate directions (three outputs per one input).

A connection example when using the MR-MV200 and the specifications are shown below.



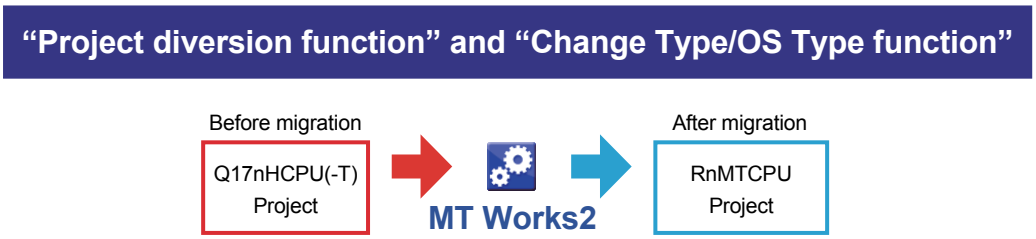
Item	Description
Input voltage [V]	21.6 to 26.4 VDC (24 VDC ± 10 %)
Consumption current [A]	0.2
Mass [kg]	0.22
Mounting method	Directly mounted to the control panel or with DIN rail
Cable length [m]	Up to 100
Number of optical hub units	Up to 16 units/line
Number of servo amplifiers	Up to 16 axes/line
Exterior dimensions [mm]	168 (H) x 30 (W) x 100 (D)

1.5 Project Diversion

The following functions can convert the projects of Q17nHCPU(-T) into those of RnMTCPU.
For the procedure of project conversion, refer to section “2.4.3 Project diversion procedures by engineering environment”.

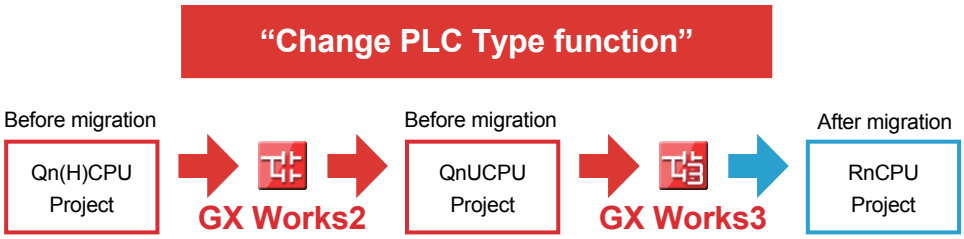
(1) Motion CPU project

“Project diversion function” and “Change type/OS type function” of MELSOFT MT Works2



(2) PLC CPU project

“Change PLC type function” of MELSOFT GX Works3



1.6 Introduction of R64MTCPU

The MELSEC iQ-R series Motion controller R64MTCPU with the maximum of 64 control axes is also available. Up to 192 axes can be synchronized by the use of three R64MTCPUs, enabling control of a large-scale system.

	R64MTCPU	R32MTCPU	R16MTCPU
Maximum number of control axes	64 axes (Note-1)	32 axes	16 axes
Command interface	SSCNETIII/H, SSCNETIII		
Number of SSCNETIII/H lines	2 lines (Note-2)		1 line (Note-2)
Maximum distance between stations [m]	100 (SSCNETIII/H), 50 (SSCNETIII)		
Maximum overall cable distance [m]	3200 (SSCNETIII/H) 800 (SSCNETIII)	1600 (SSCNETIII/H) 800 (SSCNETIII)	
Maximum number of connected optical hub units	32 (16 per line)		16
Operation cycle	0.222 ms to 7.111 ms		
Program language	Motion SFC, Dedicated instruction		

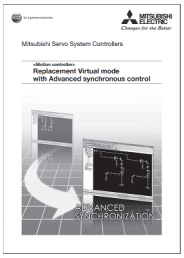
(Note-1): When SSCNETIII is used, the maximum number of control axes is 32 (16 axes per line).

(Note-2): SSCNETIII/H and SSCNETIII cannot be mixed on the same line.

1.7 Relevant Documents

Refer to the following relevant documents for the replacement.

1.7.1 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	Replacement of Virtual mode with Advanced synchronous control  L(NA)03123

1.7.2 Relevant manuals

(1) Motion controller

Manual title	Manual No.
MELSEC iQ-R Motion Controller User's Manual	IB-0300235
MELSEC iQ-R Motion Controller Programming Manual (Common)	IB-0300237
MELSEC iQ-R Motion Controller Programming Manual (Program Design)	IB-0300239
MELSEC iQ-R Motion Controller Programming Manual (Positioning Control)	IB-0300241
MELSEC iQ-R Motion Controller Programming Manual (Advanced Synchronous Control)	IB-0300243
MELSEC iQ-R Motion Controller Programming Manual (Machine Control)	IB-0300309

(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

2. DETAILS OF MIGRATION FROM Q17nHCPU(-T) TO RnMTCPU

2.1 Table of Components and Software

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

Product name			Model before migration	Model after migration
Motion CPU module			Q172HCPU	R16MTCPU(Note-1)
			Q173HCPU	R32MTCPU(Note-2)
			Q172HCPU-T	R16MTCPU(Note-1), (Note-3)
			Q173HCPU-T	R32MTCPU(Note-2), (Note-3)
PLC CPU module			Qn(H)CPU	RnCPU
Power supply module			Q6□P	R6□P
Main base unit			Q3□B	R3□B
Extension base unit			Q6□B	R6□B
Extension cable			QC□B	RC□B
Servo external signals interface module			Q172LX	MELSEC iQ-R series Input module
Serial absolute synchronous encoder interface module			Q172EX	[Synchronous encoder compatible servo amplifier] MR-J4-□B-RJ(Note-4)
			Q172EX-S1	
			Q172EX-S2	
			Q172EX-S3	
Manual pulse generator interface module			Q173PX	MELSEC iQ-R series High-speed counter module
			Q173PX-S1	
Input module				MELSEC iQ-R series Input module
	AC		QX10	
	DC		QX40, QX41, QX42, QX80, QX81 QX70, QX71, QX72	
Output module				MELSEC iQ-R series Output module
	Relay		QY10	
	Transistor	Sink	QY40P, QY41P, QY42P, QY50	
		Source	QY80, QY81P	
	TTL·CMOS (Sink)		QY70, QY71	
Input/Output composite module			QH42P, QX48Y57	MELSEC iQ-R series Input/Output composite module
Analog input module				MELSEC iQ-R series Analog input module
	Voltage input		Q68ADV	
	Current input		Q68ADI	
	Voltage·current input		Q64AD	
Analog output module				MELSEC iQ-R series Analog output module
	Voltage output		Q68DAV	
	Current output		Q68DAI	
	Voltage·current output		Q62DA, Q64DA	

(Continued)

Product name	Model before migration		Model after migration
Interrupt module	QI60		MELSEC iQ-R series Input module
Serial absolute synchronous encoder	MR-HENC		Q171ENC-W8
	Q170ENC		
Serial absolute synchronous encoder cable	MR-JHSCBL□M-H,L (For MR-HENC)		Q170ENCCBL□M-A
	Q170ENCCBL□M (For Q170ENC)		
Battery holder unit	Q170HBATC (Order if necessary)		–
Battery	Q6BAT (For Motion CPU module)		–
	A6BAT (For synchronous encoder)		– (The battery of the servo amplifier is used)
Manual pulse generator	MR-HDP01		MR-HDP01(Note-5)
SSCNETIII cable(Note-6)	MR-J3BUS□M MR-J3BUS□M-A MR-J3BUS□M-B(Note-7)		← (Same as the left)
Teaching unit	A31TU-D3K13		–
	A31TU-DNK13		
Cable for teaching unit	Q170TUD3CBL3M		–
	Q170TUDNCBL3M		
	Q170TUDNCBL03M-A		
Short-circuit connector for teaching unit	Q170TUTM		–
	A31TUD3TM		

(Note-1): The number of control axes is increased from 8 to 16.

(Note-2): If the number of axes used in the system with Q173HCPU(-T) is 16 or less, R16MTCPU can be also selected.

(Note-3): RnMTCPU does not support teaching units.

(Note-4): A synchronous encoder is connected via the servo amplifier.

(Note-5): The existing MR-HDP01 can be used continuously with RnMTCPU.
When a manual pulse generator is used with RnMTCPU, prepare a power supply separately.
In addition, Mitsubishi Electric has confirmed the operation of the following manual pulse generator.
Contact the manufacturer for details.

Product name	Model name	Description	Manufacturer
Manual pulse generator	UFO-M2-0025-2Z1-B00E	Number of pulses per revolution: 25 pulse/rev (100 pulse/rev after magnification by 4)	Nemicon Corporation

(Note-6): "□" 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-7): 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 Q17nHCPU(-T)				After migration to RnMTCPU		
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 Q17nHCPU(-T)				After migration to RnMTCPU		
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) Servo amplifiers/Direct drive motors

Before migration from Q17nHCPU(-T)				After migration to RnMTCPU		
Servo amplifier		Direct drive motor		Servo amplifier		Direct drive motor
MR-J3 series	MR-J3-□B-RJ080W	TM-RFM□	→	MR-J4 series	MR-J4-□B(-RJ) MR-J4W2-□B MR-J4W3-□B	TM-RFM□

[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		0.222 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 and standard cable for outside panel] Up to 20 m between stations Maximum overall distance: 320 m (20 m × 16 axes)		← (same as SSCNETIII)
		[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 Operating system software

Use the operating system software for RnMTCPU.

Before migration			After migration	
CPU model	OS Type	OS model	CPU model	OS model
Q173HCPU(-T)	SV13	SW6RN-SV13QK	R32MTCPU R16MTCPU	SW10DNC-RMTFW (installed before shipment)
Q172HCPU(-T)		SW6RN-SV13QM		
Q173HCPU(-T)	SV22	SW6RN-SV22QJ		
Q172HCPU(-T)		SW6RN-SV22QL		

2.1.3 Engineering environment (required)

The engineering environment that supports RnMTCPU is as follows.

Product name	Model	Version
MELSOFT MT Works2	SW1DND-MTW2-E	Ver.1.100E or later
MELSOFT GX Works3	SW1DND-GXW3-E	Ver.1.000A or later
MELSOFT MR Configurator2	SW1DNC-MRC2-E	Ver.1.27D or later

2.2 Differences Between Q17nHCPU(-T) and RnMTCPU

(1) Performance and specifications

► An item that requires a setting change at migration.

Items \ Models		Q173HCPU(-T)	Q172HCPU(-T)	R32MTCPU	R16MTCPU	Points for migration
Number of control axes		Up to 32	Up to 8	Up to 32	Up to 16	–
Operation cycle (default)	SV13	0.44ms/ 1 to 3 axes 0.88ms/4 to 10 axes 1.77ms/ 11 to 20 axes 3.55ms/21 to 32 axes		0.222ms/ 1 to 2 axes 0.444ms/ 3 to 8 axes 0.888ms/ 9 to 20 axes 1.777ms/21 to 32 axes		►If the operation cycle is set as default (automatic), the operation cycle will be changed. Set a fixed operation cycle where necessary because the change in the operation cycle may change program execution timing. (Refer to section 2.2(11).)
	SV22	0.88ms/ 1 to 5 axes 1.77ms/ 6 to 14 axes 3.55ms/15 to 28 axes 7.11ms/29 to 32 axes				
Control methods		Positioning control, Speed control, Speed/position switching control, Fixed-pitch feed, Constant speed control, Position follow-up control, Speed control with fixed position stop, Speed switching control, High-speed oscillation control, Synchronous control (SV22)		Positioning control, Speed control, Speed/position switching control, Fixed-pitch feed, Continuous trajectory control, Position follow-up control, Speed control with fixed position stop, High-speed oscillation control, Speed-torque control, Tightening & press-fit control, Advanced synchronous control		The term "constant-speed control" has been changed to "continuous trajectory control". However, the program is divertible as it is. ►If "Speed-switching control" is used, replace it with "Continuous trajectory control". (Refer to section 2.2(10).)
Motion dedicated PLC instruction		S(P).DDRD, S(P).DDWR, S(P).SFCS, S(P).SVST, S(P).CHGT, S(P).CHGV, S(P).CHGA, S(P).GINT		D(P).DDRD, D(P).DDWR, D(P).SFCS, D(P).SVST, D(P).CHGT, D(P).CHGV, D(P).CHGVS, D(P).CHGA, D(P).CHGAS, D(P).GINT, D(P).SVSTD		►Replace the Motion dedicated PLC instruction S(P).☐ with D(P).☐. Revise programs which use CHGT instructions because the unit of the torque limit value is different. (Refer to section 2.2(9).)
Program language		Motion SFC, Dedicated instruction, Mechanical support language		Motion SFC, Dedicated instruction		►For replacement of a mechanical system program (mechanical support language), refer to "Replacement of virtual mode with advanced synchronous control".
Servo external signal		Q172LX signal, Amplifier input		Bit device (When “Inter-module synchronization” is valid, “High accuracy” setting of actual input signal is possible), Amplifier input		►When the servo external signals are used, review the settings. (Refer to section 2.2(12).)
Cancel signal of servo program		Available		Not available		►Delete the cancel command in the servo program, and assign the same signal to the external signal (STOP signal) or use Rq.1140 stop command.

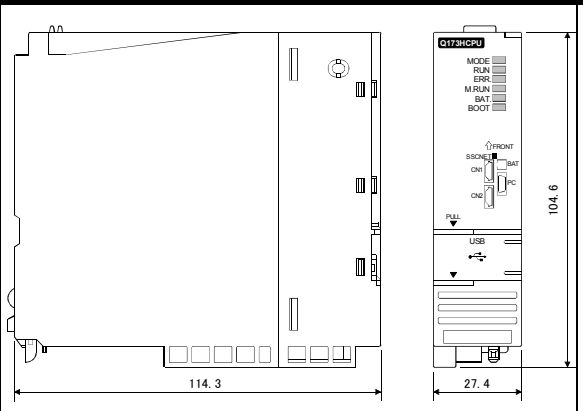
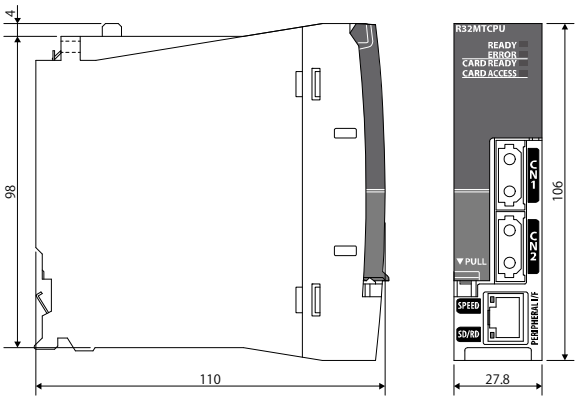
(Continued)

Items \ Models	Q173HCPU(-T)	Q172HCPU(-T)	R32MTCPU	R16MTCPU	Points for migration
Limit output data	Output enable/disable bit, Forced output bit		Forced OFF bit, Forced ON bit		The setting of "Output enable/disable bit" and "Forced output bit" in Q17nHCPU(-T) are respectively diverted as "Forced OFF bit" and "Forced ON bit" in RnMTCPU. The program can be diverted as it is.
Shared CPU memory	H0 to HFFF (4096 words)		U3E□\G0 to U3E□\G2097151 (2097152 words)		If MULTW /MULTR instructions are used for writing/reading of data to/from the shared memory, review the program. (Refer to section 2.2(6).)
Cancelling errors of Multiple CPU	[Self-diagnostic error code] • 10000: M2039 OFF • Less than 10000: M9060 OFF→ ON (The error code needs to be stored to the special register of D9060.)		SM50 ON • All errors can be cancelled. • After cancelling errors, SM50 turns OFF automatically.		For details of RnMTCPU errors, refer to section 2.2(5).
Self-diagnostic errors	Motion CPU-specific errors →"10000" is stored in the diagnostic error (D9008). At this time, the self-diagnostic error flag (M9008) and the diagnostic error flag (M9010) do not turn ON.		All errors are assigned to the self-diagnostic error codes. When an error occurs, an error code is set in SD0, and then SM0 and SM1 turn ON.		
Motion SFC error detection flag (M2039)	It depends on the error whether M2039 is turned ON or not.		None (integrated into the self-diagnostic errors)		
Battery error check of Motion CPU	Provided		None (Battery-less)		
Peripheral I/F	USB (via PLC CPU) / USB/SSCNET (Motion CPU)		USB/Ethernet (via PLC CPU) / PERIPHERAL I/F (Motion CPU)		Use a compatible I/F to communicate with peripheral devices. If PC link communication is used, replace it with USB communication. In that case, replace the existing cable with the A-miniB USB cable as well.
Servo system network	SSCNETIII		SSCNETIII/H or SSCNETIII		−
Limit switch output function	Up to 32 points		Up to 64 points		−
Mark detection function	Not available		Up to 64 settings		−
RUN/STOP	RUN/STOP switch		RUN/STOP switch, remote RUN/STOP, RUN contact		▶If M2000, M3072, or D704 is directly operated in the program to switch the RUN/STOP status, revise the program. (Refer to section 2.2(7).)

(Continued)

Items \ Models	Q173HCPU(-T)	Q172HCPU(-T)	R32MTCPU	R16MTCPU	Points for migration
Output mode setting of STOP to RUN	No option (Comparable to "Clear the output (Y)")		Output the output (Y) status before STOP/ Clear the output (Y)		▶The default setting is "Output the output (Y) status before STOP". Change the setting if necessary.
LED display	MODE, RUN, ERR, M.RUN, BAT, BOOT on LED display		READY, ERROR, CARD READY, CARD ACCESS with Dot matrix LED		More information can be indicated on the LED display, enabling to conduct troubleshooting more easily. (Refer to "MELSEC iQ-R Motion Controller User's Manual".)
Latch range setting — Latch (1)	Range in which the latch can be cleared with the latch clear		Up to 32 settings (M, B, F, D, W, # devices)		▶# devices are latched as default in Q17nHCPU(-T), however, not in RnMTCPU. Review the latch settings as needed.
Latch range setting — Latch (2)	Range in which the latch cannot be cleared with the latch clear				
Latch clear — Latch (1)	L.CLR switch		• Clearing the MELSOFT MT Works2 Motion CPU memory. • Cleaning built-in memory with Motion CPU rotary switch "C".		
Latch clear — Latch (2)	All clear function		• Cleaning built-in memory with Motion CPU rotary switch "C".		
All clear function	Turn OFF PLC ready flag (M2000) and test mode ON flag (M9075) to execute all clear		• The standard ROM and the latch range are cleared with the rotary switch for all clear. • The standard ROM is cleared by formatting the Motion CPU.		–
Acceleration/ deceleration time	1 to 65535 ms (1 word)		1 to 8388608 ms (2 words)		▶Revise the program. (Refer to section 2.2(8))
Torque limit value	1 [%] unit		0.1 [%] unit		▶Revise the program. (Refer to section 2.2(9))
Motor speed (#8066+4n, #8067+4n)	0.1 r/min unit (0.1 mm/s for linear servo motors)		0.01 r/min unit (0.01 mm/s for linear servo motors)		▶Revise the program.
Digital oscilloscope function	• Word 4CH, Bit 8CH • Real-time display • Sampling points: Up to 8192		• Word 16CH, Bit 16CH • Real-time display • Sampling points: Up to 133120 • Offline sampling • Saving sampling results to SD memory card.		Sampling can be performed without a personal computer by turning ON the sampling settings RUN request device (SM860) after files in which trigger condition, etc. are set are stored to the ROM area or SD memory card.
Security function	Protection by password		• Protection by password (32 characters) • Software security key (Common specification among MELSEC iQ-R series)		▶The setting method has been changed. (Refer to "MELSEC iQ-R Motion Controller Programming Manual (Common)")
Operating system software installation method	• MELSOFT MT Works2 • MT Developer		• MELSOFT MT Works2 • SD memory card		The installation files have been consolidated into one, making management of the files easier.

(2) Exterior dimensions and mass

	Q173HCPU	Q173HCPU-T	Q172HCPU	Q172HCPU-T	R32MTCPU	R16MTCPU
Exterior dimensions [mm]						
	104.6[H] × 27.4[W] × 114.3[D]				106.0[H] × 27.8[W] × 110.0[D]	
Mass [kg]	0.23	0.24	0.22	0.23	0.28	

(3) Base unit

The MELSEC-Q series and the MELSEC iQ-R series are different in fixing holes' position in the base unit, dimensions, and mass. Refer to "QCPU User's Manual (Hardware Design, Maintenance and Inspection)" and "MELSEC iQ-R Module Configuration Manual" for details.

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

Items	Differences		Changes/revisions
	Q17nHCPU(-T)	RnMTCPU	
System setting/ SSCNET configuration	Q173HCPU(-T): 2 lines (Up to 16 axes/line)	R32MTCPU: 2 lines (Up to 16 axes/line)	Set the servo amplifier's rotary switch and connection according to the SSCNET configuration.
	Q172HCPU(-T): 1 line (Up to 8 axes/line)	R16MTCPU: 1 line (Up to 16 axes/line)	
Electronic gear	–	–	Change "Number of pulses per revolution" and "Movement amount per revolution" of the fixed parameters according to the resolution per the connected servo motor revolution.
Battery disconnection warning, Battery warning	Servo error code 2102(9F): Battery warning 2103(92): Battery disconnection warning	Warnings 0C80(9F.1): Low battery 0C80(92.1): Encoder battery cable disconnection warning	Revise programs if they use the servo error codes on the left.
Main circuit OFF warning	If the main circuit is turned OFF while the servo OFF command (M3215+20n) is ON, the main circuit OFF warning 2149(E9) will not occur.	If the main circuit is turned OFF while the servo OFF command (M3215+20n) is ON, the [0C80 (E9.3): Ready-on signal on during main circuit off] will be turned ON.	The warning occurs when the main circuit is turned OFF while the servo OFF command (M3215+20n) is ON. In order not to turn ON the [0C80 (E9.3): Ready-on signal on during main circuit off], change the PC18 servo parameter from "0000(H)" to "1000(H)".

(5) Error codes system

MELSEC iQ-R series error codes are expressed with 4 hexadecimal digits (integer without 16-bit sign). There are errors detected with each module's self-diagnostic function, and common errors detected when communicating between modules.
The error detection types and error code ranges are shown below.

Error detection type	Error code range	Description
Detection with each module's self-diagnostic function	H0001 to H3FFF	These are errors such as module self-diagnostic errors that are different for each module.
Detection when communicating between modules	H4000 to H4FFF	CPU module error
	H7000 to H7FFF	Serial communication module error
	HB000 to HBFFF	CC-Link module error
	HC000 to HCFBF	Ethernet module error
	HD000 to HDFFF	CC-Link IE field network module error
	HE000 to HEFFF	CC-Link IE controller network module error
	HF000 to HFFFF	MELSECNET/H network module, MELSECNET/10 network module error

Errors detected at the RnMTCPU are divided into warnings and errors. The categories and error code range of errors detected at the RnMTCPU are shown below.

Category		Error code	Description	Remarks
Warning		H0800 to H0FFF	Warnings which do not stop servo programs	• Equivalent to some of the Q17nHCPU(-T) minor errors
Error	Minor	H1000 to H1FFF	Errors which stop servo programs The CPU continues to operate (in RUN status).	• Equivalent to some of the minor errors of Q17nHCPU(-T), and the major errors
	Minor (SFC)	H3100 to H3BFF	Motion SFC execution errors The CPU continues to operate (in RUN status).	• Equivalent to Motion SFC errors of Q17nHCPU(-T).
	Moderate	H2000 to H30FF	Errors that put the CPU operation status to “During stop error”.	• If the system parameter is set to “All station stop by stop error of CPU No.1 to 4”, all CPUs of the whole system will be in stop status with the specified CPU stop error. • Equivalent to system setting errors of Q17nHCPU(-T).
	Major	H3C00 to H3FFF		• If the system parameter is set to “All station stop by stop error of CPU No.1 to 4”, all CPUs of the whole system will be in stop status with the specified CPU stop error. • Equivalent to some of the self-diagnostic errors of Q17nHCPU(-T).

When the RnMTCPU detects an error, the error is displayed on the Motion CPU LED display, and the error code is stored in the relevant device. Use the relevant device in which the error code is stored in the program to enable a machine control interlock.
The following shows the methods for checking and cancelling errors.

(a) Check methods when an error occurs

1) LED display
   - The ERROR LED is ON (or flickers).
   - The dot matrix LED displays ""AL" (flickers 3 times) → "Error code" (4 digits shown 2 at a time)".

2) Special relays/special register

   [Special relays]
   - Latest self-diagnostics error (SM0)
   - Latest self-diagnostics error (SM1)
   - Warning detection (SM4)
   - Detailed information 1: flag in use (SM80)
   - Detailed information 2: flag in use (SM112)

   [Special registers]
   - Latest self-diagnostics error code (SD0)
   - Clock time for latest self-diagnostic error occurrence (SD1 to SD7)
   - Self-diagnostic error code (SD10 to SD25)
   - Detailed information 1 information category (SD80)
   - Detailed information 1 (SD81 to SD111)
   - Detailed information 2 information category (SD112)
   - Detailed information 2 (SD113 to SD143)

3) MELSOFT GX Works3 module diagnostics (error information list)
4) MELSOFT MT Works2 Motion CPU error batch monitor (Motion error history)
5) Axis status signals, and axis monitor devices (Error details detected for each axis)

(b) Cancelling errors

Among the RnMTCPU errors, continue errors (minor errors, or continue mode moderate errors) and warnings can be cancelled.

Use the following method to cancel errors after eliminating the cause.

• Cancel with MELSOFT GX Works3 "Module diagnostics"

• Cancel with MELSOFT MT Works2 "Motion Monitor"

• Cancel with "Error reset (SM50)" (Note-1)

Error type	Information required to cancel error
System common errors	• Self-diagnostic error information (SD0 to SD7, SD10 to SD25) • Diagnosis error detection (SM0, SM1) • Warning detection (SM4) • Detailed information 1 (SD80 to SD111) • Detailed information 2 (SD112 to SD143) • Detailed information 1: flag in use (SM80) • Detailed information 2: flag in use (SM112) • AC/DC DOWN counter (SD53) • AC/DC DOWN detected (SM53) • I/O module verify error module number (SD61)
Positioning/synchronous control output axis errors/warnings (Note-1)	• Warning code • Error code • Error detection signal
Servo alarms/warnings (Note-1)	• Servo error code • Servo error detection signal
Synchronous control input axis errors/warnings (Note-1)	• Command generation axis warning code • Command generation axis error code • Command generation axis error detection signal • Synchronous encoder axis warning No. • Synchronous encoder axis error No. • Synchronous encoder axis error detection signal

(Note-1): Clears errors for all axes at the same time.

Refer to “Appendix 1 Error Codes of MELSEC iQ-R Motion Controller Programming Manual (Common)” for details.

(6) Data read/write operation to the CPU shared memory

(a) MULTW/MULTR instructions

MULTW/MULTR instructions need to be used when Q17nHCPU(-T) accesses the CPU shared memory. Meanwhile, “CPU buffer memory access device (from U3E□\G0)” is available for RnMTCPU to access the memory, and therefore the MULTW/MULTR instructions have been eliminated in RnMTCPU.
If those instructions are used before migration, replace them with TO/FROM instruction, BMOV instruction, or CPU buffer memory access device to directly access the memory.

The following shows program examples for revision.

Ex. 1) The program which writes two words from D0 to the CPU shared memory (from HA00) of self-CPU (CPU No.2)

Q17nHCPU(-T)		RnMTCPU (One of the following three)
MULTW HA00, D0, K2, M0		TO H3E10, HA00, D0, K2
		BMOV U3E1\G2560, D0, K2
		U3E1\G2560L = D0L

Ex. 2) The program which reads two words from the shared memory (HC00) of CPU No.1 to #0

Q17nHCPU(-T)		RnMTCPU (One of the following three)
MULTR #0, H3E0, HC00, K2		FROM #0, HE00, HC00, K2
		BMOV #0, U3E0\G3072, K2
		#0L = U3E0\G3072L

[Point]
Make sure to review the Motion SFC program since MELSOFT MT Works2 does not automatically convert Motion SFC programs at project diversion.
An error occurs at the program conversion, and write operation cannot be performed.

(b) Access to other modules (MULTR/FROM/TO instructions)

If Q17nHCPU(-T) accesses other modules with MULTR instructions or FROM/TO instructions although the specified I/O number cannot be found (the specified module does not exist), a Motion SFC error will be outputted, however, the operation will continue.
With RnMTCPU, whether to stop or continue the program execution can be selected with parameter.
([R series common parameter] - [CPU parameter] - [RAS setting] - [CPU module operation setting at error detected] - [Module I/O No. specification incorrect])

The default setting of the parameter is “Stop”.
In order to make the setting equivalent to that of Q17nHCPU(-T) (program execution does not stop), change the parameter to “Continue”.

(7) Switching of RUN/STOP status

The RUN/STOP status of Q17nHCPU(-T) is switched by directly operating M2000 (or M3072, D704) in the program. However, the RUN/STOP status of RnMTCPU cannot be switched by the same method.

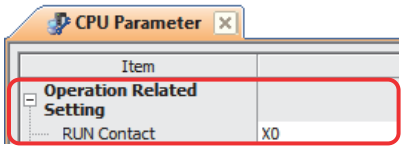
Therefore, if M2000 is used to change the status, the program is required to be changed so that a RUN contact for remote operation is used to switch the RUN/STOP status.

The following shows the procedure and point for the program revision.

[For Q17nHCPU(-T)]

Procedure	Contents
1) Direct operation of M2000 (or M3072, D704) in the program	Changes CPU operation status.

[For RnMTCPU]

Procedure	Contents
1) Set a RUN contact in the [CPU Parameter] settings of MELSOFT MT Works2	Set a X device for RUN contact (X0 to X2FFF) 
2) Change the X device status	CPU operation status can be changed by changing the status of the X-device set in 1). • RUN contact is OFF: CPU module is in RUN status. • RUN contact is ON: CPU module is in STOP status. During this operation, the RUN/STOP switch must be in RUN position.

[Point]

- M3072 and D704 have become unusable in RnMTCPU. They cannot be used as a status device.
- Note that RUN contact ON is for STOP status and the RUN contact OFF is for RUN status.

(8) Acceleration/deceleration time settings

The setting range of the acceleration/deceleration time is expanded from 1 word to 2 words in RnMTCPU. This change requires some program revisions.
Refer to the following conditions for the revisions.

[Items which need a program revision]

Function	Item
Motion control parameter (Parameter block)	Acceleration time
	Deceleration time
	Rapid stop deceleration time
Servo program	Acceleration time
	Deceleration time
	Rapid stop deceleration time
	Fixed position stop acceleration/ deceleration time

[Program change procedure]

No.	Condition		Revision procedure
1	Direct setting of the acceleration/ deceleration time		• No need to revise the program
2	Indirect setting of the acceleration /deceleration time	The start device number is an even number	• Check whether the next device of the start device is usable or not. If it is unusable, secure two words of devices for the acceleration/deceleration time settings. • Note that no error occurs at program conversion.
3		The start device number is an odd number	• An odd number cannot be set as the start device number. Secure two words of devices starting from even number. • If the device is an odd number, an error occurs at program conversion.

(9) Torque limit value settings

Torque limit value is set by 0.1 [%] unit in RnMTCPU.

Refer to the following table for the program revision.

Function	Item	Unit		Points for migration
		Q17nHCPU(-T)	RnMTCPU	
Motion control parameter (Parameter block)	Torque limit value	1 [%]	0.1 [%]	The unit is automatically converted to 0.1 [%] at project diversion.
Axis setting parameter (Home position return data) (Note):Only when the stopper method is executed	Torque limit value at creep speed	1 [%]		The unit is automatically converted to 0.1 [%] at project diversion. However, when the unit is indirectly designated, the unit is not automatically converted and a program revision is required.
Servo program	Torque limit value (common)	1 [%]		The unit is not automatically converted regardless of direct or indirect designation. A program revision is required.
	Torque limit value (parameter block)			
Data register (Monitor device)	Torque limit value (D14+20n)	1 [%]		Since the values stored in this monitor device will be changed following the unit change, a revision is needed for programs which use “D14+20n”.
Motion SFC instruction	Torque limit value change request (CHGT)	1 [%]		Since the instruction method has been changed, a program revision is required.(Note-1)
Motion dedicated PLC instruction	Torque limit value change request instruction from the PLC CPU to the Motion CPU (S(P).CHGT)	1 [%]		

(Note-1): CHGT and S(P).CHGT instructions are used to set a separate torque limit value for positive/negative direction in RnMTCPU. However, the same torque limit value will be applied to positive/negative direction if the torque limit value is set by a different method.

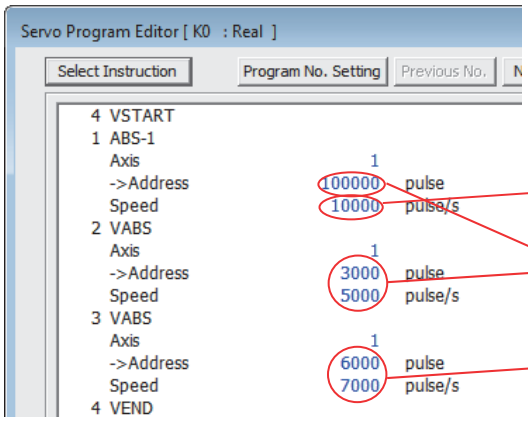
(10) Speed switching control

The speed switching control is not available with RnMTCPU.

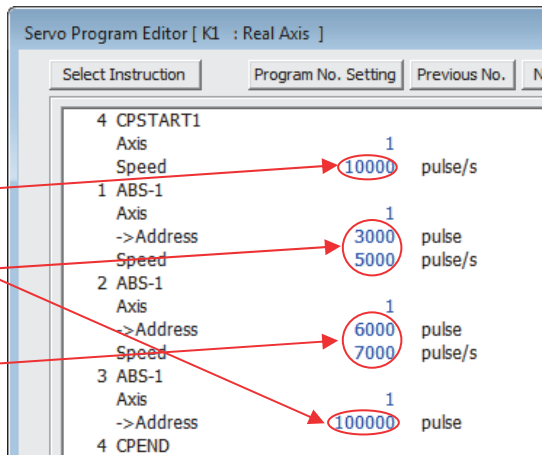
When the speed switching control is used, replace it with continuous trajectory control.

The following shows the replacement points when changing the speed switching control to the continuous trajectory control.

[Speed switching control of Q17nHCPU(-T)]



[Continuous trajectory control of RnMTCPU]



[Point]

The speed switching control program begins with the end point address/movement amount. The speed is described as needed for each speed switching point.

The continuous trajectory control program describes the address/movement amount and the speed for each point.

(11) Operation cycle

The operation cycle settings of Q17nHCPU(-T) can be imported to RnMTCPU when the projects of Q17nHCPU(-T) are diverted to RnMTCPU in MELSOFT MT Works2.
(Refer to section 2.4.3(2) for details of project diversion.)
However, if the operation cycle is set as default (automatic), the operation cycle will be changed. Set a fixed 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]

<table>
<tr><th colspan="2">Model
Item</th><th>Q173HCPU(-T)</th><th>Q172HCPU(-T)</th><th>R32MTCPU</th><th>R16MTCPU</th></tr>
<tr><td colspan="2">Number of control axes</td><td colspan="2">Up to 32</td><td>Up to 8</td><td>Up to 32</td><td>Up to 16</td></tr>
<tr><td rowspan="2">Operation cycle (default)</td><td>SV13</td><td colspan="2">0.44ms/ 1 to 3 axes
0.88ms/4 to 10 axes
1.77ms/ 11 to 20 axes
3.55ms/21 to 32 axes</td><td colspan="2" rowspan="2">0.222ms/ 1 to 2 axes
0.444ms/ 3 to 8 axes
0.888ms/ 9 to 20 axes
1.777ms/21 to 32 axes</td></tr>
<tr><td>SV22</td><td colspan="2">0.88ms/ 1 to 5 axes
1.77ms/ 6 to 14 axes
3.55ms/15 to 28 axes
7.11ms/29 to 32 axes</td></tr>
</table>

[Settable fixed operation cycle]

Q17nHCPU(-T) (SV13/SV22)	RnMTCPU
0.44ms	0.222ms
0.88ms	0.444ms
1.77ms	0.888ms
3.55ms	1.777ms
7.11ms	3.555ms
14.2ms(Note-1)	7.111ms

(Note-1): Operation cycle of 14.2ms is not settable for RnMTCPU.
If the operation cycle of 14.2ms is set in the Q17nHCPU(-T) project, the value is changed to the “default value (automatic)” at project diversion. Review the setting as needed.

(12) External signals interface module

The setting of the external signals interface module needs to be reviewed in MELSOFT GX Works3 since the system setting is read from MELSOFT GX Works3.

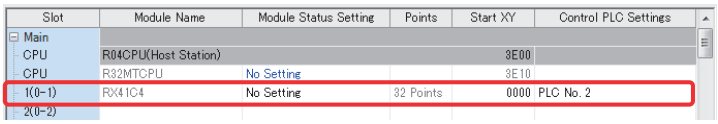
When MELSOFT GX Works2 projects are diverted to MELSOFT GX Works3, the input module is registered as a general-purpose intelligent module in the system parameters. Refer to the following setting procedures to review the settings according to the replaced input modules. (Refer to section 2.4.3(1) for details of project diversion.)

[Parameter setting methods]

RnMTCPU uses the common input module with PLC CPU. The following shows the example in which the signal of RX41C4 input module is set in the external signal parameter for each axis.

With MELSOFT GX Works3, the module to be used is set.

With MELSOFT MT Works2, the external signal parameter for each axis is set.

Setting item	Setting details
1) MELSOFT GX Works3 [system parameter] settings	Set RX41C4 input module on the [System parameter] screen. (Refer to "MELSEC iQ-R Module Configuration Manual" for details.) 
2) MELSOFT MT Works2 [Axis setting parameter] settings	Set the external signal parameters (FLS, RLS, STOP, DOG) of the target axes as shown below on the [Axis setting parameter] screen. [Signal type]→2: Bit device [Device]→X0 (X device number of the input module set in 1)) 

[Point]

When the MELSEC-Q series external signals interface module is replaced with the MELSEC iQ-R series input module, the detection accuracy depends on the operation cycle. In order to detect signals at high accuracy, set the inter-module synchronization function to "Synchronize", and set the signal to "High-accuracy".

Refer to "MELSEC iQ-R Motion Controller Programming Manual (Common)" for how to set the inter-module synchronization function.

2.3 Comparison of Devices

2.3.1 Motion registers

(1) Motion registers (Monitor devices)

Device No.		Name	Remarks
Q17nHCPU(-T)	RnMTCPU		
#8064 to #8067	#8000 to #8019	Axis 1 monitor device	
#8068 to #8071	#8020 to #8039	Axis 2 monitor device	
#8072 to #8075	#8040 to #8059	Axis 3 monitor device	
#8076 to #8079	#8060 to #8079	Axis 4 monitor device	
#8080 to #8083	#8080 to #8099	Axis 5 monitor device	
#8084 to #8087	#8100 to #8119	Axis 6 monitor device	
#8088 to #8091	#8120 to #8139	Axis 7 monitor device	
#8092 to #8095	#8140 to #8159	Axis 8 monitor device	
#8096 to #8099	#8160 to #8179	Axis 9 monitor device	
#8100 to #8103	#8180 to #8199	Axis 10 monitor device	
#8104 to #8107	#8200 to #8219	Axis 11 monitor device	
#8108 to #8111	#8220 to #8239	Axis 12 monitor device	
#8112 to #8115	#8240 to #8259	Axis 13 monitor device	
#8116 to #8119	#8260 to #8279	Axis 14 monitor device	
#8120 to #8123	#8280 to #8299	Axis 15 monitor device	
#8124 to #8127	#8300 to #8319	Axis 16 monitor device	
#8128 to #8131	#8320 to #8339	Axis 17 monitor device	
#8132 to #8135	#8340 to #8359	Axis 18 monitor device	
#8136 to #8139	#8360 to #8379	Axis 19 monitor device	
#8140 to #8143	#8380 to #8399	Axis 20 monitor device	
#8144 to #8147	#8400 to #8419	Axis 21 monitor device	
#8148 to #8151	#8420 to #8439	Axis 22 monitor device	
#8152 to #8155	#8440 to #8459	Axis 23 monitor device	
#8156 to #8159	#8460 to #8479	Axis 24 monitor device	
#8160 to #8163	#8480 to #8499	Axis 25 monitor device	
#8164 to #8167	#8500 to #8519	Axis 26 monitor device	
#8168 to #8171	#8520 to #8539	Axis 27 monitor device	
#8172 to #8175	#8540 to #8559	Axis 28 monitor device	
#8176 to #8179	#8560 to #8579	Axis 29 monitor device	
#8180 to #8183	#8580 to #8599	Axis 30 monitor device	
#8184 to #8187	#8600 to #8619	Axis 31 monitor device	
#8188 to #8191	#8620 to #8639	Axis 32 monitor device	

(2) Each axis monitor devices

Device No.(Note-1)		Name	Remarks
Q17nHCPU(-T)	RnMTCPU		
#8064+4n	#8000+20n	Servo amplifier type	
#8065+4n	#8001+20n	Motor current [0.1 %]	
#8066+4n #8067+4n	#8002+20n #8003+20n	Motor speed	The setting unit differs between Q17nHCPU(-T) and RnMTCPU. Review the program as needed. Q17nHCPU(-T): [0.1r/min] RnMTCPU: [0.01/min]
–	#8004+20n #8005+20n	Command speed	New device in RnMTCPU
–	#8006+20n #8007+20n	Home position return re-travel value	
–	#8008+20n	Servo amplifier display servo error code	
–	#8009+20n	Parameter error No.	
–	#8010+20n	Servo status 1	
–	#8011+20n	Servo status 2	
–	#8012+20n	Servo status 3	
–	#8013+20n	Unusable	
–	#8014+20n		
–	#8015+20n		
–	#8016+20n	Servo amplifier vendor ID	New device in RnMTCPU
–	#8017+20n	Unusable	
–	#8018+20n	Servo status 7	New device in RnMTCPU
–	#8019+20n	Unusable	

(Note-1): “n” indicates the corresponding axis No. (Axis No.1 to 32: n=0 to 31).

(3) Motion registers (Motion error history)

Device No.		Name	Remarks
Q17nHCPU(-T)	RnMTCPU		
#8000 to #8063	SD10 to SD25	Motion SFC error history device	Motion error history is checked with the MELSOFT MT Works2 Motion CPU error batch monitor.

2.3.2 Special relays

Device No.			Name	Remarks
Q17nHCPU(-T)	Device assignment for M9000 to M9255	RnMTCPU		
M9000/M2320	SM2000	–	Fuse blown detection flag	
M9005/M2321	SM2005	SM53	AC/DC DOWN detection flag	
M9006/M2322	SM2006	–	Battery low flag	Not required since the Motion CPU is battery-less.
M9007/M2323	SM2007	–	Battery low latch flag	
M9008/M2324	SM2008	SM1	Self-diagnostic error flag	
M9010/M2325	SM2010	SM0	Diagnostic error flag	
M9025/M3136	SM2025	–	Clock data set request	Operated on the No.1 CPU clock data.
M9026/M2328	SM2026	–	Clock data error	
M9028/M3137	SM2028	SM213	Clock data read request	
M9036/M2326	SM2036	SM400	Always ON	
M9037/M2327	SM2037	SM401	Always OFF	
M9060/M3138	SM2060	SM50	Diagnostic error reset	
M9073/M2329	SM2073	SM512	Motion CPU WDT error flag	The error cause is stored in SD512.
M9074/M2330	SM2074	SM500	PCPU READY complete flag	
M9075/M2331	SM2075	SM501	Test mode ON flag	
M9076/M2332	SM2076	SM502	External forced stop input flag	
M9077/M2333	SM2077	–	Manual pulse generator axis setting error flag	The error flag is integrated in the self-diagnostic errors (SM0, SM1). (Refer to section 2.2(5).)
M9078/M2334	SM2078	–	TEST mode request error flag	
M9079/M2335	SM2079	–	Servo program setting error flag	
M9216/M2345	SM2216	–	No.1 CPU MULTR complete flag	MULTR instructions are deleted since RnMTCPU can use CPU buffer memory access device to access the memory. (Refer to section 2.2(6).)
M9217/M2346	SM2217	–	No.2 CPU MULTR complete flag	
M9218/M2347	SM2218	–	No.3 CPU MULTR complete flag	
M9219/M2348	SM2219	–	No.4 CPU MULTR complete flag	
M9240/M2336	SM2240	SM240	No.1 CPU resetting flag	
M9241/M2337	SM2241	SM241	No.2 CPU resetting flag	
M9242/M2338	SM2242	SM242	No.3 CPU resetting flag	
M9243/M2339	SM2243	SM243	No.4 CPU resetting flag	
M9244/M2340	SM2244	SM230	No.1 CPU error flag	
M9245/M2341	SM2245	SM231	No.2 CPU error flag	
M9246/M2342	SM2246	SM232	No.3 CPU error flag	
M9247/M2343	SM2247	SM233	No.4 CPU error flag	

[Point]

When Q17nHCPU(-T) projects are converted into RnMTCPU projects by “file conversion”, M9000 to M9255 are automatically assigned as shown above in the column of “Device assignment for M9000 to M9255” in the table, however, M2320 to M3139 are not automatically converted.

2.3.3 Special registers

Device No.			Name	Remarks
Q17nHCPU(-T)	Device assignment for D9000 to D9255	RnMTCPU		
D9000	SD2000	−	Fuse blown No.	
D9005	SD2005	SD53	AC/DC DOWN counter No.	
D9008	SD2008	SD0	Latest self-diagnostic error code	Error codes for errors found by diagnosis are stored as hexadecimal notation data.
D9010	SD2010	SD1	Clock time for diagnostic error occurrence (Year (four digits))	The clock time information that SD0 data was updated is stored as BIN code.
		SD2	Clock time for diagnostic error occurrence (Month)	
D9011	SD2011	SD3	Clock time for diagnostic error occurrence (Day)	
		SD4	Clock time for diagnostic error occurrence (Hour)	
D9012	SD2012	SD5	Clock time for diagnostic error occurrence (Minute)	
		SD6	Clock time for diagnostic error occurrence (Second)	
−	−	SD7	Clock time for diagnostic error occurrence (Day of week)	
D9013	SD2013	SD80	Detailed information 1 information category	
D9014	SD2014	SD81 to SD111	Detailed information 1	
−	−	SD112	Detailed information 2 information category	
−	−	SD113 to SD143	Detailed information 2	
D9015	SD2015	SD203	Operating status of CPU	
D9017	SD2017	SD520	Scan time	
D9019	SD2019	SD521	Maximum scan time	
D9025	SD2025	SD210	Clock data (Year (four digits))	The clock data is stored as BIN code.
		SD211	Clock data (Month)	
D9026	SD2026	SD212	Clock data (Day)	
		SD213	Clock data (Hour)	
D9027	SD2027	SD214	Clock data (Minute)	
		SD215	Clock data (Second)	
D9028	SD2028	SD216	Clock data (Day of week)	
D9060	SD2060	−	Diagnostic error reset error No.	Errors are reset by SM50.
−	−	SD228	Number of CPU modules	New device in RnMTCPU
D9061	SD2061	SD229	Multiple CPU No.	
D9182	SD2182	−	Test mode request error	These error code storage devices are integrated in “Latest self diagnostics error (SD0)”.
D9183	SD2183	−		
D9184	SD2184	SD512	Motion CPU WDT error cause	

(Continued)

Device No.			Name	Remarks
Q17nHCPU(-T)	Device assignment for D9000 to D9255	RnMTCPU		
D9185	SD2185	−	Manual pulse generator axis setting error	These error code storage devices are integrated in “Latest self diagnostics error (SD0)”.
D9186	SD2186	−		
D9187	SD2187	−		
D9188	SD2188	SD522	Motion operation cycle	
D9189	SD2189	−	Error program No.	These error code storage devices are integrated in “Latest self diagnostics error (SD0)”.
D9190	SD2190	−	Error item information	
D9191	SD2191	SD502	Servo amplifier loading information	
D9192	SD2192	SD503		
D9193	SD2193	−	Real mode/virtual mode switching error information	These error code storage devices are integrated in “Latest self diagnostics error (SD0)”.
D9194	SD2194	−		
D9195	SD2195	−		
D9196	SD2196	−	PC link communication error codes	RnMTCPU is not compatible with PC link communication.
D9197	SD2197	SD523	Operation cycle of the Motion CPU setting	
D9200	SD2200	SD200	State of switch	
D9201	SD2201	SD201	State of LED	

[Point]

When Q17nHCPU(-T) projects are converted into RnMTCPU projects by “file conversion”, D9000 to D9255 are automatically assigned as shown above in the column of “Device assignment for D9000 to D9255” in the table.

2.3.4 Other devices

Items		Q17nHCPU(-T)	RnMTCPU
Internal relays/ data registers	M2400 to M3039	Device area of 9 axes or more is not usable as user devices in Q172HCPU(-T).	Device area of 17 axes or more is usable as user devices in R16MTCPU.
	M3200 to M3839		
	D0 to D639		
	D640 to D703		
PLC READY flag		M2000/M3072	M2000
Personal computer link communication error flag		M2034	– (Not compatible with personal computer link communication.)
Motion SFC error history clear request flag		M2035/M3080	"MELSOFT MT Works2 Motion CPU error batch monitor" clears the error history.
Motion SFC error detection flag		M2039	SM0, SM1 (Note-1)
Speed switching point specified flag		M2040/M3073	M2040
System setting error flag		M2041	SM0, SM1 (Note-1)
All axes servo ON command		M2042/M3074	M2042
Real/virtual mode switching request		M2043/M3075	M12000+n (Note-2)
Real/virtual mode switching status		M2044	M10880+n (Note-2)
Real/virtual mode switching error detection signal		M2045	SM0, SM1 (Note-1)
Out-of-sync warning		M2046	– (Not compatible with virtual mode) (Note-2)
Motion slot fault detection flag		M2047	SM0, SM1 (Note-1)
JOG operation simultaneous start command		M2048/M3076	M2048
Manual pulse generator 1 enable flag		M2051/M3077	M2051
Manual pulse generator 2 enable flag		M2052/M3078	M2052
Manual pulse generator 3 enable flag		M2053/M3079	M2053
Synchronous encoder current value changing flag		M2101 to M2112	– (Not compatible with virtual mode) (Note-2)
Clutch status (Main shaft side)		M2160+2n	M10560+10n
Clutch status (Auxiliary input side)		M2161+2n	M10562+10n
Minor error code		D6+20n	– (Both minor and major errors have been Integrated in D7+20n)
PLC ready flag request		D704	M2000
Speed switching point specified flag request		D705	M2040
All axes servo ON command request		D706	M2042
Real/virtual mode switching request		D707	M12000+n (Note-2)
JOG operation simultaneous start command request		D708	M2048
Manual pulse generator 1 enable flag request		D755	M2051
Manual pulse generator 2 enable flag request		D756	M2052
Manual pulse generator 3 enable flag request		D757	M2053
PCPU ready complete flag		D759	SM500

(Continued)

Items	Q17nHCPU(-T)	RnMTCPU
Real mode axis information register	D790, D791	– ("M10880+n" is used to distinguish the axis status (in synchronization or in real mode) (Note-2))
Home position return re-travel value	D9+20n	D9 + 20n (Data shortened to 1 word) #8006+20n, #8007+20n
Travel value change registers	D16+20n, D17+20n	Optional device (D16+20n and D17+20n are also usable.)
Coasting timer	FT	SD718, SD719 (Note-3)

(Note): "n" indicates the corresponding axis No. (Axis No.1 to 32: n=0 to 31).

(Note-1): The Q17nHCPU(-T) error flags are integrated in self-diagnostics error in RnMTCPU. Refer to section 2.2(5) for differences in error codes system.

(Note-2): The synchronous control function is replaced with "Advanced synchronous control" in RnMTCPU. Refer to "Replacement of virtual mode with advanced synchronous control".

(Note-3): Coasting timer (FT) is integrated into the special registers (SD718, SD719). Read SD718 device in 2 words unit.

2.4 Project Diversion

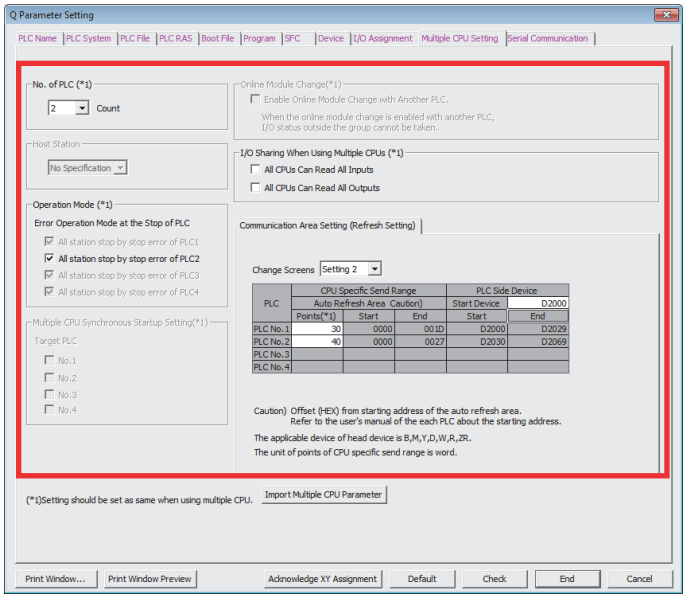
2.4.1 Module control with RnMTCPU

(1) Multiple CPU setting

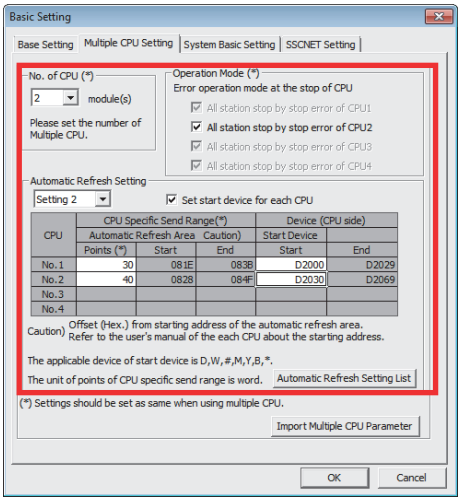
Multiple CPU settings for Qn(H)CPU and Q17nHCPU(-T), which are set in MELSOFT GX Works2 and MELSOFT MT Developer2, must be matched. However, the multiple CPU setting for RnCPU and RnMTCPU is set in MELSOFT GX Works3 first, and the setting can be read by MELSOFT MT Developer2 afterwards.

(a) Multiple CPU setting of Qn(H)CPU and Q17nHCPU(-T)

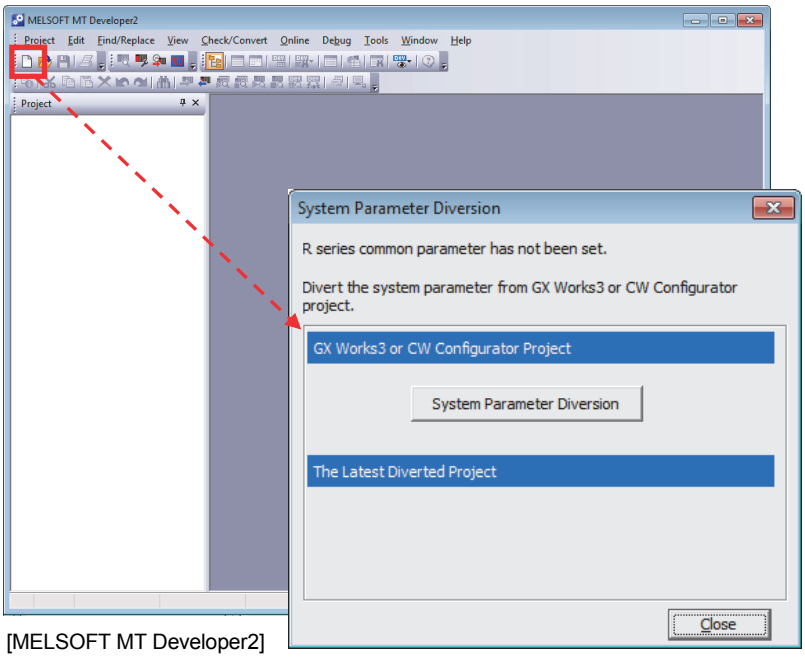
[MELSOFT GX Works2]



[MELSOFT MT Developer2]



(b) Multiple CPU setting of RnCPU and RnMTCPU



[MELSOFT MT Developer2]

(2) System parameter settings

The system configuration and the common parameters of Q17nHCPU(-T) projects cannot be directly diverted to RnMTCPU. They must be set in MELSOFT GX Works3 first, and then the set parameters can be read by MELSOFT MT Developer2.

(a) MELSOFT GX Works3 settings

Set the following system parameters at MELSOFT GX Works3

- Module configuration
- System parameter (I/O assignment setting, Multiple CPU setting, Synchronization setting)
- Set the Motion CPU as the module control CPU in "Control PLC Settings" in [I/O Assignment Setting] screen.

(b) MELSOFT MT Developer2 settings

Read the parameters set in MELSOFT GX Works3 using MELSOFT MT Developer2 [System Parameter Diversion].

After diversion, the following R series common parameters can be set.

- Module parameters for modules for which a Motion CPU has been set as the control CPU
- Multiple CPU refresh settings
- Module parameters of Motion CPU

2.4.2 List of divertible/not divertible data (SV13/SV22)

Q17nHCPU(-T) data name	Divertible/not divertible	Remarks
System settings		
Basic settings		
Base setting	△	(Note-1)
Multiple CPU setting	△	(Note-1), (Note-2)
System basic setting	○	
SSCNET setting	△	(Note-3)
System configuration	△	(Note-1)
SSCNET configuration	○	(Note-4)
High-speed read data	○	
Servo data settings		
Servo data	○	(Note-5)
Servo parameter	○	(Note-6)
Parameter block	○	
Limit output data	○	
Motion SFC programs		
Motion SFC parameter	○	
Motion SFC program	○	(Note-7)
Servo programs		
K mode allocation	○	SV22 only
Servo program	○	
Mechanical system program	○	SV22 only (Note-8)
Cam data (converted data)	○	SV22 only (Note-8)
Device memory	○	
Backup data	×	
Communication setting	×	

○: Divertible, △: Partially divertible, ×: Not divertible

(Note-1): MELSOFT MT Developer2 reads parameters set in MELSOFT GX Works3. Therefore, the existing data which have been set in MELSOFT MT Developer2 for Q17nHCPU(-T) cannot be diverted.

(Note-2): When the system parameters have been set already, only the auto refresh settings for Q17nHCPU(-T) can be diverted ([R Series Common Parameter] - [Multiple CPU Setting] - [Refresh (END) Setting])

(Note-3): Select SSCNETIII or SSCNETIII/H at SSCNET setting.

(Note-4): The servo amplifiers are replaced with MR-J4-B.

(Note-5): Review the fixed parameters according to the resolution per servo motor revolution. (Number of pulses per revolution and movement amount per revolution)

(Note-6): Refer to “MELSOFT MT Developer2 Help” for conversion rules for servo parameters.

(Note-7): When Motion registers (Monitor devices) are used in the program, they need to be changed.

(Note-8): Refer to section 2.4.4 for replacement of mechanical system programs and cam data.

2.4.3 Project diversion procedures by engineering environment

The following shows the project diversion procedures for PLC CPU and Motion CPU.

(1) Procedures for PLC CPU projects diversion by MELSOFT GX Works3

MELSOFT GX Works3 can read projects created in MELSOFT GX Works2.
If the PLC CPU is other than the following models, the programmable controller type needs to be changed to universal models.

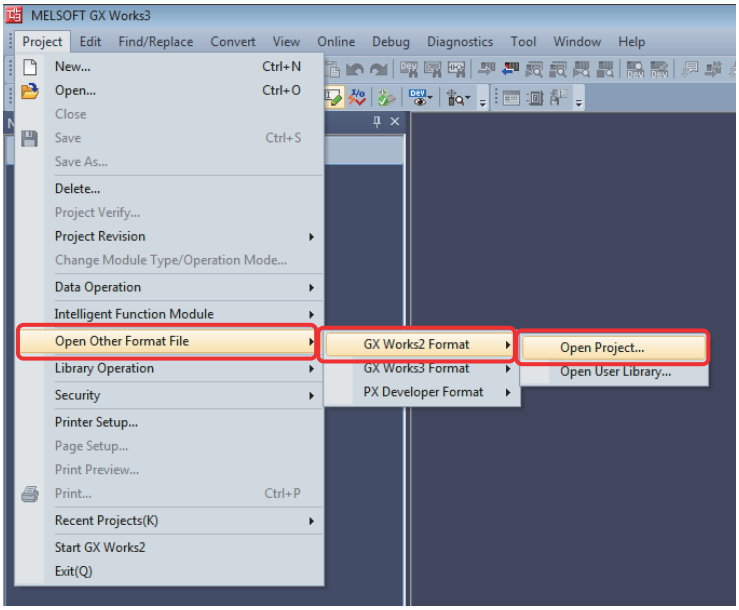
- Universal model QCPU
- High-speed universal model QCPU
- Universal model process CPU

Refer to “GX Works2 Version 1 Operating Manual (Common)” for restrictions on the programmable controller type changes.
In addition, refer to the following Technical Bulletins for details of the programmable controller type changes.
(Note): Contact your local sales office for details.

- Method of replacing Basic model QCPU with Universal model QCPU (FA-A-0054)
- Method of replacing High Performance model QCPU with Universal model QCPU (FA-A-0001)
- Method of replacing High Performance model QCPU with Universal model QCPU (Introduction) (FA-A-0209)

[Procedures when projects in which universal model QCPU is set is diverted to MELSOFT GX Works3]
Refer to “GX Works3 Operating Manual” for details of replacing MELSOFT GX Works2 projects as those for MELSOFT GX Works3.

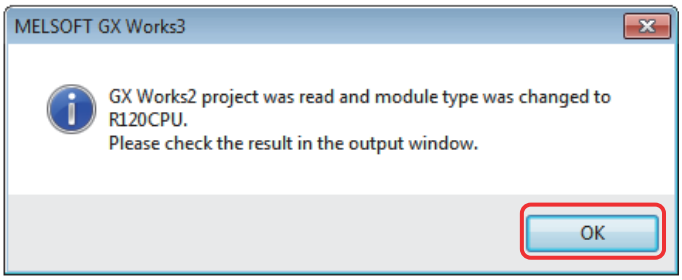
1) Start MELSOFT GX Works3. Select [Open Other Format File] - [GX Works2 Format] - [Open Project…] from “Project” menu.



2) Select the project to be diverted on the “Open GX Works2 Format Project” screen, and click “OK”.

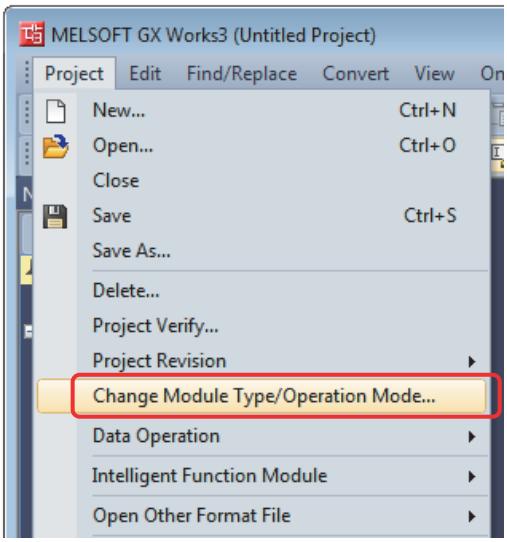
3) Check the following precaution at project diversion, and click “OK”.
[Precaution]
When MELSOFT GX Works2 projects are read by MELSOFT GX Works3, the MELSEC-Q series PLC CPUs are automatically changed to R120CPU.

4) After MELSOFT GX Works2 project is read, click “OK”.
(Make sure to check the model change result in the output window.)

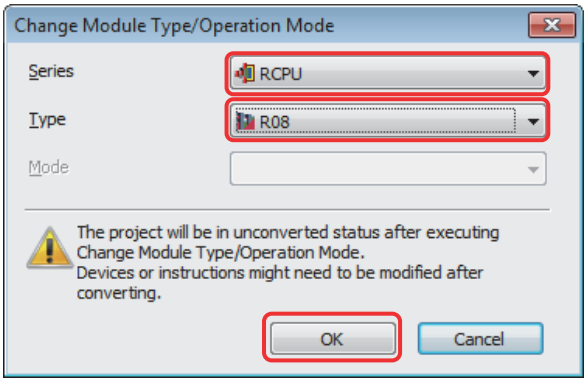


When the PLC CPU is replaced with other than R120CPU, execute the following 5) to 7).

5) Select “Change Module Type/Operation Mode…” in “Project” menu to open “Change Module Type/Operation Mode” screen.



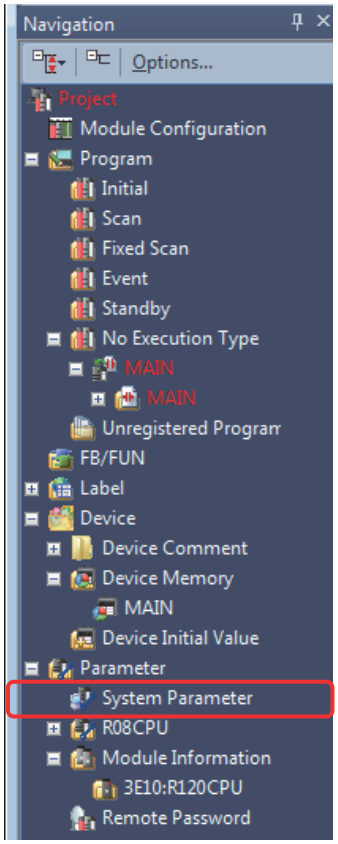
6) Select RCPU for “Series” and the replaced PLC CPU model for “Type” (the setting example below: R08CPU). Click “OK”.



7) Click “OK” after confirming the precautions at model change.
The model change result is indicated in the “output window” of MELSOFT GX Works3.

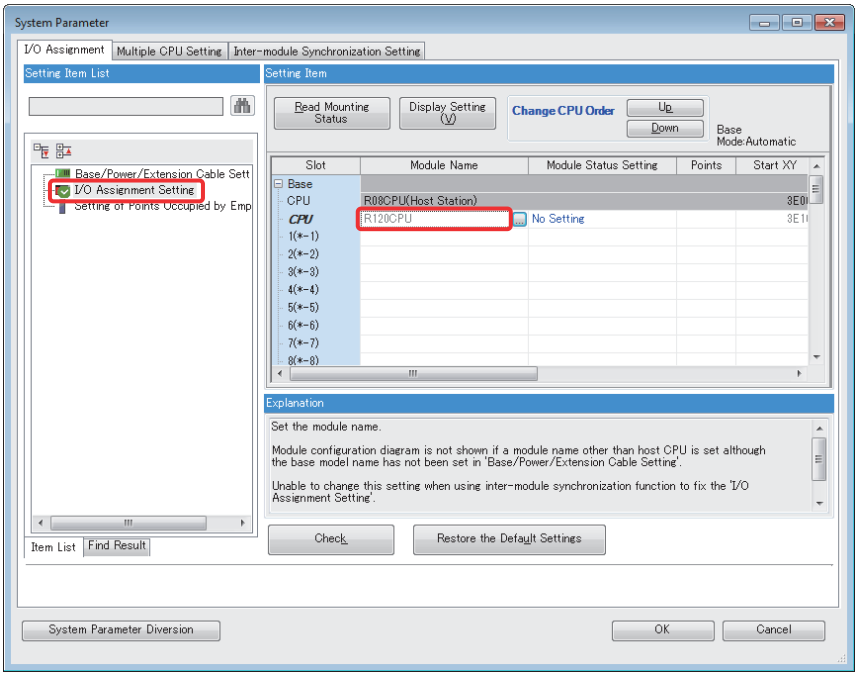
The Motion CPU set for the multiple CPU system is also automatically converted to R120CPU.
The procedure for changing R120CPU to RnMTCPU is described in the following 8) and later.

8) Double-click “System Parameter” in the navigation tree to open “System Parameter” screen.

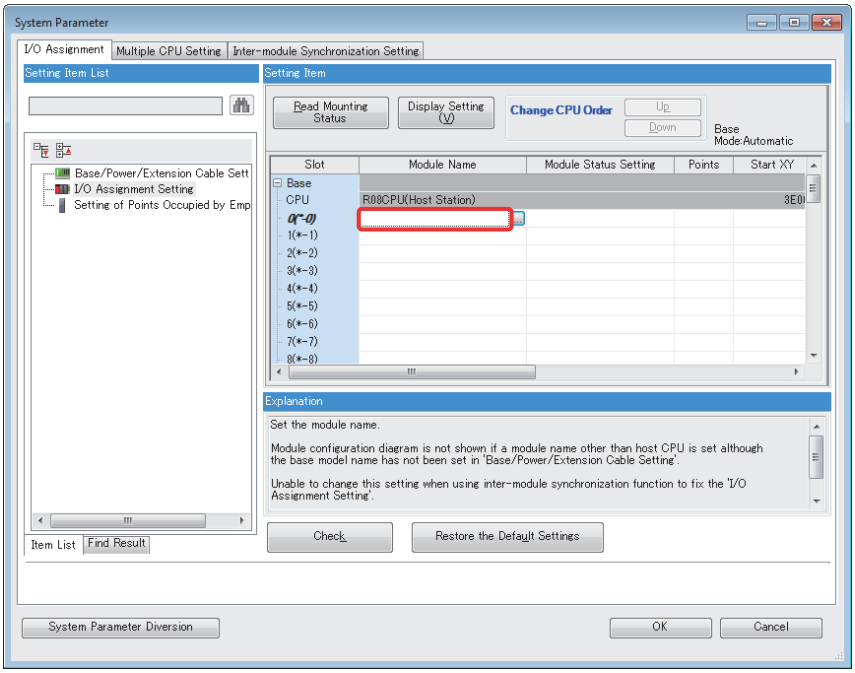


9) Select R120CPU in [I/O Assignment Setting] on “System Parameter” screen, and delete it with delete key. After the deletion, the multiple CPU setting is updated (R120CPU is deleted) by clicking one of the other tabs such as “Multiple CPU Setting” tab. Execute the procedure 9) through 11) successively.

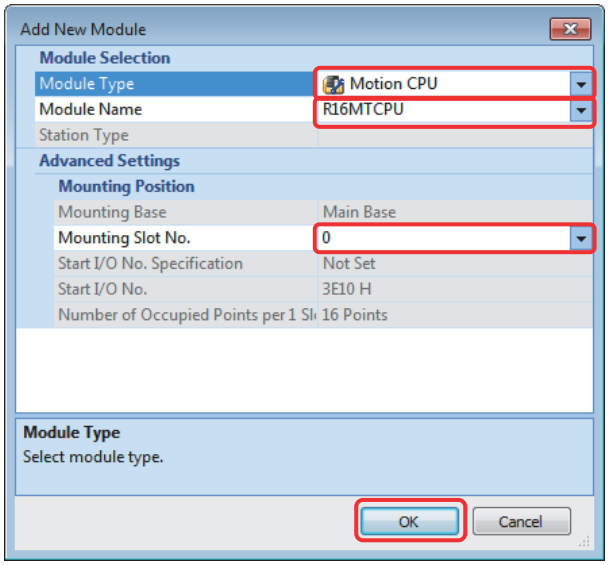
(Note): When the refresh setting is set, R120CPU cannot be deleted. Delete R120CPU after deleting the refresh setting. Refer to “MELSEC iQ-R CPU Module User's Manual (Application)” for details.



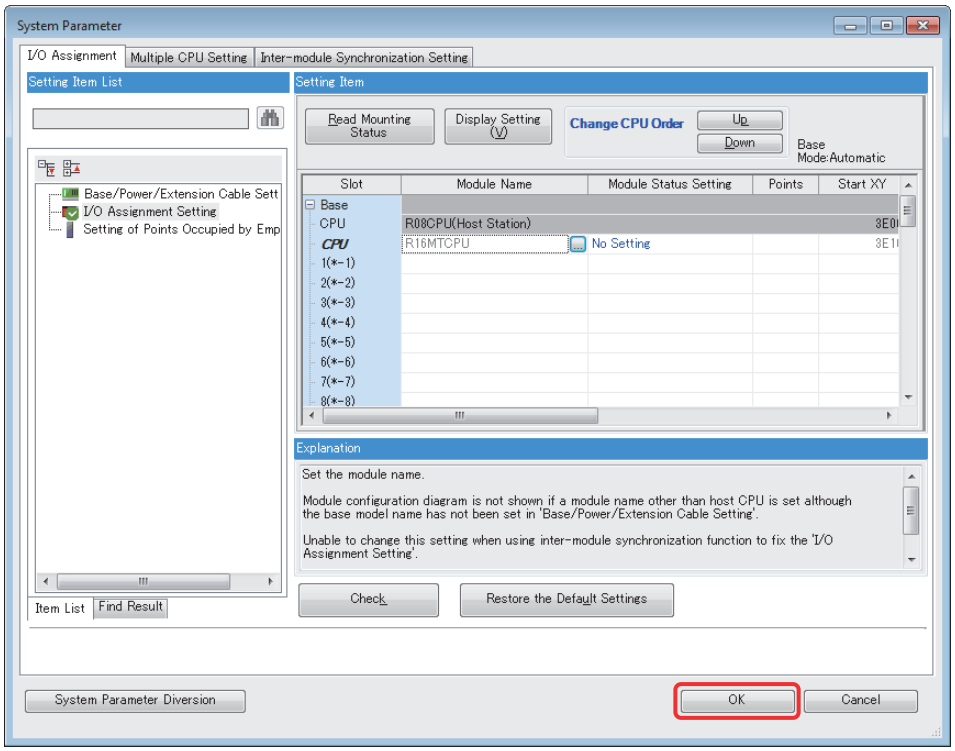
10) Double-click the deleted cell.



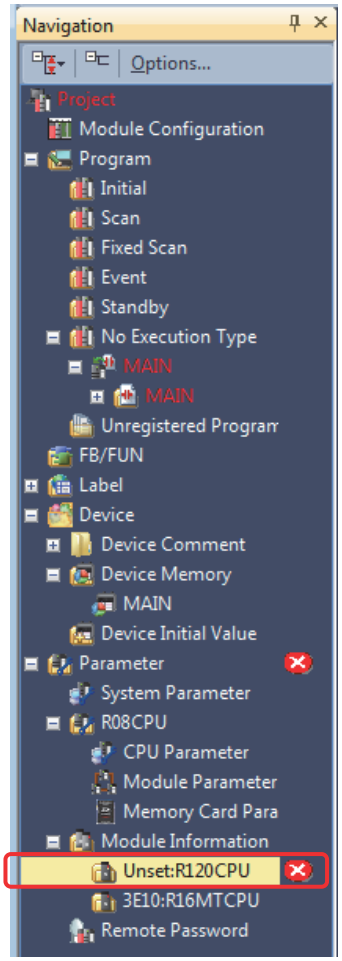
11) On the “Add New Module” screen, select Motion CPU for [Module Type], the replaced Motion CPU model for [Module Name] (the setting example below: R16MTCPU), and the slot No. for [Mounting Slot No]. Click [OK].



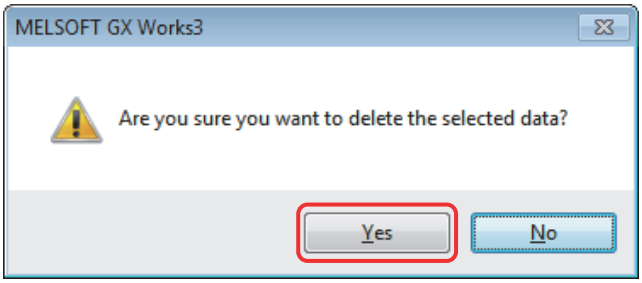
12) Click “OK” on the “System Parameter” screen.
(Note): If the refresh setting is deleted in 9), make the setting again.
(Refer to section 2.4.5.)



13) Select “Unset: R120CPU” from “Module Information” in the navigation tree, and delete it with delete key.



14) Click “Yes”.

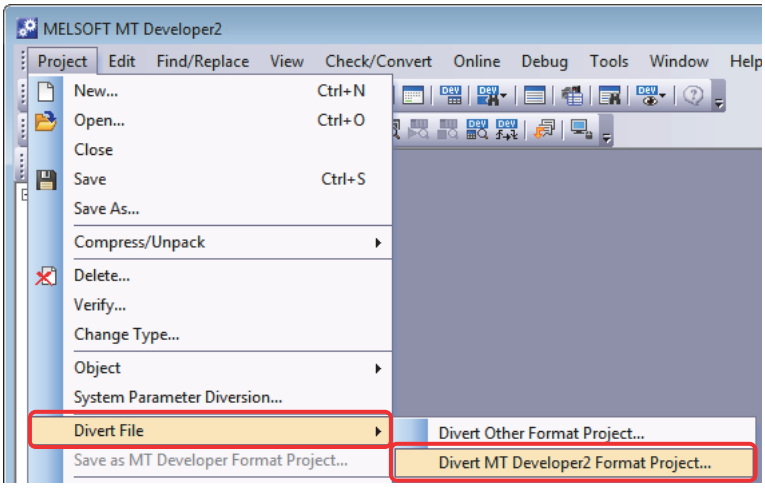


The diversion is complete.
Though a model change has been executed, conversion has not finished yet. Make sure to execute [Rebuilt All] before writing to PLC CPU.

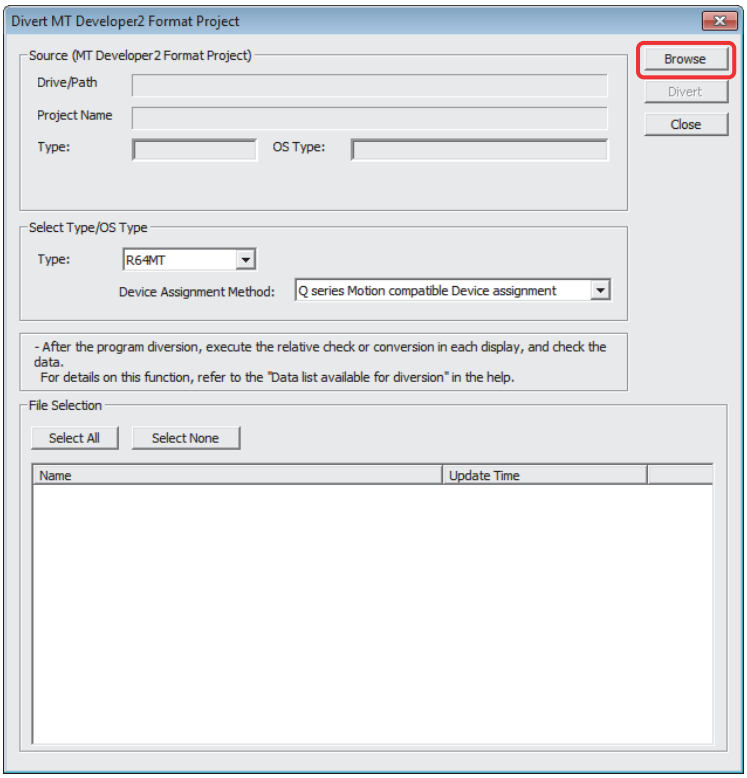
(2) Procedures for Motion CPU projects diversion by MELSOFT MT Developer2

If latch settings and CPU refresh settings (END) in R series common parameters are diverted, divert the system parameters before the Motion projects diversion.
(Refer to (3) in this section)

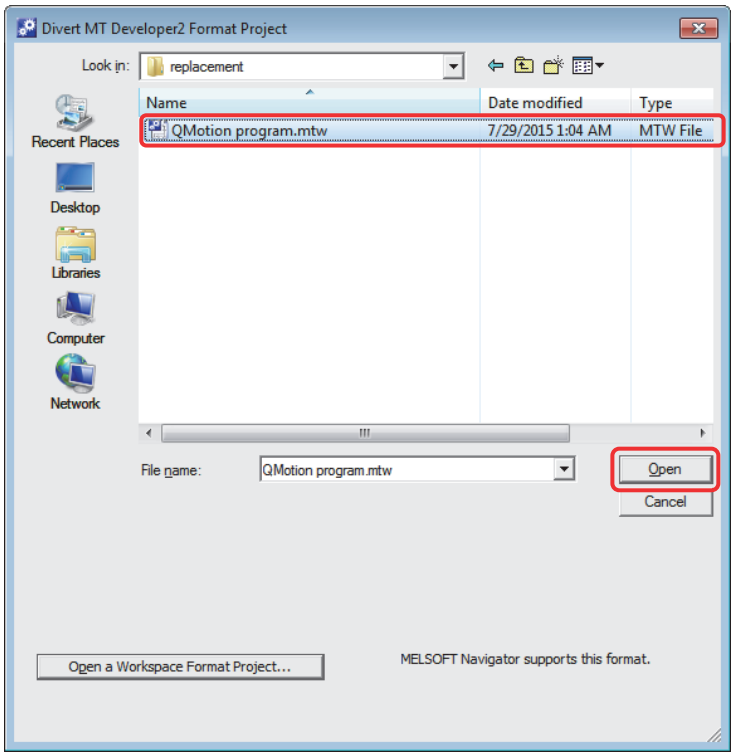
1) Start MELSOFT MT Developer2. Select [Divert file] - [Divert MT Developer2 Format Project…] from “Project” menu.



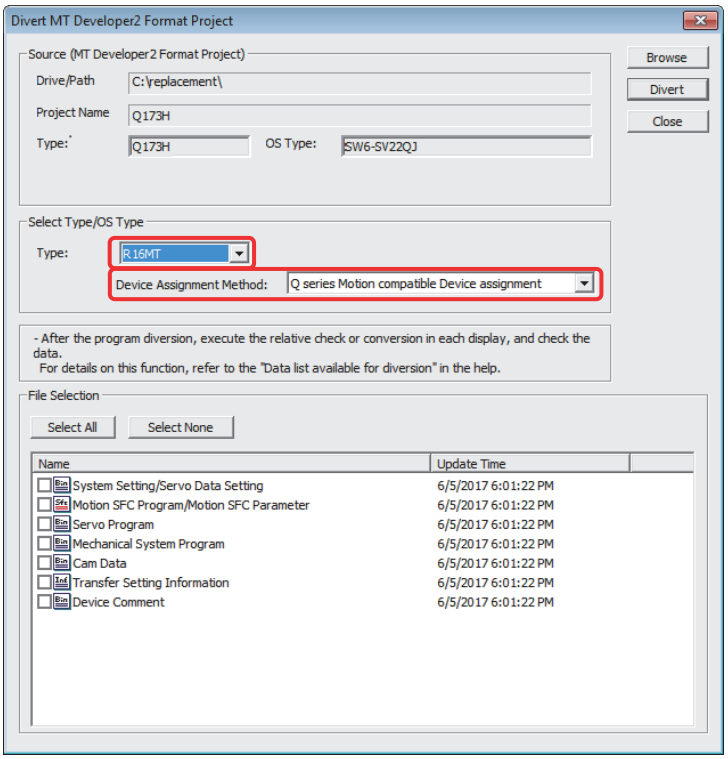
2) Click “Browse” on the “Divert MT Developer2 Format Project” screen.



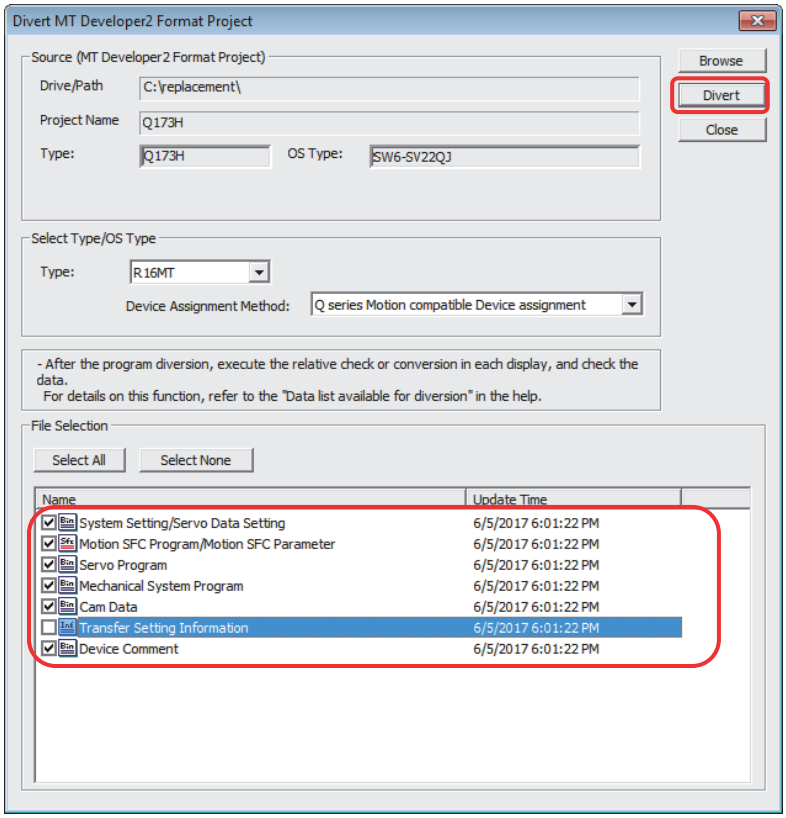
3) Select the project to be diverted on the file selection window. Click [Open] to update the selected project (MT Developer2 Format Project).



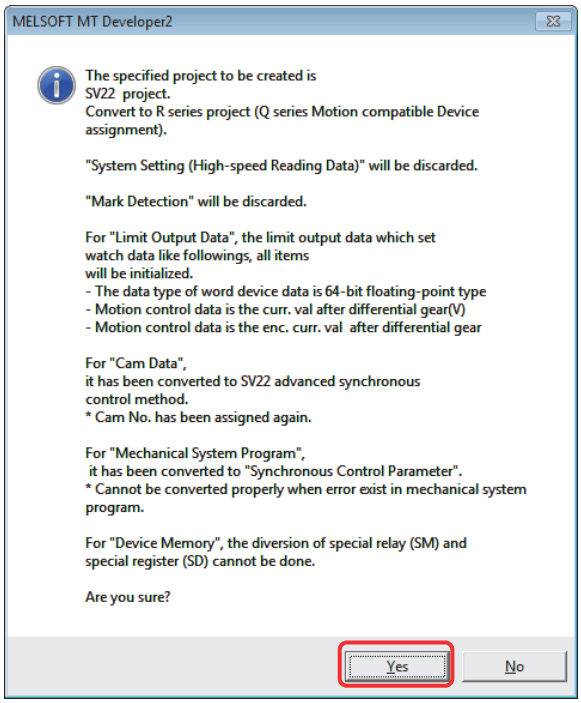
4) Select the replaced model for [Select Type/OS Type] (the setting example below: R16MTCPU). After the “Device Assignment Method” appears and becomes selectable, select “Q series Motion compatible Device assignment”.



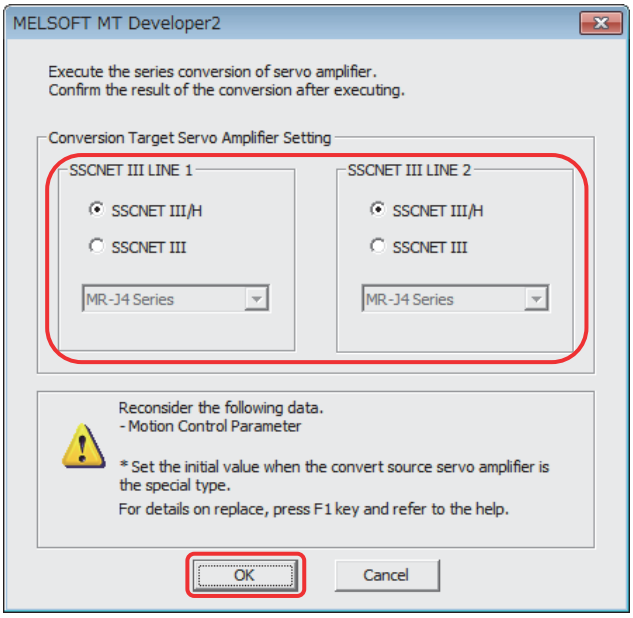
5) Check the box of the data to be diverted in the “File Selection”. Click “Divert”.
When projects for Q17nHCPU(-T) are diverted as those for RnMTCPU, remove the check of the “Transfer Setting Information” box since the “Transfer Setting Information” cannot be diverted.



6) Confirm the precautions at conversion. Click “Yes”.



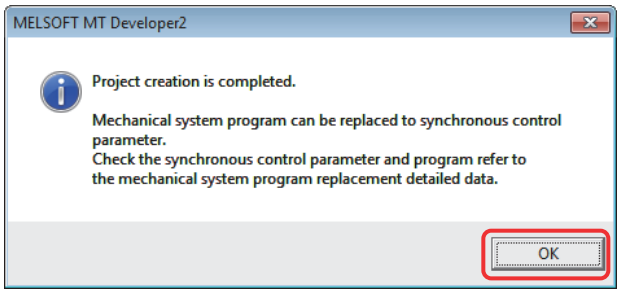
7) Execute the series conversion of the servo amplifier. Select the network to be used (SSCNETIII or SSCNETIII/H) for the replaced servo amplifiers (for RnMTCPU), and click [OK].



(Note): Refer to “MELSEC iQ-R Motion Controller User's Manual” for the servo system networks supported by the replaced servo amplifiers and SSCNETIII compatible devices (SSCNETIII or SSCNETIII/H).

(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 “MELSOFT MT Developer2 Help [Appendix] - [Servo parameter conversion]” for the conversion rules.

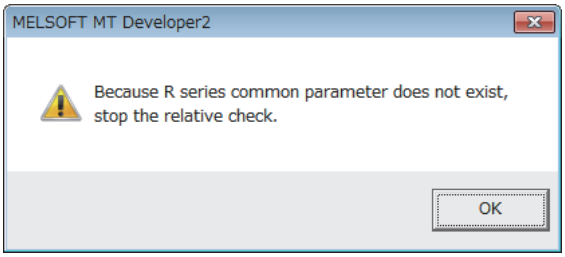
8) When the project diversion completion message appears, click [OK].



The diversion is completed.

If the operation cycle is set as default (automatic), the operation cycle will be changed.
Set a fixed operation cycle where necessary because the change in the operation cycle may change the program execution timing. (Refer to section 2.2(11).)
Though the project has been diverted, conversion of Motion SFC programs and servo programs has not finished yet. Make sure to execute [Project Batch Check/Conversion] before writing to the Motion controller.

If the error message window below appears while “Project Batch Check/Conversion” is being executed, the system parameters need to be set.
Refer to “(3) Procedures for system parameter diversion by MELSOFT MT Developer2” in this section for system parameter setting procedures.

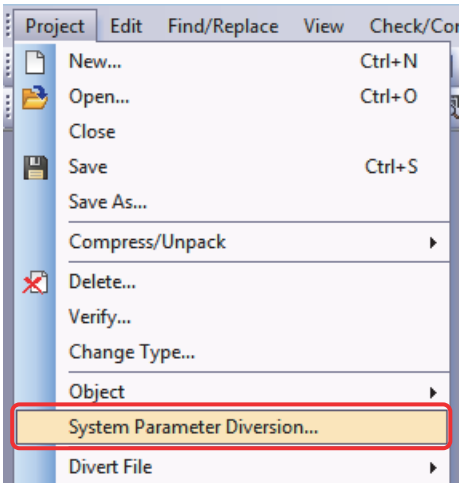


(3) Procedures for system parameter diversion by MELSOFT MT Developer2

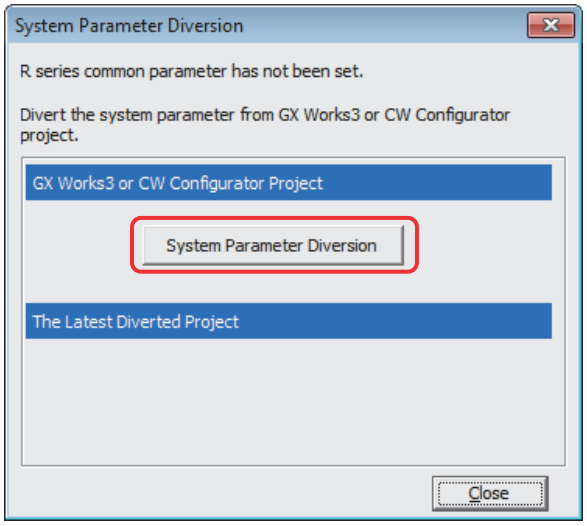
MELSOFT GX Works3 system parameters need to be diverted to R series common parameter settings (comparable to the basic settings of Q series).

The following is the diversion procedure.

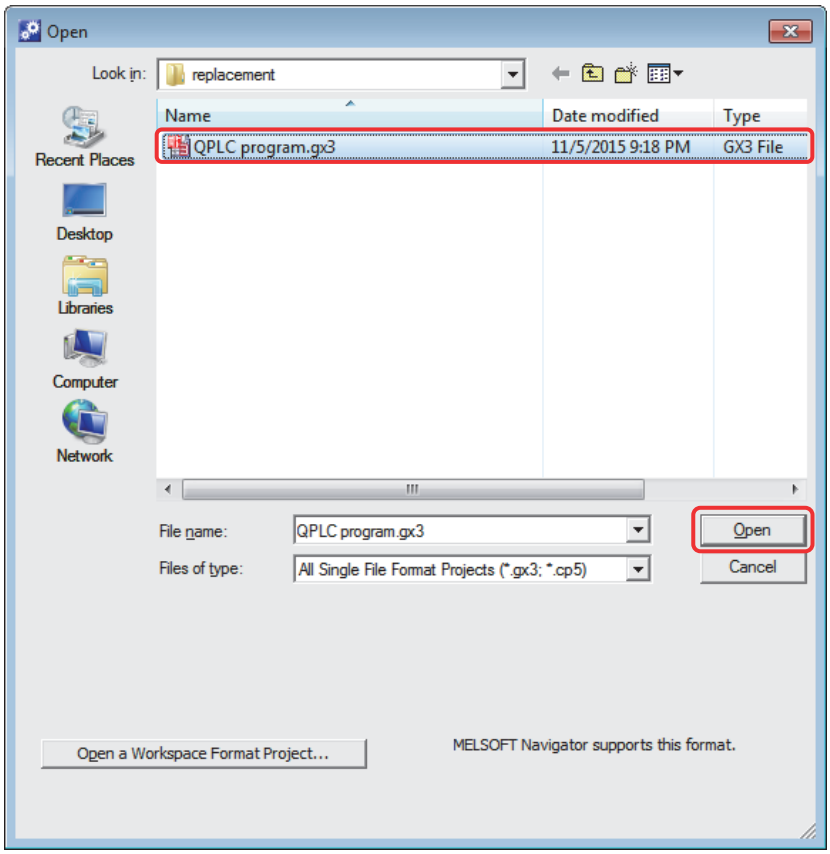
1) Start MELSOFT MT Developer2. Select “System Parameter Diversion” from “Project” menu to open the “System Parameter Diversion” screen.



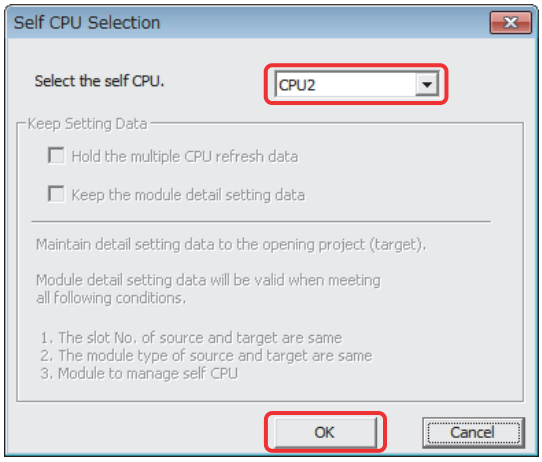
2) Click “System Parameter Diversion”.



3) Select the project to be diverted (The MELSOFT GX Works3 projects created in (1)), and click “Open”.



4) Select the self CPU No. on the “Self CPU selection” screen, and click “OK”.



The diversion is completed.

(4) Batch replacement of devices numbers by MELSOFT MT Developer2

(a) Motion register

The Motion register is expanded and the device assignment is changed when Q17nHCPU(-T) is replaced with RnMTCPU. When the Motion register "#8000 to #8191" are used in Q17nHCPU(-T), replace them by referring to "2.3.1 Motion registers".

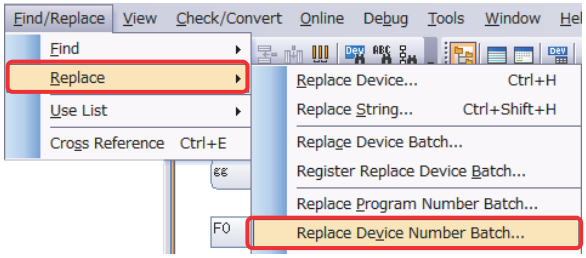
(b) Special device

When special devices are used, replace them by referring to "2.3.2 Special relays" and "2.3.3 Special registers" in this document.
Special devices (M9000 to M9255, D9000 to D9255) are replaced with SM devices (SM2000 to SM2255) and SD devices (SD2000 to SD2255).

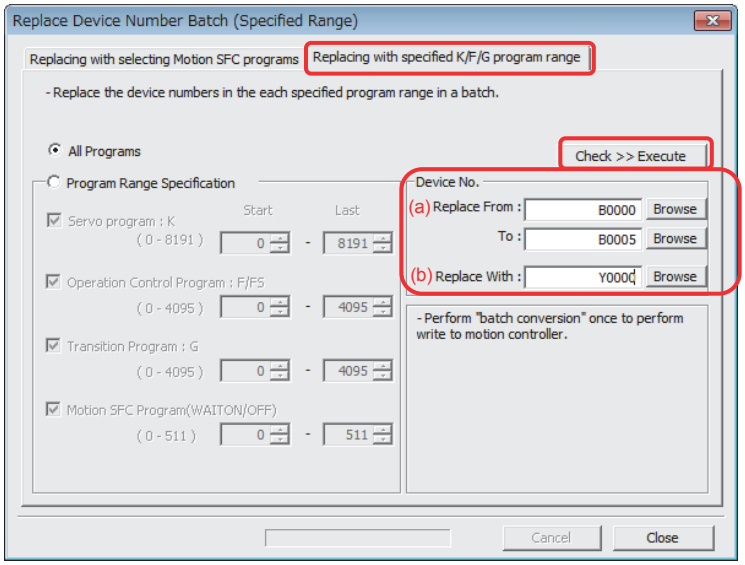
e.g.) M9074 (PCPU READY complete) is automatically converted to SM2074 when the CPU type is changed. Change SM2074 manually to the RnMTCPU special relay (SM500).

The following shows the procedure for the batch replacement of the device numbers.

1) Start MELSOFT MT Developer2, and select [Replace Device Number Batch…] from "Find/Replace" menu.



2) Select "Replacing with specified K/F/G program range" tab. Enter the device numbers in [(a) Replace From:] [To:], and [(b) Replace With:]. Click [Check >> Execute].



(a) Specify the start/end device before replacement.

(b) Specify the start device after replacement.

2.4.4 Replacement of mechanical system program with advanced synchronization

The synchronous control function is replaced with the advanced synchronous control function.

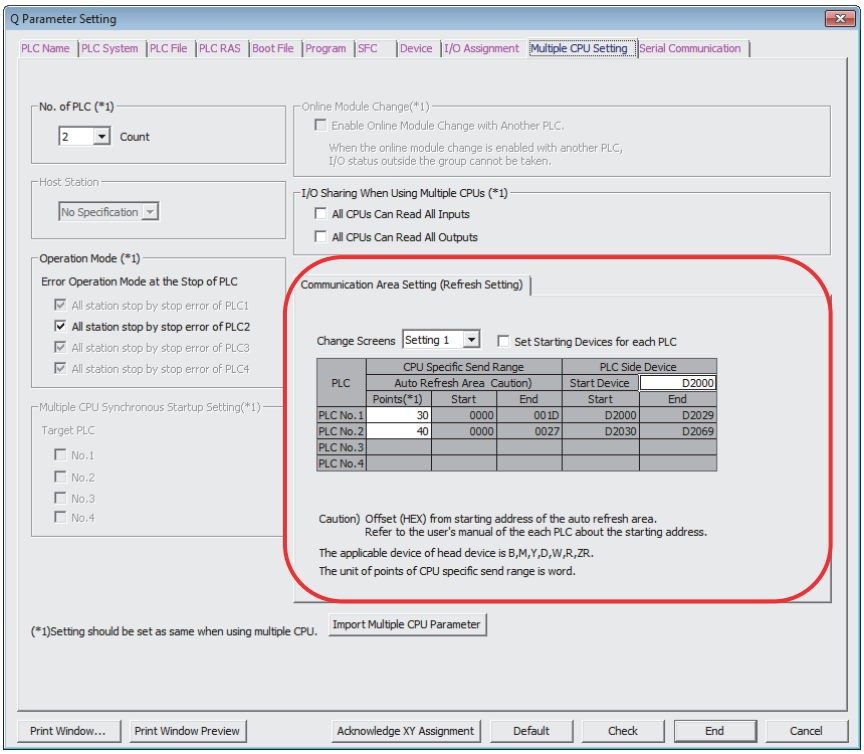
Refer to "Replacement of virtual mode with advanced synchronous control" for the replacement of the synchronous control function. However, at the time of replacement, be sure to take into account the device assignment difference between MELSEC-Q series and MELSEC iQ-R series (replace the Q-series device assignment for Q172DSCPU/Q173DSCPU/Q170MSCPU/ Q170MSCPU-S1 with those for RnMTCPU (Q series Motion compatible device assignment)).

2.4.5 Auto refresh settings in MELSOFT GX Works3

[Communication Area Setting (Refresh Setting)] of MELSOFT GX Works2 is diverted to the [Refresh (END) Setting] of MELSOFT GX Works3.

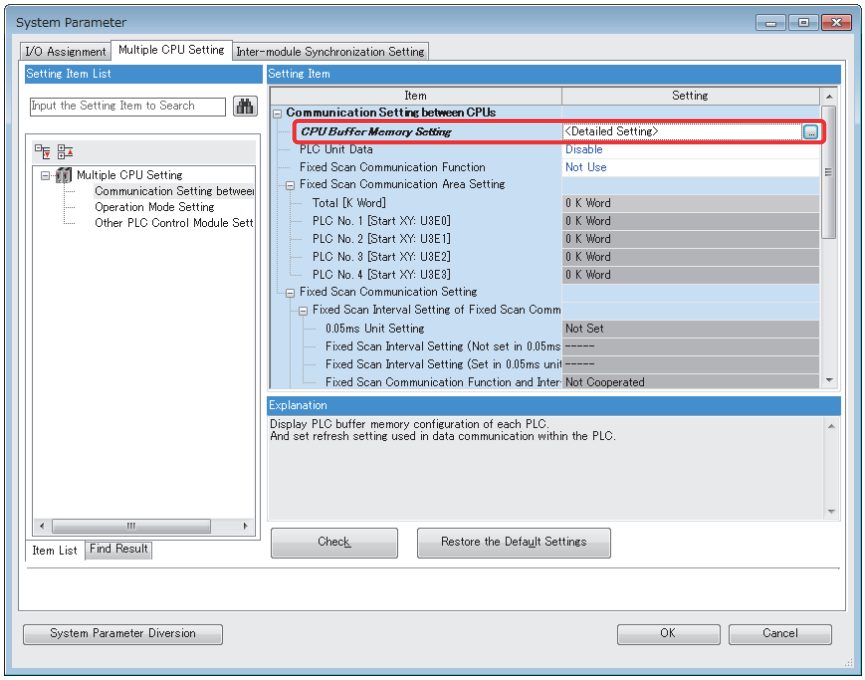
(1) Confirming the “Communication Area Setting (Refresh Setting)” of MELSOFT GX Works2

Select [Parameter] - [PLC Parameter] in the navigation tree to open the “Q Parameter Setting” screen. Select [Multiple CPU Setting] tab and confirm the details of “Communication Area Setting (Refresh Setting)”.

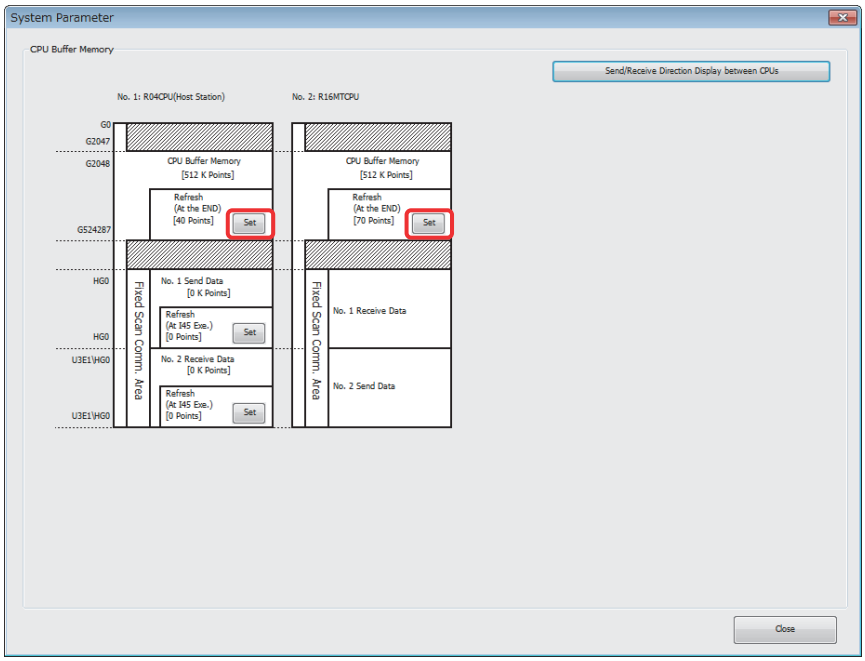


(2) Confirming “Refresh (END)” of MELSOFT GX Works3

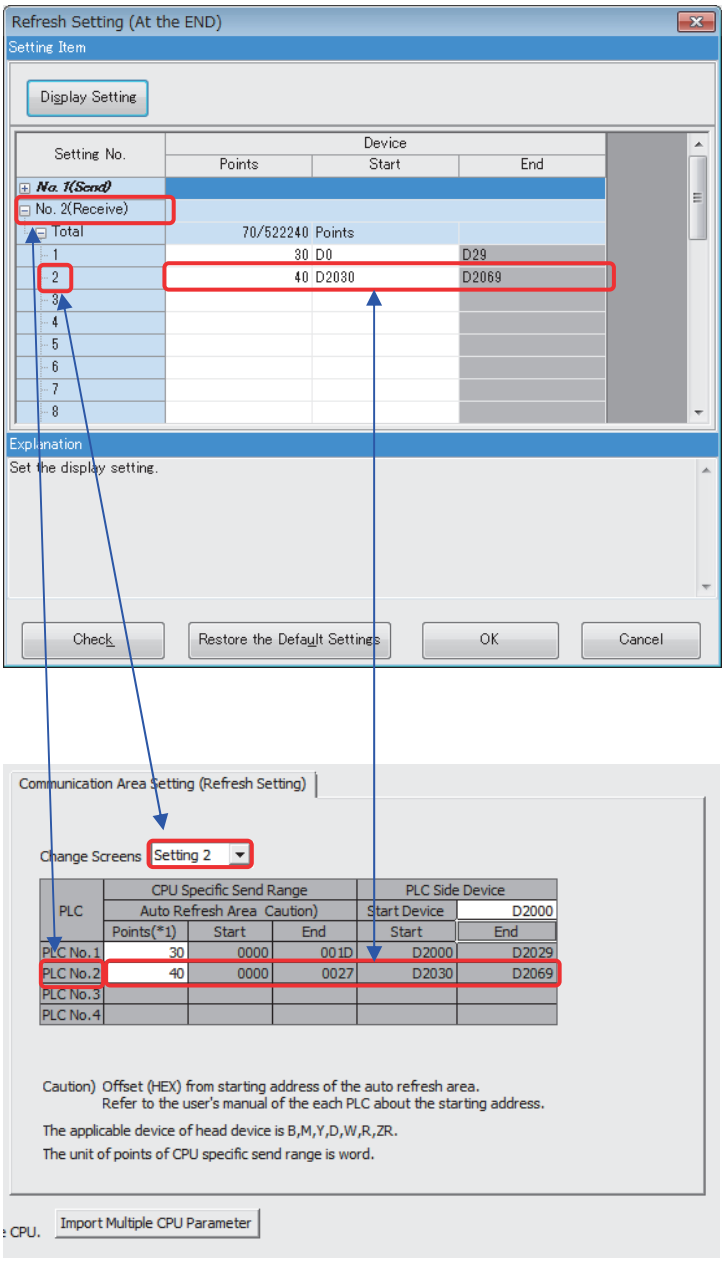
1) Select [Parameter] - [System parameter] in the navigation tree to open “System Parameter” screen. Click on “CPU Buffer Memory Setting: <Detailed Setting>” in [Multiple CPU Setting] tab.



2) The screen below appears. Click a “Set” button of either CPU No.1 or No.2 in [Refresh (At the END)].



3) Set the following on the “Refresh (END) settings” screen below.
When the refresh setting has been deleted, make the setting by referring to “Communication Area Setting (Refreshing Setting)” of MELSOFT GX Works2.



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 Motion controller, its applications should be those that may not result in a serious damage even if any failure or malfunction occurs in Motion controller, and a backup or fail-safe function should operate on an external system to Motion controller when any failure or malfunction occurs.

(2) Our Motion controller 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.

Migration Guide of Motion Controller [Q17nHCPU(-T) ⇒ RnMTCPU]

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Brazil	Mitsubishi Electric do Brasil Comercio e Servicos Ltda. Avenida Adelino Cardana, 293, 21 andar, Bethaville, Barueri SP, Brazil	Tel : +55-11-4689-3000
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