MITSUBISHI ELECTRIC

Programmable Controller

MELSEC iQ-R series

MELSEC iQ-R Motion Controller Programming Manual (Common)

-R16MTCPU
-R32MTCPU
-R64MTCPU

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 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.

[Design Precautions]

⚠ WARNING

- 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.
- 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 servo motor, 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 class 1 defined in JISC6802 or IEC60825-1.)

[Design Precautions]

⚠ CAUTION

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

[Installation Precautions]

⚠ WARNING

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

[Installation Precautions]

⚠ CAUTION

- Use the programmable controller in an environment that meets the General Specifications in the Safety Guidelines included with the base unit. Failure to do so may result in electric shock, fire, malfunction, or damage to or deterioration of the product.
- To mount a module, place the concave part(s) located at the bottom onto the guide(s) of the base unit, and push in the module until the hook(s) located at the top snaps into place. Incorrect interconnection may cause malfunction, failure, or drop of the module.
- To mount a module with no module fixing hook, place the concave part(s) located at the bottom onto the guide(s) of the base unit, push in the module, and fix it with screw(s). Incorrect interconnection may cause malfunction, failure, or drop of the module.
- When using the programmable controller in an environment of frequent vibrations, fix the module with a screw.
- Tighten the screws within the specified torque range. Undertightening can cause drop of the screw, short circuit, or malfunction. Overtightening can damage the screw and/or module, resulting in drop, short circuit, or malfunction.
- When using an extension cable, connect it to the extension cable connector of the base unit securely. Check the connection for looseness. Poor contact may cause malfunction.
- When using an SD memory card, fully insert it into the SD memory card slot. Check that it is inserted completely. Poor contact may cause malfunction.
- Securely insert an extended SRAM cassette into the cassette connector of the CPU module. After insertion, close the cassette cover and check that the cassette is inserted completely. Poor contact may cause malfunction.
- Do not directly touch any conductive parts and electronic components of the module, SD memory card, extended SRAM cassette, or connector. Doing so 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 cause the module to fail or malfunction.
- After installation and wiring, attach a blank cover module (RG60) to each empty slot and an included extension connector protective cover to the unused extension cable connector before powering on the system for operation. Failure to do so may result in electric shock.

[Wiring Precautions]

⚠ CAUTION

- Individually ground the FG and LG terminals of the programmable controller with a ground resistance of 100 ohms or less. Failure to do so may result in electric shock or malfunction.
- For terminal block wiring, use solderless terminals with an insulation sleeve. Do not connect more than two solderless terminals to a terminal.
- Use applicable solderless terminals and tighten them within the specified torque range. If any spade solderless terminal is used, it may be disconnected when the terminal screw comes loose, resulting in failure.
- Check the rated voltage and signal layout before wiring to the module, and connect the cables correctly. Connecting a power supply with a different voltage rating or incorrect wiring may cause fire or failure.
- Connectors for external devices must be crimped or pressed with the tool specified by the manufacturer, or must be correctly soldered. Incomplete connections may cause short circuit, fire, or malfunction.
- Securely connect the connector to the module. Poor contact may cause malfunction.
- Do not install the control lines or communication cables together with the main circuit lines or power cables. Keep a distance of 100mm or more between them. Failure to do so may result in malfunction due to noise.
- When an overcurrent caused by a failure of an external device or a module flows for a long time, it may cause smoke and fire. To prevent this, configure an external safety circuit, such as a fuse.
- 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.
- When disconnecting the communication cable or power cable from the module, do not pull the cable by the cable part. For the cable connected to the terminal block, loosen the terminal screws. Pulling the cable connected to the module may result in malfunction or damage to the module or cable.
- 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.
- Tighten the terminal block mounting screws, terminal screws, and module fixing screws within each specified torque range. Undertightening of the terminal block mounting screws and terminal screws can cause short circuit, fire, or malfunction. Overtightening of them can damage the screw and/or module, resulting in drop, short circuit, or malfunction. Undertightening of the module fixing screws can cause drop of the screw. Overtightening of them can damage the screw and/or module, resulting in drop.
- 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.

[Wiring Precautions]

⚠CAUTION

- 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.

[Startup and Maintenance Precautions]

⚠CAUTION

- When connecting an external device with a CPU module or intelligent function module to modify data of a running programmable controller, configure an interlock circuit in the program to ensure that the entire system will always operate safely. For other forms of control (such as program modification, parameter change, forced output, or operating status change) of a running programmable controller, read the relevant manuals carefully and ensure that the operation is safe before proceeding. Improper operation may damage machines or cause accidents.
- Especially, when a remote programmable controller is controlled by an external device, immediate action cannot be taken if a problem occurs in the programmable controller due to a communication failure. To prevent this, configure an interlock circuit in the program, and determine corrective actions to be taken between the external device and CPU module in case of a communication failure.
- Do not disassemble or modify the modules. Doing so may cause failure, malfunction, injury, or a fire.
- Use any radio communication device such as a cellular phone or PHS (Personal Handy-phone System) more than 25cm away in all directions from the programmable controller. Failure to do so may cause malfunction.
- Shut off the external power supply (all phases) used in the system before mounting or removing the module. Failure to do so may cause the module to fail or malfunction.
- Tighten the screws within the specified torque range. Undertightening can cause drop of the component or wire, short circuit, or malfunction. Overtightening can damage the screw and/or module, resulting in drop, short circuit, or malfunction.

[Startup and Maintenance Precautions]

⚠ CAUTION

- 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 of 500 times 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 may cause malfunction or failure of the module.
- Note that when the reference axis speed is specified for interpolation operation, the speed of the partner axis (2nd, 3rd, or 4th axis) may exceed the speed limit value.
- Do not go near the machine during test operations or during operations such as teaching. Doing so may lead to injuries.

[Disposal Precautions]

⚠ CAUTION

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

[Transportation Precautions]

⚠ CAUTION

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

CONDITIONS OF USE FOR THE PRODUCT

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

i) where any problem, fault or failure occurring in the PRODUCT, if any, shall not lead to any major or serious accident; and

ii) where the backup and fail-safe function are systematically or automatically provided outside of the PRODUCT for the case of any problem, fault or failure occurring in the PRODUCT.

(2) The PRODUCT has been designed and manufactured for the purpose of being used in general industries.
MITSUBISHI SHALL HAVE NO RESPONSIBILITY OR LIABILITY (INCLUDING, BUT NOT LIMITED TO ANY AND ALL RESPONSIBILITY OR LIABILITY BASED ON CONTRACT, WARRANTY, TORT, PRODUCT LIABILITY) FOR ANY INJURY OR DEATH TO PERSONS OR LOSS OR DAMAGE TO PROPERTY CAUSED BY the PRODUCT THAT ARE OPERATED OR USED IN APPLICATION NOT INTENDED OR EXCLUDED BY INSTRUCTIONS, PRECAUTIONS, OR WARNING CONTAINED IN MITSUBISHI'S USER, INSTRUCTION AND/OR SAFETY MANUALS, TECHNICAL BULLETINS AND GUIDELINES FOR the PRODUCT.
("Prohibited Application")

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

- Nuclear Power Plants and any other power plants operated by Power companies, and/or any other cases in which the public could be affected if any problem or fault occurs in the PRODUCT.

- Railway companies or Public service purposes, and/or any other cases in which establishment of a special quality assurance system is required by the Purchaser or End User.

- Aircraft or Aerospace, Medical applications, Train equipment, transport equipment such as Elevator and Escalator, Incineration and Fuel devices, Vehicles, Manned transportation, Equipment for Recreation and Amusement, and Safety devices, handling of Nuclear or Hazardous Materials or Chemicals, Mining and Drilling, and/or other applications where there is a significant risk of injury to the public or property.

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

INTRODUCTION

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

This manual describes the Multiple CPU system, parameters, devices, functions, memory structure etc. of the relevant products listed below.

Before using this product, please read this manual and the relevant manuals carefully and develop familiarity with the functions and performance of the MELSEC iQ-R series programmable controller to handle the product correctly.

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

Please make sure that the end users read this manual.

Relevant products

R16MTCPU, R32MTCPU, R64MTCPU

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RELEVANT MANUALS

Manual Name [Manual Number]	Description	Available form
MELSEC iQ-R Motion Controller Programming Manual (Common) [IB-0300237] (This manual)	This manual explains the Multiple CPU system configuration, performance specifications, common parameters, auxiliary/applied functions, error lists and others.	Print book
		e-Manual PDF
MELSEC iQ-R Motion Controller User's Manual [IB-0300235]	This manual explains specifications of the Motion CPU modules, SSCNETⅢ cables, synchronous encoder, troubleshooting, and others.	Print book
		e-Manual PDF
MELSEC iQ-R Motion Controller Programming Manual (Program Design) [IB-0300239]	This manual explains the functions, programming, debugging for Motion SFC and others.	Print book
		e-Manual PDF
MELSEC iQ-R Motion Controller Programming Manual (Positioning Control) [IB-0300241]	This manual explains the servo parameters, positioning instructions, device lists and others.	Print book
		e-Manual PDF
MELSEC iQ-R Motion Controller Programming Manual (Advanced Synchronous Control) [IB-0300243]	This manual explains the dedicated instructions to use synchronous control by synchronous control parameters, device lists and others.	Print book
		e-Manual PDF
MELSEC iQ-R Motion Controller Programming Manual (Machine Control) [IB-0300309]	This manual explains the dedicated instructions to use machine control by machine control parameters, machine positioning data, device lists and others.	Print book
		e-Manual PDF
MELSEC iQ-R Motion Controller Programming Manual (G-Code Control) [IB-0300371]	This manual explains the dedicated instructions to use G-code control by G-code control parameters and G-code programs.	Print book
		e-Manual PDF

Point

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

e-Manual has the following features:

 • Required information can be cross-searched in multiple manuals.

 • Other manuals can be accessed from the links in the manual.

 • The hardware specifications of each part can be found from the product figures.

 • Pages that users often browse can be bookmarked.

TERMS

Unless otherwise specified, this manual uses the following terms.

Term	Description
R64MTCPU/R32MTCPU/R16MTCPU or Motion CPU (module)	Abbreviation for MELSEC iQ-R series Motion controller
MR-J4(W)-□B	Servo amplifier model MR-J4-□B/MR-J4W-□B
MR-J3(W)-□B	Servo amplifier model MR-J3-□B/MR-J3W-□B
AMP or Servo amplifier	General name for "Servo amplifier model MR-J4-□B/MR-J4W-□B/MR-J3-□B/MR-J3W-□B"
RnCPU, PLC CPU or PLC CPU module	Abbreviation for MELSEC iQ-R series CPU module
Multiple CPU system or Motion system	Abbreviation for "Multiple PLC system of the R series"
CPUn	Abbreviation for "CPU No.n (n = 1 to 4) of the CPU module for the Multiple CPU system"
Operating system software	General name for "SW10DNC-RMTFW"
Engineering software package	General name for MT Developer2/GX Works3
MELSOFT MT Works2	General product name for the Motion controller engineering software "SW1DND-MTW2"
MT Developer2	Abbreviation for the programming software included in the "MELSOFT MT Works2" Motion controller engineering software
GX Works3	General product name for the MELSEC PLC software package "SW1DND-GXW3"
Serial absolute synchronous encoder or Q171ENC-W8	Abbreviation for "Serial absolute synchronous encoder (Q171ENC-W8)"
SSCNETⅢ/H[*1]	High speed synchronous network between Motion controller and servo amplifier
SSCNETⅢ[*1]	
SSCNETⅢ(/H)	General name for SSCNETⅢ/H, SSCNETⅢ
Absolute position system	General name for "system using the servomotor and servo amplifier for absolute position"
Intelligent function module	General name for module that has a function other than input or output such as A/D converter module and D/A converter module.
SSCNETⅢ/H head module[*1]	Abbreviation for "MELSEC-L series SSCNETⅢ/H head module (LJ72MS15)"
Optical hub unit or MR-MV200	Abbreviation for SSCNETⅢ/H Compatible Optical Hub Unit (MR-MV200)
Sensing module	General name for SSCNETⅢ/H compatible sensing module MR-MT2000 series
Sensing SSCNETⅢ/H head module[*1] or MR-MT2010	Abbreviation for SSCNETⅢ/H head module (MR-MT2010)
Sensing extension module	General name for I/O module (MR-MT2100), pulse I/O module (MR-MT2200), analog I/O module (MR-MT2300), encoder I/F module (MR-MT2400)
Sensing I/O module or MR-MT2100	Abbreviation for I/O module (MR-MT2100)
Sensing pulse I/O module or MR-MT2200	Abbreviation for pulse I/O module (MR-MT2200)
Sensing analog I/O module or MR-MT2300	Abbreviation for analog I/O module (MR-MT2300)
Sensing encoder I/F module or MR-MT2400	Abbreviation for encoder I/F module (MR-MT2400)

*1   SSCNET: Servo System Controller NETwork

MANUAL PAGE ORGANIZATION

Representation of numerical values used in this manual

■Axis No. representation

In the positioning dedicated signals, "n" in "M3200+20n", etc. indicates a value corresponding to axis No. as shown in the following table.

Axis No.	n	Axis No.	n	Axis No.	n	Axis No.	n	Axis No.	n	Axis No.	n	Axis No.	n	Axis No.	n
1	0	9	8	17	16	25	24	33	32	41	40	49	48	57	56
2	1	10	9	18	17	26	25	34	33	42	41	50	49	58	57
3	2	11	10	19	18	27	26	35	34	43	42	51	50	59	58
4	3	12	11	20	19	28	27	36	35	44	43	52	51	60	59
5	4	13	12	21	20	29	28	37	36	45	44	53	52	61	60
6	5	14	13	22	21	30	29	38	37	46	45	54	53	62	61
7	6	15	14	23	22	31	30	39	38	47	46	55	54	63	62
8	7	16	15	24	23	32	31	40	39	48	47	56	55	64	63

- The range of axis No.1 to 16 (n=0 to 15) is valid in the R16MTCPU. The range of axis No.1 to 32 (n=0 to 31) is valid in the R32MTCPU.
- Calculate as follows for the device No. corresponding to each axis.

Ex.

For axis No. 32 in Q series Motion compatible device assignment

M3200+20n ([Rq.1140] Stop command)=M3200+20×31=M3820

M3215+20n ([Rq.1155] Servo OFF command)=M3215+20×31=M3835

In the positioning dedicated signals, "n" in "M10440+10n", etc. of the "Synchronous encoder axis status", "Synchronous encoder axis command signal", "Synchronous encoder axis monitor device" and "Synchronous encoder axis control device" indicates a value corresponding to synchronous encoder axis No. as shown in the following table.

Synchronous encoder axis No.	n	Synchronous encoder axis No.	n	Synchronous encoder axis No.	n
1	0	5	4	9	8
2	1	6	5	10	9
3	2	7	6	11	10
4	3	8	7	12	11

- Calculate as follows for the device No. corresponding to each synchronous encoder.

Ex.

For synchronous encoder axis No.12 in Q series Motion compatible device assignment

M10440+10n ([St.320] Synchronous encoder axis setting valid flag)=M10440+10×11=M10550

D13240+20n ([Md.320] Synchronous encoder axis current value)=D13240+20×11=D13460

■Machine No. representation

In the positioning dedicated signals, "m" in "M43904+32m", etc. indicates a value corresponding to machine No. as shown in the following table.

Machine No.	m	Machine No.	m
1	0	5	4
2	1	6	5
3	2	7	6
4	3	8	7

 • Calculate as follows for the device No. corresponding to each machine.

Ex.

For machine No.8 in MELSEC iQ-R Motion device assignment

M43904+32m ([St.2120] Machine error detection) M43904+32×7=M44128

D53168+128m ([Md.2020] Machine type)=M53168+28×7=D54064

■Line No. representation in G-code control

In the positioning dedicated signals, "s" in "D54496+128s", etc. indicates a value corresponding to line No. as shown in the following table.

Line No.	s
1	0
2	1

 • Calculate as follows for the device No. corresponding to each line.

Ex.

For line No.2 in MELSEC iQ-R Motion device assignment

D54440.0+4s ([St.3208] During G-code control)=D54440.0+4×1=D54444.0

D54496+128s ([Md.3016] Number of axes on line)=D54496+128×1=D54624

■Line No. and axis No. representation in G-code control

In the positioning dedicated signals, "sn" in "D54278+16sn", etc. indicates a value corresponding to line No. and axis No. as shown in the following table.

Line No.	Axis No.	sn	Line No.	Axis No.	sn
1	1	0	2	1	8
	2	1		2	9
	3	2		3	10
	4	3		4	11
	5	4		5	12
	6	5		6	13
	7	6		7	14
	8	7		8	15

 • Calculate as follows for the device No. corresponding to each line.

Ex.

For line No.2, axis No. 8 in MELSEC iQ-R Motion device assignment

D54448.0+2sn ([St.3076] Smoothing zero)=D54448.0+2×15=D54478.0

D54754+32sn ([Md.3146] Rotating axis setting status)=D54754+32×15=D55234

Representation of device No. used in this manual

The "R" and "Q" beside the device No. of positioning dedicated signals such as "[Rq.1140] Stop command (R: M34480+32n/ Q: M3200+20n)" indicate the device No. for the device assignment methods shown below. When "R" and "Q" are not beside the device No., the device No. is the same for both device assignment methods.

Symbol	Device assignment method
R	MELSEC iQ-R Motion device assignment
Q	Q series Motion compatible device assignment

1 MULTIPLE CPU SYSTEM

1.1 Multiple CPU System

Overview

What is Multiple CPU system?

A Multiple CPU system is a system in which more than one PLC CPU module and Motion CPU module (up to 4 modules) are mounted on several main base unit in order to control the I/O modules and intelligent function modules. Each Motion CPU controls the servo amplifiers connected by SSCNETⅢ cable.

System configuration based on load distribution

- By distributing such tasks as servo control, machine control and information control among multiple processors, the flexible system configuration can be realized.
- You can increase the number of control axes by using a multiple Motion CPU modules. It is possible to control up to 192 axes by using the three CPU modules (R64MTCPU).
- Overall system responsiveness is improved by distributing the high-load processing over several CPU modules.

Communication between CPUs in the Multiple CPU system

- Since device data of other CPUs can be automatically read by the Multiple CPU refresh function, the self CPU can also use device data of other CPUs as those of self CPU.
- Motion dedicated PLC instructions can be used to access device data from the PLC CPU to Motion CPU and start Motion SFC program.

Restrictions on Multiple CPU systems using Motion CPUs

Refer to the following for details on the Multiple CPU system concept (system configuration such as CPU module installation positions and combinations, CPU Nos., I/O No. allocation etc.).

📖MELSEC iQ-R Series Module Configuration Manual

This section describes restrictions when using Motion CPUs.

CPU module installation position

Motion CPUs can only be used with the Multiple CPU system.

Motion CPU modules cannot be installed in CPU slots.

Controllable modules

■MELSEC iQ-R series modules

The following modules can be controlled with a Motion CPU. Modules other than those below cannot be controlled with a Motion CPU.

Module	Model
Input module	RX10
	RX40C7
	RX41C4
	RX42C4
	RX40PC6H
	RX40NC6H
	RX41C6HS
	RX61C6HS
Output module	RY10R2
	RY40NT5P
	RY41NT2P
	RY41NT2H
	RY42NT2P
	RY40PT5P
	RY41PT1P
	RY41PT2H
	RY42PT1P
Input/output composite module	RH42C4NT2P
Analog input module	R60AD4
	R60ADI8
	R60ADV8
	R60AD8-G
	R60AD16-G
	R60ADH4
Analog output module	R60DA4
	R60DAI8
	R60DAV8
	R60DA8-G
	R60DA16-G
High-speed counter module	RD62D2
	RD62P2
	RD62P2E
Temperature input module	RD60TD8-G
	RD60RD8-G

■MELSEC Q series modules

MELSEC Q series modules cannot be controlled with the Motion CPU. If the Motion CPU is specified as the MELSEC Q series module control CPU, a moderate error (error code: 2020H) is detected when turning ON the Multiple CPU system power supply, and the module cannot be accessed.

Module access range from non-controlling CPU

- Access to MELSEC Q series modules controlled by other CPU is not possible from Motion CPU. (I/O reading from outside the group is also not performed.)
- Module access devices (U□\G) can be read. An error (error code differs for each function) is output when attempting to write.
- X/Y devices for modules controlled by another CPU can be refreshed to a Motion X/Y with the I/O settings for outside the group. However, I/O reading from outside the group is not performed for modules controlled by other CPUs that apply to inter-module synchronization.

Module control with Motion CPUs

The settings required to control modules with Motion CPUs are as follows.

System configuration settings

The system configuration for Multiple CPU systems and common parameters is set in the GX Works3 [Module Configuration] and [System Parameter].

With Motion CPUs, parameters set in GX Works3 are read by MT Developer2, and therefore the system configuration and common parameters are not set in MT Developer2. If setting the system configuration and common parameters, always do so with GX Works3.

Furthermore, module parameters for modules set in the system configuration are set in GX Works3, however, module parameters for modules for which a Motion CPU has been set as the control CPU cannot be set in GX Works3.

Settings for modules controlled by Motion CPUs are specified at the MT Developer2 [Module Configuration List].

> **Point**
>
> For modules used with "High-accuracy" high-speed input request signals, set the "Synchronization Setting within the Modules" to "Use" in GX Works3, and set the fixed scan interval setting to "0.444ms" or greater. Please note that "Synchronization Setting within the Modules" can be used for modules with 32 or less input/output points.

System configuration setting method

■GX Works3 settings

Set the following parameters in 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].

■MT Developer2 settings

- Read the parameters set in GX Works3 using MT Developer2 [System Parameter Diversion].
- Select [R Series Common Parameters] ⇨ [Module Configuration List] ⇨ "Setting item" ⇨ "Detailed" button in MT Developer2, and then set the parameters for the module for which a Motion CPU set has been set as the control CPU in the module detailed settings that appear.

Module individual settings

The setting items for modules for which a Motion CPU has been set as the control CPU are shown below.

> **Point**
>
> Set the module settings not shown in the tables with the buffer memory for each module.

■Input module

Item[1]		Setting range[2]	Default value
Input response time setting		No setting/10micro-s/20micro-s/50micro-s/0.1ms/0.2ms/0.4ms/0.6ms/1ms/5ms/10ms/20ms/70ms	[3]
Interrupt setting	Input/interrupt setting	Input/interrupt	Input
	Interrupt condition setting	Leading edge/Trailing edge/Leading edge/trailing edge	—
	Interrupt pointer	I0 to I15	—

[1] Items that can be set will differ depending on the module used.
[2] Setting range will differ depending on the module used.
[3] Default values will differ depending on the module used.

■Output module

Item	Setting range	Default value
Setting of error-time output mode	Clear/Hold	Clear

■I/O module

Item		Setting range	Default value
Input response time setting		0.1ms/0.2ms/0.4ms/0.6ms/1ms/5ms/10ms/20ms/70ms	10ms
Interrupt setting	Input/interrupt setting	Input/interrupt	Input
	Interrupt condition setting	Leading edge/Trailing edge/Leading edge/trailing edge	—
	Interrupt pointer	I0 to I15	—
Setting of error-time output mode		Clear/Hold	Clear

■High-speed counter module

Item		Setting range[*1]	Default value
Basic setting	Pulse input mode	1-phase multiple of 1/1-phase multiple of 2/CW/CCW/ 2-phase multiple of 1/2-phase multiple of 2/2-phase multiple of 4	1-phase multiple of 1
	Counting speed setting	10kpps/100kpps/200kpps/500kpps/1Mpps/2Mpps/4Mpps/ 8Mpps	10kpps
	Counter type	Linear counter/Ring counter	Linear counter
	Counter operation mode	Pulse count mode/Pulse measurement mode/PWM output mode	Pulse count mode
	Preset value setting	-2147483648 to 2147483647	0
	Coincidence output point No.1	-2147483648 to 2147483647	0
	Coincidence output point No.2	-2147483648 to 2147483647	0
	Ring counter upper limit value	-2147483648 to 2147483647	0
	Ring counter lower limit value	-2147483648 to 2147483647	0
Application setting	Counter function selection	Count disable function/Latch counter function/Sampling counter function/Cycle pulse counter function	Count disable function
	Sampling time setting/Period time setting	1 to 65535 ×10ms	—
	Function input response time setting	Response time 0ms/Response time 0.1ms/ Response time 1ms/Response time 10ms	Response time 0.1ms
	Preset input response time setting	Response time 0ms/Response time 0.1ms/ Response time 1ms/Response time 10ms	Response time 0.1ms
	Pulse measuring interval setting	ON width/OFF width/Rise - Rise/ Fall - Fall	ON width
	PWM output interval time setting	0 to 2147483647 ×0.1μs	2147483647 ×0.1μs
	PWM output ON time setting 1	0 to 2147483647 ×0.1μs	0 ×0.1μs
	PWM output ON time setting 2	0 to 2147483647 ×0.1μs	0 ×0.1μs
	CPU error output mode setting	Clear/Hold	Clear
Interrupt setting	Interrupt pointer	I0 to I15	—

*1 Setting range will differ depending on the module used.

■Analog input module

Item[1]			Setting range[2]	Default value
Basic setting	Range switching function	Input range setting	4 to 20mA/0 to 20mA/1 to 5V/0 to 5V/-10V to 10V/ 0 to 10V/4 to 20mA (Extend)/1 to 5V (Extend)/ User range setting	[3]
	Operation mode setting function	Operation mode setting	Normal mode(A/D conversion)/Normal mode(low speed: 20μs/CH)/Normal mode(medium speed: 10μs/CH)/ Simultaneous conversion mode(5μs/4CH)/Offset/gain setting mode	[3]
	A/D conversion enable/disable setting function	A/D conversion enable/disable setting	A/D conversion enable/A/D conversion disable	[3]
	A/D conversion method	Average processing setting	Sampling processing/Time average/Count average/Moving average/Primary delay filter/Low pass filter/High pass filter/ Band pass filter	Sampling processing
		Time average/Count average/ Moving average/Primary delay filter constant setting	Time average: 1 to 5000ms Count average: 4 to 62500 times Moving average: 2 to 1000 times Primary delay filter: 1 to 500 times	—
		LPF pass band edge frequency	Low pass filter: 0 to 46700Hz	—
		HPF pass band edge frequency	High pass filter: 171 to 48000Hz	—
		BPF pass band edge frequency (low)	Band pass filter: 171 to 46699Hz	—
		BPF pass band edge frequency (high)	Band pass filter: 172 to 46700Hz	—
		Attenuation band width	Low pass filter: 170 to 48000Hz High pass filter: 170 to 47999Hz Band pass filter: 170 to 15999Hz	—

1

Item[1]			Setting range[2]	Default value
Application setting	Scaling function	Scaling enable/disable setting	Enable/Disable	Disable
		Scaling upper limit value	-32000 to -1, 1 to 32000	—
		Scaling lower limit value	-32000 to -1, 1 to 32000	—
	Shift function	Conversion value shift amount	-32768 to 32767	0
	Digital clipping function	Digital clipping enable/disable setting	Enable/Disable	Disable
	Warning output function (process alarm)	Warning output setting (Process alarm)	Enable/Disable	Disable
		Process alarm upper upper limit value	0 to 32767	—
		Process alarm upper lower limit value	0 to 32767	—
		Process alarm lower upper limit value	-32768 to 0	—
		Process alarm lower lower limit value	-32768 to 0	—
	Warning output function (rate alarm)	Warning output function (Rate alarm)	Enable/Disable	Disable
		Rate alarm detection cycle setting	1 to 32000 times	—
		Rate alarm upper limit value	0.1 to 3276.7%	—
		Rate alarm lower limit value	-3276.8 to 0.1%	—
	Input signal error detection function	Input signal error detection setting	Disable/Upper/lower limit detection/Lower limit detection/Upper limit detection	Disable
		Input signal error detection setting value	0.0 to 25.0%	—
		Input signal error detection lower limit setting value	0.0 to 25.0%	—
		Input signal error detection upper limit setting value	0.0 to 25.0%	—
		Input signal error detection auto clear enable/disable setting	Enable/Disable	Disable
	Logging function (Normal logging function)	Logging enable/disable setting	Enable/Disable	Disable
		Logging data points setting	0 to 900	200
		Logging data setting	Digital output value/digital operation value	—
		Logging cycle setting value	μs: 20 to 32767 ms:1 to 32767 s: 1 to 3600	—
		Logging cycle unit setting	μs/ms/s	—
		Level trigger condition setting	Disable/Level trigger (Condition: Rise)/Level trigger (Condition: Fall)/Level trigger (Condition: Rise and Fall)/Process alarm (Upper limit warning)/Process alarm (Lower limit warning)/Process alarm (Upper limit warning and lower limit warning)	—
		Logging points after trigger	1 to 90000	—
		Trigger data	0 to 9999	—
		Trigger setting value	-32768 to 32767	—
		Level judgment count setting value	1 to 10 times	—
		Logging loading enable/disable setting	Enable/Disable	—
		Logging read points setting value	1 to 10000	—
		Continuous logging cycle setting value	1 to 1000	1
	Inter-module synchronization function	Oversampling mode	Enable/Disable	Disable
	Online module change	Auto restore of offset/gain setting with the module change	Enable/Disable	Enable

Item[1]		Setting range[2]	Default value
Interrupt setting	Condition target setting	Disable/Error flag/Warning output flag (Process alarm)/Warning output flag (Rate alarm)/Input signal error detection flag/A/D conversion completed/Logging hold flag/Logging read/Continuous logging data storage	Disable
	Condition target channel setting	All CH specification/CH1/CH2/CH3/CH4/CH5/CH6/CH7/CH8/CH9/CH10/CH11/CH12/CH13/CH14/CH15/CH16	All CH specification
	Interrupt factor transaction setting	Interrupt reissue requests/No Interrupt reissue requests	Interrupt reissue requests
	Interrupt pointer	I0 to I15	—

*1 Items that can be set will differ depending on the module used.
*2 Setting range will differ depending on the module used.
*3 Default values will differ depending on the module used.

■Analog output module

Item[1]			Setting range[2]	Default value
Basic setting	Range switching function	Output range setting	4 to 20mA/0 to 20mA/1 to 5V/0 to 5V/-10V to 10V/-12V to 12V/4 to 20mA (Extension)/1 to 5V (Extension)/User range setting (Voltage)/User range setting (Current)/User range setting 3/User range setting 2/User range setting 1	[3]
	Operation mode setting function	Operation mode setting	Normal mode(D/A conversion process)/Offset/gain setting mode	Normal mode(D/A conversion process)
		Output mode setting	Normal output mode/Wave output mode	Normal output mode
	Output mode setting function	Analog output HOLD/CLEAR setting	CLEAR/HOLD	CLEAR
	D/A conversion enable/disable function	D/A conversion enable/disable setting	D/A conversion enable/D/A conversion disable	D/A conversion disable
Application setting	Scaling setting	Scaling enable/disable setting	Enable/Disable	Disable
		Scaling upper limit value	-32000 to -1, 1 to 32000	—
		Scaling lower limit value	-32000 to -1, 1 to 32000	—
	Shift function	Input value shift amount	-32768 to 32767	0
	Warning output function	Warning output setting	Enable/Disable	Disable
		Warning output upper limit value	1 to 32767	—
		Warning lower upper limit value	-32768 to -1	—
	Rate control function	Rate control enable/disable setting	Enable/Disable	Disable
		Increase digital limit value	0 to 64000	—
		Decrease digital limit value	0 to 64000	—
	Inter-module synchronization function	Output selection during synchronous error	Inter-module synchronization continue/Inter-module synchronization stop	Inter-module synchronization continue
	Online module change	Auto restore of Offset/gain setting with the module change	Enable/Disable	Enable
	CPU error output mode setting		Clear/Hold	Clear
Interrupt setting	Condition target setting		Disable/Error flag/Warning output flag/Disconnection detection flag/External power supply READY flag/External power supply READY flag (CH1_CH8)/External power supply READY flag (CH9_CH16)	Disable
	Condition target channel setting		All CH specification/CH1/CH2/CH3/CH4/CH5/CH6/CH7/CH8/CH9/CH10/CH11/CH12/CH13/CH14/CH15/CH16	All CH specification
	Interrupt factor transaction setting		Interrupt reissue request/No Interrupt reissue request	Interrupt reissue request
	Interrupt pointer		I0 to I15	—

*1 Items that can be set will differ depending on the module used.
*2 Setting range will differ depending on the module used.
*3 Default values will differ depending on the module used.

■Temperature input module

Item[1]			Setting range[2]	Default value
Basic setting	RTD type selection function	RTD type setting	Pt100(-200 to 850℃)/Pt100(-20 to 120℃)/JPt100(-180 to 600℃)/JPt100(-20 to 120℃)/Pt100(0 to 200℃)/JPt100(0 to 200℃)/Ni100(-60 to 250℃)/Pt50(-200 to 650℃)	Pt100(-200 to 850℃)
		Offset/gain setting	Factory default setting/User range setting	Factory default setting
	Thermocouple type selection function	Thermocouple type setting	Thermocouple K/Thermocouple E/Thermocouple J/ Thermocouple T/Thermocouple B/Thermocouple R/ Thermocouple S/Thermocouple N	Thermocouple K
		Offset/gain setting	Factory default setting/User range setting	Factory default setting
	Cold junction temperature compensation with/without setting function	Cold junction temperature compensation with/without setting	With cold junction temperature compensation/Without cold junction temperature compensation	With cold junction temperature compensation
	Operation mode setting function	Operation mode setting	Normal mode (conversion process)/Offset/gain setting mode	Normal mode (conversion process)
	Conversion enable/disable setting function	Conversion enable/disable setting	Conversion enable/Conversion disable	Conversion disable
	Temperature conversion system	Average processing setting	Sampling processing/Time average/Count average/Moving average/ Primary delay filter	Sampling processing
		Time average/Count average/ Moving average/Primary delay filter constant setting	Time average: 40 to 5000ms Count average: 4 to 500 times Moving average: 2 to 200 times Primary delay filter: 1 to 500 times	—

Item[1]			Setting range[2]	Default value
Application setting	Scaling function	Scaling enable/disable setting	Enable/Disable	Disable
		Scaling range upper limit value	-3276.8 to -0.1℃, 0.1 to 3276.7℃	—
		Scaling range lower limit value	-3276.8 to -0.1℃, 0.1 to 3276.7℃	—
		Scaling width upper limit value	-32768 to -1, 1 to 32767	—
		Scaling width lower limit value	-32768 to -1, 1 to 32767	—
	Warning output function (Process alarm)	Warning output setting (Process alarm)	Enable/Disable	Disable
		Process alarm upper upper limit value	-270.0 to 1820℃	—
		Process alarm upper lower limit value	-270.0 to 1820℃	—
		Process alarm lower upper limit value	-270.0 to 1820℃	—
		Process alarm lower lower limit value	-270.0 to 1820℃	—
	Warning output function (Rate alarm)	Warning output setting (Rate alarm)	Enable/Disable	Disable
		Rate alarm detection cycle setting	1 to 32000 times	—
		Rate alarm upper limit value	0.1 to 3276.7℃	—
		Rate alarm lower limit value	-3276.8 to -0.1℃	—
	Disconnection detection function	Disconnection detection function enable/disable setting	Enable/Disable	Enable
		Conversion setting for disconnection detection	Up scale/Down scale/Given value/Value immediately before disconnection	Down scale
		Conversion setting value for disconnection detection	-3276.8 to 3276.7℃	—
		Disconnection detection automatic clear enable/disable setting	Enable/Disable	Disable
	Logging function	Logging enable/disable setting	Enable/Disable	Disable
		Logging data setting	Measured temperature value/Scaling value	—
		Logging cycle setting value	ms:10 to 32767 s: 1 to 3600	—
		Logging cycle unit setting	ms/s	—
		Level trigger condition setting	Disable/Level trigger (Condition: Rise)/Level trigger (Condition: Fall)/Level trigger (Condition: Rise and Fall)	—
		Logging points after trigger	1 to 1000	—
		Trigger data	0 to 9999	—
		Trigger setting value	-32768 to 32767	—
		Logging loading enable/disable setting	Enable/Disable	—
		Logging read points setting value	1 to 1000	—
	Online module change	Auto restore of Offset/gain setting with the module change	Enable/Disable	Enable
Interrupt setting	Condition target setting		Disable/Error flag/Warning output flag (Process alarm)/Warning output flag (Rate alarm)/Disconnection detection flag/Conversion completed flag/Logging hold flag/Logging read	Disable
	Condition target channel setting		All CH specification/CH1/CH2/CH3/CH4/CH5/CH6/CH7/CH8	All CH specification
	Interrupt factor transaction setting		Interrupt reissue requests/No Interrupt reissue requests	Interrupt reissue requests
	Interrupt pointer		I0 to I15	—

*1 Items that can be set will differ depending on the module used.

*2 Setting range will differ depending on the module used.

1.2 Setting Operation for Multiple CPU System

This section describes all operation settings for Multiple CPU systems. Specify all operation settings for Multiple CPU systems in the GX Works3 [System Parameter]. Refer to the following for details on all operation settings.
📖MELSEC iQ-R CPU Module User's Manual (Application)

Setting operation for CPU module stop error

If a moderate or major error occurs at any of the CPUs, set whether to stop or continue operation for all CPUs.
Set the stopping mode for the CPU to be stopped in [System Parameter] ⇨ [Multiple CPU Setting] ⇨ "Multiple CPU Setting" ⇨ "Operation Mode Setting" ⇨ "Stop Setting" in GX Works3.

Multiple CPU synchronous startup setting

Multiple CPU synchronous startup function synchronizes the startups of CPU No.1 to CPU No.4. (It takes about ten seconds to startup for Motion CPU. After startup, each CPU requires time for initializing.)
Since this function monitors the startup of each CPU module, when other CPU is accessed by a user program, an interlock program which checks the CPU module startup is unnecessary. With the Multiple CPU synchronous startup function, the startup is synchronized with the slowest CPU module to startup; therefore, the system startup may be slow.

> **Point**
>
> Multiple CPU synchronous startup function is for accessing each CPU module in a Multiple CPU system without needing an interlock. This function is not for starting an operation simultaneously among CPU modules after startup.

Multiple CPU synchronous startup setting

Set "Synchronize" in the Multiple CPU synchronous startup setting of the CPU in [System Parameter] ⇨ [Multiple CPU Setting] ⇨ "Multiple CPU Setting" ⇨ "Operation Mode Setting" ⇨ "Synchronous Startup Setting"
When not performing Multiple CPU synchronous startup (each CPU startup without synchronization), startup of each CPU module can be confirmed by using special relays SM220 to SM223 (CPU No.1 to 4 READY complete flag).

Clock synchronization between Multiple CPU

Motion CPU clock data is synchronized with the clock of CPU No. 1.
The clock data used for synchronization in a Multiple CPU system can be edited.(☞ Page 113 Clock Function)

1.3 Data Communication Between CPU Modules in the Multiple CPU System

Data transfer is performed between CPU modules in the Multiple CPU system. Data can be written and read between CPUs through communication by refreshing or by direct access. Data communication methods are shown below.

Refer to the following for details on data communication between CPU modules (data communication via CPU buffer memory/fixed scan communication area).

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

Communication method	Application	Details
Data communication via CPU buffer memory	Use to transfer data based on the timing of the respective CPU modules.	CPU modules transmitting data write to the self CPU buffer memory. CPU modules receiving data read from the self CPU buffer memory of the CPU module (other CPU) from which the data was transmitted.
Data communication via fixed scan communication area	Use to transfer data based on the timing between CPU modules.	CPU modules transmitting data write to the self CPU fixed scan communication area (transmission area). CPU modules receiving data read from the self CPU fixed scan communication area (receipt area) of the CPU module to which the data was transmitted.

Used memory

Data communication between CPU modules uses the CPU buffer memory.

CPU buffer memory configuration

The CPU buffer memory configuration is shown below.
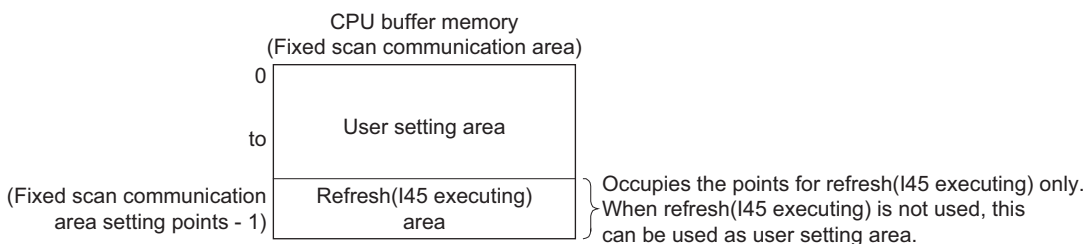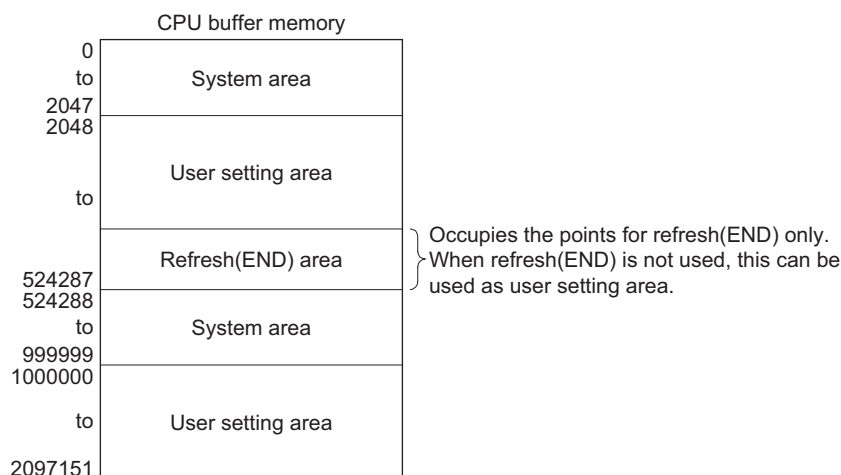
Memory	Communication method	Details	Area size
CPU buffer memory	Communication by direct access	Data reading and writing is performed for the self CPU or other CPU area.	PLC CPU: 512k words Motion CPU: 2M words
Refresh area	Communication by refresh	Data communication is performed by refreshing at END processing.	
Fixed scan communication area[*1]	Communication by direct access	Data reading and writing is performed for the self CPU fixed scan communication area, and self CPU and other CPU data transfer is performed in fixed scan communication cycles.	Changes can be made within an overall range of 0 to 24k words. The transmission area per module can be set in the 0 to 12k word range.
Refresh area	Communication by refresh	Refresh is performed in fixed scan communication cycles.	

*1 To transfer data using the fixed scan communication area, specify fixed scan communication area settings at GX Works3. Refer to the following for details on fixed scan communication area settings.
📖 MELSEC iQ-R CPU Module User's Manual (Application)

> **Point**
>
> - The system area is determined by the allocation in the system. Use the user area for communicating user data.
> - The refresh (END, I45 executing) area is used with the Multiple CPU refresh. Do not directly change this area with a program.

Assurance for data communicated between Multiple CPUs

■Assurance of data sent between CPUs

Due to the timing of data sent from the self CPU and automatic refresh in any of the other CPUs, old data and new data may become mixed (data separation).

The following shows the methods for avoiding data separation at communications by refresh.

- Data consistency for 32 bit data

  Transfer data with refresh method is in units of 32 bits. Since refresh is set in units of 32 bits, 32-bit data does not separate. For word data, 2 words data can be prevented from separating by using an even number to set the first number of each device in refresh setting.

- Data consistency for 64-bit data

  By setting the first number for the device set by refreshing to a multiple of 4, 64-bit data separation can be prevented.

- Data consistency for data exceeding 64 bits

  In refresh method, data is read in descending order of the setting number in refresh setting parameter. Transfer data separation can be avoided by using a transfer number lower than the transfer data as an interlock device.

Data communication by refreshing at Motion CPUs

This section describes data communication by refreshing at Motion CPUs.

Refresh timing

The refresh timing at Motion CPUs differs from that for PLC CPUs. The refresh types and refresh timing are as follows.

Refresh type		Memory used	Refresh timing	
			PLC CPU side	Motion CPU side
MELSEC iQ-R series	Refresh (END)	CPU buffer memory	At END processing	Main cycle
	Refresh (Q compatibility high-speed refresh)[*1]			Operation cycle and main cycle[*2]
	Refresh (I45 executing)	Fixed scan communication area	When executing Multiple CPU synchronous interrupt program (I45)	The longer of the operation cycle or fixed scan communication cycle[*3]
MELSEC Q series (iQ Platform compatible)	Automatic refresh		At END processing	Main cycle
	High-speed refresh			The longer of the operation cycle or 0.888ms and main cycle[*2]

*1   This is an interchangeable setting equivalent to the MELSEC Q series "High-speed refresh" setting.
*2   The order of processing inside the Motion CPU is as follows.
      "Motion SFC event task → Receipt refresh → Motion operation → Transmission refresh"
*3   The order of processing inside the Motion CPU is as follows.
      "Receipt refresh → Motion SFC event task → Motion operation → Transmission refresh".
      Furthermore, if the operation cycle is shorter than the fixed scan communication cycle, receipt refresh and transmission refresh are performed only at the operation cycle immediately after the fixed scan communication cycle.
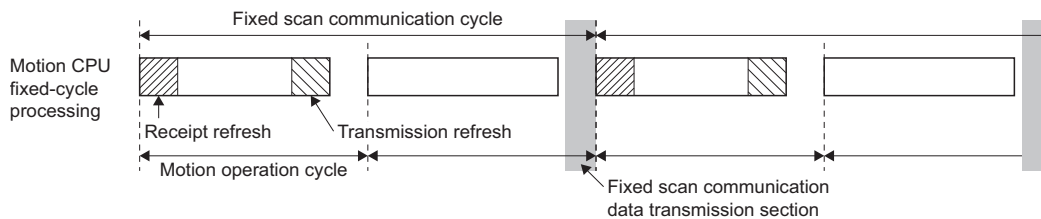
Point

If using refresh (fixed scan communication), it is recommended that fixed scan communication cycles and Motion operation cycles be aligned.

Multiple CPU refresh setting

Setting for communicating by refresh.

In the refresh settings, up to 32 setting ranges (refresh (END) and refresh (I45 executing)) can be set for each CPU module.

🖱 [R Series Common Parameter] ➡ [System Parameter] ➡ [Multiple CPU Setting] ➡ "Communication Setting between CPU" ➡ "Refresh (END) Setting" or "Refresh (I45 executing) Setting" ➡ "Detailed Setting"

Window
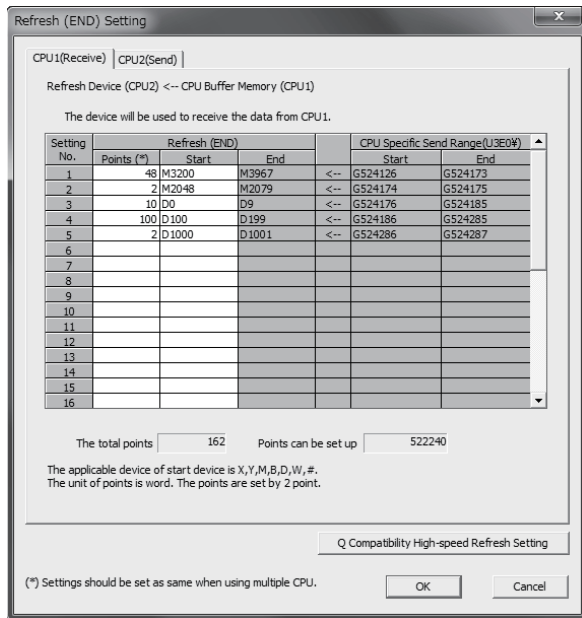
Displayed items

Item	Setting description	Setting range	Restriction	Data size consistency check
Refresh timing	Select "Detailed setting" based on the timing at which data communication by refresh is executed.	Refresh (END) setting/Refresh (I45 executing)	Fixed-cycle refresh cannot be set if fixed scan communication is invalid.	—
CPU selection	Select the CPU module for editing of the CPU specific send range setting.	CPU No.1 to No.4	CPU No. which exceeds the number of CPU modules cannot be selected.	—
Setting No.	The setting No. for transmission of each CPU module is displayed. Automatic refresh is executed between devices set to the same setting No. for all CPUs that constitute the Multiple CPU system.	1 to 32	—	—
Points	Set the number of points for data communication.	Range: Refer to device list for usable ranges. (☞ Page 75 Device List) Unit: 2 [points]	• Setting which exceeds the number of points of the self CPU send area allocated to each CPU module (CPU specific send range) cannot be set. • Bit device can be specified in units of 32 points (2 words) only.	Provided
Start	Specifies the device which performs the data communication (refresh). Specifies the device sent by the self CPU when the "Send source CPU selection" is the self CPU, and specifies the device received by the self CPU when the CPU specific send range setting is the other CPU.	Usable device (X, Y, M, B, D, W, #)*1	• Bit device can be specified in units of 16 points (1 word) only. • Device number cannot be duplicated.	None

*1   Set "blank" when automatic refresh is not executed.

Point

Parameters set at GX Works3 are read at MT Developer2, and therefore there is no need to specify the refresh (END) and refresh (I45 executing) settings, however, they should be set in the following cases.
 • When a Motion register (#) is set to the transmitting device.
 • When the Q compatibility high-speed refresh setting is used.
If specifying the Refresh (I45 executing) setting, specify the following settings in the GX Works3 [System Parameter] ⇨ [Multiple CPU Setting] ⇨ "Communication setting between CPU".
Refer to the following for details on settings.
▢MELSEC iQ-R CPU Module User's Manual (Application)
 • Set the "Fixed scan communication function" to "Use".
 • Set the send area range for each CPU in the "Fixed scan communication area setting".
 • Set the fixed scan interval setting of fixed scan communication (0.222ms/0.444ms/0.888ms/1.777ms/ 3.555ms/7.111ms) in "Fixed scan communication settings".
Refresh processing performance is improved by setting the first device beginning with a 2-word unit or 4-word unit.

■Operation example of refresh (END) that uses CPU buffer memory

A refresh (END) operation example using the CPU buffer memory is shown below.
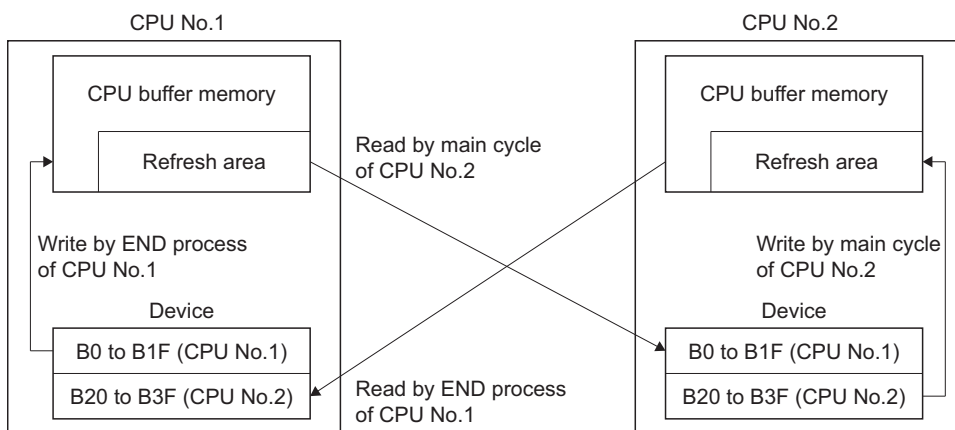
■Refresh (I45 executing) operation example using fixed scan communication area

A refresh (I45 executing) operation example using the fixed scan communication area is shown below.
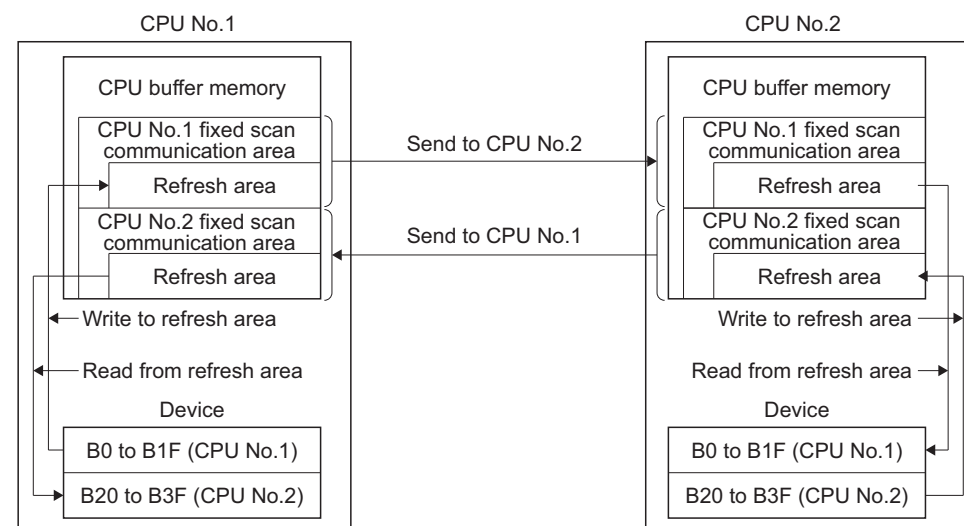
Refresh before and after I45 process

Refresh at the longer cycle of operation cycle or fixed scan communication cycle

■Application example of refresh setting (I45 executing)

Refresh setting (I45 executing) is used as in the following applications.
 • Read the data such as the real current value and synchronous encoder current value with PLC CPU at high speed.
 • Exchange the FIN waiting signal at high speed.

Multiple CPU refresh setting (Q compatibility high-speed refresh setting)

With self Motion CPUs, data between Motion CPU internal devices and the CPU buffer memory is updated every operation cycle in the settings of devices for which refresh (at END) is set.

✎ [R Series Common Parameter] ⇨ [System Parameter] ⇨ [Multiple CPU Setting] ⇨ "Fixed Scan Communication Area Setting" ⇨ "Refresh (END) Setting" ⇨ "Detailed Setting" ⇨ "Q Compatibility High-speed Refresh Setting"

Window
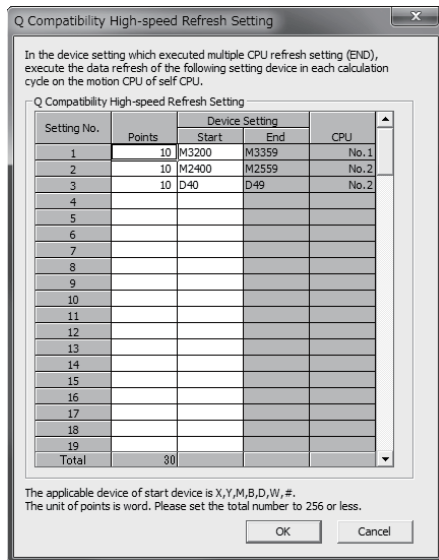
Displayed items

Classification	Item	Description	Setting/display value	Restriction
Display	Setting No.	Setting No. which executes high speed refresh is displayed.	1 to 128 (Up to 128)	
	CPU	CPU No. set in the refresh (END) setting is automatically displayed by setting devices. • Self CPU Refresh from the internal device of Motion CPU to CPU buffer memory. • Other CPU Refresh from the CPU buffer memory to internal device of Motion CPU.	CPU No. 1 to No.4	
User setting	Device setting	Set the device No. of Motion CPU to execute the high speed refreshes.	Usable device: D, W, #, M, X, Y, B	• The start device number must be a multiple of 16 for the bit device. • Cannot set a device not set also in the refresh (END) setting. • No. of "start device+number of points" cannot exceed setting range of each setting No. in refresh (END) setting. • Cannot overlap the device No. between setting No..
	Points	Set the number of points to refresh data of each data in word unit. *: Refresh is not executed when not set.	Range: 2 to 256[points] Unit: 2 points *1	Sets the total of all CPUs to 256 points or lower.
	Refresh cycle	Operation cycle (fixed)	—	—

*1 Point in word unit.

Point

This refresh method is a setting for compatibility with the Q series Motion CPU with the purpose of making the data refresh timing equivalent to that of "Multiple CPU high speed refresh" of the Q series Motion CPU. When configuring a new system, we recommend using refresh (I45 executing) for communication of data that is synchronized with the control of the Motion CPU.

■**Operation example of Multiple CPU refresh setting (Q compatibility high-speed refresh setting)**

The operation example of Multiple CPU refresh setting (Q compatibility high-speed refresh setting) is shown below.
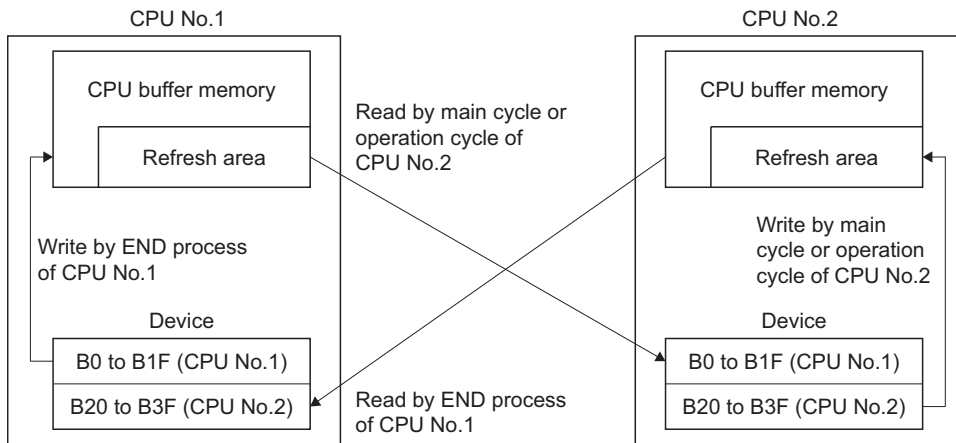
Fixed scan data transmission section over check

A check is performed to verify whether Motion CPU fixed-cycle processing (Motion SFC event tasks, motion operations, etc.) is completed by the data transmission section of the CPU fixed scan communication.

A check can be carried out to detect whether fixed scan transmission data separation has occurred. "Detect/Not detected" and "Stop/Continue" can be selected in the "RAS settings" (☞ Page 55 CPU parameter).
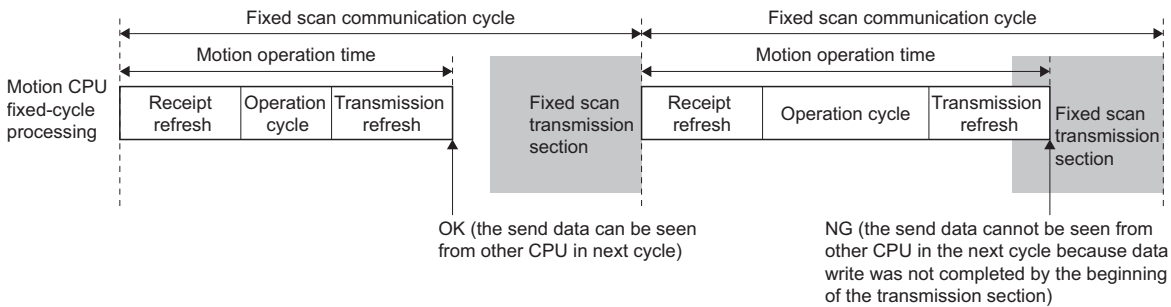
Checks are performed as follows depending on the relationship between the motion operation cycle and fixed scan communication cycle.

When motion operation cycle < fixed scan communication cycle

A check is performed only when an operation cycle over condition is detected, and not performed otherwise.

When motion operation cycle = fixed scan communication cycle

A check is performed every cycle.

When motion operation cycle > fixed scan communication cycle

A check is performed only at the fixed scan communication section immediately before the motion operation cycle. No check is performed part of the way into a fixed scan communication section during a motion operation cycle, thus if a cycle shorter than the motion operation cycle is referenced from another CPU, separation may occur even if no error occurs when performing this check.

Special relay/special register

The special relay and special register relating to the fixed scan data communication section excess check are shown below. Refer to the following for details on special relays and special registers.

- Special relay(☞ Page 427 Special Relays)
- Special register(☞ Page 432 Special Registers)

Device	Number	Name
Special relay	SM484	Fixed scan data transmission section over
Special register	SD484	Fixed scan data transmission section over count

Inter-module synchronization function

Inter-module synchronization function overview

- By using the inter-module synchronization function, control timing can be synchronized across Motion CPUs, I/O modules, and intelligent function modules. By enabling inter-module synchronization for modules controlled by a Motion CPU, motion control and synchronized I/O control are possible.
- With the inter-module synchronization function, each module executes a "Inter-module synchronization interrupt program" to perform fixed-cycle control. At the Motion CPU, overall Motion CPU fixed-cycle processing (Motion SFC fixed-cycle event tasks, motion operation processing, etc.) corresponds to the inter-module synchronization interrupt program.
- By enabling the inter-module synchronization function between Multiple CPUs, the execution timing for self CPU Motion CPU fixed-cycle processing and other CPU inter-module synchronization interrupt programs (PLC CPU 144 interrupt program, Motion CPU fixed-cycle processing) can be synchronized.
- Set the inter-module synchronization function in the following cases.
  - When using I/O module signals as high-speed input request signals
  - When using a synchronous encoder via a high-speed counter module (By enabling inter-module synchronization, variations between synchronous encoder input value operation cycles are reduced.)

> **Point**
>
> Refer to the following for details on the overall system inter-module synchronization function, including PLC CPUs and network modules.
> ☐MELSEC iQ-R Inter-Module Synchronization Function Reference Manual

Inter-module synchronization setting

Set the inter-module synchronization settings in [System Parameter] ⇨ [Synchronization Setting within the Modules] ⇨ "Synchronization Setting within the Modules" of GX Works3. Inter-module synchronization settings must be consistent across the Multiple CPU system.
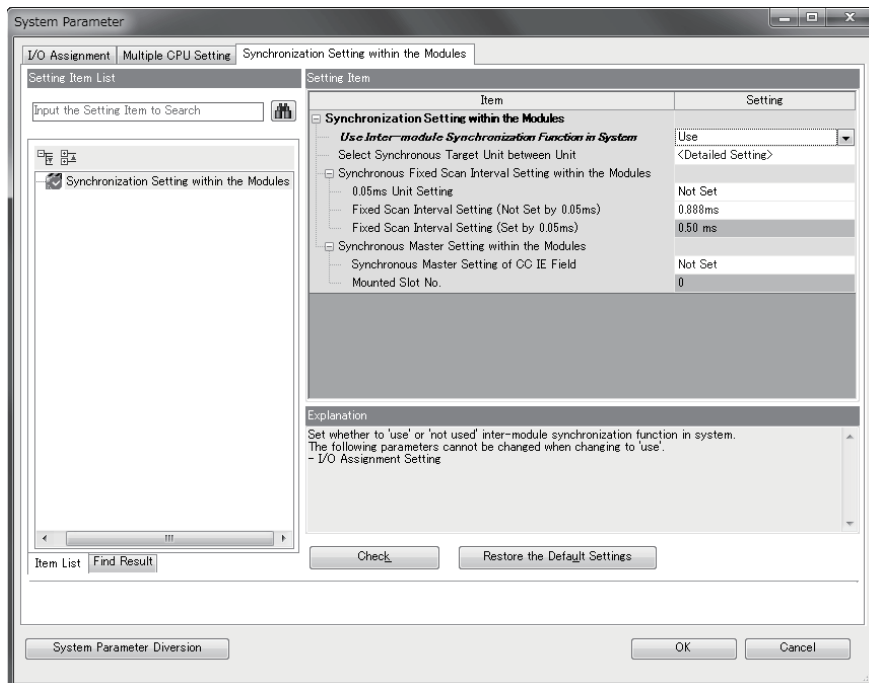
If setting inter-module synchronization settings at the Motion CPU, set as follows.

Operating procedure
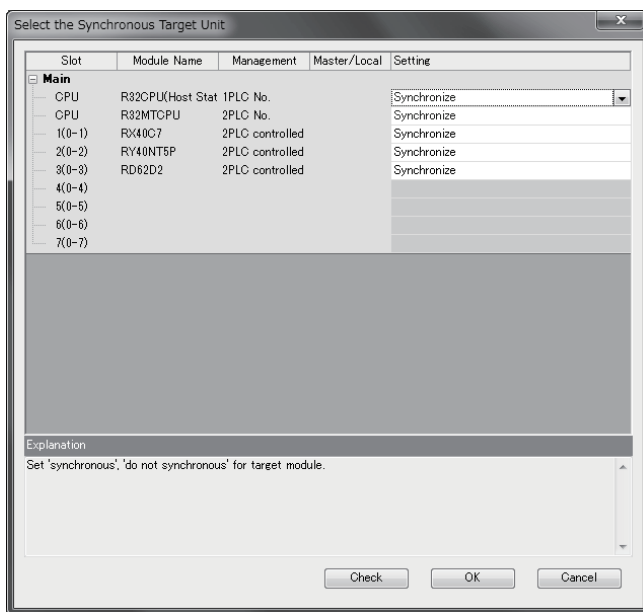
1. Set "Use inter-module synchronization function in system" to "Use".

2. Set "Synchronize" from the setting of the selected synchronization target module displayed in "Select the synchronous target unit", for the module to be synchronized.

3. Set the "Inter-module synchronization target module selection" as follows.
- Set "0.05ms unit setting" to "Not set".
- Set the following fixed scan interval compatible with the Motion CPU in "Fixed scan interval setting (not set by 0.05ms)".
   (0.222ms, 0.444ms, 0.888ms, 1.777ms, 3.555ms, 7.111ms)[*1]

*1 If a fixed scan interval other than the above that is not compatible with the Motion CPU is set, a moderate error (error code: 2222H) occurs when the Multiple CPU system power supply is turned ON.

The operating status of the inter-module synchronization function for each module can be checked with the GX Works3 system monitor function.

Inter-module synchronization target refresh settings

Refresh settings are not required for modules controlled by Motion CPUs. I/O (X/Y) refresh is performed for all modules controlled by Motion CPU control. Also, perform read to and write from the module buffer memory by direct access with a module access device (U□\G).

Inter-module synchronization control timing

■Timing of I/O refresh processing

When using the inter-module synchronization function, the timing of motion operation cycles with Motion CPUs is linked to inter-module synchronization cycles. Refresh of inter-module synchronization target modules I/O (X/Y) is performed before and after Motion CPU fixed-cycle processing (Motion SFC fixed-cycle event tasks, motion operation processing, etc.) The processing timing is as follows.
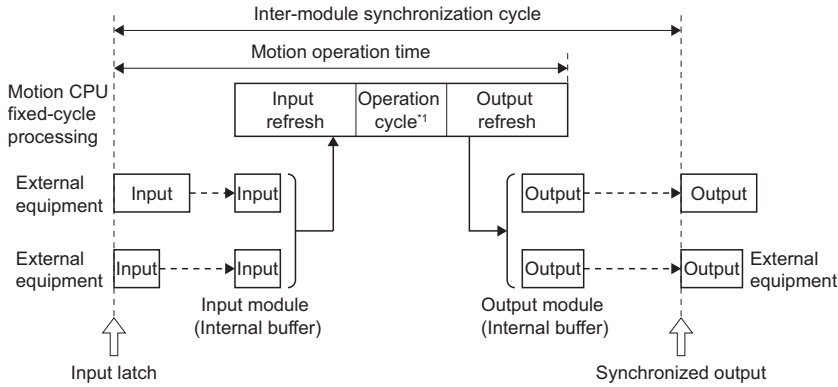
*1   Motion SFC event task and Motion real-time task processing

Inter-module synchronization target module input (X) refresh is performed when starting Motion CPU fixed-cycle processing, and output (Y) refresh is performed when Motion CPU fixed-cycle processing is complete. Perform read to and write from the module buffer memory by direct access with a module access device (U□\G). Depending on the module, a buffer memory is available for inter-module synchronous control. Refer to the User's Manual of each module for details on module operation relating to the inter-module synchronization function.

■When the inter-module synchronization cycle and motion operation cycle differ

The processing timing if the inter-module synchronization cycle and motion operation cycle differ is as follows.

• When inter-module synchronization cycle < motion operation cycle
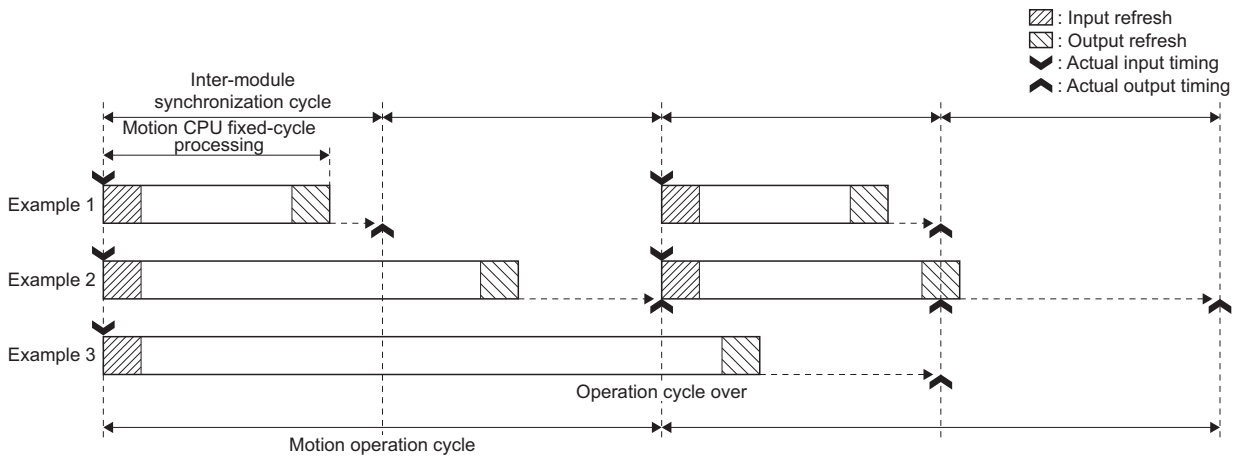
• The Y device content at the moment output refresh processing is executed is output at the inter-module synchronization cycle immediately after. (Example 1, 2)
• When the timing of the output refresh and inter-module synchronization cycle overlap, a discrepancy in the actual output timing may occur depending on the module. (Example 2) Therefore, to align the actual output timing of all modules, ensure that the "inter-module synchronization cycle ≥ motion operation cycle".
• If the Motion CPU fixed-cycle processing time, including output refresh processing, does not end within the motion operation cycle, an operation cycle over is detected. (Example 3)

- When inter-module synchronization cycle > motion operation cycle
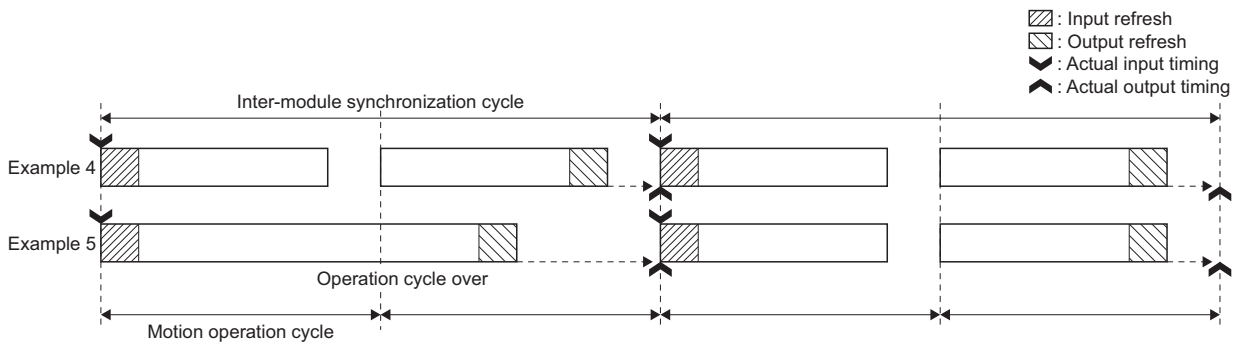
- Input refresh is performed when processing the first Motion CPU fixed cycle within the inter-module synchronization cycle. Output refresh is performed when processing the last Motion CPU fixed cycle within the inter-module synchronization cycle. (Example 4)
- If the Motion CPU fixed-cycle processing time, including output refresh processing, does not end within the motion operation cycle, an operation cycle over is detected. (Example 5)

CPU module operating status and refresh operation

The CPU module operating status when using the inter-module synchronization function and the I/O (X/Y) refresh operation are shown below.

CPU operating status	Refresh executed/not executed	I/O (X/Y) refresh timing	Remarks
RUN (including when continue error occurs)	Refresh	Motion operation cycle[*1]	
STOP (including when stop error occurs due to moderate error)			• Refresh OFF for Y.[*2] • Refresh is not performed at such times as when the module does not start up or refresh does not function due to a parameter error, etc.
STOP (when major error occurs)	Do not refresh	—	
Test mode (including when continue error occurs)	Refresh	Motion operation cycle[*1]	

*1 Refresh is still performed if interrupt is prohibited with a Motion SFC DI instruction.
*2 The Y immediately before going into STOP status is saved, and all devices are turned OFF. Not all modules are turned OFF if there are modules with allocations as synchronous encoder/manual pulse generator inputs.

Inter-module synchronization processing time

When using the inter-module synchronization function with a Motion CPU, I/O refresh is performed when processing fixed cycles in the Motion CPU, therefore processing time increases by the increased amount of motion operation time. The following is a guideline for inter-module synchronization function processing time.

Inter-module synchronization function processing time = 5[μs] + 0.7[μs] × Number of input points [*1] +3[μs] × Number of output points [*1]

 *1 Total number of I/O points (words) for modules that are part of inter-module synchronization and controlled by the Motion CPU

If an operation cycle over condition occurs, review the module subject to synchronization and the inter-module synchronization cycle settings.

Point

If not using the inter-module synchronization function, by accessing actual I/O (X/Y) at the Motion SFC fixed-cycle event task, bus access occurs for each instruction, causing a drop in performance.
If using the inter-module synchronization function, an overhead occurs for the amount of processing time mentioned above, and actual I/O (X/Y) are collectively refreshed, which can reduce motion operation time.

Special relay/special register

The special relays and special register relating to the inter-module synchronization function are shown below. Refer to the following for details on special relays and special registers.
- Special relay(☞ Page 427 Special Relays)
- Special register(☞ Page 432 Special Registers)

Device	Number	Name
Special relay	SM480	Motion operation cycle over flag
	SM488	Module synchronization error detection
Special register	SD480	Motion CPU operation cycle over counter No.

Inter-module synchronization function in Multiple CPU configuration

■Operating specifications

Refer to relationship between fixed scan communication and inter-module synchronization for the motion operation cycle relationship when fixed scan communication and inter-module synchronization are combined. (☞ Page 47 Relationship between fixed scan communication and inter-module synchronization)

The data flow when fixed scan communication and the inter-module synchronization function are combined and communicating with the PLC CPU is as follows.
- When the Multiple CPU synchronous interrupt function and inter-module synchronization function are combined (PLC CPU → Motion CPU)

  Two inter-module synchronization cycles are required for data acquired by the PLC CPU by the time it reaches the Motion CPU via the CPU buffer memory (fixed scan communication area). When synchronizing output between CPUs, use a function block for the inter-module synchronization function with a PLC CPU, and program taking into account the difference in output timing (two cycles) between the PLC CPU control module and Motion CPU control module.
- When the Multiple CPU synchronous interrupt function and inter-module synchronization function are combined (Motion CPU → PLC CPU)

  One inter-module synchronization cycle is required for data acquired by the Motion CPU by the time it reaches the PLC CPU via the CPU buffer memory (fixed scan communication area). If synchronizing output between CPUs, adjust the number of Motion SFC fixed-cycle event task consecutive transitions for the Motion CPU, and program taking into account the difference in output timing (one cycle) between the PLC CPU control module and Motion CPU control module.

■Module access from other CPU

Even if the following settings are set in GX Works3, inputs (X) and outputs (Y) cannot be read from modules subject to the inter-module synchronization function. Reading from the buffer memory is possible by direct access with a module access device (U□\G), FROM instruction, etc.
- When set to "import" at the [System Parameter] ⇨ [Multiple CPU Setting] ⇨ "Other PLC Control Module Setting" ⇨ "I/O Setting Outside Group".

■Aligning the inter-module synchronization function start timing at all CPUs, all stations

Specify the following settings in GX Works3.
- Set each module in [System Parameter] ⇨ [Synchronization Setting within the Modules] ⇨ "Select Synchronous Target Unit between Unit" to "Synchronize".
- Set all CPUs in [System Parameter] ⇨ [Multiple CPU Setting] ⇨ "Operation Mode Setting" ⇨ "Synchronous Startup Setting" to "Synchronize".

■Link between inter-module synchronization function and CPU fixed scan communication

When the following are set in GX Works3, CPU fixed scan communication operates based on the fixed scan interval set with the inter-module synchronization function, enabling control with the timing of both inter-module synchronization function and CPU fixed scan communication aligned.

- Set "Cooperate" in [System Parameter] ⇨ [Multiple CPU Setting] ⇨ "Communication Setting Between CPU" ⇨ "Fixed Scan Communication Function" ⇨ "Fixed Scan Interval Setting of Fixed Scan Communication" ⇨ "Fixed Scan Communication Function and Inter-Module Synchronization Function".

> **Point**
>
> If using both the fixed scan communication function and inter-module synchronization function, set "Fixed Scan Communication Function and Inter-Module Synchronization Function" to "Cooperate". If set to "Not cooperated", a moderate error (error code: 2222H) occurs, and the Motion CPU does not RUN.

Inter-module synchronization function operation when CPU operating status changes

■Operation at power supply ON, reset

- Normal startup (RUN)

  If there are no setting errors in the parameters etc. after analyzing inter-module synchronization function related settings (system parameters, CPU parameters, module parameters) written to the Motion CPU when turning the Multiple CPU system power supply ON or when cancelling a reset, the inter-module synchronization function operates.

- Abnormal stop (STOP)

  When parameter inconsistencies between Multiple CPUs or network parameter setting errors, etc. occur, or if module hardware errors have occurred when analyzing inter-module synchronization function related settings (system parameters, CPU parameters, module parameters) written to the Motion CPU when turning the Multiple CPU system power supply ON or when cancelling a reset, the inter-module synchronization function does not operate, and a stop error occurs. When this happens, I/O refresh is not performed.

■Operation at STOP (RUN → STOP)

- Normal stop

  I/O refresh continues even during a STOP condition. With a normal stop operation such as STOP, Motion CPU output is turned OFF, and a stop command is issued to each module. Refer to the User's Manual for each module for details on operation when the module stops normally.
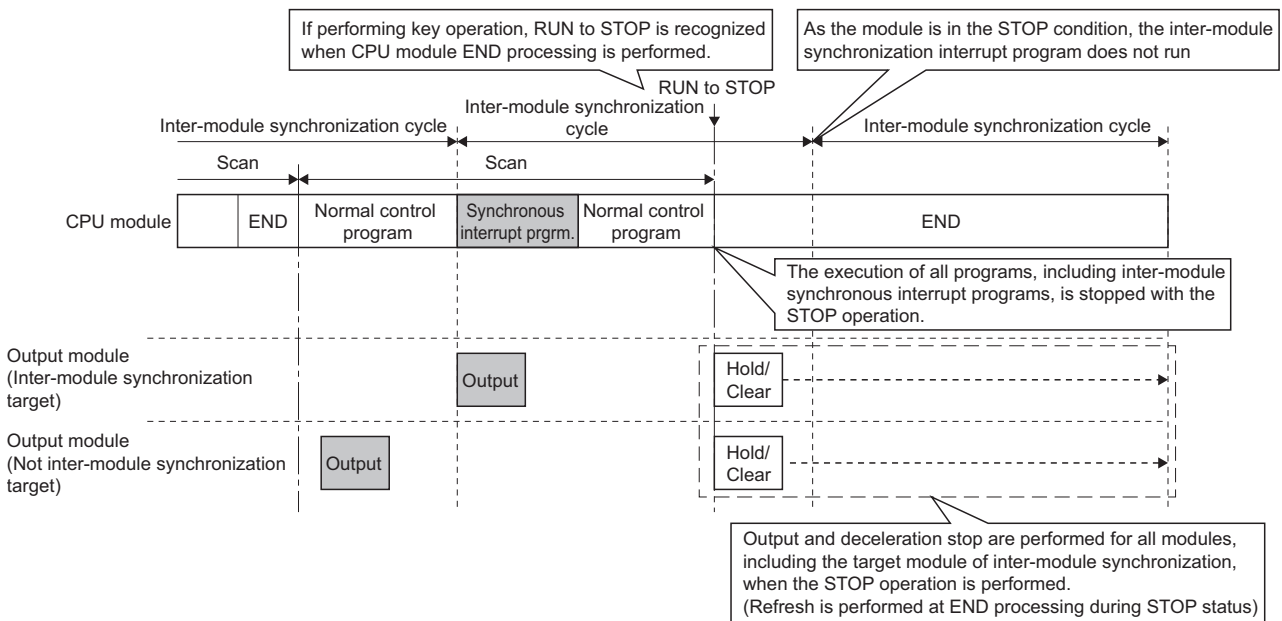
- Abnormal stop

If a Motion CPU major/moderate error occurs (including cases where settings ensure that Motion CPUs stop at a major/moderate error at each module), Motion CPU output is turned OFF (there are also cases when output is retained depending on the parameter settings), and a stop command is issued to the control module. I/O refresh continues even during a STOP condition. Refer to the User's Manual for each module for details on operation when the module stops abnormally.
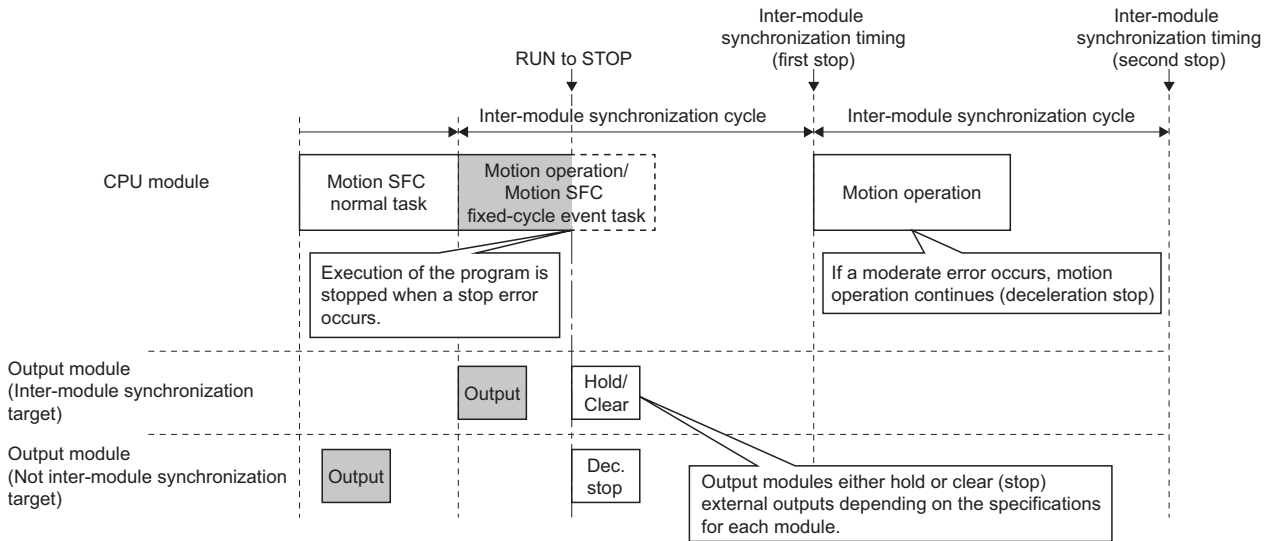
■Operation at RUN (STOP → RUN)

When the Motion CPU is changed from STOP to RUN, the Motion CPU issues an inter-module synchronization start command to each module at the next inter-module synchronization cycle after STOP to RUN, and begins execution of the Motion SFC fixed-cycle event task at the next inter-module synchronization cycle.
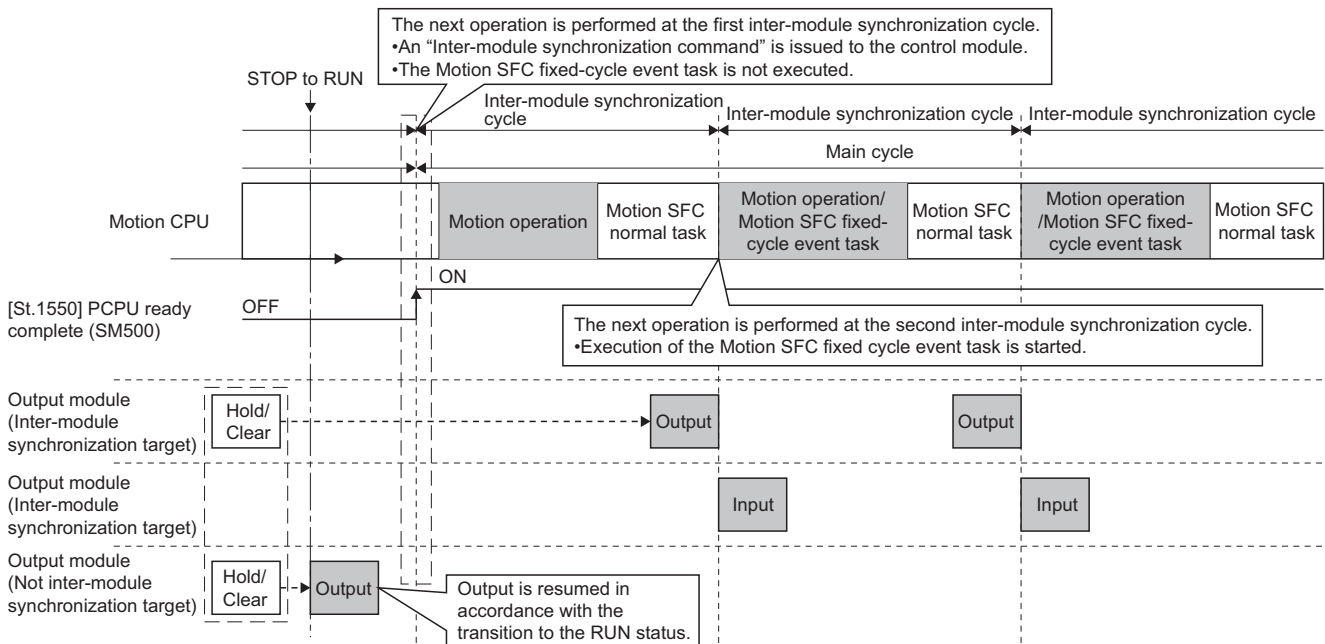
Please note that if system parameters related to the inter-module synchronization function are rewritten during STOP, analysis is not performed at STOP to RUN, and therefore the module operates based on parameters before rewriting. The changed parameters will be valid the next time the Multiple CPU system power supply is turned ON, or when reset.

Error detection

The following error statuses are monitored at the Motion CPU.

■Execution time monitoring of the Motion CPU fixed-cycle processing

Regardless of whether the inter-module synchronization function is used, the Motion CPU fixed-cycle processing (inter-module synchronization I/O refresh, Motion SFC fixed-cycle event task, motion operation processing, etc.) execution time is monitored. When Motion CPU fixed-cycle processing is not completed within the motion operation cycle, the number of times that a Motion CPU fixed-cycle processing cycle error occurs is stored in "Motion CPU operation cycle over counter No. (SD480)".

When "Over Execute Time (Operation Cycle Over)" in [CPU Parameter] ⇨ "RAS Setting" ⇨ "Error Detections Setting" is set to "Detect", "Stop" or "Continue" can be selected for Motion CPU operation processing. When set to "Detect", a moderate error (error code: 2600H) is output.
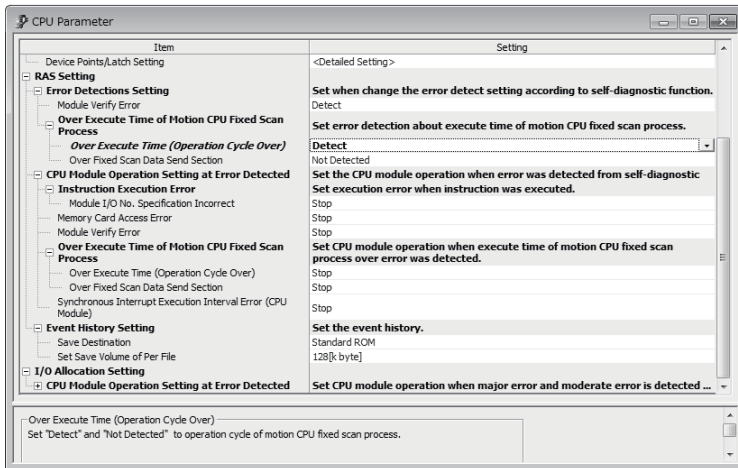
■Inter-module synchronization signal error monitor

Inter-module synchronization signal cycle errors are monitored, and a moderate error (error code: 2610H) occurs if there is an error.

Motion CPU operation processing can bet set to "Stop" or "Continue" when an inter-module synchronization signal error occurs with [CPU Parameter] ⇨ "RAS Setting" ⇨ "CPU Module Operation Setting at Error Detected".

Point

> When "Synchronous Interrupt Execution Interval Error (CPU module)" is set to "Continue", if the continuation error is cancelled, the Motion CPU ERROR LED turns OFF but the error factor is not removed. Furthermore, errors are not detected again even if a synchronous interrupt execution interval error reoccurs.

Relationship between fixed scan communication and inter-module synchronization

If using fixed scan communication and inter-module synchronization between multiple CPUs, the relationship between motion operations and Motion SFC event task (fixed-cycle tasks) is as follows.

			Inter-module synchronization function	
			Not used[*1]	Used
Fixed scan communication function	Not used		Motion CPU inherent cycle	Synchronization with inter-module synchronization cycle[*2] (timing example 2)
	Used	If the "Fixed scan communication function and inter-module synchronization function" setting is "Not cooperated".	Synchronization with fixed scan communication cycle[*2] (timing example 1)	Moderate error (error code: 2222H)
		If the "Fixed scan communication function and inter-module synchronization function " setting is "Cooperate".	Setting not possible with Engineering Tool	Inter-module synchronization cycle =synchronization with fixed scan communication cycle[*2] (timing example 3)

*1   If inter-module synchronization function is set to not used, or if the Motion CPU is not the module subject to inter-module synchronization.

*2   If the motion operation cycle and fixed scan communication cycle, or the inter-module synchronization cycle differ, the start timing with longer cycle is always synchronized with the start timing with shorter cycle.

Point

If a cycle (other than 0.222ms, 0.444ms, 0.888ms, 1.777ms, 3.555ms, 7.111ms) not compatible with Motion CPUs is set for a fixed scan communication cycle or inter-module synchronization cycle, a moderate error (error code: 2222H) occurs when the Multiple CPU system power supply is turned ON.

Timing Example 1

Fixed scan communication timing

Motion operation

Timing Example 2

Inter-module synchronization timing

Motion operation

Timing Example 3

Fixed scan communication timing

Inter-module synchronization timing

Motion operation
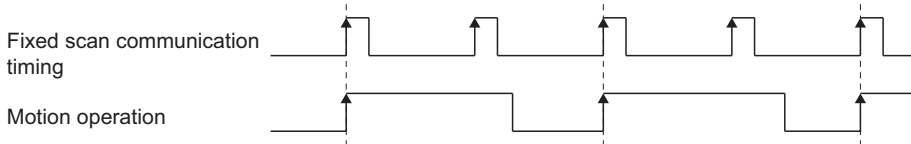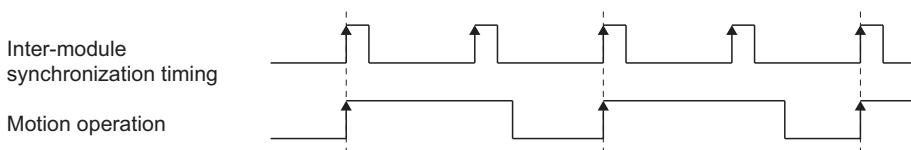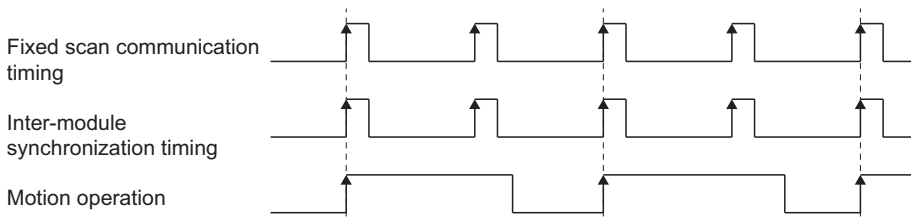
Control instruction from PLC CPU to Motion CPU

Control can be instructed from the PLC CPU to the Motion CPU using the Motion dedicated PLC instructions listed in the table below.

Refer to the following for the details of each instruction. (Control may not be instructed from one Motion CPU to another Motion CPU.)

📖MELSEC iQ-R Motion controller Programming Manual (Program Design)

Instruction name		Description
M(P).□	**D(P).□**	
M(P).SFCS	D(P).SFCS	Start request of the Motion SFC program (Program No. may be specified.)
M(P).SVST	D(P).SVST	Start request of the specified servo program
M(P).SVSTD	D(P).SVSTD	Direct positioning start request
M(P).CHGA	D(P).CHGA	Current value change request of the specified axis
M(P).CHGAS	D(P).CHGAS	Current value change request of the specified command generation axis
M(P).CHGV	D(P).CHGV	Speed change request of the specified axis
M(P).CHGVS	D(P).CHGVS	Speed change request of the specified command generation axis
M(P).CHGT	D(P).CHGT	Torque control value change request of the specified axis
M(P).MCNST	D(P).MCNST	Machine program operation start request
M(P).GINT	D(P).GINT	Execute request of an event task to the other CPU (Motion CPU)
M(P).DDWR	D(P).DDWR	Write device data of the self CPU (PLC CPU) to the device of other CPU (Motion CPU)
M(P).DDRD	D(P).DDRD	Read device data of other CPU (Motion CPU) to the device of self CPU (PLC CPU)
M(P).BITWR	D(P).BITWR	Write bit operation to the bit device of another Motion CPU

For example, by using the D(P).SFCS instruction of Motion dedicated PLC instruction, the Motion SFC of the Motion CPU can be started from the PLC CPU.

Ex.
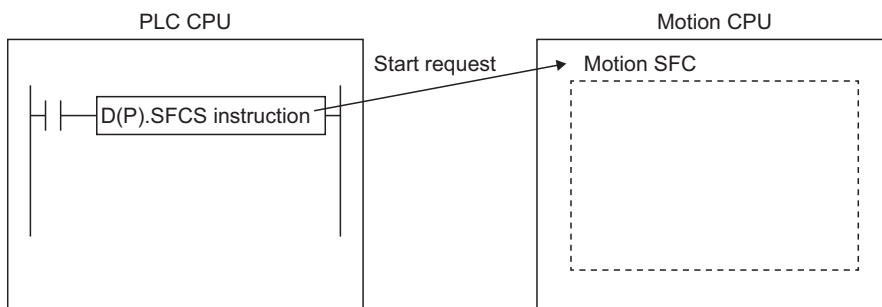
2 COMMON PARAMETERS

2.1 Parameters Used by the Motion CPU

The parameters used by the Motion CPU are as follows.

Parameter	Details
R series common parameters	Common parameters for R series CPU modules
Motion CPU common parameters	Common parameters for Motion CPU modules
Motion control parameters	Positioning control parameters and synchronous control parameters used by the Motion CPU for Motion control

A list of parameters used by the Motion CPU is shown below.

○: Input, ×: Not input

Parameter item		Parameter input timing		Details	Reference
		At ON/reset of Multiple CPU system power supply	At STOP to RUN/test mode request		
R series common parameter	System parameter	○	×	Set the R series CPU common parameters for the base, slot, and module settings and the Multiple CPU system settings. The system parameters for each CPU in the Multiple CPU system must be matched.	☞ Page 53 System parameter
	CPU parameter	○	×		☞ Page 55 CPU parameter
	Module parameter	○	×		☞ Page 58 Module Parameter
Motion CPU common parameter	Basic setting	○	×	Set the basic parameters of the Motion system, such as operation cycle and the external forced stop input.	☞ Page 61 Basic setting
	Servo network setting	○	×	Set the servo network type, and the connected servo amplifiers, SSCNETⅢ/H head modules, and sensing modules.	☞ Page 64 Servo network setting
	Limit output data	○	○	Set the output device and watch data for limit output.	☞ Page 90 Limit output data setting
	High-speed input request signal	○	×	Set the high-accuracy input request signal used for advanced synchronous control or mark detection.	☞ Page 96 High-speed input request signal setting
	Mark detection	○	×	Set the data for mark detection.	☞ Page 102 Mark detection setting
	Manual pulse generator connection setting	○	×	Set the data required for connecting the manual pulse generator to the module.	☞ Page 70 Manual pulse generator connection setting
	Vision system parameter	×	○	Set the parameters used for connecting the vision system.	☞ Page 316 Vision system parameter setting
	Head module	○	×	Set the parameters used for connecting the SSCNETⅢ/H head module and sensing module.	☞ Page 200 Parameter setting of SSCNETIII/H head module ☞ Page 208 Parameter setting of sensing module
	Refresh (END/I45 executing) setting	○	×	Set the Multiple CPU refresh (main cycle/operation cycle).	☞ Page 34 Multiple CPU refresh setting ☞ Page 53 System parameter

Parameter item			Parameter input timing		Details	Reference
			At ON/reset of Multiple CPU system power supply	At STOP to RUN/test mode request		
Motion control parameter	Axis setting parameter	Fixed parameter	○	×	Set the fixed data based on the mechanical system, etc. of the controlled axis.	*1
		Home position return data	○	×	Set the data required for the home position return.	
		JOG operation data	○	○	Set the data to perform the JOG operation.	
		External signal parameter	○	×	Set the external signals (upper stroke limit (FLS), lower stroke limit (RLS), stop (STOP), and proximity dog or speed/position switching (DOG/CHANGE)) used for each axis.	
		Expansion parameter	○	○	Set when the following functions are used. • Individual monitoring of positive and negative direction torque limit values • Change the acceleration/deceleration time when changing speed • Set the servo motor maximum speed. • When performing positioning control in the absolute data method in degrees, specify the positioning direction.	
		Speed-torque control data	○	×	Set when the speed-torque control is performed.	
		Optional data monitor	○	×	Set the type of the monitored data and the storage device when the servo amplifier status, etc. is monitored.	☞ Page 175 Optional data monitor setting
		Pressure control data	○	×	Set when performing pressure control that uses a profile.	*1
		Override data	○	×	Set when using the override function.	
		Vibration suppression command filter data	○	×	Set when using vibration suppression command filter function.	
	Servo parameter		○	○	Parameters for the servo amplifier and sensing module are set based on the specifications for the servo amplifier, servo motor, and sensing module.	
	Parameter block		○	○	Set the data for acceleration/deceleration control, etc. used for each positioning processing.	
	Synchronous control parameter	Input axis parameter	○	×	Set the input axis used for advanced synchronous control.	*2
		Synchronous parameter	○	×	Set the synchronous parameters for the output axis used for advanced synchronous control.	
		Multiple CPU advanced synchronous control setting	○	×	Set the master CPU and slave CPU for performing Multiple CPU advanced synchronous control.	
	Machine control parameter	Machine common parameter	○	×	Set the common parameters and point blocks used for machine control.	*3
		Machine parameter	○	×	Set the parameters for performing machine control.	
	G-code control parameter	G-code control system parameter	×	○*4	Set the parameters used on a line for each G-code control line.	*5
		G-code control axis parameter	×	○*4	Set the parameters for each axis in each G-code control line.	
		G-code control work parameter	×	○*4	Set the parameters for working in G-code control.	

*1 📖 MELSEC iQ-R Motion Controller Programming Manual (Positioning Control)

*2 📖MELSEC iQ-R Motion Controller Programming Manual (Advanced Synchronous Control)

*3 📖MELSEC iQ-R Motion Controller Programming Manual (Machine Control)

*4 Not loaded at test mode request.

*5 📖MELSEC iQ-R Motion Controller Programming Manual (G-Code Control)

2.2 R Series Common Parameter

Set the MELSEC iQ-R series CPU module common parameters used at the Multiple CPU system for the R series common parameters.
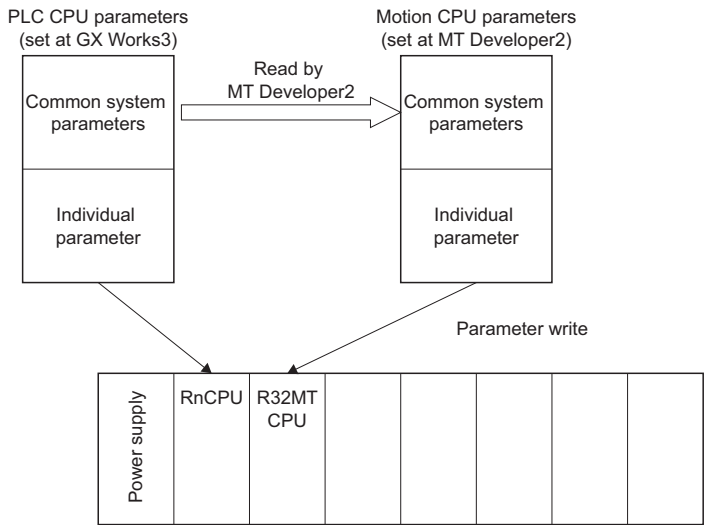
System parameter

These parameters are used to set the Multiple CPU system module configuration and common system items. The system parameters for each CPU in the Multiple CPU system must be matched. There is no need to set system parameters because the parameters set in the GX Works3 "Module Configuration" or "System Parameter" are read by MT Developer2. However, the "Refresh (END) setting", "Refresh (I45 executing) setting", and "Q compatibility high-speed refresh setting" in the communication setting between CPU can be set based on the Motion CPU settings.

✑ [R Series Common Parameter] ⇨ [System Parameter] ⇨ [Multiple CPU Setting] ⇨ "Communication Setting between CPU"

Window
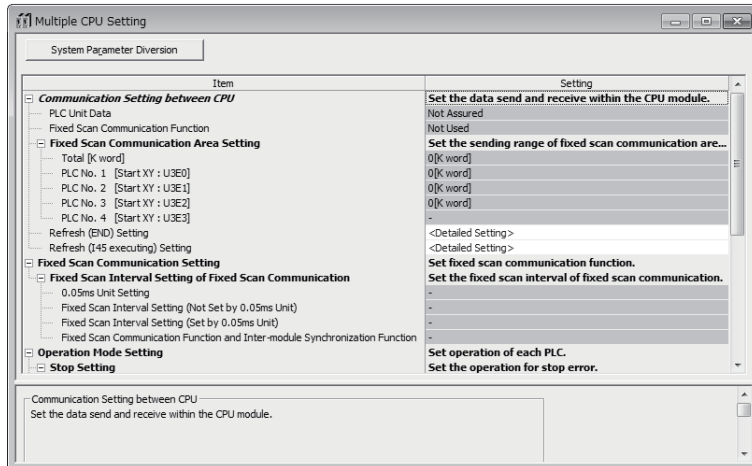
Displayed items

Item			Setting range	Default
Multiple CPU setting	Communication setting between CPU	Refresh (END) setting[*1]	Up to 32 settings for each CPU No. of points:Refer to device list for allowable setting range. (⏍ Page 75 Device List) Start: Usable devices (X, Y, M, B, D, W, #)	No setting
		Refresh (I45 executing) setting	Up to 32 settings for each CPU No. of points:Refer to device list for allowable setting range. (⏍ Page 75 Device List) Start: Usable devices (X, Y, M, B, D, W, #)	No setting

*1 Q compatibility high-speed refresh setting

Setting range	Default
Up to 128 settings for each CPU No. of points: 2 to 256 Start: Usable devices (X, Y, M, B, D, W, #)	No setting

Communication setting between CPU

■Refresh (END) setting

Set up to 32 settings for refresh device per CPU. Refer to device list for the range of devices that can be set. (☞ Page 75 Device List)

• Q compatibility high-speed refresh setting

Set refresh between CPUs with up to of 128 settings for the entire Multiple CPU system. Set 2 points (words) or more each, and no more than 256 points in total. Refer to device list for the range of devices that can be set. (☞ Page 75 Device List)

■Refresh (I45 executing)

Set up to 32 settings for refresh device per CPU. Refer to device list for the range of devices that can be set. (☞ Page 75 Device List)

> **Point** ℘
>
> • Refer to Multiple CPU refresh setting for details on the Refresh (at END) and Refresh (I45 executing) settings. (☞ Page 34 Multiple CPU refresh setting, ☞ Page 36 Multiple CPU refresh setting (Q compatibility high-speed refresh setting))
> • If using the CPU fixed scan communication function set at GX Works3, or the inter-module synchronization function, set the cycles that can be set at the Motion CPU (0.222ms/0.444ms/0.888ms/1.777ms/3.555ms/ 7.111ms) for the fixed scan communication cycle or inter-module synchronization cycle. A moderate error (error code: 2222H) occurs if a cycle other than the above cycles is set. Refer to relationship between fixed scan communication and inter-module synchronization for details on the relationship with motion operation cycle settings. (☞ Page 47 Relationship between fixed scan communication and inter-module synchronization)

CPU parameter

Set the operational details for the Motion CPU's functions. Also, regarding the overall system, settings for which verification between CPUs is not necessary are also stored in these parameters.

👆 [R Series Common Parameter] ➪ [Motion CPU Module] ➪ [CPU Parameter]

Window

Displayed items

Item			Setting range	Default value
Name setting	Title setting		Up to 32 characters	No setting
	Comment setting		Up to 256 characters	No setting
Operation related setting	RUN contact		X0 to X2FFF	No setting
	Output mode setting of STOP to RUN		Output the output (Y) status before STOP/ Clear the output (Y) (output is 1 scan later)	Output the output (Y) status before STOP
	Module synchronous setting		Synchronize/Do not synchronize	Synchronize
Device related setting	Device points		Bit device (M, B, F)/Word device (D, W, #)	☞ Page 84 Device points setting
	Latch setting		Up to 32 settings	No setting
RAS setting	Error detections setting	Module verify error	Detect/Not detected	Detect
		Over execute time of Motion CPU fixed scan process — Over execute time (operation cycle over)	Detect/Not detected	Not detected
		Over execute time of Motion CPU fixed scan process — Over fixed scan data send section	Detect/Not detected	Not detected
	CPU module operation setting at error detected	Instruction execution error module I/O No. specification incorrect	Stop/Continue	Stop
		Memory card access error	Stop/Continue	Stop
		Module verify error	Stop/Continue	Stop
		Over execute time of Motion CPU fixed scan process — Over execute time (operation cycle over)	Stop/Continue	Stop
		Over execute time of Motion CPU fixed scan process — Over fixed scan data send section	Stop/Continue	Stop
		Synchronous interrupt execution interval error (CPU module)	Stop/Continue	Stop
	Event history setting	Save destination	SD memory card/Standard ROM	Standard ROM
		Set save volume of per file	1 to 2048[k bytes]	128[k bytes]
I/O assignment setting	CPU module operation setting at error detected	Slot 0 to 63	Major: Stop, Moderate: Stop/ Major: Stop, Moderate: Continue/ Major: Continue, Moderate: Continue	Major: Stop, Moderate: Continue

Name setting

■Title setting

Set the Motion CPU title (name, application). Up to 32 characters can be set.

■Comment setting

Set a comment for the title. Up to 256 characters can be set.

Operation related setting

■RUN contact

Set contacts used to control Motion CPU RUN signals. Only inputs (X) can be set.

Setting range
X0 to X2FFF

Refer to remote RUN/STOP for details on operation with RUN contacts. (☞ Page 303 Remote RUN/STOP)

■Output mode setting of STOP to RUN

Set the output (Y) operation when switching from the STOP status to RUN status.

- Output the output (Y) status before STOP: If outputting the output (Y) status before STOP
- Clear the output (Y) (output 1 scan later) : If clearing the output (Y) status and outputting 1 scan later

■Module synchronous setting

Set whether or not to synchronize Motion CPU and intelligent function module startup.

- Synchronize: Synchronizes startup.
- Do not synchronize: Does not synchronize startup.

Device related setting

■Device points

Set the range for the number of points for each device.

Refer to device points setting for details on the number of devices setting. (☞ Page 84 Device points setting)

Refer to device list for the range of devices that can be set. (☞ Page 75 Device List)

Settable devices
M, B, F, D, W, #

■Latch setting

Set the device (M, B, F, D, W, #) latch range. Up to 32 devices can be set for the latch (1) and latch (2) latch range. Refer to latch function for details on the latch range setting. (☞ Page 86 Latch Function)

Refer to device list for the range of devices that can be set. (☞ Page 75 Device List)

RAS setting

■Error detections setting

- Module verify error

  Set whether to "Detect" or "Not detect" module comparison errors in cases such as when a different module is detected when the Multiple CPU system power supply is ON.

- Over execute time of Motion CPU fixed scan process
  - Over execute time (operation cycle over)

    Set whether to "Detect" or "Not detect" Motion CPU fixed-cycle processing execution time over conditions.
  - Over fixed scan data send section

    Set whether to "Detect" or "Not detect" errors if Motion CPU fixed-cycle processing is not complete by the time fixed scan data communication to another CPU starts.

■CPU module operation setting at error detected

- Instruction execution error module I/O No. specification incorrect

  Set whether to "Stop" or "Continue" Motion CPU processing if a module I/O No. specification incorrect error is detected.

- Memory card access error

  Set whether to "Stop" or "Continue" Motion CPU processing if a memory card access error is detected.

- Module verify error

  Set whether to "Stop" or "Continue" Motion CPU processing if a module comparison error is detected.

- Over execute time of Motion CPU fixed scan process
  - Over execute time (operation cycle over)

    Set whether to "Stop" or "Continue" Motion CPU processing if a Motion CPU fixed-cycle processing operation cycle over condition is detected.
  - Over fixed scan data send section

    Set whether to "Stop" or "Continue" Motion CPU processing if a Motion CPU fixed-cycle processing fixed scan data communication section over condition is detected.

- Synchronous interrupt execution interval error (CPU module)

  Set whether to "Stop" or "Continue" Motion CPU processing if the Motion CPU detects a synchronous signal error.

■Event history setting

- Save destination

  Set the storage destination for event history files.
  - SD memory card
  - Standard ROM

- Set save volume of per file

  Set the saving volume per event history file.

Setting range
1 to 2048[k bytes]

I/O assignment setting

■CPU module operation setting at error detected

Set the CPU module operation mode during error for slot 0 to slot 63.

- Major: Stop, Moderate: Stop
- Major: Stop, Moderate: Continue
- Major: Continue, Moderate: Continue

Module Parameter

Specify local node settings and security in order to communicate with external devices with the Motion CPU PERIPHERAL I/F.

👉 [R Series Common Parameter] ⇨ [Motion CPU Module] ⇨ [Module Parameter]

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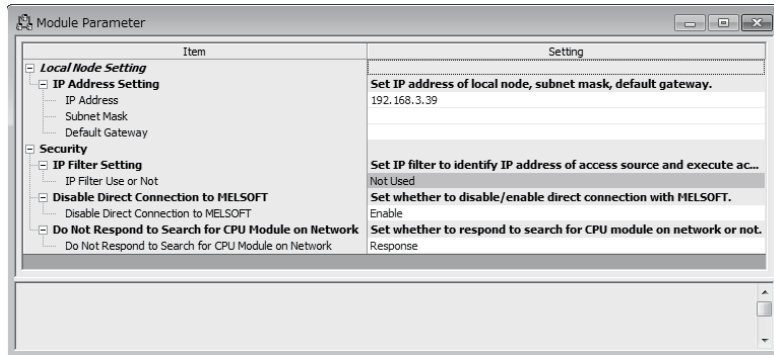
Displayed items

Item			Setting range	Default value
Local node setting	IP address setting	IP address	0.0.0.1 to 223.255.255.254	192.168.3.39
		Subnet mask	0.0.0.1 to 255.255.255.254/blank	No setting
		Default gateway	0.0.0.1 to 255.255.255.254/blank	No setting
Security	IP filter setting	IP filter use or not	Use/Not used	Not used
		IP filter setting	Up to 32 settings	No setting
	Disable direct connection to MELSOFT		Enable/Disable	Enable
	Do not respond to search for CPU module on network		Response (no check)/Not responded (check)	Response (no check)

Local node setting

■IP address setting

• IP address

Set the local node IP address.

• Subnet mask

Set the IP address in order to set which upper bit to use for the network address to identify the network.

• Default gateway

Set the IP address for the passing device (default gateway) used to access the network device to which the local node belongs.

Security

■IP filter setting

Data set at GX Works3 is read by MT Developer2, and therefore there is no need to set the IP filter.

■Disable direct connection to MELSOFT

Set whether to "Enable" or "Disable" a direct connection (simple connection) with the Engineering Tool.

■Do not respond to search for CPU module on network

Set whether to "Respond" or "Not respond" to an Engineering Tool network CPU module search.

2.3 Motion CPU Common Parameter

The Motion CPU common parameters are used to specify Motion CPU basic settings, the servo network configuration, and all auxiliary functions. A list of Motion CPU common parameter settings is shown in the table below.

Item				Setting range	Default value	Remark
Basic setting	Operation cycle			0.222ms/0.444ms/0.888ms/1.777ms/3.555ms/7.111ms/Default setting	Default setting	Set the operation cycle of Motion control.
	Low speed operation cycle magnification setting			Not used/2 times/4 times/8 times	Not used	Set the magnification for the operation cycle.
	Forced stop input setting	Instruction		Not used/Used	Not used	Set the bit device to use for the forced stop.
		Device		Bit device	Not setting	
	File transmission setting during booting			Standard ROM write permission/read protection/ Standard ROM write protection/read protection/ Standard ROM write protection/read permission/ Standard ROM write permission/read permission/ Boot operation file invalid	Standard ROM write permission/ read protection	Set whether to permit/protect file transmission at boot
	Machine control setting			Not used/Used	Not used	Set whether to use/not use machine control.
	G-code control setting			Not used/Use line 1 only/Use line 1 and line 2	Not used	Set whether to use/not use G-code control.
Servo network setting	SSCNET setting	Communication type		SSCNETⅢ/H/SSCNETⅢ	SSCNETⅢ/H	Set the communication type for every line.
	Amplifier setting	Amplifier information	Amplifier model	<Communication type "SSCNETⅢ/H" use> MR-J4(W)-B(-RJ)/MR-J4-B-LL/FR-A800-1/FR-A800-2/MR-MT2010/LJ72MS15/VCⅡ (CKD NIKKI DENSO)/VPH (CKD NIKKI DENSO)/αSTEP AZ (ORIENTAL MOTOR)/5-Phase ST (ORIENTAL MOTOR)/IAI Driver for Electric Actuator (IAI)	MR-J4(W)-B(-RJ)	Set the model name, axis No. and other details for the servo amplifiers.
				<Communication type "SSCNETⅢ" use> MR-J3(W)-B/MR-J3-B(S) Fully closed/MR-J3(W)-B Linear/MR-J3(W)-B DD motor/MR-MT1200/FR-A700/FR-A700-NA/FR-A700-EC/FR-A700-CHT/ VCⅡ (CKD NIKKI DENSO)/VPH (CKD NIKKI DENSO)	MR-J3(W)-B	
			Amplifier operation mode[1]	<Communication type "SSCNETⅢ/H" use> Standard/Fully closed/Linear/DD motor	Standard	
			Use as virtual servo amplifier[1]	<Communication type "SSCNETⅢ/H" use> Use/not use as virtual servo amplifier	Not use as virtual servo amplifier	
		Axis information	Axis No.	R64MTCPU: Up to 2 lines, 64 axes R32MTCPU: Up to 2 lines, 32 axes R16MTCPU: Up to 1 line, 16 axes	No setting	
			RIO axis No.[2]	<Communication type "SSCNETⅢ/H" use> R64MTCPU: Up to 2 lines, 8 axes R32MTCPU: Up to 2 lines, 8 axes R16MTCPU: Up to 1 line, 4 axes	No setting	
			Station No.d	<Communication type "SSCNETⅢ/H" use> 1 to 64	No setting	
			Axis label/ RIO axis label[2]	Up to 32 characters	No setting	
		External synchronous encoder input[1]		Invalid/ABS/INC	Invalid	
		Input filter setting		Nothing/0.8ms/1.7ms/2.6ms/3.5ms	3.5ms	
		Operation cycle selection		Operation cycle/Low speed operation cycle	Operation cycle	
		Allowable travel during Power-Off		<Communication type "SSCNETⅢ" use> 0 to 8191 revolution	10	

Item				Setting range	Default value	Remark
Servo network setting	Amplifier setting	Sensing module information[*3]	Operation mode	1 station occupied mode/Axis mode (MR-MT2200)	No setting	Set the model name, axis No. and other details for the servo amplifiers.
			Extension module connection number	<Operation mode "1 station occupied mode" use> 0 to 4	No setting	
			Used axis number	<Operation mode "Axis mode (MR-MT2200)" use> 1 to 4	No setting	
		Extension module setting information[*3]	No.1 type to No.4 type	<Operation mode "1 station occupied mode" use> MR-MT2100/MR-MT2200/MR-MT-2300/MR-MT2400	No setting	
		MR-MT2200 axis information[*3]	Axis No.	<Operation mode "Axis mode (MR-MT2200)" use> R64MTCPU: Up to 2 lines, 64 axes R32MTCPU: Up to 2 lines, 32 axes R16MTCPU: Up to 1 line, 16 axes	No setting	
			Station No.d	<Operation mode "Axis mode (MR-MT2200)" use> 1 to 64	No setting	
Limit output data				Set 1 to 64	No setting	☞ Page 90 Limit output data setting
High-speed input request signal				Set 1 to 64	No setting	☞ Page 96 High-speed input request signal setting
Mark detection				Set 1 to 64	No setting	☞ Page 102 Mark detection setting
Manual pulse generator connection setting				Set P1 to P3	No setting	☞ Page 70 Manual pulse generator connection setting
Vision system parameter	Ethernet communication line			Vision system No. 1 to 32	No setting	☞ Page 316 Ethernet Communication Line Setting
	Vision program operation			Program No. 1 to 128	No setting	☞ Page 319 Vision Program Operation Setting
Head module				Set module 1 to 4 for each line. R64MTCPU: 2 lines (Up to 8 modules) R32MTCPU: 2 lines (Up to 8 modules) R16MTCPU: 1 line (Up to 4 modules)	No setting	☞ Page 200 Parameter setting of SSCNETIII/H head module ☞ Page 208 Parameter setting of sensing module

*1   This can only be set when "MR-J4(W)-B(-RJ)" is selected for the amplifier model.
*2   This is the RIO-axis when "LJ72MS15" or "MR-MT2010 (operation mode: 1 station occupied mode)" is selected for the amplifier model.
*3   This can only be set when "MR-MT2010" is selected for the amplifier model.

Basic setting

The following explains each item to be set in basic setting.

✎ [Motion CPU Common Parameter] ⇨ [Basic setting]

Window
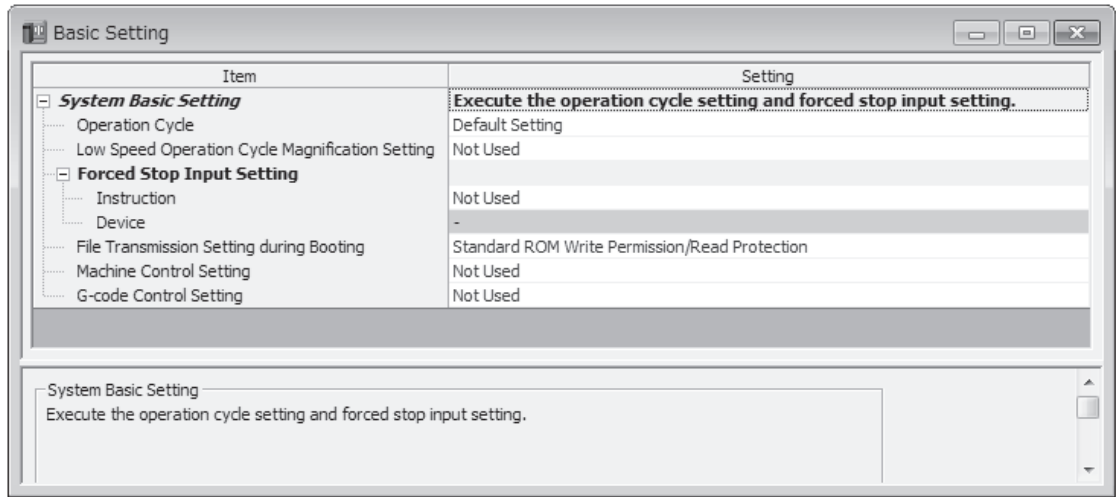
Displayed items

Item		Setting range	Default value
Operation cycle		0.222ms/0.444ms/0.888ms/1.777ms/3.555ms/7.111ms/Default setting	Default setting
Low speed operation cycle magnification setting		Not used/2 times/4 times/8 times	Not used
Forced stop input setting	Instruction	Not used/Used	Not used
	Device	Bit device	No setting
File transmission setting during booting		Standard ROM write permission/read protection/ Standard ROM write protection/read protection/ Standard ROM write protection/read permission/ Standard ROM write permission/read permission/Boot operation file invalid	Standard ROM write permission/read protection
Machine control setting		Not used/Used	Not used
G-code control setting		Not used/Use line 1 only/Use line 1 and line 2	Not used

Operation cycle

- Set the of motion operation cycle (cycles at which a position command is computed and sent to the servo amplifier).
- The default value is "Default Setting". The operation cycle is set according to the table below based on the number of axes for servo amplifier set in the servo network setting.

Number of axes			Operation cycle setting
R64MTCPU	**R32MTCPU**	**R16MTCPU**	
1 to 2 axes	1 to 2 axes	1 to 2 axes	0.222ms
3 to 8 axes	3 to 8 axes	3 to 8 axes	0.444ms
9 to 20 axes	9 to 20 axes	9 to 16 axes	0.888ms
21 to 38 axes	21 to 32 axes	—	1.777ms
39 to 64 axes	—	—	3.555ms

- If the duration of motion operation has exceeded the operation cycle, the "[St.1046] Operation cycle over flag (R: M30054/ Q: M2054)" turns ON. (☞ Page 371 Processing time monitor and check)
- The number of stations capable of connecting to the SSCNETⅢ(/H) 1 line is limited based on the motion operation cycle. Refer to the following for details on restrictions based on the communication types and operation cycles used.
  📖 MELSEC iQ-R Motion Controller User's Manual

Low speed operation cycle magnification setting

Set the magnification of the operation cycle for using the mixed operation cycle function.

Refer to mixed operation cycle function for details of mixed operation cycle function (☞ Page 160 Mixed Operation Cycle Function)

Setting	Details
Not used	Not use the low speed operation cycle.
2 times	The low speed operation cycle is executed at intervals 2 times the operation cycles.
4 times	The low speed operation cycle is executed at intervals 4 times the operation cycles.
8 times	The low speed operation cycle is executed at intervals 8 times the operation cycles.

> **Point**
>
> The setting information of the low speed motion operation cycle when the Multiple CPU system power supply is turned ON is stored in the following special registers.
> - Low speed Motion setting operation cycle (SD714)
> - Low speed operation cycle control axis information (SD732 to SD735)
> - Command generation axis low speed operation cycle control axis information (SD736 to SD739)
>
> Refer to special registers for details of special registers (☞ Page 432 Special Registers)

Forced stop input setting

Set the bit device used for the forced stop to perform a forced stop for all servo amplifier axes together. Refer to device list for the range of bit devices that can be set. (☞ Page 75 Device List)

No default value has been set. The set bit device is designated as contact B and performs the following control in response to ON/OFF of the device.

Bit device	Details
Bit device is turned OFF	Forced stop input is ON (forced stop)
Bit device is turned ON	Forced stop input is OFF (forced stop is released.)

File transmission setting during booting

Set the operation for performing the file transmission at boot function.

Refer to file transmission at boot function for details of the file transmission at boot function. (☞ Page 118 File Transmission at Boot Function)

The file transmission at boot settings from the last time power supply was shutoff are valid when the power supply of the Multiple CPU system is turned ON.

Setting	Details
Standard ROM write permission/read protection	• Moving or copying to the standard ROM is permitted for files saved outside of the standard ROM. • Moving or copying out of the standard ROM is protected for files saved in the standard ROM.
Standard ROM write protection/read protection	• Moving or copying to the standard ROM is protected for files saved outside of the standard ROM. • Moving or copying out of the standard ROM is protected for files saved in the standard ROM.
Standard ROM write protection/read permission	• Moving or copying to the standard ROM is protected for files saved outside of the standard ROM. • Moving or copying out of the standard ROM is permitted for files saved in the standard ROM.
Standard ROM write permission/read protection	• Moving or copying to the standard ROM is permitted for files saved outside of the standard ROM. • Moving or copying out of the standard ROM is permitted for files saved in the standard ROM.
Boot operation file invalid	File transmission at boot function cannot be used.

> **Point**
>
> The file transmission at boot settings at the time of when Multiple CPU system power supply is turned ON are stored in "Boot file transfer information (SD509)".
>
> Refer to special registers for details on special registers. (☞ Page 432 Special Registers)

Machine control setting

Set when performing machine control.

Refer to the following for details on machine control.

📖MELSEC iQ-R Motion Controller Programming Manual (Machine Control).

Setting	Details
Not used	• Machine control is disabled. • Machine common parameters, and machine parameters are not read.
Used	• Machine control is enabled. • When machine control parameters (machine common parameters, machine parameters) exist, they are read and machine control is performed. • When machine control parameters do not exist, machine control is not performed.

> **Point**
>
> The machine control settings at the time of when Multiple CPU system power supply is turned ON are stored in "Machine control setting information (SD519)".
>
> Refer to special registers for details on special registers. (☞ Page 432 Special Registers)

G-code control setting

Set when performing G-code control.

Add-on library must be installed to perform G-code control.

Refer to the following for details on G-code control.

📖MELSEC iQ-R Motion Controller Programming Manual (G-Code Control).

Setting	Details
Not used	• G-code control is disabled. • The G-code add-on library is not executed, and G-code control parameters are not read.
Use line 1 only Use line 1 and line 2	• When the G-code control add-on library is installed, G-code control is enabled. (When the G-code control add-on library is not installed, a moderate error (error code: 30FFH) occurs.) • If the parameters for G-code control (G-code control system parameters, G-code control axis parameters, and G-code control work parameters) are written in the Motion CPU, the parameters are read and G-code control is performed. • When G-code control parameters do not exist, a moderate error (error code: 2200H) occurs.

> **Point**
>
> The G-code control enable information at the time of when Multiple CPU system power supply is turned ON is stored in "G-code control enable information (SD518)".
>
> Refer to special registers for details on special registers. (☞ Page 432 Special Registers)

Servo network setting

The following explains each item to be set in servo network setting.

☞ [Motion CPU Common Parameter] ⇨ [Servo network setting]

Window

Displayed items

Item	Setting range
SSCNET setting	☞ Page 65 SSCNET setting
Amplifier setting	☞ Page 66 Amplifier setting

SSCNET setting

👈 [Motion CPU Common Parameter] ⇨ [Servo network setting] ⇨ [SSCNET Setting]

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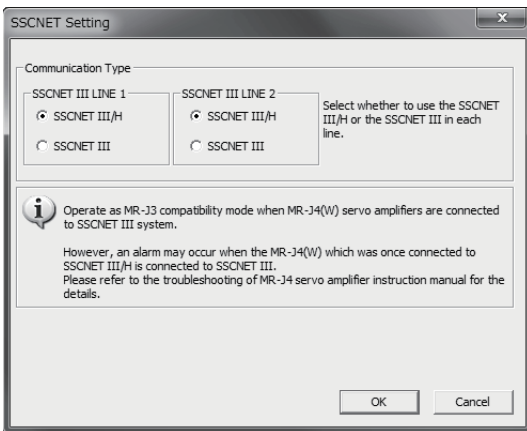
Displayed items

Item	Setting range	Default value
Communication type	SSCNETⅢ/H/SSCNETⅢ	SSCNETⅢ/H

■Communication type

Set the communication type to communicate with the servo amplifier for every line.

- SSCNETⅢ/H: MR-J4(W)-□B
- SSCNETⅢ: MR-J3(W)-□B

Amplifier setting

👆 [Motion CPU Common Parameter] ⇨ [Servo network setting] ⇨ [Amplifier Setting]

Window

Displayed items

Item		Setting range	Default value
Amplifier information	Amplifier model	<Communication type "SSCNETⅢ/H" use> MR-J4(W)-B(-RJ)/MR-J4-B-LL/FR-A800-1/FR-A800-2/MR-MT2010/LJ72MS15/ VCⅡ (CKD NIKKI DENSO)/VPH (CKD NIKKI DENSO)/αSTEP AZ (ORIENTAL MOTOR)/5-Phase ST (ORIENTAL MOTOR)/IAI Driver for Electric Actuator (IAI)	MR-J4(W)-B(-RJ)
		<Communication type "SSCNETⅢ" use> MR-J3(W)-B/MR-J3-B(S) Fully closed/MR-J3(W)-B Linear/MR-J3(W)-B DD motor/ MR-MT1200/FR-A700/FR-A700-NA/FR-A700-EC/FR-A700-CHT/VCⅡ (CKD NIKKI DENSO)/VPH (CKD NIKKI DENSO)	MR-J3(W)-B
	Amplifier operation mode[*1]	<Communication type "SSCNETⅢ/H" use> Standard/Fully closed/Linear/DD motor	Standard
	Use as virtual servo amplifier[*1]	<Communication type "SSCNETⅢ/H" use> Use/not use as virtual servo amplifier	Not use as virtual servo amplifier
Axis information	Axis No.	R64MTCPU: Up to 2 lines, 64 axes R32MTCPU: Up to 2 lines, 32 axes R16MTCPU: Up to 1 line, 16 axes	No setting
	RIO axis No.[*2]	<Communication type "SSCNETⅢ/H" use> R64MTCPU: Up to 2 lines, 8 axes R32MTCPU: Up to 2 lines, 8 axes R16MTCPU: Up to 1 line, 4 axes	No setting
	Station No.d	<Communication type "SSCNETⅢ/H" use> 1 to 64	No setting
	Axis label/RIO axis label[*2]	Up to 32 characters	No setting
External synchronous encoder input[*1]		Invalid/ABS/INC	Invalid
Input filter setting		Nothing/0.8ms/1.7ms/2.6ms/3.5ms	3.5ms
Operation cycle selection		Operation cycle/Low speed operation cycle	Operation cycle
Allowable travel during Power-Off		<Communication type "SSCNETⅢ" use> 0 to 8191 revolution	10
Sensing module information[*3]	Operation mode	1 station occupied mode/Axis mode (MR-MT2200)	No setting
	Extension module connection number	<Operation mode "1 station occupied mode" use> 0 to 4	No setting
	Used axis number	<Operation mode "Axis mode (MR-MT2200)" use> 1 to 4	No setting

Item		Setting range	Default value
Extension module setting information[*3]	No.1 type to No.4 type	<Operation mode "1 station occupied mode" use> MR-MT2100/MR-MT2200/MR-MT-2300/MR-MT2400	No setting
MR-MT2200 axis information[*3]	Axis No.	<Operation mode "Axis mode (MR-MT2200)" use> R64MTCPU: Up to 2 lines, 64 axes R32MTCPU: Up to 2 lines, 32 axes R16MTCPU: Up to 1 line, 16 axes	No setting
	Station No.d	<Operation mode "Axis mode (MR-MT2200)" use> 1 to 64	No setting

*1   This can only be set when "MR-J4(W)-B(-RJ)" is selected for the amplifier model.

*2   This is the RIO-axis when "LJ72MS15" or "MR-MT2010 (operation mode: 1 station occupied mode)" is selected for the amplifier model.

*3   This can only be set when "MR-MT2010" is selected for the amplifier model.

■Amplifier information

Set the amplifier model and amplifier operation mode.

• Amplifier model

Communication type	Amplifier model
When "SSCNETⅢ/H" is set	• MR-J4(W)-B(-RJ) • MR-J4-B-LL • FR-A800-1 • FR-A800-2 • MR-MT2010 • LJ72MS15 • VCⅡ (CKD NIKKI DENSO) • VPH (CKD NIKKI DENSO) • αSTEP AZ (ORIENTAL MOTOR) • 5-Phase ST (ORIENTAL MOTOR) • IAI Driver for Electric Actuator (IAI)
When "SSCNETⅢ" is set	• MR-J3(W)-B • MR-J3-B(S) fully closed • MR-J3(W)-B linear • MR-J3(W)-B DD motor • MR-MT1200 • FR-A700 • FR-A700-NA • FR-A700-EC • FR-A700-CHT • VCⅡ (CKD NIKKI DENSO) • VPH (CKD NIKKI DENSO)

• Amplifier operation mode

Set the amplifier operation mode only when "MR-J4(W)-B(-RJ)" is selected for the amplifier model.

Amplifier model	Amplifier operation mode
MR-J4(W)-B(-RJ)	• Standard • Fully closed • Linear • DD motor

• Use as virtual servo amplifier

Set whether to use/not use as virtual servo amplifier only when "MR-J4(W)-B(-RJ)" is selected for the amplifier model.

■Axis information

Set the axis No., station No., and axis label used to identify the servo amplifier.

• Axis No.

Set the axis No. for each line used by the Motion CPU to identify the servo amplifier.

Motion CPU	Axis No. setting range
R64MTCPU	1 to 64
R32MTCPU	1 to 32
R16MTCPU	1 to 16

- RIO Axis No.

  Set the RIO axis No. used by the Motion CPU to identify the remote I/O only when "LJ72MS15", or "MR-MT2010 (operation mode: 1 station occupied mode)" is selected for the amplifier model.

Motion CPU	Axis No. setting range
R64MTCPU	601 to 608
R32MTCPU	601 to 608
R16MTCPU	601 to 604

- Station No. d

  Set the station No. set with the servo amplifier rotary switch for each line.

Communication type	Station No. setting range
When "SSCNETⅢ/H" is set	1 to 64
When "SSCNETⅢ" is set	1 to 16

- Axis label/RIO axis label

  Set an axis label of up to 32 characters for the set axis/RIO axis. This is the RIO axis label when "LJ72MS15" is selected for the amplifier model. When "MR-MT2010" is selected for the amplifier model, the RIO axis label is set if operation mode is "1 station occupied mode", and axis label is set if operation mode is "Axis mode (MR-MT2200)".

■External synchronous encoder input

Set external synchronous encoder input when "MR-J4(W)-B(-RJ)" is selected for the amplifier model.

■Input filter setting

Set the signal input filter time for the servo amplifier with external input signal.

■Operation cycle selection

Set the cycle for operation control of the applicable axes.

Setting	Details
Operation cycle	The applicable axis operates at the operation cycle.
Low speed operation cycle	The applicable axis operates at the low speed operation cycle.

Refer to mixed operation cycle function for details of low speed operation cycle. (☞ Page 160 Mixed Operation Cycle Function)

Point

When [Motion CPU Common Parameter] ⇨ [Basic Setting] ⇨ "Low Speed Operation Cycle Magnification Setting" is set to "Not Used", this setting is ignored.

■Allowable travel during power off

Set only when "MR-J3(W)-B" or "MR-J3-B(S) fully closed" is selected for the amplifier model when communication type "SSCNETⅢ" is selected. If the motor travel distance when the servo amplifier control circuit power supply is OFF exceeds the permissible travel amount when power supply off, a warning (error code: 093FH) occurs.

Setting range
0 to 8191

■Sensing module information

Set the sensing module operation mode and extension module connection number when "MR-MT2010" is selected for the amplifier model.

- Operation mode

  Set the sensing module operation mode.

Amplifier model	Operation mode
MR-MT2010	• 1 station occupied mode • Axis mode (MR-MT2200)

- Extension module connection number

  Set the number of sensing extension modules connected when "1 station occupied mode" is selected for the operation mode. When using the sensing SSCNETⅢ/H head module only, set "0",

Setting range
0 to 4

- Used axis number

  Set the used axis number of the sensing pulse I/O modules to control the axes when "Axis mode (MR-MT2200)" is selected for the operation mode.

Setting range
1 to 4

■Extension module setting information

Set the extension modules for the number of modules set in extension module connection number when "MR-MT2010" is selected for the amplifier model, and "1 station occupied mode" is selected for operation mode.

Item	Extension module type
No.1 type to No.4 type	• MR-MT2100 • MR-MT2200 • MR-MT2300 • MR-MT2400

■MR-MT2200 axis information

Set the axis No. and station No. for identifying the sensing pulse I/O module to control the axes when "MR-MT2010" is selected for the amplifier model, and "Axis mode (MR-MT2200)" is selected for the operation mode.

- Axis No.

  Set the axis No. that the Motion CPU uses to identify the sensing pulse I/O module.

Motion CPU	Axis No. setting range
R64MTCPU	1 to 64
R32MTCPU	1 to 32
R16MTCPU	1 to 16

- Station No.

  Set the station No. set by the rotary switch of the sensing module.

Station No. setting range
1 to 64

Manual pulse generator connection setting

This section describes the manual pulse generator connection setting items.

👉 [Motion CPU Common Parameter] ⇨ [Manual Pulse Generator Connection Setting]

Window
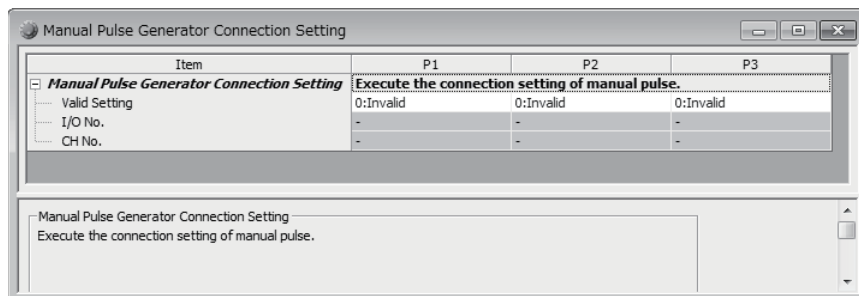
Displayed items

Item	Setting range	Default value
Valid setting	0: Invalid/1: Valid	0: Invalid
I/O No.	H0000 to H0FF0	No setting
CH No.	1 to 2	No setting

Valid setting

Enable/disable the manual pulse generator (P1 to P3).

Setting range	Details
0: Invalid	Does not connect the manual pulse generator (P1 to P3).
1: Valid	Connects the manual pulse generator (P1 to P3).

I/O No.

Set the start I/O No. for the high-speed counter module used to connect the manual pulse generator. Set the high-speed counter module as the Motion CPU management module in the GX Works3 "System Parameters" ⇨ "I/O Assignment Setting".

Setting range
H0000 to H0FF0

CH No.

Set the channel number for the high-speed counter module used to connect the manual pulse generator. The same channel number for the same module can be set to overlap in manual pulse generator (P1 to P3).

Setting range
1 to 2

Point 🖉

Refer to the following for details on the manual pulse generator.
📖MELSEC iQ-R Motion Controller Programming Manual (Positioning Control)

2.4 Motion CPU Operating Status

This section describes the Motion CPU operating status and details of all processes. The operation for when the Motion CPU is started with the rotary switch set to "0: Normal mode" are shown below. Refer to each function for details on operation when started with rotary switch set to other than "0: Normal mode".

Initial processing

Initial processing the pre-processing used to start Motion CPU control. Initial processing is performed once only when the CPU module status is one of those shown in the table below. When initial processing is complete, the Motion CPU transitions to the operating status based on "[Rq.1120] PLC ready flag (R: M30000/Q: M2000)". Details of initial process are shown in the table below.

○: Execute, ×: Don't execute

Initial processing item			Motion CPU status		
			When Multiple CPU system power supply turned ON	When resetting Multiple CPU system	At STOP to RUN/When making test mode request
Executing file transmission at boot			○	○	×
R series common parameters reading and check	System parameter		○	○	×
	CPU parameter				
	Module parameter				
Motion CPU common Parameter reading[1]	Basic setting		○	○	×
	Servo network setting				
	Limit switch output setting				○
	High-speed input request signal setting				×
	Mark detection setting				
	Manual pulse generator connection setting				
	Vision system parameter		×	×	○
	Head module setting		○	○	×
	Refresh (END/I45 executing) setting				
Motion control Parameter reading[1]	Axis setting parameter	Fixed parameter	○	○	×
		Home position return data			
		JOG operation data			○
		External signal parameter			×
		Expansion parameter			○
		Speed-torque control data			×
		Optional data monitor setting			
		Pressure control data			
		Override data			
		Vibration suppression command filter data			
	Servo parameter				○
	Parameter block				
	Synchronous control parameter	Input axis parameter			×
		Synchronous parameter			
	Machine control parameter	Machine common parameter			
		Machine parameter			
	G-code control parameter	G-code control system parameter	×	×	○
		G-code control axis parameter	×	×	○
		G-code control work parameter	×	×	○
System configuration check			○	○	×
I/O module, intelligent function module initialization			○	○	×
Initialization of devices outside latch range			○	○	×
Motion SFC program, servo program reading			○	○	○

Initial processing item	Motion CPU status		
	When Multiple CPU system power supply turned ON	When resetting Multiple CPU system	At STOP to RUN/ When making test mode request
Cam data reading	○	○	○

*1 Shows the timing at which data is read from the settings file. Refer to each function for details on the indirect setting data read cycle and data check timing.

Point

Parameter and program content is read from a file and processed as follows until used for control.

(1) Data (programs or parameters) is read from a file.

(2) The read data is extracted to standard memory. (A consistency check is performed if necessary.)

(3) Indirectly set parameter values are read from the device.

(4) The data content is checked. (Value range check, etc.)

(5) Data is then used for control.

The timing of the above steps (1) to (5) may differ depending on the processing. The parameter and program read processing in the table above indicates the timing for steps (1) and (2). Refer to each function for details on the timing of steps (3) to (5).

RUN/STOP status control

STOP/RUN/test mode

When initial processing is complete, the Motion CPU status will be "STOP status", "RUN status", or "Test mode status" depending on the "[Rq.1120] PLC ready flag (R: M30000/Q: M2000)" and existence of a test mode request from MT Developer2, and the respective control will be performed.

Motion CPU processing will be as follows for each operating status.

○: Possible, △: Possible (restrictions apply), ×: Not possible

Processing details		Motion CPU status				
		Stop error		STOP	RUN	Test mode
		Major	Moderate			
Multiple CPU/module control	Input (X) module refresh processing	×	×	○	○	○
	Output (Y) module refresh processing	×	×	△*1	○	○
	Self-diagnosis processing	×	△*2	○	○	○
	Multiple CPU auto refresh	×	×	○	○	△*3
	Multiple CPU clock synchronization	×	△*2	○	○	○
	Error reset	×	×	○	○	○
Program execution/positioning control	Positioning control, home position return, JOG operation, manual pulse generator operation, speed-torque control	×	×	×	○	△*4
	Motion SFC program execution	×	×	×	○	×
	Motion dedicated command accept	×	×	△*5	○	△*5
Synchronous control	Synchronous control operation	×	×	○	○	×
	Synchronous encoder monitor	×	△*2	○	○	○
Machine control	Machine control operation	×	×	×	○	×
G-code control	G-code control operation	×	×	×	○	×
Communication with peripheral devices	Program/parameter reading	×	△*2	○	○	○
	Program/parameter writing	×	△*2	○	×	×
	Online change	×	△*2	○	○	○
	Device monitor, device test	×	△*2	○	○	○
	Transition to test mode	×	×	○	×	—
	Remote operation request	×	×	○	○	×
	Latch clear	×	△*2	○	×	×
	Memory formatting	×	△*2	○	×	×
SSCNETⅢ(/H) control function	Communication with servo amplifier	×	△*2	△*6	○	○
	Disconnect/disconnect function	×	△*2	○	○	○
	Amplifier-less operation function	×	△*2	○	○	○
	Servo parameter transfer/read/change	×	△*2	○	○	○
	Optional data monitor function	×	△*2	○	○	○
Auxiliary/application function	Limit switch output function	×	△*2	○	○	○
	Mark detection function	×	△*2	○	○	○
	Servo ON/OFF	×	△*2	○	○	○
	Follow-up function	×	△*2	○	○	○
	Digital oscilloscope (online/offline)	×	△*2	○	○	○
File management	SD memory card disable	×	△*2	○	○	○

*1 Refer to "[Rq.1120] PLC ready flag (R: M30000/Q: M2000)" ON → OFF (RUN → STOP) processing. (☞ Page 74 "[Rq.1120] PLC ready flag (R: M30000/Q: M2000)" ON -> OFF (RUN -> STOP) processing)

*2 Execution may not be possible if an error occurs.

*3 Only transmission refresh is performed.

*4 Refer to test mode for functions that can be used from the MT Developer2 test screen. (☞ Page 329 Test Mode)

*5 Only the M(P).CHGA/D(P).CHGA/M(P).CHGT/D(P).CHGT/D(P).DDWR/M(P).DDWR/D(P).DDRD/M(P).DDRD/M(P).BITWR/D(P).BITWR commands are possible.

*6 The servo system can be turned ON, however, axes cannot be moved. Furthermore, only position control mode is possible.

"[Rq.1120] PLC ready flag (R: M30000/Q: M2000)" OFF -> ON (STOP -> RUN) processing

■Processing details

1. The Y device content is initialized based on the "Output mode setting of STOP to RUN" (Refer to ☞ Page 55 CPU parameter) operation.

2. All parameters are read from a file. (Refer to ☞ Page 71 Initial processing)

3. Clear the M-code storage area of all axes.

4. The "PCPU READY complete flag (SM500)" is turned ON when all of the above steps are complete. (Motion SFC program execution is possible. The execution of automatically started Motion SFC programs is started from the beginning.)

• If there is a starting axis, an error occurs, and the processing above is not executed.

• The processing above is not executed during the test mode. It is executed when the test mode is cancelled and "[Rq.1120] PLC ready flag (R: M30000/Q: M2000)" is ON.
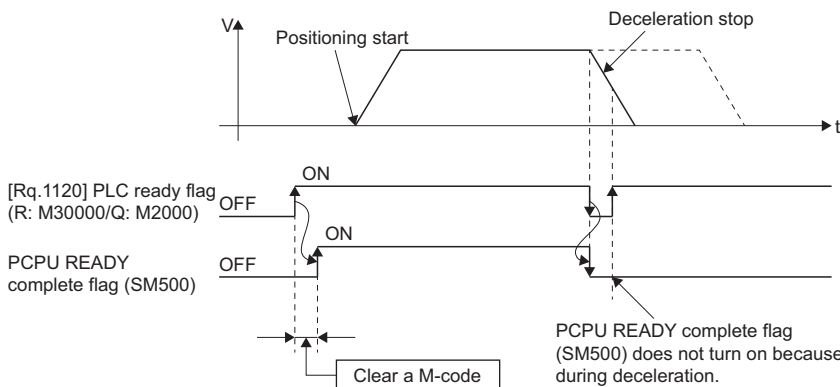
> **Point** 𝓟
>
> Refer to the following for details on the processing time when the "[Rq.1120] PLC ready flag (R: M30000/Q: M2000)" turns from OFF to ON.
> 📖 MELSEC iQ-R Motion Controller Programming Manual (Positioning Control)

"[Rq.1120] PLC ready flag (R: M30000/Q: M2000)" ON -> OFF (RUN -> STOP) processing

■Processing details

1. Deceleration stop of the starting axis.

2. Execution of the Motion SFC program is stopped. (The program currently being executed stops at the position where only the set number of consecutive transitions has been executed.)

3. All Y devices are turned OFF. If the "Output mode setting of STOP to RUN" (Refer to ☞ Page 55 CPU parameter) is "output the output (Y) status before STOP", the status prior to clearing is saved. However, the high-speed counter module Y device set for the synchronous encoder or manual pulse generator input does not turn OFF even if the status is STOP.

4. The "PCPU READY complete flag (SM500)" is turned OFF.

> **Point** 𝓟
>
> • Refer to the following for details on the processing time when the "[Rq.1120] PLC ready flag (R: M30000/Q: M2000)" turns from ON to OFF.
> 📖 MELSEC iQ-R Motion Controller Programming Manual (Positioning Control)
> • Axis stoppage processing when transitioning from the RUN status to STOP status may differ depending on the cause of the stoppage. Refer to the following for details.
> 📖 MELSEC iQ-R Motion Controller Programming Manual (Positioning Control)

3 DEVICES

This section describes the devices used with the Motion CPU.

3.1 Device List

The following is a list of devices that can be used with the Motion CPU.

○: Setting possible, ×: Setting not possible

Category	Type	Device name	Device range			Word device bit specification[*1]	Latch setting[*2]
			No. of points	Setting range	Notation		
User device	Bit device	Input (X)	12288 points (12k)[*3]	X0 to X2FFF	Hexadecimal	—	×
		Output (Y)	12288 points (12k)[*3]	Y0 to Y2FFF	Hexadecimal		
		Internal relay (M)	49152 points (48k)[*4][*5]	M0 to M49151	Decimal		○
		Link relay (B)	8192 points (8k)[*4]	B0 to B1FFF	Hexadecimal		
		Annunciator (F)	2048 points (2k)[*4]	F0 to F2047	Decimal		
	Word device	Data register (D)	57344 points (56k)[*4][*5]	D0 to D57343	Decimal	○	
		Link register (W)	8192 points (8k)[*4]	W0 to W1FFF	Hexadecimal		
		Motion register (#)	12288 points (12k)[*4]	#0 to #12287	Decimal		
System device	Bit device	Special relay (SM)	4096 points	SM0 to SM4095	Decimal	—	×
	Word device	Special register (SD)	4096 points	SD0 to SD4095	Decimal	○	
CPU buffer memory access device	Word device	CPU buffer memory access device	Up to 2097152 (2M)	U3E□\G0 to U3E□\G2097151[*6][*7]	Decimal		
		CPU buffer memory access device (fixed scan communication area)	Up to 12288 points (12k)[*8]	U3E□\HG0 to U3E□\HG12287[*6]	Decimal		
Module access device	Word device	Module access device	Up to 268435456 points (256M)	U□\G0 to U□G268435455[*9]	Decimal		
Constant	16-bit integer type	Decimal notation	K-32768 to K32767				
		Hexadecimal notation	H0 to HFFFF				
	32-bit integer type	Decimal notation	K-2147483648L to K2147483647L				
		Hexadecimal notation	H0L to HFFFFFFFFL				
	64-bit floating-point type	Decimal notation	K-1.79E+308 to K-2.23E-308 K0.0 K2.23E-308 to K1.79E+308				

*1 The description for word device bit specification is "Device No. n (n = bit No.: 0 to F)".
   (Example) "W100.A" indicates W100 bit A.
*2 Refer to latch function for details on the latch function. (☞ Page 86 Latch Function)
*3 Up to 4096 X/Y points set in the GX Works3 [System Parameter] ⇨ [I/O Assignment Setting] can be used as actual input/actual output.
   (By specifying I/O settings other than group settings, the I/O status for management of other CPUs can be read.)
*4 The total number of devices for the number of devices/latch setting can be changed within 128k words.(☞ Page 84 Device points setting)
*5 Includes dedicated positioning devices.
*6 □ indicates the CPU No. (CPU No.1: 0, CPU No.2: 1, CPU No.3: 2, CPU No.4: 3).
*7 This is the usage range at the Motion CPU. The maximum number of CPU buffer memory access devices will differ depending on the CPU module.
*8 The total number for each unit can be changed within 24k words in the GX Works3 [System Parameter] ⇨ [Multiple CPU Setting]. However, the maximum number per CPU is 12288.
*9 □ indicates 00H to FFH (module I/O No. /10H). The accessible range differs depending on the module. Refer to the manual for the module being used.

Point

[Device writing precautions]

Do not write to the following devices from the Motion CPU. Writing will be ignored, or a malfunction will occur.

- Actual input devices, or I/O number that is not allocated to any module and is within range of the maximum I/O number for the modules being used, from inputs (X).
- Actual output devices from outputs (Y) for which other CPU management performed.
- Other CPU buffer memory access devices (U3E□\G, U3E□\HG).
- Other CPU management module access devices (U□\G).
- Devices updated at the module side from module access devices (U□\G).
- Devices other than user set devices from special relays (SM), special registers (SD).
- Monitor signals from internal relay (M), data register (D), Motion register (#) dedicated positioning devices.

Devices that can be used with each function

The following is a list of word and bit devices that can be used with each Motion CPU function.

○: Setting possible, △: Setting possible (restrictions apply), ×: Setting not possible

Item				Device type			System device compatibility (SM/SD)
				Bit device	Word device bit specification	Word device	
Multiple CPU refresh setting	First device			△[*1]	×	△[*2]	×
Parameter	R series common parameter	CPU refresh setting	END	△[*1]	×	△[*2]	×
			I45 executing	△[*1]	×	△[*2]	×
			Main cycle/operation cycle	△[*1]	×	△[*2]	×
		CPU parameter	RUN contact	△[*3]	×	×	×
	Module CPU common parameter	Basic settings	Forced stop input setting	○	○	×	○
		Limit switch output setting	Bit device setting item	○	○	×	○
			Word device setting item	×	×	○	○
		High-speed input request signal setting	Bit device setting item	○	○	×	○
			Word device setting item	×	×	○	○
		Mark detection setting	Bit device setting item	○	○	×	○
			Word device setting item	×	×	○	○
		Vision system parameter	Bit device setting item	○	○	×	○
			Word device setting item	×	×	○	○
		Head module setting	CPU refresh device setting (Input: RX, RWr/Output: RY, RWw)	○	×	○	○
			Status device	○	×	○	○
			Monitor device	×	×	○	×
			Command device	○	×	○	○
	Motion control parameter	Axis setting parameter	Home position return data	Word device setting item	×	×	○	×
			External signal parameter	Bit device setting item	○	○	×	×
			Expansion parameter	Bit device setting item	○	○	×	×
				Word device setting item	×	×	○	×
			Speed-torque control parameter	Bit device setting item	○	○	×	×
				Word device setting item	×	×	○	×
			Optional data monitor	Storage device No.	×	×	○	×
			Pressure control data	Bit device setting item	○	○	×	×
				Word device setting item	×	×	○	×
			Override data	Word device setting item	×	×	○	×
			Vibration suppression command filter data	Bit device setting item	○	○	×	×
				Word device setting item	×	×	○	×
		Synchronous control parameter	Command generation axis parameter	Bit device setting item	○	○	×	×
				Word device setting item	×	×	○	×
			Multiple CPU advanced synchronous control setting	Status device setting	○	○	○	×
		Machine control parameter	Machine common parameter	Point block setting	×	×	○	×
			Machine parameter	Option setting A	○	×	○	○
				Option setting B	○	×	○	○

Item					Device type			System device compatibility (SM/SD)
					Bit device	Word device bit specification	Word device	
Parameter	Motion control parameter	G-code control parameter	G-code control system parameter	Bit device setting item	○	○	×	×
				Word device setting item	×	×	○	×
Device allocation					△*4	×	△*2	×
Latch function					△*4	×	△*2	×
Program	Motion dedicated sequence command		Motion SFC start request from the PLC CPU to the Motion CPU (M(P).SFCS/D(P).SFCS)		○	×	△*2	○
			Servo program start request from the PLC CPU to the Motion CPU (M(P).SVST/D(P).SVST)		○	×	△*2	○
			Direct positioning start instruction from the PLC CPU to the Motion CPU (M(P).SVSTD/ D(P).SVSTD)		○	×	△*2	○
			Current value change instruction from the PLC CPU to the Motion CPU (M(P).CHGA/ D(P).CHGA)		○	×	△*2	○
			Current value change instruction of command generation axis from the PLC CPU to the Motion CPU (M(P).CHGAS/D(P)CHGAS)		○	×	△*2	○
			Speed change instruction from the PLC CPU to the Motion CPU (M(P).CHGV/D(P).CHGV)		○	×	△*2	○
			Speed change instruction of command generation axis from the PLC CPU to the Motion CPU (M(P).CHGVS/D(P).CHGVS)		○	×	△*2	○
			Torque limit value change request instruction from the PLC CPU to the Motion CPU (M(P).CHGT/ D(P).CHGT)		○	×	△*2	○
			Machine program operation start request from the PLC CPU to the Motion CPU (M(P).MCNST/ D(P).MCNST)		○	×	△*2	○
			Device writing to Motion CPU(M(P).DDWR/ D(P).DDWR)		○	×	△*2	○
			Reading from Motion CPU device (M(P).DDRD/ D(P).DDRD)		○	×	△*2	○
			Write bit device to the Motion CPU (M(P).BITWR/ D(P).BITWR)		○	×	△*2	○
			Interrupt instruction to the other CPU (M(P).GINT/ D(P).GINT)		○	×	△*2	○
	Servo program(K)		Servo command	Bit device setting item	○	○	×	○
				Word device setting item	×	×	○	○
			Positioning data	Bit device setting item	○	○	×	○
				Word device setting item	×	×	○	○
	Motion SFC program		Operation control program (F/FS)/ transition program (G)	Bit device setting item	○	△*5	×	○
				Word device setting item	×	×	○	○
			WAIT ON/WAIT OFF		○	○	×	○
	Motion SFC parameter		Program parameter	Executing flag	△*1	○	×	×
Digital oscilloscope	Sampling function		Sampling target		○	○	○	○

*1   Annunciators (F) cannot be set.

*2   CPU buffer memory access devices (U3E□\G, U3E□\HG) and module access devices (U□\G) cannot be set.

*3   Only inputs (X) can be set.

*4   Inputs (X) and outputs (Y) cannot be set.

*5   Setting is not possible for commands (BMOV, FMOV, TO, RTO, RFROM, DIN, DOUT) in which bit data is used as 16 point units or 32 point units.

3.2 User Device

This section describes user devices used with the Motion CPU.

Input (X)

These are commands or data given to the Motion CPU with external devices such as buttons, switches, limit switches, and digital switches.

Output (Y)

These are program control results output to external signal lamps, digital displays, electromagnetic contactors, and solenoids, etc.

Internal relay (M)

These are devices intended for use as auxiliary relays inside the Motion CPU. When the following operations are performed, all internal relays turn OFF.
- Multiple CPU system power OFF → ON
- Multiple CPU system reset
- Latch clear

Some internal relays (M) are used as positioning signals.

Refer to the following for details.

📖MELSEC iQ-R Motion Controller Programming Manual (Positioning Control)

Link relay (B)

These are devices intended for use as auxiliary relays inside the Motion CPU. Link relays perform the same role as internal relays (M).

Annunciator (F)

These are devices intended for use as auxiliary relays inside the Motion CPU. Annunciators perform the same role as internal relays (M).

Data register (D)

These devices are able to store numerical data. Some data registers (D) are used for positioning control.

Refer to the following for details.

📖MELSEC iQ-R Motion Controller Programming Manual (Positioning Control)

Link register (W)

These devices are able to store numerical data. Link registers (W) perform the same role as data registers (D).

Motion register (#)

These devices are able to store numerical data. Some Motion registers (#) are used as monitoring devices.

Refer to the following for details.

📖MELSEC iQ-R Motion Controller Programming Manual (Positioning Control)

3.3 System Device

System devices are devices for the system. Allocation and capacity are fixed, and cannot be changed arbitrarily.

Special relay (SM)

These are internal relays whose specifications inside the Motion CPU are fixed, and as with standard internal relays, they cannot be used at the program. However, they can be turned ON and OFF to control the Motion CPU if required.
Refer to special relays for details on special relays. (☞ Page 427 Special Relays)

Special register (SD)

These are internal registers whose specifications inside the Motion CPU are fixed, and as with standard internal registers, they cannot be used at the program. However, data can be written to control the Motion CPU if required.
Refer to special registers for details on special registers. (☞ Page 432 Special Registers)

3.4 CPU Buffer Memory Access Device

These devices access memory used to read and write data between CPU modules in a Multiple CPU system.

Specification method

Specify with U [CPU module installation position]\[Communication area][First address in buffer memory].

U 3E□ \ □ □
→ First address in buffer memory
→ Communication area
 • G: CPU buffer memory
 • HG: Fixed scan communication area
→ CPU module installation position
 CPU No.1: 3E0
 CPU No.2: 3E1
 CPU No.3: 3E2
 CPU No.4: 3E3
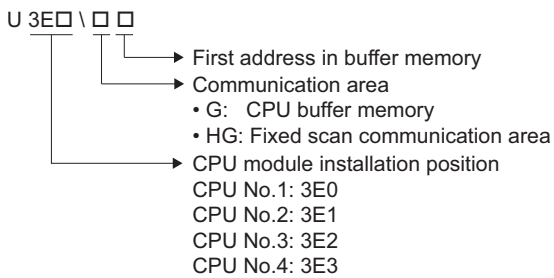
Ex.
CPU No.2, CPU buffer memory address 4095
· U3E1\G4095

CPU No.3, CPU buffer memory (fixed scan communication area) address 1024
· U3E2\HG1024

3.5 Module Access Device

These devices are used to directly access the buffer memory in intelligent function modules or I/O modules installed on the main base unit or expansion base unit from the Motion CPU.

Specification method

Specify with U [Intelligent function module or I/O module I/O No.[*1]]\[Buffer memory address].

  *1 2 high-order digits if first I/O No. is expressed with 3 digits
      For X/Y1F0: X/Y1F0 → Specification: 1F

U □ \ □
      → Buffer memory address
     → Intelligent function module or
       I/O module I/O number
       • 00 to FF
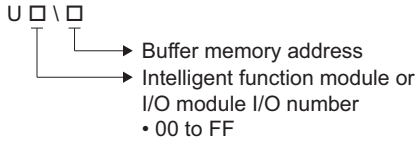
Ex.

Intelligent function module I/O No. 050, buffer memory address 11

· U5\G11

3.6 Constants

This section describes constants.

Decimal constants (K)

These devices are used to specify decimal data in the program. Specify with K□.

The specification range is determined based on the argument data type for the instruction using the decimal constant.

Hexadecimal constants (H)

These devices are uses to specify hexadecimal data in the program. Specify with H□.

To specify data by BCD, specify each hexadecimal digit with 0 to 9.

The specification range is determined based on the argument data type for the instruction using the hexadecimal constant.

3.7 Device Setting

Device assignment method

Device assignment methods set the usable range of devices to be used by the Motion CPU.

The device assignment methods available are MELSEC iQ-R Motion device assignment, and Q series Motion compatible device assignment.

Refer to the following for the devices of MELSEC iQ-R Motion device assignment and Q series Motion compatible device assignment.

📖 MELSEC iQ-R Motion Controller Programming Manual (Positioning Control)

Device assignment method for the Motion CPU

■MELSEC iQ-R Motion device assignment

This device assignment is best suited for the device assignment of positioning dedicated signals (internal relay(M), data register(D)) for the MELSEC iQ-R series Motion CPU. When configuring a new system, the MELSEC iQ-R Motion device assignment method is recommended.

Ex.
For axis status

Axis 1 status (M32400 to M32431)
Axis 2 status (M32432 to M32463)
⋮
⋮
Axis 63 status (M34384 to M34415)
Axis 64 status (M34416 to M34447)

Device assignment of axis 1 to 64 is MELSEC iQ-R Motion device assignment

■Q series Motion compatible device assignment

This device assignment provides compatibility for the device assignment of positioning dedicated signals (internal relay(M), data register(D), Motion register(#)) for the Q series Motion CPU. Use Q series Motion compatible device assignment in the following cases:

• When diverting devices from a Q series system.
• When diverting devices from a Q series system, and expanding the system from 33 axes onwards with the R64MTCPU.

Ex.
For axis status

Axis 1 status (M2400 to M2419)
Axis 2 status (M2420 to M2439)
⋮
⋮
Axis 31 status (M3000 to M3019)
Axis 32 status (M3020 to M3039)
Axis 33 status (M33424 to M33455)
Axis 34 status (M33456 to M33487)
⋮
⋮
Axis 63 status (M34384 to M34415)
Axis 64 status (M34416 to M34447)

Device assignment of axis 1 to 32 is Q series Motion compatible device assignment

Device assignment of axis 33 to 64 is MELSEC iQ-R Motion device assignment

Selecting device assignment method

The device assignment method can be selected in MT Developer2 by the following method.

For details on the operation for selecting device assignment method, refer to the following.

📖Help of MT Developer2

■Selecting at the creation of a new project

When creating a new project in MT Developer2, select MELSEC iQ-R Motion device assignment or Q series Motion compatible device assignment.

■Switching device assignment methods

Switching between MELSEC iQ-R Motion device assignment method and Q series Motion compatible device assignment method is possible in the change device assignment method screen of MT Developer2.

🖱 [Online] ⇨[Change Device Assignment Method]

Precautions

- When changing the device assignment method, the changes are enabled by power ON of the Multiple CPU system, or by reset.
- When using R64MTCPU in Q series Motion compatible device assignment, the devices for axis 33 to 64 use MELSEC iQ-R Motion device assignment. Bear in mind that the regularity of MELSEC iQ-R Motion device assignment differs to that of Q series Motion compatible device assignment.
- Performing "Motion CPU memory clear" from MT Developer2, or clearing "Backup RAM" with the "built-in memory clear" by rotary switch returns the device assignment "Q series Motion compatible device assignment".
- When loading backup data to the Motion CPU with MT Developer2, the device assignment method of the Motion CPU where backup data is being loaded and the backup data must be the same. If the device assignments methods are different an error occurs and loading is not possible. Also, when the backup data does not support the device assignment method of the Motion CPU, set the device assignment method of the Motion CPU to "Q series Motion compatible device assignment".
- Communication between MT Developer2 and the Motion CPU is not possible when the device assignment methods differ.

Device points setting

Device points setting for user devices

The number of devices used can be changed with the number of device points/latch setting.

✎ [R Series Common Parameter] ⇨ [Motion CPU Module] ⇨ [CPU Parameter] ⇨ "Device Related Setting" ⇨ "Device Points/Latch Setting" ⇨ "Detailed Setting"

Window
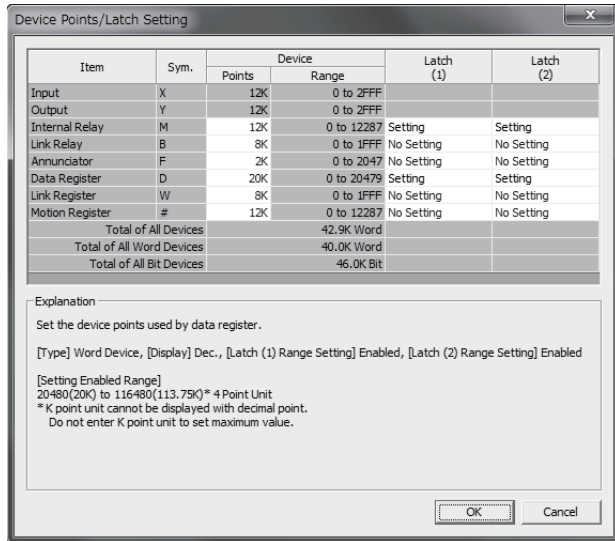
Precautions

Pay attention to the following if changing the number of devices.

- The number of inputs (X) and outputs (Y) cannot be changed.
- The maximum number of total user devices is 128k words.
- When device points are outside the setting range, the default points are set.
- The range within which each device can be changed is shown below.

■MELSEC iQ-R Motion device assignment, Q series Motion compatible device assignment (R64MTCPU)

Device	Setting unit	Default No. of points	Min. No. of points	Maximum No. of points
Internal relay (M)	64 points	48k (49152) points	48k (49152) points	128k (131072) points
Link relay (B)	64 points	8k (8192) points	0k (0) points	128k (131072) points
Annunciator (F)	64 points	2k (2048) points	0k (0) points	128k (131072) points
Data register (D)	4 points	56k (57344) points	56k (57344) points	111.50k (114176) points[*1]
Link register (W)	4 points	8k (8192) points	0k (0) points	55.50k (56832) points[*1]
Motion register (#)	4 points	12k (12288) points	12k (12288) points	67.50k (69120) points[*1]

*1 If devices other than the relevant device are set as the minimum number of set devices

■Q series Motion compatible device assignment (R32MTCPU/R16MTCPU)

Device	Setting unit	Default No. of points	Min. No. of points	Maximum No. of points
Internal relay (M)	64 points	12k (12288) points	12k (12288) points	128k (131072) points
Link relay (B)	64 points	8k (8192) points	0k (0) points	128k (131072) points
Annunciator (F)	64 points	2k (2048) points	0k (0) points	128k (131072) points
Data register (D)	4 points	20k (20480) points	20k (20480) points	113.75k (116480) points[*1]
Link register (W)	4 points	8k (8192) points	0k (0) points	93.75k (96000) points[*1]
Motion register (#)	4 points	12k (12288) points	12k (12288) points	105.75k (108288) points[*1]

*1 If devices other than the relevant device are set as the minimum number of set devices

User device memory capacity

Set user devices so that they satisfy the following formula.

(Bit device capacity) + (word device capacity) $\leq$ 128k words

■Bit devices

For bit devices, 16 points are calculated as 1 word.

$$(\text{Bit device capacity}) = \frac{(X+Y+M+B+F)}{16} \text{ (words)}$$

■Word devices

For data registers (D), link registers (W), and Motion registers (#), 16 points are calculated as 16 words.

$$(\text{Word device capacity}) = \frac{(D+W+\#)}{16} \times 16 \text{ (words)}$$

Device allocation examples

An example of device point allocation is shown below.

Ex.

For Q series Motion compatible device assignment

Device name		Symbol	Number base	Device points		Limit check	
				Points	Setting range	Capacity (words)	
Bit devices	Input	X	Hexadecimal	12k (12288) points	X0 to X2FFF	÷ 16	768 words
	Output	Y	Hexadecimal	12k (12288) points	Y0 to Y2FFF	÷ 16	768 words
	Internal relay	M	Decimal.	16k (16384) points	M0 to M16383	÷ 16	1024 words
	Link relay	B	Hexadecimal	1k (1024) points	B0 to B03FF	÷ 16	64 words
	Annunciator	F	Decimal.	4k (4096) points	F0 to F4095	÷ 16	256 words
Word devices	Data register	D	Decimal.	22k (22528) points	D0 to D22527	× 1	22528 words
	Link register	W	Hexadecimal	5k (5120) points	W0 to W13FF	× 1	5120 words
	Motion register	#	Decimal.	15k (15360) points	#0 to #15359	× 1	15360 words
Device total							45888 words (131072 words or less)

3.8 Latch Function

The content of each Motion CPU device is cleared in the following cases, and is returned to the respective default value (bit devices: OFF, word devices: 0).

- Multiple CPU system power supply OFF to ON
- Multiple CPU system reset
- Power failure longer than permissible momentary power failure time

The content of each device for which the latch setting has been specified is retained in the event of a power failure even in the above cases. Consequently, when managing data when performing consecutive control, all data is retained, allowing control to be continued even if the Multiple CPU system power supply turns OFF to ON, or if a power failure longer than permissible momentary power failure time occurs.

Devices for which latch is possible

Devices for which a latch is possible are as follows.

- Internal relays (M)
- Link relays (B)
- Annunciators (F)
- Data registers (D)
- Link registers (W)
- Motion registers (#)

Operation when latches used

Operation in the program is the same regardless of whether a latch has been set.

Latch range setting

Set the latch range for each device with the device points/latch setting.

Multiple latch ranges can be set for each device type. A combined total of 32 latch ranges can be set for latch (1) and latch (2). However, the latch range must be set so that the latch (1) and latch (2) ranges do not overlap.

Latch range setting is valid when the Multiple CPU system power supply is turned ON.

👆 [R Series Common Parameter] ⇨ [Motion CPU Module] ⇨ [CPU Parameter] ⇨ "Device Related Setting" ⇨ "Device Points/Latch Setting" ⇨ "Detailed Setting"

Window

Device Points/Latch Setting

| Item | Sym. | Device | | Latch (1) | Latch (2) |
		Points	Range		
Input	X	12K	0 to 2FFF		
Output	Y	12K	0 to 2FFF		
Internal Relay	M	12K	0 to 12287	Setting	Setting
Link Relay	B	8K	0 to 1FFF	No Setting	No Setting
Annunciator	F	2K	0 to 2047	No Setting	No Setting
Data Register	D	20K	0 to 20479	Setting	Setting
Link Register	W	8K	0 to 1FFF	No Setting	No Setting
Motion Register	#	12K	0 to 12287	No Setting	No Setting
Total of All Devices			42.9K Word		
Total of All Word Devices			40.0K Word		
Total of All Bit Devices			46.0K Bit		

Explanation

Set the device points used by input.

[Type] Bit Device, [Display] Hex., [Latch (1) Range Setting] Disabled, [Latch (2) Range Setting] Disabled

[Setting Enabled Range]
Change Disabled

OK   Cancel

Clearing the latch range

The latch (1) and latch (2) ranges are cleared with the following operations. (☞ Page 353 Memory Initialization)

Latch range	Clear operation
Latch (1)	• Clearing the MT Developer Motion CPU memory. • Cleaning built-in memory with Motion CPU rotary switch "C".
Latch (2)	Cleaning built-in memory with Motion CPU rotary switch "C".

Precautions

- When increasing the ranges set for latch (1) or latch (2), the latch device value when the Multiple CPU system power supply is turned ON again after parameter writing will be the value when the power supply was previously turned OFF.
- All latch ranges are cleared if the device point setting, or device assignment method differs from the setting at the previous operation when turning ON the Multiple CPU system or when resetting.

3

4 AUXILIARY AND APPLIED FUNCTIONS

4.1 Limit Switch Output Function

This function is used to output the ON/OFF signal corresponding to the data range of the watch data set per output device. Motion control data or optional word data can be used as watch data.(☞ Page 90 Limit output data setting)
A maximum output device for 64 points can be set regardless of the number of axes.

Operations

Limit switch output function

ON output to an output device is made while the watch data value is in the ON region set with lower limit value and upper limit value in the limit switch output function. Up to two ON regions can be set for each limit output setting data.

• Lower limit value, upper limit value and watch data value are handled as signed data. ON output region where an ON output is made to the output device is governed by the magnitude relationship between lower limit value and upper limit value as indicated below.

Relationship between lower limit value and upper limit value	ON output region
Lower limit value < Upper limit value	Lower limit value ≤ (watch data value) < Upper limit value
Lower limit value > Upper limit value	Lower limit value ≤ (watch data value) (Watch data value) < Upper limit value
Lower limit value = Upper limit value	Output OFF in whole region

- The limit switch outputs are controlled based on each watch data during the READY complete status (SM500: ON) by the "[Rq.1120] PLC ready flag (R: M30000/Q: M2000)" from OFF to ON. With the setting of "Rq.1120: PLC ready flag keep the output device when turns OFF" invalid, when the "PCPU READY complete flag (SM500)" turns OFF by turning the "[Rq.1120] PLC ready flag (R: M30000/Q: M2000)" from ON to OFF, all points turn OFF. With the setting of "Rq.1120: PLC ready flag keep the output device when turns OFF" valid for output devices other than Y devices, the output devices do not turn OFF even when the "[Rq.1120] PLC ready flag (R: M30000/Q: M2000)" turns from ON to OFF. The setting is valid for all the output devices. Y devices always turn OFF when the "[Rq.1120] PLC ready flag (R: M30000/Q: M2000)" turns from ON to OFF. When lower limit value and upper limit value are specified with word devices, the word device contents are input to the internal area when the "[Rq.1120] PLC ready flag (R: M30000/Q: M2000)" turns from OFF to ON. After that, the word device contents are input per motion operation cycle, and limit switch outputs are controlled.
- Multiple outputs (Up to 64 points) can be also set to one watch data. In each setting, the output device may be the same. If both of the two regions of the ON section setting are used or if the same output device is designated by multiple output settings (regardless of whether or not the watch data is the same), the logical add of the output results in the regions is output.
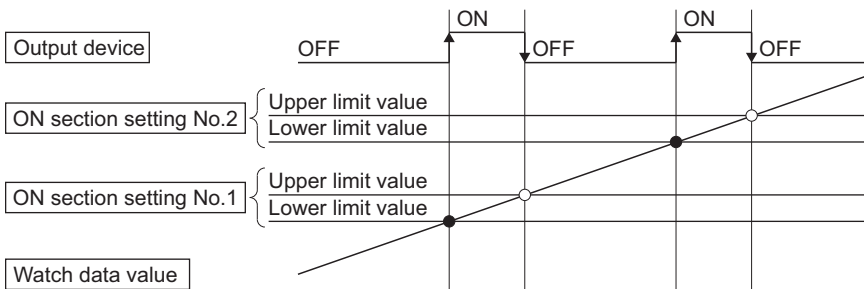
Setting the forced OFF bit

Forced OFF bit can be set to forcibly turn off the output of the output device point-by-point. When the forced OFF bit is ON, the output is OFF.

Setting the forced ON bit

Forced ON bit can be set to forcibly turn on the output of the output device point-by-point. When the forced ON bit is ON, the output is ON. Priority is given to control of this setting over ON of the "forced OFF bit" (forced output OFF).

Limit output data setting

This section describes limit output data setting items.

Up to 64 points of output devices can be set. (The items in the table below are set together as one point.)

🖘 [Motion CPU Common Parameter] ➡ [Limit Output Data]

Window
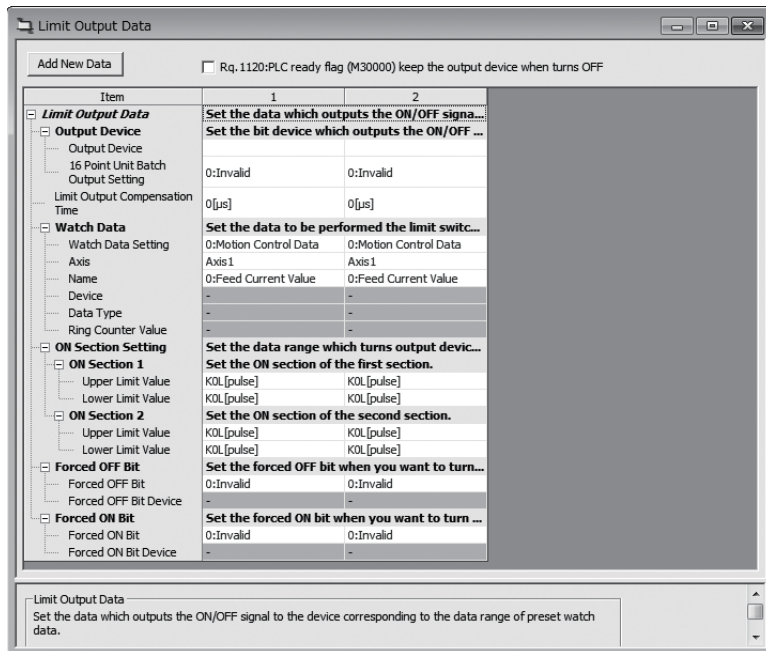
Displayed items

Item			Setting range	Fetch cycle	Refresh cycle
Rq.1120: PLC ready flag keep the output device when turns OFF			Invalid (default)/valid	—	—
Output device	Output device		Bit device		Operation cycle
	16 point unit batch output setting		Invalid (default)/valid		—
Limit output compensation time			-5000000 to 5000000[μs]/Word device	Operation cycle	
Watch data	Watch data setting		Motion control data/Word device data/Word device data (ring counter)		
	Axis[1]		1 to 64		
	Name[1]		🖙 Page 92 Motion control data		
	Device[2][3]		Word device		
	Data type[2][3]		16-bit integer type/32-bit integer type		
	Ring counter value[3]		16-bit integer type: K1 to K32767, H0001 to H7FFF 32-bit integer type: K1 to K2147483647, H00000001 to H7FFFFFFF	—	
ON section setting	ON section setting 1	Upper limit value	Word device/constant (K, H)	Operation cycle	
		Lower limit value			
	ON section setting 2	Upper limit value			
		Lower limit value			
Forced OFF bit	Forced OFF bit		Invalid (default)/valid		
	Forced OFF bit device		Bit device		
Forced ON bit	Forced ON bit		Invalid (default)/valid		
	Forced ON bit device		Bit device		

*1 When Motion control data selected
*2 When word device data selected
*3 When word device data (ring counter) selected

Rq.1120: PLC ready flag keep the output device when turns OFF

With this setting valid for output devices other than Y devices, the output devices do not turn OFF even when the "[Rq.1120] PLC ready flag (R: M30000/Q: M2000)" turns from ON to OFF. The setting is valid for all the output devices. Y devices always turn OFF when the "[Rq.1120] PLC ready flag (R: M30000/Q: M2000)" turns from ON to OFF.

Output device

- Set the bit device which outputs the ON/OFF signal toward the preset watch data.
- As the output device, bit devices are used. Refer to device list for the range of bit devices that can be set. (☞ Page 75 Device List)
- When the 16 point unit batch output setting is valid, the batch output of the sequential 16 point unit devices has less effect on the operation cycle as compared with the output of each output device point-by-point. When the 16 point unit batch output setting is valid, it is recommended to set multiple output devices as sequential 16 point unit output devices. The sequential devices to be output in a 16 point unit batch is counted as one set and up to 4 sets can be set. When the 16 point unit batch output setting is valid, among the 16 point unit devices, the devices that are not used as the output devices are always OFF.

16 point unit batch output setting	Control description
Invalid	The output device is output point-by-point.
Valid	The sequential 16-point output devices are output in a batch.

Limit output compensation time

Compensate the output timing of the output device.

Set it to compensate for output signal delays. (Set a positive value to compensate for a delay.)

In indirect setting, the timing is compensated as "-5000000" when the compensation time is set to less than -5000000, and it is compensated as "5000000" when it is set to more than 500000.

■Direct setting

Setting range
-5000000 to 5000000[μs]

■Indirect setting

Word devices are used for the limit output compensation time.

Set an even number for the device number. Refer to device list for the range of word devices that can be set. (☞ Page 75 Device List)

Watch data

This data is used to perform the limit switch output function. This data is comparison data to output the ON/OFF signal. The output device is ON/OFF-controlled according to the ON section setting.

As the watch data, motion control data, word device data or word device data (ring counter) can be used.

■Motion control data

Settable watch data is shown in the following table.

Item	Unit	Data type	Axis No. setting range			Remarks
			R64MTCPU	R32MTCPU	R16MTCPU	
Feed current value	Control unit	32-bit integer type	1 to 64	1 to 32	1 to 16	—
Real current value						
Servo command value	pulse					
Position feed back						
Absolute position encoder single revolution position						
Absolute position encoder multiple revolution position	—	16-bit integer type				
Deviation counter value	pulse	32-bit integer type				
Servo command speed	pulse/s					
Motor speed	0.01r/min					
Motor current value	0.1%	16-bit integer type				
Command generation axis feed current value	Control unit	32-bit integer type				
Command generation axis cumulative current value						
Command generation axis current value per cycle						
Synchronous encoder axis current value	Encoder axis unit		1 to 12			
Synchronous encoder axis current value per cycle						
Cam axis current value per cycle	Cam axis cycle unit		1 to 64	1 to 32	1 to 16	Valid in synchronous control
Cam axis current value per cycle (Actual)						

■Word device data/word device data (ring counter)

• Device

Word devices are used for watch data. Refer to device list for the range of word devices that can be set. (☞ Page 75 Device List)

• Data type

The following data type is set as the data type to be compared.

Data type	Remarks
16-bit integer type	—
32-bit integer type	Set the device No. as an even No.

• Ring counter value

When the watch data is the word device data (ring counter), the ring counter value is set.

Data type	Remarks
16-bit integer type	H0001 to H7FFF
32-bit integer type	K1 to K2147483647, H00000001 to H7FFFFFFF
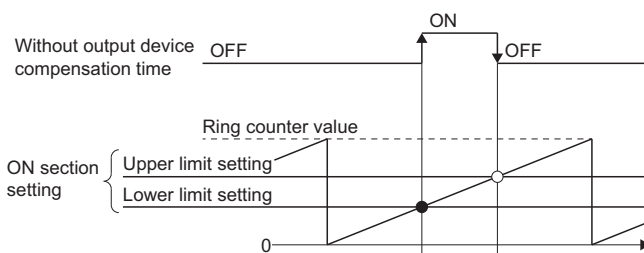
For the word device data updated as ring counter, when the output timing is compensated without setting the correct ring counter value or when the output timing is compensated by setting the ring counter for the word device data that is not updated as ring counter, the output device may not be output at the correct timing.

ON section setting

- The data range which makes the output device turn ON/OFF toward the watch data. Up to two ON regions can be set for each limit output setting data.
- Word devices constants (Hn/Kn) can be used as the lower limit value and upper limit value of the data range. The data type of device/constant to be set is the same as the type of watch data. Refer to device list for the range of word devices that can be set. (Page 75 Device List)

Forced OFF bit

- Set the "forced OFF bit" when forced OFF of the output device is desired during operation. The following control is exercised.

Forced OFF bit		Control description
Invalid		Output device is turned ON/OFF based on the ON section setting.
Valid	OFF	
	ON	Output device is turned OFF.

- Bit devices are used for forced OFF bits. Refer to device list for the range of bit devices that can be set. (Page 75 Device List)

Forced ON bit

- Set the "forced ON bit" when forced ON of the output device is desired during operation. The following control is exercised.

Forced ON bit		Control description
Invalid		Output device is turned ON/OFF based on the ON section setting.
Valid	OFF	
	ON	Output device is turned ON.

- Bit devices are used for forced ON bits. Refer to device list for the range of bit devices that can be set. (Page 75 Device List)

4.2 External Input Signal

External input signals are managed as "external signals" or "high-speed input request signals".

External signals are used with control functions such as home position return, speed/position switching control, hardware limits, and stop processing.

High-speed input request signals are used with control functions such as mark detection clutch control, and synchronous encoder axis current value changes.
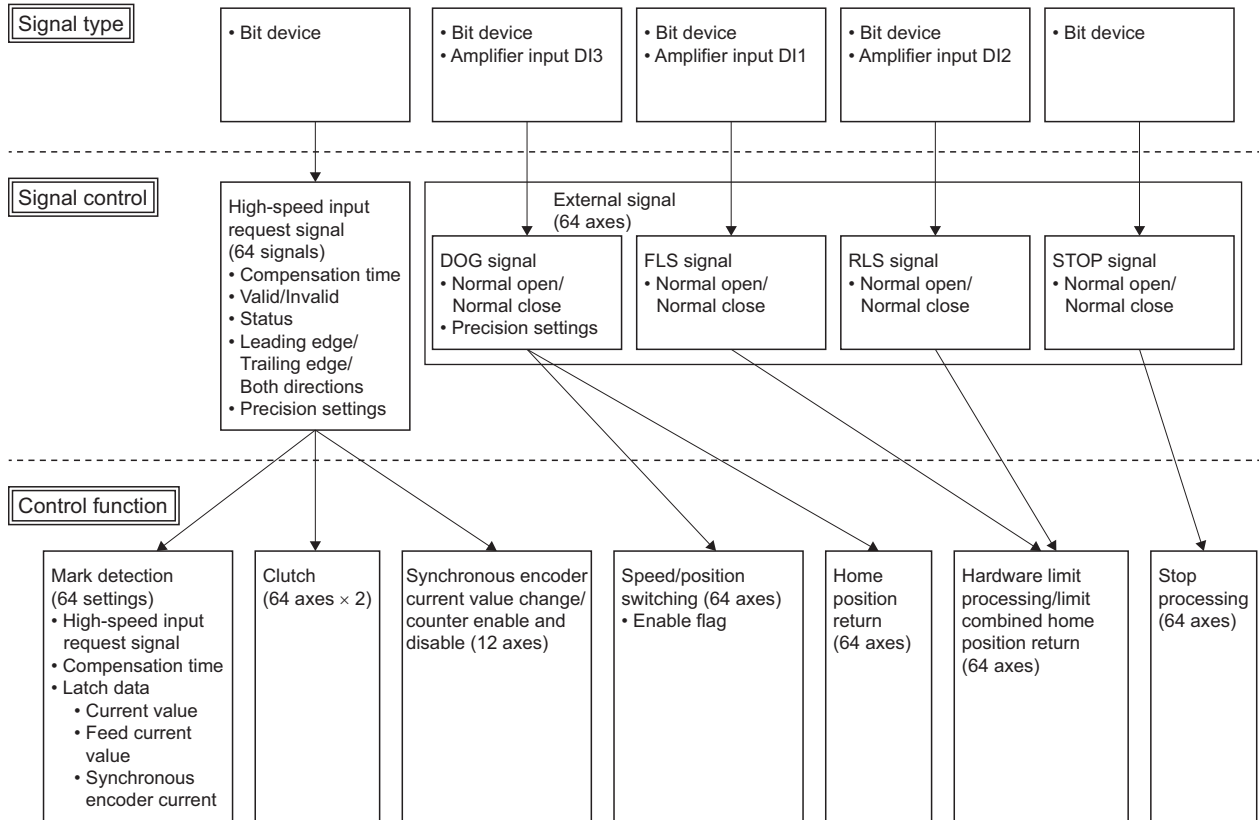
External signal

External signals (FLS signals, RLS signals, STOP signals, DOG signals) are assigned to each axis, and are used with control functions such as home position return, speed/position switching control, hardware limits, and stop processing.

External signals are set in the external signal parameters.

Refer to following for details on external signal parameters.

📖MELSEC iQ-R Motion Controller Programming Manual (Positioning Control)

High-speed Input Request Signal

Set the allocation of high-speed input request signals. The high-speed input request signals are used for mark detection and to control clutch ON/OFF operations, synchronous control or the counter enable/counter disable/current value change operation of the synchronous encoder axis with high accuracy. An example of current value change of the synchronous encoder axis using input module (X0005) as the high-speed input request signal is shown below.

[Md.320] Synchronous encoder axis current value
(R: D38650+32n, D38561+32n/
Q: D13240+20n, D13241+20n)

High-speed input request signal 3 (X0005)

High-speed input request signal valid flag

High-speed input request signal status

[Cd.320] Synchronous encoder axis control start condition
(R: D42322+16n/Q: D14822+10n)

103: High-speed input request signal 3

[Cd.321] Synchronous encoder axis control method
(R: D42323+16n/Q: D14823+10n)

0: Current value change

*1: Set the high-speed input request signal detection direction to "Leading edge"

High-speed input request signal setting

This section describes the high-speed input request signal setting items. Up to 64 signals can be registered.

✎ [Motion CPU Common Parameter] ⇨ [High-speed Input Request Signal]

Window
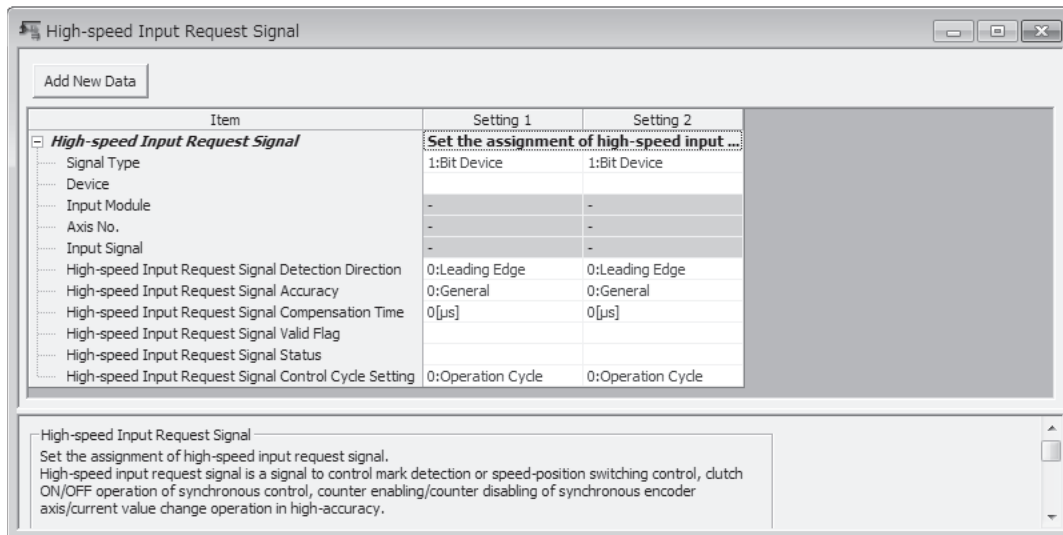
Displayed items

Item		Setting range
High-speed input request signal	Signal type	Bit device/Amplifier input/Sensing module input
	Device[*1]	Bit device
	Input module[*2]	MR-MT2010/MR-MT2100/MR-MT2200
	Axis No.[*2][*3]	1 to 64, 601 to 608
	Input signal[*2][*3]	DI1 to DI16
High-speed input request signal detection direction[*1][*3]		Leading edge/Trailing edge/Both directions
High-speed input request signal accuracy[*1][*3]		General/High-accuracy
High-speed input request signal compensation time		-5000000 to 5000000[μs]/Word device
High-speed input request signal valid flag		—[*4]/Bit device
High-speed input request signal status		—[*4]/Bit device
High-speed input request signal control cycle setting		Operation cycle/Low speed operation cycle

*1 When bit device is selected
*2 When sensing module input is selected
*3 When amplifier input is selected
*4 This setting can be omitted

■High-speed input request signal

Set the input signal for high-speed input request signal.

- Bit device

  Bit devices are used for high-speed input request signals. Refer to device list for the range of bit devices that can be set.
  (☞ Page 75 Device List)

- Amplifier input

  Input signals DI1 to DI3 of the servo amplifier are used for high-speed input request signals.

Input module	Axis No.			Input signal
	R64MTCPU	R32MTCPU	R16MTCPU	
Servo amplifier	1 to 64	1 to 32	1 to 16	DI1 to DI3

- Sensing module input

  The external input signal DI□ of the sensing module is used as the high-speed input request signal.

Input module		Axis No.			Input signal
Model	Operation mode	R64MTCPU	R32MTCPU	R16MTCPU	
MR-MT2010[*1]	Station mode	601 to 608	601 to 608	601 to 608	DI1 to DI12[*2]
	Axis mode	1 to 64	1 to 32	1 to 16	
MR-MT2100	Station mode	601 to 608	601 to 608	601 to 608	DI1 to DI16
MR-MT2200[*3]					DI1 to DI14 (CH.1: DI1 to DI7, CH.2: DI8 to DI14)

*1   When the operation mode of MR-MT2010 is axis mode and high-accuracy ("1: Timing-latch input" set in servo parameter "DI□ setting 2 (function selection)") is set, or MR-MT2010 is set at an axis No. other than the start station in 1 block, a moderate error (error code: 30D3H) occurs.

*2   When "MR-MT2010+Extension modules" is 1 station and using the high-speed input request signal with high-accuracy, the setting range is "DI1 to DI4".

*3   When high-accuracy ("1: Timing-latch input" set in servo parameter "DI□ setting 2 (function selection)") is set for MR-MT2200, or the operation mode is axis mode, a moderate error (error code: 30D3H) occurs.

■**High-speed input request signal detection direction**

When bit device or amplifier input is set, set whether to perform the high-speed input request signal detection operation in the input signal leading edge (OFF to ON), trailing edge (ON to OFF), or both directions (OFF to ON, ON to OFF).

Input signal detection direction	Remarks
Leading edge	Performs high-speed input request detection with the input signal OFF to ON.
Trailing edge	Performs high-speed input request detection with the input signal ON to OFF.
Both directions	Performs high-speed input request detection with the input signal OFF to ON or ON to OFF.

Point

For sensing module input, the high-speed input request signal detection direction is set in the servo parameters. Refer to the following for details of servo parameters.

📖Sensing Module Instruction Manual

- When the high-speed input request signal accuracy of the sensing module is set to general, the high-speed input request signal detection direction is leading edge only. However, when detecting by input ON or input OFF to the DI signal, set the servo parameter "DI□ setting 1 (polarity selection)".
- When the high-speed input request signal accuracy of the sensing module is set to high-accuracy, the detection direction can be set in the servo parameter "DI□ setting 2 (DI signal edge selection)"

■High-speed input request signal accuracy

When bit device or amplifier input is set, set the accuracy of high-speed input request signals.

High-speed input request signal accuracy	Signal type	Setting required on the module side	Detection accuracy[µs]
General	Bit device	None	222[*1]
	Amplifier input (DI1 to DI3)	None	• Operation cycle 1.777[ms] or less: Operation cycle • Operation cycle 3.555[ms] or more: 3555
High-accuracy	Bit device	• Enable the inter-module synchronization function.[*2] • Set the input response time.	[*3]

*1　When using an actual device with the inter-module synchronization setting, the inter-module synchronization cycle is used.

*2　When not set, a moderate error (error code: 30D3H) occurs.

*3　Detection accuracy of the high-accuracy setting of the bit device.

Input response time [ms]	Detection accuracy	
	Theoretical value [µs]	Measured value [µs]
0.10	4.9	7
0.20	9.9	12
0.40	19.8	22
0.60	25.0	27
1.00	39.5	41
5.00	158	160
10.00	316	318
20.00	630	632
70.00	2500	2502

- General

  The detection accuracy is based on the fixed-cycle processing of the Motion CPU. General detection accuracy is used even when the input module setting is "Enable synchronization between modules".

- High-accuracy

  When the input module setting is "inter-module synchronization valid", by setting the high-speed input request signal accuracy to "High-accuracy", high-speed input request signals can be controlled with high accuracy. If this signal is specified for a signal that is not compatible with high-accuracy input, a moderate error (error code: 30D3H) occurs.

Point⚲

For sensing module input, the high-speed input request signal accuracy is set in the servo parameters. Refer to the following for details of servo parameters.

📖Sensing Module Instruction Manual

- When the high-speed input request signal accuracy of the sensing module is set to general, set "0: Digital input" in the servo parameter "DI☐ setting 2 (function selection)".

- When setting the high-speed input request signal accuracy of the sensing module to high-accuracy, set "1: Timing-latch input" in the servo parameter "DI☐ setting 2 (function selection)". By setting a sensing module DI signal that supports the timing-latch input function, control accuracy using the high-speed input request signal can be changed to high-accuracy. Refer to timing-latch input function for details of timing-latch input function. (☞ Page 241 Timing-latch input function)

The detection accuracy of sensing module input is as follows.

High-speed input request signal accuracy	Detection accuracy [µs]
General	• Operation cycle 0.444[ms] or less: Operation cycle • Operation cycle 0.888[ms] or more: 888
High-accuracy	1

■High-speed input request signal compensation time

Compensate the input timing of the high-speed input request signal. Set it to compensate for sensor input delays, etc. Set a positive value to compensate for a delay, and set a negative value to compensate for an advance. However, high-speed input request status outputs the status of the signal with no relation to the set value.

In indirect setting, the timing is compensated as "-5000000" when the compensation time is set to less than -5000000, and it is compensated as "5000000" when it is set to more than 500000.

If "Estimate calculation" is set to "Invalid" in the mark detection settings, the input timing for high-speed input request signals is not compensated.

• Direct setting

Setting range
-5000000 to 5000000[μs]

• Indirect setting

Word devices are used for the high-speed input request signal compensation time. Setting values are read each operation cycle. Refer to device list for the range of word devices that can be set. (☞ Page 75 Device List)

■High-speed input request signal valid flag

The high-speed input request signal is valid only when the flag is ON. The high-speed input request signal is invalid when the flag is OFF. This setting can be omitted. When the setting is omitted, the high-speed input request signal is valid at all times. Bit devices are used for high-speed input request signal valid flags. ON/OFF commands are read when high-speed input request signals are detected. Refer to device list for the range of bit devices that can be set. (☞ Page 75 Device List)

■High-speed input request signal status

The ON/OFF status of high-speed input request signal can be monitored. ON/OFF status can be monitored regardless of the status of the high-speed input request signal valid flag. This setting can be omitted. Bit devices are used for high-speed input request signal status. The ON/OFF status is output each operation cycle. Refer to device list for the range of bit devices that can be set. (☞ Page 75 Device List)

> **Point**
>
> When signals are input in situations such as the following when the detection of high-speed input request signals is unnecessary, turn the high-speed input request signal enable flag OFF, and when detection becomes necessary, turn it ON.
> • When "[St.380] Synchronous control (R: M40000+n/Q: M10880+n)" is OFF
> • When "[Rq.320] Synchronous encoder axis control request (R: M42241+8n/Q: M11601+4n)" is OFF.
> • When mark detection is not used.

■High-speed input request signal control cycle setting

Set the cycle for the detection intervals of the high-speed input request signal, and whether to update the "high-speed input request signal compensation time" and "high-speed input request signal status" every operation cycle or every low speed operation cycle.

This needs to be set when using the high-speed input request signal with the mark detection function or clutch control in advanced synchronous control on an axis operating at the low speed operation cycle. Refer to mixed operation cycle function for details. (☞ Page 160 Mixed Operation Cycle Function)

> **Point**
>
> When [Motion CPU Common Parameter] ⇨ [Basic Setting] ⇨ "Low Speed Operation Cycle Magnification Setting" is set to "Not Used", this setting is ignored, and the axis operates at the operation cycle.

Precautions

• When high-speed input request signal is set to a sensing module external input signal, set signal type to "sensing module input". When "bit device" is selected, and a link device that supports external input signals is set, the signal state may not be correctly detected.

• Do not change high-speed input request signal settings which have "sensing module input" set to signal type by the parameter change function.

4.3 Mark Detection Function

Any motion control data and all device data can be latched at the input timing of the high-speed input request signal. Also, data within a specific range can be latched by specifying the data detection range.

The following three modes are available for execution of mark detection.

Continuous Detection mode

The latched data is always stored at mark detection.
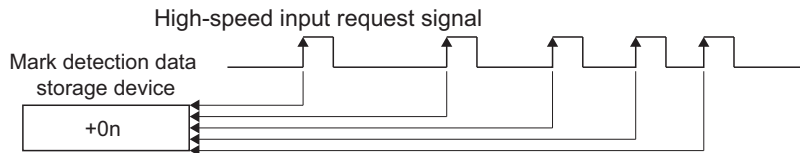
Specified Number of Detection mode

The latched data from a specified number of detections is stored.

Ex.
Number of detections: 3
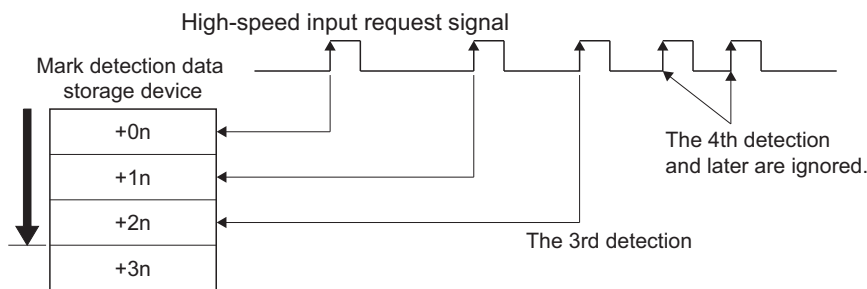
Ring Buffer mode

The latched data is stored in a ring buffer for a specified number of detections. The latched data is always stored at mark detection.

Ex.
Number of detections: 4
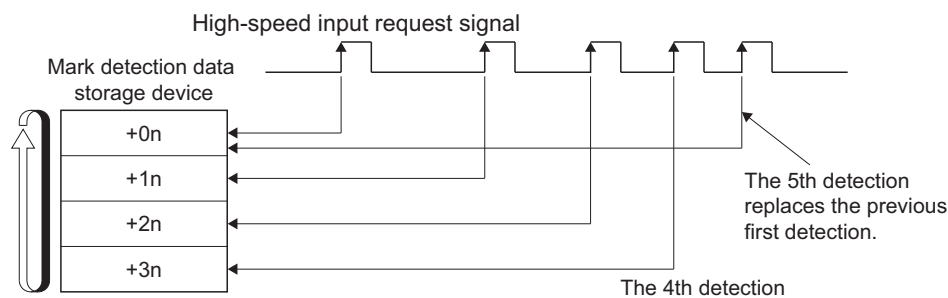
"n" in above figure is different depending on the data type storage device.
- 16-bit integer type: 1
- 32-bit integer type: 2
- 64-bit floating-point type: 4

Operations

Operations done at mark detection are shown below.

- Calculations for the mark detection data are estimated at leading edge/trailing edge/both directions of the high-speed input request signal. However, when the Specified Number of Detection mode is set, the current mark detection is checked against the counter value for number of mark detections and then it is determined whether or not to latch the current detection data.
- When a mark detection data range is set, it is first confirmed whether the mark detection data is within the range or not. Data outside the range are not detected.
- The mark detection data is stored in the first device of the mark detection data storage area according to the mark detection mode, and then the number of mark detections counter is updated.

Operation examples for each mode are shown below.

Continuous Detection mode
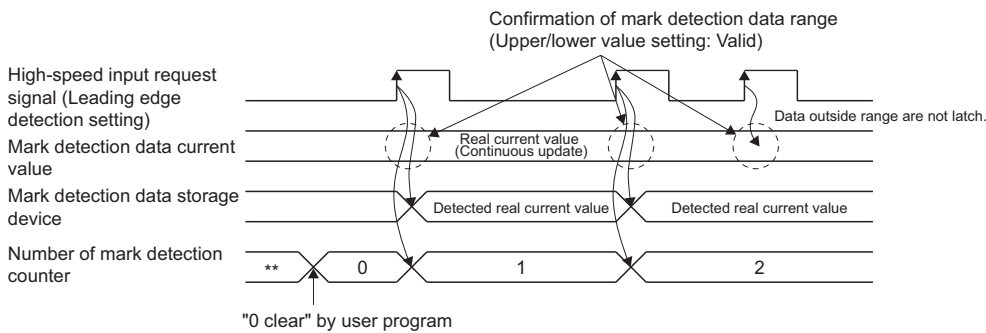
Specified Number of Detection mode (Number of detections: 2)
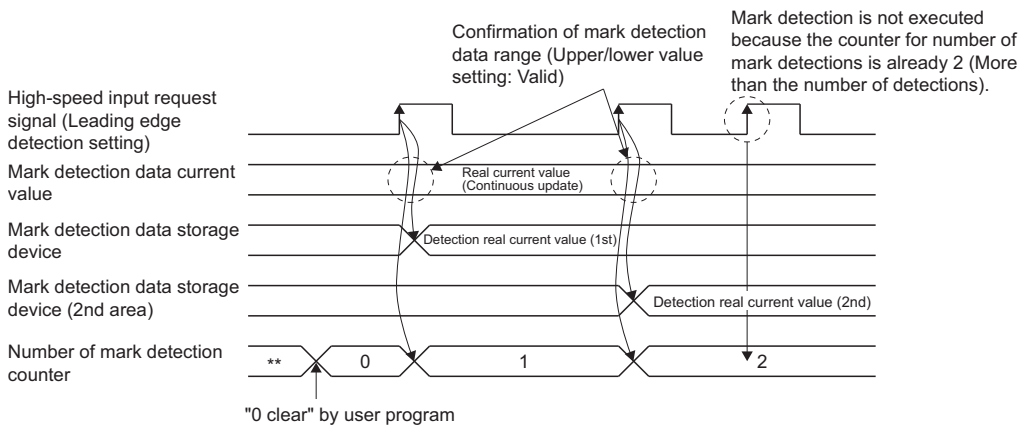
Mark detection setting

This section describes the mark detection setting items. Up to 64 mark detections setting can be registered.

👉 [Motion CPU Common Parameter] ⇨ [Mark Detection]

Window

Displayed items

Item		Setting range
High-speed input request signal		1 to 64
Mark detection process compensation time[*1]		-5000000 to 5000000[μs]/Word device
Mark detection data	Mark detection data	Motion control data/Word device data
	Axis No.[*2]	1 to 64
	Set data[*2]	☞ Page 104 Motion control data
	Device[*3]	Word device
	Data type[*3]	16-bit integer type/32-bit integer type/64-bit floating-point type
	Estimate calculation[*3]	Valid (Normal data)/Valid (Ring counter)/Invalid
	Ring counter value[*3]	16-bit integer type: K1 to K32767, H001 to H7FFF 32-bit integer type: K1 to K2147483647, H00000001 to H7FFFFFFF 64-bit floating-point type: K2.23E-308 to K1.79E+308
Mark detection data storage device		Word device
Mark detection data range	Upper value	Direct designation (K, H)/Word device 16-bit integer type: K-32768 to K32767, H0000 to HFFFF
	Lower value	32-bit integer type: K-2147483648 to K2147483647, H00000000 to HFFFFFFFF 64-bit floating-point type: K-1.79E+308 to K-2.23E-308, K0, K2.23E-308 to K1.79E+308
Mark detection mode setting	Mark detection mode setting	Continuous detection mode/Specified No. of detection mode/Ring buffer mode/Word device
	Number of detections	1 to 8192 (Specified number of detection mode/Ring buffer mode)
	Device	Word device
	Number of mark detections counter	—[*4](Continuous detection mode)/Word device
Mark detection current value monitor device		—[*4]/Word device

*1 The mark detection signal compensation time cannot be set if "Invalid" is selected in the estimate calculation. (0[μs] is set.)
*2 When Motion control data selected
*3 When word device data selected
*4 This setting can be omitted.

High-speed Input Request Signal

Set the high-speed input request signal used for mark detection. Use the high-speed input request signal settings to specify the input signal detection direction and compensation time. Mark detection accuracy is determined by the high-speed input request signal accuracy setting.

Setting range
1 to 64

Point

When mixed operation cycle function is enabled, set the setting No. of the high-speed input request signal where the high-speed input request signal control cycle setting matches the control cycle of the axes set in the mark detection data. If the control cycles do not match, a moderate error (error code: 30D5H) occurs. Refer to mixed operation cycle function for details. (☞ Page 160 Mixed Operation Cycle Function)

Mark detection process compensation time

The mark detection process delay time can be compensated. Set this time if wishing to compensate delays and so on inherent to mark detection process separately from the high-speed input request signal compensation time. (If compensating the delay, set a positive value.) However, when "Invalid" is selected for estimation calculation, the mark detection process compensation time cannot be set. (The time will be 0 [µs].)

In indirect setting, the timing is compensated as "-5000000" when the compensation time is set to less than -5000000, and it is compensated as "5000000" when it is set to more than 500000.

■Direct setting

Setting range
-5000000 to 5000000[µs]

■Indirect setting

Word devices are used for the mark detection process compensation time. Set an even number for the device number. Refer to device list for the range of word devices that can be set. (☞ Page 75 Device List)

When using the "real current value" in mark detection data, set the mark detection signal compensation time referring to the following chart.

Operation cycle setting [ms]	Mark detection processing compensation time [µs][1]
0.222	$-222+\alpha$
0.444	$-444+\alpha$
0.888	$-888+\alpha$
1.777	$-1777+\alpha$
3.555	$-3555+\alpha$
7.111	$-7111+\alpha$

*1 α=sensor input delay time

Mark detection data

Set the data to latch at mark detection.

■Motion control data

Settable Motion control data is shown in the table below.

Setting Data	Unit	Data type	Axis No. setting range		
			R64MTCPU	R32MTCPU	R16MTCPU
Feed current value	10^{-1}[μm], 10^{-5}[inch], 10^{-5}[degree], [pulse]	32-bit integer type	1 to 64	1 to 32	1 to 16
Real current value					
Servo command value	[pulse]				
Position feed back					
Absolute position encoder single revolution position					
Absolute position encoder multiple revolution position	—	16-bit integer type			
Deviation counter value	[pulse]	32-bit integer type			
Servo command speed	[pulse/s]				
Motor speed	0.01[r/min]				
Motor current value	0.1[%]	16-bit integer type			
Command generation axis feed current value	Control unit	32-bit integer type			
Command generation axis cumulative current value					
Command generation axis current value per cycle					
Synchronous encoder axis current value	Encoder axis unit		1 to 12		
Synchronous encoder axis current value per cycle					
Cam axis current value per cycle	Cam axis cycle unit		1 to 64	1 to 32	1 to 16
Cam axis current value per cycle (Actual)[*1]					

*1   Current value per cycle takes into consideration the delay of the servo amplifier.

Since the system-specific delay exists in the current value data of the synchronous encoder axis, there may be a difference between the actual current value and the current value of mark detection. When the "synchronous encoder current value", "synchronous encoder axis current value" or "synchronous encoder axis current value per cycle" is used in the mark detection data, the mark detection process compensation time shown below can be set to compensate the delay. However, when the "phase compensation advance time" is set in the synchronous control parameter to compensate the delay of the synchronous encoder, setting of the mark detection process compensation time is not necessary.

Synchronous encoder type	Mark detection process compensation time[μs]
Incremental synchronous encoder	-614
Q171ENC-W8 (Via servo amplifier)	-968

■Word device data

- Device

  Word devices are set for mark detection data. Refer to device list for the range of word devices that can be set. (☞ Page 75 Device List)

- Data type

  Set the data type at word device data setting.

Data type	Remarks
16-bit integer type	—
32-bit integer type	Set the device No. as an even No.
64-bit floating-point type	

• Estimate calculation

Set the estimate calculation to "Valid/Invalid" at the word device data setting.

Estimate calculation		Ring counter value	
Valid	Normal data	—	
	Ring counter	16-bit integer type	K1 to K32767, H0001 to H7FFF
		32-bit integer type	K1 to K2147483647, H00000001 to H7FFFFFFF
		64-bit floating-point type	K2.23E-308 to K1.79E+308
Invalid		—	

(1) Estimate calculation: Valid

Calculation for word device data in the operation cycle is estimated. The latch data is the value estimated at the timing in which the high-speed input request signal is input. The value is calculated as shown in the figure below whether the word device data is normal data or a ring counter. Set the ring counter value for the ring counter.

• Valid (Normal data)
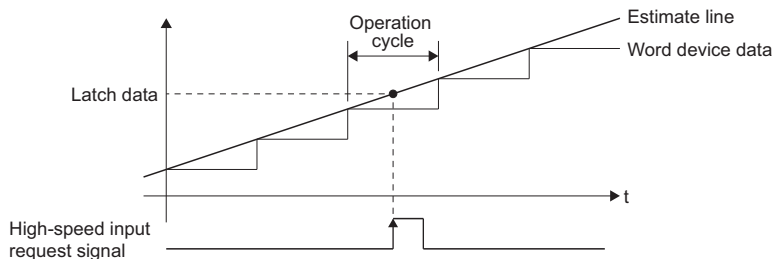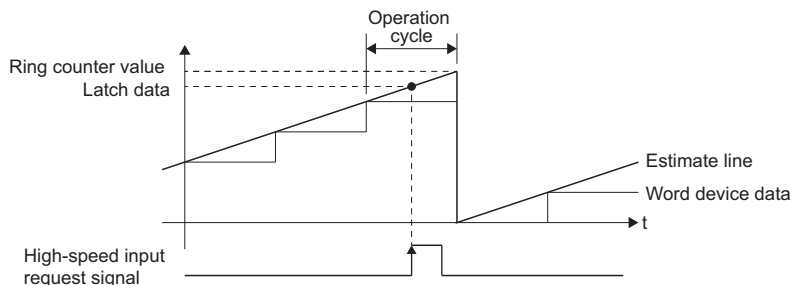
• Valid (Ring counter)

Point

If "Valid (Normal data)" is selected for word device data updated as a ring counter, the latch data may not be estimated correctly.

(2) Estimate calculation: Invalid

Calculation for word device data in operation cycle is not estimated. The latch data is the word device data at the timing in which the high-speed input request signal is input. The detection accuracy is the operation cycle regardless of the high-speed input request signal type.
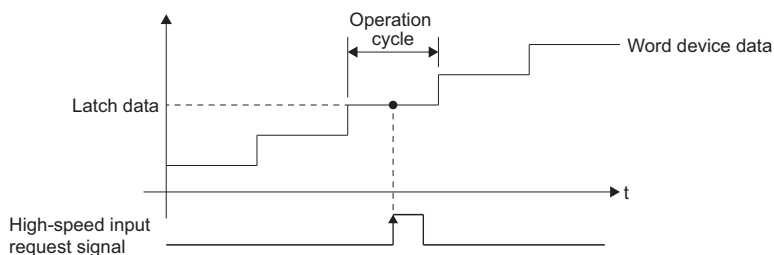
Mark detection data storage device

Set the mark detection data storage device (first device to use in the "Specified Number of Detections mode" or "Ring Buffer mode"). When using the "Specified Number of Detections mode" or "Ring Buffer mode", reserve the device area to accommodate the number of detections. Word devices are set for mark detection data storage devices. Set an even number at the start of the device for 32-bit integer type/64-bit floating-point type devices. If storing 64-bit floating-point type data in specified number of detection mode or ring buffer mode, mark detection data cannot be stored when the device No. for which mark detection data is stored is the end device No. -1. Refer to device list for the range of word devices that can be set. (☞ Page 75 Device List)

Ex.

In the below case, mark detection data is stored in W1FFA: F for the first mark detection, however, data is not stored for subsequent mark detections.

Data type: 64-bit floating-point type data

Mark detection data storage device: W1FFA

Mark detection mode: Specified Number of Detection mode or Ring Buffer mode

Number of mark detections set: 2 or more

Mark detection data range

When the data at mark detection is within the range, they are stored in the mark detection data storage device and the number of mark detections counter is incremented by 1. When outside of range, mark detection is not processed.

- Upper limit value > Lower limit value

  The mark detection is executed when the mark detection data is "greater or equal to the lower limit value and less than or equal to the upper limit value".
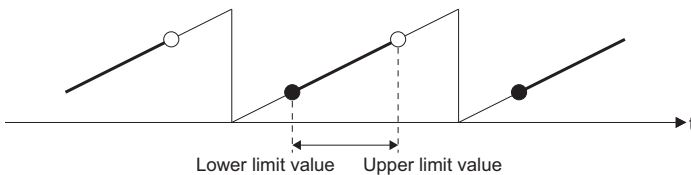
Lower limit value   Upper limit value

- Upper limit value < Lower limit value

  The mark detection is executed when the mark detection data is "greater or equal to the lower limit value or less than or equal to the upper limit value".

Lower limit value   Upper limit value
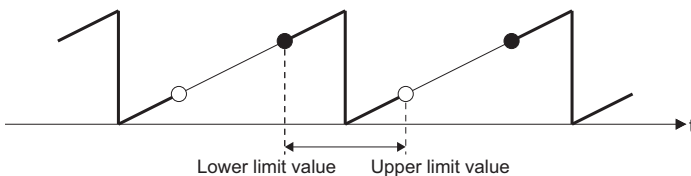
- Upper limit value = Lower limit value

  The mark detection range is not checked. The mark detection is always executed.

■Direct setting

Data type	Setting range
16-bit integer type	K-32768 to K32767, H0000 to HFFFF
32-bit integer type	K-2147483648 to K2147483647, H00000000 to HFFFFFFFF
64-bit floating-point type	K-1.79E+308 to K-2.23E-308, K0, K2.23E-308 to K1.79E+308

■Indirect setting

Word devices are set for the mark detection data range. Set an even number at the start of the device for 32-bit integer type/64-bit floating-point type devices. Setting values are read each operation cycle. Refer to device list for the range of word devices that can be set. (☞ Page 75 Device List)

Mark detection mode setting

Set the data storage method of mark detection.

■Direct setting

Mode	Number of detections	Operation for mark detection	Mark detection data storage method
Continuous detection mode	—	Always	The data is updated in the mark detection data storage device.
Specified number of detection mode	1 to 8192	Number of detections (If the number of mark detections counter is the number of detections or more, the mark detection is not executed.)	The data is stored in the following device area. "Mark detection data storage device + Number of mark detections counter × Mark detection data size"
Ring buffer mode	1 to 8192	Always (The mark detection data storage device is used as a ring buffer for the number of detections.)	

■Indirect setting

Word devices are set for the mark detection mode setting. Refer to device list for the range of word devices that can be set. (☞ Page 75 Device List)

 • Used as a 1 word device.

 • The mark detection mode is specified with the following setting values.

Setting value	Mode
0	Continuous detection mode
1 to 8192	Specified number of detection mode (Set the number of detections)
-8192 to -1	Ring Buffer mode (Set a negative value for the buffer count.)
Other than the above	Mark detection invalid

 • Setting values are read each operation cycle.

Number of mark detections counter

The counter value is incremented by 1 at mark detection. Preset the initial value (0, etc.) in the user program to execute the mark detection in "Specified Number of Detections mode" or "Ring Buffer mode". Word devices are set for the mark detection times counter. Refer to device list for the range of word devices that can be set. (☞ Page 75 Device List)

 • Used as a 1 word device.

 • The counter is updated as follows after mark detection data storage.

Mode	Storage value
Continuous detection mode	0 to 65535 1 is added to the counter value. The counter returns to 0 if 65535 is exceeded.
Specified number of detection mode	0 to (specified number of detections) 1 is added to the counter value.
Ring buffer mode	0 to (buffer count -1) 1 is added to the counter value. The counter returns to 0 if the counter value reaches or exceeds the buffer count.

This setting can be omitted when the continuous detection mode is selected.

Mark detection current value monitor device

The current value of mark detection data can be monitored. Word devices are set for mark detection current value monitor devices. Set an even number at the start of the device for 32-bit integer type/64-bit floating-point type devices. Monitor values are updated each operation cycle. Refer to device list for the range of word devices that can be set. (☞ Page 75 Device List) This setting can be omitted.

4.4 Servo ON/OFF

Servo ON/OFF

This function executes servo ON/OFF of the servo amplifiers connected to the Motion CPU. By establishing the servo ON status with the servo ON command, servo motor operation is enabled. The following two signals can be used to execute servo ON/OFF.

- [Rq.1123] All axes servo ON command (R: M30042/Q: M2042) (Common on all axes)
- [Rq.1155] Servo OFF command (R: M34495+32n/Q: M3215+20n) (For each axis)

A list of the "[Rq.1123] All axes servo ON command (R: M30042/Q: M2042)" and "[Rq.1155] Servo OFF command (R: M34495+32n/Q: M3215+20n)" is given below.

○: Servo ON (Servo operation enabled), ×: Servo OFF (Servo operation disabled)

		[Rq.1155] Servo OFF command (R: M34495+32n/Q: M3215+20n)			
		OFF		ON	
		Operation enabled/disabled	Command to servo amplifier	Operation enabled/disabled	Command to servo amplifier
[Rq.1123] All axes servo ON command (R: M30042/Q: M2042)	OFF	×	Servo ON command: OFF Ready ON command: OFF	×	Servo ON command: OFF Ready ON command: OFF
	ON	○	Servo ON command: ON Ready ON command: ON	×	Servo ON command: OFF Ready ON command: ON

> **Point**
>
> - Refer the following for details of servo ON command OFF and ready ON command OFF from Motion CPU.
>   📖 Servo amplifier Instruction Manual
> - When the delay time of "Electromagnetic brake sequence output (PC02)" is used, execute the servo ON to OFF by "[Rq.1155] Servo OFF command (R: M34495+32n/Q: M3215+20n)".
> - If the servomotor is rotated by external force during the servo OFF status, follow up processing is performed. (☞ Page 109 Follow up function)
> - Change between servo ON or OFF status while operation is stopped (position control mode). The servo OFF command of during operation (during start accept flag ON) will be ignored.
> - When "[Rq.1123] All axes servo ON command (R: M30042/Q: M2042)" is turned OFF → ON, the servo does not turn ON for axes for which the "[Rq.1155] Servo OFF command (R: M34495+32n/Q: M3215+20n)" is ON.
> - When the servo OFF is given to all axes, "[Rq.1123] All axes servo ON command (R: M30042/Q: M2042)" is applied even if all axis servo ON command is turned ON to OFF with "[Rq.1155] Servo OFF command (R: M34495+32n/Q: M3215+20n)".
> - Even if the Motion CPU status is STOP, ON/OFF control for "[Rq.1123] All axes servo ON command (R: M30042/Q: M2042)" is possible.
> - "[Rq.1123] All axes servo ON command (R: M30042/Q: M2042)" is forcibly turned OFF when the forced stop input bit device is turned ON → OFF (set at [Motion CPU Common Parameter] ⇨ [Basic Setting] ⇨ "Forced stop input setting").

Monitor signals

The servo ON/OFF and ready ON/OFF status can be monitored with the following signals.

■Servo ON/OFF
- [St.1075] Servo ready (R: M32415+32n/Q: M2415+20n)
- [Md.108] Servo status 1 (R: D32032+48n/Q: #8010+20n) (b1: Servo ON)

■Ready ON/OFF
- [Md.108] Servo status 1 (R: D32032+48n/Q: #8010+20n) (b0: Ready ON)

Monitor devices and the servo amplifier status

The relationship between related command devices, monitor devices and the servo amplifier status is shown below. Refer to the following for details on servo amplifier LED display and each status.

📖 Servo amplifier Instruction Manual
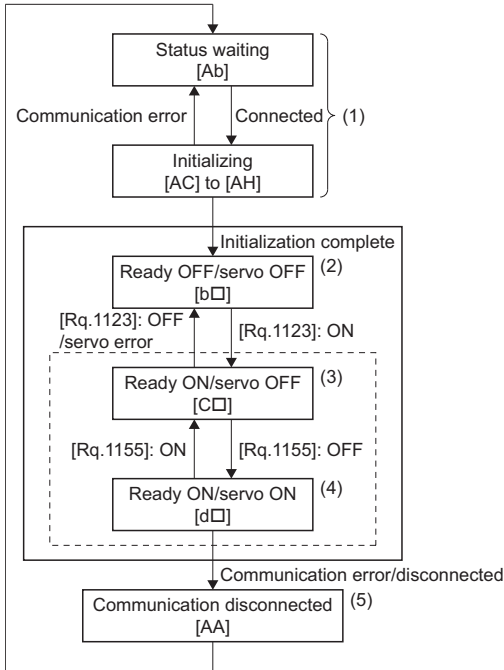
*: The value in the parentheses [ ] indicates the servo amplifier LED display.

	[St.1075] Servo ready (R: M32415+32n/Q: M2415+20n)	[Md.108] Servo status1 (R: D32032+48n/Q: #8010+20n)	
		b1: Servo ON	b0: Ready ON
(1)	OFF	OFF	OFF
(2)	OFF	OFF	OFF
(3)	OFF	OFF	ON
(4)	ON	ON	ON
(5)	OFF	OFF	OFF

Follow up function

The follow up function monitors the number of motor rotations (actual present value) with the servo OFF and reflects the value in the present feed value. If the servomotor rotates during the servo OFF, the servomotor will not just rotate for the amount of droop pulses at switching the servo ON next time, so that the positioning can be performed from the stop position.

Execution of follow up

Follow up function is executed continually in the operation cycle during the servo OFF status (including servo OFF by servo error).

Point💡
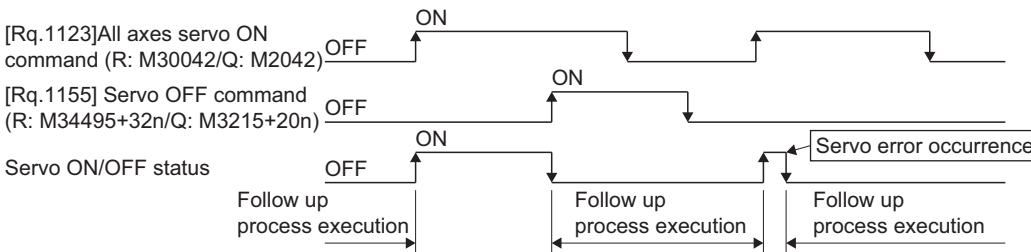
The follow-up process is performed during "servo OFF" and SSCNETⅢ(/H) communication.

4.5　Absolute Position System

Absolute position system

The positioning control for absolute position system can be performed using the absolute-position-compatible servomotors and servo amplifiers. If the machine position is set at the system starting, home position return is not necessary because the absolute position is detected at the power on. Absolute data (current value backup data, home position data) used with absolute system control is stored in the Motion CPU internal backup memory. The absolute position system configuration is as follows.
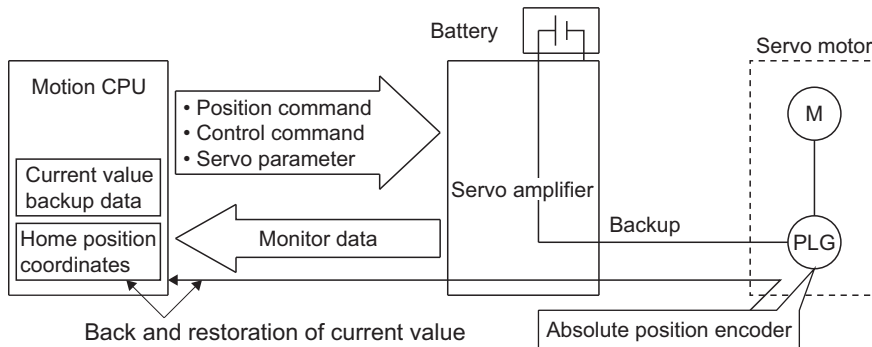
Absolute position system start

Set the "Absolute position detection system (PA03)" in the servo parameters to "1" for axes used with the absolute position system. To establish the machine position, perform home position return with the servo program servo command (ZERO), or with test mode. (☞ Page 329 Test Mode)

Establishing the absolute position

In the absolute positioning system, the absolute position may be lost in the following cases: Set the absolute position with a home position return.
- The battery unit of the servo amplifier is removed or replaced.
- The battery error of the servo amplifier occurs. (It is detected at the servo amplifier power on).
- The machine system is disturbed by a shock.
- The cable between servo amplifier and encoder is removed, or the servo amplifier or encoder is replaced.
- If there is an abnormality with the counter of the absolute position encoder.

Monitoring the absolute position data

Absolute position data can be monitored with the MT Developer2 current value history monitor. (☞ Page 334 Current value history monitor)

Erasing of absolute position data

If a minor error (error code: 197EH) occurs because of a communication error between the servo amplifier and encoder, depending on the servo amplifier software version, "[St.1069] Home position return request (R: M32409+32n/Q: M2409+20n)" may turn ON, and absolute position data is erased.

一: There is no restriction by the version.

Servo amplifier		Operation of "[St.1069] Home position return request (R: M32409+32n/Q: M2409+20n)" when error occurs
Model name	Software version	
MR-J3-□B	C3 or later	"[St.1069] Home position return request (R: M32409+32n/Q: M2409+20n: OFF)" does not turn ON.
MR-J3-□B-RJ006		
MR-J3-□B Safety		
MR-J3-□B-RJ004	C5 or later	
MR-J3-□B-RJ080W		
MR-J3W-□B	B1 or later	
MR-J4-□B	—	
MR-J4-□B-RJ		
MR-J4-□B-LL		
MR-J4W-□B		
Others		"[St.1069] Home position return request (R: M32409+32n/Q: M2409+20n: ON)" turns ON. (absolute position data is lost)

Clearing absolute position data

Absolute position data stored in the Motion CPU module is erased when the built-in memory (for all axes) is cleared with the rotary switch. Always perform home position return after clearing absolute position data. Furthermore, take a data backup if necessary. Please note that absolute position data will not be lost when installing the operating system software.

⚠ CAUTION

- After removing or replacing the battery unit of the servo amplifier, check that the absolute position is established.
- After a servo amplifier battery error occurs, eliminate the cause of the error and ensure operation is safe before setting the absolute position.
- After the mechanical system is disturbed by a shock, make the necessary checks and repairs, and ensure operation is safe before setting the absolute position.

Point🖉

- The address setting range of absolute position system is -2147483648 to 2147483647. It is not possible to restore position commands that exceed this limit, or current values after a power interruption. Correspond by the [degree] setting for an infinite feed operation.
- Even when the current value address is changed by a current value change instruction, the restored data for the current value after a power interruption is the value based on the status prior to execution of the current value change instruction.
- When home position return has not been completed (home position return request is ON), restoration of the current value after a power interruption is not possible.

Synchronous control absolute position system

The status (current value, reference position, etc.) of each module when performing advanced synchronous control is stored in the Motion CPU internal backup memory. (A backup is always taken regardless of the servo amplifier used, or the valid/invalid status of the servo motor absolute position system.) Resuming synchronous control is easy using an absolute position compatible servo motor and servo amplifier. Refer to the following for details on how to resume synchronous control.

📖MELSEC iQ-R Motion Controller Programming Manual (Advanced Synchronous Control)

Synchronous control backup data stored in the Motion CPU is erased (for all axes) when the built-in memory is cleared with the rotary switch. Set the synchronous positional relationship for each axis if necessary.

Saving and recovering backup data

Absolute position data stored inside the Motion CPU and synchronous control backup data can be saved or recovered with the MT Developer2 backup function. By saving/recovering not only programs and parameters, but also absolute position data and synchronous control backup data when replacing the Motion CPU module, the time take to restart can be shortened.

4.6 Clock Function

The CPU No.1 PLC CPU clock data is the standard clock information added to event history and all kinds of monitor information. The following is an overview of the clock function.

Clock data settings

Set the CPU No.1 clock data. Refer to the following for details on the CPU No.1 clock data setting method.
📖MELSEC iQ-R CPU Module User's Manual (Application)
The Motion CPU runs automatically based on the CPU No.1 clock data.

Clock data synchronization timing and precision

When power supply in turned ON, the clock is always synchronized with the clock data of CPU No. 1.(1ms precision)
However, for information on errors that occurred when transmission with CPU No. 1 is not established such as during initial processing, the correct clock data may not be applied.

Clock data information

The clock data transmitted by the CPU No.1 is in year (1980 to 2079), month, day of the month, day of the week, hour, minute, and second (1/1000th units).

Clock data reading

If using the clock data with the program, clock data can be read with the following special relay and special registers.

■Special relay
 • Clock data read request (SM213)
Refer to special relays for details on special relays.()

■Special register
 • Clock data (SD210) (Year)
 • Clock data (SD211) (Month)
 • Clock data (SD212) (Day)
 • Clock data (SD213) (Hour)
 • Clock data (SD214) (Minute)
 • Clock data (SD215) (Second)
 • Clock data (SD216) (Day of week)

Refer to special registers for details on special registers. ()

4.7 File Transfer Function

The file transfer function is capable of reading and writing the following files with a "File transmission request (SD820)".

○: Possible, ✕: Not possible

File	Reading from file	Writing to file
Servo parameters	○	○
Cam file	○	✕

> **Point**
>
> By performing file transfer to the write target file, the existing target file is overwritten. Transfer the necessary data after first performing a backup with MT Developer2.

Device list

With the file transfer function, all requests are set in "File transmission request (SD820)", and the processing status for each request is stored in "File transfer status (SD554)".

■File transfer status devices

Device No.	Content details	Set side
SD554	The status of data transfer between the file and built-in memory is stored. | Monitor value	Status	Details | |---|---|---| | 0 | Awaiting request acceptance | File transfer requests can be accepted. | | -1 | Awaiting execution | The system is waiting for a file transfer request. | | -2 | Executing | File transfer is being executed. | | -1□□ | Error completion | An error occurred and file transfer was not completed. □□ represents the following. • Setting servo parameters: Axis No. at which error occurred • Servo amplifier axis: 1 to 64 • Sensing module (RIO axis): 91 to 98 (601 to 608) • Setting cam file: fixed at 00 |	System (main processing)

■File transfer request (command) devices

Device No.	Content details	Set side
SD820	Data between the file and built-in memory is synchronized, and a file transfer request is made. The type of data to be synchronized is set in hexadecimal notation. **Setting value / Command / Details table below**	User (During STOP/during RUN)

Setting value	Command	Details
0000H	No request	This value is set when there is no request.
1000H to 9062H	Servo parameter reading/writing command	Specifies the servo parameter target axis No. and target file to be read/written for file transfer. H □□□□ → Target axis No. (Axis No.: 1 to 64, RIO axis No.: 601 to 608) • 00 to 40H: Servo amplifier axis • 5B to 62H: Sensing module (RIO axis) *: "00H" applies to all axes → Read/write target file • 10: Built-in memory to file (Standard ROM) • 20: Built-in memory to file (SD memory card) • 80: File (Standard ROM) to built-in memory • 90: File (SD memory card) to built-in memory
A000H to B400H	Cam file reading/writing command	Specifies the cam file target cam No. and target file to be read/written for file transfer. H □□□□ → Target cam No.(1 to 1024) 000 to 400H *: "000H" applies to all cam files → Read/write target file • A: File (Standard ROM) to built-in memory • B: File (SD memory card) to built-in memory
FFFEH	Execution command	By specifying a setting value when "File transfer status (SD554)" is waiting to be executed (-1) after setting each command value, processing is executed.

Point

- The moment that the servo parameter read/write command (1000H to 9062H) and cam file read/write command (A000H to B400H) used to perform file transfer are set in the "File transmission request (SD820)", the "File transfer status (SD554)" only changes to the awaiting execution status (-1), and actual processing is not yet performed. Perform processing by setting the execution command (FFFEH) in the "File transmission request (SD820)".
- If an axis No. (00H to 40H, 5BH to 62H), SSCNETⅢ/H head module RIO axis No., or cam No. (000H to 400H) that has not been set in the system is set, the status returns to awaiting command acceptance (0), and the "File transfer status (SD554)" does not change to the awaiting execution status (-1).
- If any of the following occur while "File transfer status (SD554)" is being executed (-2), an error occurs, and file transfer is terminated. (The "File transmission request (SD820)" status changes to awaiting request acceptance (0).)

  • The target file does not exist. (Transferring from file to built-in memory)
  • The target file cannot be opened.
  • The target file is corrupt.
  • The target folder capacity is insufficient. (Transferring from built-in memory to file)
  • The content of the servo parameter file is incorrect.
  • The cam file content is incorrect.
  • The cam open area size is insufficient.

File transfer operation

- Operation when the file transfer target is a servo parameter file is as follows.

Request	Target axis	Operation
Built-in memory to file transfer	Any given 1 axis	• The target axis servo parameter open area content is written to the servo parameter file. • If an error occurs during execution, the servo parameter file is not updated.
	All axes	• The servo parameter open area content is written to the servo parameter file in order of the smallest system setting axis No. first. • When transfer is complete for all axes, the "File transfer status (SD554)" changes to "0: Awaiting request acceptance". • If an error occurs with any of the files, transfer is terminated for the axis at which the error occurred and after.
File to built-in memory	Any given 1 axis	• The target axis servo parameter file content is read to the servo parameter open area. • If an error occurs during execution, the servo parameter open area is not updated.
	All axes	• The servo parameter file content is read to the servo parameter open area in order of the smallest axis No. set in the system. • When transfer is complete for all axes, the "File transfer status (SD554)" changes to "0: Awaiting request acceptance". • If an error occurs with any of the files, transfer is terminated for the axis at which the error occurred and after.

- Operation when the file transfer target is a cam file is as follows.

Request	Target cam No.	Operation
File to built-in memory	Any given 1 file	• The target cam file content is read to the cam open area. • If an error occurs during execution, the cam open area is not updated.
	All cam files	• The content of the cam file in the folder is read to the cam open area one item at a time. • When transfer is complete for all axes, the "File transfer status (SD554)" changes to "0: Awaiting request acceptance". • If an error occurs for any files, expansion of that file is terminated, and the next cam file is transferred. (The "File transfer status (SD554)" changes to "-100: Error completion".)

> **Point**
>
> When the execution command (FFFEH) is accepted, "Cam data writing (SM505)" turns ON, and then turns OFF when file transfer is complete. The system will be executing a CAMRD, CAMWR, or CAMM command when the execution command is accepted, and therefore if "Operating cam data (SM505)" is ON, file transfer will not be executed, and the "File transfer status (SD554)" will change to error completion (-100).

File transfer procedure

The procedures used to transfer servo parameter files and cam files is shown below.

■Transferring servo parameter files from the built-in memory to the SD memory card

Operating procedure

1. Set the axis No. to be transferred to "File transmission request (SD820)". (Setting: 2001h to 2040H, 205BH to 2062H)

2. Ensure that the "File transfer status (SD554)" is "-1: Awaiting execution".

3. Set the "FFFEH: Execution command" for the "File transmission request (SD820)".

4. Ensure that the "File transfer status (SD554)" is "-2: Executing". (Performing file transfer)

5. Ensure that the "File transfer status (SD554)" is "0: Awaiting request acceptance". (File transfer complete)

■Transferring all standard ROM cam files to the cam open area

Operating procedure

1. Ensure that the "Cam data writing flag (SM505)" is OFF.

2. Set the "A000H" for the "File transmission request (SD820)".

3. Ensure that the "File transfer status (SD554)" is "-1: Awaiting execution".

4. Set the "FFFEH: Execution command" for the "File transmission request (SD820)".

5. Ensure that the "File transfer status (SD554)" is "-2: Executing". Ensure that the "Cam data writing flag (SM505)" is ON. (Performing file transfer)

6. Ensure that the "File transfer status (SD554)" is "0: Awaiting request acceptance". Ensure that the "Cam data writing flag (SM505)" is OFF. (File transfer complete)

4.8 File Transmission at Boot Function

By using the file transmission at boot function, operations such as the following can be performed when Multiple CPU system power supply is turned ON, or reset.

- Copy the parameters and programs on the standard ROM to the SD memory card.
- Copy the parameters and programs on the SD memory card to the standard ROM and startup Motion CPU.

Set the operation of the file transmission at boot function in [Motion CPU Common Parameter] ⇨ [Basic Setting] ⇨ "File Transmission Setting during Booting".

When the Multiple CPU system power supply is turned ON, file transmission at boot is executed as per the "File Transmission Setting during Booting".

⚠ CAUTION

- Depending on the contents of the boot operation file, Motion CPU control can be changed just by installing the SD memory card. To avoid unexpected operations, check the data on the SD memory card before installing.
- Depending on the boot operation file, control data in the Motion CPU can be taken out from the CPU. To avoid the unauthorized reading/taking of data, use the security function. (☞ Page 295 Security Function)

File transmission at boot files

In file transmission at boot, the boot operation file, and boot log file are saved to the "$MMTPRJ$" folder of the SD memory card root folder.

Item	File name	Operation	File saving
Boot operation file	boot01.csv	Executes file transmission at boot after Multiple CPU system power supply is turned ON.	User saves the file in the "$MMTPRJ$" folder.
Boot log file	bootlog.txt	Stores the list of files that are read at the initial processing after Multiple CPU system power supply is turned ON, and the processing details of file transmission at boot. The contents are overwritten each time the Multiple CPU system power supply is turned ON.	System saves the file in the "$MMTPRJ$" folder.
Boot log file (previous boot log)	bootlog.bak	Renames the "bootlog.txt" file as "bootlog.bak" when the Multiple CPU system power supply is turned ON.	

Functions of the boot operation file

The operations specified by the boot operation file are shown below.

○: Can be specified, —: Can not specified (specified as blank)

Function (Transmit mode character string)	Operation	Setting items				Remarks
		File name	Source	Destination	Transmit mode	
File copy (copy)	Copies the specified file, or files in the specified folder.	○	○	○	○	When a file with the same name exists in the destination, the file is overwritten.
File move (move)	Moves the specified file, or files in the specified folder.	○	○	○	○	When a file with the same name exists in the destination, the file is overwritten. The source file is deleted.
File delete (delete)	Deletes the specified file, or specified folder.	○	—	○	○	For "delete", specify the source as blank.
Control data set (pathset)	Specifies the file to be used as control data. The system can be startup by reading a file from a different folder, without changing the standard ROM.	○	○	—	○	• For "pathset" specify the destination as blank. • The control data to be changed becomes the specified file in the parameter change function as well. • A servo parameter file cannot be specified to the file name.

Boot operation file content

The boot operation file is written in CSV (comma-separated values) format. Write CSV file records (1 line) as follows. There is no restriction on the number of records.

■Format (1 record)

[File name], [Source], [Destination], [Transmit mode]

Format	Character string	Details	Remarks
File name	Character string	Up to 63 characters	• Write the file (in the $MMTPRJ$ folder) of the control data to be transmitted. • Wildcard symbol may be used.
	Wildcard symbol	*: Any given character string ?: Any given character	
Source	/rom	Standard ROM	• Write the memory of the source. • When specifying file delete (delete), specify the source as blank.
	/sdc	SD memory card	
Destination	/rom	Standard ROM	• Write the memory of the destination. • When "/rom" is written, the files in the standard ROM are updated, and the Motion CPU controls with the updated data after the file transmission at boot is completed. • When specifying control data set (pathset) to the transmit mode, specify as blank. • When file copy (copy) or file move (move) is specified and the source and destination are the same, it is not processed.
	/sdc	SD memory card	
Transmit mode	copy	File copy	Write the transmit mode.
	move	File move	
	delete	File delete	
	pathset	Control data set	

Point

- When the specified file cannot be found, or the transmit mode cannot be determined, the file is not read and the next record (next line) is analysed.
- The files that are not specified by the boot operation file are read from the standard ROM.
- The characters for each field are not case-sensitive.
- By writing "//" at the beginning of a record (1 line), the character string is determined to be a comment line and is ignored, and analysis moves to the next record (next line).
- The character strings of the fields after the transmit mode are ignored, and the next record (next line) is analysed.
- When a boot operation file is in both the standard ROM and SD memory card, the boot operation file in the SD memory card is processed.
- When there are too many files to be processed by the boot operation file (boot01.csv) and it takes time to transmit all files, a moderate error (error code: 2460H) may occur after turning the Multiple CPU system power supply ON. Revise the files to be transferred.
- Copying and moving is not performed for programs that are locked by Motion CPU security.
- Copying and moving the boot operation file (boot01.csv) and boot log file (bootlog.txt) by file transmission at boot is not possible. The copy and move commands are ignored.
- When an error occurred during file transmission or security authentication, a moderate error (error code: 3070H to 3073H) is detected, and an error message is output to the boot log file (bootlog.txt).
- When an error is detected in the boot log file (bootlog.txt), a warning (error code: 0ED0H, 0ED1H) occurs.

■File types that can be specified

The files that can be specified to control data are shown below.

The maximum number of files that can be specified in control data set (pathset) is 512.

However, when using wildcard or specifying a folder, numerous files are selected with one specification.

When there is cam data in the folder specified for control data, the folder of the cam data files is switched. (A message for the change of the folder of the cam data is output to the boot log.)

Method of control data specification	File type	Remarks
Specification of files individually	■R series common parameter (/sys/) • System parameter file (SYSTEM.PRM) • CPU parameter file (CPU.PRM) • Module parameter file (UNIT.PRM) ■Motion CPU common parameter (/sys/) • Basic settings file (mot_sys.csv) • Servo network settings file (motnet01.csv, motnet02.csv) • High-speed input request signal settings file (fsinput.csv) • Mark detection setting file (markdt.csv) • Limit switch output settings file (limitout.csv) • Manual pulse generator connection settings file (mpulser.csv) • Vision system parameters files (vs_sys.csv, vs_prg.csv) • Head module settings file (rioref.csv) • Multiple CPU refresh (main cycle/operation cycle) settings file (fastref.csv) ■Motion control parameter (/motpara/) • Axis settings parameter file (axpara01.csv to axpara64.csv) • Parameter block file (para_blk.csv) • Servo input axis parameter file (in_servo.csv) • Machine common parameter (mcn_com.csv) • Machine parameter (mcn01.csv to mcn08.csv) ■Advanced synchronous control data (/sync/) • Synchronous encoder axis parameter file (in_enc.csv) • Command generation axis parameter file (in_cmgen.csv) • Synchronous parameter file (out01.csv to out64.csv) • Multiple CPU advanced synchronous control settings file (cpu_sync.csv) ■Program (/prog/) • Servo program file (servo.prg) • Servo program file (servo2.prg) • Motion SFC parameter file (motsfcpr.bin) • Motion SFC parameter file (motsfcp2.bin) • Motion SFC program file (motsfc.prg) • Motion SFC program file (motsfc2.prg) ■G-code control (/gcode/) • G-code control system parameter file (gcdsys01.csv, gcdsys02.csv) • G-code control axis parameter file (line 1)(gcd1ax1.csv to gcd1ax8.csv) • G-code control axis parameter file (line 2)(gcd2ax1.csv to gcd2ax8.csv) • G-code control work parameter file (gcdproc.csv) ■Label/structure • Label/structure file (GL_LABEL.IF2)	• Wildcard specification is possible. • Folder specification is possible. (Files in the folder are searched for, and the folder of each file is set. When there is cam data, the folder is switched in the same way as when "cam*.csv" is specified. When there is a G-code control program, the folder is switched in the same way as when "O*.gcd" is specified.)
Specification of files by file type	■Advanced synchronous control data (/sync/) • Cam data file (cam*.csv) ■G-code control (/gcode/prog) • G-code program file (O*.gcd)	• All cam data files (cam0001.csv to cam1024.csv) are specified by writing "cam*.csv". All G-Code control program files (O001.gcd to O256.gcd) are specified by writing "O*.gcd". • When cam data files and G-code control program files are specified individually, they are not processed. • When cam files are specified, the cam data of the specified folder is read at the Multiple CPU system power supply turning ON.
Cannot be specified	■Motion control parameter • Servo parameter file (svpara01.csv to svpara64.csv, svpara91.csv to svpara98.csv) ■Program • Online change program file (df_f0000.prg to df_f4095.prg, df_g0000.prg to df_g4095.prg, df_k0000.prg to df_k8191.prg, df_sf000.prg to df_sf511.prg) ■Digital oscilloscope • Digital oscilloscope sampling data file (********.csv) • Digital oscilloscope settings file (osc01.csv) ■Device comment • Device comment file (DEVCMNT.DC2)	When control data is specified, it is not processed.

Description example

- Write all of the data in the "$MMTPRJ$" folder of the standard ROM to the SD memory card.

```
*, /rom, /sdc, copy
```

- Overwrite the standard ROM with the data in the "$MMTPRJ$/motpara" folder of the SD memory card.

```
/motpara/*, /sdc, /rom, move
```

- Delete all of the cam data files (cam0001.csv to cam1024.csv) in the "/sync" folder of the SD memory card.

```
/sync/cam*.csv, , /sdc, delete
```

- Read the data of "$MMTPRJ$/motpara/axpara01.csv" on the SD memory card, and startup the system.

```
/motpara/axpara01.csv, /sdc, , pathset
```

Precautions

- When a Motion SFC program file, or servo program file is specified, depending on whether an online change program file exists or not, the program may not operate as intended. Therefore before performing file transmission at boot, we recommend deleting the "/prog" folder of the destination using file delete (delete), then transmitting the entire "/prog" folder.

Ex.

Moving the data of the /prog folder on the SD memory card to the standard ROM

```
/prog/*, , /rom, delete
/prog/*, /sdc, /rom, move
```

- When an online change is performed on a Motion SFC program or servo program file, the change is not reflected on the program on the SD memory card.
- When "copy" or "move" from the SD memory card to the standard ROM is specified by the boot operation file, the file saved on destination Motion CPU is overwritten.
- Even if the parameter files are stored in the SD memory card, when the control data is not specified by the boot operation file, operation is conducted according to the parameter file settings in the Motion CPU.
- Make the module (Motion CPU model) of the program written to the SD memory card (program set by the boot operation file settings), and the Motion CPU model of the destination the same.
- When characters other than ASCII characters are used in the file name, a moderate error (error code: 3070H) occurs.
- When a wildcard specification is used in the file name, and characters other than ASCII characters are used in the file names in the SD memory card, a moderate error (error code: 3070H) occurs.

File transmission at boot procedure

The procedure for performing a file transmission at boot from the SD memory card to the standard ROM is shown below.

Create boot operation file

Using a personal computer, create the boot operation file (boot01.csv), and write the boot operation file (boot01.csv) to the "$MMTPRJ$" folder in the SD memory card.

Set parameters of the Motion CPU

Set the file transmission at boot parameters in [Motion CPU Common Parameter] ⇨ [Basic Setting] ⇨ "File Transmission Setting during Booting". (☞ Page 61 Basic setting)
Write the parameters to the Motion CPU, and turn Multiple CPU system power supply OFF to ON, or reset.

> **Point**
>
> The status of file transmission at boot can be checked with "Boot file transfer information (SD509)"

Write data to SD memory card

Install the SD memory card to the Motion CPU, and write the files to be used in file transmission at boot to the SD memory card using MT Developer2.

Execute file transmission at boot

Execute the boot operation file (boot01.csv) in the SD memory card by turning Multiple CPU system power supply ON to OFF, or reset.
The processing details of the file transmission at boot are stored in the standard ROM and SD memory card as a boot log file (bootlog.txt).

> **Point**
>
> Check the contents of the boot log file (bootlog.txt) using a personal computer to view the boot log file (bootlog.txt) in the "$MMTPRJ$" folder in the SD memory card.

Operation when security function is set

This section shows the operation when security function is set.

Refer to security function for the security function. (☞ Page 295 Security Function)

File password

If a file password is set to a file in the Motion CPU, the file password is authenticated at file transmission at boot.

When file passwords are set to files inside the boot operation file, files are transmitted only when all the file passwords of all of the files in the source and destination are matched.

■Transmitting from SD memory card to standard ROM

—: No such combination

Source (SD memory card) file		Destination (standard ROM) file		Password matched/not matched[1]	Transmission permitted
Files	File password setting	Files	File password setting		
Files are stored	File password set	Files are stored	File password set	Matched	Transmission permitted
				Not matched	Transmission not permitted[2]
			No file password set	—	Transmission not permitted[2]
		No files are stored	—	—	Transmission permitted
	No file password set	Files are stored	File password set	—	Transmission not permitted[2]
			No file password set	—	Transmission permitted
		No files are stored	—	—	Transmission permitted

*1 When a read protect and a write protect password are set, if one of the passwords do not match, the file passwords are determined as not matched.
*2 A moderate error (error code: 3072H) occurs.

■Boot file transmission from standard ROM to SD memory card

—: No such combination

Source (standard ROM) file		Destination (SD memory card) file		Password matched/not matched[1]	Transmission permitted
Files	File password setting	Files	File password setting		
Files are stored	File password set	Files are stored	File password set	Matched	Transmission not permitted[2]
				Not matched	Transmission not permitted[2]
			No file password set	—	Transmission not permitted[2]
		No files are stored	—	—	Transmission not permitted[2]
	No file password set	Files are stored	File password set	—	Transmission not permitted[2]
			No file password set	—	Transmission permitted
		No files are stored	—	—	Transmission permitted

*1 When a read protect and a write protect password are set, if one of the passwords do not match, the file passwords are determined as not matched.
*2 A moderate error (error code: 3072H) occurs.

Point

When performing file delete (delete), the files to be deleted will be deleted regardless of whether there is a file password set or not.

Security key

When a security key is set to a program file, and the security key of the program file does not match the security key of the Motion CPU, a moderate error (error code: 3072H) occurs, and file transmission is not performed. A moderate error (error code: 3072H) also occurs when a security key is not written to the Motion CPU.

■Transmitting from SD memory card to standard ROM

—: No such combination

Program file security key	Motion CPU security key	Security key matched/not matched	Transmission permitted
Security key set	Security key is written	Matched	Transmission permitted
		Not matched	Transmission permitted[*1]
	Security key is not written	—	Transmission permitted[*1]

*1 Transmission is permitted but a moderate error (error code: 2300H) occurs at security key authorization when the Multiple CPU system power supply is turned ON.

■Boot file transmission from standard ROM to SD memory card

—: No such combination

Program file security key	Motion CPU security key	Security key matched/not matched	Transmission permitted
Security key set	Security key is written	Matched	Transmission not permitted[*1]
		Not matched	Transmission not permitted[*1]
	Security key is not written	—	Transmission not permitted[*1]

*1 A moderate error (error code: 3072H) occurs.

4.9 File Transmission Via FTP Server

The parameters and project files in the Motion CPU can be viewed via a module (such as RJ71EN71) that can access other CPUs using the FTP server function. The following operations are possible when using the file transmission via FTP server.

- When combined with the digital oscilloscope function (CSV format) online, preventive maintenance data such as servo motor temperatures and lifetimes can be obtained periodically, or at error occurrences, and analyzed on an FTP client or personal computer.
- Files such as project files, parameters, and cam data can be read to a remote device, or written from a remote device via FTP. (Each file can be output with "Read from memory card" and "Write to memory card" in MT Developer2.)
- Large amounts of data files stored in the central server can be read or written via FTP.

*1: Security settings
(1) External security device (such as IP filtering)
(2) Enable/disable network FTP function
(3) Network module security settings
(4) File password function
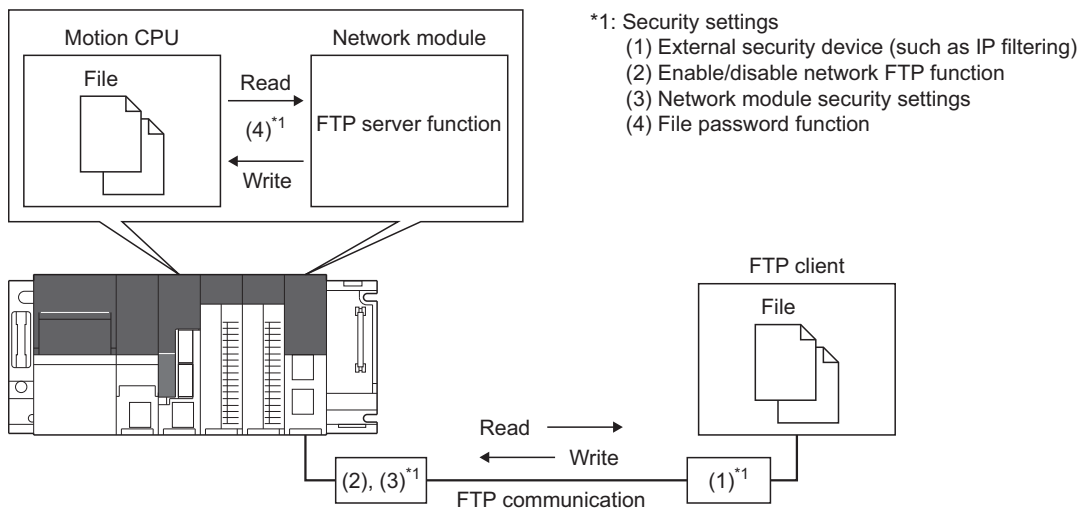
FTP command

The commands that can access the Motion CPU via FTP server function are shown below.

Refer to the following for details of FTP commands.

📖MELSEC iQ-R Ethernet User's Manual (Application)

Command	Function
cpuchg	Specify the CPU module for accessing when configuring the Multiple CPU system.
delete	Delete a CPU module file.
get	Read a file from CPU module.
put	Write a file to CPU module.
passwd-rd	Set/display/clear a file password (read password).
passwd-wr	Set/display/clear a file password (write password).

- The operations for each command when executed for a directory are shown below.

Command	Operation
delete	• When the directory is empty, the directory is deleted. • When the directory is not empty, the directory is not deleted.
get	The directory is not written.
put	The directory is not read.

- The drive No. of the Motion CPU used in each command is shown below.

Drive No.	Drive name
2	SD memory card
4	Standard ROM

Writing example

■Getting parameters via the FTP server function

Login from an FTP client to a module that can be accessed with the FTP server function.

Specify the access target of the module that can be accessed with the FTP server function in the Motion CPU.

Example	Details	Remarks
quote cpuchg no2	Specify Motion CPU No.2	Each command can be sent to the Motion CPU after successfully accessing the Motion CPU.
quote passwd-rd ABCD	Read password (example: ABCD) is enabled in "axpara01.csv", therefore password is authenticated.	When password setting of a module with FTP server function is completed, files with Motion CPU read password enabled can be accessed.
get 4:\$MMTPRJ$\motpara\axpara01.csv	Read the parameters of axis 1 from the Motion CPU to the FTP client.	Set the name of the file to get and the path. After getting the file, it is transmitted from the Motion CPU to a local directory on the FTP client, and the file is generated in the FTP client.

■Writing parameters of axis 1 from the FTP client

Example	Details	Remarks
quote passwd-wr EFGH	Write password (example: EFGH) is enabled in "axpara01.csv", therefore password is authenticated.	When password setting of a module with FTP server function is completed, files with Motion CPU write password enabled can be written to.
delete 4:\$MMTPRJ$\motpara\axpara01.csv	Delete axis 1 parameters from FTP client.	Delete the file before sending it from the FTP client.
put axpara01.csv 4:\$MMTPRJ$\motpara\axpara01.csv	Specify "axpara01.csv" for transmitting to the directory on the FTP client.	When sending the file is completed, the file is transmitted to the Motion CPU.

> **Point**
>
> - Depending on the module with FTP server function, the overwriting of files by the "put" command may be restricted. In this case, transmit the new file after deleting the Motion CPU file first.
> - When the Multiple CPU system power supply is shut-off or reset while writing files, the temporary file for transmitting from the module with FTP server function remains. In this case, delete the temporary file from the module with FTP server function by using the file delete command. Refer to the following for details of temporary files.
>   📖 MELSEC iQ-R Ethernet User's Manual (Application)
> - Files with file passwords set cannot be accessed without password authentication.
> - With the exception of some files, transmitted parameter files are loaded when the Multiple CPU system power supply is turned ON. Online change is not supported, therefore when a parameter file is changed, turn ON the Multiple CPU power supply again, or reset.
> - When a file is accessed it is recorded in the event history.

Precautions

- Be sure to implement security such as setting login passwords to modules that have FTP server function.
- Operating system software and add-on library cannot be read or written.
- When a file that is not supported is transmitted, an error occurs at startup, or an unexpected operation may occur. For files to be transmitted, check that they have been correctly written from MT Developer2 and have had an operation check before transmitting the files.
- Use file names that can be specified by a Motion CPU when using the file transmission via FTP server. Upper case and lower case characters are distinguished from eachother thus operation may fail if using the incorrect case.
- Only ASCII characters are supported for file names and data. Do not transmit files in UNICODE format. Transferring these files may lead to an unexpected operation.
- If the Multiple CPU system power supply or network communication is shut-off during file transmission, the transmission fails and the file may be corrupted. When the transmission fails and the file is corrupted, write the file again. Also, when start-up fails, initialize the memory of the Motion CPU.
- Do not perform FTP transmission or access the same file from multiple modules.
- When large files such as cam data are in the Motion CPU and the location of the file to be accessed is near the end, it may take time until the command is completed.

4

4.10 Parameter Change Function

The parameter change function allows the writing, or reading of individual parameters from a specified Motion CPU. To write, or read parameters, use the following special registers.

For servo parameters, refer to "servo parameter change function", or "file transfer function". (☞ Page 171 Servo Parameter Read/Change Function, Page 114 File Transfer Function)

Devices used for "Motion control parameter write/read request"

No.	Name	Meaning	Details	Set by
SD544 SD545	Motion control parameter write/read request	Parameter read value	• The read value of parameter which executed "2: 2 word read request" in "Motion control parameter write/read request flag (SD840)" is stored. • The read value (low 2 word) of parameter which executed "4: 4 word read request" in "Motion control parameter write/read request flag (SD840)" is stored.	System (At read request)
SD546 SD547			The read value (high 2 word) of parameter which executed "4: 4 word read request" in "Motion control parameter write/read request flag (SD840)" is stored.	
SD840		Parameter write/read request flag	• Requests the write/read of parameter after axis No., parameter No., and parameter ID are set. 1: 2 word write request 2: 2 word read request 3: 4 word write request 4: 4 word read request • At the completion of parameter write/read the Motion CPU automatically stores "0". (At a write/read error, the Motion CPU store "-1") • After a request is stored, it cannot be cancelled nor can another request be made until processing is completed.	User/System
SD841		Parameter No.[*1]	Stores the parameter No. to be write/read.	User

SD842		Axis No.	When the parameter No. specified in SD841 is "2", "11", "17", or "20" to "22" the axis No., line No., and machine No. to write/read the parameter is stored.
			Specify 0 if not specifying any of the parameter Nos. above.
			• Parameter No.2
			  Stores the line No. to write/read parameter
			1: SSCNETⅢ line 1
			2: SSCNETⅢ line 2
			• Parameter No.11, 17
			  Stores the axis No. to write/read parameter
			R64MTCPU: 1 to 64
			R32MTCPU: 1 to 32
			R16MTCPU: 1 to 16
			• Parameter No.20
			  Stores the machine No. to write/read parameter
			1 to 8: Machine No. 1 to 8
			• Parameter No.21
			  Stores the line No. of G-code control to write/read parameter
			1: Line 1
			2: Line 2
			• Parameter No.22
			  Stores the axis Nos. of each line of G-code control to write/read parameter
			1 to 8: Line 1, axis 1 to 8
			9 to 16: Line 2, axis 1 to 8	

SD844		Parameter ID[*1]	Stores the column No. of the parameter ID.	
SD845			Stores the line No. of the parameter ID.	
SD846 SD847		Parameter setting value[*1] (2 word)	• Stores the setting value of the parameter to write when "1: 2 word write request" is set to SD840. • Stores the setting value(low 2 word) of the parameter to write when "3: 4 word write request" is set to SD840.	
SD848 SD849			Stores the setting value(high 2 word) of the parameter to write when "3: 4 word write request" is set to SD840.	

*1 Refer to parameters used with parameter change for details of the contents to be stored. (☞ Page 130 Parameters used with parameter change)

Parameter write/read request procedure

■Procedure to write

1. Set the parameter No., axis No., parameter ID, and parameter setting value in SD841, SD842, and SD844 to SD847 (SD844 to SD849 when writing 4 words).

2. Set "1: 2 word write request" or "3: 4 word write request" in SD840.

3. Check that "0" is set in SD840. (Completion of write)

■Procedure to read

1. Set the parameter No., axis No., and parameter ID in SD841, SD842, and SD844 to SD845.

2. Set "2: 2 word read request" or "4: 4 word read request" in SD840.

3. Check that "0" is set in SD840. (Completion of read)

4. The reading value is stored in SD544 to SD545 (SD544 to SD547 when reading 4 words).

> **Point**
>
> - R series common parameters cannot be set.
> - Writing/reading is not possible when the parameter value to be write/read is indirectly set.
> - An indirect setting cannot be set to the parameter setting value.
> - When axis No., parameter No., and parameter setting value are outside the setting range, or if the parameter file does not exist, "-1: Write/read error" is stored in the parameter write/read request flag.
> - Do not turn OFF the Multiple CPU system power supply, or change the "[Rq.1120] PLC ready flag (R: M30000/Q: M2000)" while writing/reading. The parameter data may be corrupted or the Motion CPU may malfunction.
> - When a write error/read error has occurred, the parameter file may be broken or an incorrect value may be stored. Check the parameter with MT Developer2, remove all error causes, and after writing the parameter with MT Developer2, change the parameter.
> - Do not write values that are outside of the setting range. The system may perform an unintended operation.
> - The parameter write/read request is loaded in the main cycle.
> - The parameter change function writes/reads the parameters in the standard ROM. However, when the SD memory card is specified as the parameter write/read destination with the file transfer at boot function, the parameter change function writes/reads the parameters in the SD memory card.
> - When write/read is performed for parameter files with a write protect/read protect password registered, "-1: Write/read error" is stored in the parameter write/read request flag, and write/read is not performed.
> - Parameters that have been read are enabled at the time of loading for each parameter file.

Parameters used with parameter change

The list of parameters that are stored in special registers (SD841 to SD845) are shown below.

Parameter		Parameter No. (SD841)	Axis No.(Line No.) (SD842)	Details
Motion CPU common parameter	Basic setting	1	0	☞ Page 132 Basic setting (parameter No. 1)
	Servo network setting	2	1 to 2	☞ Page 132 Servo network setting (parameter No. 2)
	High-speed input request signal setting	3	0	☞ Page 133 High-speed input request signal setting (parameter No. 3)
	Mark detection setting	4	0	☞ Page 134 Mark detection setting (parameter No. 4)
	Limit switch output setting	5	0	☞ Page 135 Limit output data setting (parameter No. 5)
	Manual pulse generator connection setting	6	0	☞ Page 135 Manual pulse generator connection setting (parameter No. 6)
	Vision system parameter (Ethernet communication line setting)	7	0	☞ Page 136 Vision system parameter (Ethernet communication line setting)(parameter No. 7)
	Vision system parameter (Vision program operation setting)	8	0	☞ Page 136 Vision system parameter (Vision program operation setting)(parameter No. 8)
	Head module setting	9	0	☞ Page 137 Head module setting (parameter No. 9)
	Multiple CPU refresh (Main cycle/operating cycle) setting	10	0	☞ Page 138 Multiple CPU refresh (Main cycle/operating cycle) setting (parameter No. 10)

Parameter			Parameter No. (SD841)	Axis No.(Line No.) (SD842)	Details
Motion control parameter	Axis setting parameter	Fixed parameter	11	1 to 64	☞ Page 138 Fixed parameter
		Home position return data			☞ Page 139 Home position return data
		JOG operation data			☞ Page 139 JOG operation data
		Expansion parameter			☞ Page 140 Expansion parameter
		Speed-torque control data			☞ Page 140 Speed-torque control data
		Optional data monitor			☞ Page 141 Optional data monitor
		External signal parameter			☞ Page 143 External signal parameter
		Pressure control data			☞ Page 143 Pressure control data
		Override data			☞ Page 144 Override data
		Vibration suppression command filter data			☞ Page 144 Vibration suppression command filter data
	Parameter block		13	0	☞ Page 145 Parameter block (parameter No.13)
	Servo input axis parameter		14	0	☞ Page 145 Servo input axis parameter (parameter No.14)
	Synchronous encoder axis parameter		15	0	☞ Page 146 Synchronous encoder axis parameter (parameter No.15)
	Command generation axis parameter		16	0	☞ Page 147 Command generation axis parameter (parameter No.16)
	Synchronous parameter		17	1 to 64	☞ Page 148 Synchronous parameter (parameter No.17)
	Multiple CPU advanced synchronous control setting		18	0	☞ Page 152 Multiple CPU advanced synchronous control setting (parameter No.18)
	Machine common parameter		19	0	☞ Page 152 Machine common parameter (parameter No.19)
	Machine parameter		20	1 to 8	☞ Page 153 Machine parameter (parameter No.20)
	G-code control system parameter		21	1 to 2	☞ Page 155 G-code control system parameter (parameter No.21)
	G-code control axis parameter		22	1 to 16	☞ Page 157 G-code control axis parameter (parameter No.22)
	G-code control work parameter		23	0	☞ Page 159 G-code control work parameter (parameter No.23)

Basic setting (parameter No. 1)

The basic setting is shown below.

Item	Parameter change	Parameter ID		Size (Word)	Initial value	Setting range
		Line No. (SD845)	Column No. (SD844)			
Operation cycle setting	○	1	1	2	0	H0000: Default value H0010: 0.222ms H0020: 0.444ms H0040: 0.888ms H0080: 1.777ms H0100: 3.555ms H0200: 7.111ms
Forced stop input setting	×		2	—	0	—
File transmission setting during booting	○		4	2	0	0: Standard ROM write permission/read protection 1: Standard ROM write protection/read protection 2: Standard ROM write protection/read permission 3: Standard ROM write permission/read permission 256: Boot operation file invalid
Machine control setting	×		5	—	0	—
Low speed operation cycle magnification setting	○		6	2	0	0: Not used 2: 2 times 4: 4 times 8: 8 times
G-code control setting	○		7	1	0	0: Not used 1: Use line 1 only 2: Use line 1 and line 2

Servo network setting (parameter No. 2)

Servo network setting is shown below.

Item	Parameter change	Parameter ID		Size (Word)	Initial value	Setting range
		Line No. (SD845)	Column No. (SD844)			
I/F module type	×	1	1	—	0	—
I/F module start I/O No.	×		2	—	0	—
I/F module Channel No.	○		3	2	0	0: Line 1 1: Line 2
Servo network type	○		4	2	0	0: SSCNETⅢ 1: SSCNETⅢ/H
Station No.	○	n+1[*1]	1	2	0	0: No setting axis 1 to 64: Station No.
Axis No./RIO axis No.	○		2	2	0	1 to 64: Axis No. 601 to 608: RIO axis No.
Vendor ID	○		3	2	0000H	H0000 to HFFFF
Type code	○		4	2	0000H	H0000 to HFFFF
Servo parameter setting information	×		6	2	0	—
Operation cycle selection	○		11	2	0	0: Operation cycle 1: Low speed operation cycle

*1   n=the placing No. (1 to 32) where a servo amplifier is connected from the start of a line.

High-speed input request signal setting (parameter No. 3)

High-speed input request signal setting is shown below.

| Item | Parameter change | Parameter ID | | Size (Word) | Initial value | Setting range[1] |
		Line No. (SD845)	Column No. (SD844)			
High-speed input request signal type	○	n[2]	1	2	0	0: No setting 1: Bit device 2: Amplifier input 3: Sensing module input
High-speed input request signal detection direction	○[3]		2	2	0	0: Leading edge 1: Trailing edge 2: Both directions
High-speed input request signal device	×		3	—	0	—
High-speed input request signal axis No.	○		4	2	0	1 to 64:Axis No. 601 to 608: RIO axis No.
High-speed input request signal DI signal[4]	○		5	2	0	1: DI1 2: DI2 3: DI3 4: DI4 5: DI5 6: DI6 7: DI7 8: DI8 9: DI9 10: DI10 11: DI11 12: DI12 13: DI13 14: DI14 15: DI15 16: DI16
High-speed input request signal accuracy	○[3]		6	2	0	0: General 1: High-accuracy[5]
High-speed input request signal compensation time	○		7	2	0	-5000000 to 5000000[μs]
High-speed input request signal valid flag	×		8	—	0	—
High-speed input request signal status	×		9	—	0	—
High-speed input request signal input module	○		10	2	0	1: MR-MT2010 2: MR-MT2100 3: MR-MT2200
High-speed input request signal control cycle setting	○		11	2	0	0: Operation cycle 1: Low speed operation cycle

*1 An indirect setting cannot be set.

*2 n=the setting No. (1 to 64) of the high-speed input request signal.

*3 When high-speed input request signal type is "3: Sensing module input", this item is "×". Do not set for "3: Sensing module input".

*4 Depending on the high-speed input request signal type, the following setting ranges are valid.

High-speed input request signal type	High-speed input request signal input module	Setting range
2: Amplifier input	—	1: DI1 to 3: DI3
3: Sensing module input	1: MR-MT2010	1: DI1 to 12: DI12
	2: MR-MT2100	1: DI1 to 16: DI16
	3: MR-MT2200	1: DI1 to 14: DI14

*5 Valid when high-speed input request signal is "1: Bit device".

Mark detection setting (parameter No. 4)

Mark detection setting is shown below.

Item	Parameter change	Parameter ID		Size (Word)	Initial value	Setting range[1]
		Line No. (SD845)	Column No. (SD844)			
High-speed input request signal	○	n[2]	1	2	0	0: No setting 1 to 64:High-speed input request signal No.
Mark detection process compensation time	○		2	2	0	-5000000 to 5000000[μs]
Mark detection data	○		3	2	0	0 to 999:Motion control data 1000:Word device 1001:Word device (ring counter)
Mark detection data axis No.	○		4	2	0	1 to 64: Axis No.
Mark detection data device	×		5	—	0	—
Mark detection data type	○		6	2	0	2: 16-bit integer type 4: 32-bit integer type 8: 64-bit floating-point type
Mark detection estimate calculation	○		7	2	0	0: Valid 1: Invalid
Mark detection ring counter value[3]	○		8	4	0	16-bit integer type: K1 to K32767, H0001 to H7FFF 32-bit integer type: K1 to K2147493647, H00000000 to H7FFFFFFF 64-bit floating-point type: K2.23E-308 to K1.79E+308
Mark detection data storage device	×		9	—	0	—
Mark detection data range upper value	○		10	4	0	16-bit integer type: K-32768 to 32767, H0000 to HFFFF 32-bit integer type: K-2147493648 to 2147493647, H00000000 to HFFFFFFFF 64-bit floating-point type: K-1.79E+308 to K-2.23E-308, K0, K2.23E-308 to K1.79E+308
Mark detection data lower value	○		11	4	0	
Mark detection mode setting	○		12	2	0	0: Continuous detection mode 1 to 8192:Specified No. of detection mode -1 to -8192:Ring buffer mode (The minus value of the buffer)
Number of mark detections counter	×		13	—	0	—
Mark detection current value monitor device	×		14	—	0	—

*1 An indirect setting cannot be set.

*2 n=the setting No. (1 to 64) of the mark detection setting.

*3 When changing the data type, change "mark detection data type" first.

Limit output data setting (parameter No. 5)

Limit output data setting is shown below.

Item	Parameter change	Parameter ID		Size (Word)	Initial value	Setting range[1]
		Line No. (SD845)	Column No. (SD844)			
Output device	×	n[2]	1	—	0	—
Keep output device	○		2	2	0	0: PLC ready flag keep the output device when turns OFF invalid 1: PLC ready flag keep the output device when turns OFF valid
16 point unit batch output	○		3	2	0	0: Invalid 1: Valid
Limit output compensation time	○		4	2	0	-5000000 to 5000000[μs]
Watch data	○		5	2	0	0 to 999: Motion control data 1000: Word device 1001: Word device (ring counter)
Watch data axis No.	○		6	2	0	1 to 64: Axis No.
Watch data device	×		7	—	0	—
Watch data type	○		8	4	0	2: 16-bit integer type 4: 32-bit integer type
Watch data ring counter value[3]	○		9	4	0	16-bit integer type: K1 to K32767, H0001 to H7FFF 32-bit integer type: K1 to K2147493647, H00000000 to H7FFFFFFF
ON section 1 upper limit value	○		10	2	0	16-bit integer type: K-32768 to 32767, H0000 to HFFFF 32-bit integer type: K-2147493648 to 2147493647, H00000000 to HFFFFFFFF
ON section 1 lower limit value	○		11	2	0	
ON section 2 upper limit value	○		12	2	0	
ON section 2 lower limit value	○		13	2	0	
Forced OFF bit	×		14	—	0	—
Forced ON bit	×		15	—	0	—

*1 An indirect setting cannot be set.
*2 n=the setting No. (1 to 64) of the limit output data setting.
*3 When changing the data type, change "watch data type" first.

Manual pulse generator connection setting (parameter No. 6)

Manual pulse generator connection setting is shown below.

Item	Parameter change	Parameter ID		Size (Word)	Initial value	Setting range
		Line No. (SD845)	Column No. (SD844)			
I/O No.	○	n[1]	1	2	FFFFH	HFFFF: Invalid H0000 to H0FF0: I/O No.
CH No.	○		2	2	0	1 to 2: CH No.

*1 n=the No. (1 to 3) of manual pulse generator P1 to P3.

Vision system parameter (Ethernet communication line setting)(parameter No. 7)

Vision system parameter (Ethernet communication line setting) is shown below.

Item	Parameter change	Parameter ID		Size (Word)	Initial value	Setting range
		Line No. (SD845)	Column No. (SD844)			
IP address	×	n[*1]	1	—	0	—
Telnet port	○		2	2	0	1 to 65535[*2]
TCP/IP port	○		3	2	0	
User name	×		4	—	0	—
Password	×		5	—	0	—
Status storage device	×		6	—	0	—
Error flag	×		7	—	0	—

*1   n=vision system No. (1 to 32).
*2   21, 68, 80, 502, 1069, 1070, 1212, 2222, 44818, 50000 cannot be used.

Vision system parameter (Vision program operation setting)(parameter No. 8)

Vision system parameter (Vision program operation setting) is shown below.

Item	Parameter change	Parameter ID		Size (Word)	Initial value	Setting range
		Line No. (SD845)	Column No. (SD844)			
Vision system No.	○	n[*1]	1	2	0	0: No setting 1 to 32: Vision system No.
Vision program name	×		2	—	0	—
Status storage device	×		3	—	0	—
Read value cell	×		4	—	0	—
Read value storage device	×		5	—	0	—
Image data storage device	×		6	—	0	—

*1   n=program No. (1 to 128).

Head module setting (parameter No. 9)

Head module setting is shown below.

Item	Parameter change	Parameter ID Line No. (SD845)	Column No. (SD844)	Size (Word)	Initial value	Setting range
Link device Bit start (input)	×	n-600[*1]	1	2	0	—
CPU side refresh device bit points (input)	○		2	2	0	■Using SSCNETⅢ/H head module 0 to 128: Number of words[*2] ■Using sensing module 1 to 4[*2][*3]
CPU side refresh device bit start (input)	×		3	—	0	—
Link device Word start (input)	×		4	—	0	—
CPU side refresh device bit points (input)	○		5	2	0	■Using SSCNETⅢ/H head module 0 to 128: Number of words ■Using sensing module 1 to 30[*3]
CPU side refresh device bit start (input)	×		6	—	0	—
Link device Bit start (output)	×		7	—	0	—
CPU side refresh device bit points (output)	○		8	2	0	■Using SSCNETⅢ/H head module 0 to 128: Number of words[*2] ■Using sensing module 1 to 4[*2][*3]
CPU side refresh device bit start (output)	×		9	—	0	—
Link device Word start (output)	×		10	—	0	—
CPU side refresh device bit points (output)	○		11	2	0	■Using SSCNETⅢ/H head module 0 to 128: Number of words ■Using sensing module 1 to 30[*3]
CPU side refresh device bit start (output)	×		12	—	0	—
Status device	×		13	—	0	—
Monitor device	×		14	—	0	—
Command device	×		15	—	0	—

*1 n=the RIO axis No. (601 to 608).
*2 Set bit devices in word units.
*3 Depending on the module configuration and operation mode, the following setting ranges are valid.

Module configuration		Operation mode	Setting range	
			Refresh device (CPU side) bit points (Input/Output)	Refresh device (CPU side) word points (Input/Output)
Start station	Sensing SSCNETⅢ/H head module only	1 station occupied mode	1 to 2	1 to 30
	Sensing SSCNETⅢ/H head module+Sensing extension module		1 to 4	1 to 28
		Axis mode	1	—
Other than start station	Sensing extension module	1 station occupied mode	1 to 2	1 to 22

4

Multiple CPU refresh (Main cycle/operating cycle) setting (parameter No. 10)

Multiple CPU refresh (Main cycle/operating cycle) setting is shown below.

Item	Parameter change	Parameter ID		Size (Word)	Initial value	Setting range
		Line No. (SD845)	Column No. (SD844)			
Points	○	n[*1]	1	2	0	0: No setting 2 to 256:Points (2 point units)
Target CPU	○		2	2	0	0: CPU No.1 1: CPU No.2 2: CPU No.3 3: CPU No.4
Device setting	×		3	—	0	—

*1   n=the setting No. (1 to 128) of Multiple CPU refresh setting.

Axis setting parameter (parameter No. 11)

Axis setting parameter (fixed parameter, home position return data, JOG operation data, expansion parameter, speed-torque control data, optional data monitor, external signal parameter, machine configuration data, pressure control data, override data, vibration suppression command filter data) are shown below.

■Fixed parameter

Item	Parameter change	Parameter ID		Size (Word)	Initial value	Setting range
		Line No. (SD845)	Column No. (SD844)			
Unit setting	○	1	1	2	3	0: mm 1: inch 2: degree 3: pulse
Speed control 10 × multiplier setting for degree axis	○		2	2	0	0: Invalid 1: Valid
Number of pulses per revolution	○		3	2	20000	1 to 2147483647[pulse]
Movement amount per revolution	○		4	2	20000	1 to 2147483647[mm, inch, degree, pulse]
Upper stroke limit	○		5	2	2147483647	■When "mm, inch, pulse" are set -2147483648 to 2147483647 ■When "degree" is set 0 to 35999999
Lower stroke limit	○		6	2	0	
Command in-position range	○		7	2	100	■When "mm, inch, pulse" are set 1 to 2147483647 ■When "degree" is set 1 to 35999999
Backlash compensation	○		8	2	0	0 to 65535[mm, inch, degree, pulse]

■Home position return data

Item	Parameter change	Parameter ID		Size (Word)	Initial value	Setting range[*1]
		Line No. (SD845)	Column No. (SD844)			
Home position return direction	○	2	1	2	0	0: Reverse direction 1: Forward direction
Home position return method	○		2	2	0	0: Proximity dog method 1 1: Count method 1 2: Data set method 1 3: Data set method 2 4: Proximity dog method 2 5: Count method 2 6: Count method 3 7: Dog cradle method 8: Stopper method 1 9: Stopper method 2 10: Limit switch combined method 11: Scale home position detection method 12: Dogless home position signal reference method 13: Driver home position return method 14: Data set method 3
Home position address	○		3	2	0	■When "mm, inch, pulse" are set -2147483648 to 2147483647 ■When "degree" is set 0 to 35999999
Home position return speed	○		4	2	1	■When "mm, inch" are set 1 to 600000000[mm/min, inch/min] ■When "degree, pulse" is set 1 to 2147483647[degree/min, pulse/s]
Creep speed	○		5	2	1	■When "mm, inch" are set 1 to 600000000[mm/min, inch/min] ■When "degree, pulse" is set 1 to 2147483647[degree/min, pulse/s]
Movement amount setting after proximity dog	○		6	2	0	0 to 2147483647[mm, inch, degree, pulse]
Parameter block setting	○		7	2	1	1 to 64
Home position return retry function	○		8	2	0	0: Retry function invalid 1: Retry function valid
Dwell time at home position return retry	○		9	2	0	0 to 5000[ms]
Home position shift amount	○		10	2	0	-2147483648 to 2147483647[mm, inch, degree, pulse]
Torque limit at creep speed	○		11	2	3000	1 to 10000($\times 10^{-1}$[%])
Speed set at home position shift	○		12	2	0	0: Home position return speed 1: Creep speed
Operation for home position return incompletion	○		13	2	1	0: Execute servo program 1: Not execute servo program

*1 An indirect setting cannot be set.

■JOG operation data

Item	Parameter change	Parameter ID		Size (Word)	Initial value	Setting range
		Line No. (SD845)	Column No. (SD844)			
JOG speed limit value	○	3	1	2	20000	■When "mm, inch" are set 1 to 600000000[mm/min, inch/min] ■When "degree, pulse" is set 1 to 2147483647[degree/min, pulse/s]
Parameter block setting	○		2	2	0	1 to 64

■Expansion parameter

Item	Parameter change	Parameter ID		Size (Word)	Initial value	Setting range[1]
		Line No. (SD845)	Column No. (SD844)			
Positive direction torque limit value monitor device	×	4	1	—	0	—
Negative direction torque limit value monitor device	×		2	—	0	—
Acceleration/deceleration time change enable device	×		3	—	0	—
New acceleration time value device	×		4	—	0	—
New deceleration time value device	×		5	—	0	—
Servo motor maximum speed	○		6	2	0	0 to 10000000($\times 10^{-2}$[r/min])
Deceleration time constant	○		7	2	0	0: Deceleration stop according to the rapid stop deceleration time set in the parameter block 1 to 20000[ms]
ABS direction in degrees device	×		8	—	0	—

*1   An indirect setting cannot be set.

■Speed-torque control data

Item	Parameter change	Parameter ID		Size (Word)	Initial value	Setting range[1]
		Line No. (SD845)	Column No. (SD844)			
Control mode switching request device	×	5	1	—	0	—
Control mode setting device	×		2	—	0	—
Speed limit value in speed-torque control	○		3	2	200000	■When "mm, inch" are set 1 to 600000000[mm/min, inch/min] ■When "degree, pulse" is set 1 to 2147483647[degree/min, pulse/s]
Torque limit value in speed-torque control	○		4	2	3000	1 to 10000($\times 10^{-1}$[%])
Speed command device	×		5	—	0	—
Command speed acceleration time	○		6	2	1000	0 to 8388608[ms]
Command speed deceleration time	○		7	2	1000	0 to 8388608[ms]
Torque command device	×		8	—	0	—
Command torque (positive direction)	○		9	2	1000	0 to 8388608[ms]
Command torque (negative direction)	○		10	2	1000	0 to 8388608[ms]
Speed initial value selection at control mode switching	○		11	2	0	0: Command speed 1: Feedback speed 2: Automatic selection
Torque initial value selection at control mode switching	○		12	2	0	0: Command torque 1: Feedback torque
Invalid selection during zero speed at control mode switching	○		12	2	0	0: Switching condition at switching control mode is valid 1: ON condition during zero speed at switching control mode is invalid

*1   An indirect setting cannot be set.

■Optional data monitor

Item		Parameter change	Parameter ID		Size (Word)	Initial value	Setting range
			Line No. (SD845)	Column No. (SD844)			
Setting 1	Data type	○	6	1	2	0	*1*2
	Storage device No.	×		2	—	—	—
	Data address	○		3	2	0	■Registered monitor device H00000000 to H00007FFE ■Transient command H00000000 to H0000FFFF
Setting 2	Data type	○		4	2	0	*1*2
	Storage device No.	×		5	—	—	—
	Data address	○		6	2	0	■Registered monitor device H00000000 to H00007FFE ■Transient command H00000000 to H0000FFFF
Setting 3	Data type	○		7	2	0	*1*2
	Storage device No.	×		8	—	—	—
	Data address	○		9	2	0	■Registered monitor device H00000000 to H00007FFE ■Transient command H00000000 to H0000FFFF
Setting 4	Data type	○		10	2	0	*1*2
	Storage device No.	×		11	—	—	—
	Data address	○		12	2	0	■Registered monitor device H00000000 to H00007FFE ■Transient command H00000000 to H0000FFFF
Setting 5	Data type	○		13	2	0	*1*2
	Storage device No.	×		14	—	—	—
	Data address	○		15	2	0	■Registered monitor device H00000000 to H00007FFE ■Transient command H00000000 to H0000FFFF
Setting 6	Data type	○		16	2	0	*1*2
	Storage device No.	×		17	—	—	—
	Data address	○		18	2	0	■Registered monitor device H00000000 to H00007FFE ■Transient command H00000000 to H0000FFFF
Setting 7	Data type	○		19	2	0	*1*2
	Storage device No.	×		20	—	—	—
	Data address	○		21	2	0	■Registered monitor device H00000000 to H00007FFE ■Transient command H00000000 to H0000FFFF
Setting 8	Data type	○		22	2	0	*1*2
	Storage device No.	×		23	—	—	—
	Data address	○		24	2	0	■Registered monitor device H00000000 to H00007FFE ■Transient command H00000000 to H0000FFFF
Setting 9	Data type	○		25	2	0	*1*2
	Storage device No.	×		26	—	—	—
	Data address	○		27	2	0	■Registered monitor device H00000000 to H00007FFE ■Transient command H00000000 to H0000FFFF

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Item		Parameter change	Parameter ID		Size (Word)	Initial value	Setting range
			Line No. (SD845)	Column No. (SD844)			
Setting 10	Data type	○	6	28	2	0	*1*2
	Storage device No.	×		29	—	—	—
	Data address	○		30	2	0	■Registered monitor device H00000000 to H00007FFE ■Transient command H00000000 to H0000FFFF
Setting 11	Data type	○		31	2	0	*1*2
	Storage device No.	×		32	—	—	—
	Data address	○		33	2	0	■Registered monitor device H00000000 to H00007FFE ■Transient command H00000000 to H0000FFFF
Setting 12	Data type	○		34	2	0	*1*2
	Storage device No.	×		35	—	—	—
	Data address	○		36	2	0	■Registered monitor device H00000000 to H00007FFE ■Transient command H00000000 to H0000FFFF
Setting 13	Data type	○		37	2	0	*1*2
	Storage device No.	×		38	—	—	—
	Data address	○		39	2	0	■Registered monitor device H00000000 to H00007FFE ■Transient command H00000000 to H0000FFFF
Setting 14	Data type	○		40	2	0	*1*2
	Storage device No.	×		41	—	—	—
	Data address	○		42	2	0	■Registered monitor device H00000000 to H00007FFE ■Transient command H00000000 to H0000FFFF

*1 Registered monitor

0: No setting
1: Effective load ratio
2: Regenerative load ratio
3: Peak load ratio
4: Position F/B
5: Encoder position within 1 revolution
6: Load inertia moment ratio (real servo motor use: load mass ratio)
7: Model loop gain
8: Bus voltage
9: Encoder multi-revolution counter
10: Cumulative current value
11: Servo motor speed (real servo motor use: servo motor speed)

12: Selected droop pulse
13: Unit power consumption
14: Unit total power consumption
15: Instantaneous torque (instantaneous thrust)
16: Load side encoder information 1
17: Load side encoder information 2
18: Z-phase counter
20: Servo motor thermistor temperature
21: Torque equivalent to disturbance (real servo motor use: Thrust equivalent to disturbance)
22: Overload alarm margin
23: Excessive error alarm margin

24: Settling time
25: Overshoot amount
26: Servo motor/load side position deviation
27: Servo motor/load side speed deviation
28: Servo command value
29: Torque command
30: Unit power consumption (2 word)
31: Pressure command
32: Load cell pressure
33: External encoder counter value
34: Internal temperature of encoder
35: Analog monitor input 1
36: Analog monitor input 2
98: Optional address of registered monitor

*2 Transient command

100: Servo motor ID (SSCNETⅢ)/Encoder ID
101: Servo motor ID (SSCNETⅢ/H)
102: Encoder resolution
103: Servo amplifier serial number (First 8 characters)
104: Servo amplifier serial number (Last 8 characters)
105: Servo amplifier identification information (First 8 characters)
106: Servo amplifier identification information (Last 8 characters)
107: Servo amplifier S/W No. (First 8 characters)
108: Servo amplifier S/W No. (Last 8 characters)
109: Accumulated power-on time
110: Number of inrush current switching times
111: Read alarm history number
112: Alarm history/Detail #1, #2
113: Alarm history/Detail #3, #4
114: Alarm history/Detail #5, #6

116: Alarm history/Detail/Occurrence time
117: Alarm occurrence time #1, #2
118: Alarm occurrence time #3, #4
119: Alarm occurrence time #5, #6
121: Alarm history clear command
122: Home position [command unit]
123: Bus voltage
124: Regenerative load ratio
125: Effective load ratio
126: Peak load ratio
127: Estimate inertia moment ratio
128: Model loop gain
129: LED display
130: Load side encoder information 1
131: Load side encoder information 2
132: Speed F/B
133: Servo motor thermistor temperature

134: Z-phase counter
135: Unit power consumption
136: Unit total power consumption
138: Torque equivalent to disturbance
139: Instantaneous torque
140: Overload alarm margin
141: Excessive error alarm margin
142: Settling time
143: Overshoot amount
144: Servo motor/load side position deviation
145: Servo motor/load side speed deviation
146: Machine diagnostic status
147: Friction estimation
148: Vibration estimation
149: Internal temperature of encoder
255: Optional transient command

■External signal parameter

Item	Parameter change	Parameter ID Line No. (SD845)	Column No. (SD844)	Size (Word)	Initial value	Setting range
FLS signal Signal type	○	7	1	2	0	0: Invalid 1: Amplifier input 2: Bit device
FLS signal Contact	○		2	2	1	0: Normally open contact 1: Normally closed contact
FLS signal Device	×		3	—	0	—
RLS signal Signal type	○		4	2	0	0: Invalid 1: Amplifier input 2: Bit device
RLS signal Contact	○		5	2	1	0: Normally open contact 1: Normally closed contact
RLS signal Device	×		6	—	0	—
STOP signal Signal type	○		7	2	0	0: Invalid 2: Bit device
STOP signal Contact	○		8	2	0	0: Normally open contact 1: Normally closed contact
STOP signal Device	×		9	—	0	—
DOG signal Signal type	○		10	2	0	0: Invalid 1: Amplifier input 2: Bit device
DOG signal Contact	○		11	2	0	0: Normally open contact 1: Normally closed contact
DOG signal Device	×		12	—	0	—
DOG signal Precision	○		13	2	0	0: General 1: High-accuracy[*1]

*1 Valid when signal type is "2: Bit device".

■Pressure control data

Item	Parameter change	Parameter ID Line No. (SD845)	Column No. (SD844)	Size (Word)	Initial value	Setting range[*1]
Pressure control selection	○	9	1	2		0: Do not use pressure control 1: Use pressure control
Feed/pressure maintaining start device	×		2	—	—	—
Pressure maintaining forced switching device	×		3	—	—	—
Pressure release start device	×		4	—	—	—
Pressure command reference	○		5	2		1 to 32767
Speed limit reference	○		6	2		1 to 2147483647
Abnormal pressure switching mode	○		7	2		0: Unselect 1: Select
Abnormal pressure setting	○		8	2		0 to 32767
Abnormal pressure setting time	○		9	2		0 to 32767[ms]
Mode reset selection	○		10	2		0: Do not reset mode after passing dwell time 1: Reset mode after passing dwell time
Pressure profile start device	×		11	—	—	—
Pressure control status device	×		12	—	—	—
Feed execution point device	×		13	—	—	—
Pressure maintaining execution point device	×		14	—	—	—
Pressure release execution point device	×		15	—	—	—

*1 An indirect setting cannot be set.

■Override data

Item	Parameter change	Parameter ID		Size (Word)	Initial value	Setting range
		Line No. (SD845)	Column No. (SD844)			
Override ratio setting device	×	10	1	—	—	—

■Vibration suppression command filter data

Item	Parameter change	Parameter ID		Size (Word)	Initial value	Setting range[*1]
		Line No. (SD845)	Column No. (SD844)			
Vibration suppression command filter 1 Mode selection device	×	11	1	—	—	—
Vibration suppression command filter 1 Frequency	○		2	2	1000	20 to 25000($\times 10^{-2}$[Hz])
Vibration suppression command filter 1 Depth	○		3	2	0	0: -40.0dB 1: -24.1dB 2: -18.1dB 3: -14.5dB 4: -12.0dB 5: -10.1dB 6: -8.5dB 7: -7.2dB 8: -6.0dB 9: -5.0dB 10: -4.1dB 11: -3.3dB 12: -2.5dB 13: -1.8dB 14: -1.2dB 15: -0.6dB
Vibration suppression command filter 2 Mode selection device	×		7	—	0	—
Vibration suppression command filter 2 Frequency	○		8	2	1000	100 to 25000($\times 10^{-2}$[Hz])
Feed current value monitor device after filter	×		13	—	0	—
Command output complete signal after filter	×		14	—	0	—

*1 An indirect setting cannot be set.

Parameter block (parameter No.13)

Parameter block is shown below.

Item	Parameter change	Parameter ID		Size (Word)	Initial value	Setting range
		Line No. (SD845)	Column No. (SD844)			
Interpolation control unit	○	n[*1]	1	2	3	0: mm 1: inch 2: degree 3: pulse
Deceleration process on STOP	○		2	2	0	0: Deceleration stop 1: Rapid stop
Speed limit value	○		3	2	200000	■When "mm, inch" are set 1 to 600000000[mm/min, inch/min] ■When "degree, pulse" is set 1 to 2147483647[degree/min, pulse/s]
Acceleration time	○		4	2	1000	1 to 8388608[ms]
Deceleration time	○		5	2	1000	1 to 8388608[ms]
Rapid stop deceleration time	○		6	2	1000	1 to 8388608[ms]
S-curve ratio	○		7	2	0	0 to 100[%]
Torque limit value	○		8	2	3000	0 to 100000($\times 10^{-1}$[%])
Allowable error range for circular interpolation	○		9	2	100	0 to 100000[mm, inch, degree, pulse]
Bias speed at start	○		10	2	0	■When "mm, inch" are set 1 to 600000000[mm/min, inch/min] ■When "degree, pulse" is set 1 to 2147483647[degree/min, pulse/s]
Acceleration/deceleration system	○		11	2	0	0: Trapezoid/S-curve 1: Advanced S-curve
Acceleration section 1 ratio	○		12	2	200	0 to 1000($\times 10^{-1}$[%])
Acceleration section 2 ratio	○		13	2	200	
Deceleration section 1 ratio	○		14	2	200	
Deceleration section 2 ratio	○		15	2	200	

*1 n=the block No. (1 to 64) of parameter block.

Servo input axis parameter (parameter No.14)

Servo input axis parameter is shown below.

Item	Parameter change	Parameter ID		Size (Word)	Initial value	Setting range
		Line No. (SD845)	Column No. (SD844)			
Servo input axis type	○	n[*1]	1	2	0	0: Invalid 1: Feed current value 2: Actual current value 3: Servo command value 4: Feedback value
Servo input axis rotation direction restriction	○		2	2	0	0: Without rotation direction restriction 1: Enable only for current value increase direction 2: Enable only for current value decrease direction
Servo input axis smoothing time constant	○		3	2	0	0 to 5000[ms]
Servo input axis phase compensation advance time	○		4	2	0	-2147483648 to 2147483647[μs]
Servo input axis phase compensation time constant	○		5	2	10	0 to 65535[ms]

*1 n=the axis No. (1 to 64) of servo input axis.

Synchronous encoder axis parameter (parameter No.15)

Synchronous encoder axis parameter is shown below.

Item	Parameter change	Parameter ID		Size (Word)	Initial value	Setting range
		Line No. (SD845)	Column No. (SD844)			
Synchronous encoder axis type	○	n[1]	1	2	0	0: Invalid 1: Via module 101 to 164:Via servo amplifier 201: Via device 301 to 364:Master CPU servo input axis 401 to 464:Master CPU command generation axis 501 to 512:Master CPU synchronous encoder axis 601 to 608:Via sensing module
Synchronous encoder axis rotation direction restriction	○		2	2	0	0: Without rotation direction restriction 1: Enable only for current value increase direction 2: Enable only for current value decrease direction
Synchronous encoder axis unit setting	○		3	2	0003H	H□□□□ Control unit 0: mm 1: inch 2: degree 3: pulse Number of decimal places 0 to 9 Speed time unit 0: s 1: min Number of decimal places for speed 0 to 9
Synchronous encoder axis unit conversion numerator	○		4	2	1	-2147483648 to 2147483647[2]
Synchronous encoder axis unit conversion denominator	○		5	2	1	-2147483648 to 2147483647[pulse]
Synchronous encoder axis length per cycle	○		6	2	4000	1 to 2147483647[2]
Synchronous encoder axis smoothing time constant	○		7	2	0	0 to 5000[ms]
Synchronous encoder axis phase compensation advance time	○		8	2	0	-2147483648 to 2147483647[μs]
Synchronous encoder axis phase compensation time constant	○		9	2	10	0 to 65535[ms]
Resolution of synchronous encoder via device	○		10	2	0	1 to 2147483647[pulse]
I/O No.	○		11	2	0000H	H0000 to H0FF0
CH No.[3]	○		12	2	1	1 to 2

*1 n=the axis No. (1 to 12) of synchronous encoder axis.
*2 Unit: Synchronous encoder axis position unit.
*3 Valid when synchronous encoder axis type is "1: Via module", and "601 to 608: Via sensing module".

Command generation axis parameter (parameter No.16)

Command generation axis parameter is shown below.

Item	Parameter change	Parameter ID		Size (Word)	Initial value	Setting range
		Line No. (SD845)	Column No. (SD844)			
Command generation axis valid setting	○	n[*1]	1	2	0	0: Command generation axis invalid 1: Command generation axis valid
Command generation axis speed control 10 × multiplier setting for degree axis	○		2	2	0	0: 10 × multiplier for degree axis speed invalid 1: 10 × multiplier for degree axis speed valid
Command generation axis JOG operation parameter block setting	○		3	2	1	1 to 64
Command generation axis unit setting	○		4	2	0003H	2140H: mm 3151H:inch 3152H:degree (10 × multiplier for degree axis speed invalid) 2152H:degree (10 × multiplier for degree axis speed valid) 0003H:pulse
Command generation axis upper stroke limit	○		5	2	0	■When "mm, inch, pulse" are set -2147483648 to 2147483647 ■When "degree" is set 0 to 35999999
Command generation axis lower stroke limit	○		6	2	0	■When "mm, inch, pulse" are set -2147483648 to 2147483647 ■When "degree" is set 0 to 35999999
Command generation axis command in-position range	○		7	2	100	1 to 2147483647[*2]
Command generation axis length per cycle	○		8	2	0	0 to 2147483647[*2]
Command generation axis JOG speed limit value	○		9	2	20000	1 to 2147483647[*2]
Command generation axis acceleration/deceleration time change enable device	×		10	—	0	—
Command generation axis new acceleration time value device	×		11	—	0	—
Command generation axis new deceleration time value device	×		12	—	0	—
Command generation axis ABS direction in degrees device	×		13	—	0	—
Command generation axis override ratio setting device	×		14	—	—	—
Command generation axis operation cycle selection	○		15	2	0	0: Operation cycle 1: Low speed operation cycle

*1   n=the axis No. (1 to 64) of command generation axis.
*2   Unit: Command generation axis position unit.

Synchronous parameter (parameter No.17)

Synchronous parameter is shown below.

Item	Parameter change	Parameter ID		Size (Word)	Initial value	Setting range
		Line No. (SD845)	Column No. (SD844)			
Main input axis No.	○	1	1	2	0	0: Invalid 1 to 64:Servo input axis 201 to 264:Command generation axis 801 to 812:Synchronous encoder axis
Sub input axis No.	○		2	2	0	0: Invalid 1 to 64:Servo input axis 201 to 264:Command generation axis 801 to 812:Synchronous encoder axis
Main shaft composite gear	○	2	1	2	0001H	H00□□ └→ Main input method 　0: No input 　1: Input + 　2: Input - └→ Sub input method 　0: No input 　1: Input + 　2: Input -
Main shaft gear numerator	○	3	1	2	1	-2147483648 to 2147483647
Main shaft gear denominator	○		2	2	1	1 to 2147483647
Main shaft clutch control setting	○	4	1	2	0000H	H□□□□ └→ ON control mode 　0: No clutch 　1: Clutch command ON/OFF 　2: Clutch command leading edge 　3: Clutch command trailing edge 　4: Address mode 　5: High-speed input request └→ OFF control mode 　0: OFF control invalid 　1: One-shot OFF 　2: Clutch command leading edge 　3: Clutch command trailing edge 　4: Address mode 　5: High-speed input request └→ High-speed input request signal 　00 to 3F: Signal 1 to 64
Main shaft clutch reference address setting	○		2	2	0	0: Current value after main shaft composite gear 1: Current value per cycle after main shaft gear
Main shaft clutch ON address	○		3	2	0	-2147483648 to 2147483647[*1]
Movement amount before main shaft clutch ON	○		4	2	0	-2147483648 to 2147483647[*1]
Main shaft clutch OFF address	○		5	2	0	-2147483648 to 2147483647[*1]
Movement amount before main shaft clutch OFF	○		6	2	0	-2147483648 to 2147483647[*1]
Main shaft clutch smoothing system			7	2	0	0: Direct 1: Time constant system (Exponent) 2: Time constant system (Linear) 3: Slippage system (Exponent) 4: Slippage system (Linear) 5: Slippage system (Linear: Input value follow up)
Main shaft clutch smoothing time constant			8	2	0	0 to 5000[ms]
Slippage at main shaft clutch ON	○		9	2	0	0 to 2147483647[*1]
Slippage at main shaft clutch OFF	○		10	2	0	0 to 2147483647[*1]
Auxiliary shaft axis No.	○	5	1	2	0	0: Invalid 1 to 64:Servo input axis 201 to 264:Command generation axis 801 to 812:Synchronous encoder axis

Item	Parameter change	Parameter ID		Size (Word)	Initial value	Setting range
		Line No. (SD845)	Column No. (SD844)			
Auxiliary shaft composite gear	○	6	1	2	0001H	H00□□ └→Main shaft 　0: No input 　1: Input + 　2: Input - └→Auxiliary shaft 　0: No input 　1: Input + 　2: Input -
Auxiliary shaft gear numerator	○	7	1	2	1	-2147483648 to 2147483647
Auxiliary shaft gear denominator	○		2	2	1	1 to 2147483647
Auxiliary shaft clutch control setting	○	8	1	2	0000H	H□□□□ └→ON control mode 　0: No clutch 　1: Clutch command ON/OFF 　2: Clutch command leading edge 　3: Clutch command trailing edge 　4: Address mode 　5: High-speed input request →OFF control mode 　0: OFF control invalid 　1: One-shot OFF 　2: Clutch command leading edge 　3: Clutch command trailing edge 　4: Address mode 　5: High-speed input request →High-speed input request signal 　00 to 3F: Signal 1 to 64
Auxiliary shaft clutch reference address setting	○		2	2	0	0: Auxiliary shaft current value 1: Current value per cycle after auxiliary shaft gear
Auxiliary shaft clutch ON address	○		3	2	0	-2147483648 to 2147483647[*2]
Movement amount before auxiliary shaft clutch ON	○		4	2	0	-2147483648 to 2147483647[*2]
Auxiliary shaft clutch OFF address	○		5	2	0	-2147483648 to 2147483647[*2]
Movement amount before auxiliary shaft clutch OFF	○		6	2	0	-2147483648 to 2147483647[*2]
Auxiliary shaft clutch smoothing system	○		7	2	0	0: Direct 1: Time constant system (Exponent) 2: Time constant system (Linear) 3: Slippage system (Exponent) 4: Slippage system (Linear) 5: Slippage system (Linear: Input value follow up)
Auxiliary shaft clutch smoothing time constant	○		8	2	0	0 to 5000[ms]
Slippage at auxiliary shaft clutch ON	○		9	2	0	0 to 2147483647[*2]
Slippage at auxiliary shaft clutch ON	○		10	2	0	0 to 2147483647[*2]
Speed change gear 1 arrangement	○	9	1	2	0	0: No speed change gear 1: Main shaft side 2: Auxiliary shaft side 3: After auxiliary shaft composite gear
Speed change gear 1 smoothing time constant	○		2	2	0	0 to 5000[ms]
Speed change gear 1 numerator	○		3	2	1	-2147483648 to 2147483647
Speed change gear 1 denominator	○		4	2	1	1 to 2147483647

Item	Parameter change	Parameter ID		Size (Word)	Initial value	Setting range
		Line No. (SD845)	Column No. (SD844)			
Speed change gear 2 arrangement	○	10	1	2	0	0: No speed change gear 1: Main shaft side 2: Auxiliary shaft side 3: After auxiliary shaft composite gear
Speed change gear 2 smoothing time constant	○		2	2	0	0 to 5000[ms]
Speed change gear 2 numerator	○		3	2	1	-2147483648 to 2147483647
Speed change gear 2 denominator	○		4	2	1	1 to 2147483647
Cam axis cycle unit setting	○	11	1	2	0000H	H□0□□ Unit 0: mm 1: inch 2: degree 3: pulse Number of decimal places 0 to 9 Unit setting selection 0: Use units of main input axis 1: Use units in this setting
Cam axis length per cycle	○		2	2	4194304	1 to 2147483647[*3]
Cam No.	○		3	2	0	0: Linear cam 1 to 1024:User created cam
Cam stroke amount	○		4	2	4194304	-2147483648 to 2147483647[*4]
Cam axis phase correction advance time	○		5	2	0	-2147483648 to 2147483647[μs]
Cam axis phase correction time constant	○		6	2	10	0 to 65535[ms]
Synchronous control parameter block No.	○		7	2	1	1 to 64
Output axis smoothing time constant	○		8	2	0	0 to 5000[ms]
Cam axis length per cycle change setting	○		9	2	0	0: Invalid 1: Valid

Item	Parameter change	Parameter ID Line No. (SD845)	Parameter ID Column No. (SD844)	Size (Word)	Initial value	Setting range
Current value per cycle after main shaft gear setting method	○	12	1	2	0	0: Previous value 1: Current value per cycle after main shaft gear 2: Calculate from input axis
Current value per cycle after auxiliary shaft gear setting method	○		2	2	0	0: Previous value 1: Current value per cycle after auxiliary shaft gear 2: Calculate from input axis
Current value per cycle after main shaft gear initial setting value	○		3	2	0	0 to (Cam axis length per cycle - 1)[*3]
Current value per cycle after auxiliary shaft gear initial setting value	○		4	2	0	0 to (Cam axis length per cycle - 1)[*3]
Cam axis position recovery target	○		5	2	0	0: Cam axis current value per cycle recovery 1: Cam reference position recovery 2: Cam axis feed current value recovery
Cam reference position setting method	○		6	2	0	0: Previous value 1: Cam reference position 2: Feed current value
Cam reference position initial setting value	○		7	2	0	-2147483648 to 2147483647[*4]
Cam axis current value per cycle setting method	○		8	2	0	0: Previous value 1: Cam axis current value per cycle 2: Current value per cycle after main shaft gear 3: Current value per cycle after auxiliary shaft gear
Cam axis current value per cycle initial setting value	○		9	2	0	0 to (Cam axis length per cycle - 1)[*3]

*1 Unit: Main input axis position unit or cam axis cycle unit
*2 Unit: Auxiliary shaft position unit or cam axis cycle unit
*3 Unit: Cam axis cycle unit
*4 Unit: Output axis position unit

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Multiple CPU advanced synchronous control setting (parameter No.18)

Multiple CPU advanced synchronous control setting is shown below.

Item	Parameter change	Parameter ID		Size (Word)	Initial value	Setting range
		Line No. (SD845)	Column No. (SD844)			
Multiple CPU Advanced synchronous control CPU setting	○	1	1	2	0	0: Independent CPU 1: Master CPU 2: Slave CPU
Synchronous controlling	×	2	1	—	0	—
Master CPU input axis transfer information	×		2	—	0	—
Master CPU input axis error information	×		3	—	0	—
Status for each CPU	×		4	—	0	—
Error status for each CPU and axis	×		5	—	0	—
Synchronous controlling	×	3	1	—	0	—
Master CPU input axis transfer information	×		2	—	0	—
Master CPU input axis error information	×		3	—	0	—
Status for each CPU	×		4	—	0	—
Error status for each CPU and axis	×		5	—	0	—
Synchronous controlling	×	4	1	—	0	—
Master CPU input axis transfer information	×		2	—	0	—
Master CPU input axis error information	×		3	—	0	—
Status for each CPU	×		4	—	0	—
Error status for each CPU and axis	×		5	—	0	—

Machine common parameter (parameter No.19)

Machine common parameter is shown below.

Item	Parameter change	Parameter ID		Size (Word)	Initial value	Setting range
		Line No. (SD845)	Column No. (SD844)			
Start point block No.	○	n[*1]	1	2	0	0: No point block setting 1 to 8192:Point block No. start
Number of point block	○		2	2	0	0: Empty 1 to 8192:Number of point block
Point block device	×		3	—	0	—

*1   n=setting No. (1 to 32) of point block setting

Machine parameter (parameter No.20)

Machine parameter is shown below.

Item		Parameter change	Parameter ID		Size (Word)	Initial value	Setting range[1]
			Line No. (SD845)	Column No. (SD844)			
Machine basic setting	Machine type	○	1	1	2	0	0: Independent CPU 1: Master CPU 2: Slave CPU
	Operating range type	○		2	—	0	—
Joint axis structure	Joint axis JNT1	○	2	1	2	0	0: Unused axis 1 to 64:Axis No.
	Joint axis JNT2	○		2	2	0	
	Joint axis JNT3	○		3	2	0	
	Joint axis JNT4	○		4	2	0	
	Joint axis JNT5	○		5	2	0	
	Joint axis JNT6	○		6	2	0	
Arm length setting	Arm length L1	○	3	1	2	0	-1000000000 to 1000000000($\times 10^{-1}$[μm])[2]
	Arm length L2	○		2	2	0	
	Arm length L3	○		3	2	0	
	Arm length L4	○		4	2	0	
	Arm length L5	○		5	2	0	
	Arm length L6	○		6	2	0	
Machine speed setting	Parameter block designation	○	4	1	2	1	1 to 64: Parameter block No.
	Machine JOG speed limit value (mm)	○		2	2	1500000	1 to 600000000($\times 10^{-2}$[mm/min])
	Machine JOG speed limit value (degree)	○		3	2	1500000	1 to 2147483647($\times 10^{-3}$[degree/min])
XYZ stroke limit setting	XYZ stroke limit X coordinate upper limit value	○	5	1	2	0	-2147483648 to 2147483647($\times 10^{-1}$[μm])[2]
	XYZ stroke limit X coordinate lower limit value	○		2	2	0	
	XYZ stroke limit Y coordinate upper limit value	○		3	2	0	
	XYZ stroke limit Y coordinate lower limit value	○		4	2	0	
	XYZ stroke limit Z coordinate upper limit value	○		5	2	0	
	XYZ stroke limit Z coordinate lower limit value	○		6	2	0	

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Item		Parameter change	Parameter ID		Size (Word)	Initial value	Setting range[1]
			Line No. (SD845)	Column No. (SD844)			
Base transformation (install coordinate offset)	Base transformation X coordinate	○	6	1	2	0	-2147483648 to 2147483647(×10⁻¹[µm])[2]
	Base transformation Y coordinate	○		2	2	0	
	Base transformation Z coordinate	○		3	2	0	
	Base transformation A rotating axis angle	○		4	2	0	-35999999 to 35999999(×10⁻⁵[degree])[2]
	Base transformation B rotating axis angle	○		5	2	0	
	Base transformation C rotating axis angle	○		6	2	0	
Tool transformation	Tool transformation X coordinate	○	7	1	2	0	-2147483648 to 2147483647(×10⁻¹[µm])[2]
	Tool transformation Y coordinate	○		2	2	0	
	Tool transformation Z coordinate	○		3	2	0	
Option setting A	Option setting A1	×	8	1	4	H0	H0 to HFFFFFFFFFFFFFFFF[2]
	Option setting A2	×		2	4	H0	
	Option setting A3	×		3	4	H0	
	Option setting A4	○		4	4	H0	
	Option setting A5	○		5	4	H0	
	Option setting A6	○		6	4	H0	
	Option setting A7	○		7	4	H0	
	Option setting A8	○		8	4	H0	
	Option setting A9	○		9	4	H0	
	Option setting A10	○		10	4	H0	
Option setting B	Option setting B1	○	9	1	4	H0	H0 to HFFFFFFFFFFFFFFFF[2]
	Option setting B2	○		2	4	H0	
	Option setting B3	○		3	4	H0	
	Option setting B4	○		4	4	H0	
	Option setting B5	○		5	4	H0	
	Option setting B6	○		6	4	H0	
	Option setting B7	○		7	4	H0	
	Option setting B8	○		8	4	H0	
	Option setting B9	○		9	4	H0	
	Option setting B10	○		10	4	H0	

[1] An indirect setting cannot be set.
[2] Setting range differs depending on the machine type.

G-code control system parameter (parameter No.21)

G-code control system parameter is shown below.

Item		Parameter change	Parameter ID		Size (Word)	Initial value	Setting range
			Line No. (SD845)	Column No. (SD844)			
Line basic setting	Number of axes on line	○	1	1	1	1	1 to 8:Number of axes on line
Modal initial setting	Interpolation mode	○	2	1	1	0	0: Linear interpolation (G01 command status) 1: Positioning (G00 command status)
	Plane selection	○		2	1	0	0: X-Y plane (G17 command status) 1: X-Y plane (G17 command status) 2: Z-X plane (G18 command status) 3: Y-Z plane (G19 command status)
	Absolute setting	○		3	1	0	0: Increment setting (G91 command status) 1: Absolute setting (G90 command status)
Control setting	G00 non-interpolation	○	3	1	1	0	0: Move to the end point in a straight line. (Interpolation) 1: Move to the end point of each axis, at the fast forward speed of each axis (non-interpolation)
	Deceleration check	○		2	1	0000H	H 0 0 □□ → G00 deceleration check method 0: Command deceleration check 1: In-position check method 2: Smoothing check method → G01 deceleration check method 0: Command deceleration check 1: In-position check method 2: Smoothing check method
	G1→G1 deceleration check	○		3	1	1	0: Do not execute deceleration check 1: Execute deceleration check
	Arc deviation	○		4	1	100	1 to 1000($\times 10^{-4}$[mm])
	Permissible compensation value of arc center deviation	○		5	1	0	-1000 to 100($\times 10^{-4}$[mm])
Override setting	Automatic corner override	○	4	1	1	0	0 to 100[%] *: Automatic corner override is disabled with 0 or 100
	Automatic corner override maximum angle	○		2	1	0	0 to 180[degree]
	Length before corner (automatic corner override)	○		3	2	0	0 to 99999999($\times 10^{-4}$[mm])
	Fast forward rate override	×		4	—	—	—
	Cutting feed rate override	×		5	—	—	—
	Override cancel	×		6	—	—	—
Plane composition	Base axis I	○	5	1	1	1	0: No setting 1: X 2: Y 3: Z 4: A 5: B 6: C 7: U 8: V 9: W
	Base axis J	○		2	1	2	
	Base axis K	○		3	1	3	

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Item		Parameter change	Parameter ID		Size (Word)	Initial value	Setting range
			Line No. (SD845)	Column No. (SD844)			
Normal line control	Normal line control axis	○	6	1	1	0	0: No normal line control 1: X 2: Y 3: Z 4: A 5: B 6: C 7: U 8: V 9: W
	Normal line control type	○		2	1	0	0: Normal line control type I 1: Normal line control type II
	Minimum rotating angle	○		3	2	0	0 to 3600000($\times 10^{-4}$[degree])
	Normal line control axis rotating speed	○		4	2	2000	0 to 100000([degree/min])
	Minimum rotating movement amount	○		5	2	0	0 to 99999999($\times 10^{-4}$[mm])
	Normal line control axis rotating radius	○		6	2	0	0 to 99999999($\times 10^{-4}$[mm])
	Normal line control axis insert radius	○		7	2	0	0 to 99999999($\times 10^{-4}$[mm])
Auxiliary function	M binary	○	7	1	1	0	0: BCD 1: Unsigned binary -1: Signed binary
Polar coordinate interpolation	Polar coordinate interpolation linear axis	○	8	1	1	0	0: No setting 1: X 2: Y 3: Z 4: A 5: B 6: C 7: U 8: V 9: W
	Polar coordinate interpolation rotating axis	○		2	1	0	
High-accuracy control	Acceleration/deceleration before interpolation - maximum speed	○	9	1	2	2000	1 to 999999[mm/min]
	Acceleration/deceleration before interpolation - time constant	○		2	1	100	1 to 5000[ms]
	Tolerable acceleration control for each axis ON	○		3	1	0	0: Optimum corner deceleration 1: Tolerable acceleration control for each axis
	Corner deceleration angle	○		4	1	5	1 to 89[degree]
	Corner accuracy coefficient	○		5	1	0	-1000 to 99[%]
	Curve accuracy coefficient	○		6	1	0	-1000 to 99[%]
	Arc deceleration speed change	○		7	1	0	0: Do not decelerate 1: Decelerate
	Arc deceleration speed	○		8	2	1	1 to 999999[mm/min]

Item		Parameter change	Parameter ID		Size (Word)	Initial value	Setting range
			Line No. (SD845)	Column No. (SD844)			
Macro control	Common variable points for all systems	○	10	1	1	0	0 to 900: Common variable points for all systems
	Common variable points for each system	○		2	1	0	0 to 900: Common variable points for each system
	Start device No. of common variable for all systems	×		3	—	—	—
	Start device No. of common variable for each system	×		4	—	—	—

G-code control axis parameter (parameter No.22)

G-code control axis parameter is shown below.

Item		Parameter change	Parameter ID		Size (Word)	Initial value	Setting range
			Line No. (SD845)	Column No. (SD844)			
Line axis information	Axis No.	○	1	1	1	0	0: No setting 1 to 64:Axis No.
	Axis name	○		2	1	0	0: No setting 1: X 2: Y 3: Z 4: A 5: B 6: C 7: U 8: V 9: W
	Rotation axis	○		4	1	0	0: Linear axis 1: Rotation axis
Stored stroke limit	Software limit -	○	2	1	2	-99999999	■Linear axis setting -99999999 to 99999999($\times 10^{-4}$[mm]) ■Rotation axis setting -99999999 to 99999999($\times 10^{-4}$[degree])
	Software limit +	○		2	2	-99999999	■Linear axis setting -99999999 to 99999999($\times 10^{-4}$[mm]) ■Rotation axis setting -99999999 to 99999999($\times 10^{-4}$[degree])
Speed/time constant	Fast forward speed	○	3	1	2	2000	■Linear axis setting 1 to 1000000([mm/min]) ■Rotation axis setting 1 to 1000000([degree/min])
	Cutting feed clamp speed	○		2	2	2000	■Linear axis setting 1 to 1000000([mm/min]) ■Rotation axis setting 1 to 1000000([degree/min])
	G0 time constant (linear)	○		3	1	1000	1 to 4000[ms]
	G1 time constant (linear)	○		4	1	1000	1 to 4000[ms]
Rotation axis information	Rotation axis type	○	4	1	1	0	0: Shortcut invalid 1: Shortcut valid 3: All linear coordinates

Item		Parameter change	Parameter ID		Size (Word)	Initial value	Setting range
			Line No. (SD845)	Column No. (SD844)			
Tandem function	Master control axis name	○	5	1	1	0	0: No setting 1: X 2: Y 3: Z 4: A 5: B 6: C 7: U 8: V 9: W
High-accuracy control	Rapid traverse rate during high-accuracy control mode	○	6	1	2	0	■Linear axis setting 0 to 1000000[mm/min] ■Rotation axis setting 0 to 1000000[degree/min]
	Cutting feed clamp speed for high-accuracy control mode	○		2	2	0	■Linear axis setting 0 to 999999[mm/min] ■Rotation axis setting 0 to 999999[degree/min]
	Cutting feed for each axis before interpolation - maximum speed	○		3	2	0	■Linear axis setting 0 to 999999[mm/min] ■Rotation axis setting 0 to 999999[degree/min]
	Cutting feed for each axis before interpolation - time constant	○		4	1	0	0 to 5000[ms]
	Accuracy coefficient for each axis	○		5	1	0	-1000 to 99[%]

G-code control work parameter (parameter No.23)

G-code control work parameter is shown below.

Item		Parameter change	Parameter ID		Size (Word)	Initial value	Setting range
			Line No. (SD845)	Column No. (SD844)			
Tool radius compensation	Tool radius compensation type	○	1	1	1	0	0: Type A 1: Type B
	Interference check	○		2	1	0	0: Interference check alarm 1: Interference check disable 1: Interference check avoid
	Select tool radius or diameter compensation	○		4	1	0	0: Radius compensation amount 1: Diameter compensation amount
Tool compensation data	Tool radius/diameter compensation amount	○	n+1[*1]	1	2	0	-99999999 to 99999999(×10⁻⁴[mm])
	Tool length compensation amount	○		2	2	0	-99999999 to 99999999(×10⁻⁴[mm])
Workpiece coordinate offset	X coordinate offset	○	m+41[*2]	1	2	0	■Linear axis setting -99999999 to 99999999(×10⁻⁴[mm]) ■Rotation axis setting -99999999 to 99999999(×10⁻⁴[degree])
	Y coordinate offset	○		2	2	0	
	Z coordinate offset	○		3	2	0	
	A coordinate offset	○		4	2	0	
	B coordinate offset	○		5	2	0	
	C coordinate offset	○		6	2	0	
	U coordinate offset	○		7	2	0	
	V coordinate offset	○		8	2	0	
	W coordinate offset	○		9	2	0	
Program coordinate rotation	Coordinate rotation type	○	48	1	1	0	0: Coordinate rotation type 0 1: Coordinate rotation type 1

*1 n=tool group No. (1 to 40)

*2 m=offset group No. (1 to 6)

4

4.11 Mixed Operation Cycle Function

The mixed operation cycle function executes the Motion operation processing of servo amplifier axes and command generation axes by setting the low speed operation cycle magnification setting and dividing the processes into 2 tasks, the operation cycle, and a slower low speed operation cycle.

For system configurations where the operation cycle setting becomes slower, operating only the specified the axes at the faster operation cycle maintains the operating cycle of axes that require high responsiveness.
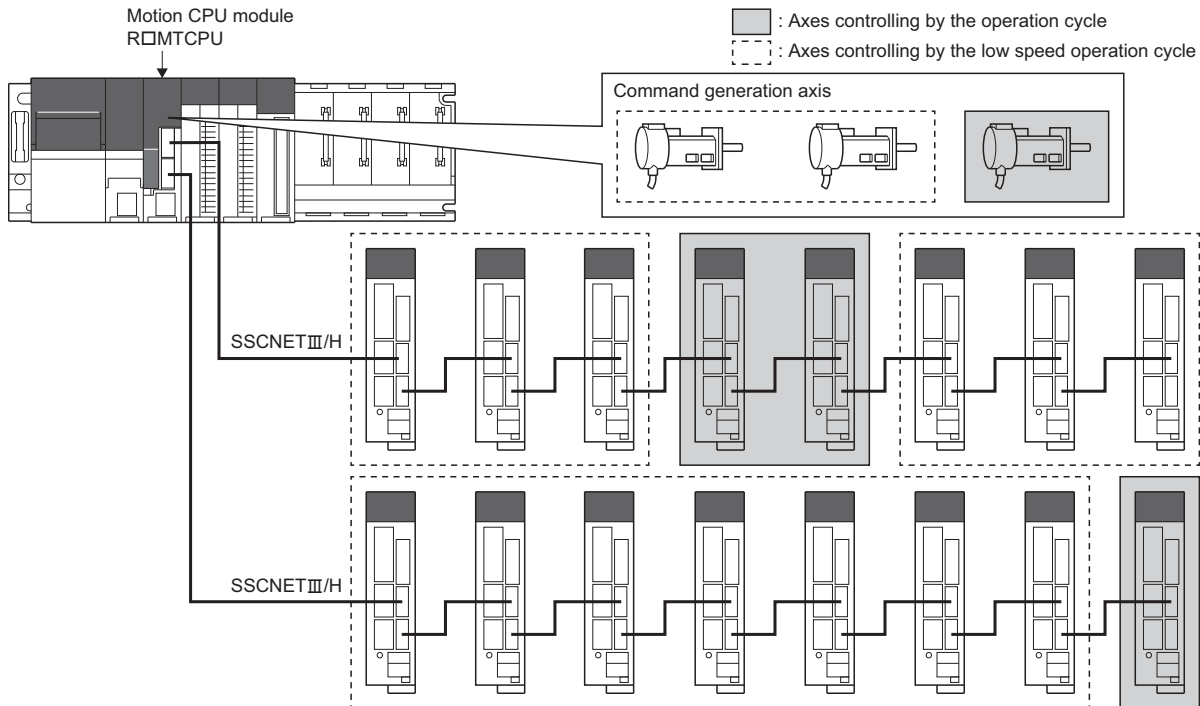
Setting the low speed operation cycle

■Low speed operation cycle magnification setting

To use the low speed operation cycle, set the magnification (2 times/4 times/8 times) of the operation cycle for the low speed operation cycle in the low speed operation cycle magnification setting. ()

When the operation cycle setting is set to "Default setting", the operation cycle is set as follows according to the number of servo amplifier axes set in the servo network setting and the low speed operation cycle magnification setting.

Number of used axes			Operation cycle setting	
R64MTCPU	R32MTCPU	R16MTCPU	When low speed operation cycle magnification setting is disabled ("Not used" is set)	When low speed operation cycle magnification setting is enabled ("2 times/4 times/8 times" is set)
1 to 2 axes	1 to 2 axes	1 to 2 axes	0.222ms	0.444ms
3 to 8 axes	3 to 8 axes	3 to 8 axes	0.444ms	
9 to 20 axes	9 to 20 axes	9 to 16 axes	0.888ms	0.888ms
21 to 38 axes	21 to 32 axes	—	1.777ms	1.777ms
39 to 64 axes	—	—	3.555ms	3.555ms

When low speed operation cycle magnification setting is set, a moderate error (error code: 30F9H) occurs when the Multiple CPU power supply is turned ON for the following.

• A SSCNETⅢ line exists in the servo network settings.
• The operation cycle is 0.222ms.
• The operation cycle is 0.444ms, and the low speed operation cycle magnification setting is 8 times.
• "Operation cycle × low speed operation cycle magnification" exceeds 14.222ms.
• There is no servo amplifier axis or command generation axis that controls at the low speed operation cycle.
• Machine control function is enabled.

■Operation cycle selection

Set the operation cycle in the operation cycle selection for each servo amplifier axis and command generation axis controlling at the low speed operation cycle. For servo amplifier axes, set the operation cycle by [Servo Network Setting] ⇨ [Amplifier Setting] ⇨ "Operation Cycle Selection". (☞ Page 68 Operation cycle selection)

For command generation axes, set in the command generation axis parameter "[Pr.354] Command generation axis operation cycle selection". Refer to the following for details.

📖MELSEC iQ-R Motion Controller Programming Manual (Advanced Synchronous Control)

Operation cycle and low speed operation cycle combinations

■Operation control settings and low speed operation cycle setting combinations

The following shows the available low speed operation cycle settings for the operation cycle settings.

○: Available, ×: Not available, ―: No restriction

Operation cycle setting	Low speed operation cycle magnification setting		
	2 times	4 times	8 times
0.222ms	×	×	×
0.444ms	○	○	×
0.888ms	○	○	○
1.777ms	○	○	○
3.555ms	○	○	×
7.111ms	○	×	×

■Number of control axes combinations

The following shows the combinations for the number of operation cycle control axes and the number of low speed operation cycle control axes. When the number of operation cycle control axes is increased by increasing the overall number of control axes, or reducing the number of low speed operation cycle control axes, an operation cycle over may occur. When an operation cycle over occurs, refer to low speed operation cycle over check. (☞ Page 165 Low speed operation cycle over check)

×: Not available, ―: No restriction

Operation cycle setting	Low speed operation cycle magnification setting								
	2 times			4 times			8 times		
	Number of control axes			Number of control axes			Number of control axes		
	Operation cycle	Low speed operation cycle	Overall	Operation cycle	Low speed operation cycle	Overall	Operation cycle	Low speed operation cycle	Overall
0.222ms	×			×			×		
0.444ms	2 axes	14 axes	16 axes	2 axes	24 axes	26 axes	×		
0.888ms	2 axes	36 axes	38 axes	12 axes	38 axes	50 axes	―		
				2 axes	62 axes	64 axes			
1.777ms	18 axes	46 axes	64 axes	―			―		
3.555ms	―			―			×		
7.111ms	―			×			×		

Monitor devices

The low speed operation cycle settings at system start-up can be monitored with the following special relays and special registers.

■Special relays

 • Low speed Motion operation cycle over flag (SM490)

Refer to special relays for details of special relays. (☞ Page 427 Special Relays)

■Special registers

 • Low speed Motion operation cycle task processing time (SD599)

 • Low speed Motion setting operation cycle (SD714)

 • Low speed Motion operation cycle (SD715)

 • Low speed Motion maximum operation cycle (SD716)

 • Operation cycle counter (SD717)

 • Low speed operation cycle control axis information (SD732 to SD735)

 • Command generation axis low speed operation cycle control axis information (SD736 to SD739)

Refer to special registers for details of special registers. (☞ Page 432 Special Registers)

Control details

The internal processes of the Motion CPU are defined by levels of priority. When executing tasks, if the execute conditions of a high priority task are established, the Motion CPU processes the task of high priority. The low speed operation cycle processes have a lower priority than operation cycle processes. Therefore they are processed in the standby time after the completion of the operation cycle.

As an example, the process timing inside the Motion CPU, and the monitor devices for processing times when low speed operation cycle magnification setting is set to "4 times" are shown below.
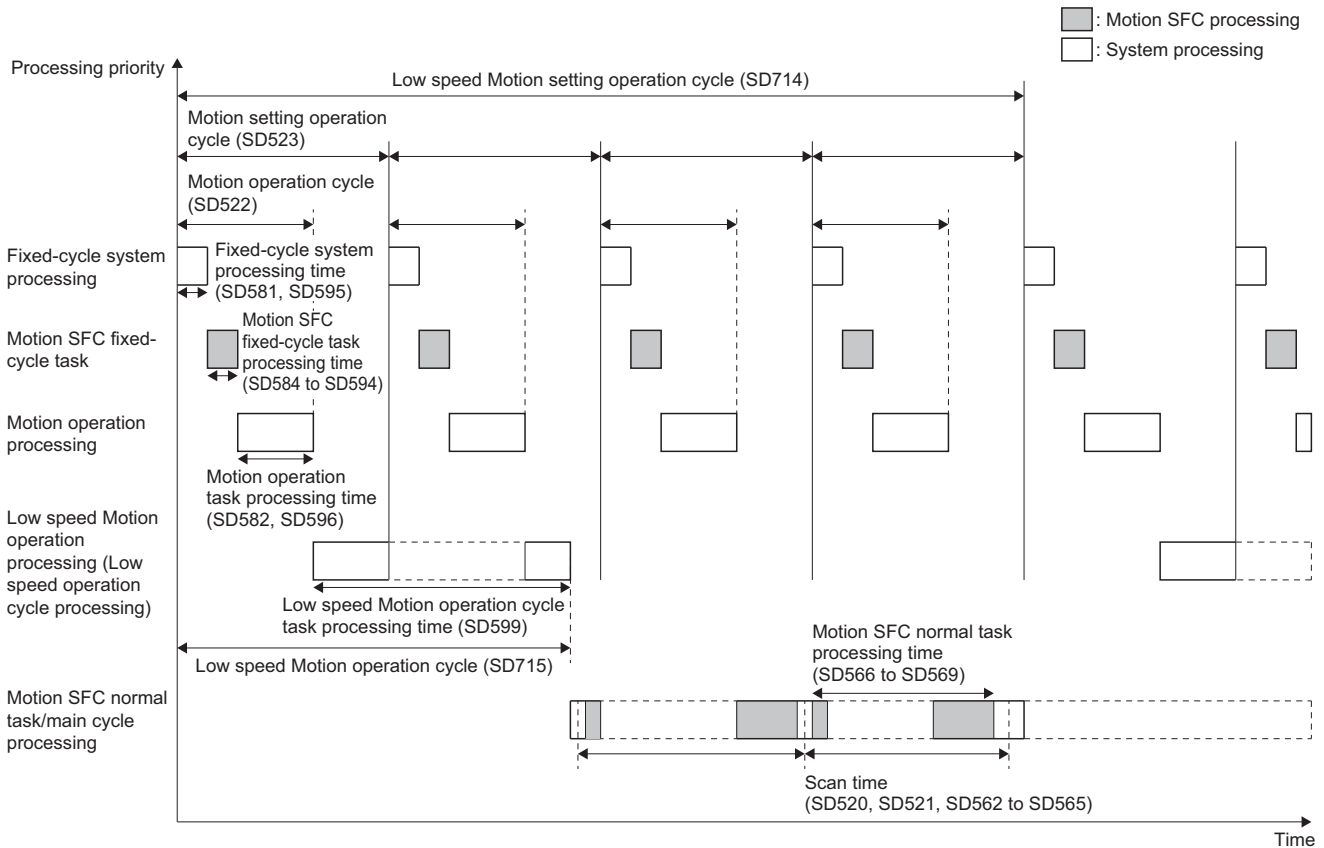
*1: The "Low speed Motion operation cycle (SD715)" maximum value latches to the "Low speed Motion maximum operation cycle (SD716)".

Refer to processing time monitor and check for process timing when low speed operation cycle is not set. (Page 371 Processing time monitor and check)

> **Point**
>
> - Low speed operation cycle processes are processed in the standby time after the completion of the operation cycle. Therefore, when operation cycle time is increased, there may not be enough time for processing the low speed operation cycle processes.
> - Motion SFC normal task processes, and scan time processes are processed in the standby time after the completion of the low speed operation cycle. Therefore, when low speed operation cycle is set, the scan time may increase.

Operation cycle counter (SD717)

- The operation cycle counter is incremented by 1 at the fixed-cycle system processing every time the operation cycle is completed. When the count exceeds 65535, the operation cycle counter returns to 0. When the low speed operation cycle is enabled, the operation cycle counter returns to 1 when the low speed operation cycle magnification setting is exceeded. The low speed operation cycle is executed at the cycle where the operation cycle counter value is 1, and the timing of execution for the operation cycle and low speed operation cycle can be checked with "Operation cycle counter (SD717)".
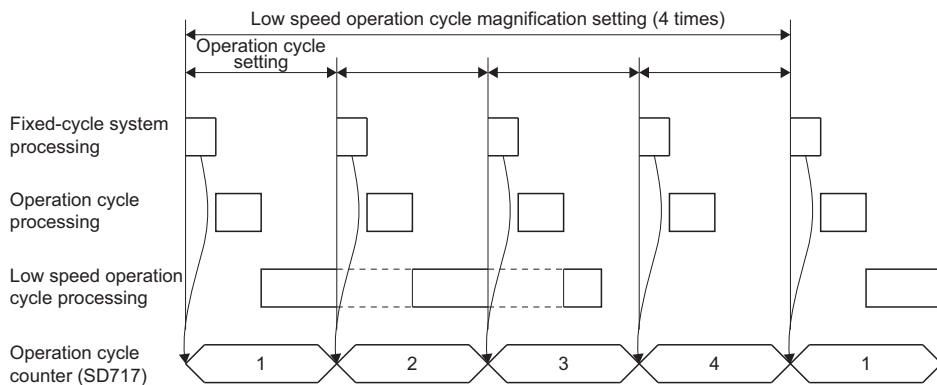
- When the operation cycle is exceeded, the operation cycle counter is not incremented. The operation cycle counter value is adjusted at the cycle which the exceeding operation cycle is completed.
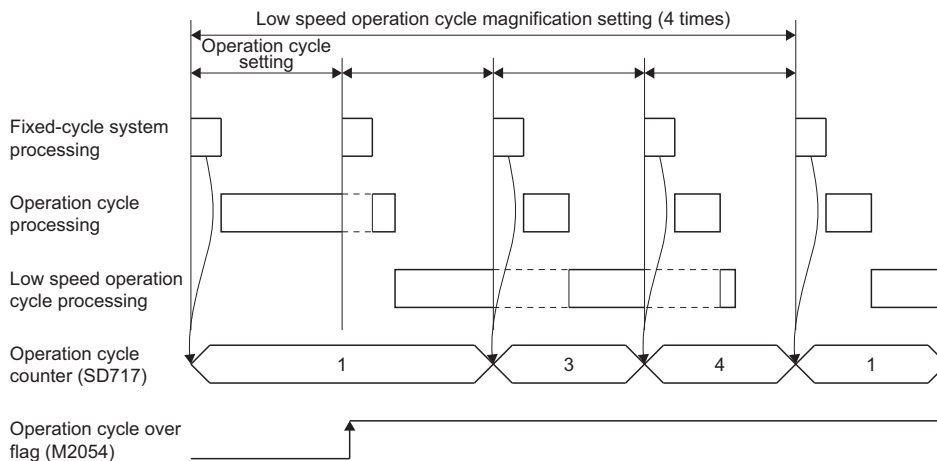
Low speed operation cycle over check

When "Low speed Motion operation cycle (SD715)" exceeds "Low speed Motion setting operation cycle (SD714)", the "Low speed Motion operation cycle over flag (SM490)" turns ON. Also, when the operation cycle exceeds the operation cycle in the cycle where the low speed operation cycle is executed (the cycle where "Operation cycle counter (SD717)" is 1), the "Low speed Motion operation cycle over flag (SM490)" turns ON. In this case, the low speed operation cycle is not executed.
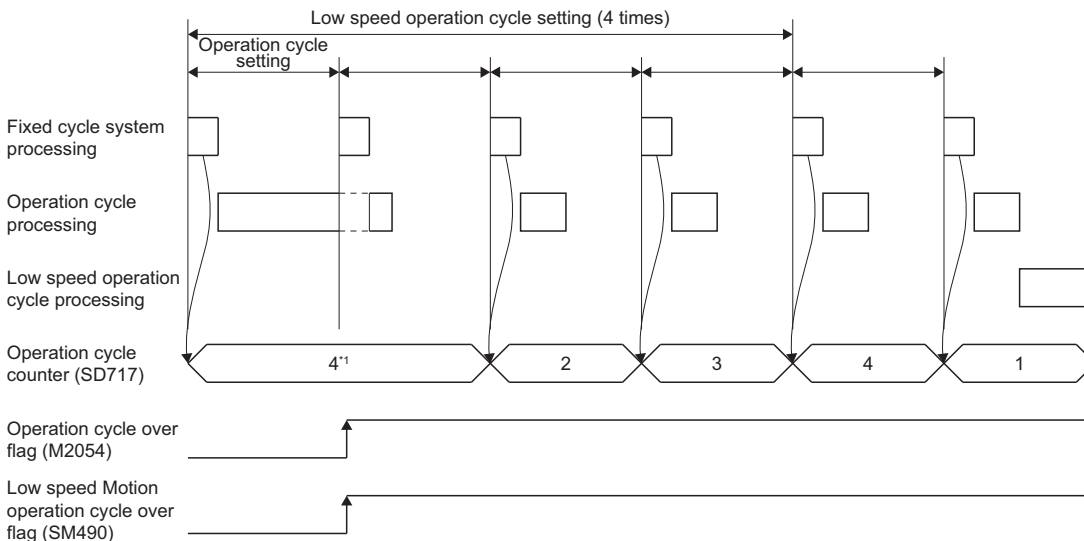
*1: Should be cycle "1".

- When a low speed operation cycle over is detected, monitor the devices that store the processing time, and do one of the following to prevent the time taken in Motion operation from exceeding the set operation cycle. When revising the operation cycle and the number of control axes, refer to operation cycle and low speed operation cycle combinations. (☞ Page 161 Operation cycle and low speed operation cycle combinations)
    - Change the magnification of the low speed operation cycle to a larger value in [Motion CPU Common Parameter] ⇨ [Basic Setting] ⇨ "Low speed operation cycle magnification setting".
    - Review the processing times of the operation cycle and low speed operation cycle, and the number of control axes.
    - Change the operation cycle to a larger value in [Motion CPU Common Parameter] ⇨ [Basic Setting] ⇨ "Operation cycle"
    - Reduce the number of event task and NMI task instructions executed in the Motion SFC program.
- When low speed operation cycle over is detected consecutively (5 times), "Motion CPU WDT error (SM512)" turns ON, and "error code: 3 (WDT timeout detection(low speed operation cycle))" is stored in "Motion CPU WDT error cause (SD512)".
- To turn OFF "Low speed Motion operation cycle over flag (SM490)" perform one of the operations below.
    - Turn the Multiple CPU system power supply OFF
    - Reset the Multiple CPU system
    - Reset by the user program

Point

Updating the commands to the servo amplifier is stopped in the cycle where operation cycle is exceeded and may cause abnormal noises and vibrations, or collisions with machinery.

Precautions during control

Refresh cycle

The refresh cycle of the status devices and monitors of servo amplifier axes and command generation axes operating at the low speed operation cycle is the low speed operation cycle. However, the following status devices are refreshed at the operation cycle.

- [St.1047] Speed change accepting flag (R: M30144+n/Q: M2061+n)
- [St.1048] Automatic decelerating flag (R: M30208+n/Q: M2128+n)
- [St.1049] Speed change "0" accepting flag (R: M30272+n/Q: M2240+n)

Ex.

Axis B operating at low speed operation cycle performs position follow-up of the feed current value of axis A operating at operation cycle
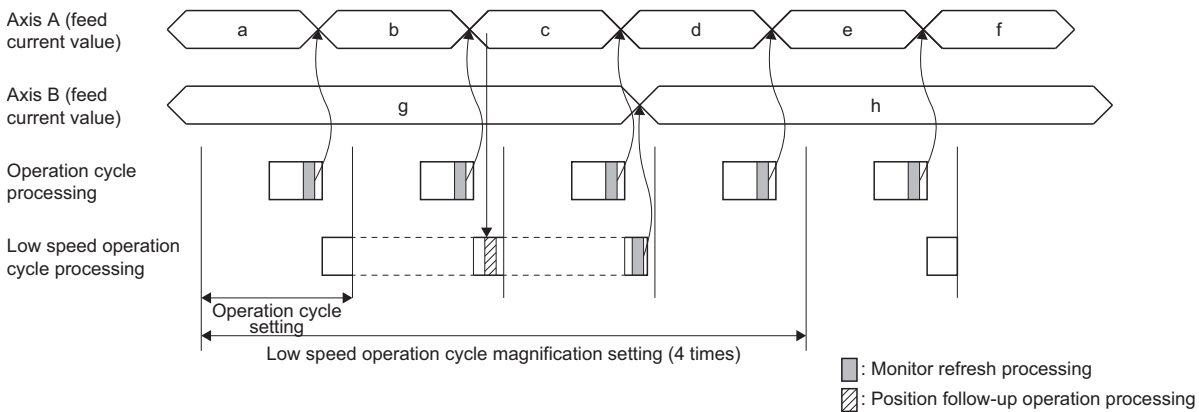
When fetch cycle is an operation cycle command signal/control device

When the fetch cycle is an operation cycle command signal or control device, a maximum delay equivalent to the low speed operation cycle occurs compared to an operation cycle axis. Therefore, when command signals and control devices are updated at an interval less than the Motion setting low speed operation cycle, the update may not be detected in the low speed operation cycle.

Ex.

Detection timing for an axis stop command
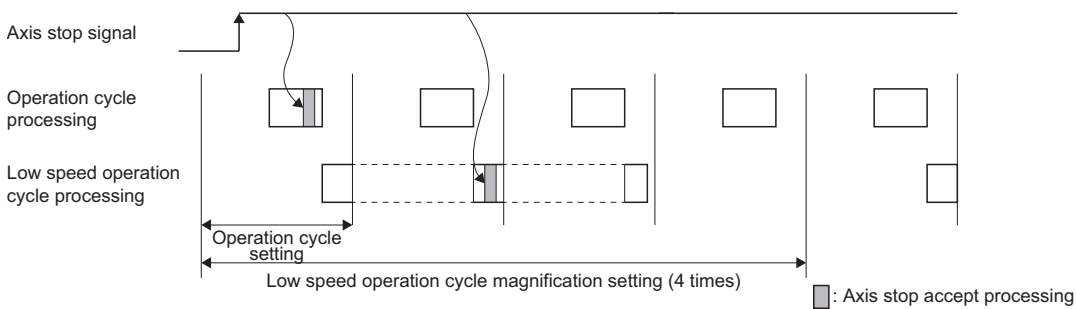
Combining axes with different control operation cycles

Combining axes with different control operation cycles and performing interpolation operation instructions is not possible. A minor error (error code: 19F9H) occurs, and the program does not start.

When advanced synchronous control input axis and output axis have different control operation cycles

■When input axis is operation cycle, and output axis is low speed operation cycle

The movement amount sent to the output axis is calculated based on the input axis calculation for the operation cycle at the start of the low speed operation cycle (the cycle when "Operation cycle counter (SD717)" is 1).
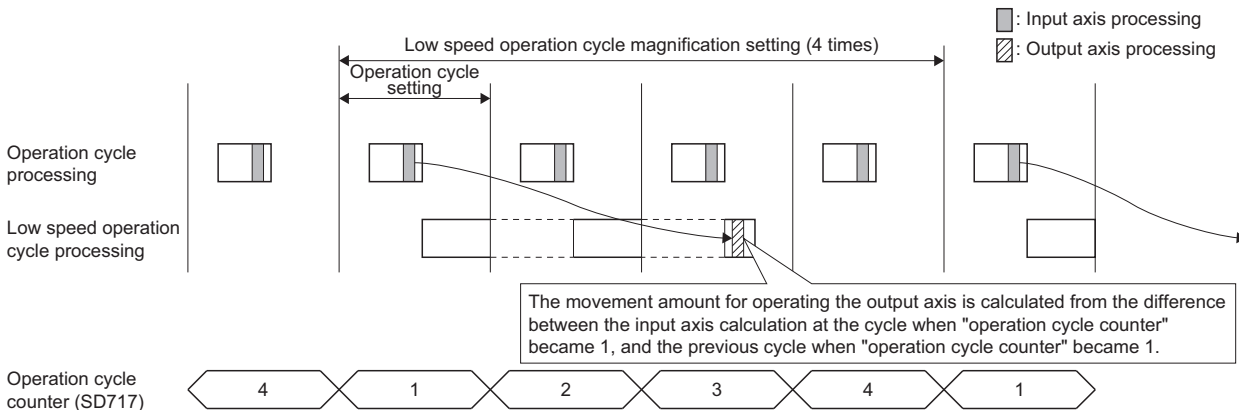
■When input axis is low speed operation cycle, and output axis is operation cycle

The movement amount sent to the output axis is calculated by getting the input axis calculation of the low speed operation cycle at the operation cycle of the start of the low speed operation cycle (the cycle when "Operation cycle counter (SD717)" is 1). For this reason, the input value sent to the output axis is only updated once for the low speed operation cycle magnification setting, and the output axis also operates once for the low speed operation cycle magnification setting.
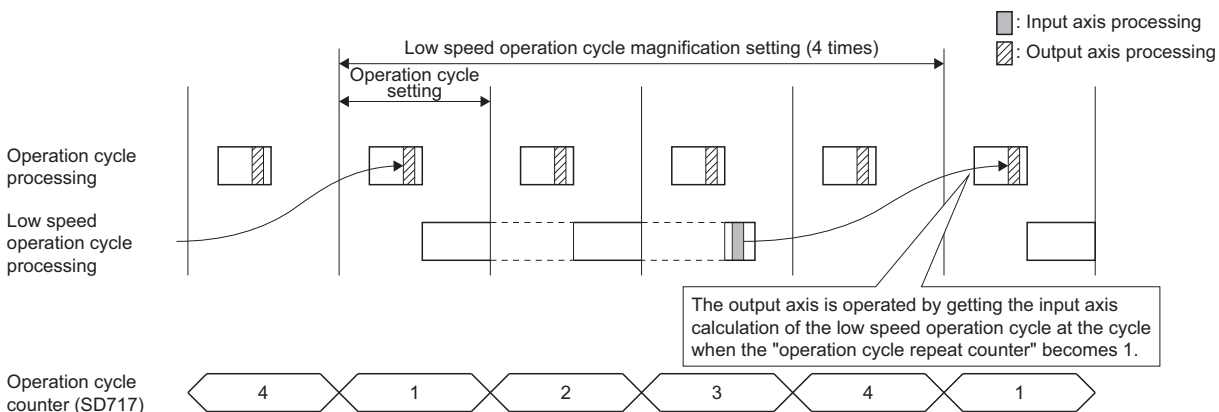
> **Point**
>
> When the control cycles of the input axis and output axis are different, and performing operations that repeatedly change "[Md.400] Current value after composite main shaft gear (R: D39120+32n, D39121+32n/Q: D13600+30n, D13601+30n)" with the input axis, be sure to make these operations after the low speed operation cycle has passed. If repeatedly performing these operations in the low speed operation cycle, "[Md.400] Current value after composite main shaft gear" may not change.

Using high-speed input request signal on axes controlling at low speed operation cycle

When using a high-speed input request signal on an axis controlling at low speed operation cycle for mark detection, advanced synchronous control clutch etc., make sure to set the high-speed input request signal control cycle setting of the applicable high-speed input request signal to "low speed operation cycle".

If the high-speed input request signal is used with setting as "operation cycle", the ON/OFF of the high-speed input request signal cannot be detected at the low speed Motion operation cycle.

If a high-speed input request signal setting with a cycle that does not match the cycle set in mark detection, synchronous encoder axis, or advanced synchronous control clutch control has been set, an error occurs.

Refer to high-speed input request signal setting for high-speed input request signal control cycle setting. (☞ Page 96 High-speed input request signal setting)

Restrictions when using each function

The restrictions for when the low speed operation cycle magnification setting is used with each function are shown below.

Function	Restrictions
Synchronous encoder axis	• The synchronous encoder axis operates at the operation cycle. • When a servo amplifier axis with "[Pr.320] Synchronous encoder axis type" set to "101: Via servo amplifier" has a low speed operation cycle of 1.777[ms] or less, the data refresh cycle of the synchronous encoder is the low speed operation cycle. To refresh data every operation cycle, connect the synchronous encoder to a servo amplifier axis controlling at the operation cycle.
Digital oscilloscope	When the sampling interval is set to "operation cycle", sampling is performed at operation cycle.
Mark detection function	• The data update cycle for when Motion control data is set is the control operation cycle of the target axis. • The data update cycle for when word devices are set is fixed as the operation cycle. • Refresh of indirectly specified devices of mark detection setting data is executed at the operation cycle. • Set the setting No. of the high-speed input request signal whose control cycle setting matches the control cycle of the axis specified by the mark detection data.
Limit switch output function	• The sampling cycle of watch data is the control operation cycle of the target axis. • The fetch cycle of forced OFF bit, forced ON bit, and limit output compensation time is executed at the operation cycle.
High-speed input request signal	• Set the high-speed input request signal control cycle setting for axes controlling at the low speed operation cycle to "low speed operation cycle". • Fetch of compensation time, and refresh of status devices is dependent on high-speed input request signal control cycle settings.
Multiple CPU data refresh	Data is refreshed at the timing of the operation cycle. (Data refresh is not performed at low speed operation cycle,)
Multiple CPU advanced synchronous control	• Set the same operation cycle to all Motion CPUs performing Multiple CPU advanced synchronous control. • Data refresh between master CPUs and slave CPUs is executed every operation cycle. (Data refresh is not performed at low speed operation cycle,) Therefore, servo amplifier axes and command generation axes used as input axes to the slave CPU must be set to operate at the operation cycle.
Vibration suppression command filter	When the control operation cycle of the target axis is 7.111[ms] or more, the vibration suppression command filter becomes invalid.
Manual pulse generator operation	Do not set axes with different control operation cycles to "[Cd.1098] Manual pulse generator 1 axis No. setting registers (R: D35294 to D35297/Q: D714, D715)", "[Cd.1099] Manual pulse generator 2 axis No. setting registers (R: D35298 to D35301/Q: D716, D717)", and "[Cd.1100] Manual pulse generator 3 axis No. setting registers (R: D35302 to D35305/Q: D718, D719)". When axes with different control operation cycles are set, a warning (error code: 098DH) occurs, and manual pulse generator operation does not start.
Servo access	When low speed operation cycle magnification setting is set, a moderate error (error code: 30F9H) occurs if a SSCNETⅢ line exists in the servo network settings.When SSCNETⅢ/H head module or sensing module (station mode) is connected, the refresh cycle of status devices and monitor devices is fixed as the operation cycle.
Add-on function	• The low speed operation cycle cannot be set as an automatic execution for the add-on module. • Using the low speed operation cycle magnification setting with each add-on module depends on the specifications of the add-on module.
Machine control	When machine control is enabled, a moderate error (error code: 30F9H) occurs.
G-code control	When G-code control is enabled, a moderate error (error code: 30F9H) occurs.

5 FUNCTIONS USED WITH SSCNET COMMUNICATION

5.1 Servo Parameter Management

Transmission of servo parameters

The Motion CPU stores servo parameters as a file, extracts them to the internal servo parameter open area (backup memory), and then communicates with the servo amplifier. The servo parameter storage area, and transfer timing is shown below.
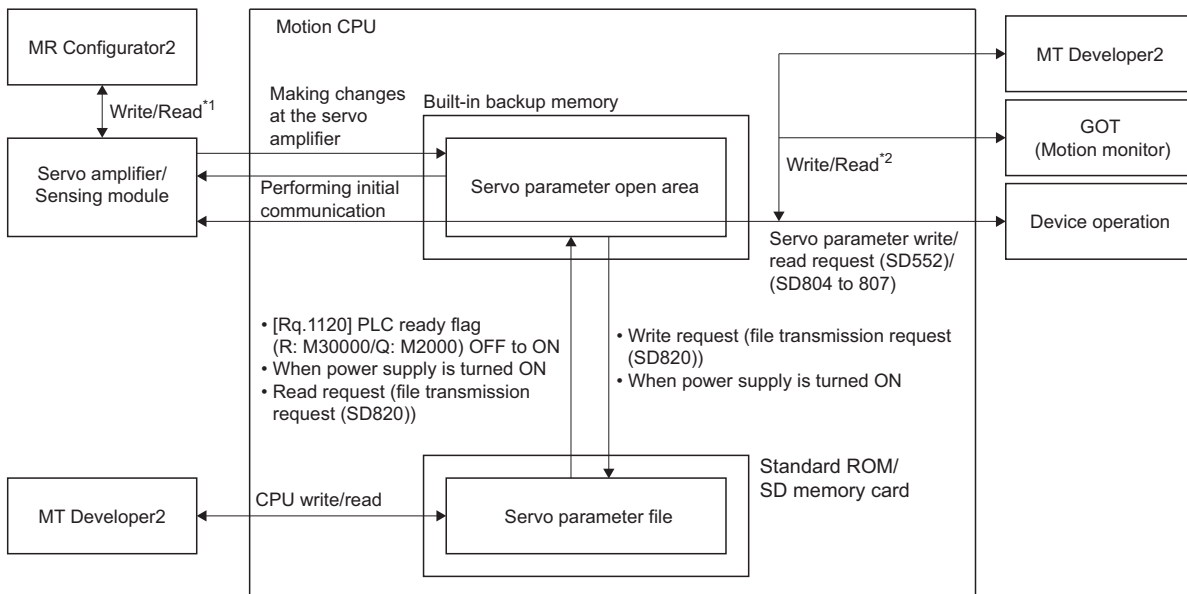
*1 The sensing module cannot write/read servo parameters by direct connection to MR Configurator2.
*2 The sensing module cannot write/read servo parameters via GOT(Motion monitor).

Managed servo parameters

Servo parameters managed by the Motion CPU are first extracted to the servo parameter open area, and are then automatically transferred to the servo amplifier/sensing module when performing initial communication.

Point

If changes are made to the content of the servo parameter file, use the following procedure to update the changed content to the servo amplifier/sensing module.
 • Turn OFF or reset the Multiple CPU system.
 • Turn the "[Rq.1120] PLC ready flag (R: M30000/Q: M2000)" from OFF to ON (or, "File transfer flag (SD820)"), and then turn ON the servo amplifier/sensing module control power supply again, or disconnect and then reconnect SSCNET communication.

If changes are also made to servo parameters for which it is necessary to reboot the servo amplifier control circuit power supply, it is first necessary to perform the procedure above, and then reboot the servo amplifier/sensing module control circuit power supply again.

When parameters are updated at the servo amplifier side

When the servo parameters are changed by one of the causes below after communication with the servo amplifier has been established, the Motion CPU will automatically read the servo parameters and reflect them to the servo parameter storage area in the Motion CPU.

- The parameters are changed by auto tuning.
- The parameters are changed by connecting directly MR Configurator2 to the servo amplifier.

> **Point**
>
> - If the power supply of Multiple CPU system is turned off/reset or the power supply of servo amplifier is turned off immediately after change of parameters on the servo amplifier side, changes may not be reflected to the built-in memory or the servo parameter file.
> - If changes are made to the servo parameter file content, and these changes are updated to the servo parameter open area inside the Motion CPU, any changes made to parameters at the servo will not be updated to the servo parameter open area inside the Motion CPU until updating of the changed parameter content to the servo amplifier is complete.
> - When changes to the servo parameters need to be reflected to the MT Developer2 project, read the servo parameters from the Motion CPU and save data.

When the update of the servo parameter file is required

If the content of the servo parameter open area inside the Motion CPU changes, and it is necessary to update the servo parameter file, the relevant axis bit for the "Servo parameter change flag (RIO)(SD555)", and "Servo parameter change flag (SD556 to SD559)" will turn ON, and changes will be automatically updated to the servo parameter file the next time the Multiple CPU system power supply is turned OFF or the system is reset. Furthermore, changes can be updated to the servo parameter file with a "File transmission request (SD820)". (The relevant axis bit turns OFF when the file update is complete.)

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
SD555	—	—	—	—	—	—	—	—	Axis 608	Axis 607	Axis 606	Axis 605	Axis 604	Axis 603	Axis 602	Axis 601
SD556	Axis 16	Axis 15	Axis 14	Axis 13	Axis 12	Axis 11	Axis 10	Axis 9	Axis 8	Axis 7	Axis 6	Axis 5	Axis 4	Axis 3	Axis 2	Axis 1
SD557	Axis 32	Axis 31	Axis 30	Axis 28	Axis 28	Axis 27	Axis 26	Axis 25	Axis 24	Axis 23	Axis 22	Axis 21	Axis 20	Axis 19	Axis 18	Axis 17
SD558	Axis 48	Axis 47	Axis 46	Axis 45	Axis 44	Axis 43	Axis 42	Axis 41	Axis 40	Axis 39	Axis 38	Axis 37	Axis 36	Axis 35	Axis 34	Axis 33
SD559	Axis 64	Axis 63	Axis 62	Axis 61	Axis 60	Axis 59	Axis 58	Axis 57	Axis 56	Axis 55	Axis 54	Axis 53	Axis 52	Axis 51	Axis 50	Axis 49

Devices used

Explicit synchronization of servo parameters between areas can be performed with a special register. The special registers used and update target areas are shown below.

- Servo Parameter Read/Change Function(☞ Page 171 Servo Parameter Read/Change Function)
- File Transfer Function(☞ Page 114 File Transfer Function)

●: Update source, ○: Update target

Special register	Update target			
	Servo parameter file	Servo parameter open area	Servo amplifier/ Sensing module	Device
Servo parameter write request (SD804)	—	○	○	●
Servo parameter read request (SD804)	—	○	●	○
File transmission request (SD820) (write)	○	●	—	—
File transmission request (SD820) (read)	●	○	—	—

Servo Parameter Read/Change Function

The servo parameters can be changed or displayed individually from Motion CPU. Use the following special registers to change or display the servo parameter.

"Servo parameter write/read request" device

No.	Name	Meaning	Details	Set by
SD552	Servo parameter write/read request	Servo parameter read value	The read value of servo parameter which executed "2: Read request" in SD804 is stored.	System(At reading request)
SD804[*1]		Servo parameter write/read request flag	• The "write/read request" is executed after setting of the axis No. and servo parameter No. 1: Write request 2: Read request • "0" is automatically set by Motion CPU after completion of servo parameter write/read request. ("-1" is stored by Motion CPU at write/read error.)	User/System
SD805		Axis No.	The axis No. to write/read servo parameter is stored. R64MTCPU: 1 to 64 R32MTCPU: 1 to 32 R16MTCPU: 1 to 16 Sensing module (station mode): 601 to 608	User
SD806		Servo parameter No.	The servo parameter No. to be written/read is stored in hexadecimal. H □□□□ └──→ Parameter No. └──→ Parameter group No. • 0: PA • 5: PF • 1: PB • 9: Po • 2: PC • A: PS • 3: PD • B: PL (MR-J4(W)-□B only) • 4: PE • C: PT (MR-J4(W)-□B only) └──→ Fixed to 0 • Using sensing module (station mode) H □□□□ └──→ Parameter No. └──→ Parameter group No. • 0: Sensing SSCNETⅢ/H head module (MR-MT2010) • 1: Sensing extension module (MR-MT2100, MR-MT2200, MR-MT2300, MR-MT2400)	
SD807		Servo parameter setting value	The setting value of servo parameter to be written is stored when "1: Write request" is set in SD804.	

*1 Do not execute the automatic refresh.

Servo parameter write/read request procedure

■Procedure to write

1. Set the axis No., servo parameter No. and servo parameter setting value in SD805 to SD807.

2. Set "1: Write request" in SD804.

3. Check that "0" is set in SD804. (Completion of write)

■Procedure to read

1. Set the axis No. and servo parameter No. in SD805 and SD806.

2. Set "2: Read request" in SD804.

3. Check that "0" is set in SD804. (Completion of read)

4. Stores the read value in SD552.

Point

- New servo parameter is reflected to Motion CPU, therefore, the servo parameter of Motion CPU side does not need to change.
- When the axis No., servo parameter No. or servo parameter setting value is outside the setting range, "-1: write/read error" is stored in the servo parameter write/read request flag. The setting value of servo parameter is reflected to Motion CPU even when the write error occurred. Be sure to set within the setting range.
- When the following is set for sensing module, and servo parameter read/write is executed, "-1: write/read error" is stored in the servo parameter write/read request flag.
  - When sensing SSCNETⅢ/H head module is set at an axis No. other than the start station in 1 block.
  - When a sensing extension module is set in a sensing SSCNETⅢ/H head module only configuration.
- When servo parameter read/write is executed for the RIO axis of the SSCNETⅢ/H head module, "-1: write/read error" is stored in the servo parameter write/read request flag.

5.2 Optional Data Monitor Function

The optional data monitor function is used to store data in the servo amplifier to a specified word device and monitor the data.

In the optional data monitor, there is registered monitor and transient command.

Refer to the following for details of the data types set by registered monitor and transient command.

📖 Servo amplifier Instruction Manual

Registered monitor

The registered monitor data is refreshed every operation cycle.

The data is stored in the device set by the storage device No.
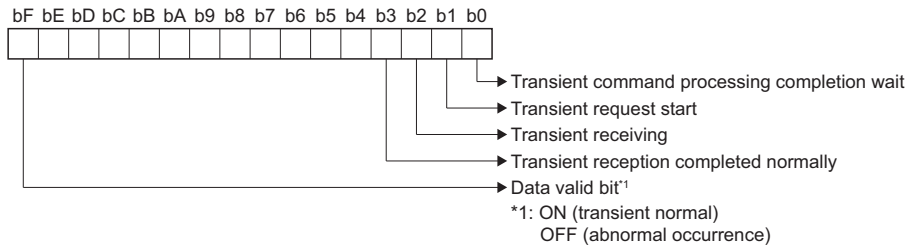
Transient command

Transient command data is sent and received asynchronously (one item at a time). Although refreshing data with transient command is slower compared to registered monitor, transient command is used to receive data that is not required to be read in fixed cycles. Transient command can also send commands to the servo amplifier according to the data type.

The 12 points from the device set by the storage device No. are stored as transient send and receive data in the following manner.

■Transient send and receive data

"Control data" is automatically initialized according to the specified data type when the Multiple CPU system power supply is turned ON, and the result is stored to the "monitor data". To change the data to be sent and received while the Multiple CPU system power supply is turned ON, change the transient command after setting the command send request as "0 (no request)".

Offset	Item		Details
+0	Control data	Command send request	Requests send of transient command. The default value after Multiple CPU system power supply is turned ON is "2: Transient request (continuous send)". • If the value is changed while processing, the process is not interrupted. • For "1: Transient request (individual send)", all data is cleared to 0 upon the completion of all processes • Setting range 1: Transient request (individual send) 2: Transient request (continuous send) Other than 1: No request
+1		Transient command	Sets the transient command to be sent. • Without checking the value, the set value is sent to the servo amplifier as a command. Do not set values other than those that are set for transient commands as the servo amplifier operation for other values is not guaranteed. • When the issued command is a send command, it is recorded to the event history. • After Multiple CPU system power supply is turned ON, the command that supports the data type set by the parameter is stored as the initial value.
+2		Request data	Sets the request data. Can be used as a command option when using a send command such as alarm history clear command. • Without checking the value, the set value is sent to the servo amplifier as a command. • Set "0" when request data is not defined by command.
+3			
+4			
+5			
+6	Monitor data	Transient status	The process after sending transient request is stored. bF bE bD bC bB bA b9 b8 b7 b6 b5 b4 b3 b2 b1 b0 → Transient command processing completion wait → Transient request start → Transient receiving → Transient reception completed normally → Data valid bit[1] *1: ON (transient normal) OFF (abnormal occurrence)
+7		Unusable	—
+8		Response data	The response data from the servo amplifier is stored. The response data includes valid data and invalid data (0), and is always stored as 4 words. • When SSCNETⅢ(/H) is disconnected, data is cleared to 0.
+9			
+10			
+11			

■Send and receive timing

The send and receive timing of transient send and receive data is shown below.

• Normal timing
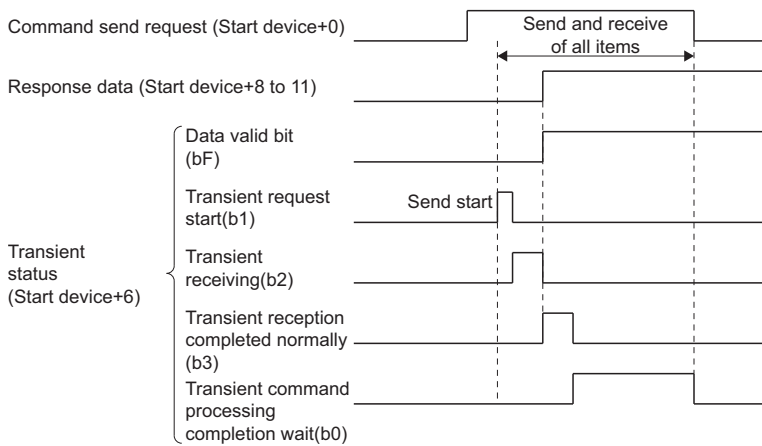
• Abnormal timing
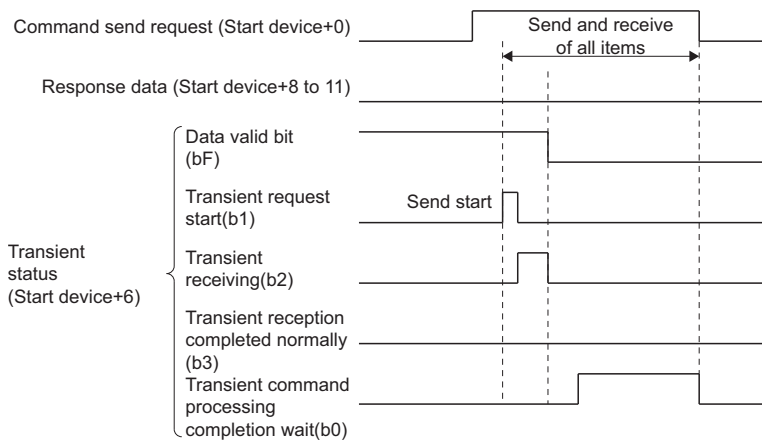
• When disconnected during continuous send
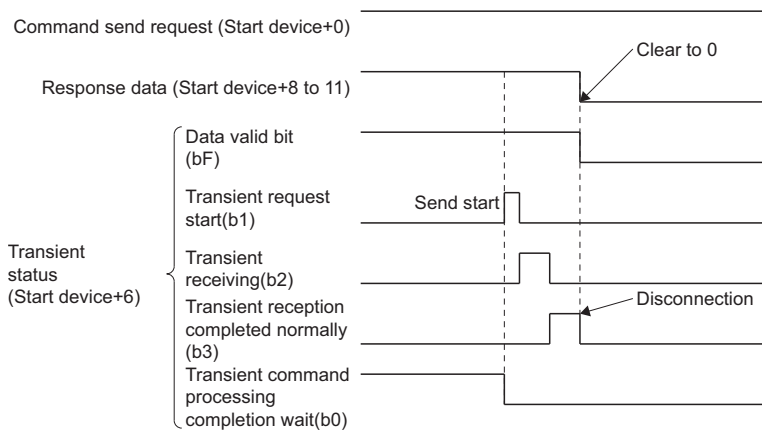
Point

• Response data is only updated when normal receive is completed.
• When an error occurs with the data valid bit (bF), it is kept until normal receive is completed.

Optional data monitor setting

This section explains the setting items of the optional data monitor.

Data for registered monitor and transient command data types per axis can be set for setting 1 to 14.

However, of the 14 settings, set no more than 6 settings of registered monitor data for SSCNETⅢ/H lines, and no more than 3 settings of registered monitor data for SSCNETⅢ lines.

👌 [Motion Control Parameter] ⇨ [Axis Setting Parameter] ⇨ "Optional Data Monitor"

Item		Setting range	Default
Setting 1 to 14	Data type	☞ Page 175 Registered monitor ☞ Page 177 Transient command	0
	Address/Transient ID	Address ID: H0000 to H7FFE Transient ID: H0000 to HFFFF	—
	Storage device No.	Word device	—

Data type

Set the total of number of communication data points per 1 axis so they are no more than the points shown below.

Servo amplifier	Total number of communication data points per 1 axis
MR-J4(W)-□B	Up to 6 points
MR-J4-□B-RJ[*1]	Up to 2 points
MR-J4-□B-LL	Up to 5 points
MR-J3(W)-□B	Up to 3 points

*1 When setting an axis of servo amplifier selected as "101: Synchronous encoder via servo amplifier" by "[Pr.320] Synchronous encoder axis type".

■Registered monitor

○: Settable, ×: Unsettable

Data type	Unit	Number of words	Number of communication data points	Servo amplifier		Address ID[*1][*2]	Remark
				MR-J3(W)-□B	MR-J4(W)-□B		
Effective load ratio	[%]	1	1	○	○	009CH	
Regenerative load ratio	[%]	1	1	○	○	009AH	
Peak load ratio	[%]	1	1	○	○	009EH	
Position F/B	[pulse]	2	0	○	○	—	
Encoder position within 1 revolution	[pulse]	2	0	○	○	0018H(lower), 001AH(upper)	
Encoder multi-revolution counter	[rev]	1	0	○	○	0028H	
Load inertia moment ratio	[×0.1]	1	1	○	○	00A0H	
Load mass ratio							Linear servo motor use
Model loop gain	[rad/s]	1	1	○	○	00A2H	
Bus voltage	[V]	1	1	○	○	0098H	
Cumulative current value[*3]	[Position command][*4]	2	0	○	○	—	
Servo motor speed[*5]	[r/min]	1	1	○	○	0184H	
Servo motor speed[*5]	[mm/s]						Linear servo motor use
Selected droop pulse	[pulse]	2	2	○	○	0080H(lower), 0082H(upper)	
Unit power consumption[*6]	[W]	1	1	×	○	0140H	
Unit power consumption (2 word)[*6]	[W]	2	2	×	○	0164H	
Unit total power consumption[*6]	[Wh]	2	2	×	○	0144H(lower), 0146H(upper)	
Instantaneous torque	[0.1%]	1	1	×	○	0152H	
Instantaneous thrust							Linear servo motor use

Data type	Unit	Number of words	Number of communication data points	Servo amplifier		Address ID[*1][*2]	Remark
				MR-J3(W)-□B	MR-J4(W)-□B		
Load side encoder information 1	[pulse]	2	2	○	○	0110H(lower), 0112H(upper)	Fully closed control or synchronous encoder via servo amplifier use
Load side encoder information 2	—	2	2	○	○	0114H(lower), 0116H(upper)	
Z-phase counter	[pulse]	2	2	×	○	00A8H(lower), 00AAH(upper)	Linear servo motor use
Servo motor thermistor temperature	[℃]	1	1	○	○	00A4H	
Torque equivalent to disturbance	[0.1%]	1	1	×	○	0150H	
Thrust equivalent to disturbance							Linear servo motor use
Overload alarm margin	[0.1%]	1	1	×	○	0154H	
Excessive error alarm margin	[16pulse]	1	1	×	○	0156H	
Settling time	[ms]	1	1	×	○	0158H	
Overshoot amount	[pulse]	1	1	×	○	015AH	
Servo motor/load side position deviation	[pulse]	2	2	×	○	015CH(lower), 015EH(upper)	Fully closed control use
Servo motor/load side speed deviation	[0.01r/min]	2	2	×	○	0160H(lower), 0162H(upper)	
Servo command value[*3][*7]	[pulse]	2	0	○	○	—	
Torque command[*3][*8]	[0.1%]	1	0	○	○	—	
Pressure command	—	1	0	×	○	—	MR-J4-□B-LL use
Load cell pressure	—	1	0	×	○	0300H	
External encoder counter value	[pulse]	2	2	×	×	7000H(lower), 7002H(upper)	Stepping driver use
Internal temperature of encoder	[℃]	1	1	×	○	014EH	Software version C4 or later of MR-J4(W)-□B
Analog monitor input 1	—	1	1	×	○	0302H	MR-J4-□B-LL use
Analog monitor input 2	—	1	1	×	○	0304H	
Optional address of registered monitor	—	1	1	○	○	—	

*1 Data with "Lower, Upper" in the address ID use lower word and upper word of 2 word data therefore two settings should be made. Be sure to monitor the data in 2 words.

*2 Set an even number for the address ID of registered monitors.

*3 The "Cumulative current value", "Servo command value", and "Torque command" are all command values for the servo amplifier. All other data types are servo amplifier monitor values (feedback).

*4 Position commands are in the command unit set at [Motion Control Parameter] ⇨ [Axis Setting Parameter] ⇨ "Fixed Parameter" ⇨ "Unit setting".

*5 The speed will be the average of every 227[ms]. Use a servo amplifier version compatible with this monitor. The result will always be 0 if monitoring is performed with an incompatible servo amplifier.

*6 In the servo amplifier for multiple axes, the measured value of whole unit is monitored. When these values set to each axis of MR-J4 multi-axis servo amplifier, the same value can be monitored in each axis. Use the monitored value of not each axis but each module to calculate the module power consumption and unit integral power consumption of multiple modules.

*7 The servo amplifier command value is a command value for the servo amplifier. Coordinates differ from those for the Motion CPU, and therefore the result will not be 0 even if the home position is set.

*8 The torque command is a command value for the servo amplifier. Torque command values are only valid in speed-torque control torque control mode and continuous operation torque control mode. The previous value will remain for the torque command value when restoring to position control from torque control, etc., however, it is not actually used.

■Transient command

○: Settable, ×: Unsettable

Data type	Unit	Number of words[*1]	Number of communic-ation data points	Servo amplifier MR-J3(W)-□B	Servo amplifier MR-J4(W)-□B	Transient ID	Storage device (response data (+8 to 11)) content[*2]	Remark
Servo motor ID (SSCNETⅢ)/Encoder ID	—	3	0	○	○	0304H	+8: Motor ID +10: Encoder ID	
Servo motor ID (SSCNETⅢ/H)	—	2	0	×	○	0309H		
Encoder resolution	[pulse]	2	0	○	○	0305H		
Servo amplifier serial number (First 8 characters)	[characters]	4	0	×	○	0306H		
Servo amplifier serial number (Last 8 characters)	[characters]	4	0	×	○	0307H		
Servo amplifier identification information (First 8 characters)	[characters]	4	0	○	○	0310H		
Servo amplifier identification information (Last 8 characters)	[characters]	4	0	○	○	0311H		
Servo amplifier S/W No, (First 8 characters)	[characters]	4	0	○	○	0312H		
Servo amplifier S/W No, (Last 8 characters)	[characters]	4	0	○	○	0313H		
Accumulated power-on time	[h]	2	0	○	○	0319H		
Number of inrush current switching times	[times]	2	0	○	○	031AH		
Read alarm history number	[items]	1	0	○	○	0323H		
Alarm history/Detail #1, #2	—	4	0	○	○	0324H	+8: Alarm history #1 +9: Alarm detail #1 +10: Alarm history #2 +11: Alarm detail #2	
Alarm history/Detail #3, #4	—	4	0	○	○	0325H	+8: Alarm history #3 +9: Alarm detail #3 +10: Alarm history #4 +11: Alarm detail #4	
Alarm history/Detail #5, #6	—	4	0	○	○	0326H	+8: Alarm history #5 +9: Alarm detail #5 +10: Alarm history #6 +11: Alarm detail #6	
Alarm history/Detail/ Occurrence time	—/[h]	4	0	○	○	0328H	+8: Alarm history number #(N+1) +9: Alarm history number #(N+1) detail +10: Alarm history number #(N+1) occurrence time (2 words)	
Alarm occurrence time #1, #2	[h]	4	0	○	○	0329H	+8: Alarm occurrence time #1 (2 words) +10: Alarm occurrence time #2 (2 words)	
Alarm occurrence time #3, #4	[h]	4	0	○	○	032AH	+8: Alarm occurrence time #3 (2 words) +10: Alarm occurrence time #4 (2 words)	

Data type	Unit	Number of words[1]	Number of communic-ation data points	Servo amplifier MR-J3(W)-□B	Servo amplifier MR-J4(W)-□B	Transient ID	Storage device (response data (+8 to 11)) content[2]	Remark
Alarm occurrence time #5, #6	[h]	4	0	○	○	032BH	+8: Alarm occurrence time #5 (2 words) +10: Alarm occurrence time #6 (2 words)	
Alarm history clear command	—	1	0	○	○	0382H		(Example) Store request data 1 device to 1EA5H
Home position [command unit]	[pulse]/[rev]	3	0	○	○	0408H	+8: Home position within one revolution (2 words) +10: Home position multiple revolution counter	
Bus voltage	[V]	1	0	○	○	040AH		
Regenerative load ratio	[%]	1	0	○	○	040BH		
Effective load ratio	[%]	1	0	○	○	040CH		
Peak load ratio	[%]	1	0	○	○	040DH		
Estimate inertia moment ratio	[× 0.1]	1	0	○	○	040EH		
Model loop gain	[rad/s]	1	0	○	○	040FH		
LED display	[characters]	2	0	○	○	0410H	+8: Lower 2 digits +9: Higher 2 digits	
Load side encoder information 1	[pulse]	2	0	○	○	0416H		Fully closed control or synchronous encoder via servo amplifier use
Load side encoder information 2	[pulse]	2	0	○	○	0417H		
Speed F/B	[0.01mm/s]	2	0	○	○	0418H		Linear servo motor use
Servo motor thermistor temperature	[℃]	1	0	○	○	0419H		
Z-phase counter	[pulse]	2	0	×	○	041AH		Linear servo motor use
Unit power consumption	[W]	2	0	×	○	0424H		
Unit total power consumption	[Wh]	2	0	×	○	0425H		
Torque equivalent to disturbance	[0.1%]	1	0	×	○	0427H		
Instantaneous torque	[0.1%]	1	0	×	○	0428H		
Overload alarm margin	[0.1%]	1	0	×	○	0429H		
Excessive error alarm margin	[pulse]	2	0	×	○	042AH		
Settling time	[ms]	1	0	×	○	042BH		
Overshoot amount	[pulse]	1	0	×	○	042CH		
Servo motor/load side position deviation	—	2	0	×	○	042DH		Fully closed control use
Servo motor/load side speed deviation	—	2	0	×	○	042EH		
Machine diagnostic status	—	1	0	×	○	042FH	+8: Machine diagnostic status	

Data type	Unit	Number of words[1]	Number of communication data points	Servo amplifier MR-J3(W)-□B	Servo amplifier MR-J4(W)-□B	Transient ID	Storage device (response data (+8 to 11)) content[2]	Remark
Friction estimation	[0.1%]	4	0	×	○	0430H	+8: Forward rotation torque Coulomb friction [0.1%] +9: Forward rotation torque Friction torque at rated speed [0.1%] +10: Reverse rotation torque Coulomb friction [0.1%] +11: Reverse rotation torque Friction torque at rated speed [0.1%]	
Vibration estimation	[Hz/0.1%]	4	0	×	○	0431H	+8: Motor stopped Oscillation frequency [Hz] +9: Motor stopped Vibration level [0.1%] +10: Motor operating Oscillation frequency [Hz] +11: Motor operating Vibration level [0.1%]	
Internal temperature of encoder	[℃]	1	0	×	○	0434H		Software version C4 or later of MR-J4(W)-□B
Optional transient command	—	4	0	○	○	—		

*1 Number of words for response data (+8 to 11).
*2 Refer to the following for details on the content stored in response data (+8 to 11).
📖Servo amplifier Instruction Manual

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Address/Transient ID

Set when the registered monitor "Optional address of registered monitor", or transient command "Optional transient command" is set.

Data type	Input range	Remarks
Optional address of registered monitor	H0000 to H7FFE	Refer to registered monitor for the address ID that can be set.(☞ Page 175 Registered monitor)
Optional transient command	H0000 to HFFFF	Refer to transient command for the transient commands that can be set. (☞ Page 177 Transient command)

⚠ **CAUTION**

- Do not set an address/transient ID other than those published in this manual. Setting an address/transient ID not published in this manual can cause the servo amplifier to perform an unpredictable operation.

Storage device No.

Specifies the word device for storing registered monitor data, or transient send and receive data.(☞ Page 75 Device List)

Point🔍

- The updating cycle of registered monitor data is every operation cycle.
- Set an even numbered device No. when the data type of registered monitor data is two word data, or transient send and receive data.

Example of using transient commands

The following explains the operating procedure for setting the transient command data types "Friction estimation", "Vibration estimation", and "Optional transient command".

Friction estimation/vibration estimation

Setting "Friction estimation" and "Vibration estimation" to the optional monitor data settings does not enable the correct values to be stored. With the procedure below, perform machine diagnosis and store the values.

Operating procedure

1. In optional data monitor settings, set the transient command data type "machine diagnostic status", "friction estimation", and "vibration estimation".

2. Operate the servo motor for approximately 20 minutes in the operation pattern of servo parameter "Machine diagnosis function - Friction judgment speed (PF31)" until the diagnosis function is complete.

3. Check that the "forward rotation friction (b0 only)", "reverse rotation friction (b4 only)", and "vibration estimation (b8)" of the machine diagnostic status are ON, and the machine diagnosis is completed normally. When the values are not that of estimation completion and machine diagnosis fails, repeat the operating procedure starting from procedure 2.

4. Check the stored values in the devices set by "friction estimation", "vibration estimation".

> **Point**
>
> When the correct machine diagnosis conditions are not reached at the time of machine diagnosis estimation, the friction estimation and vibration estimation are not stored. Refer to the following manual to make sure the correct machine diagnosis conditions are reached.
>
> 📖 Servo amplifier Instruction Manual

■Setting example

An example for setting "machine diagnostic status", "friction estimation", and "vibration estimation" in the data type of the optional data monitor is shown below.

Ex.

When setting "Setting 1 to Setting 3" of optional data monitor, and storing friction estimation to "W50 to W53", and vibration estimation to "W60 to W63"

• Optional data monitor setting

Item		Setting value	Remarks
Setting 1	Data type	Machine diagnostic status	The data returned by the machine diagnostic status is stored in W8. (Settings and operations are not performed in W0 to W7.) The friction estimation status can be checked as follows. b15 ... b9 b8 b7 ... b4 b3 ... b0 W8 [ ] → Forward rotation friction 0000: Estimating friction 0001: Estimating complete 0010: One side operation (motor rotation stays in one direction) 0011: Parameter threshold exceeded 0100: Low variation high-speed operation 0101: Time constant underestimate 0111: 60 minutes elapsed Reverse rotation friction 0000: Estimating friction 0001: Estimating complete 0010: One side operation (motor rotation stays in one direction) 0011: Parameter threshold exceeded 0100: Low variation high-speed operation 0101: Time constant underestimate 0111: 60 minutes elapsed → Vibration estimation 0: Estimating vibration 1: Estimating complete
	Address/Transient ID	—	
	Storage device No.	W0	

Item		Setting value	Remarks
Setting 2	Data type	Friction estimation	When friction estimation is completed normally, friction estimation is stored to the following devices. (Settings and operations are not performed in W12 to W19.) • W20: Forward rotation torque Coulomb friction [0.1%] • W21: Forward rotation torque Friction torque at rated speed [0.1%] • W22: Reverse rotation torque Coulomb friction [0.1%] • W23: Reverse rotation torque Friction torque at rated speed [0.1%]
	Address/Transient ID	—	
	Storage device No.	W12	
Setting 3	Data type	Vibration estimation	When vibration estimation is completed normally, vibration estimation is stored to the following devices. (Settings and operations are not performed in W24 to W31.) • W32: Motor stopped Oscillation frequency [Hz] • W33: Motor stopped Vibration level [0.1%] • W34: Motor operating Oscillation frequency [Hz] • W35: Motor operating Vibration level [0.1%]
	Address/Transient ID	—	
	Storage device No.	W24	

• Motion SFC program

Start machine diagnosis

*: Refer to the following manual, and conduct the machine diagnosis estimation operation pattern
📖Servo amplifier Instruction Manual

[G1]
//Wait for estimation completion
W8==H0111

[F2]
//Read friction estimation
W50=W20 //Forward rotation torque Coulomb friction [0.1%]
W51=W21 //Forward rotation torque Friction torque at
          rated speed [0.1%]
W52=W22 //Reverse rotation torque Coulomb friction [0.1%]
W53=W23 //Reverse rotation torque Friction torque at
          rated speed [0.1%]

[F3]
//Read vibration estimation
W60=W32//Motor stopped Oscillation frequency [Hz]
W61=W33//Motor stopped Vibration level [0.1%]
W62=W34//Motor operating Oscillation frequency [Hz]
W63=W35//Motor operating Vibration level [0.1%]

END

Optional transient command

If using optional transient commands, any given data type can be stored in response data devices (+8 to 11) by inputting the transient ID from a GOT etc. to the device set in the transient command (+1) of transient send data.

■Setting example

An example for using optional transient commands is shown below.

Ex.

When switching to "effective load ratio" and storing, after storing "bus voltage".

• Optional data monitor setting

Item		Setting value
Setting 1	Data type	Optional transient command
	Address/Transient ID	H040A
	Storage device No.	W0

• Motion SFC program

```
                    Transient

        ┌─────────────────────────────────────────────┐
        │ [G10]                                        │
        │ //Confirm transient communication received   │
        │   normally                                   │
        │ //Data enabled bit(bF) & normal receive      │
        │   complete bit(b3) ON?                        │
        │ W6==H8008                                    │
        └─────────────────────────────────────────────┘

        ┌─────────────────────────────────────────────┐
        │ [F10]                                        │
        │ //Read bus voltage ID: 040Ah                 │
        │ W50=W8 //Store bus voltage data[V] to W50     │
        └─────────────────────────────────────────────┘

        ┌─────────────────────────────────────────────┐
        │ [F11]                                        │
        │ //Stop optional transient communication       │
        │   temporarily                                │
        │ W0=0 //2: Continuous send →0: Stop            │
        └─────────────────────────────────────────────┘

        ┌─────────────────────────────────────────────┐
        │ [G11]                                        │
        │ //Wait 1s until transient stops              │
        │ TIME 1000                                    │
        └─────────────────────────────────────────────┘

        ┌─────────────────────────────────────────────┐
        │ [F12]                                        │
        │ //From ID: 040Ah to ID: 040Ch               │
        │ W1=H040C //Switch to effective load ratio     │
        └─────────────────────────────────────────────┘

        ┌─────────────────────────────────────────────┐
        │ [F13]                                        │
        │ //Restart optional transient communication    │
        │ W0=2 //0: Stop→2: Continuous send             │
        └─────────────────────────────────────────────┘

        ┌─────────────────────────────────────────────┐
        │ [G12]                                        │
        │ //Confirm transient communication received   │
        │   normally                                   │
        │ //Data enabled bit(bF) & normal receive      │
        │   complete bit(b3) ON?                        │
        │ W6==H8008                                    │
        └─────────────────────────────────────────────┘

        ┌─────────────────────────────────────────────┐
        │ [F14]                                        │
        │ //Read effective load ratio                  │
        │ W60=W8 //Store effective load ratio[%] to W60 │
        └─────────────────────────────────────────────┘

                      END
```

5.3 SSCNET Control Function

The following controls are possible in the SSCNET control function.

Function	Application
Connect/disconnect of SSCNET communication	Temporarily connect/disconnect of SSCNET communication is executed during Multiple CPU system's power supply ON. This function is used to exchange the servo amplifiers or SSCNETⅢ cables.
Start/release of amplifier-less operation	Start/release of amplifier-less operation is requested. This function is used to confirm the operation without connection of the servo amplifies.

Device list

Set the request in "SSCNET control (command) (SD803)", and the process status is stored in "SSCNET control (status) (SD508)".

■SSCNET control (status) devices

Device No.	Overview				Set by
SD508	The execute status [1] of the SSCNET control is stored.				System
	Monitoring value	**Status**	**Contents**		
	0	Command accept waiting	Connect/disconnect command of SSCNET communication or start/release command of amplifier-less operation is in the status that can be accepted.		
	-1	Execute waiting	SD508 is waiting for connect/disconnect execute command after accepting the connect/disconnect command of SSCNET communication or start/release of amplifier-less operation.		
	-2	Executing	Connect/disconnect of SSCNET communication or start/release of amplifier-less operation is in process.		

*1   The status for amplifier-less operation status is set in the "amplifier-less operation status flag (SM508)". (☞ Page 188 Amplifier-less operation function)

■SSCNET control (command) devices

Device No.	Overview					Set by
SD803	Set the SSCNET control command.					User
	Setting value	**Command**	**Contents**	**Connect/ Disconnect**	**Amplifier-less operation**	
	0	No command	Set "0" if there is no command.	○	○	
	1 to 64	Disconnect command of SSCNET communication	Set axis No. "1 to 64" to be disconnected.	○		
	-10	Connect command of SSCNET communication	Set "-10" to connect axis while disconnecting.	○		
	-20	Start command of amplifier-less operation	Set to change from the normal operation to amplifier-less operation.		○	
	-25	Release command of amplifier-less operation	Set "-25" to change from the amplifier-less operation to normal operation.		○	
	-2	Execute command	Set "-2" to execute the processing when the status (SD508) is execute waiting after setting the value of each command.	○	○	

Connect/disconnect function of SSCNET communication

Temporarily connect/disconnect of SSCNET communication is executed during Multiple CPU system's power supply ON. This function is used to exchange the servo amplifiers or SSCNET cables. Set the request for the connect/disconnect of SSCNET communication in "SSCNET control (command) (SD803)", and the status for the command accept waiting or execute waiting is stored in "SSCNET control (status) (SD508)". Use this device to connect the servo amplifiers disconnected by this function. When the power supply module of head axis of each SSCNET line (servo amplifier connected directly to the Motion CPU module) turns OFF/ON, this function is not necessary.

> **Point**
> - Servo amplifiers connected after the axis specified for SSCNET communication disconnect processing are also disconnected. Confirm the LED display of the servo amplifier for "AA" after completion of SSCNET communication disconnect processing. And then, turn OFF the servo amplifier's power supply.
> - The "SSCNET control (status) (SD508)" only changes into the execute waiting status (-1) even if the disconnect command of SSCNET communication (1 to 64) or connect command of SSCNET communication (-10) is set in "SSCNET control (command) (SD803)". The actual processing is not executed. Set the execute command (-2) in "SSCNET control (command) (SD803)" to execute.
> - When the disconnect command of SSCNET communication (1 to 64) is set to axis not disconnect, the "SSCNET control (status) (SD508)" returns the command accept waiting status (0) without entering the execute waiting status (-1).
> - Operation failure may occur in some axes if the servo amplifier's power supply is turned OFF without using the disconnect function. Be sure to turn OFF the servo amplifier's power supply by the disconnect function.
> - When the connect/disconnect command is executed to the axis allocated to B-axis and C-axis of MR-J4W-□B or B-axis of MR-J3W-□B, it can be disconnected, however it cannot be reconnected. Execute the connect/disconnect command to the A-axis.
> - Only the release command of amplifier-less operation can be accepted during amplifier-less operation. The connect/disconnect command cannot be accepted.
> - If using the connect/disconnect function of SSCNET communication in a line used to perform driver communication, connection/disconnection is only possible at the first axis (the servo amplifier directly connected to Motion CPU). (☞ Page 195 Precautions during control)

Procedure to connect/disconnect of SSCNET communication

Procedure to connect/disconnect at the exchange of servo amplifiers or SSCNETⅢ cables is shown below.

■Procedure to disconnect

1. Set the axis No. to disconnect in "SSCNET control (command) (SD803)". (Setting value: 1 to 64)

2. Check that "-1: Execute waiting" is set in "SSCNET control (status) (SD508)". (Disconnect execute waiting)

3. Set "-2: Execute command" in "SSCNET control (command) (SD803)".

4. Check that "0: Command accept waiting" is set in "SSCNET control (status) (SD508)". (Completion of disconnection)

5. Turn OFF the servo amplifier's power supply after checking the LED display "AA" of servo amplifier to be disconnected.
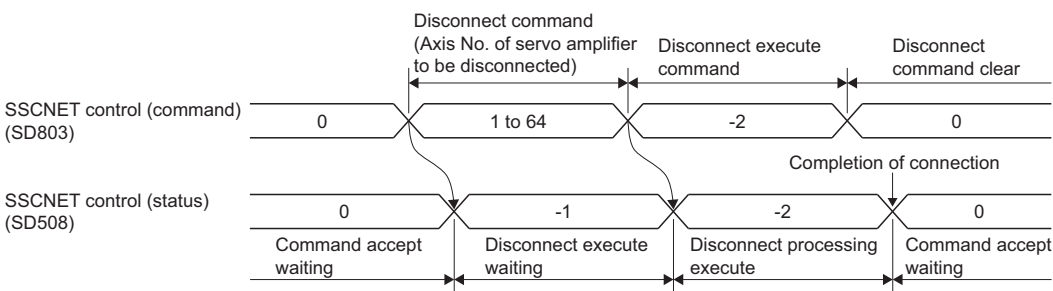
■Procedure to connect

1. Turn ON the servo amplifier's power supply.

2. Set "-10: Connect command of SSCNET communication" in "SSCNET control (command) (SD803)".

3. Check that "-1: Execute waiting" is set in "SSCNET control (status) (SD508)". (Connect execute waiting)

4. Set "-2: Execute command" in "SSCNET control (command) (SD803)".

5. Check that "0: Command accept waiting" is set in "SSCNET control (status) (SD508)". (Completion of connection)

6. Resume operation of servo amplifier after checking the "[St.1075] Servo ready (R: M32415+32n/Q: M2415+20n)" ON.
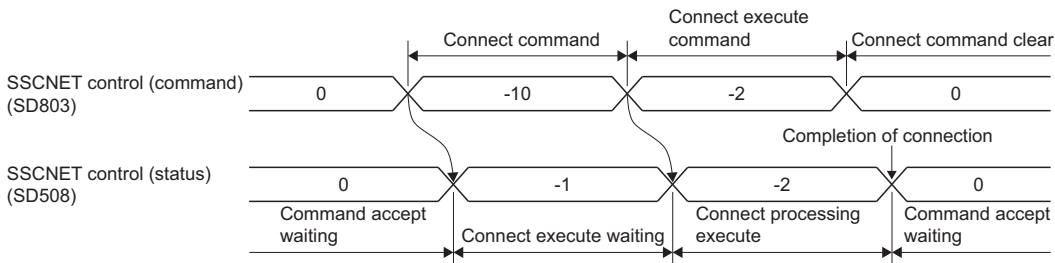
Program

■Program to connect/disconnect the servo amplifiers after Axis 5 of self CPU

Procedure	Operation
Disconnect procedure	Turn OFF the servo amplifier's control circuit power supply after checking the LED display "AA" of servo amplifier.
Connect procedure	Resume operation of servo amplifier after checking the "[St.1075] Servo ready (R: M32415+32n/Q: M2415+20n)" ON.

System configuration
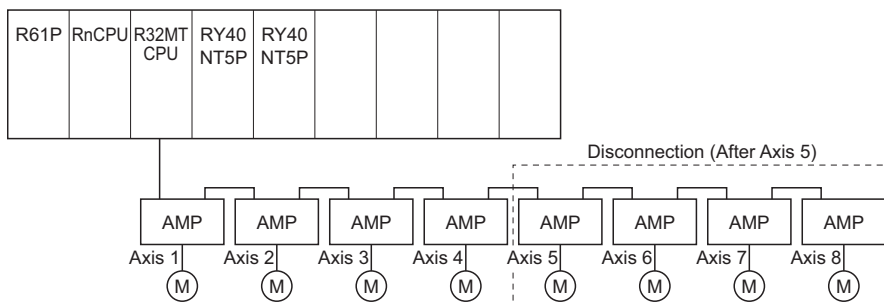
•Motion SFC program
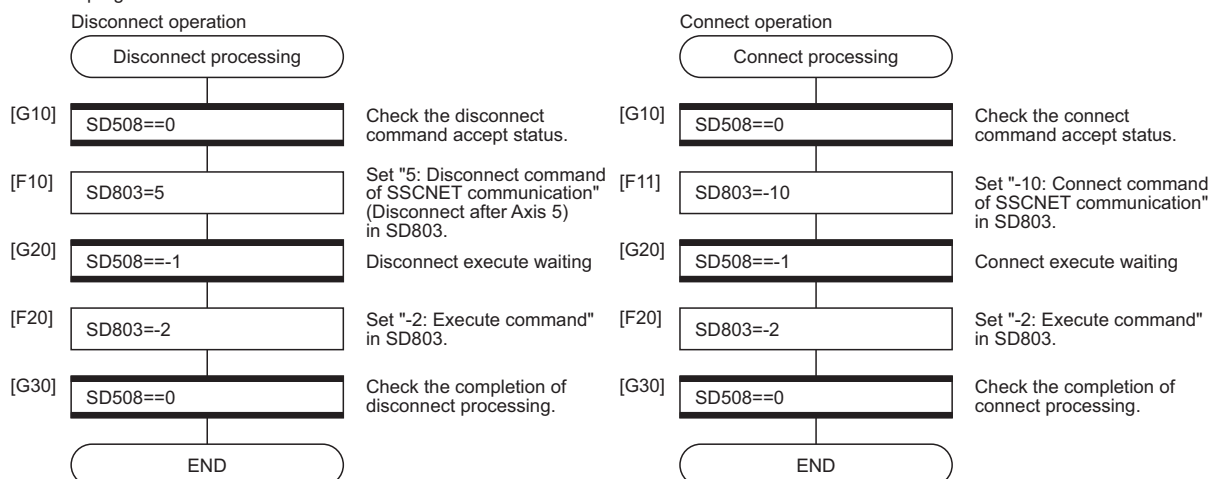
■**Program to connect/disconnect the servo amplifiers after Axis 5 connected to the Motion CPU (CPU No.2) by the PLC CPU (CPU No.1).**

Procedure	Operation
Disconnect procedure	Turn OFF the servo amplifier's control circuit power supply after checking the LED display "AA" of servo amplifier by turning X0 from OFF to ON.
Connect procedure	Resume operation of servo amplifier after checking the "[St.1075] Servo ready (R: M32415+32n/Q: M2415+20n)" of servo amplifier by turning X1 from OFF to ON.

System configuration

Disconnection (After Axis 5)

• Sequence program


```
 0  SM400                                        [ MOV  K1    D51 ]

                                                 [ MOV  K-2   D104 ]   Set "-2: Execute command" in D104.

 5  M100 M101 M102  X0                           [ MOV  K5    D102 ]   Set "5: Disconnect command of SSCNET
    ─┤/├─┤/├─┤/├─┤↑├                                                   communication" (Disconnect after Axis 5)
                                                 [ SET M100 ]          in D102.
                  X1
                 ─┤↑├                            [ MOV  K-10  D102 ]   Set "-10: Connect command of SSCNET
                                                                       communication" in D102.
                                                 [ SET M100 ]

18  M100 M10                  [ DP.DDRD  H3E1  D50  "SD508"  D100  M10 ]   Read the data of SD508 for Multiple CPU
    ─┤├─┤/├                                                               system (CPU No.2) by turning M100 ON, and
        M10  M11                                                          store them to data area (D100) of self CPU.
       ─┤├─┤/├─[ = D100 K0 ]                      [ RST M100 ]

                                                 [ SET M101 ]

39  M101 M12                  [ DP.DDWR  H3E1  D50  D102  "SD803"  M12 ]   Write D102 to the data of SD803 for Multiple
    ─┤├─┤/├                                                               CPU system (CPU No.2) by turning M101 ON.
        M12  M13                                                          (Disconnect/Connect command)
       ─┤├─┤/├                                   [ RST M101 ]

                                                 [ SET M102 ]

57  M102 M10                  [ DP.DDRD  H3E1  D50  "SD508"  D100  M10 ]   Read the data of SD508 for Multiple CPU
    ─┤├─┤/├                                                               system (CPU No.2) by turning M102 ON, and
        M10  M11                                                          store them to data area (D100) of self CPU.
       ─┤├─┤/├─[ = D100 K-1 ]                     [ RST M102 ]

                                                 [ SET M103 ]

78  M103 M12                  [ DP.DDWR  H3E1  D50  D104  "SD803"  M12 ]   Write D104 to the data of SD803 for Multiple
    ─┤├─┤/├                                                               CPU system (CPU No.2) by turning M103 ON.
        M12  M13                                                          (Disconnect/connect execute command)
       ─┤├─┤/├                                   [ RST M103 ]

                                                 [ SET M104 ]

96  M104 M10                  [ DP.DDRD  H3E1  D50  "SD508"  D100  M10 ]   Read the data of SD508 for Multiple CPU
    ─┤├─┤/├                                                               system (CPU No.2) by turning M104 ON, and
        M10  M11                                                          store them to data area (D100) of self CPU.
       ─┤├─┤/├─[ = D100 K0 ]                      [ RST M104 ]
```

5

Amplifier-less operation function

This function is used to confirm for the operation without connecting the servo amplifiers at the starting or debugging. The start/release request of amplifier-less operation is set in "SSCNET control (command) (SD803)", and status of the command accepting waiting or execute waiting is stored in "SSCNET control (status) (SD508)". Confirm the amplifier-less operation status by the "Amplifier-less operation status flag (SM508)".

> **Point**
>
> - The "SSCNET control (status) (SD508)" only changes into the execute waiting status (-1) even if the start command of amplifier-less operation (-20) or release command of amplifier-less operation (-25) in "SSCNET control (command) (SD803)". The actual processing is not executed. Set the execute command (-2) in "SSCNET control (command) (SD803)" to executed.
> - Only the release command of amplifier-less operation can be accepted during amplifier-less operation. The start command for the other amplifier-less operation cannot be accepted.
> - The operation of servo motor or the timing of operation cycle, etc. at the amplifier-less operation is different from the case where the servo amplifiers are connected. Confirm the operation finally with a real machine.
> - The amplifier-less operation becomes invalid immediately after the Multiple CPU system's power supply ON or reset.

Amplifier-less operation status flag

Device No.	Signal name	Overview	Set by
SM508	Amplifier-less operation status flag	The amplifier-less operation status is stored. OFF: During normal operation ON:　During amplifier-less operation	System

Control details

Operation during amplifier-less operation is shown below.

Item	Operation
Servo amplifier type	All axes set in the system setting are connected with the following type regardless of the setting details of system setting. ■For communication type "SSCNETⅢ/H" • Servo amplifier: MR-J4-10B • Servo motor: HG-KR053 ■For communication type "SSCNETⅢ" • Servo amplifier: MR-J3-10B • Servo motor: HF-KP053

Servo amplifier status	• Deviation counter value
	  Always 0
	• Motor speed
	  Motor speed for the command
	• Motor current value
	  At the amplifier-less operation start: "0" (The motor current value can be simulated during amplifier-less operation by changing the "[Md.104] Motor current value (R: D32020+48n/Q: #8001+20n)" using the user program.)
	• Servo ready signal
	  This signal changes depending on the status of "[Rq.1123] All axes servo ON command (R: M30042/Q: M2042)" or "[Rq.1155] Servo OFF command (R: M34495+32n/Q: M3215+20n)".
	• Torque limiting signal
	  This signal turns ON by the following condition.
	  |Motor current value|≥Torque limit value
	  *: When the positive direction and negative direction of torque limit value is set individually using CHGT instruction is as follows.
	    |Motor current value|≥Positive direction torque limit or Negative direction torque limit value
	• Zero pass signal
	  Always ON

Servo amplifier external signal (At the setting valid)	Each signals is shown below at the amplifier-less operation start. • [St.1071] External signals FLS (R: M32411+32n/Q: M2411+20n): Normal open: OFF/Normal close: ON • [St.1072] External signals RLS (R: M32412+32n/Q: M2412+20n): Normal open: OFF/Normal close: ON • [St.1074] External signals DOG/CHANGE (R: M32414+32n/Q: M2414+20n): Normal open: OFF/Normal close: ON The servo amplifier external signals can be operated during amplifier-less operation by turning ON/OFF the "[St.1071] External signals FLS (R: M32411+32n/Q: M2411+20n)", "[St.1072] External signals RLS (R: M32412+32n/Q: M2412+20n)" or "[St.1074] External signals DOG/CHANGE (R: M32414+32n/Q: M2414+20n)" using the user program.
Home position return	All home position return methods can be used.
Absolute position system	The absolute position is controlled as the normal servo amplifier connection. ■At the amplifier-less operation start The absolute position is restored by the saved absolute position data. The absolute position is restored as the travel value "0" during the servo amplifier's power supply OFF. ■During amplifier-less operation Suppose the servo motor operated during amplifier-less operation, and the absolute position data is refreshed. ■The servo amplifiers are connected after amplifier-less operation The absolute position is restored by the refreshed absolute position data and the actual motor position during amplifier-less operation.
Operation using MR Configurator2	Online operation and monitor of the servo amplifiers cannot be executed.
Optional data monitor	Only the following data types are possible. The other monitor values are "0". ■Registered monitor • Position F/B • Encoder position within 1 revolution • Encoder multi-revolution counter • Cumulative current value • Servo command value • Torque command ■Transient command • Home position [command unit] • LED display
Driver communication	Cannot change to amplifier-less operation when connected and not connected servo amplifier axes are mixed. Change to amplifier-less operation when all axes are connected, or disconnect all axes of the servo amplifier.
SSCNETⅢ/H head module	The module is disconnected during amplifier-less operation.
Sensing module	

Procedure to start/release of amplifier-less operation

■Procedure to start

1. Set "-20: Start command of amplifier-less operation" in "SSCNET control (command) (SD803)".

2. Check that "-1: Execute waiting" is set in "SSCNET control (status) (SD508)". (Start processing execute waiting of amplifier-less operation)

3. Set "-2: Execute command" in "SSCNET control (command) (SD803)".

4. Check that "0: Command accept waiting" is set in "SSCNET control (status) (SD508)". (Start processing completion of amplifier-less operation)

5. Check that "ON: During amplifier-less operation" is set in "SSCNET control (status) (SD508)". Resume operation of servo amplifier after checking the "[St.1075] Servo ready (R: M32415+32n/Q: M2415+20n)" ON.
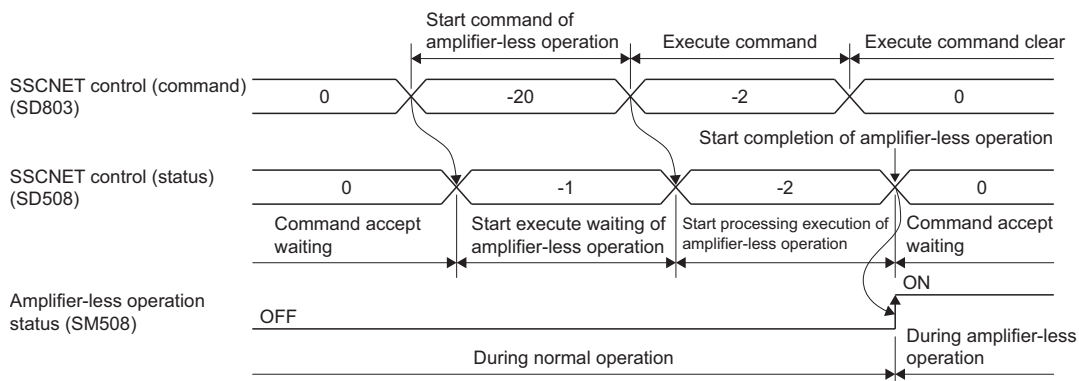

■Procedure to release

1. Set "-25: Release command of amplifier-less operation" in "SSCNET control (command) (SD803)".

2. Check that "-1: Execute waiting" is set in "SSCNET (status) (SD508)". (Release processing execute waiting of amplifier-less operation)

3. Set "-2: Execute command" in "SSCNET control (command) (SD803)".

4. Check that "0: Command accept waiting" is set in "SSCNET (status) (SD508)".

5. Check that "OFF: During normal operation" is set in "SSCNET (status) (SD508)". (Release processing completion of amplifier-less operation. When the servo amplifiers are connected, they are automatically reconnected.)
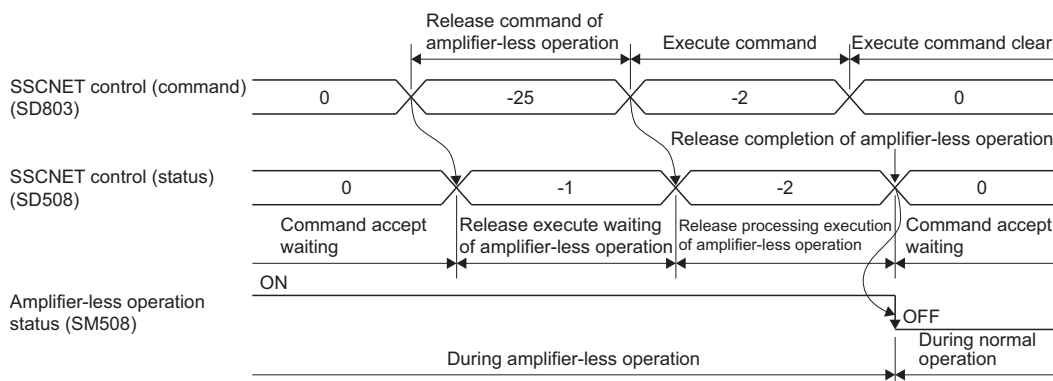
Program

■Program to start/release of amplifier-less operation for the self CPU

•Motion SFC program

Operation start

Start processing of
amplifier-less operation

[G40] !SM508   Check the normal
                             operation.

[G10] SD508==0   Check the accept status.

[F12] SD803=-20   Set "-20: Start command
                             of amplifier-less operation"
                             in SD803.

[G20] SD508==-1   Execute waiting

[F20] SD803=-2   Set "-2: Execute command"
                             in SD803.

[G41] SM508   Check the amplifier-less
                             operation.

END

Operation release

Release processing of
amplifier-less operation

[G41] SM508   Check the amplifier-less
                             operation.

[G10] SD508==0   Check the connect
                             command accept status.

[F11] SD803=-25   Set "-25: Release command
                             of amplifier-less operation"
                             in SD803.

[G20] SD508==-1   Execute waiting

[F20] SD803=-2   Set "-2: Execute command"
                             in SD803.

[G40] !SM508   Check the normal operation.

END

5

5.4 Virtual Servo Amplifier Function

When the virtual servo amplifier function is used, virtual operation (operation as if a servo amplifier is connected) is possible without having a servo amplifier connected. By using the virtual servo amplifier as the servo input axis in synchronous control, synchronous control is possible with a virtual input command. The function can also be used for a simulated operation on axes without a servo amplifier installed.

> **Point**
> - Virtual servo amplifier settings are enabled by turning ON Multiple CPU system power supply or reset.
> - Do not connect a servo amplifier to the same station No. that the virtual servo amplifier is set. If a servo amplifier is connected, a minor error (error code: 1CB1H) occurs, and servo amplifiers connected after cannot be connected.
>   For lines with only virtual servo amplifiers set, an error does not occur when a servo amplifier is connected to the same station No. that a virtual servo amplifier is set.
> - Switching operation between an actual servo amplifier and a virtual servo amplifier is not possible. To switch operation, turn ON the Multiple CPU system power supply, or reset after writing the parameters with MT Developer2.

Parameter settings

When using a virtual servo amplifier, set the servo network settings as the following. ()
- Set "SSCNETⅢ/H" to the communication type in SSCNET setting.
- Set "MR-J4(W)-B(-RJ)" to the amplifier model in amplifier setting.
- Set "Use as virtual servo amplifier" in the amplifier setting.

Control details

Operation of virtual servo amplifier is shown below.

Item	Operation
Servo amplifier type	All axes with a virtual servo amplifier connected are connected with the following type. • Servo amplifier: MR-J4-10B • Servo motor: HG-KR053
Servo amplifier status	• Deviation counter value 　Always 0 • Motor speed 　Motor speed for the command • Motor current value 　Turns "0" immediately after Multiple CPU system power supply ON. (The motor current value can be emulated while using a virtual servo amplifier by changing the "[Md.104] Motor current value (R: D32020+48n/Q: #8001+20n)" using the user program.) • Servo ready signal 　This signal changes depending on the status of "[Rq.1123] All axes servo ON command (R: M30042/Q: M2042)" or "[Rq.1155] Servo OFF command (R: M34495+32n/Q: M3215+20n)" of each axis. • Torque limiting signal 　This signal turns ON by the following condition. 　|Motor current value|≥Torque limit value 　*: When the positive direction and negative direction of torque limit values are set individually, CHGT instruction is as follows. 　　|Motor current value|≥Positive direction torque limit or Negative direction torque limit value • Zero pass signal 　Always ON
Servo amplifier external signal (At the setting valid)	Each signal is shown below immediately after Multiple CPU system power supply ON or reset. • [St.1071] External signals FLS (R: M32411+32n/Q: M2411+20n): Normal open: OFF/Normal close: ON • [St.1072] External signals RLS (R: M32412+32n/Q: M2412+20n): Normal open: OFF/Normal close: ON • [St.1074] External signals DOG/CHANGE (R: M32414+32n/Q: M2414+20n): Normal open: OFF/Normal close: ON The servo amplifier external signals can be operated while using virtual servo amplifier by turning ON/OFF the "[St.1071] External signals FLS (R: M32411+32n/Q: M2411+20n)", "[St.1072] External signals RLS (R: M32412+32n/Q: M2412+20n)" or "[St.1074] External signals DOG/CHANGE (R: M32414+32n/Q: M2414+20n)" using the user program.
Home position return	All home position return methods can be used.
Absolute position system	The absolute position is controlled as the normal servo amplifier connection. ■Immediately after Multiple CPU system power supply ON or reset. The absolute position is restored by the saved absolute position data. The absolute position is restored as the travel value "0" during the servo amplifier's power supply OFF. ■During virtual servo amplifier operation Suppose the servo motor operated during virtual servo amplifier operation, and the absolute position data is refreshed.
Operation using MR Configurator2	Online operation and monitor of the servo amplifiers cannot be executed.
Optional data monitor	Only the following data types are possible. The other monitor values are "0". ■Registered monitor • Position F/B • Encoder position within 1 revolution • Encoder multi-revolution counter • Cumulative current value • Servo command value • Torque command ■Transient command • Home position [command unit] • LED display
Driver communication	When driver communication is set to an axis set to virtual servo amplifier, the virtual servo amplifier does not operate as a master axis or slave axis. Do not set driver communication.
Connect/disconnect function	When a disconnect command is set to an axis set to virtual servo amplifier, "SSCNET control (status)(SD508)" does not change to "-1: Execute waiting" and returns to "0: Command accept waiting". A disconnect command to another axis will not disconnect the virtual servo amplifier.

5.5   Driver Communication Function

This function uses the "Master-slave operation function" of servo amplifier. The Motion CPU controls the master axis and the slave axis is controlled by data communication (driver communication) between servo amplifiers without going through the Motion CPU. This function is used for the case such as to operate the ball screw controlled by multiple axes via the belt. There are restrictions in the function that can be used by the version of the servo amplifier. Refer to the "Servo amplifier Instruction Manual" for details.

The following shows the number of settable axes for the master axis and slave axis.

—: No restriction

Model name	Number of SSCNETIII(/H) lines	Number of control axes	Combination of number of settable axes		Remark
			Master axis	**Slave axis**	
			SSCNETIII[*1]	SSCNETIII/H[*2]	
R64MTCPU	2 lines	64 axes	1 axis to 8 axes	1 axis to 16 axes	—	The axes other than the master axis and slave axis can be used as normal axis.
R32MTCPU	2 lines	32 axes			
R16MTCPU	1 line	16 axes	1 axis to 4 axes	1 axis to 8 axes	

*1   Up to 4 axes per line are settable in the master axis.
*2   Up to 8 axes per line are settable in the master axis.

> **Point**
>
> Driver communication function is only valid in MR-J3-□B and MR-J4-□B. MR-J4W-□B and MR-J3W-□B cannot be used. Nor can MR-J4W-□B be used in MR-J3-□B compatibility mode.

Control details

Set the master axis and slave axis in the servo parameter. Execute each control of Motion CPU in the master axis. (However, be sure to execute the servo ON/OFF of slave axis, and error reset at servo error occurrence in the slave axis.) The servo amplifier set as master axis receives command (positioning command, speed command, torque command) from the Motion CPU, and sends the control data to the servo amplifier set as slave axis by driver communication between servo amplifiers. The servo amplifier set as the slave axis is controlled by the control data transmitted from the master axis by driver communication between servo amplifiers.

Point
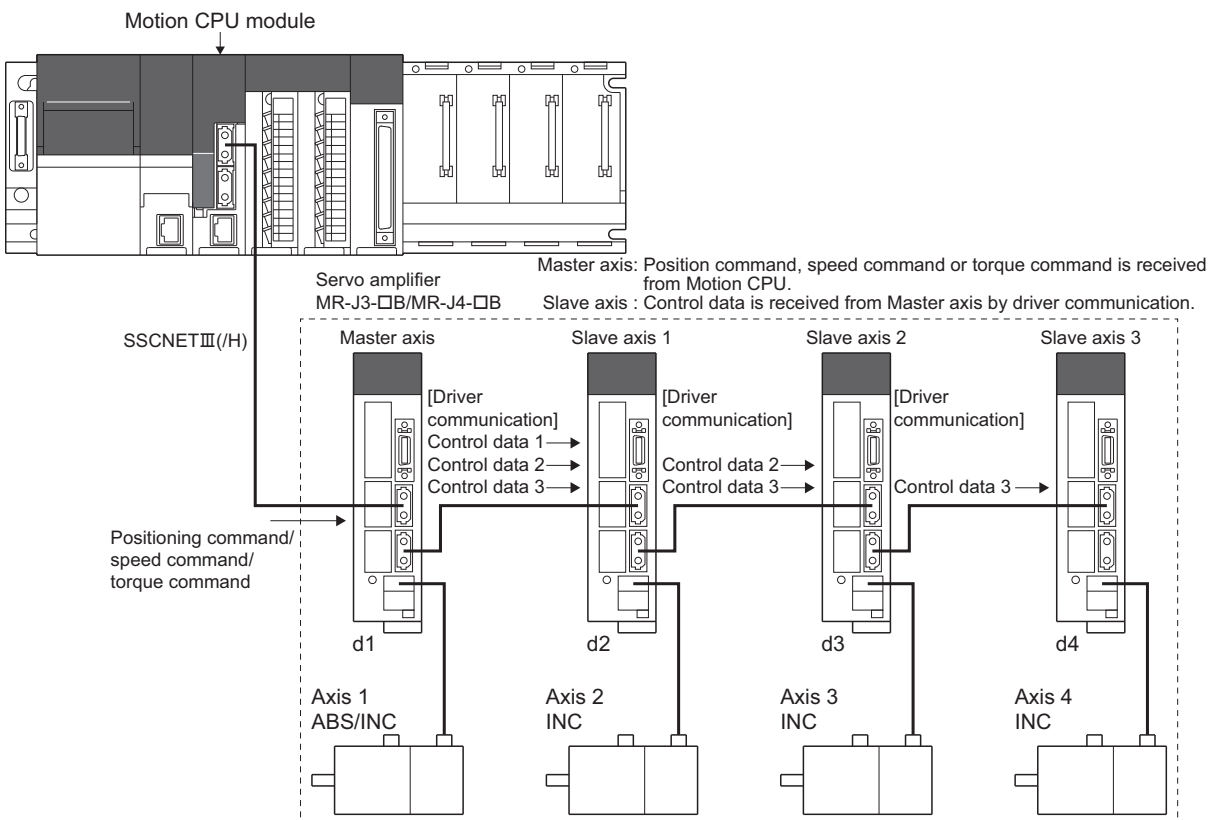
When a servo amplifier fails due to a SSCNETⅢ(/H) communication failure, communication with the axes after the failed axis cannot be executed. For this reason, be sure to connect the master axis to the position closest to the Motion CPU.

Precautions during control

⚠ CAUTION

- During operation by driver communication function, the positioning control or JOG operation, etc. by servo program is not interrupted even if a servo error occurs in the slave axis. Be sure to stop the master axis by user program.

Servo amplifier

- For the axes where driver communication is executed, be sure to use a servo amplifier that supports driver communication.
- Driver communication function is only valid in MR-J3-□B and MR-J4-□B. MR-J4W-□B and MR-J3W-□B cannot be used. Nor can MR-J4W-□B be used in MR-J3-□B compatibility mode.
- Be sure to connect the master CPU and slave CPU in the same SSCNETⅢ(/H) line.
- The master CPU and slave CPU combination is set in the servo parameters. After writing the servo parameters, turn ON again or reset the Multiple CPU system power supply so that the parameters become valid.
- The differences between SSCNETⅢ and SSCNETⅢ/H communication type in driver communication function are shown below.

	Communication type	
	SSCNETIII	**SSCNETIII/H**
Communication with servo amplifiers after Multiple CPU system power supply ON.	Servo amplifiers cannot be operated until connection with all axes set by system setting is confirmed.	Servo amplifier cannot be operated until connection with all axes set to driver communication is confirmed. Normal axes (axes not set to driver communication) can also be connected after the network is established.
Connect/disconnect with servo amplifier	Only the first axis of the SSCNET line (servo amplifier connected directly to the Motion CPU) can connect/disconnect. Servo amplifiers other than the first axis can be disconnected but cannot be connected.	Only the first axis of the SSCNET line (servo amplifier connected directly to the Motion CPU) can connect/disconnect. Only normal axes (axes not set to driver communication) other than the first axis can be connected when they are disconnected. However, when axes set to driver communication are disconnected, they cannot communicate with servo amplifiers that were connected after disconnecting. (The servo amplifier's LED display remains "AA")

- If all axes set to driver communication are not detected at the start of communication with the servo amplifier, all axes connected to that line, including normal axes cannot be operated. (The servo amplifier's LED display remains "Ab"). Check with the following "SSCNETⅢ searching flag (Line 1) (SM532)"/"SSCNETⅢ searching flag (Line 2) (SM533)" if a SSCNET line can be operated. When all normal axes and axes set to driver communication are connected, the "SSCNETⅢ searching flag (Line 1) (SM532)"/"SSCNETⅢ searching flag (Line 2) (SM533)" turn OFF.

Device No.	Name	Details	Set by
SM532	SSCNETⅢ searching flag (Line 1)	• Turns ON when searching axes that have been set by system setting in line 1 or line 2. • Turns OFF when all axes that have been set by system setting in line 1 or line 2 have been searched. OFF: Search complete ON: Searching	S (Change status)
SM533	SSCNETⅢ searching flag (Line 2)		

Positioning dedicated device used for positioning control of slave axis

In the slave axis, only the following positioning dedicated devices are valid. Do not use devices other than the following.

■Axis status

- [St.1066] Zero pass (R: M32406+32n/Q: M2406+20n)[*1]
- [St.1068] Servo error detection (R: M32408+32n/Q: M2408+20n)
- [St.1075] Servo ready (R: M32415+32n/Q: M2415+20n)

*1   Because the slave axis cannot execute home position return, it does not use this in control.

■Axis command signal

- [Rq.1148] Servo error reset command (R: M34488+32n/Q: M3208+20n)
- [Rq.1155] Servo OFF command (R: M34495+32n/Q: M3215+20n)

■Axis monitor device

- [Md.1005] Servo error code (R: D32008+48n/Q: D8+20n)
- [Md.35] Torque limit value (R: M32014+48n/Q: D14+20n)

■JOG speed setting register

"[Cd.1110] JOG speed setting (R: D35120+2n, D35121+2n/Q: D640+20n, D641+20n)" that apply to the slave axis become invalid.

■Common device

The following common devices that apply to the slave axis cannot be used. Do not use an interlock.

- [St.1040] Start accept flag (R: M30080+n/Q: M2001+n)
- [St.1047] Speed change accepting flag (R: M30144+n/Q: M2061+n)
- [St.1048] Automatic decelerating flag (R: M30208+n/Q: M2128+n)
- [St.1049] Speed change "0" accepting flag (R: M30272+n/Q: M2240+n)
- [St.1050] Control loop monitor status (R: M30336+n/Q: M2272+n)

Current position management

- Set "0: Used in incremental system" in " Absolute position detection system (PA03)" of servo parameter for slave axis.
- Because the slave axis is in torque control and operates by input from the master axis, current feed value and deviation counter are not updated. However, the real current value is updated. (During servo ON, the current feed value is not a value that reflects the motor movement amount. If servo is turned OFF, the current feed value is a value that reflects the motor movement amount. The deviation counter is always 0.)
- The "[St.1069] Home position return request (R: M32409+32n/Q: M2409+20n)" of slave axis is always ON but has no influence on the control of slave axis.
- During slave operation, the following slave axis external signals, and parameters are invalid.
- Upper stroke limit signal (FLS)
- Lower stroke limit signal (RLS)
- Stop signal (STOP)
- Upper/lower stroke limit value of fixed parameter
- Do not operate the slave axis by a method other than driver communication with the master axis. If operated by a method other than driver communication, commands to the servo amplifier become invalid and current feed value and other current position management cannot be guaranteed.

Servo program

Do not set the slave axis to the start axis of the servo program. When slave axis is started, the position commands to the servo amplifier become invalid.

Advanced synchronous control

- The master axis can be set to the servo input axis, or the output axis.
- When the slave axis is set to the servo input axis, set "[Pr.300] Servo input axis type" to "2: Real current value", or "4: Feedback value". When set to anything else, the slave axis does not operate as input axis.
- Do not set the slave axis to output axis. When the slave axis is set to output axis, the position commands to the servo amplifier become invalid.

Motion dedicated PLC instruction

Do not execute the following Motion dedicated PLC instructions for slave axis. When executed they become invalid.
- M(P).SVST/D(P).SVST (Start request of the specified servo program)
- M(P).SVSTD/D(P).SVSTD (Direct positioning start request)
- M(P).CHGV/D(P).CHGV (Speed change request of the specified axis)

Motion SFC program

Do not execute the following instructions for slave axis. When executed they become invalid.
- CHGV (Speed change request)
- CHGP (Target position change request)

Control mode of master axis

The control mode of the master axis can switch between position control mode, speed control mode, and torque control mode. For the master axis, when a switch to continuous operation to torque control mode is executed, there is a warning (error code: 09E8H), and the control mode does not switch.

Control mode of slave axis

- Because the slave axis is always controlled by torque mode, the control mode (b2, b3) of "[Md.108] Servo status1 (R: D32032+48n/Q: #8010+20n)" is in torque control mode ([0, 1]).
- Do not operate slave axis by speed-torque control. For the slave axis, when a control mode switch is executed, or is operated by speed-torque control, the speed-torque control commands become invalid.

Servo parameter

Set the following parameters for the axes that execute the master-slave operation.

(Refer to the following for details.)

📖Servo amplifier Instruction Manual

No.	Item	Setting details	Setting range	
			MR-J3-□B	MR-J4-□B
PA04	Function selection A-1	Set the forced stop input and forced stop deceleration function. • Set "0: Forced stop deceleration function disabled" for forced stop deceleration function selection.	0000H to 2100H	0000H to 2100H
PD15	Driver communication setting	Set the master axis and slave axis.	0000H to 0011H	0000H to 0011H
PD16	Driver communication setting Master transmit data selection 1	Set the transmitted data at master axis setting.	0000H to FFFFH	0000H to FFFFH
PD17	Driver communication setting Master transmit data selection 2		0000H to FFFFH	0000H to FFFFH
PD20	Driver communication setting Master axis No. selection 1 for slave	Set the axis No. (d1 to d16) of master axis at slave axis setting.	0 to 16	0 to 32
PD30	Master-slave operation Torque command coefficient on slave	Set the coefficient to reflect the internal torque command with the torque command value from the master axis.	0000H to 01FFH	0 to 500
PD31	Master-slave operation Speed limit coefficient on slave	Set the coefficient to reflect the internal speed limit command with the speed limit command value from the master axis.	0000H to 01FFH	0 to 500
PD32	Master-slave operation Speed limit adjusted value on slave	Set the lowest value of the internal speed limit.	0000h to 7FFFh	0 to 32767

Point

After writing the servo parameters to the Motion CPU, turn ON again or reset the Multiple CPU system power supply so that the parameters become valid.

5.6 Connection of SSCNETIII/H Head Module

The MELSEC-L series SSCNETIII/H head module (LJ72MS15) can be connected to the Motion CPU module.

System configuration

A system configuration that uses SSCNETIII/H head modules is shown below.
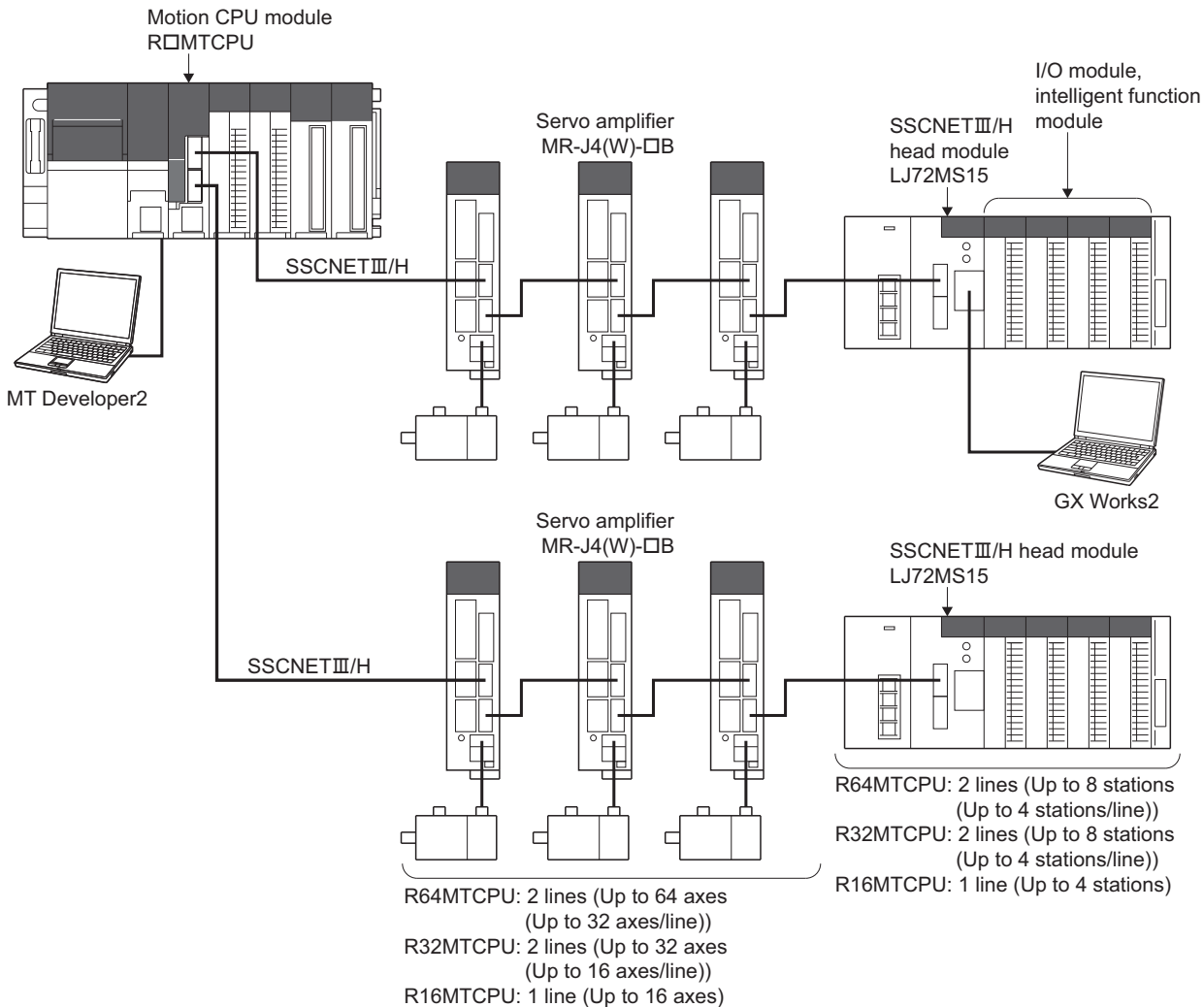
SSCNETⅢ/H head module parameters

Set the parameters used for connecting the SSCNETⅢ/H head module.

Servo network settings

Set "LJ72MS15" for the amplifier setting in the servo network settings, and set the "RIO axis No.", "Station No. d", and "RIO axis label". (☞ Page 66 Amplifier setting)

Item			Setting range
Amplifier setting	Amplifier information	Amplifier model	LJ72MS15
	Axis information	RIO axis No.	R64MTCPU: 601 to 608 R32MTCPU: 601 to 608 R16MTCPU: 601 to 604
		Station No. d	1 to 64
		RIO axis label	Up to 32 characters

Parameter setting of SSCNETⅢ/H head module

Set the parameters to use the SSCNETⅢ/H head module.

🖰 [Motion CPU Common Parameter] ⇨ [Head Module]

Item		Setting range	Default value
Axis No.		601 to 608	—
Refresh device setting (CPU side) (Input: RX, RWr/Output: RY, RWw)	Device name	Bit device name/Word device name	—
	Module I/O No./10H(**)	00 to FF	—
	Points	Bit device: 16 to 512 Word device: 1 to 32	—
	Start	Bit device/Word device	—
Status device		Bit device/Word device	—
Monitor device		Word device	—
Command device		Bit device/Word device	—

> **Point**
>
> • The number of SSCNETⅢ/H head module stations that can be connected to a SSCNETⅢ/H line according to operation cycle settings, are as follows.
>
> | Operation cycle [ms] | Stations connected |
> |---|---|
> | 0.888 | Up to 4 stations |
> | 0.444 | Up to 2 stations |
> | 0.222 | Up to 1 stations |

■Axis No.

Display the SSCNETⅢ/H head module RIO axis No. and RIO axis label settings set in the servo network settings.

(For Motion SFC programs, this number is used for specifying).

■Refresh device setting (CPU side)

Set the device (Input: RX, RWr/Output: RY, RWw) for storage of link data. Motion CPU device is set using automatic refresh by cyclic transmission of the SSCNETⅢ/H head module. Link devices (RX, RWr, RY, RWw) of the Motion CPU are automatically assigned in MT Developer2.

> **Point**
>
> Link devices (RX, RWr, RY, RWw) of the Motion CPU are used only for internal processing. These cannot be used in user data such as Motion SFC programs etc.

- Device name

  Set the device name for the bit device or word device that stores link data. Refer to device list for bit device and word device names that can be set. (☞ Page 75 Device List)

- Module I/O No./10h(**)

  If a module access device (U□\G) is set for the device name, set the I/O No. for the module access device (U□\G) in which the link data being input is stored. Refer to device list for the range of module access devices (U□\G) that can be set. (☞ Page 75 Device List)

- Points

  Set the points of the device that stores link data. Set the points of the device in units of words. The total points for input (RX+RWr), and output (RY+RWw) must be 64 bytes or less.

Device	Setting range
Bit device[1]	16 to 512
Word device	1 to 32

[1] Set in units of 16 points (1 word).

- Start

  Set the start device number in which link data is stored with a bit device or word device. For bit devices, set a multiple of 16. Refer to device list for the range of bit devices and word devices that can be set. (☞ Page 75 Device List)

■Status device

Set the device for storage of the status of the SSCNETⅢ/H head module with a bit device or word device.
- Refer to device list for the range of bit devices and word devices that can be set. (☞ Page 75 Device List)
- The device uses 16 points (1 point if a word device) from the specified device number. The details stored in the status device are shown below.

Off set	Signal name	Refresh cycle	Details
+0	Unusable	—	—
+1			
+2			
+3			
+4			
+5			
+6			
+7	During stop error	Operation cycle	Can be used to judge whether there is an error or not by the signal turning ON when a stop error is detected in the SSCNETⅢ/H head module. The applicable error code is stored in the error code signal of the monitor device set in Monitor device. (☞ Page 202 Monitor device) If error is reset by turning ON the error reset command, or turning ON the SSCNETⅢ/H head module power supply again, the signal turns OFF.
+8	Unusable	—	—
+9			
+10			
+11			
+12			
+13			
+14			
+15	During continue error	Operation cycle	Can be used to judge whether there is an error or not by the signal turning ON when a continue error is detected in the SSCNETⅢ/H head module. The applicable error code is stored in the error code signal of the monitor device set in Monitor device. (☞ Page 202 Monitor device) If error is reset by turning ON the error reset command, or turning ON the SSCNETⅢ/H head module power supply again, the signal turns OFF.

■Monitor device

Set the devices for monitoring the status of SSCNETⅢ/H head module with a word device.
- Refer to device list for the range of word devices that can be set. (☞ Page 75 Device List)
- The device uses 10 points per word from the specified device number. The details stored in the status device are shown below.

Off set	Signal name	Refresh cycle	Details
+0	Module operating status	Operation cycle	Stores the operating status of SSCNETⅢ/H head module. 0: No communication 1: STOP status 2: RUN status 3: ERROR status
+1	Error code		Stores the error code when an error is detected in the SSCNETⅢ/H head module. (Continue error and stop error) If error is reset by turning ON the error reset command, or the SSCNETⅢ/H head module power supply is turned ON again, this device is also cleared.
+2	Accumulative count for communication retry	At a communication retry	Holds the accumulative count for communication retry with the SSCNETⅢ/H head module.
+3	Maximum continuous times for communication retry		Counts each time a communication retry with the SSCNETⅢ/H head module occurs. When communication is successful, the count is "0".
+4	Unusable	—	—
+5			
+6			
+7			
+8			
+9			

■Command device

Set the device for issuing commands to the SSCNETⅢ/H head module with a bit device or word device.

- Refer to device list for the range of bit devices and word devices that can be set. (☞ Page 75 Device List)
- The device uses 16 points (1 point if a word device) from the specified device number. The details stored in the command device are shown below.

Off set	Signal name	Refresh cycle	Details
+0	Unusable	—	—
+1			
+2			
+3			
+4			
+5			
+6			
+7	Error reset command	Main cycle	Clears the error code storage device and resets the error code detection signal of the SSCNETⅢ/H head module. At an error reset command, turn this signal OFF after confirming the error detection signal of the SSCNETⅢ/H head module is turned OFF. However, depending on the error of the SSCNETⅢ/H head module, an error reset may not be executed, or conditions may apply to the error reset. In this case, the error code storage device is not cleared and the error code detection signal is not reset, even if an alarm reset is executed. Refer to the following for details. 📖MELSEC-L SSCNETIII/H Head Module User's Manual
+8	Unusable	—	—
+9			
+10			
+11			
+12			
+13			
+14			
+15			

5

Operation example of parameter

When setting 2 SSCNETⅢ/H head modules (station 17, station 18) to SSCNET line 1.

■Parameter setting

The setting example of parameter is shown below.

Station No.	Axis No.	Input/ Output	Link device[1]				Refresh device (CPU side)			Status device	Monitor device	Command device
			Device name	Points	Start	End	Points	Start	End			
17	1	Input	RX	128	0000	007F	→ 128	M112	M239	M0	D2000	M16
			RWr	24	0000	0017	→ 24	W0000	W0017			
		Output	RY	128	0000	007F	← 128	M240	M367			
			RWw	24	0000	0017	← 24	W0018	W002F			
18	2	Input	RX	0			→ 0			M32	D2010	M48
			RWr	32	0018	0037	→ 32	D2020	D2051			
		Output	RY	0			← 0					
			RWw	32	0018	0037	← 32	D2052	D2083			

*1 Used only for internal processing of Motion CPU. The number of points set in the refresh device (CPU side) is automatically assigned in MT Developer2.

■Operation example

The example of operating parameter is shown below.
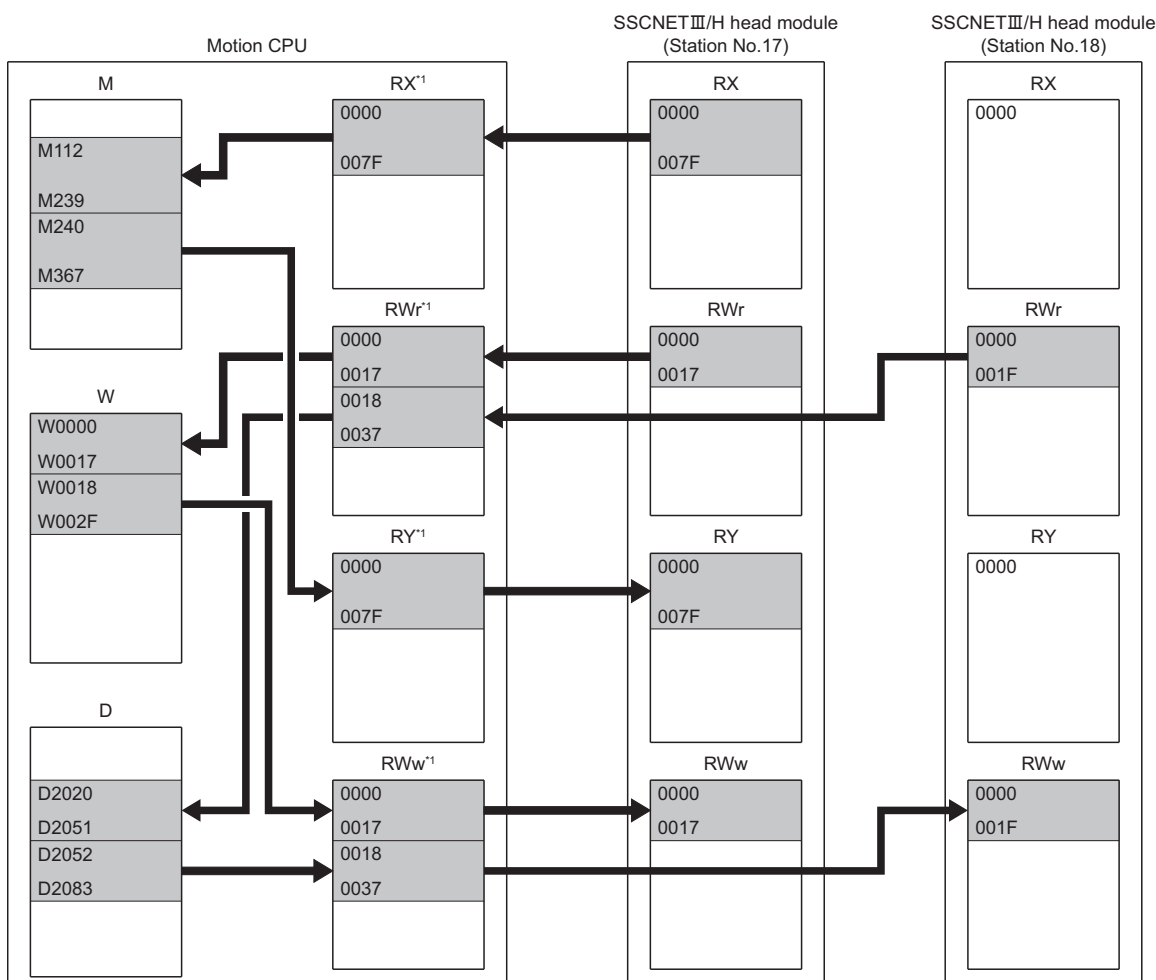
*1 Used only for internal processing of Motion CPU. The number of points set in the refresh device (CPU side) is automatically assigned in MT Developer2.

Data operation of intelligent function module by Motion SFC program

In addition to refresh of data by device, data read/write operations to the buffer memory of intelligent function modules on the SSCNETⅢ/H head module can be executed by the RTO and RFROM instructions of Motion SFC programs.

Refer to the following for details.

📖MELSEC iQ-R Motion controller Programming Manual (Program Design)

Classification	Symbol	Instruction	Description
Others	RTO	Write buffer memory data to head module	Writes word device data to the buffer memory of the intelligent function module mounted to the SSCNETⅢ/H head module.
	RFROM	Read buffer memory data from head module	Reads data from the buffer memory of the intelligent function module mounted to the SSCNETⅢ/H head module, to the word device.

Data of refresh device

The refresh of data by device, for the status of Motion CPU, or when there is a communication failure with the head module are as follows.

State	Refresh of data			
	Bit device		Word device	
	Input(RX)	Output(RY)	Input(RWr)	Output(RWw)
At communication failure occurrence	Clear		Maintain	
At STOP of Motion CPU	Maintain			
At Motion CPU operation stop error occurrence	Clear			

Precautions when using SSCNETIII/H head module

Disconnect/reconnect function cannot be used for SSCNETⅢ/H head module. If executed it is ignored.

5.7 Connection of Sensing Module

The SSCNETⅢ/H compatible sensing module MR-MT2000 series connects to SSCNETⅢ/H sensing extension modules (sensing I/O module, sensing pulse I/O module, sensing analog I/O module, sensing encoder I/F module), and fetches and outputs signals synchronized with SSCNETⅢ/H communication.

System configuration

A system configuration that uses sensing modules is shown below.

Sensing module
MR-MT2000 series (station mode)

Sensing SSCNETⅢ/H head module MR-MT2010

Sensing extension module MR-MT2100/MR-MT2200/ MR-MT2300/MR-MT2400

Motion CPU module R□MTCPU

Servo amplifier MR-J4(W)-□B

SSCNETⅢ/H

R64MTCPU: 2 lines (Up to 8 stations
(Up to 4 stations/line))
R32MTCPU: 2 lines (Up to 8 stations
(Up to 4 stations/line))
R16MTCPU: 1 line (Up to 4 stations)

Sensing module
MR-MT2000 series (axis mode)

Sensing SSCNETⅢ/H head module MR-MT2010

Sensing extension module MR-MT2200

Servo amplifier MR-J4(W)-□B

SSCNETⅢ/H

Stepping motor driver etc.

R64MTCPU: 2 lines (Up to 64 axes (Up to 32 axes/line))
R32MTCPU: 2 lines (Up to 32 axes (Up to 16 axes/line))
R16MTCPU: 1 line (Up to 16 axes)

Point

Refer to the following for details of the sensing module.
📖Sensing Module Instruction Manual

Sensing module parameters

Set the parameters for using the sensing module.

Servo network settings

Set "MR-MT2010" for the amplifier setting in the servo network settings, and set the following according to the operation mode. (☞ Page 66 Amplifier setting)

■Station mode settings

Item			Setting range
Amplifier setting	Amplifier information	Amplifier model	MR-MT2010
	Axis information	RIO axis No.	R64MTCPU: 601 to 608 R32MTCPU: 601 to 608 R16MTCPU: 601 to 604
		Station No.d	1 to 64
	Sensing module information	Operation mode	1 station occupied mode
		Extension module connection number	0 to 4
	Extension module setting information	No.1 type to No.4 type	MR-MT2100/MR-MT2200/MR-MT2300/MR-MT2400

■Axis mode settings

Item			Setting range
Amplifier setting	Amplifier information	Amplifier model	MR-MT2010
	Sensing module information	Operation mode	Axis mode (MR-MT2200)
		Used axis number	1 to 4
	MR-MT2200 axis information	Axis No.	R64MTCPU: 1 to 64 R32MTCPU: 1 to 32 R16MTCPU: 1 to 16
		Station No.d	1 to 64

Servo parameter setting of sensing module

The servo parameters are set in the sensing module. Set the data for controlling the sensing module. Refer to the following for details of servo parameters.
📖Sensing Module Instruction Manual

Refer to servo parameter management for management of servo parameters in the Motion CPU. (☞ Page 169 Servo Parameter Management)

Parameter setting of sensing module

Set the parameters to use the sensing module.

 [Motion CPU Common Parameter] ⇨ [Head Module]

Item		Setting range	Default value
Axis No.		■Station mode 601 to 608 ■Axis mode 1 to 64	—
Refresh device setting (CPU side) (Input: RX, RWr/Output: RY, RWw)	Device name	Bit device name/Word device name	—
	Module I/O No./10H(**)	00 to FF	—
	Points	☞ Page 208 Refresh device setting (CPU side)	—
	Start	Bit device/Word device	—
Status device		Bit device/Word device	—
Monitor device		Word device	—
Command device		Bit device/Word device	—

Point

- The number of sensing module stations that can be connected to a SSCNETⅢ/H line according to operation cycle settings, are as follows.

Operation cycle [ms]	Stations connected
0.888	Up to 4 stations
0.444	Up to 2 stations
0.222	Up to 1 stations

■Axis No.

Display the sensing module RIO axis No./axis No., and axis label set in the servo network settings.
(For Motion SFC programs, this number is used for specifying).

■Refresh device setting (CPU side)

Set the device (Input: RX, RWr/Output: RY, RWw) for storage of link data. Motion CPU device is set using automatic refresh by cyclic transmission with the sensing module. Link devices (RX, RWr, RY, RWw) of the Motion CPU are automatically assigned in MT Developer2.

Point

Link devices (RX, RWr, RY, RWw) of the Motion CPU are used only for internal processing. These cannot be used in user data such as Motion SFC programs etc.

- Device name
  Set the device name for the bit device or word device that stores link data. Refer to device list for bit device and word device names that can be set. (☞ Page 75 Device List)
- Module I/O No./10H(**)
  If a module access device (U□\G) is set for the device name, set the I/O No. of the module access device (U□\G) in which the link data being input is stored. Refer to device list for the range of module access devices (U□\G) that can be set.
  (☞ Page 75 Device List)

• Points

Set the points of the device that stores link data. Set the points of the device in units of words. The total points for input (RX+RWr), and output (RY+RWw) must be 64 bytes or less.

Module configuration		Operation mode	Device	Setting range			
				RX	RY	RWr	RWw
Start station	Sensing SSCNETⅢ/H head module only	1 station occupied mode	Bit device[*1]	16 to 32		16 to 480	
			Word device	1 to 2		1 to 30	
	Sensing SSCNETⅢ/H head module+Sensing extension module		Bit device[*1]	16 to 64		16 to 448	
			Word device	1 to 4		1 to 28	
		Axis mode	Bit device[*1]	16		—	
			Word device	1			
Other than start station	Sensing extension module	1 station occupied mode	Bit device[*1]	16 to 32		16 to 352	
			Word device	1 to 2		1 to 22	
		Axis mode	Bit device[*1]	—			
			Word device				

*1   Set in units of 16 points (1 word).

• Start

Set the start device No. in which link data is stored with a bit device or word device. For bit devices, set a multiple of 16.

Refer to device list for the range of bit devices and word devices that can be set. (☞ Page 75 Device List)

5

Point

- When the module configuration of 1 block is "Sensing SSCNETⅢ/H head module+sensing extension module", set the total points of the sensing SSCNETⅢ/H head module and the sensing extension modules, and start device No. For the link devices of the next station and after, set the sensing extension module points, and start device No. that excludes the sensing SSCNETⅢ/H head module points and devices. The range for storing the link devices of the start station are as follows.

- RX/RY link device
  - Bit device setting

Offset	Target module
+0	Sensing SSCNETⅢ/H head module
⋮	
+31	
+32	Sensing extension module
⋮	
+63	

  - Word device setting

Offset	Target module
+0	Sensing SSCNETⅢ/H head module
+1	
+2	Sensing extension module
+3	

- RWr/RWw link device
  - Bit device setting

Offset	Target module
+0	Sensing SSCNETⅢ/H head module
⋮	
+95	
+96	Sensing extension module
⋮	
+447	

  - Word device setting

Offset	Target module
+0	Sensing SSCNETⅢ/H head module
⋮	
+5	
+6	Sensing extension module
⋮	
+27	

- When operation mode is set to "Axis mode", link devices (Input: RWr/Output: RWw), status devices, monitor devices, command devices are not set.
- When the set points of the CPU-side refresh device (Output: RY, RWw) are less than the maximum points, "0", or "OFF" are set to the CPU-side refresh device (Output: RY, RWw) link data that is not set and sent to the sensing module. Make sure to set the maximum points for CPU-side refresh device points.
- Set the device Nos. of the sensing module and SSCNETⅢ/H head module CPU-side refresh devices so that they do not overlap.

■Status device

Set the device for storage of the status of the sensing module with a bit device or word device.

- Refer to device list for the range of bit devices and word devices that can be set. (☞ Page 75 Device List)
- The device uses 16 points (1 point if a word device) from the set device No. The details stored in the status device are shown below.

Off set	Signal name	Refresh cycle	Details
+0	Unusable	—	—
+1			
+2			
+3			
+4			
+5			
+6			
+7	Alarm	Operation cycle[1]	Can be used to judge whether there is an error or not by the signal turning ON when an alarm is detected in the sensing module. The applicable error code is stored in the monitor device error code set in Monitor device. (☞ Page 212 Monitor device) If error is reset by any of the following, the signal turns OFF. • Turn ON alarm reset command • Click the [Occurred Alarm Reset] button in MR Configurator2 • Reset the Multiple CPU system • Turn ON the sensing module control circuit power supply again.
+8	Unusable	—	—
+9			
+10			
+11			
+12			
+13			
+14			
+15	Warning	Operation cycle[1]	Can be used to judge whether there is an error or not by the signal turning ON when a warning is detected in the sensing module. The applicable error code is stored in the monitor device error code set in Monitor device. (☞ Page 212 Monitor device) If any of the following are performed, the signal turns OFF. • Turn ON alarm reset command • Click the [Occurred Alarm Reset] button in MR Configurator2 • Remove the cause of the error

[1] When operation cycle is 7.111[ms] or more, refresh cycle is 3.555[ms].

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■Monitor device

Set the devices for monitoring the status of sensing module with a word device.

- Refer to device list for the range of word devices that can be set. ($\mathbb{\square}$ Page 75 Device List)
- The device uses 10 points (word) from the specified device number. The details stored in the status device are shown below.

Off set	Signal name	Refresh cycle	Details
+0	Module operating status	Operation cycle[*1]	Stores the operating status of sensing module. 0: No communication 1: STOP status 2: RUN status 3: ERROR status
+1	Error code		Stores the error code when an alarm/warning is detected in the sensing module. If error is reset by turning ON the alarm reset command, this device is also cleared.
+2	Accumulative count for communication retry	At a communication retry	Holds the accumulative count for communication retry with the sensing module.
+3	Maximum continuous times for communication retry		Counts each time a communication retry with the sensing module occurs. When communication is successful, the count is "0".
+4	Unusable	—	—
+5			
+6			
+7			
+8			
+9			

*1 When operation cycle is 7.111[ms] or more, refresh cycle is 3.555[ms].

■Command device

Set the device for issuing commands to the sensing module with a bit device or word device.

- Refer to device list for the range of bit devices and word devices that can be set. ($\mathbb{\square}$ Page 75 Device List)
- The device uses 16 points (1 point if a word device) from the specified device number. The details stored in the command device are shown below.

Off set	Signal name	Refresh cycle	Details
+0	Unusable	—	—
+1			
+2			
+3			
+4			
+5			
+6			
+7	Alarm reset command	Main cycle	Clears the error code storage device and resets the alarm/warning detection signal of the sensing module. At an alarm reset command, turn this signal OFF after confirming the alarm/warning detection signal of the sensing module is turned OFF. However, depending on the alarm of the sensing module, an alarm reset may not be executed, or conditions may apply to the alarm reset. In this case, the error code storage device is not cleared and the alarm detection signal is not reset, even if an alarm reset is executed. Refer to the following for details. $\mathbb{\square}$Sensing Module Instruction Manual
+8	Unusable	—	—
+9			
+10			
+11			
+12			
+13			
+14			
+15			

Operation example of parameter (station mode)

When setting the sensing module to SSCNET line 1 with the following settings.

Station No.	Axis No.	Operation mode	Connected module
17	601	1 station occupied mode	MR-MT2010+MR-MT2100
18	602		MR-MT2200
19	603		MR-MT2300

■Parameter setting

The setting example of parameter is shown below.

Station No.	Axis No.	Input/ Output	Link device[1]					Refresh device (CPU side)			Status device	Monitor device	Command device
			Device name	Points	Start	End		Points	Start	End			
17	601[2][3]	Input	RX	32	0000	001F	→	32	M0	M31	B0	#0	B10
			RWr	6	0000	0005	→	6	D2000	D2005			
		Output	RY	32	0000	001F	←	32	M128	M159			
			RWw	6	0000	0005	←	6	D3000	D3005			
	601[4]	Input	RX	32	0020	003F	→	32	M32	M63			
			RWr	22	0006	001B	→	22	D2006	D2027			
		Output	RY	32	0020	003F	←	32	M160	M191			
			RWw	22	0006	001B	←	22	D3006	D3027			
18	602	Input	RX	32	0040	005F	→	32	M64	M95	B20	#10	B30
			RWr	22	001C	0031	→	22	D4000	D4021			
		Output	RY	32	0040	005F	←	32	M192	M223			
			RWw	22	0018	0031	←	22	D4022	D4043			
19	603	Input	RX	32	0060	007F	→	32	M96	M127	B40	#20	B50
			RWr	22	0032	0047	→	22	D5000	D5022			
		Output	RY	32	0060	007F	←	32	M224	M255			
			RWw	22	0032	0047	←	22	D5022	D5043			

[1] Used only for internal processing of Motion CPU. The number of points set in the refresh device (CPU side) is automatically assigned in MT Developer2.

[2] The refresh device (CPU side) of the sensing SSCNETⅢ/H head module in 1 block is shared.

[3] MR-MT2010 side.

[4] MR-MT2100 side.

■Operation example
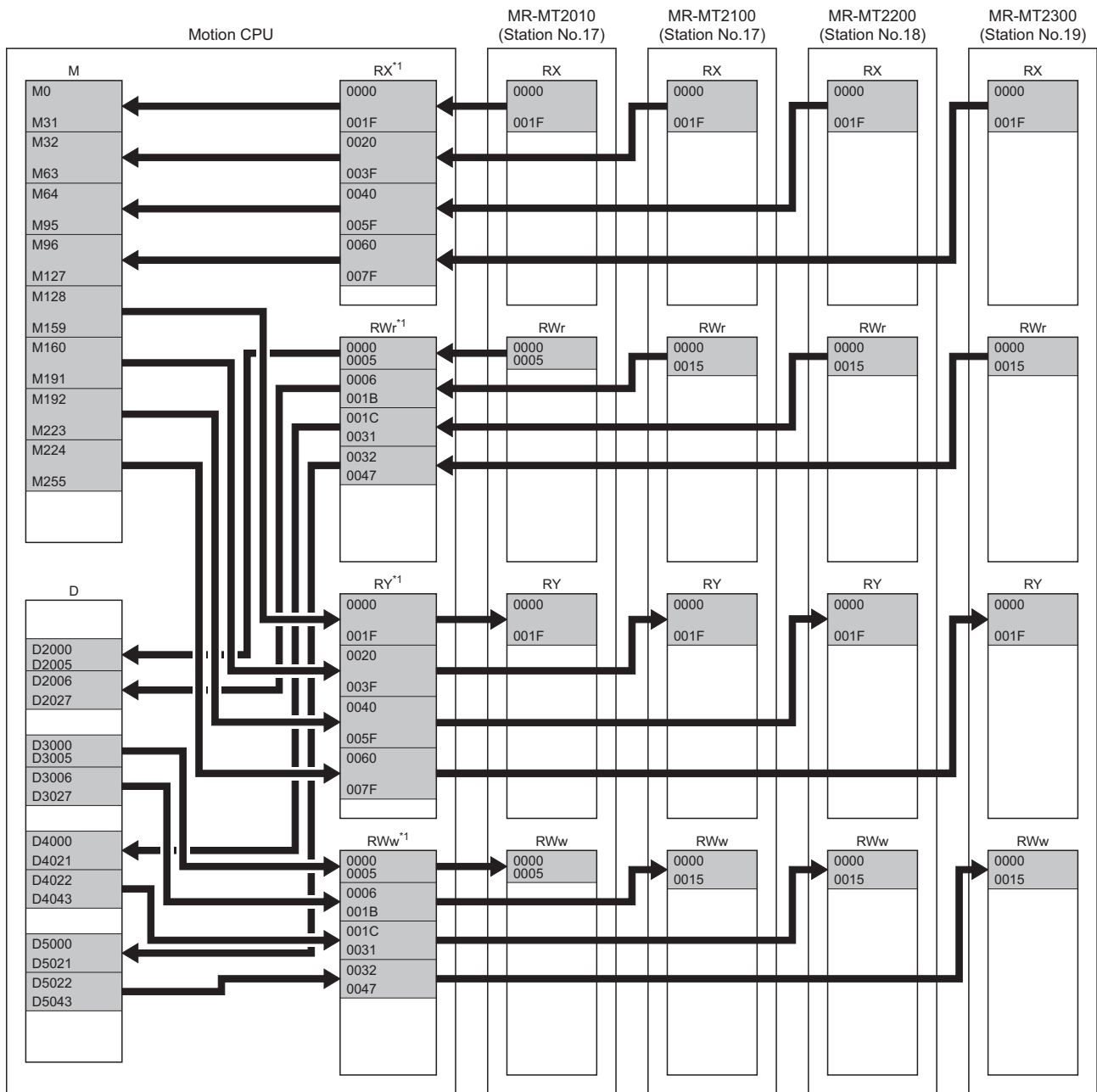
The example of operating parameter is shown below.

*1 Used only for internal processing of Motion CPU. The number of points set in the refresh device (CPU side) is automatically assigned in MT Developer2.

Operation example of parameter (axis mode)

When setting the sensing module to SSCNET line 1 with the following settings.

Station No.	Axis No.	Operation mode	Connected module
1	1	Axis mode (MR-MT2200)	MR-MT2010+MR-MT2200
2	2		MR-MT2200
3	3		MR-MT2200

■Parameter setting

The setting example of parameter is shown below.

Station No.	Axis No.	Input/ Output	Link device[1]					Refresh device (CPU side)			Status device	Monitor device	Command device
			Device name	Points	Start	End		Points	Start	End			
1	1[2]	Input	RX	16	0000	000F	→	16	M0	M15	—	—	—
			RWr	—	—	—	→	—	—	—			
		Output	RY	16	0000	000F	←	16	M16	M31			
			RWw	—	—	—	←	—	—	—			
	1[3]	Input	RX	—	—	—	→	—	—	—			
			RWr	—	—	—	→	—	—	—			
		Output	RY	—	—	—	←	—	—	—			
			RWw	—	—	—	←	—	—	—			
2	2	Input	RX	—	—	—	→	—	—	—	—	—	—
			RWr	—	—	—	→	—	—	—			
		Output	RY	—	—	—	←	—	—	—			
			RWw	—	—	—	←	—	—	—			
3	3	Input	RX	—	—	—	→	—	—	—	—	—	—
			RWr	—	—	—	→	—	—	—			
		Output	RY	—	—	—	←	—	—	—			
			RWw	—	—	—	←	—	—	—			

*1 Used only for internal processing of Motion CPU. The number of points set in the refresh device (CPU side) is automatically assigned in MT Developer2.
*2 MR-MT2010 side.
*3 MR-MT2200 side.

■Operation example
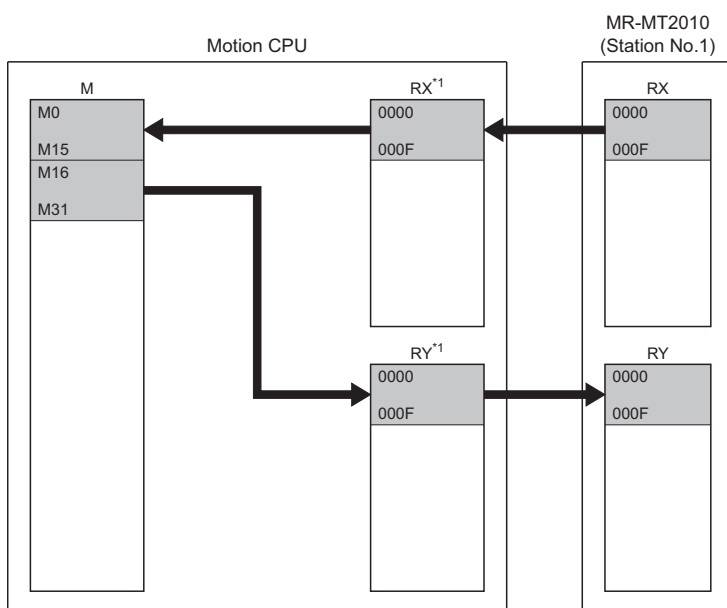
The example of operating parameter is shown below.

*1 Used only for internal processing of Motion CPU. The number of points set in the refresh device (CPU side) is automatically assigned in MT Developer2.

Data of refresh device

The refresh of data by device for the status of Motion CPU, or when there is a communication failure with the sensing module are as follows.

State	Refresh of data			
	Bit device		**Word device**	
	Input(RX)	**Output(RY)**	**Input(RWr)**	**Output(RWw)**
At communication failure occurrence	Clear		Maintain	
At STOP of Motion CPU	Maintain			
At Motion CPU operation stop error occurrence	Clear			

Link data (station mode)

The contents of the devices (Input: RX, RWr/Output: RY, RWw) for storage of link data for communicating between the Motion CPU and sensing module (station mode) are different for each module. The contents of the devices for storage of link data for each module are shown below.

Sensing SSCNETIII/H head module

The contents of the devices (Input: RX, RWr/Output: RY, RWw) for storage of link data for communicating between the Motion CPU and sensing SSCNETⅢ/H head module are shown below.

■Input device

- Bit data area (RX)

Offset	Signal name	Refresh cycle	Description
+0	External input DI1	Operation cycle[1]	Stores the input state of DI1 to DI12 of sensing SSCNETⅢ/H head module. 0: OFF 1: ON
+1	External input DI2		
+2	External input DI3		
+3	External input DI4		
+4	External input DI5		
+5	External input DI6		
+6	External input DI7		
+7	External input DI8		
+8	External input DI9		
+9	External input DI10		
+10	External input DI11		
+11	External input DI12		
+12	Unusable	—	—
+13			
+14			
+15			
+16	DO1 output enabling	Operation cycle[1]	Stores the output enable state of DO1 and DO2 of sensing SSCNETⅢ/H head module. 0: Disable 1: Enable
+17	DO2 output enabling		
+18	Unusable	—	—
+19			
+20			
+21			
+22			
+23			
+24			
+25			
+26			
+27			
+28			
+29			
+30			
+31			

*1 When the operation cycle is set to 7.111[ms] or more, the operation cycle is 3.555[ms].

• Word data area (RWr)

Offset	Signal name	Refresh cycle	Description
+0	DO output state (DO for each signal)	Operation cycle[*1]	Stores the DO output state of the sensing SSCNETⅢ/H head module.
+1	Unusable	—	—
+2			
+3			
+4			
+5			
+6			
+7			
+8			
+9			
+10			
+11			
+12			
+13			
+14			
+15			
+16			
+17			
+18			
+19			
+20			
+21			
+22			
+23			
+24			
+25			
+26			
+27			
+28			
+29			
+30			
+31			

*1 When the operation cycle is set to 7.111[ms] or more, the operation cycle is 3.555[ms].

■Output device

• Bit data area (RY)

Offset	Signal name	Refresh cycle	Description
+0	External output signal DO1	Operation cycle[*1]	Sets the command for DO1, DO2 of sensing SSCNETⅢ/H head module. 0: OFF 1: ON
+1	External output signal DO2		
+2	Unusable	—	—
+3			
+4			
+5			
+6			
+7			
+8			
+9			
+10			
+11			
+12			
+13			
+14			
+15			
+16	DO1 output enable	Operation cycle[*1]	Enables output of DO1, DO2 of the sensing SSCNETⅢ/H head module. 0: Disable 1: Enable
+17	DO2 output enable		
+18	Unusable	—	—
+19			
+20			
+21			
+22			
+23			
+24			
+25			
+26			
+27			
+28			
+29			
+30			
+31			

*1   When the operation cycle is set to 7.111[ms] or more, the operation cycle is 3.555[ms].

• Word data area (RWw)

Offset	Signal name	Refresh cycle	Description
+0	Unusable	—	—
+1			
+2			
+3			
+4			
+5			
+6			
+7			
+8			
+9			
+10			
+11			
+12			
+13			
+14			
+15			
+16			
+17			
+18			
+19			
+20			
+21			
+22			
+23			
+24			
+25			
+26			
+27			
+28			
+29			
+30			
+31			

Sensing SSCNETⅢ/H head module+Sensing extension module

The contents of the devices (Input: RX, RWr/Output: RY, RWw) for storage of link data for communicating between the Motion CPU and sensing SSCNETⅢ/H head module+sensing extension module are shown below.

■Input device

• Bit data area (RX)

Offset	Signal name	Refresh cycle	Description
+0	External input DI1	Operation cycle[*1]	Stores the input state of DI1 to DI12 of sensing SSCNETⅢ/H head module. 0: OFF 1: ON
+1	External input DI2		
+2	External input DI3		
+3	External input DI4		
+4	External input DI5		
+5	External input DI6		
+6	External input DI7		
+7	External input DI8		
+8	External input DI9		
+9	External input DI10		
+10	External input DI11		
+11	External input DI12		
+12	Unusable	—	—
+13			
+14			
+15			
+16	DO1 output enabling	Operation cycle[*1]	Stores the output enable state of DO1 and DO2 of sensing SSCNETⅢ/H head module. 0: Disable 1: Enable
+17	DO2 output enabling		
+18	Unusable	—	—
+19			
+20			
+21			
+22			
+23			
+24			
+25			
+26			
+27			
+28			
+29			
+30			
+31			
+32	Sensing extension module bit data area		Stores the bit data area (RX) of the sensing extension module set to first station.
⋮			
+63			

*1 When the operation cycle is set to 7.111[ms] or more, the operation cycle is 3.555[ms].

• Word data area (RWr)

Offset	Signal name	Refresh cycle	Description
+0	DO output state (DO for each signal)	Operation cycle[*1]	Stores the DO output state of the sensing SSCNETⅢ/H head module.
+1	Unusable	—	—
+2			
+3			
+4			
+5			
+6 ⋮ +27	Sensing extension module word data area		Stores the bit data area (RWr) of the sensing extension module set to first station.

*1   When the operation cycle is set to 7.111[ms] or more, the operation cycle is 3.555[ms].

■Output device

• Bit data area (RY)

Offset	Signal name	Refresh cycle	Description
+0	External output signal DO1	Operation cycle[*1]	Sets the command for DO1, DO2 of sensing SSCNETⅢ/H head module. 0: OFF 1: ON
+1	External output signal DO2		
+2	Unusable	—	—
+3			
+4			
+5			
+6			
+7			
+8			
+9			
+10			
+11			
+12			
+13			
+14			
+15			
+16	DO1 output enable	Operation cycle[*1]	Enables output of DO1, DO2 of the sensing SSCNETⅢ/H head module. 0: Disable 1: Enable
+17	DO2 output enable		
+18	Unusable	—	—
+19			
+20			
+21			
+22			
+23			
+24			
+25			
+26			
+27			
+28			
+29			
+30			
+31			
+32 ⋮ +63	Sensing extension module bit data area		Sets the bit data area (RY) of the sensing extension module set to first station.

*1   When the operation cycle is set to 7.111[ms] or more, the operation cycle is 3.555[ms].

• Word data area (RWw)

Offset	Signal name	Refresh cycle	Description
+0	Unusable	—	—
+1			
+2			
+3			
+4			
+5			
+6	Sensing extension module word data area		Sets the word data area (RWw) of the sensing extension module set to first station.
⋮			
+27			

Sensing I/O module

The contents of the devices (Input: RX, RWr/Output: RY, RWw) for storage of link data for communicating between the Motion CPU and sensing I/O module are shown below.

■Input device

• Bit data area (RX)

Offset	Signal name	Refresh cycle	Description
+0	External input DI1	Operation cycle[*1]	Stores the input state of DI1 to DI16 of sensing I/O module. 0: OFF 1: ON
+1	External input DI2		
+2	External input DI3		
+3	External input DI4		
+4	External input DI5		
+5	External input DI6		
+6	External input DI7		
+7	External input DI8		
+8	External input DI9		
+9	External input DI10		
+10	External input DI11		
+11	External input DI12		
+12	External input DI13		
+13	External input DI14		
+14	External input DI15		
+15	External input DI16		
+16	DO1 output enabling		Stores the output enable state of DO1 to DO16 of sensing I/O module. 0: Disable 1: Enable
+17	DO2 output enabling		
+18	DO3 output enabling		
+19	DO4 output enabling		
+20	DO5 output enabling		
+21	DO6 output enabling		
+22	DO7 output enabling		
+23	DO8 output enabling		
+24	DO9 output enabling		
+25	DO10 output enabling		
+26	DO11 output enabling		
+27	DO12 output enabling		
+28	DO13 output enabling		
+29	DO14 output enabling		
+30	DO15 output enabling		
+31	DO16 output enabling		

*1 When the operation cycle is set to 7.111[ms] or more, the operation cycle is 3.555[ms].

- Word data area (RWr)r

Offset	Signal name	Refresh cycle	Description
+0	DO output state (for each DO signal)	Operation cycle[*1]	Stores the DO output state of the sensing I/O module.
+1	Unusable	—	—
+2			
+3			
+4			
+5			
+6			
+7			
+8			
+9			
+10			
+11			
+12			
+13			
+14			
+15			
+16			
+17			
+18			
+19			
+20			
+21			

*1   When the operation cycle is set to 7.111[ms] or more, the operation cycle is 3.555[ms].

■Output device

- Bit data area (RY)

Offset	Signal name	Refresh cycle	Description
+0	External output signal DO1	Operation cycle[*1]	Sets the command for DO1 to DO16 of sensing I/O module. 0: OFF 1: ON
+1	External output signal DO2		
+2	External output signal DO3		
+3	External output signal DO4		
+4	External output signal DO5		
+5	External output signal DO6		
+6	External output signal DO7		
+7	External output signal DO8		
+8	External output signal DO9		
+9	External output signal DO10		
+10	External output signal DO11		
+11	External output signal DO12		
+12	External output signal DO13		
+13	External output signal DO14		
+14	External output signal DO15		
+15	External output signal DO16		
+16	DO1 output enable		Enables output of DO1 to DO16 of the sensing I/O module. 0: Disable 1: Enable
+17	DO2 output enable		
+18	DO3 output enable		
+19	DO4 output enable		
+20	DO5 output enable		
+21	DO6 output enable		
+22	DO7 output enable		
+23	DO8 output enable		
+24	DO9 output enable		
+25	DO10 output enable		
+26	DO11 output enable		
+27	DO12 output enable		
+28	DO13 output enable		
+29	DO14 output enable		
+30	DO15 output enable		
+31	DO16 output enable		

*1   When the operation cycle is set to 7.111[ms] or more, the operation cycle is 3.555[ms].

5

- Word data area (RWw)

Offset	Signal name	Refresh cycle	Description
+0	Unusable	—	—
+1			
+2			
+3			
+4			
+5			
+6			
+7			
+8			
+9			
+10			
+11			
+12			
+13			
+14			
+15			
+16			
+17			
+18			
+19			
+20			
+21			

Sensing pulse I/O module

The contents of the devices (Input: RX, RWr/Output: RY, RWw) for storage of link data for communicating between the Motion CPU and sensing pulse I/O module are shown below.

■Input device

• Bit data area (RX)

Offset	Signal name		Refresh cycle	Description
+0	CN1	External input DI1A	Operation cycle[*1]	Stores the input state of CN1-DI1A to CN1-DI7A of sensing pulse I/O module.
+1		External input DI2A		0: OFF
+2		External input DI3A		1: ON
+3		External input DI4A		
+4		External input DI5A		
+5		External input DI6A		
+6		External input DI7A		
+7		Unusable	—	—
+8		DO1A output enabling	Operation cycle[*1]	Stores the output enable state of CN1-DO1A to CN1-DO5A of sensing pulse I/O module.
+9		DO2A output enabling		0: Disable
+10		DO3A output enabling		1: Enable
+11		DO4A output enabling		
+12		DO5A output enabling		
+13		Unusable	—	—
+14				
+15				
+16	CN2	External input DI1B	Operation cycle[*1]	Stores the input state of CN2-DI1B to CN2-DI7B of sensing pulse I/O module.
+17		External input DI2B		0: OFF
+18		External input DI3B		1: ON
+19		External input DI4B		
+20		External input DI5B		
+21		External input DI6B		
+22		External input DI7B		
+23		Unusable	—	—
+24		DO1B output enabling	Operation cycle[*1]	Stores the output enable state of CN2-DO1B to CN2-DO5B sensing pulse I/O module.
+25		DO2B output enabling		0: Disable
+26		DO3B output enabling		1: Enable
+27		DO4B output enabling		
+28		DO5B output enabling		
+29		Unusable	—	—
+30				
+31				

*1 When the operation cycle is set to 7.111[ms] or more, the operation cycle is 3.555[ms].

• Word data area (RWr)

Offset	Signal name		Refresh cycle	Description
+0	CN1	Pulse accumulated value	Operation cycle[*1]	Stores the pulse accumulated value input to CN1 of sensing pulse I/O module.
+1				
+2		Latch counter DI4A (pulse counter value)		Stores the pulse count value when the CN1-DI4A of sensing pulse I/O module were input.
+3				
+4		DO output state (for each DO signal)		Stores the output state of CN1-DO of sensing pulse I/O module.
+5		Unusable	—	—
+6				
+7				
+8	CN2	Pulse accumulated value	Operation cycle[*1]	Stores the pulse accumulated value input to CN2 of sensing pulse I/O module.
+9				
+10		Latch counter DI4B (pulse counter value)		Stores the pulse count value when the CN2-DI4B of sensing pulse I/O module were input.
+11				
+12		DO output state (for each DO signal)		Stores the output state of CN2-DO of sensing pulse I/O module.
+13		Unusable	—	—
+14				
+15				
+16	Unusable		—	—
+17				
+18				
+19				
+20				
+21				

*1   When the operation cycle is set to 7.111[ms] or more, the operation cycle is 3.555[ms].

■Output device

- Bit data area (RY)

Offset	Signal name		Refresh cycle	Description
+0	CN1	External output signal DO1A	Operation cycle[*1]	Sets the command for CN1-DO1A to CN1-DO5A of sensing pulse I/O module. 0: OFF 1: ON
+1		External output signal DO2A		
+2		External output signal DO3A		
+3		External output signal DO4A		
+4		External output signal DO5A		
+5		Unusable	—	—
+6				
+7				
+8		DO1A output enable	Operation cycle[*1]	Enables output of CN1-DO1A to CN1-DO5A of sensing pulse I/O module. 0: Disable 1: Enable
+9		DO2A output enable		
+10		DO3A output enable		
+11		DO4A output enable		
+12		DO5A output enable		
+13		Unusable	—	—
+14				
+15				
+16	CN2	External output signal DO1B	Operation cycle[*1]	Sets the command for CN2-DO1B to CN2-DO5B of sensing pulse I/O module. 0: OFF 1: ON
+17		External output signal DO2B		
+18		External output signal DO3B		
+19		External output signal DO4B		
+20		External output signal DO5B		
+21		Unusable	—	—
+22				
+23				
+24		DO1B output enable	Operation cycle[*1]	Enables output of CN2-DO1B to CN2-DO5B of sensing pulse I/O module. 0: Disable 1: Enable
+25		DO2B output enable		
+26		DO3B output enable		
+27		DO4B output enable		
+28		DO5B output enable		
+29		Unusable	—	—
+30				
+31				

*1 When the operation cycle is set to 7.111[ms] or more, the operation cycle is 3.555[ms].

• Word data area (RWw)

Offset	Signal name		Refresh cycle	Description
+0	CN1	Pulse command value	Operation cycle[*1]	Sets the accumulated pulses since the power supply ON of the control circuit, output by CN1 of sensing pulse I/O module.
+1				
+2		ON timing (For pulse coincidence output function)		Sets the ON timing when counter coincidence DO output is enabled.
+3				
+4		OFF timing (For pulse coincidence output function)		Sets the OFF timing when counter coincidence DO output is enabled.
+5				
+6		Unusable	—	—
+7				
+8	CN2	Pulse command value	Operation cycle[*1]	Sets the accumulated pulses since the power supply ON of the control circuit, output by CN2 of sensing pulse I/O module.
+9				
+10		ON timing (For pulse coincidence output function)		Sets the ON timing when counter coincidence DO output is enabled.
+11				
+12		OFF timing (For pulse coincidence output function)		Sets the OFF timing when counter coincidence DO output is enabled.
+13				
+14		Unusable	—	—
+15				
+16	Unusable		—	—
+17				
+18				
+19				
+20				
+21				

*1   When the operation cycle is set to 7.111[ms] or more, the operation cycle is 3.555[ms].

Sensing analog I/O module

The contents of the devices (Input: RX, RWr/Output: RY, RWw) for storage of link data for communicating between the Motion CPU and sensing analog I/O module are shown below.

■Input device

- Bit data area (RX)

Offset	Signal name	Refresh cycle	Description
+0	Analog output signal CH1	Operation cycle[*1]	Stores the output state of analog output CH1 to CH4 of sensing analog I/O module. 0: Stopped 1: Outputting
+1	Analog output signal CH2		
+2	Analog output signal CH3		
+3	Analog output signal CH4		
+4	Unusable	—	—
+5			
+6			
+7			
+8			
+9			
+10			
+11			
+12			
+13			
+14			
+15			
+16			
+17			
+18			
+19			
+20			
+21			
+22			
+23			
+24			
+25			
+26			
+27			
+28			
+29			
+30			
+31			

*1 When the operation cycle is set to 7.111[ms] or more, the operation cycle is 3.555[ms].

• Word data area (RWr)

Offset	Signal name	Refresh cycle	Description
+0	Maximum/Minimum value reset complete	Operation cycle[*1]	Stores the reset state of maximum/minimum value. b0 0: CH1 resetting 1: CH1 reset complete b1 0: CH2 resetting 1: CH2 reset complete b2 0: CH3 resetting 1: CH3 reset complete b3 0: CH4 resetting 1: CH4 reset complete
+1	Unusable	—	—
+2	Digital value of analog input CH1	Operation cycle[*1]	Converts the scaled value of voltage input to analog input CH1 to CH4 of sensing analog I/O module, and transfers to the Motion CPU.
+3	Digital value of analog input CH2		
+4	Digital value of analog input CH3		
+5	Digital value of analog input CH4		
+6	Analog input channel average value Setting 1		Stores the average value of data for the CH set to analog input average 1 and 2.
+7	Analog input channel average value Setting 2		
+8	Analog input maximum CH1		Stores the maximum value of voltage input to analog input CH1 to CH4 of sensing analog I/O module.
+9	Analog input maximum CH2		
+10	Analog input maximum CH3		
+11	Analog input maximum CH4		
+12	Analog input minimum CH1		Stores the minimum value of voltage input to analog input CH1 to CH4 of sensing analog I/O module.
+13	Analog input minimum CH2		
+14	Analog input minimum CH3		
+15	Analog input minimum CH4		
+16	Unusable	—	—
+17			
+18			
+19			
+20			
+21			

*1   When the operation cycle is set to 7.111[ms] or more, the operation cycle is 3.555[ms].

■Output device

• Bit data area (RY)

Offset	Signal name	Refresh cycle	Description
+0	Analog output enable CH1	Operation cycle[*1]	Enable output of CH1 to CH4 of the sensing analog I/O module
+1	Analog output enable CH2		0: Disable
+2	Analog output enable CH3		1: Enable
+3	Analog output enable CH4		
+4	Unusable	—	—
+5			
+6			
+7			
+8			
+9			
+10			
+11			
+12			
+13			
+14			
+15			
+16			
+17			
+18			
+19			
+20			
+21			
+22			
+23			
+24			
+25			
+26			
+27			
+28			
+29			
+30			
+31			

*1   When the operation cycle is set to 7.111[ms] or more, the operation cycle is 3.555[ms].

• Word data area (RWw)

Offset	Signal name	Refresh cycle	Description
+0	Maximum/Minimum value reset request	Operation cycle[*1]	Stores the reset state of maximum/minimum value. b0 0: CH1 reset command OFF 1: CH1 reset command ON b1 0: CH2 reset command OFF 1: CH2 reset command ON b2 0: CH3 reset command OFF 1: CH3 reset command ON b3 0: CH4 reset command OFF 1: CH4 reset command ON
+1	Unusable	—	—
+2	Digital value of analog output CH1	Operation cycle[*1]	Sets the voltage output by CH1 to CH4 of sensing analog I/O module with the scaled internal value.
+3	Digital value of analog output CH2		
+4	Digital value of analog output CH3		
+5	Digital value of analog output CH4		
+6	Unusable	—	—
+7			
+8			
+9			
+10			
+11			
+12			
+13			
+14			
+15			
+16			
+17			
+18			
+19			
+20			
+21			

*1   When the operation cycle is set to 7.111[ms] or more, the operation cycle is 3.555[ms].

Sensing encoder I/F module

The contents of the devices (Input: RX, RWr/Output: RY, RWw) for storage of link data for communicating between the Motion CPU and sensing encoder I/F module are shown below.

■Input device

• Bit data area (RX)

Offset	Signal name	Refresh cycle	Description
+0	Unusable	—	—
+1			
+2			
+3			
+4			
+5			
+6			
+7			
+8			
+9			
+10			
+11			
+12			
+13			
+14			
+15			
+16			
+17			
+18			
+19			
+20			
+21			
+22			
+23			
+24			
+25			
+26			
+27			
+28			
+29			
+30			
+31			

• Word data area (RWr)

Offset	Signal name		Refresh cycle	Description
+0	CH.A	Encoder information 1	Operation cycle[1]	Transfers all data acquired from the encoder connected to CH.A of sensing encoder input I/F module. The information that can be acquired differs by encoder.
+1				
+2		Encoder information 2		
+3				
+4		Encoder information 3		
+5				
+6		Encoder current value (signed 32-bit data)		Transfers the current position data of the encoder connected to CH.A of sensing encoder input I/F module.
+7				
+8		Encoder error information		Transfers the alarm information of the encoder connected to CH.A of sensing encoder input I/F module. b0 to b1: Not used b2: 0: No alarm 1: Alarm b3 to bF: Not used
+9		Unusable	—	—
+10	CH.B	Encoder information 1	Operation cycle[1]	Transfers all data acquired from the encoder connected to CH.B of sensing encoder input I/F module. The information that can be acquired differs by encoder.
+11		Encoder information 2		
+12		Encoder information 3		
+13		External input signal DI2 latch counter		
+14		External input signal DI3 latch counter		
+15		External input signal DI4 latch counter		
+16		Encoder current value (signed 32-bit data)		Transfers the current position data of the encoder connected to CH.B of sensing encoder input I/F module.
+17				
+18		Encoder error information		Transfers the alarm information of the encoder connected to CH.B of sensing encoder input I/F module. b0 to b1: Not used b2: 0: No alarm 1: Alarm b3 to bF: Not used
+19		Unusable	—	—
+20	Unusable		—	—
+21				

*1 When the operation cycle is set to 7.111[ms] or more, the operation cycle is 3.555[ms].

■Output device

• Bit data area (RY)

Offset	Signal name	Refresh cycle	Description
+0	Unusable	—	—
+1			
+2			
+3			
+4			
+5			
+6			
+7			
+8			
+9			
+10			
+11			
+12			
+13			
+14			
+15			
+16			
+17			
+18			
+19			
+20			
+21			
+22			
+23			
+24			
+25			
+26			
+27			
+28			
+29			
+30			
+31			

• Word data area (RWw)

Offset	Signal name	Refresh cycle	Description
+0	Unusable	—	—
+1			
+2			
+3			
+4			
+5			
+6			
+7			
+8			
+9			
+10			
+11			
+12			
+13			
+14			
+15			
+16			
+17			
+18			
+19			
+20			
+21			

Link data (axis mode)

The contents of the devices (Input: RX/Output: RY) for storage of link data for communicating between the Motion CPU and sensing module (axis mode) are shown below.

Sensing SSCNETIII/H head module

The contents of the devices (Input: RX/Output: RY) for storage of link data for communicating between the Motion CPU and sensing SSCNETⅢ/H head module are shown below.

■Input device
• Bit data area (RX)

Offset	Signal name	Refresh cycle	Description
+0	External input DI1	Operation cycle[*1]	Stores the input state of DI1 to DI12 of sensing SSCNETⅢ/H head module. 0: OFF 1: ON
+1	External input DI2		
+2	External input DI3		
+3	External input DI4		
+4	External input DI5		
+5	External input DI6		
+6	External input DI7		
+7	External input DI8		
+8	External input DI9		
+9	External input DI10		
+10	External input DI11		
+11	External input DI12		
+12	Unusable	—	—
+13			
+14	DO1 output	Operation cycle[*1]	Stores the output state of DO1 and DO2 of sensing SSCNETⅢ/H head module. 0: OFF 1: ON
+15	DO2 output		

*1   When the operation cycle is set to 7.111[ms] or more, the operation cycle is 3.555[ms].

■Output device
• Bit data area (RY)

Offset	Signal name	Refresh cycle	Description
+0	External output signal DO1	Operation cycle[*1]	Sets the command for DO1 and DO2 of sensing SSCNETⅢ/H head module. 0: OFF 1: ON
+1	External output signal DO2		
+2	Unusable	—	—
+3			
+4			
+5			
+6			
+7			
+8			
+9			
+10			
+11			
+12			
+13			
+14			
+15			

*1   When the operation cycle is set to 7.111[ms] or more, the operation cycle is 3.555[ms].

Sensing module functions (station mode)

The sensing module functions in station mode are shown below.

The functions that can be used for each module when the sensing module is in station mode are shown below.

○: Available ×: Not available

Function	Description	Sensing module					Reference
		Sensing SSCNETIII /H head module	Sensing I/O module	Sensing pulse I/O module	Sensing analog I/O module	Sensing encoder I/F module	
Digital input function	Transfers the state of the DI signal to the Motion CPU.	○	○	○	×	×	—
Timing-latch input function	Transfers the timing of the DI signal input to the Motion CPU.	○	○	×	×	×	☞ Page 241 Timing-latch input function
Digital output function	Turns ON/OFF the DO signal with a command from the Motion CPU.	○	○	○	×	×	—
Level output function	Turns ON/OFF the DO signal according to the monitor value of the monitoring target (sensing analog I/O module, sensing pulse I/O module, sensing encoder I/F module)	○	○	×	×	×	—
Output CLEAR/HOLD function	Sets the operation for when communication with the Motion CPU is disconnected.	○	○	○	×	×	☞ Page 242 Output CLEAR/ HOLD function
Pulse input function	Transfers the number of pulses input to the sensing pulse I/O module to the Motion CPU.	×	×	○	×	×	—
Pulse output function	Outputs the pulses specified by the Motion CPU in accordance with output format and polarity.	×	×	○	×	×	—
Pulse coincidence output function	Turns on DO signal when the pulse input value or pulse output value is within the specified range.	×	×	○	×	×	—
Analog input function	Transfers the analog data input to the sensing analog I/O module to the Motion CPU.	×	×	×	○	×	—
Analog output function	Outputs analog data with a command from the Motion CPU.	×	×	×	○	×	—
Analog input averaging function	Averages multiple analog input data and transfers to the Motion CPU.	×	×	×	○	×	—
Maximum/minimum value holding function	Holds the maximum and minimum analog input value and transfers to the Motion CPU.	×	×	×	○	×	—
Encoder input function	Transfers the position data input to the sensing encoder I/F module to the Motion CPU.	×	×	×	×	○	☞ Page 243 Encoder input function
Servo parameter read/change function	Changes or displays each servo parameter of the axis specified by the Motion CPU.	○	○	○	○	○	☞ Page 171 Servo Parameter Read/Change Function

Timing-latch input function

The timing-latch input function latches the input timing of the external input signal DI in 0.1[μs] increments. By using the latched timing in the high-speed input request signal, the counter enable/counter disable/current value change of the synchronous encoder axis, advanced synchronous control clutch ON/OFF, and mark detection can be controlled with high accuracy.
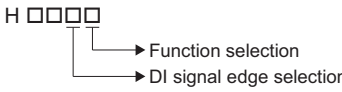
■Timing-latch input function settings

Set the following servo parameters for the timing-latch input function.

Refer to the following for details of servo parameters.
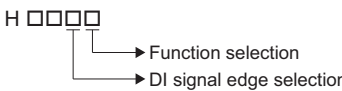
📖Sensing Module Instruction Manual

• Using sensing SSCNETⅢ/H head module

Parameter No.	Item	Setting details
PTA002	DI1(CN2-13) setting 2	Set function selection and DI signal edge selection.
PTA004	DI2(CN2-1) setting 2	H □□□□
PTA006	DI3(CN2-14) setting 2	→ Function selection
PTA008	DI4(CN2-2) setting 2	→ DI signal edge selection
PTA010	DI5(CN2-15) setting 2	
PTA012	DI6(CN2-3) setting 2	
PTA014	DI7(CN2-16) setting 2	
PTA016	DI8(CN2-4) setting 2	
PTA018	DI9(CN2-17) setting 2	
PTA020	DI10(CN2-5) setting 2	
PTA022	DI11(CN2-18) setting 2	
PTA024	DI12(CN2-6) setting 2	

Item	Setting value	Details
Function selection	1: Timing-latch input	Set the DI signal function to the timing-latch input.
DI signal edge selection	0: Rising edge 1: Falling edge	Latch the counter at the rising (OFF to ON), or the falling (ON to OFF) of the input signal.

• Using sensing I/O module

Parameter No.	Item	Setting details
PTB002	DI1(CN1-10) setting 2	Set function selection and DI signal edge selection.
PTB004	DI2(CN1-1) setting 2	H □□□□
PTB006	DI3(CN1-11) setting 2	→ Function selection
PTB008	DI4(CN1-2) setting 2	→ DI signal edge selection
PTB010	DI5(CN1-12) setting 2	
PTB012	DI6(CN1-3) setting 2	
PTB014	DI7(CN1-13) setting 2	
PTB016	DI8(CN1-4) setting 2	
PTB018	DI9(CN1-14) setting 2	
PTB020	DI10(CN1-5) setting 2	
PTB022	DI11(CN1-15) setting 2	
PTB024	DI12(CN1-6) setting 2	
PTB026	DI13(CN1-16) setting 2	
PTB028	DI14(CN1-7) setting 2	
PTB030	DI15(CN1-17) setting 2	
PTB032	DI16(CN1-8) setting 2	

Item	Setting value	Details
Function selection	1: Timing-latch input	Set the DI signal function to the timing-latch input.
DI signal edge selection	0: Rising edge 1: Falling edge	Latch the counter at the rising (OFF to ON), or the falling (ON to OFF) of the input signal.

■Example

An example for mark detection using the external input signal (DI1) of the sensing I/O module (RIO axis No. 601) is shown below.

1. Set the servo parameters as follows.

Servo parameter		Setting value
DI1(CN1-10) setting 2 (PTB002)	Function selection	1: Timing-latch input
	DI signal edge selection	0: Rising edge, or 1: Falling edge

2. Set the high-speed input request signal settings as follows.

Item	Setting value
Signal type	3: Sensing module input
Input module	2: MR-MT2100
Axis No.	601
Input signal	1: DI1

3. Set the number of the high-speed input request signal set in "2." to the "High-speed input request signal" of mark detection.

4. Turn ON/OFF the external input signal (DI1) of the sensing I/O module (RIO axis No. 601).

Restriction 👌

- When operation mode is "Axis mode", the timing-latch input function cannot be used.
- For sensing SSCNETⅢ/H head module+sensing extension module, the input signals compatible with the timing-latch input of sensing SSCNETⅢ/H head module are "DI1 to DI4".

Output CLEAR/HOLD function

When a failure occurs in communication with the Motion CPU, or the Motion CPU operation has been stopped by an error, with the sensing module, set whether to hold the output state of the external output signal DO immediately before, or clear.

■Output CLEAR/HOLD function settings

For the Output CLEAR/HOLD function set the following servo parameters.

Refer to the following for details of servo parameters.

📖Sensing Module Instruction Manual

- Using sensing SSCNETⅢ/H head module

Parameter No.	Item		Setting value	Setting details
PTA027	DO1(CN2-20) setting 1	Operation selection at disconnection of communication	0: CLEAR	Sets the output state of the DO signal at disconnection of communication.
PTA029	DO2(CN2-8) setting 1		1: HOLD	

• Using sensing I/O module

Parameter No.	Item		Setting value	Setting details
PTB037	DO1(CN2-11) setting 1	Operation selection at disconnection of communication	0: CLEAR 1: HOLD	Sets the output state of the DO signal at disconnection of communication.
PTB039	DO2(CN2-1) setting 1			
PTB041	DO3(CN2-12) setting 1			
PTB043	DO4(CN2-2) setting 1			
PTB045	DO5(CN2-13) setting 1			
PTB047	DO6(CN2-3) setting 1			
PTB049	DO7(CN2-14) setting 1			
PTB051	DO8(CN2-4) setting 1			
PTB053	DO9(CN2-15) setting 1			
PTB055	DO10(CN2-5) setting 1			
PTB057	DO11(CN2-16) setting 1			
PTB059	DO12(CN2-6) setting 1			
PTB061	DO13(CN2-17) setting 1			
PTB063	DO14(CN2-7) setting 1			
PTB065	DO15(CN2-18) setting 1			
PTB067	DO16(CN2-8) setting 1			

• Using sensing pulse I/O module

Parameter No.	Item		Setting value	Setting details
PTC065	DO1A(CN1-11) setting 1	Operation selection at disconnection of communication	0: CLEAR 1: HOLD	Sets the output state of the DO signal at disconnection of communication.
PTC067	DO2A(CN1-12) setting 1			
PTC069	DO3A(CN1-23) setting 1			
PTC071	DO4A(CN1-1) setting 1			
PTC073	DO5A(CN1-13) setting 1			
PTC075	DO1B(CN2-11) setting 1			
PTC077	DO2B(CN2-12) setting 1			
PTC079	DO3B(CN2-23) setting 1			
PTC081	DO4B(CN2-1) setting 1			
PTC083	DO5B(CN2-13) setting 1			

■**Output state on the external input signal**

When there is a failure with the Motion CPU or in communication with the sensing module, the following occurs, depending on the setting of the servo parameter "DO□ setting 1 (operation selection at disconnection of communication)".

Operation state		DO□ setting 1 (operation selection at disconnection of communication)			
		0: CLEAR		1: HOLD	
		Output state: OFF	Output state: ON	Output state: OFF	Output state: ON
During data link	At Motion CPU STOP	OFF	ON	OFF	ON
	At stop by Motion CPU error	OFF	OFF	OFF	ON
At disconnection of communication		OFF	OFF	OFF	ON

Refer to data of refresh device for clear/hold of Motion CPU refresh device.

Restriction

When operation mode is "Axis mode", the output state at disconnection of communication can be set with the servo parameter "DO□ setting 1 (operation selection at disconnection of communication)" only for the external output signal DO of the sensing SSCNETⅢ/H head module.

Encoder input function

Gets position information from encoders connected to the sensing encoder I/F module, and uses as a synchronous encoder axis. Refer to the following for synchronous encoder setting method.

📖MELSEC iQ-R Motion Controller Programming Manual (Advanced Synchronous Control)

Sensing module functions (axis mode)

Positioning control of pulse command interface stepping motor drivers etc. is possible when using the sensing pulse I/O module in axis mode. When the sensing pulse I/O module is used in axis mode, the functions and operations differ to when a servo amplifier is used. This section describes the functions/operations that differ from when a servo amplifier is used. For items that are not described, refer to ▨MELSEC iQ-R Motion Controller User's Manual, and the Programming Manuals.

Sensing pulse I/O module settings

The settings for using the sensing pulse I/O module in axis mode are shown below.

■Connected station No. setting

Set the station No. with the station selection rotary switch (SW1 and SW2) of the sensing SSCNETⅢ/H head module. Refer to the following for how to set the station selection rotary switch.

▨Sensing Module Instruction Manual

■Axis setting of connected axis

Set the number of axes with motors to be connected with the mode select switch (SW1) of the sensing pulse I/O module. Refer to the following for how to set the mode select switch.

▨Sensing Module Instruction Manual

■Parameter setting

Set the parameters for when the sensing pulse I/O module is used in axis mode. For details, refer to sensing module parameters. (☞ Page 207 Sensing module parameters)

> **Point** 🔍
>
> Make sure the sensing pulse I/O module settings and servo network settings are matched. If they do not match, the connected axes of the sensing pulse I/O module do not start up normally.

Feedback pulse input settings and current position follow-up

Set the feedback pulse input to valid/invalid. With this setting, the current position follow-up operation is different at servo OFF.

■When feedback pulse input is valid

The current position of the Motion CPU is created with the feedback pulse of the sensing pulse I/O module. Current position can be followed-up during servo OFF.

■When feedback pulse is invalid

The current position of the Motion CPU is the same as the Motion CPU command position. Current position can not be followed-up during servo OFF, therefore perform a home position return for every servo ON.

> **Point** 🔍
>
> In order to enable current position follow-up, make sure that the output pulses and input pulses of the sensing pulse I/O module match the running axes over the same movement amount. If they do not match, the follow-up function does not work correctly and a discrepancy occurs with the command position and actual position.

Restrictions when using sensing pulse I/O module (axis mode)

The following restrictions apply when using the sensing pulse I/O module in axis mode.

■Absolute position system

The axes connected to the sensing pulse I/O module do not support the absolute position system.

■Home position return

- Home position return operation types

  The home position return methods that can be used in axis mode of the sensing pulse I/O module are shown below.

○: Possible, ×: Not possible

Home position return method		Possible/Not possible
Proximity dog method	Proximity dog method 1	○
	Proximity dog method 2	○
Count method	Count method 1	○
	Count method 2	○
	Count method 3	○
Data set method	Data set method 1	○
	Data set method 2	○
	Data set method 3	×[*1]
Dog cradle method		○
Stopper method	Stopper method 1	×[*1]
	Stopper method 2	×[*1]
Limit switch combined method		○
Scale home position signal detection method		×[*1]
Dogless home position signal reference method		○
Driver home position return method		×[*1]

*1 Minor error (error code: 1979H) occurs, and home position return is not performed.

For home position return of axes connected to the sensing pulse I/O module, the zero point is detected by the zero point signal input to the sensing pulse I/O module. The differences to when a servo amplifier is used for each home position return operation when using the sensing pulse I/O module are shown below.

Home position return method	Summary	Remarks
Proximity dog method 1, 2[*1]	While moving to zero point after proximity dog OFF, movement stops immediately with zero point signal ON.	Because these methods refer to the zero point signal, be sure to input the zero point signal to the sensing pulse I/O module.
Count method 1, 3[*2]	While moving to zero point after movement according to the "travel value after proximity dog ON" of home position return data is completed, movement stops immediately with zero point signal ON.	
Count method 2	Because there is no movement to zero point, control is the same as when a servo amplifier is used.	
Data set method 1, 2		
Dog cradle method	While moving to zero point after a stop by proximity dog OFF while running in reverse, movement stops immediately with zero point signal ON.	Because these methods refer to the zero point signal, be sure to input the zero point signal to the sensing pulse I/O module.
Limit switch combined method	While moving to zero point after a stop by limit switch ON while running in reverse, movement stops immediately with zero point signal ON.	
Dogless home position signal reference method[*3]	Home position return operation is executed with "operation B". While moving in the direction set by the creep speed, movement stops immediately with zero point signal ON	

*1 When proximity dog method 2 is set, the home position return operation is the same as proximity dog method 1.
*2 When count method 3 is set, the home position return operation is the same as count method 1.

*3 When performing "dogless home position signal reference method" in the sensing pulse I/O module, the home position, home position return operation, and home position return data (home position return retry function, dwell time at the home position return retry) is as follows. Also, servo parameter (PC17) can no longer be set in the sensing pulse I/O module.

Servo amplifier model	Linear encoder	Home position	Home position return operation[4]	Home position return data		Servo parameter (PC17)
				Home position return retry function	Dwell time at home position return retry	
MR-MT2200	—	Home signal (zero point) position	Operation B	Invalid		Can not be set

*4 Refer to the following for home position return operation.
📖 MELSEC iQ-R Motion Controller Programming Manual (Positioning Control)

- Home position return data

  Set "Home position return request setting in pulse conversion unit" and "Standby time after clear signal output in pulse conversion unit" in the home position return data.

Item	Details
Home position return request setting in pulse conversion unit	• When feedback pulse input is invalid: "0: Home position return request ON at servo OFF" • When feedback pulse input is valid: "1: Home position return request does not turn ON at servo OFF"
Standby time after clear signal output in pulse conversion unit	• Set the standby time from the output of the clear signal until position settling. By setting the standby time after clear signal output in pulse conversion unit, the standby time until the position of home position return settles can be adjusted. • The standby time after clear signal output in pulse conversion unit and operation example for home position return by proximity dog method 1 is shown below. (The control operation after immediate stop by zero point signal ON is the same for other home position return methods.) <Processing> (1) In the Motion CPU, after detecting the timing of zero point detection start (in this example, when the proximity dog signal turns OFF), the command pulses are stopped when the sensing pulse I/O module detects the first zero point signal (PG). Afterwards, clear output (CLEAR) turns ON. (2) After clear output (CLEAR) turns ON, the system waits for the standby time after clear signal output in pulse conversion unit. (3) After standby time after clear signal output in pulse conversion unit has elapsed, if home position shift amount is set, the system moves and home position return processing is completed.

Point

- When feedback pulse input is "invalid", if the home position return data "Home position return request setting in pulse conversion unit" is set to "1: Home position return request not ON during servo OFF", follow-up is not performed and "[St.1069] Home position return request (R: M32409+32n/Q: M2409+20n)" does not turn ON, causing a position discrepancy to occur. In this case, make sure to set "Home position return request setting in pulse conversion unit" to "0: Home position return request ON during servo OFF".
- When a time shorter than the sensing pulse I/O module parameter "Clear signal output pulse width time (PB12)" is set in "Standby time after clear signal output in pulse conversion unit", the time set to "Clear signal output pulse width time (PB12)" is used.
- When feedback pulse input is "valid" and position does not settle within the "Standby time after clear signal output in pulse conversion unit", the home position return may be completed with a position discrepancy between the current position and feedback position. In this case, set the "Standby time after clear signal output in pulse conversion unit" to match the position settling time of the home position return operation.

■Servo OFF

- When the feedback pulse input setting of the sensing pulse I/O module is invalid, do not rotate the motor during servo OFF. Rotating the motor will create a position discrepancy.
- After completing home position return, if "Home position return request setting in pulse conversion unit" is "0: Home position return request ON during servo OFF", "[St.1069] Home position return request (R: M32409+32n/Q: M2409+20n)" turns ON at a servo OFF state. After turning servo ON, perform a home position return operation again.

■Servo instructions

- Speed control (Ⅱ) (VVF instruction, VVR instruction) cannot be used.
- If the VVF instruction or VVR instruction are started, a minor error (error code: 19EBH) occurs.

■Current value history monitor

The multi-revolution counter and position within a single revolution of the current value history monitor are not updated.

■Optional data monitor setting

The following shows data types that can be set.

Set the data so that the total number of communication points per axis is no more than 6 points.

- Registered monitor

Data type	Unit	Number of words	Number of communication data points	Address ID[1]
Position F/B[2]	[pulse]	2	0	—
Cumulative current value[3]	[Positioning command][4]	2	0	—
Servo command value	[pulse]	2	0	—
Optional address of registered monitor	—	1	1	—

*1 Set an even number for the address ID of registered monitor.

*2 Depending on the feedback pulse input setting of the sensing pulse I/O module, the monitor values are as follows.

Feedback pulse input	Position feedback monitor value
Invalid	Cumulative command pulses of the sensing pulse I/O module
Valid	The position input to the sensing pulse I/O module from the driver

*3 The "Cumulative current value" is a command value for the servo amplifier. All other data types are servo amplifier monitor values (feedback).

*4 Position commands are positioning units set in [Motion control parameter] ⇨[Axis setting parameter] ⇨ "Fixed parameter" ⇨ "Unit setting".

5.7 Connection of Sensing Module **247**

Data type	Unit	Number of words[*1]	Number of communication data points	Transient ID	Storage device (response data (+8 to 11)) content
Encoder resolution	[pulse]	2	0	0305H	
Servo amplifier identification information (First 8 characters)	[characters]	4	0	0310H	
Servo amplifier identification information (Last 8 characters)	[characters]	4	0	0311H	
Servo amplifier S/W No. (First 8 characters)	[characters]	4	0	0312H	
Servo amplifier S/W No. (Last 8 characters)	[characters]	4	0	0313H	
Read alarm history number	[items]	1	0	0323H	
Alarm history/Detail #1, #2	—	4	0	0324H	+8: Alarm history #1 +9: Alarm detail #1 +10: Alarm history #2 +11: Alarm detail #2
Alarm history/Detail #3, #4	—	4	0	0325H	+8: Alarm history #3 +9: Alarm detail #3 +10: Alarm history #4 +11: Alarm detail #4
Alarm history/Detail #5, #6	—	4	0	0326H	+8: Alarm history #5 +9: Alarm detail #5 +10: Alarm history #6 +11: Alarm detail #6
Alarm history/Detail #7, #8	—	4	0	0327H	+8: Alarm history #7 +9: Alarm detail #7 +10: Alarm history #8 +11: Alarm detail #8
Alarm history/Detail/Occurrence time	—/[h]	4	0	0328H	+8: Alarm history number #(N+1) +9: Alarm history number #(N+1) detail +10: Alarm history number #(N+1) occurrence time (2 words)
Alarm occurrence time #1, #2	[h]	4	0	0329H	+8: Alarm occurrence time #1 (2 words) +10: Alarm occurrence time #2 (2 words)
Alarm occurrence time #3, #4	[h]	4	0	032AH	+8: Alarm occurrence time #3 (2 words) +10: Alarm occurrence time #4 (2 words)
Alarm occurrence time #5, #6	[h]	4	0	032BH	+8: Alarm occurrence time #5 (2 words) +10: Alarm occurrence time #6 (2 words)
Alarm occurrence time #7, #8	[h]	4	0	032CH	+8: Alarm occurrence time #7 (2 words) +10: Alarm occurrence time #8 (2 words)
Alarm history clear command	—	1	0	0382H	
LED display	[characters]	2	0	0410H	+8: Lower 2 digits +9: Higher 2 digits
Optional transient command	—	4	0	—	

*1 Number of words for response data (+8 to 11)

■Monitor devices (R: D32020+48n to D32039+48n/Q: #8000 to #8639)

- When using the sensing pulse I/O module in axis mode, the following values are stored to "[Md.1014] Servo amplifier type (R: D32030+48n/Q: #8000+20n)".

Type code	Details
0	Not used
12309(3015H)	MR-MT2010 (Sensing SSCNETⅢ/H head module)+MR-MT2200 (Sensing pulse I/O module: Axis mode Station 1)
12322(3022H)	MR-MT2200 (Sensing pulse I/O module: Axis mode Station 2 and after)

- "[Md.104] Motor current value (R: D32020+48n/Q: #8001+20n)" is always "0".
- "[Md.103] Motor speed (R: D32022+48n, D32023+48n/Q: #8002+20n, #8003+20n)" is not the actual motor speed. It is the value of pulse output converted to speed (r/min) by sensing pulse I/O module parameters "Number of pulses per revolution setting Low (PA15)", and "Number of pulses per revolution setting High (PA16)".
- When using the sensing pulse I/O module in axis mode, the following values are stored to "[Md.1027] Servo amplifier Vendor ID (R: D32031+48n/Q: #8016+20n)".

Vendor ID code	Details
0	Mitsubishi Electric Corporation

■Torque limit

- The torque limit depends on the specifications of the driver connected to the sensing pulse I/O module.
- The torque limit at the axes connected to the sensing pulse I/O module is ignored.

■Axis status signals

- "[St.1066] Zero pass (R:M32406+32n/Q: M2406+20n)" is always turned ON.
- When "Home position return request setting in pulse conversion unit" is "0: Home position return request ON during servo OFF", "[St.1069] Home position return request (R: M32406+32n/Q: M2409+20n)" turns ON at a servo OFF state. All other operations are the same as the servo amplifier.
- "[St.1076] Torque limiting (R: M32416+32n/Q: M2416+20n)" is always turned OFF.

■Axis command signals

- "[Rq.1156] Gain changing command (R: M34496+32n/Q: M3216+20n)" for the axes connected to the sensing pulse I/O module is ignored.
- "[Rq.1157] PI-PID switching command (R: M34497+32n/Q: M3217+20n)" for the axes connected to the sensing pulse I/O module is ignored.
- "[Rq.1158] Control loop changing command (R: M34498+32n/Q: M3218+20n)" for the axes connected to the sensing pulse I/O module is ignored.

■Axis monitor devices

- The initial value of 300[%] is stored to "[Md.35] Torque limit value (R: D32014+48n/Q: D14+20n)" at power supply ON of the servo amplifier control circuit, but the torque limit value is not sent to the pulse conversion module. Even if the value of the torque limit value storage register is changed by the servo program or torque limit value change request (CHGT), the new torque limit value is not sent to the pulse conversion module.
- "[Md.1006] Home position return re-travel value (R: D32009+48n/Q: D9+20n)" is always "0".

■Amplifier-less operation

Amplifier-less operation cannot be used for axes connected to sensing pulse I/O module. When amplifier-less operation is executed, the axis changes to a disconnected state, and servo ready does not turn ON.

■Speed-torque control

Speed-torque control cannot be performed on axes connected to sensing pulse I/O module. When control mode is changed to speed-torque control, a warning (error code: 09EAH) occurs.

■Driver communication

Driver communication cannot be used.

■Sensing SSCNETⅢ/H head module functions

When the sensing pulse I/O module is used in axis mode, only the following functions are valid for the sensing SSCNETⅢ/H head module.

• Digital input function
• Digital output function

Errors detected by sensing module

Errors at station mode

When an error occurs in the sensing module, alarm of the status device, or warning signal turns ON, and the error code is stored in the error code of the monitor device. Sensing module errors are treated as servo errors with minor error (error code: 1C80H), or warning (error code: 0C80H) being stored in "Latest self-diagnosis error (SD0)". The error codes read from the sensing module can be checked with the Motion error history in the MT Developer2 Motion CPU error batch monitor. If errors are cancelled by turning ON alarm reset of the command device, or resetting the control circuit power supply of the sensing module, the alarm or warning signals turn OFF, and the error code is cleared.
Refer to the following for details of errors.
📖Sensing Module Instruction Manual

Point 🔎

- When an error occurs in the sensing SSCNETⅢ/H head module, the alarm of the status device or warning signal turns ON at the first station in a block, and the error code is stored in the error code of the monitor device.
- When an error occurs in the sensing extension modules, the alarm of the status device or warning signal turns ON at the target station only, and the error code is stored in the error code of the monitor device.

Errors at axis mode

When an error occurs in the sensing pulse I/O module, "[St.1068] Servo error detection (R: M32408+32n/Q: M2408+20n)" turns ON, and minor error (error code: 1C80H), or warning (error code: 0C80H) is stored in "[Md.1005] Servo error code (R: D32008+48n/Q: D8+20n)". The error codes or warning codes read from the sensing pulse I/O module are stored in "[Md.1019] Servo amplifier display servo error code (R: D32028+48n/Q: #8008+20n)". Remove the error cause, and turn ON "[Rq.1148] Servo error reset command (R: M34488+32n/Q: M3208+20n)" to reset the error.
Refer to the following for details of errors.
📖Sensing Module Instruction Manual

Precautions when using sensing module

Precautions when using the sensing module in station mode are shown below.
- Disconnect/reconnect function cannot be used for the sensing module. When disconnect/reconnect is executed, it is ignored.
- The Motion SFC program RTO instruction and RFROM instruction cannot be used for the sensing module. When a RTO instruction or RFROM instruction is executed for a RIO axis of the sensing module, a minor error (SFC) (error code: 397CH, 397DH) occurs.

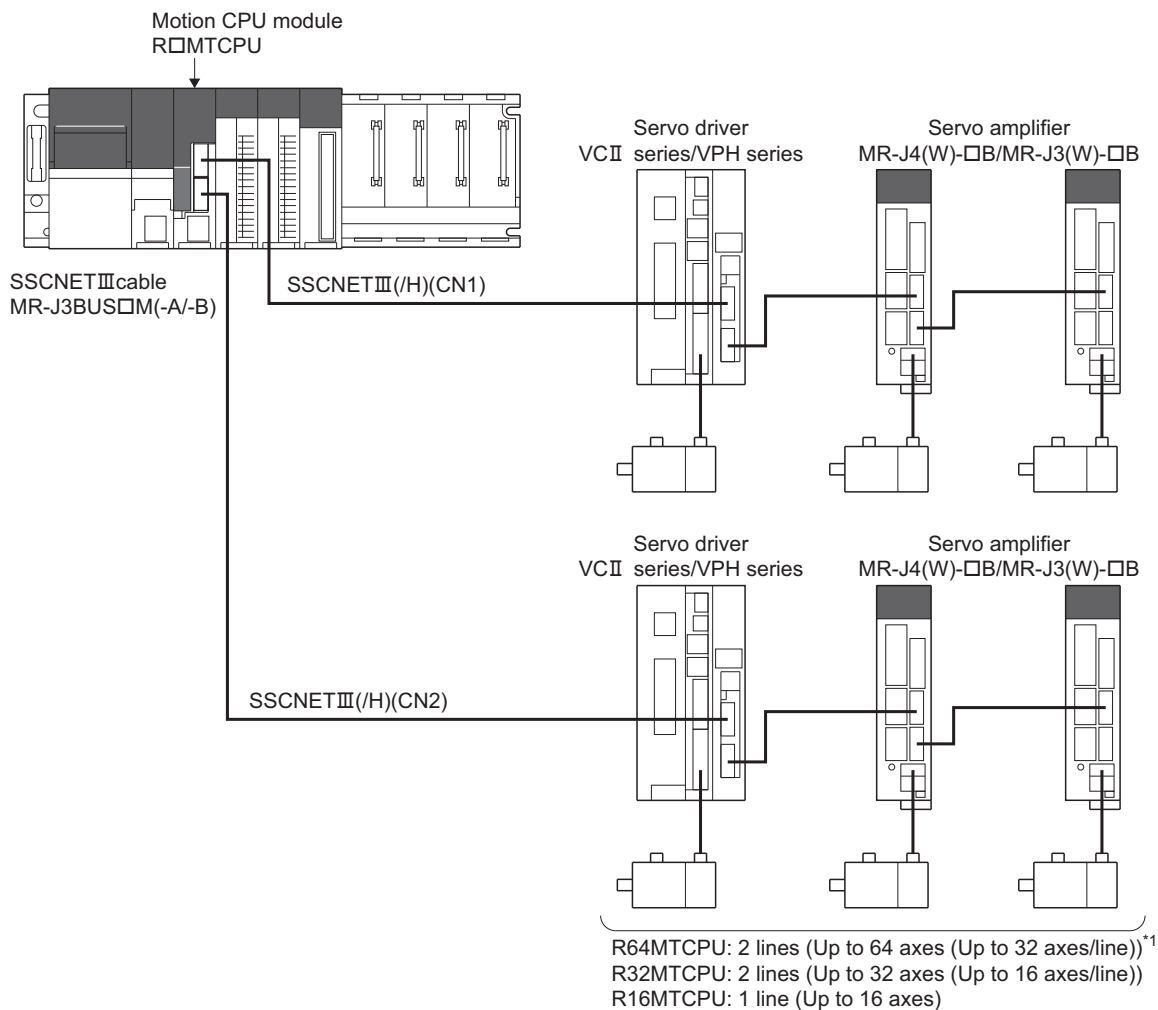# 5.8 Compatible Devices with SSCNETIII(/H)

Servo driver VCII series/VPH series manufactured by CKD Nikki Denso Co., Ltd.

The direct drive τDISC/τiD roll/τServo compass/τLinear stage, etc. manufactured by CKD Nikki Denso Co., Ltd. can be controlled by connecting with the servo driver VCII series/VPH series manufactured by the same company using the Motion CPU and SSCNETIII(/H).

Contact CKD Nikki Denso overseas sales office for details of VCII series/VPH series.

System configuration

The system configuration using VCII series/VPH series is shown below.

R64MTCPU: 2 lines (Up to 64 axes (Up to 32 axes/line))[*1]
R32MTCPU: 2 lines (Up to 32 axes (Up to 16 axes/line))
R16MTCPU: 1 line (Up to 16 axes)

*1 When the communication type is SSCNETIII, the R64MTCPU controls a maximum of 16 axes per line.

Parameter setting

To connect VCII series/VPH series, set the following in the servo network setting. (☞ Page 64 Servo network setting)

- Set the following for communication type in SSCNET setting.
  - When connecting SSCNETIII/H: "SSCNETIII/H"
  - When connecting SSCNETIII: "SSCNETIII"
- Set the amplifier model in amplifier setting to "VCII (CKD NIKKI DENSO)" or "VPH (CKD NIKKI DENSO)".

Control of VCII series/VPH series parameters

Parameters set in VCII series/VPH series are not controlled by the Motion CPU. They are set directly using VCII/VPH data editing software. For details on setting items for VCII series/VPH series, refer to the instruction manual of VCII series/VPH series.

Comparisons of specifications with MR-J4(W)-B/MR-J3(W)-B

Item		VCII series[1]	VPH series[1]	MR-J4(W)-□B	MR-J3(W)-□B
Amplifier type		VCII (CKD NIKKI DENSO)	VPH (CKD NIKKI DENSO)	MR-J4(W)-B(-RJ)	MR-J3(W)-B, MR-J3(W)-B Fully closed, MR-J3(W)-B Linear, MR-J3(W)-B DD motor
Control of servo amplifier parameters		Controlled by VCII series	Controlled by VPH series	Controlled by Motion CPU	
External input signal		Bit devices are available		External input signals of servo amplifier, and bit devices are available.	
Optional data monitor (Data type)	Registered monitor	• Effective load ratio • Regenerative load ratio • Peak load ratio • Position F/B • Encoder position within 1 revolution • Encoder multi-revolution counter • Model loop gain • Cumulative current value • Servo command value • Torque command • Optional address of registered monitor	• Effective load ratio • Regenerative load ratio • Peak load ratio • Position F/B • Encoder position within 1 revolution • Encoder multi-revolution counter • Model loop gain • Bus voltage • Cumulative current value • Servo command value • Torque command • Optional address of registered monitor	• Effective load ratio • Regenerative load ratio • Peak load ratio • Position F/B • Encoder position within 1 revolution • Encoder multi-revolution counter • Load inertia moment ratio • Model loop gain • Bus voltage • Cumulative current value • Servo motor speed • Selected droop pulse • Unit power consumption • Unit power consumption (2 word) • Unit total power consumption • Instantaneous torque • Load side encoder information 1 • Load side encoder information 2 • Z-phase counter • Servo motor thermistor temperature • Torque equivalent to disturbance • Overload alarm margin • Excessive error alarm margin • Settling time • Overshoot amount • Servo motor/load side position deviation • Servo motor/load side speed deviation • Servo command value • Torque command • Internal temperature of encoder • Optional address of registered monitor	• Effective load ratio • Regenerative load ratio • Peak load ratio • Position F/B • Encoder position within 1 revolution • Encoder multi-revolution counter • Load inertia moment ratio • Model loop gain • Bus voltage • Cumulative current value • Servo motor speed • Selected droop pulse • Load side encoder information 1 • Load side encoder information 2 • Servo motor thermistor temperature • Servo command value • Torque command • Optional address of registered monitor

Item		VCII series[*1]	VPH series[*1]	MR-J4(W)-□B	MR-J3(W)-□B
Optional data monitor (Data type)	Transient command	• Encoder resolution • Servo amplifier identification information (First 8 characters) • Servo amplifier identification information (Last 8 characters) • Servo amplifier S/W No. (First 8 characters) • Servo amplifier S/W No. (Last 8 characters) • Read alarm history number • Alarm history/Detail #1, #2 • Alarm history/Detail #3, #4 • Alarm history/Detail #5, #6 • Alarm history/Detail/Occurrence time • Alarm history clear command • Regenerative load ratio • Effective load ratio • Peak load ratio • Model loop gain • LED display • Optional transient command		• Servo motor ID (SSCNETⅢ)/ Encoder ID • Servo motor ID (SSCNETⅢ/H) • Encoder resolution • Servo amplifier serial number (First 8 characters) • Servo amplifier serial number (Last 8 characters) • Servo amplifier identification information (First 8 characters) • Servo amplifier identification information (Last 8 characters) • Servo amplifier S/W No. (First 8 characters) • Servo amplifier S/W No. (Last 8 characters) • Accumulated power-on time • Number of inrush current switching times • Read alarm history number • Alarm history/Detail #1, #2 • Alarm history/Detail #3, #4 • Alarm history/Detail #5, #6 • Alarm history/Detail/ Occurrence time • Alarm occurrence time #1, #2 • Alarm occurrence time #3, #4 • Alarm occurrence time #5, #6 • Alarm history clear command • Home position [command unit] • Bus voltage • Regenerative load ratio • Effective load ratio • Peak load ratio • Estimate inertia moment ratio • Model loop gain • LED display • Load side encoder information 1 • Load side encoder information 2 • Speed F/B • Servo motor thermistor temperature • Z-phase counter • Unit power consumption • Unit total power consumption • Torque equivalent to disturbance • Instantaneous torque • Overload alarm margin • Excessive error alarm margin • Settling time • Overshoot amount • Servo motor/load side position deviation • Servo motor/load side speed deviation • Machine diagnostic status • Friction estimation • Vibration estimation • Internal temperature of encoder • Optional transient command	• Servo motor ID (SSCNETⅢ)/ Encoder ID • Encoder resolution • Servo amplifier identification information (First 8 characters) • Servo amplifier identification information (Last 8 characters) • Servo amplifier S/W No. (First 8 characters) • Servo amplifier S/W No. (Last 8 characters) • Accumulated power-on time • Number of inrush current switching times • Read alarm history number • Alarm history/Detail #1, #2 • Alarm history/Detail #3, #4 • Alarm history/Detail #5, #6 • Alarm history/Detail/ Occurrence time • Alarm occurrence time #1, #2 • Alarm occurrence time #3, #4 • Alarm occurrence time #5, #6 • Alarm history clear command • Home position [command unit] • Bus voltage • Regenerative load ratio • Effective load ratio • Peak load ratio • Estimate inertia moment ratio • Model loop gain • LED display • Load side encoder information 1 • Load side encoder information 2 • Speed F/B • Servo motor thermistor temperature • Optional transient command
Absolute position detection system		Usable[*2]		Usable	

Item	VCII series[*1]	VPH series[*1]	MR-J4(W)-□B	MR-J3(W)-□B
Home position return method	Proximity dog method (1, 2), Count method (1 to 3), Data set method (1), Dog cradle method, Limit switch combined method, Scale home position signal detection method, Dogless home position signal reference method		Proximity dog method (1, 2), Count method (1 to 3), Data set method (1 to 3), Dog cradle method, Stopper method (1, 2), Limit switch combined method, Scale home position signal detection method, Dogless home position signal reference method	
Speed-torque control	Position control mode, Speed control mode, Torque control mode		Position control mode, Speed control mode, Torque control mode, Continuous operation to torque control mode	
Torque limit value change	Usable (Separate setting: Restrictions[*3])		Usable	
Gain changing command	Valid		Valid	
PI-PID switching command	Valid	Invalid	Valid	
Control loop changing command	Invalid		Valid	Valid when using servo amplifier (MR-J3B-□RJ006) for fully closed loop control
Amplifier-less operation function[*4]	Usable		Usable	
Servo parameter read/change	Usable		Usable	
Driver communication	Unusable		Usable[*5]	
Servo error (Motion error history)	Error codes detected by VCII series are stored	Error codes detected by VPH series are stored	Error codes detected by servo amplifier are stored.	
Programming tool	MR Configurator2 is not available. Use VCII/VPH data editing software.		MR Configurator2 is available.	

*1   Confirm the specifications of VCII series/VPH series for details.
*2   The direct drive τDISC series manufactured by CKD Nikki Denso Co., Ltd. can restore the absolute position in the range from -2147483648 to 2147483647. Confirm the specifications of VCII series/VPH series for restrictions by the version of VCII series/VPH series.
*3   The specification of torque limit direction differs by the version of VCII series/VPH series. Confirm the specifications of VCII series/VPH series for details.
*4   During amplifier-less operation function, the following are spuriously connected.

	Communication type	
	SSCNETIII/H	SSCNETIII
Servo amplifier	MR-J4-10B	MR-J3-10B
Servo motor	HG-KR053	HF-KP053

*5   Refer to the following for the servo amplifiers that can be used.
     📖Servo amplifier Instruction Manual

5

Precautions during control

■Absolute position system(ABS)/Incremental system (INC)

ABS/INC setting is set on the VCⅡ series/VPH series side.

Item		Precautions
Incremental system (INC)		No restrictions.
Absolute position system (ABS)	Operating system software version "09" or later	
	Operating system software version "08" or earlier	When control units are degree axis and the stroke limit is valid, a minor error (error code: 1A18H) occurs when the following positioning controls are started. • Instructions for pass point absolute specifications in continuous trajectory control (CPSTART instruction) (linear interpolation, circular interpolation, helical interpolation) • Position follow-up control (PFSTART instruction)

■Home position return

• Home position return operation types

The home position return methods that can be used in VCⅡ series/VPH series are shown below.

○: Possible, ×: Not possible

Home position return method		Possible/Not possible
Proximity dog method	Proximity dog method 1	○
	Proximity dog method 2	○
Count method	Count method 1	○
	Count method 2	○
	Count method 3	○
Data set method	Data set method 1	○
	Data set method 2	×[*1]
	Data set method 3	×[*1]
Dog cradle method		○
Stopper method	Stopper method 1	×[*1]
	Stopper method 2	×[*1]
Limit switch combined method		○
Scale home position signal detection method		○
Dogless home position signal reference method		○
Driver home position return method		×[*1]

*1 Minor error (error code: 1979H) occurs, and home position return is not performed.

• Dogless home position signal reference method

When performing "dogless home position signal reference method" in VCⅡ series/VPH series, the home position, home position return operation, and home position return data (home position return retry function, dwell time at the home position return retry) is the following. Also, set the VCⅡ series/VPH series parameter "Select function for SSCNETⅢ on communicate mode (P612) (Condition selection of home position set)" as follows.

Servo amplifier type		Linear encoder type	Home position	Home position return operation[*1]	Home position return data		Parameter "Select function for SSCNETIII on communicate mode (P612) (Condition selection of home position set)"
					Home position return retry function	Dwell time at the home position return retry	
VCⅡ series/ VPH series	Linear stage	Absolute position type	Position where address of absolute linear encoder becomes 0	Operation C	Invalid		—
		Incremental type	Reference mark	Operation A	Valid		0
	Direct drive motor	Absolute position type	Home position signal (zero point)	Operation A/ Operation B	Valid/Invalid		0/1
		Incremental type		Operation A	Valid		0

*1 Refer to the following for home position return operation.
📖MELSEC iQ-R Motion Controller Programming Manual (Positioning Control)

- Home position return without passing motor Z phase

Servo driver	Details
VCⅡ series	When "1" is set in the first digit of the parameter of VCⅡ series "Select function for SSCNETⅢ on communicate mode (P612)", it is possible to carry out the home position return without passing the zero point. (Return to home position after power is supplied will be executed when passing of motor Z phase is not necessary.) When "0" is set, a minor error (error code: 197AH) occurs because the home position is executed without passing the motor Z phase (motor reference position signal).
VPH series	When the parameter of VPH series "Marker (zero point/Z-phase) transit selection in communication mode (P800)" is set to "Zero return operation allowed", it is possible to carry out the home position return without passing the zero point. (Return to home position after power is supplied will be executed when passing of motor Z phase is not necessary.) When "Zero return operation allowed after the marker is passed" is set, a minor error (error code: 197AH) occurs because the home position is executed without passing the motor Z phase (motor reference position signal).

■Control mode

Control modes that can be used are shown below.

- Position control mode (position control, and speed control including position loop)
- Speed control mode (speed control not including position loop)
- Torque control mode (torque control)

However, it is not available to switch to continuous operation to torque control mode of "Speed-torque control". If the mode is switched to continuous operation to torque control mode, a warning (error code: 09EAH) occurs and the operation stops. "1: Feedback torque" cannot be set in "Torque initial value selection at control mode switching". If it is set, a warning (error code: 0A55H) occurs and the command value immediately after switching is the same as the case of selecting "0: Command torque".

■Control of servo parameters

Parameters of VCⅡ series/VPH series are not controlled by Motion CPU. Therefore, even though the parameter of VCⅡ series/VPH series is changed during the communication between Motion CPU and VCⅡ series/VPH series, it does not process, and is not reflected to the parameter.

■Servo parameter change function

- Change function of servo parameter can be executed.

  The following is the operation for the servo parameter change function.

	Operation for the servo parameter change function
Servo parameter write request	The servo parameter of VCⅡ series/VPH series is controlled in a unit of 2 words, so that it is necessary to set "3: 2 words write request" in "Servo parameter write/read request (SD804)" for executing the parameter write. If "1: write request" is executed to VCⅡ series/VPH series, the parameter write fails, and "-1" is stored in "Servo parameter write/read request (SD804)".
Servo parameter read request	The servo parameter of VCⅡ series/VPH series is controlled in a unit of 2 words, so that it is necessary to set "4: 2 words read request" in "Servo parameter write/read request (SD804)" for executing the parameter read. If "2: read request" is executed to VCⅡ series/VPH series, the parameter read fails, and "-1" is stored in "Servo parameter write/read request (SD804)".

- When the servo parameter of VCⅡ series/VPH series is changed by the servo parameter change function, the parameter value after changing the servo parameter cannot be confirmed using VCⅡ/VPH data editing software. When confirming the parameter value, execute the servo parameter read request. Also, when the power of VCⅡ series/VPH series is turned OFF, the parameter changed by the servo parameter change function becomes invalid, and the value written by VCⅡ/VPH data editing software becomes valid.

- "Servo parameter write/read" device

Store the value in the following special registers to change or display the servo parameter.

No.	Name	Meaning	Details	Set by
SD552	Servo parameter write/read request	Servo parameter read value	The read value (low 1 word) of servo parameter which executed "4: 2 word read request" in "Servo parameter write/read request (SD804)" is stored.	System (At reading request)
SD553			The read value (high 1 word) of servo parameter which executed "4: 2 word read request" in "Servo parameter write/read request (SD804)" is stored.	
SD804[*1]		Servo parameter write/read request flag	• The "write/read request" is executed after setting of the axis No. and servo parameter No. 3: 2 word write request 4: 2 word read request • "0" is automatically set by Motion CPU after completion of servo parameter write/read request. ("-1" is stored by Motion CPU at write/read error.)	User/System
SD805		Axis No.	The axis No. to write/read servo parameter is stored. R64MTCPU: 1 to 64 R32MTCPU: 1 to 32 R16MTCPU: 1 to 16	User
SD806		Servo parameter No.	The servo parameter No. to be written/read is stored in hexadecimal. H□□□□ → Parameter No. → Parameter group No. • 0: Group 0 • 5: Group 5 • 1: Group 1 • 6: Group 6 • 2: Group 2 • 7: Group 7 • 3: Group 3 • 8: Group 8 • 4: Group 4 • 9: Group 9	
SD808		Servo parameter setting value (2 word)	The setting value of servo parameter to be written is stored when "3: 2 word write request" is set in "Servo parameter write/read request (SD804)".	
SD809				

*1 Do not execute the automatic refresh.

■Optional data monitor setting

The following table shows data types that can be set.

Set the data so that the total number of communication data points per axis is no more than 6 points in a SSCNETⅢ/H line, and no more than 3 points in a SSCNETⅢ line.

- Registered monitor

Data type	Unit	Number of words	Number of communication data points	Data types that can be set		Address ID[*1][*2]
				VCII series	VPH series	
Effective load ratio	[%]	1	1	○	○	009CH
Regenerative load ratio	[%]	1	1	○	○	009AH
Peak load ratio	[%]	1	1	○	○	009EH
Position F/B	[pulse]	2	0	○	○	—
Encoder position within 1 revolution	[pulse]	2	0	○	○	0018H(lower), 001AH(upper)
Encoder multi-revolution counter	[rev]	1	0	○	○	0028H
Model loop gain	[rad/s]	1	1	○	○	00A2H
Bus voltage	[V]	1	1	×	○	0098H
Cumulative current value[*3]	[Positioning command][*4]	2	0	○	○	—
Servo command value[*3][*5]	[pulse]	2	0	○	○	—
Torque command[*3][*6]	[0.1%]	1	0	○	○	—
Optional address of registered monitor	—	1	1	○	○	—

*1 Data with "Lower, Upper" in the address ID use lower word and upper word of 2 word data therefore two settings should be made. Be sure to monitor the data in 2 words.

*2 Set an even number for the address ID of registered monitors.

*3 The "Cumulative current value", "Servo command value", and "Torque command" are all command values for the servo amplifier. All other data types are servo amplifier monitor values (feedback).

*4 Position commands are in the command unit set at [Motion Control Parameter] ⇨ [Axis Setting Parameter] ⇨ "Fixed Parameter" ⇨ "Unit setting".

*5 The servo amplifier command value is a command value for the servo amplifier. Coordinates differ from those for the Motion CPU, and therefore the result will not be 0 even if the home position is set.

*6 The torque command is a command value for the servo amplifier. Torque command values are only valid in speed-torque control torque control mode and continuous operation torque control mode. The previous value will remain for the torque command value when restoring to position control from torque control etc., however, it is not actually used.

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Data type	Unit	Number of words[*1]	Number of communication data points	Transient ID	Storage device (response data (+8 to 11)) content
Encoder resolution	[pulse]	2	0	0305H	
Servo amplifier identification information (First 8 characters)	[characters]	4	0	0310H	
Servo amplifier identification information (Last 8 characters)	[characters]	4	0	0311H	
Servo amplifier S/W No. (First 8 characters)	[characters]	4	0	0312H	
Servo amplifier S/W No. (Last 8 characters)	[characters]	4	0	0313H	
Read alarm history number	[items]	4	0	0323H	
Alarm history/Detail #1, #2	—	4	0	0324H	+8: Alarm history #1 +9: Alarm detail #1 +10: Alarm history #2 +11: Alarm detail #2
Alarm history/Detail #3, #4	—	4	0	0325H	+8: Alarm history #3 +9: Alarm detail #3 +10: Alarm history #4 +11: Alarm detail #4
Alarm history/Detail #5, #6	—	4	0	0326H	+8: Alarm history #5 +9: Alarm detail #5 +10: Alarm history #6 +11: Alarm detail #6
Alarm history/Detail/Occurrence time	—/[h]	4	0	0328H	+8: Alarm history number #(N+1) +9: Alarm history number #(N+1) detail +10: Alarm history number #(N+1) occurrence time (2 words)
Alarm history clear command	—	1	0	0382H	
Regenerative load ratio	[%]	1	0	040BH	
Effective load ratio	[%]	1	0	040CH	
Peak load ratio	[%]	1	0	040DH	
Model loop gain	[rad/s]	1	0	040FH	
LED display	[characters]	2	0	0410H	+8: Lower 2 digits +9: Higher 2 digits
Optional transient command	—	4	0	—	

*1 Number of words for response data (+8 to 11)

■Gain changing command, PI-PID switching command, control loop changing command

• VCII series

Gain changing command and PI-PID switching command are available. Control loop changing command becomes invalid.

• VPH series

Gain changing command is available. PI-PID switching command and control loop changing command become invalid.

■Driver communication

The driver communication is not supported. If the driver communication is set in a servo parameter, a minor error (error code: 1C93H) will occur when the power supply of Multiple CPU system is turned ON.

■Monitor devices (R: D32020+48n to D32039+48n/Q: #8000 to #8639)

This register stores the servo amplifier types and servo amplifier vendor ID below when using VCII series/VPH series.

• [Md.1014] Servo amplifier type (R: D32030+48n/Q: #8000+20n)

Type code	Details
258(0102h)	VCII series (For linear stage) [*1] (CKD Nikki Denso Co., Ltd. make)
263(0107h)	VCII series (For direct drive motor) [*1] (CKD Nikki Denso Co., Ltd. make)
4096(1000h)	VCII series [*2] (CKD Nikki Denso Co., Ltd. make)
770(0302H)	VPH series (For linear stage) [*1] (CKD Nikki Denso Co., Ltd. make)
775(0307H)	VPH series (For direct drive motor) [*1] (CKD Nikki Denso Co., Ltd. make)
4864(1300H)	VPH series [*2] (CKD Nikki Denso Co., Ltd. make)

*1   When connecting SSCNETIII/H
*2   When connecting SSCNETIII

• [Md.1027] Servo amplifier Vendor ID (R: D32031+48n/Q: #8016+20n)

Vendor ID code	Details
8	CKD Nikki Denso Co., Ltd.

■Operation cycle

If "SSCNETIII" is set as the SSCNET settings communication type, the operation cycle of 0.222[ms] cannot be used. Furthermore, even if the operation cycle is set to 0.222[ms] in the setting for axes 1 to 4 for 1 line, if the servo amplifier is mixed with the VCII series, the servo amplifier operates with an operation cycle of 0.444[ms]. If "SSCNETIII/H" is set as the SSCNET settings communication type, there are no restrictions.

VCII series/VPH series detection error

When an error occurs on VCII series/VPH series, the "[St.1068] Servo error detection (R: M32408+32n/Q: M2408+20n)" turns ON, and the minor error (error code: 1C80H) is stored in "[Md.1005] Servo error code (R: D32008+48n/Q: D8+20n)". Error codes read from the VCII series/VPH series are stored in "[Md.1019] Servo amplifier display servo error code (R: D32028+48n/Q: #8008+20n)". Eliminate the error cause, reset the servo amplifier error by turning ON "[Rq.1148] Servo error reset command (R: M34488+32n/Q: M3208+20n)" and perform re-start. However, "0" is always stored in "[Md.107] Parameter error No. (R: D32029+48n/Q: #8009+20n)". Refer to the instruction manual of VCII series/VPH series for details of the errors.

Inverter FR-A700 series

FR-A700 series can be connected via SSCNETⅢ by using built-in option FR-A7AP and FR-A7NS.

> **Point**
>
> FR-A700 series cannot be used on a line where the communication type in SSCNETⅢ setting of MT Developer2 is set to "SSCNETⅢ/H".

System configuration

The system configuration using FR-A700 series is shown below.

R64MTCPU: 2 lines (Up to 32 axes (Up to 16 axes/line))
R32MTCPU: 2 lines (Up to 32 axes (Up to 16 axes/line))
R16MTCPU: 1 line (Up to 16 axes)
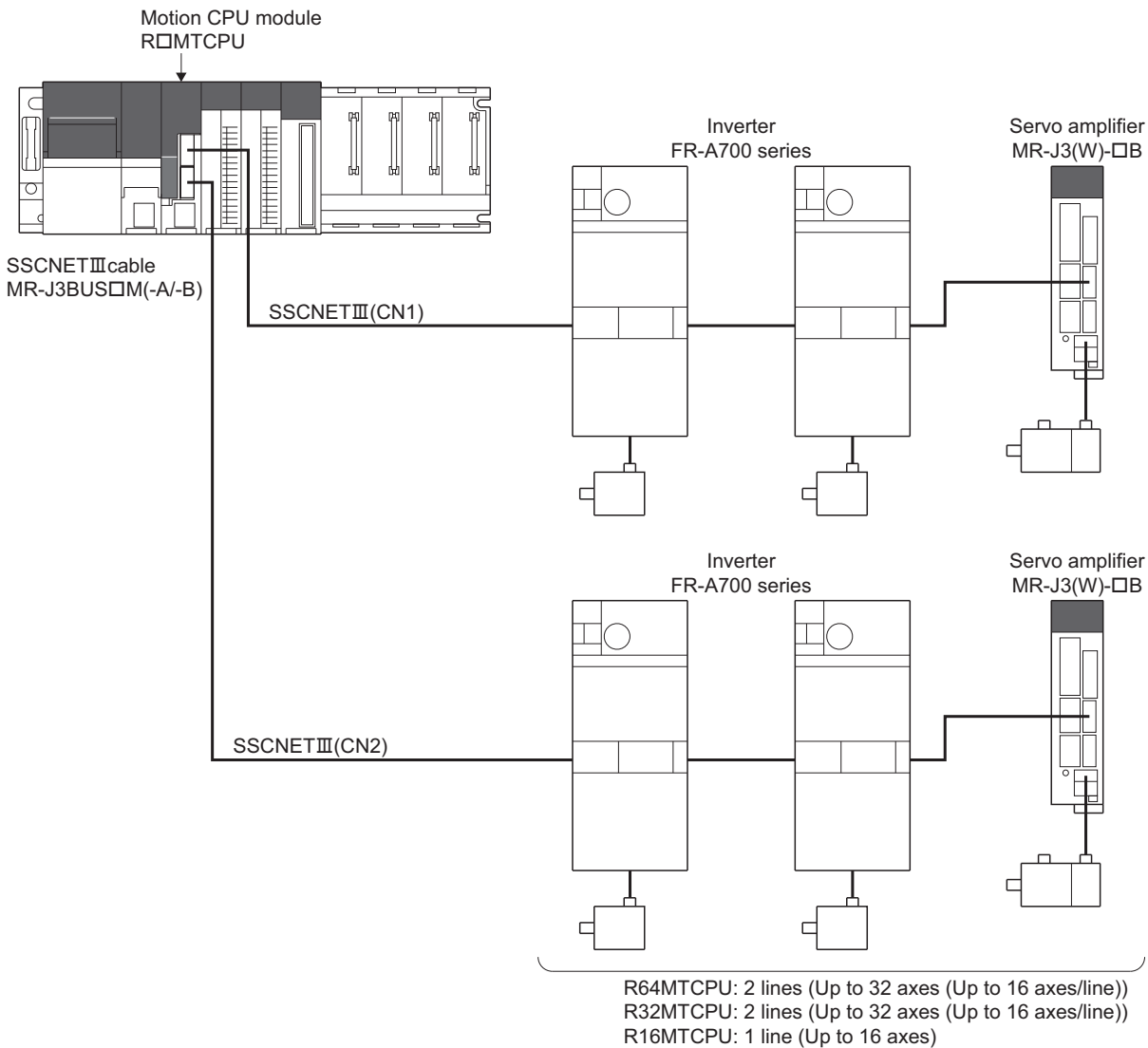
Parameter setting

To connect FR-A700 series, set the following in the servo network setting. (☞ Page 64 Servo network setting)
- Set "SSCNETⅢ" for communication type in SSCNET setting.
- Set the amplifier model in amplifier setting to "FR-A700".

Control of FR-A700 series parameters

Parameters set in FR-A700 series are not controlled by Motion CPU. Set the parameters by connecting FR-A700 series directly with the operation panel on the front of inverter (FR-DU07/FR-PU07) or FR Configurator that is inverter setup software. For details on setting items for FR-A700 series, refer to the instruction manual of the FR-A700 series.

Point

In the state of connecting between FR-A700 series and Motion CPU, only a part of parameters can be set if the parameter of the inverter " Pr.77 Parameter write selection" is in the initial state. Set "2: Write parameters during operation" to rewrite the parameters of FR-A700 series.

Reset selection/disconnected PU detection/PU stop selection

When PU stop is executed in FR-A700 series, position error excessive, etc. occur because a command from Motion CPU does not stop. Set "0 to 3" in the parameter of the inverter " Pr.75 Reset selection/disconnected PU detection/PU stop selection". To stop FR-A700 series, use the stop signal and the forced stop of Motion CPU, or use the output stop (MRS) of FR-A700 series.

Setting item	Default value	Setting value	Details
Reset selection/ disconnected PU detection/PU stop selection (Pr. 75)	14	0	• Reset input is always enabled. • If the PU is disconnected, operation will be continued. • PU stop is disabled at SSCNETⅢ connection.
		1	• A reset can be input only when the protective function is activated. • If the PU is disconnected, operation will be continued. • PU stop is disabled at SSCNETⅢ connection.
		2	• Reset input is always enabled. • When the PU is disconnected, the inverter trips. • PU stop is disabled at SSCNETⅢ connection.
		3	• A reset can be input only when the protective function is activated. • When the PU is disconnected, the inverter trips. • PU stop is disabled at SSCNETⅢ connection.
		14	• Reset input is always enabled. • If the PU is disconnected, operation will be continued. • Deceleration stop by PU stop in any operation mode.
		15	• A reset can be input only when the protective function is activated. • If the PU is disconnected, operation will be continued. • Deceleration stop by PU stop in any operation mode.
		16	• Reset input is always enabled. • When the PU is disconnected, the inverter trips. • Deceleration stop by PU stop in any operation mode.
		17	• A reset can be input only when the protective function is activated. • When the PU is disconnected, the inverter trips. • Deceleration stop by PU stop in any operation mode.

*1 Note that the default value is set to "14". (Change the value to "0 to 3")

In-position range

Set the in-position range in the parameter of the inverter "In-position width (Pr. 426)". When the position of the cam axis is restored in advanced synchronous control, a check is performed by the servo parameter "In-position range"(PA10). However, because the servo parameter settings are not performed in FR-A700, the "In-position range" is checked as 100[pulse] (fixed value).

Optional data monitor setting

The following table shows data types that can be set.

Set the data so that the total number of communication data points per axis is no more than 3 points.

■Registered monitor

Data type	Unit	Number of words	Number of communication data points	Address ID[*1][*2]
Motor load ratio	[%]	1	1	009CH
Position F/B	[pulse]	2	0	—
Encoder position within 1 revolution	[pulse]	2	0	0018H(lower), 001AH(upper)
Encoder multi-revolution counter	[rev]	1	0	0028H
Load inertia moment ratio	[× 0.1 times]	1	1	00A0H
Model loop gain	[rad/s]	1	1	00A2H
Converter output voltage	[V]	1	1	0098H
Cumulative current value[*3]	[Positioning command][*4]	2	0	—
Torque command [*3][*5]	[0.1 %]	1	0	—
Optional address of registered monitor	—	1	1	—

*1 Data with "Lower, Upper" in the address ID use lower word and upper word of 2 word data therefore two settings should be made. Be sure to monitor the data in 2 words.

*2 Set an even number for the address ID of registered monitors,

*3 The "Cumulative current value", "Servo command value", and "Torque command" are all command values for the servo amplifier. All other data types are servo amplifier monitor values (feedback).

*4 Position commands are in the command unit set in the servo data settings.

*5 The torque command is a command value for the servo amplifier. Torque command values are only valid in speed-torque control torque control mode and continuous operation torque control mode. The previous value will remain for the torque command value when restoring to position control from torque control, etc., however, it is not actually used.

■Transient command

Data type	Unit	Number of words[*1]	Number of communication data points	Transient ID	Storage device (response data (+8 to 11)) content
Servo amplifier identification information (First 8 characters)	[characters]	4	0	0310H	
Servo amplifier identification information (Last 8 characters)	[characters]	4	0	0311H	
Servo amplifier S/W No. (First 8 characters)	[characters]	4	0	0312H	
Servo amplifier S/W No. (Last 8 characters)	[characters]	4	0	0313H	
Read alarm history number	[items]	4	0	0323H	
Alarm history/Detail #1, #2	—	4	0	0324H	+8: Alarm history #1 +9: Alarm detail #1 +10: Alarm history #2 +11: Alarm detail #2
Alarm history/Detail #3, #4	—	4	0	0325H	+8: Alarm history #3 +9: Alarm detail #3 +10: Alarm history #4 +11: Alarm detail #4
Alarm history/Detail #5, #6	—	4	0	0326H	+8: Alarm history #5 +9: Alarm detail #5 +10: Alarm history #6 +11: Alarm detail #6
Alarm history/Detail #7, #8	—	4	0	0327H	+8: Alarm history #7 +9: Alarm detail #7 +10: Alarm history #8 +11: Alarm detail #8

Data type	Unit	Number of words[*1]	Number of communication data points	Transient ID	Storage device (response data (+8 to 11)) content
Alarm occurrence time #1, #2	[h]	4	0	0329H	+8: Alarm occurrence time #1 (2 words) +10: Alarm occurrence time #2 (2 words)
Alarm occurrence time #3, #4	[h]	4	0	032AH	+8: Alarm occurrence time #3 (2 words) +10: Alarm occurrence time #4 (2 words)
Alarm occurrence time #5, #6	[h]	4	0	032BH	+8: Alarm occurrence time #5 (2 words) +10: Alarm occurrence time #6 (2 words)
Alarm occurrence time #7, #8	[h]	4	0	032CH	+8: Alarm occurrence time #7 (2 words) +10: Alarm occurrence time #8 (2 words)
Alarm history clear command	—	1	0	0382H	
Bus voltage	[V]	1	0	040AH	
Effective load ratio	[%]	1	0	040CH	
Estimate inertia moment ratio	[× 0.1]	1	0	040EH	
Model loop gain	[rad/s]	1	0	040FH	
LED display	[characters]	2	0	0410H	+8: Lower 2 digits +9: Higher 2 digits
Optional transient command	—	4	0	—	

*1   Number of words for response data (+8 to 11)

Point

When FR-A700 series is used, each data is delayed for "update delay time + communication cycle" because of the update cycle of the inverter. The update delay time for each data is shown in the table below.

Data type	Update delay time of FR-A700 series
Motor load ratio	12.5ms
Position F/B	222μs
Encoder position within 1 revolution	222μs
Encoder multi-revolution counter	222μs
Load inertia moment ratio	56ms or more (up to 2500ms)
Model loop gain	56ms or more (up to 2500ms)
Converter output voltage	9.888ms

External input signal

Set as the following to fetch the external input signal (FLS/RLS/DOG) via FR-A700 series.

■Setting in MT Developer2

Set "Amplifier input" for every axis with signal type in the external signal parameter of axis setting parameter.

■Parameter settings on the inverter side

Set the parameters of the inverter as follows. (Otherwise, each signal remains OFF.)

Setting item	Default value	Setting value	Details
STF terminal function selection (Pr. 178)	60	60	Use with the default value
STR terminal function selection (Pr. 179)	61	61	
JOG terminal function selection (Pr. 185)	5	76	Set 76 (Proximity dog)
SSCNETⅢ input filter selection (Pr. 449)	4	0: None 1: 0.88ms 2: 1.77ms 3: 2.66ms 4: 3.55ms	Set the input filter setting value at reading an external signal.

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Comparisons of specifications with MR-J3(W)-B

Item		FR-A700 series[1]	MR-J3(W)-□B
Amplifier type		FR-A700	MR-J3(W)-B, MR-J3(W)-B Fully closed, MR-J3(W)-B Linear, MR-J3(W)-B DD motor
Control of servo amplifier parameters		Set directly by inverter. (Not controlled by Motion CPU.)	Controlled by Motion CPU.
External input signal		External input signals of FR-A700 series, and bit devices are available.	External input signals of servo amplifier, and bit devices are available.
Optional data monitor (Data type)	Registered monitor	• Motor load ratio • Position F/B • Encoder position within 1 revolution • Encoder multi-revolution counter • Load inertia moment ratio • Model loop gain • Converter output voltage • Cumulative current value • Torque command • Optional address of registered monitor	• Effective load ratio • Regenerative load ratio • Peak load ratio • Position F/B • Encoder position within 1 revolution • Encoder multi-revolution counter • Load inertia moment ratio • Model loop gain • Bus voltage • Cumulative current value • Servo motor speed • Selected droop pulse • Load side encoder information 1 • Load side encoder information 2 • Servo motor thermistor temperature • Servo command value • Torque command • Optional address of registered monitor
	Transient command	• Servo amplifier identification information (First 8 characters) • Servo amplifier identification information (Last 8 characters) • Servo amplifier S/W No. (First 8 characters) • Servo amplifier S/W No. (Last 8 characters) • Read alarm history number • Alarm history/Detail #1, #2 • Alarm history/Detail #3, #4 • Alarm history/Detail #5, #6 • Alarm history/Detail #7, #8 • Alarm occurrence time #1, #2 • Alarm occurrence time #3, #4 • Alarm occurrence time #5, #6 • Alarm occurrence time #7, #8 • Alarm history clear command • Bus voltage • Effective load ratio • Estimate inertia moment ratio • Model loop gain • LED display • Optional transient command	• Servo motor ID (SSCNETⅢ)/Encoder ID • Encoder resolution • Servo amplifier identification information (First 8 characters) • Servo amplifier identification information (Last 8 characters) • Servo amplifier S/W No. (First 8 characters) • Servo amplifier S/W No. (Last 8 characters) • Accumulated power-on time • Number of inrush current switching times • Read alarm history number • Alarm history/Detail #1, #2 • Alarm history/Detail #3, #4 • Alarm history/Detail #5, #6 • Alarm history/Detail/Occurrence time • Alarm occurrence time #1, #2 • Alarm occurrence time #3, #4 • Alarm occurrence time #5, #6 • Alarm history clear command • Home position [command unit] • Bus voltage • Regenerative load ratio • Effective load ratio • Peak load ratio • Estimate inertia moment ratio • Model loop gain • LED display • Load side encoder information 1 • Load side encoder information 2 • Speed F/B • Servo motor thermistor temperature • Optional transient command
Absolute position detection system		Unusable	Usable
Home position return method		Proximity dog method (1, 2), Count method (1 to 3), Data set method (1), Dog cradle method, Limit switch combined method, Scale home position signal detection method	Proximity dog method (1, 2), Count method (1 to 3), Data set method (1 to 3), Dog cradle method, Stopper method (1, 2), Limit switch combined method, Scale home position signal detection method, Dogless home position signal reference method
Speed-torque control		Position control mode, Speed control mode, Torque control mode	Position control mode, Speed control mode, Torque control mode, Continuous operation to torque control mode
Gain changing command		Valid	Valid

Item	FR-A700 series[1]	MR-J3(W)-□B
PI-PID switching command	Valid	Valid
Control loop changing command	Invalid	Valid when using servo amplifier for fully closed loop control (MR-J3-□B-RJ006)
Servo parameter read/write	Unusable	Usable
Amplifier-less operation function[2]	Usable[3]	Usable
Driver communication	Unusable	Usable[4]
Monitoring of servo parameter error No.	Unusable	Usable
Servo error (Motion error history)	Error codes detected by FR-A700 series are stored.	Error codes detected by servo amplifier are stored.
Programming tool	MR Configurator2 is not available. Use FR-DU07/FR-PU07, or FR Configurator.	MR Configurator2 is available.

*1 For details of FR-A700 series, refer to FR-A700 series instruction manual.

*2 During amplifier-less operation function, the following are spuriously connected.
  ·Servo amplifier: MR-J3-10B
  ·Servo motor: HF-KP053

*3 Parameters set in FR-A700 series are not controlled by Motion CPU. Therefore, the operation is the same as when the servo parameter "Rotation direction selection/travel direction selection (PA14)" is set as below during amplifier-less operation mode.

Setting item	Setting value	Details
Rotation direction selection/travel direction selection (PA14)	0	Positioning address increase: CCW or positive direction
		Positioning address decrease: CW of negative direction

*4 Refer to the "Servo Amplifier Instruction Manual" for the servo amplifiers that can be used.

Precautions during control

■Absolute position system (ABS)/Incremental system (INC)

When using FR-A700 series, absolute position system (ABS) cannot be used.

■Control mode

Control modes that can be used are shown below.
 • Position control mode (position control, and speed control including position loop)
 • Speed control mode (speed control not including position loop)
 • Torque control mode (torque control)

However, it is not available to switch to continuous operation to torque control mode of "Speed-torque control". If the mode is switched to continuous operation to torque control mode, a warning (error code: 09EAH) occurs and the operation stops. "1: Feedback torque" cannot be set in "Torque initial value selection at control mode switching". If it is set, a warning (error code: 0A55H) occurs and the command value immediately after switching is the same as the case of selecting "0: Command torque".

■Control mode switching of speed-torque control

The axis connected with FR-A700 series takes more time to switch the control mode than the axis connected with the servo amplifier.

Switching operation	Switching time at the servo amplifier use	Switching time at FR-A700 series use
Position control mode → Speed control mode	6 to 11ms	19 to 24ms
Speed control mode → Position control mode		
Position control mode → Torque control mode		
Torque control mode → Position control mode		
Speed control mode → Torque control mode		
Torque control mode → Speed control mode		

■Driver communication

The driver communication is not supported. If the driver communication is set in a servo parameter, a minor error (error code: 1C93H) will occur when the power supply of the Multiple CPU system is turned ON.

■**Monitor devices (R: D32020+48n to D32039+48n/Q: #8000 to #8639)**

This register stores the servo amplifier types and servo amplifier vendor ID below when using FR-A700 series.

• [Md.1014] Servo amplifier type (R: D32030+48n/Q: #8000+20n)

Type code	Details
16640(4100H)	FR-A700 series (Inverter)
16641(4101H)	FR-A700-NA series (Inverter)
16642(4102H)	FR-A700-EC series (Inverter)
16643(4103H)	FR-A700-CHT series (Inverter)

• [Md.1027] Servo amplifier Vendor ID (R: D32031+48n/Q: #8016+20n)

Vendor ID code	Details
0	Mitsubishi Electric Corporation

■**Operation cycle**

If "SSCNETⅢ" is set as the SSCNET settings communication type, the operation cycle of 0.222[ms] cannot be used. Furthermore, even if the operation cycle is set to 0.222[ms] in the setting for axes 1 to 4 for 1 line, if the servo amplifier is mixed with the FR-A700 series, the servo amplifier operates with an operation cycle of 0.444[ms].

FR-A700 series detection error

When an error occurs on FR-A700 series, the "[St.1068] Servo error detection (R: M32408+32n/Q: M2408+20n)" turns ON, and the minor error (error code: 1C80H) is stored in "[Md.1005] Servo error code (R: D32008+48n/Q: D8+20n)". Error codes read from the FR-A700 series are stored in "[Md.1019] Servo amplifier display servo error code (R: D32028+48n/Q: #8008+20n)". . Eliminate the error cause, reset the servo amplifier error by turning ON "[Rq.1148] Servo error reset command (R: M34488+32n/Q: M3208+20n)" and perform re-start. However, "0" is always stored in "[Md.107] Parameter error No. (R: D32029+48n/Q: #8009+20n)", and "Absolute position lost (b14)" of "[Md.108] Servo status 1 (R: D32032+48n/Q: #8010+20n)".

Refer to the instruction manual of FR-A700 series for details of the errors.

Inverter FR-A800 series

FR-A800 series can be connected via SSCNETⅢ/H by using built-in option FR-A8AP and FR-A8NS.

System configuration

The system configuration using FR-A800 series is shown below.

R64MTCPU: 2 lines (Up to 64 axes (Up to 32 axes/line))
R32MTCPU: 2 lines (Up to 32 axes (Up to 16 axes/line))
R16MTCPU: 1 line (Up to 16 axes)
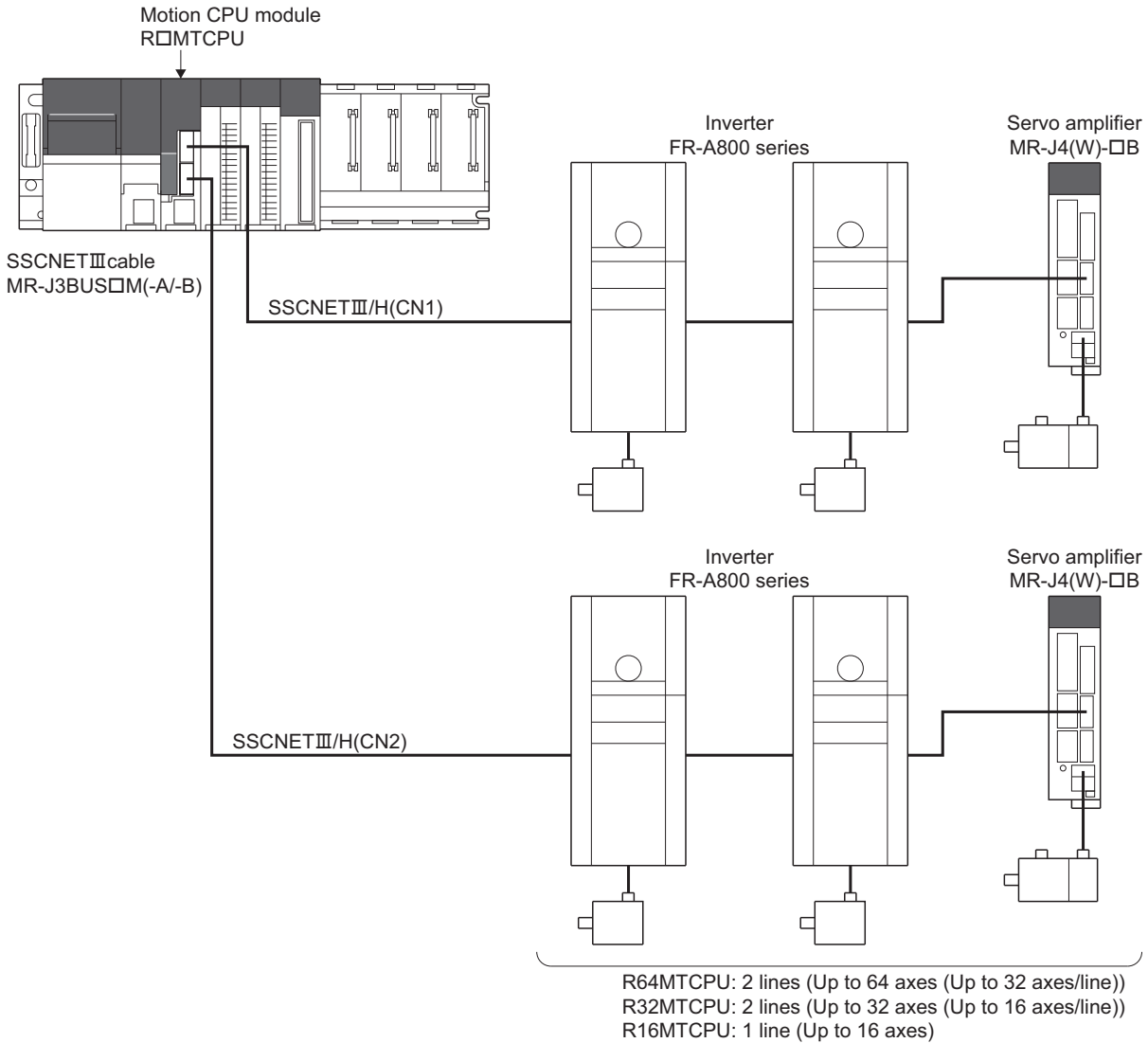
Parameter setting

To connect FR-A800 series, set the following in the servo network setting. (☞ Page 64 Servo network setting)
- Set "SSCNETⅢ/H" for communication type in SSCNET setting.
- Set the amplifier model in amplifier setting to "FR-A800-1", or "FR-A800-2".

Control of FR-A800 series parameters

Parameters set in FR-A800 series are not controlled by Motion CPU. Set the parameters by connecting FR-A800 series directly with the operation panel on the front of inverter (FR-DU08/FR-LU08/FR-PU07) or FR Configurator2 that is inverter setup software. For details on setting items for FR-A800 series, refer to the instruction manual of the FR-A800 series.

Point

In the state of connecting between FR-A800 series and Motion CPU, only a part of parameters can be set if the parameter of the inverter " Pr.77 Parameter write selection" is in the initial state. Set "2: Write parameters during operation" to rewrite the parameters of FR-A800 series.

In-position range

Set the in-position range in the parameter of the inverter "In-position width (Pr. 426)". When the position of the cam axis is restored in advanced synchronous control, a check is performed by the servo parameter "In-position range"(PA10). However, because the servo parameter settings are not performed in FR-A800 series, the "In-position range" is checked as 100[pulse] (fixed value).

Optional data monitor setting

The following table shows data types that can be set.

Set the data so that the total number of communication data points per axis is no more than 6 points.

■Registered monitor

Data type	Unit	Number of words	Number of communication data points	Address ID[*1][*2]
Motor load ratio	[%]	1	1	009CH
Position F/B	[pulse]	2	0	—
Encoder position within 1 revolution	[pulse]	2	0	0018H(lower), 001AH(upper)
Encoder multi-revolution counter	[rev]	1	0	0028H
Load inertia moment ratio	[× 0.1 times]	1	1	00A0H
Model loop gain	[rad/s]	1	1	00A2H
Converter output voltage	[V]	1	1	0098H
Cumulative current value[*3]	[Positioning command][*4]	2	0	—
Torque command [*3][*5]	[0.1 %]	1	0	—
Optional address of registered monitor	—	1	1	—

*1   Data with "Lower, Upper" in the address ID use lower word and upper word of 2 word data therefore two settings should be made. Be sure to monitor the data in 2 words.

*2   Set an even number for the address ID of registered monitors.

*3   The "Cumulative current value", "Servo command value", and "Torque command" are all command values for the servo amplifier. All other data types are servo amplifier monitor values (feedback).

*4   Position commands are in the command unit set in the servo data settings.

*5   The torque command is a command value for the servo amplifier. Torque command values are only valid in speed-torque control torque control mode and continuous operation torque control mode. The previous value will remain for the torque command value when restoring to position control from torque control, etc., however, it is not actually used.

■Transient command

Data type	Unit	Number of words[*1]	Number of communication data points	Transient ID	Storage device (response data (+8 to 11)) content
Servo amplifier identification information (First 8 characters)	[characters]	4	0	0310H	
Servo amplifier identification information (Last 8 characters)	[characters]	4	0	0311H	
Servo amplifier S/W No. (First 8 characters)	[characters]	4	0	0312H	
Servo amplifier S/W No. (Last 8 characters)	[characters]	4	0	0313H	
Read alarm history number	[items]	4	0	0323H	
Alarm history/Detail #1, #2	—	4	0	0324H	+8: Alarm history #1 +9: Alarm detail #1 +10: Alarm history #2 +11: Alarm detail #2
Alarm history/Detail #3, #4	—	4	0	0325H	+8: Alarm history #3 +9: Alarm detail #3 +10: Alarm history #4 +11: Alarm detail #4
Alarm history/Detail #5, #6	—	4	0	0326H	+8: Alarm history #5 +9: Alarm detail #5 +10: Alarm history #6 +11: Alarm detail #6
Alarm history/Detail #7, #8	—	4	0	0327H	+8: Alarm history #7 +9: Alarm detail #7 +10: Alarm history #8 +11: Alarm detail #8
Alarm occurrence time #1, #2	[h]	4	0	0329H	+8: Alarm occurrence time #1 (2 words) +10: Alarm occurrence time #2 (2 words)
Alarm occurrence time #3, #4	[h]	4	0	032AH	+8: Alarm occurrence time #3 (2 words) +10: Alarm occurrence time #4 (2 words)
Alarm occurrence time #5, #6	[h]	4	0	032BH	+8: Alarm occurrence time #5 (2 words) +10: Alarm occurrence time #6 (2 words)
Alarm occurrence time #7, #8	[h]	4	0	032CH	+8: Alarm occurrence time #7 (2 words) +10: Alarm occurrence time #8 (2 words)
Alarm history clear command	—	1	0	0382H	
Bus voltage	[V]	1	0	040AH	
Effective load ratio	[%]	1	0	040CH	
Estimate inertia moment ratio	[× 0.1]	1	0	040EH	
Model loop gain	[rad/s]	1	0	040FH	
LED display	[characters]	2	0	0410H	+8: Lower 2 digits +9: Higher 2 digits
Optional transient command	—	4	0	—	

*1 Number of words for response data (+8 to 11)

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Point

When FR-A800 series is used, each data is delayed for "update delay time + communication cycle" because of the update cycle of the inverter. The update delay time for each data is shown in the table below.

Data type	Update delay time of FR-A800 series
Motor load ratio	10ms
Position F/B	222μs
Encoder position within 1 revolution	222μs
Encoder multi-revolution counter	222μs
Load inertia moment ratio	10ms
Model loop gain	10ms
Converter output voltage	5ms

External input signal

Set as the following to fetch the external input signal (FLS/RLS/DOG) via FR-A800 series.

■Setting in MT Developer2

Set "Amplifier input" for every axis with signal type in the external signal parameter of axis setting parameter.

■Parameter settings on the inverter side

Refer to the instruction manual of FR-A800 series for parameter settings on the inverter side.

Comparisons of specifications with MR-J4(W)-B

Item		FR-A800 series[1]	MR-J4(W)-□B
Amplifier type		FR-A800-1, FR-A800-2	MR-J4(W)-B(-RJ)
Control of servo amplifier parameters		Set directly by inverter. (Not controlled by Motion CPU.)	Controlled by Motion CPU.
External input signal		External input signals of FR-A800 series, and bit devices are available.	External input signals of servo amplifier, and bit devices are available.
Optional data monitor (Data type)	Registered monitor	• Motor load ratio • Position F/B • Encoder position within 1 revolution • Encoder multi-revolution counter • Load inertia moment ratio • Model loop gain • Converter output voltage • Cumulative current value • Torque command • Optional address of registered monitor	• Effective load ratio • Regenerative load ratio • Peak load ratio • Position F/B • Encoder position within 1 revolution • Encoder multi-revolution counter • Load inertia moment ratio • Model loop gain • Bus voltage • Cumulative current value • Servo motor speed • Selected droop pulse • Unit power consumption • Unit power consumption (2 word) • Unit total power consumption • Instantaneous torque • Load side encoder information 1 • Load side encoder information 2 • Z-phase counter • Servo motor thermistor temperature • Torque equivalent to disturbance • Overload alarm margin • Excessive error alarm margin • Settling time • Overshoot amount • Servo motor/Load side position deviation • Servo motor/Load side speed deviation • Servo command value • Torque command • Internal temperature of encoder • Optional address of registered monitor

Item		FR-A800 series[*1]	MR-J4(W)-□B
Optional data monitor (Data type)	Transient command	• Servo amplifier identification information (First 8 characters) • Servo amplifier identification information (Last 8 characters) • Servo amplifier S/W No. (First 8 characters) • Servo amplifier S/W No. (Last 8 characters) • Read alarm history number • Alarm history/Detail #1, #2 • Alarm history/Detail #3, #4 • Alarm history/Detail #5, #6 • Alarm history/Detail #7, #8 • Alarm occurrence time #1, #2 • Alarm occurrence time #3, #4 • Alarm occurrence time #5, #6 • Alarm occurrence time #7, #8 • Alarm history clear command • Bus voltage • Effective load ratio • Estimate inertia moment ratio • Model loop gain • LED display • Optional transient command	• Servo motor ID (SSCNETⅢ)/Encoder ID • Servo motor ID (SSCNETⅢ/H) • Encoder resolution • Servo amplifier serial number (First 8 characters) • Servo amplifier serial number (Last 8 characters) • Servo amplifier identification information (First 8 characters) • Servo amplifier identification information (Last 8 characters) • Servo amplifier S/W No. (First 8 characters) • Servo amplifier S/W No. (Last 8 characters) • Accumulated power-on time • Number of inrush current switching times • Read alarm history number • Alarm history/Detail #1, #2 • Alarm history/Detail #3, #4 • Alarm history/Detail #5, #6 • Alarm history/Detail/Occurrence time • Alarm occurrence time #1, #2 • Alarm occurrence time #3, #4 • Alarm occurrence time #5, #6 • Alarm history clear command • Home position [command unit] • Bus voltage • Regenerative load ratio • Effective load ratio • Peak load ratio • Estimate inertia moment ratio • Model loop gain • LED display • Load side encoder information 1 • Load side encoder information 2 • Speed F/B • Servo motor thermistor temperature • Z-phase counter • Unit power consumption • Unit total power consumption • Torque equivalent to disturbance • Instantaneous torque • Overload alarm margin • Excessive error alarm margin • Settling time • Overshoot amount • Servo motor/Load side position deviation • Servo motor/Load side speed deviation • Machine diagnostic status • Friction estimation • Vibration estimation • Internal temperature of encoder • Optional transient command
Absolute position detection system		Unusable	Usable
Home position return method		Proximity dog method (1, 2), Count method (1 to 3), Data set method (1), Dog cradle method, Limit switch combined method, Scale home position signal detection method	Proximity dog method (1, 2), Count method (1 to 3), Data set method (1 to 3), Dog cradle method, Stopper method (1, 2), Limit switch combined method, Scale home position signal detection method, Dogless home position signal reference method
Speed-torque control		Position control mode, Speed control mode, Torque control mode	Position control mode, Speed control mode, Torque control mode, Continuous operation to torque control mode
Gain changing command		Valid	Valid
PI-PID switching command		Valid	Valid
Control loop changing command		Invalid	Valid
Servo parameter read/write		Unusable	Usable
Amplifier-less operation function[*2]		Usable[*3]	Usable
Driver communication		Unusable	Usable[*4]
Monitoring of servo parameter error No.		Unusable	Usable
Servo error (Motion error history)		Error codes detected by FR-A800 series are stored.	Error codes detected by servo amplifier are stored.

Item	FR-A800 series[*1]	MR-J4(W)-□B
Programming tool	MR Configurator2 is not available. Use FR-DU08/FR-LU08/FR-PU07, or FR Configurator2.	MR Configurator2 is available.

*1 For details of FR-A800 series, refer to FR-A800 series instruction manual.

*2 During amplifier-less operation function, the following are spuriously connected.
·Servo amplifier: MR-J4-10B
·Servo motor: HF-KR053

*3 Parameters set in FR-A800 series are not controlled by Motion CPU. Therefore, the operation is the same as when the servo parameter "Rotation direction selection/travel direction selection (PA14)" is set as below during amplifier-less operation mode.

Setting item	Setting value	Details
Rotation direction selection/travel direction selection (PA14)	0	Positioning address increase: CCW or positive direction
		Positioning address decrease: CW of negative direction

*4 Refer to the "Servo Amplifier Instruction Manual" for the servo amplifiers that can be used.

Precautions during control

■Absolute position system (ABS)/Incremental system (INC)
When using FR-A800 series, absolute position system (ABS) cannot be used.

■Control mode
Control modes that can be used are shown below.
 • Position control mode (position control, and speed control including position loop)
 • Speed control mode (speed control not including position loop)
 • Torque control mode (torque control)
However, it is not available to switch to continuous operation to torque control mode of "Speed-torque control". If the mode is switched to continuous operation to torque control mode, a warning (error code: 09EAH) occurs and the operation stops. "1: Feedback torque" cannot be set in "Torque initial value selection at control mode switching". If it is set, a warning (error code: 0A55H) occurs and the command value immediately after switching is the same as the case of selecting "0: Command torque".

■Driver communication
The driver communication is not supported. If the driver communication is set in a servo parameter, a minor error (error code: 1C93H) will occur when the power supply of the Multiple CPU system is turned ON.

■Monitor devices (R: D32020+48n to D32039+48n/Q: #8000 to #8639)
This register stores the servo amplifier types and servo amplifier vendor ID below when using FR-A800 series.
 • [Md.1014] Servo amplifier type (R: D32030+48n/Q: #8000+20n)

Type code	Details
8192(2000H)	FR-A800-1 (Inverter)
8193(2001H)	FR-A800-2 (Inverter)

 • [Md.1027] Servo amplifier Vendor ID (R: D32031+48n/Q: #8016+20n)

Vendor ID code	Details
0	Mitsubishi Electric Corporation

■Command speed
If FR-A800 series is operated at a command speed more than the maximum speed, the stop position may be overshoot.

FR-A800 series detection error

When an error occurs on FR-A800 series, the "[St.1068] Servo error detection (R: M32408+32n/Q: M2408+20n)" turns ON, and the minor error (error code: 1C80H) is stored in "[Md.1005] Servo error code (R: D32008+48n/Q: D8+20n)". Error codes read from the FR-A800 series are stored in "[Md.1019] Servo amplifier display servo error code (R: D32028+48n/Q: #8008+20n)". Eliminate the error cause, reset the servo amplifier error by turning ON "[Rq.1148] Servo error reset command (R: M34488+32n/Q: M3208+20n)" and perform re-start. However, "0" is always stored in "[Md.107] Parameter error No. (R: D32029+48n/Q: #8009+20n)", and "Absolute position lost (b14)" of "[Md.108] Servo status 1 (R: D32032+48n/Q: #8010+20n)". Refer to the instruction manual of FR-A800 series for details of the errors.

Optical hub unit

The SSCNETⅢ/H Compatible Optical Hub Unit (MR-MV200) is a unit that enables the branching of SSCNETⅢ/H communication on 1 line (3 branches for 1 input). SSCNETⅢ/H communication can be branched by installing an optical hub unit in a SSCNETⅢ/H system. The optical hub unit is compatible with all slave equipment (servo amplifiers etc.) that supports SSCNETⅢ/H communication. Setting the optical hub unit station settings on Motion CPUs and MT Developer2 is not required. The power supply of equipment connected to the optical hub unit can be turned OFF/ON (Disconnect/Reconnect) during operation.

System configuration

The transmission route that passes through the optical hub unit IN connector (CN1A connector for servo amplifier) and OUT1 connector (CN1B connector for servo amplifier) is called the "Main route", and the transmission routes that pass through OUT2 connector and OUT3 connectors are called the "Sub route". The optical hub unit can only be connected on the main route. A maximum of 16 optical hub units can be connected on one line, and optical hub units are not included in the number of connected modules on a line. A connection example using optical hub units is shown below.
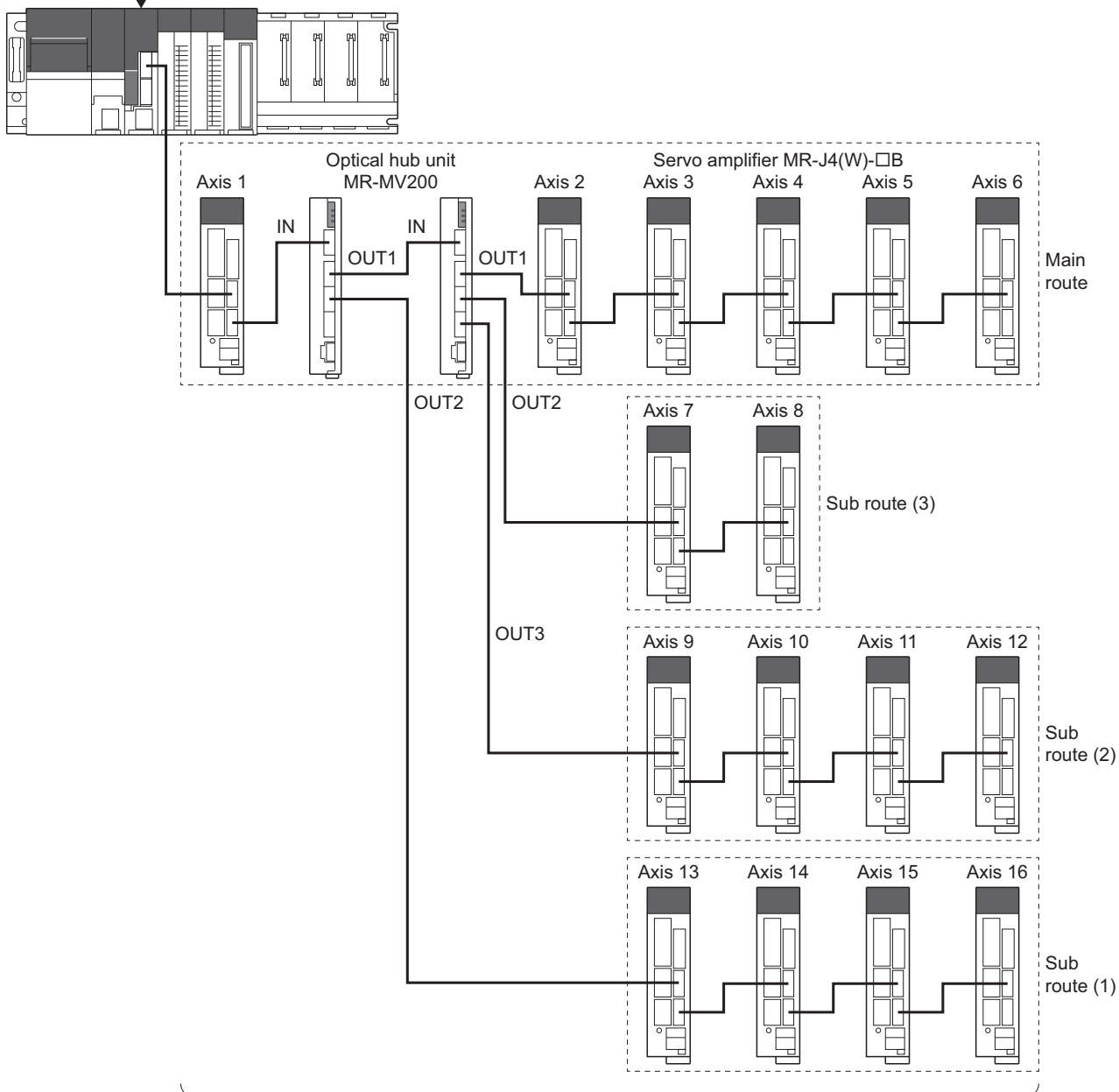
R64MTCPU: 2 lines (Up to 64 axes (up to 32 axes per line))
R32MTCPU: 2 lines (Up to 32 axes (up to 16 axes per line))
R16MTCPU: 1 line (Up to 16 axes)   *: The optical hub unit is not included in the count

Point

- If the optical hub unit is connected to a sub route, an error occurs, and the optical hub unit does not communicate with the Motion CPU.
- A servo amplifier can be connected between two optical hub units, and between a Motion CPU and an optical hub unit.
- When turning OFF the control circuit power supply of SSCNETⅢ/H compatible devices connected to an optical hub unit, use the "connect/disconnect function of SSCNET communication". Refer to connect/disconnect function of SSCNET communication for details of "connect/disconnect function of SSCNET communication". (☞ Page 185 Connect/disconnect function of SSCNET communication)

SCCNET communication restrictions

- Set the communication type to "SSCNETⅢ/H" for the SSCNET setting connecting the optical hub unit. SSCNETⅢ/H communication devices set in MT Developer2 can be connected. There are no restrictions on connection order or connection position. The servo amplifiers and SSCNETⅢ/H compatible devices that can be used with the optical hub unit are shown below.

○: Available, ×: Not available

SSCNET setting	Servo amplifier		SSCNETIII/H compatible devices
	MR-J4(W)-□B	**MR-J3(W)-□B**	
SSCNETⅢ/H	○	×	○
SSCNETⅢ	×	×	×

- When using a multi-axis servo amplifier (MR-J4W-□B), there is a restriction on the number of connectable SSCNETⅢ/H compatible devices (servo amplifier (MR-J4(W)-□B), SSCNETⅢ/H head module, other drivers etc.) between the Motion CPU and the multi-axis servo amplifier depending on the number of optical hub units being used. The number of connectable SSCNETⅢ/H compatible devices depending on how many optical hub units are used are shown below. When more than the number of connectable units are connected, a warning (error code: 0C82H) occurs. While communication with MR-J4W-□B is still possible when the warning occurs, communication becomes unstable, therefore the unit configuration should be reviewed.

Servo amplifier		Number of connectable SSCNETIII/H compatible devices between the Motion CPU and the multi-axis servo amplifier									
		Number of optical hub units connected[*1]									
		0	1	2	3	4	5	6	7	8	9 or more
MR-J4-□B		No restriction									
MR-J4W2-□B	1 axis set										
	2 axes set	14	12	10	9	7	5	4	2	1	×[*2]
MR-J4W3-□B	1 axis set	No restriction									
	2 axes set	14	12	10	9	7	5	4	2	1	×[*2]
	3 axes set	13	11	9	8	6	4	3	1	×[*2]	

*1 Only the units on the same route are included in the count.
*2 A warning (error code: 0C82H) occurs.

Ex.
When 2 axes are set to a multi-axis servo amplifier (MR-J4W2-□B)

Motion CPU module

Two optical hub units are connected on the main route therefore the number of connectable SSCNETⅢ/H compatible devices (MR-J4(W)-□B, SSCNETⅢ/H head module, other drivers, etc.) is 10 or less.

Optical hub unit
IN
OUT1

Optical hub unit
IN
OUT1

Servo amplifier MR-J4W2-□B
Main route

OUT2

OUT2

MR-J4W-□B is not connected on the same route therefore there are no restrictions on the number of connectable SSCNETⅢ/H compatible devices.

Sub route (2)

Sub route (1)

Checking the status of the optical hub unit

The connection status of the optical hub unit can be checked with the special registers below.

Device No.	Name	Meaning	Details	Set by
SD504	SSCNETⅢ/H compatible optical hub unit loading information (line 1)	SSCNETⅢ/H compatible optical hub unit loading information (line 1)	• Checks the connection status (Installed: 1/Not installed: 0) of the optical hub unit and stores as bit data. SD504: b0 to b15 (Optical hub unit No. 1 to No. 16 on the first line) SD506: b0 to b15 (Optical hub unit No. 1 to No. 16 on the second line) *: No. 1 to No. 16 is the connection order from the Motion CPU • "1" is stored to the installation status of an optical hub unit with a servo amplifier connected. • "0" is stored to the installation status when an optical hub unit is not connected after an optical hub unit that is not connected to a servo amplifier, or when the optical hub unit connected after an optical hub unit is not connected to a servo amplifier either. • For optical hub units connected before an optical hub unit connected to a servo amplifier, "1" is stored to the installation status, regardless of whether there is a servo amplifier connection or not.	System (Operation cycle)
SD506	SSCNETⅢ/H compatible optical hub unit loading information (line 2)	SSCNETⅢ/H compatible optical hub unit loading information (line 2)		

Driver communication function

Driver communication function is only supported between servo amplifiers on the same route starting from the Motion CPU until the last module.

Driver communication is not performed between servo amplifiers on different sub routes, or between a servo amplifier connected on the main route after an optical hub unit and a servo amplifier on a sub route connected to an optical hub unit.

When an axis set for driver communication is in a position where driver communication cannot be performed, or when the connection of an axis set for driver communication is not confirmed, all servo amplifiers including those that are on axes not set to driver communication, cannot communicate with the Motion CPU.

Routes where driver communication function is possible are shown below.

○: Driver communication, ×: No driver communication

Route	Supported
Within the main route	○
Within the same sub route	○
Between different sub routes	×
Between main route and sub route (Between slaves on first optical hub unit (main route) and sub route)	○
Between main route and sub route (Between slaves on later optical hub unit (main route) and sub route)	×

Point

Refer to driver communication function for details of "Driver communication function". (☞ Page 194 Driver Communication Function)

■Servo amplifier layout for driver communication

A connection example showing where driver communication is possible/not possible is shown below.

*: Driver communication is possible within ⌐ ⌐.
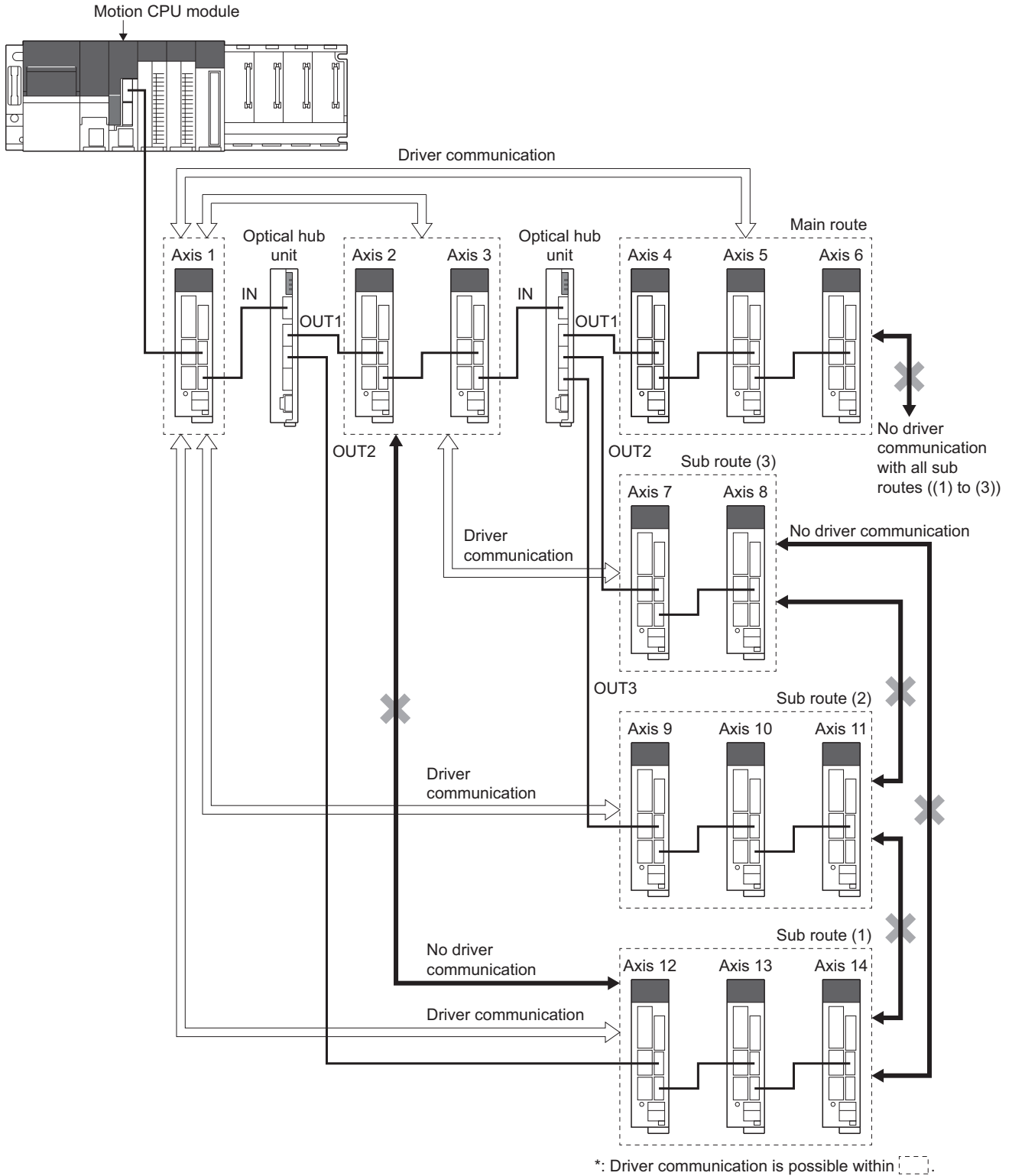
AlphaStep/5-phase stepping motor driver manufactured by ORIENTAL MOTOR Co., Ltd.

The ORIENTAL MOTOR Co., Ltd. made stepping motor driver AlphaStep/5-phase can be connected via SSCNETⅢ/H.Contact ORIENTAL MOTOR Co., Ltd. overseas sales office for details of AlphaStep/5-phase.

> **Point**
>
> AlphaStep/5-phase cannot be used on a line where the communication type in SSCNET setting of MT Developer2 is set to "SSCNETⅢ".

System configuration

The system configuration using AlphaStep/5-phase is shown below.

R64MTCPU: 2 lines (Up to 64 axes (32 axes per line))
R32MTCPU: 2 lines (Up to 32 axes (16 axes per line))
R16MTCPU: 1 line (Up to 16 axes)
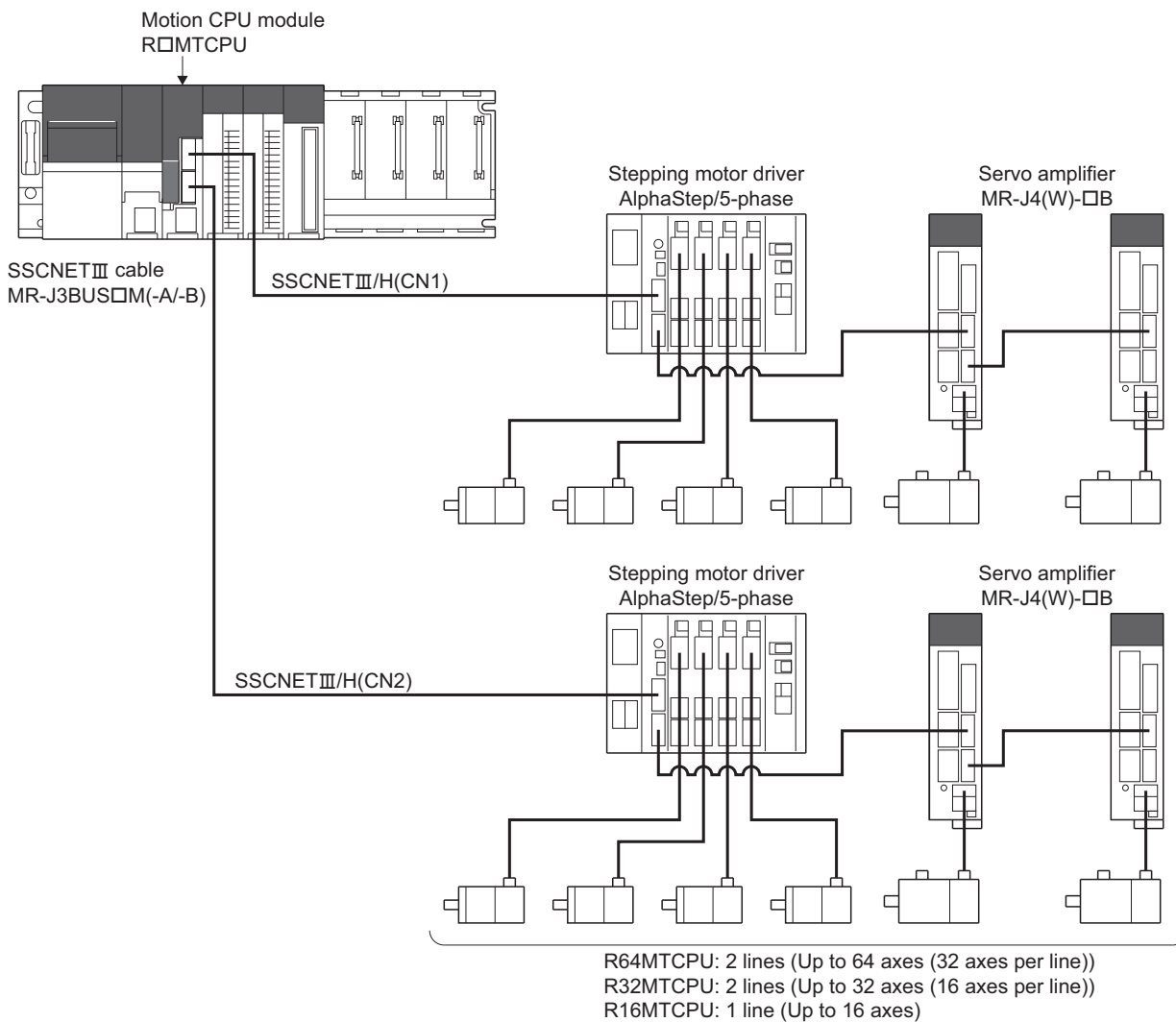
Parameter setting

To connect AlphaStep/5-phase, set the following in the servo network setting of MT Developer2. ( )

- Set "SSCNETⅢ/H" for communication type in SSCNET setting.
- Set the amplifier model in amplifier setting to the stepping motor driver to be used.
  - αSTEP AZ (ORIENTAL MOTOR)
  - 5-phase ST (ORIENTAL MOTOR)

Control of AlphaStep/5-phase parameters

Parameters set in AlphaStep/5-phase are not controlled by Motion CPU. They are set directly using AlphaStep/5-phase data editing software. For details on setting items for AlphaStep/5-phase, refer to the instruction manual of the AlphaStep/5-phase.

Comparisons of specifications with MR-J4(W)-B

Item		AlphaStep/5-phase[1]	MR-J4(W)-□B
Amplifier type		αSTEP AZ (ORIENTAL MOTOR), 5-phase ST (ORIENTAL MOTOR)	MR-J4(W)-B(-RJ)
Control of servo amplifier parameters		Controlled by AlphaStep/5-phase	Controlled by Motion CPU.
External input signal		External input signals of AlphaStep/5-phase series, and bit devices are available.	External input signals of servo amplifier, and bit devices are available.
Optional data monitor (Data type)	Registered monitor	• Position F/B • Encoder position within 1 revolution • Encoder multi-revolution counter • Cumulative current value • Servo command value • External encoder counter value • Optional address of registered monitor	• Effective load ratio • Regenerative load ratio • Peak load ratio • Position F/B • Encoder position within 1 revolution • Encoder multi-revolution counter • Load inertia moment ratio • Model loop gain • Bus voltage • Cumulative current value • Servo motor speed • Selected droop pulse • Unit power consumption • Unit power consumption (2 word) • Unit total power consumption • Instantaneous torque • Load side encoder information 1 • Load side encoder information 2 • Z-phase counter • Servo motor thermistor temperature • Torque equivalent to disturbance • Overload alarm margin • Excessive error alarm margin • Settling time • Overshoot amount • Servo motor/Load side position deviation • Servo motor/Load side speed deviation • Servo command value • Torque command • Internal temperature of encoder • Optional address of registered monitor

Item		AlphaStep/5-phase[1]	MR-J4(W)-□B
Optional data monitor (Data type)	Transient command	• Encoder resolution • Servo amplifier S/W No. (First 8 characters) • Servo amplifier S/W No. (Last 8 characters) • Optional transient command	• Servo motor ID (SSCNETⅢ)/Encoder ID • Servo motor ID (SSCNETⅢ/H) • Encoder resolution • Servo amplifier serial number (First 8 characters) • Servo amplifier serial number (Last 8 characters) • Servo amplifier identification information (First 8 characters) • Servo amplifier identification information (Last 8 characters) • Servo amplifier S/W No. (First 8 characters) • Servo amplifier S/W No. (Last 8 characters) • Accumulated power-on time • Number of inrush current switching times • Read alarm history number • Alarm history/Detail #1, #2 • Alarm history/Detail #3, #4 • Alarm history/Detail #5, #6 • Alarm history/Detail/Occurrence time • Alarm occurrence time #1, #2 • Alarm occurrence time #3, #4 • Alarm occurrence time #5, #6 • Alarm history clear command • Home position [command unit] • Bus voltage • Regenerative load ratio • Effective load ratio • Peak load ratio • Estimate inertia moment ratio • Model loop gain • LED display • Load side encoder information 1 • Load side encoder information 2 • Speed F/B • Servo motor thermistor temperature • Z-phase counter • Unit power consumption • Unit total power consumption • Torque equivalent to disturbance • Instantaneous torque • Overload alarm margin • Excessive error alarm margin • Settling time • Overshoot amount • Servo motor/Load side position deviation • Servo motor/Load side speed deviation • Machine diagnostic status • Friction estimation • Vibration estimation • Internal temperature of encoder • Optional transient command
Absolute position detection system		Usable	Usable
Unlimited length feed		Usable	Usable
Home position return method		Count method (2), Data set method (1), Driver home position return method	Proximity dog method (1, 2), Count method (1 to 3), Data set method (1 to 3), Dog cradle method, Stopper method (1, 2), Limit switch combined method, Scale home position signal detection method, Dogless home position signal reference method
Speed-torque control		Position control mode	Position control mode, Speed control mode, Torque control mode, Continuous operation to torque control mode
Gain changing command		Invalid	Valid
PI-PID switching command		Invalid	Valid
Control loop changing command		Invalid	Valid
Amplifier-less operation function		Unusable	Usable
Servo parameter read/change		Usable	Usable
Driver communication		Unusable	Usable[2]
Servo error (Motion error history)		Error codes detected by AlphaStep/5-phase are stored.	Error codes detected by servo amplifier are stored.

Item	AlphaStep/5-phase[1]	MR-J4(W)-□B
Programming tool	MR Configurator2 is not available. Use AlphaStep/5-phase editing software.	MR Configurator2 is available.

*1 For details of AlphaStep/5-phase, refer to AlphaStep/5-phase instruction manual.

*2 Refer to the servo amplifier instruction manual for the servo amplifiers that can be used.

Precautions during control

■Absolute position system (ABS)/Incremental system (INC)

Set the ABS/INC settings with the AlphaStep/5-phase.

Item		Precautions
Incremental system (INC)		When the Multiple CPU power supply is turned OFF and then turned ON again, home position return request turns ON, and the feed current value taken from the AlphaStep/5-phase is displayed.
Absolute position system (ABS)	Operating system software version "09" or later	No restrictions.
	Operating system software version "08" or earlier	• "3: Servo command value" and "4: Feedback value" for "[Pr.300] Servo input axis type" cannot be used. If they are used the current value of the servo input axis may not be correctly restored therefore use "1: Feed current value" and "2: Actual current value". • When control units are degree axis and the stroke limit is valid, a minor error (error code: 1A18H) occurs when the following positioning controls are started. (1) Instructions for pass point absolute specifications in continuous trajectory control (CPSTART instruction) (linear interpolation, circular interpolation, helical interpolation) (2) Position follow-up control (PFSTART instruction)

■Home position return

• Home position return operation types

The home position return methods that can be used in AlphaStep/5-phase are shown below.

○: Possible, ×: Not possible

Home position return method		Possible/Not possible
Proximity dog method	Proximity dog method 1	×[1]
	Proximity dog method 2	×[1]
Count method	Count method 1	×[1]
	Count method 2	○
	Count method 3	×[1]
Data set method	Data set method 1	○
	Data set method 2	×[1]
	Data set method 3	×[1]
Dog cradle method		×[1]
Stopper method	Stopper method 1	×[1]
	Stopper method 2	×[1]
Limit switch combined method		×[1]
Scale home position signal detection method		×[1]
Dogless home position signal reference method		×[1]
Driver home position return method		○

*1 Minor error (error code: 1979H) occurs, and home position return is not performed.

• Servo external signals when using driver home position return method

At driver home position return method home position return, check the status of the servo external signals. Also check the external signals are OFF when external signal parameters are not set. For contacts (normally open contact/ normally closed contact), match each setting of the AlphaStep/5-phase with the external signal parameters of the motion control parameters. Refer to AlphaStep/5-phase instruction manual for details.

■Control mode

Control modes that can be used are shown below.

 • Position control mode (position control, and speed control including position loop)

However, speed-torque control (speed control not including position loop, torque control, continuous operation to torque control) cannot be used. If a control mode switch is performed, a warning (error code: 09EAH) occurs and the current control is stopped.

■Servo OFF

The following occurs for 5-phase (open loop control configuration).

 • When servo OFF occurs, if the motor is moved by an external force it is not possible to detect the position and position information is not updated. Do not rotate the motors during servo OFF. If the motors are rotated a position displacement occurs.

 • In a servo OFF state the home position return request turns ON. After turning servo ON, perform a home position return again.

 • When an encoder is installed, checking position displacement and maladjustments is possible by monitoring "position feedback" and "external encoder counter value" in the optional data monitor. Refer to the instruction manual of AlphaStep/5-phase for the units and increase direction of the encoder count value, and checking methods.

■Servo instructions

Speed control(Ⅱ) (VVF instruction, VVR instruction) cannot be used. If the VVF instruction or VVR instruction are started, a minor error (error code: 19EBH) occurs.

■Control of servo parameters
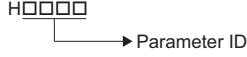
Parameters of AlphaStep/5-phase are not controlled by Motion CPU. Therefore, even though the parameter of AlphaStep/5-phase is changed during the communication between Motion CPU and AlphaStep/5-phase, it does not process, and is not reflected to the parameter.

■Servo parameter change function

 • Change function of servo parameter can be executed.

 • When the power of AlphaStep/5-phase is turned OFF, the parameter changed by the servo parameter change function becomes invalid, and the value written by AlphaStep/5-phase data editing software becomes valid.

 • "Servo parameter write/read" device

   Store the value in the following special registers to change or display the servo parameter.

Device No.	Name	Meaning	Details	Set by
SD552	Servo parameter write/read request	Servo parameter read value	The read value of servo parameter which executed "2: Read request" in "servo parameter write/read request (SD804)" is stored.	System (At read request)
SD804[*1]		Servo parameter write/read request flag	• The "write/read request" is executed after setting of the axis No. and servo parameter No. 1: Write request 2: Read request • "0" is automatically set by Motion CPU after completion of servo parameter write/read request. ("-1" is stored by Motion CPU at write/read error.)	User/ System
SD805		Axis No.	The axis No. to write/read servo parameter is stored. R64MTCPU: 1 to 64 R32MTCPU: 1 to 32 R16MTCPU: 1 to 16	User
SD806		Servo parameter No.	The servo parameter No. to be written/read is stored in hexadecimal. H□□□□ → Parameter ID *: Refer to the AlphaStep/5-phase instruction manual for details of parameter ID.	
SD807		Servo parameter setting value	The setting value of servo parameter to be written is stored when "1: Write request" is set in "servo parameter write/read request (SD804)".	

*1   Do not execute the automatic refresh.

■Optional data monitor setting

The following shows data types that can be set.

Set the data so that the total number of communication points per axis is no more than 6 points.

- Registered monitor

Data type	Unit	Number of words	Number of communication data points	Address ID[*1][*2]
Position F/B	[pulse]	2	0	—
Encoder position within 1 revolution	[pulse]	2	0	0018H(lower), 001AH(upper)
Encoder multi-revolution counter	[rev]	1	0	0028H
Cumulative current value[*3]	[Positioning command][*4]	2	0	—
Servo command value[*3][*5]	[pulse]	2	0	—
External encoder counter value	[pulse]	2	2	7000H(lower), 7002H(upper)
Optional address of registered monitor	—	1	1	—

*1   Data with "Lower, Upper" in the address ID use lower word and upper word of 2 word data therefore two settings should be made. Be sure to monitor the data in 2 words.

*2   Set an even number for the address ID of registered monitors.

*3   The "Cumulative current value", and "Servo command value" are command values for the servo amplifier. All other data types are servo amplifier monitor values (feedback).

*4   Position commands are positioning units set in [Motion control parameter] ⇨ [Axis setting parameter] ⇨ "Fixed parameter" ⇨ "Unit setting".

*5   The servo command value is a command value for the servo amplifier. The coordinates differ from those of the Motion CPU, therefore even if setting the home position, the value does not become 0.

- Transient command

Data type	Unit	Number of words[*1]	Number of communication data points	Transient ID	Storage device (response data (+8 to 11)) content
Encoder resolution	[pulse]	2	0	0305H	
Servo amplifier S/W No. (First 8 characters)	[characters]	4	0	0312H	
Servo amplifier S/W No. (Last 8 characters)	[characters]	4	0	0313H	
Optional transient command	—	4	0	—	

*1   Number of words for response data (+8 to 11)

■Gain changing command, PI-PID switching command, control loop changing command

Gain changing command, PI-PID switching command, and control loop changing command becomes invalid.

■Amplifier-less operation

Amplifier-less operation cannot be used for axes connected to AlphaStep/5-phase. When amplifier-less operation is executed, the axis changes to a disconnected state, and servo ready does not turn ON.

■Driver communication

The driver communication is not supported. If the driver communication is set in a servo parameter, a minor error (error code: 1C93H) will occur when the power supply of Multiple CPU system is turned ON.

■Monitor devices (R: D32020+48n to D32039+48n/Q: #8000 to #8639)

- [Md.1014] Servo amplifier type (R: D32030+48n/Q: #8000+20n)

  This register stores the servo amplifier types below when using AlphaStep/5-phase.

Type code	Details
8233(0102H)	5-phase stepping motor driver (ORIENTAL MOTOR Co., Ltd. make)
8234(0107H)	Stepping motor driver AlphaStep (AZ series) (ORIENTAL MOTOR Co., Ltd. make)

- [Md.1027] Servo amplifier vendor ID (R: D32031+48n/Q: #8016+20n)

  This register stores the servo amplifier vendor ID below when using AlphaStep/5-phase.

Vendor ID code	Details
3	ORIENTAL MOTOR Co., Ltd.

- "[Md.1015] Motor current value (R: D32020+48n/Q: #8001+20n)" is always "0".

■Torque limit

The torque limit value set by the Motion CPU is ignored. Set the torque limit value with the parameter on the AlphaStep/5-phase side.

■In-position range

When the position of the cam axis is restored in advanced synchronous control, a check is performed by the servo parameter "In-position range (PA10)". However, because the servo parameter settings are not performed in AlphaStep/5-phase, the "In-position range" is checked as 100[pulse].

■Operation cycle

The operation cycle of 0.222[ms] cannot be used. Furthermore, even if the operation cycle is set to 0.222[ms] in the setting foraxes 1 to 4 for 1 line, if the servo amplifier is mixed with the AlphaStep/5-phase, the servo amplifier operates with an operation cycle of 0.444[ms].

AlphaStep/5-phase detection error

When an error occurs on AlphaStep/5-phase, the "[St.1068] Servo error detection (R: M32408+32n/Q: M2408+20n)" turns ON, and the minor error (error code: 1C80H) is stored in "[Md.1005] Servo error code (R: D32008+48n/Q: D8+20n)". Error codes read from the AlphaStep/5-phase are stored in "[Md.1019] Servo amplifier display servo error code (R: D32028+48n/Q: #8008+20n)". Also, when an error occurs during home position return by driver home position return method, "Driver operation alarm (b9)" of "[Md.500] Servo status7 (R: D32038+48n/Q: #8018+20n) turns ON, and the minor error (error code: 194BH) is stored in "[Md.1005] Servo error code (R: D32008+48n/Q: D8+20n)". Alarms read from the AlphaStep/5-phase are stored in the event history.

Eliminate the error cause, reset the servo amplifier error by turning ON "[Rq.1148] Servo error reset command (R: M34488+32n/Q: M3208+20n)" and perform re-start. However, "0" is always stored in "[Md.107] Parameter error No. (R: D32029+48n/Q: #8009+20n)".

Refer to the instruction manual of AlphaStep/5-phase for details of the errors.

IAI electric actuator controller manufactured by IAI Corporation

The IAI Corporation made IAI electric actuator controller can be connected via SSCNETⅢ/H. Contact your nearest IAI sales office for details of IAI electric actuator controller.

Point

IAI electric actuator controller cannot be used on a line where the communication type in SSCNET setting of MT Developer2 is set to "SSCNETⅢ".

System configuration

The system configuration using IAI electric actuator controller is shown below.

R64MTCPU: 2 lines (Up to 64 axes (32 axes per line))
R32MTCPU: 2 lines (Up to 32 axes (16 axes per line))
R16MTCPU: 1 line (Up to16 axes)
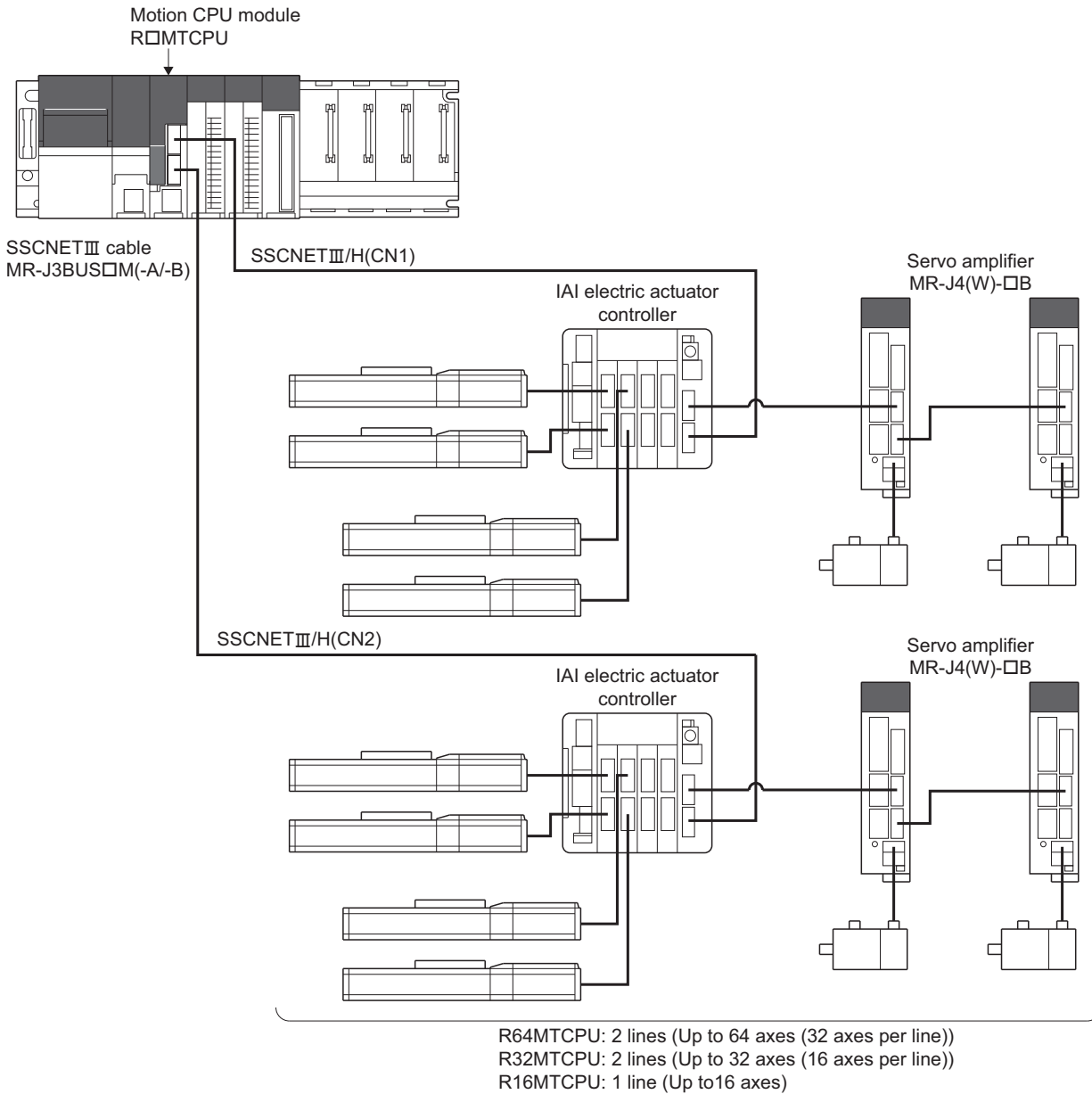
Point

The IAI electric actuator controller can only be set on even-numbered axes.

Parameter setting

To connect IAI electric actuator controller, set the following in the servo network setting of MT Developer2. (☞ Page 64 Servo network setting)

- Set "SSCNETⅢ/H" for communication type in SSCNET setting.
- Set the amplifier model in amplifier setting to "IAI Driver for Electric Actuator (IAI)".

Control of IAI electric actuator controller parameters

Parameters set in IAI electric actuator controller are not controlled by Motion CPU. They are set directly using IAI electric actuator controller data editing software. For details on setting items for IAI electric actuator controller, refer to the instruction manual of the IAI electric actuator controller.

Comparisons of specifications with MR-J4(W)-B

Item		IAI electric actuator controller[*1]	MR-J4(W)-□B
Amplifier type		IAI Driver for Electric Actuator (IAI)	MR-J4(W)-B(-RJ)
Control of servo amplifier parameters		Controlled by IAI electric actuator controller	Controlled by Motion CPU.
External input signal		Bit devices are available.	External input signals of servo amplifier, and bit devices are available.
Optional data monitor (Data type)	Registered monitor	• Position F/B • Cumulative current value • Servo command value • Optional address of registered monitor	• Effective load ratio • Regenerative load ratio • Peak load ratio • Position F/B • Encoder position within 1 revolution • Encoder multi-revolution counter • Load inertia moment ratio • Model loop gain • Bus voltage • Cumulative current value • Servo motor speed • Selected droop pulse • Unit power consumption • Unit power consumption (2 word) • Unit total power consumption • Instantaneous torque • Load side encoder information 1 • Load side encoder information 2 • Z-phase counter • Servo motor thermistor temperature • Torque equivalent to disturbance • Overload alarm margin • Excessive error alarm margin • Settling time • Overshoot amount • Servo motor/Load side position deviation • Servo motor/Load side speed deviation • Servo command value • Torque command • Internal temperature of encoder • Optional address of registered monitor

Item		IAI electric actuator controller[1]	MR-J4(W)-□B
Optional data monitor (Data type)	Transient command	• Optional transient command	• Servo motor ID (SSCNETⅢ)/Encoder ID • Servo motor ID (SSCNETⅢ/H) • Encoder resolution • Servo amplifier serial number (First 8 characters) • Servo amplifier serial number (Last 8 characters) • Servo amplifier identification information (First 8 characters) • Servo amplifier identification information (Last 8 characters) • Servo amplifier S/W No. (First 8 characters) • Servo amplifier S/W No. (Last 8 characters) • Accumulated power-on time • Number of inrush current switching times • Read alarm history number • Alarm history/Detail #1, #2 • Alarm history/Detail #3, #4 • Alarm history/Detail #5, #6 • Alarm history/Detail/Occurrence time • Alarm occurrence time #1, #2 • Alarm occurrence time #3, #4 • Alarm occurrence time #5, #6 • Alarm history clear command • Home position [command unit] • Bus voltage • Regenerative load ratio • Effective load ratio • Peak load ratio • Estimate inertia moment ratio • Model loop gain • LED display • Load side encoder information 1 • Load side encoder information 2 • Speed F/B • Servo motor thermistor temperature • Z-phase counter • Unit power consumption • Unit total power consumption • Torque equivalent to disturbance • Instantaneous torque • Overload alarm margin • Excessive error alarm margin • Settling time • Overshoot amount • Servo motor/Load side position deviation • Servo motor/Load side speed deviation • Machine diagnostic status • Friction estimation • Vibration estimation • Internal temperature of encoder • Optional transient command
Absolute position detection system		Unusable	Usable
Unlimited length feed		Unusable	Usable
Home position return method		Driver home position return method	Proximity dog method (1, 2), Count method (1 to 3), Data set method (1 to 3), Dog cradle method, Stopper method (1, 2), Limit switch combined method, Scale home position signal detection method, Dogless home position signal reference method
Speed-torque control		Position control mode	Position control mode, Speed control mode, Torque control mode, Continuous operation to torque control mode
Gain changing command		Invalid	Valid
PI-PID switching command		Invalid	Valid
Control loop changing command		Invalid	Valid
Amplifier-less operation function		Unusable	Usable
Servo parameter read/change		Usable	Usable
Driver communication		Unusable	Usable[2]

Item	IAI electric actuator controller[1]	MR-J4(W)-□B
Servo error (Motion error history)	Error codes detected by IAI electric actuator controller are stored.	Error codes detected by servo amplifier are stored.
Programming tool	MR Configurator2 is not available. Use IAI electric actuator controller editing software.	MR Configurator2 is available.

*1 For details of IAI electric actuator controller, refer to IAI electric actuator controller instruction manual.

*2 Refer to the servo amplifier instruction manual for the servo amplifiers that can be used.

Precautions during control

■Absolute position system (ABS)/Incremental system (INC)

The IAI electric actuator controller is not compatible with the absolute position system. When the Multiple system power supply is turned OFF and ON again, home position return request turns ON, and the feed current value taken from the IAI electric actuator controller is displayed.

■Home position return

• Home position return operation types

The home position return methods that can be used in IAI electric actuator controller are shown below.

○: Possible, ✕: Not possible

Home position return method		Possible/Not possible
Proximity dog method	Proximity dog method 1	✕[1]
	Proximity dog method 2	✕[1]
Count method	Count method 1	✕[1]
	Count method 2	✕[1]
	Count method 3	✕[1]
Data set method	Data set method 1	✕[1]
	Data set method 2	✕[1]
	Data set method 3	✕[1]
Dog cradle method		✕[1]
Stopper method	Stopper method 1	✕[1]
	Stopper method 2	✕[1]
Limit switch combined method		✕[1]
Scale home position signal detection method		✕[1]
Dogless home position signal reference method		✕[1]
Driver home position return method		○

*1 Minor error (error code: 1979H) occurs, and home position return is not performed.

• Servo external signals when using driver home position return method

At driver home position return method home position return, check the status of the servo external signals. Also check the external signals are OFF when external signal parameters are not set. For contacts (normally open contact/normally closed contact), match each setting of the IAI electric actuator controller with the external signal parameters of the motion control parameters. Refer to IAI electric actuator controller instruction manual for details.

■Control mode

Control modes that can be used are shown below.

• Position control mode (position control, and speed control including position loop)

However, speed-torque control (speed control not including position loop, torque control, continuous operation to torque control) cannot be used. If a control mode switch is performed, a warning (error code: 09EAH) occurs and the current control is stopped.

■Servo OFF

When the motor is moved by an external force during servo OFF, position information is updated.

■Servo instructions

Speed control(Ⅱ) (VVF instruction, VVR instruction) cannot be used. If the VVF instruction or VVR instruction are started, a minor error (error code: 19EBH) occurs.

■Control of servo parameters

Parameters of IAI electric actuator controller are not controlled by Motion CPU. Therefore, even though the parameter of IAI electric actuator controller is changed during the communication between Motion CPU and IAI electric actuator controller, it does not process, and is not reflected to the parameter.

■Servo parameter change function

- Change function of servo parameter can be executed.

  The operation for the servo parameter change function is shown below.

	Operation for the servo parameter change function
Servo parameter write request	The servo parameter of IAI electric actuator controller is controlled in a unit of 2 words, so that it is necessary to set "3: 2 words write request" in "Servo parameter write/read request (SD804)" for executing the parameter write. If "1: write request" is executed to IAI electric actuator controller, the parameter write fails, and "-1" is stored in "Servo parameter write/read request (SD804)".
Servo parameter read request	The servo parameter of IAI electric actuator controller is controlled in a unit of 2 words, so that it is necessary to set "4: 2 words read request" in "Servo parameter write/read request (SD804)" for executing the parameter read. If "2: read request" is executed to IAI electric actuator controller, the parameter read fails, and "-1" is stored in "Servo parameter write/read request (SD804)".

- The parameter changed by the servo parameter change function can be saved by writing to the Motion CPU. The changed parameter becomes valid by turning ON the power supply of the IAI electric actuator controller again.
- "Servo parameter write/read" device

  Store the value in the following special registers to change or display the servo parameter.

No.	Name	Meaning	Details	Set by
SD552	Servo parameter write/read request	Servo parameter read value	The read value (low 1 word) of servo parameter which executed "4: 2 word read request" in "Servo parameter write/read request (SD804)" is stored.	System (At reading request)
SD553			The read value (high 1 word) of servo parameter which executed "4: 2 word read request" in "Servo parameter write/read request (SD804)" is stored.	
SD804[*1]		Servo parameter write/read request flag	• The "write/read request" is executed after setting of the axis No. and servo parameter No. 3: 2 word write request 4: 2 word read request • "0" is automatically set by Motion CPU after completion of servo parameter write/read request. ("-1" is stored by Motion CPU at write/read error.)	User/System
SD805		Axis No.	The axis No. to write/read servo parameter is stored. R64MTCPU: 1 to 64 R32MTCPU: 1 to 32 R16MTCPU: 1 to 16	User
SD806		Servo parameter No.	The servo parameter No. to be written/read is stored in hexadecimal. H□□□□ 　　→ Parameter No. 　　*: Refer to the IAI electric actuator controller instruction manual for details of parameter No.	
SD808		Servo parameter setting value (2 word)	The setting value of servo parameter to be written is stored when "3: 2 word write request" is set in "Servo parameter write/read request (SD804)".	
SD809				

*1   Do not execute the automatic refresh.

■Optional data monitor setting

The following shows data types that can be set.

Set the data so that the total number of communication points per axis is no more than 6 points.

• Registered monitor

Data type	Unit	Number of words	Number of communication data points	Address ID[1]
Position F/B	[pulse]	2	0	—
Cumulative current value[2]	[Positioning command][3]	2	0	—
Servo command value[2][4]	[pulse]	2	0	—
Optional address of registered monitor	—	1	1	—

[1] Set an even number for the address ID of registered monitor.

[2] The "Cumulative current value", and "Servo command value" are command values for the servo amplifier. All other data types are servo amplifier monitor values (feedback).

[3] Position commands are positioning units set in [Motion control parameter] ⇨[Axis setting parameter] ⇨ "Fixed parameter" ⇨ "Unit setting".

[4] The servo command value is a command value for the servo amplifier. The coordinates differ from those of the Motion CPU, therefore even if setting the home position, the value does not become 0.

• Transient command

Data type	Unit	Number of words[1]	Number of communication data points	Transient ID	Storage device (response data (+8 to 11)) content
Optional transient command	—	4	0	—	

[1] Number of words for response data (+8 to 11)

■Gain changing command, PI-PID switching command, control loop changing command

Gain changing command, PI-PID switching command, and control loop changing command becomes invalid.

■Amplifier-less operation

Amplifier-less operation cannot be used for axes connected to IAI electric actuator controller. When amplifier-less operation is executed, the axis changes to a disconnected state, and servo ready does not turn ON.

■Driver communication

The driver communication is not supported. If the driver communication is set in a servo parameter, a minor error (error code: 1C93H) will occur when the power supply of Multiple CPU system is turned ON.

■Monitor devices (R: D32020+48n to D32039+48n/Q: #8000 to #8639)

• [Md.1014] Servo amplifier type (R: D32030+48n/Q: #8000+20n)

  This register stores the servo amplifier types below when using IAI electric actuator controller.

Type code	Details
8193(2001H)	IAI electric actuator controller (IAI Corporation)

• [Md.1027] Servo amplifier vendor ID (R: D32031+48n/Q: #8016+20n)

  This register stores the servo amplifier vendor ID below when using IAI electric actuator controller.

Vendor ID code	Details
10	IAI Corporation

• "[Md.1015] Motor current value (R: D32020+48n/Q: #8001+20n)" is always "0".

■Torque limit

The torque limit value set by the Motion CPU is ignored. Set the torque limit value with the parameter on the IAI electric actuator controller side.

■In-position range

When the position of the cam axis is restored in advanced synchronous control, a check is performed by the servo parameter "In-position range (PA10)". However, because the servo parameter settings are not performed in IAI electric actuator controller, the "In-position range" is checked as 100[pulse].

■Operation cycle

For each operation cycle, the following number of axes per controller can be set. When the number of axes is more than what can be set, and an operation cycle other than those below is set, a minor error (error code: 1C83H) occurs.

Operation cycle	Number of axes per controller available
0.222[ms]	1 to 2 axes
0.444[ms]	3 to 4 axes
0.888[ms]	5 axes or more

IAI electric actuator controller detection error

When an error occurs on IAI electric actuator controller, the "[St.1068] Servo error detection (R: M32408+32n/Q: M2408+20n)" turns ON, and the minor error (error code: 1C80H) is stored in "[Md.1005] Servo error code (R: D32008+48n/Q: D8+20n)". Error codes read from the IAI electric actuator controller are stored in "[Md.1019] Servo amplifier display servo error code (R: D32028+48n/Q: #8008+20n)".

Also, when an error occurs during home position return by driver home position return method, "Driver operation alarm (b9)" of "[Md.500] Servo status7 (R: D32038+48n/Q: #8018+20n) turns ON, and the minor error (error code: 194BH) is stored in "[Md.1005] Servo error code (R: D32008+48n/Q: D8+20n)". Alarms read from the IAI electric actuator controller are stored in the event history.

Eliminate the error cause, reset the servo amplifier error by turning ON "[Rq.1148] Servo error reset command (R: M34488+32n/Q: M3208+20n)" and perform re-start. However, "0" is always stored in "[Md.107] Parameter error No. (R: D32029+48n/Q: #8009+20n)".

Refer to the instruction manual of IAI electric actuator controller for details of the errors.

5

6 COMMUNICATION FUNCTIONS

6.1 Communication Function List

Motion CPUs are equipped with following list of communication interfaces.

Communication type		Communication route		Reference
		Via Multiple CPU[*1]	PERIPHERAL I/F ( ) indicates the Ethernet port number.	
MELSOFT communication	Via Multiple CPU	○	—	—
	Direct connection	—	○(UDP5008)	☞ Page 305 Direct connection
	Via Ethernet hub	—	○(TCP5007, UDP5006)	☞ Page 308 Connection via HUB
	CPU search	—	○(UDP5009)	
Native mode communication with Cognex Corporation In-Sight® vision system		—	○(Arbitrary TCP)	☞ Page 312 Vision System Connection Function

*1 Communication via other CPU to Motion CPU is possible with a Multiple CPU system.

6.2 Security Function

The theft, tampering, incorrect operation, and illegal execution of customer assets stored on personal computers, or customer assets inside modules in the MELSEC iQ-R series system due to unauthorized access by a third party is prevented. Use each security function for the purposes below.

Data protection target	Purpose	Security function	Reference
Project	Prevents unauthorized program (program file units) viewing. (Uses a security key.)	Security key authentication function	☞ Page 297 Software security key authentication
Motion CPU	Prevents unauthorized program execution. (Uses a security key.)		
	Prevents unauthorized file reading/writing. (Uses a password.)	File password function	☞ Page 295 File password
	Recognizes the IP address of external devices via a PERIPHERAL I/F and blocks access with unauthorized IP addresses.	IP filter function	☞ Page 302 IP filter function

File password

This function is used to protect the data of Motion CPU by registering a password for the file in the Motion CPU.

Password authentication is required when reading/writing data.

There are two types of password, "Read protect" and "Write protect". Both settings can be specified for a single data item.

Data protected by file password

The data protected file password are shown below.

Data type	Data name	Protected content
Motion SFC parameter	Motion SFC parameter	Motion SFC parameter
Motion SFC program	Motion SFC program	Motion SFC program
Servo program	Servo program	Servo program and program allocation
R series common parameter	System parameter	System parameter
	CPU parameter	CPU parameter
	Module parameter	Module parameter
Servo parameter	Axis 1 to axis 64 servo parameter Axis 601 to axis 608 servo parameter (sensing module)	Servo parameter (up to 72 axes)
Synchronous control parameter	Command generation axis parameter	Command generation axis parameter
	Synchronous encoder axis parameter	Synchronous encoder axis parameter
	Servo input axis parameter	Servo input axis parameter
	Axis 1 to axis 64	Synchronous control parameters (up to 64 axes)
Machine control parameter	Machine common parameter	Machine common parameter
	Machine parameter	Machine parameter
Cam data	Cam data	Cam data (up to 1024 data items)
Label/structured data types	Label/structured data types settings	Label/structured data types settings (Excluding label allocation information)
Device comment	Device comment	Device comment

Operations requiring password authentication with file password

Operations requiring password authentication for data for which a file password has been registered are as follows.

Online operation	Corresponding password type
Reading to Motion CPU	Read protect password
Writing to Motion CPU	Write protect password
Online change	Write protect password
Verification with Motion CPU	Read protect password
File password setting (registration/change/authentication/deletion)	Read protect password, write protect password
Motion CPU data deletion	Write protect password
Motion CPU memory formatting (initialization)	—*1
File transmission at boot*2	Read protect password, write protect password

*1   Password authentication is not required for Motion CPU memory formatting (initialization).
*2   Refer to file password for operation when file password is set. (☞ Page 123 File password)

File password setting

File password registration, change, authentication and deletion are performed in MT Developer2.
Refer to the following for details of the operation procedures.
📖 Help of MT Developer2

🖱 [Project] ⇨ [Security] ⇨ [File Password Setting]

Window
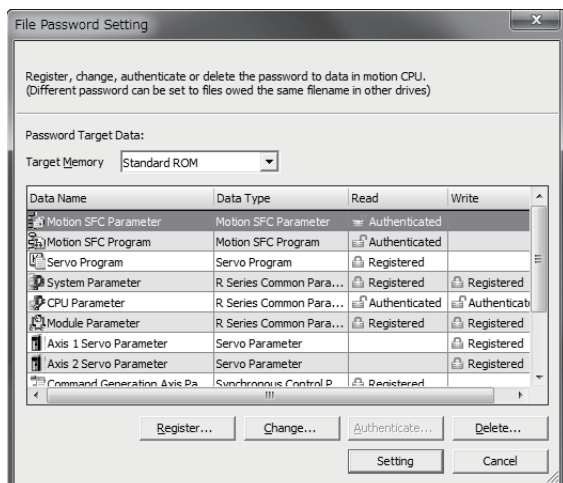
Point 🔑

• Store passwords carefully. If a user has forgotten a registration password, initialize the memory where the password is registered (standard ROM of the Motion CPU, or SD memory card). However, if initializing the standard ROM all password data and data are cleared. Re-write the data to the Motion CPU. (☞ Page 353 Memory Initialization)
• When setting a file password for both the standard ROM and the SD memory card data, set a password for the standard ROM, and another password for the SD memory card data.
• Be sure to register/change/delete password when the Motion CPU is in STOP state. Registering/changing/ deleting password when in RUN state may cause the Motion SFC program to operate incorrectly.

Software security key authentication

This function is used to protect the user data by setting a common security key to the project and Motion CPU to limit the personal computer which operates the project and Motion CPU which runs the project. The security key is created in MT Developer2 and registered to the personal computer, or Motion CPU. Security keys are set for the following.

Security key target		Application
Program file	Security keys can be registered for each program file, however, the same security key is used for all program files in a project.	• Restricts the viewing of program files inside the project. • Restricts the execution of programs with Motion CPUs.
Personal computer	Multiple security keys can be registered for a single personal computer.	Protected program files can be viewed with a security key.
Motion CPU	Only one security key can be written per CPU module.	Restricted programs can be executed by security keys.

Operations that can be restricted with security key authentication function

■Program viewing
Operation is controlled based on whether the security keys for program files and the personal computer match.
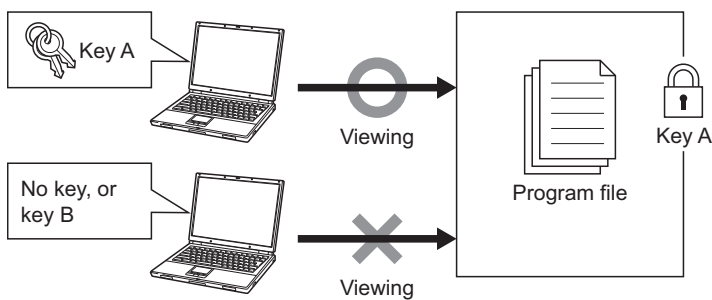
■Program execution inside Motion CPU
Operation is controlled based on whether program files written to the Motion CPU and Motion CPU security key match.
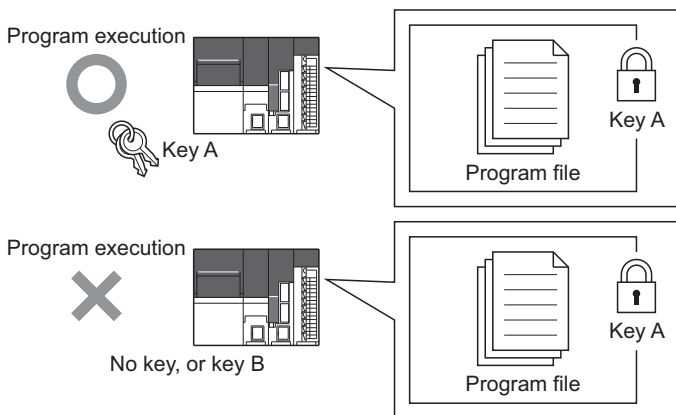
Copying security keys

Security keys registered in the personal computer can be imported or exported and used at another personal computer.

Expiry dates can be set for copied security keys.
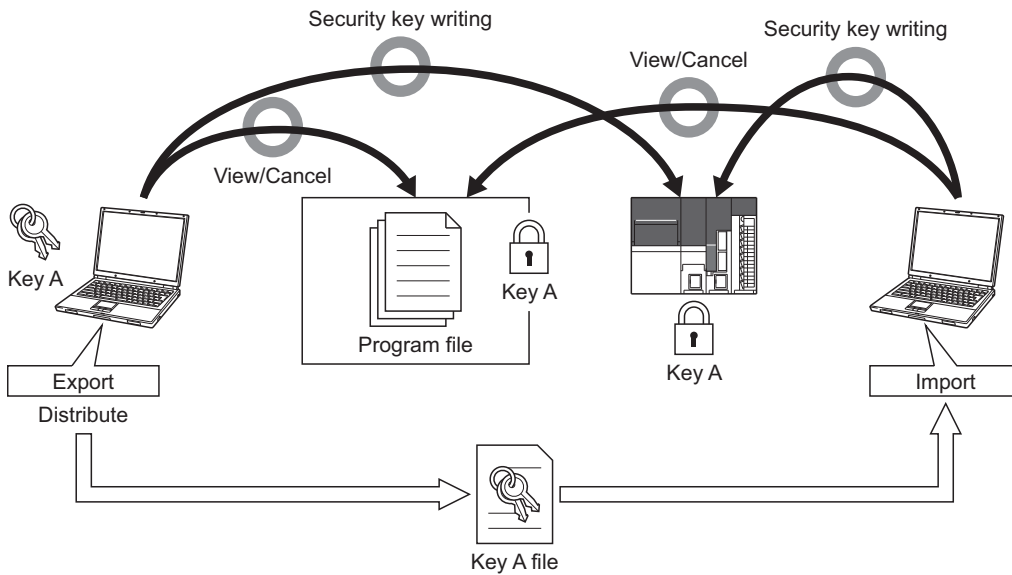
> **Point**
> - Even if MT Developer2 is uninstalled, security keys set at the personal computer are not deleted. To delete, do so at the "Security key management" screen.
> - Refer to security key for operation when performing file transmission at boot for a Motion CPU with a security key set. (☞ Page 124 Security key)

⚠ CAUTION

Program asset outflow cannot be prevented if a personal computer at which a security key is set is misused by a third party, and therefore customers must take the following countermeasures to protect against this.
- Personal computer theft prevention measures (use of wire locks, etc.)
- Personal computer user management (deletion of redundant user accounts, strict control of login information, adoption of fingerprint authentication, etc.)

Furthermore, if a personal computer at which security keys are registered malfunctions, locked project data cannot be viewed or edited. Mitsubishi Electric accepts no responsibility for losses to customers, other individuals, or organizations as a result of this. Customers must therefore take the following countermeasures to protect against this.
- Import registered security keys to another personal computer.
- Store exported files containing registered security keys in a safe location.

Creating/deleting/copying the software security key

The operation of software security key function is executed on the security key management screen of MT Developer2.
Refer to the following for details of the operation procedures.

📖 Help of MT Developer2

🖱 [Project] ⇨ [Security] ⇨ [Security Key Management]

Window
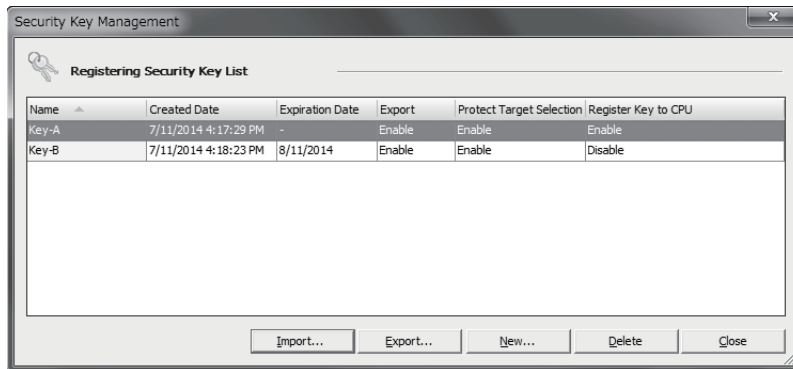
■Security key creation

Create a new security key and register it at the personal computer. Security keys are created for each personal computer login user, and up to 128 keys can be created, including newly created keys and imported keys.

■Security key deletion

Delete security keys registered in the personal computer. By deleting a security key used to lock a project, it will no longer be possible to view or edit locked data in the project. Furthermore, even if a security key with the same name is created after deleting, the security key will not be the same. Exercise sufficient caution when deleting security keys.

■Copying security keys

• Export

Export security keys registered at the personal computer to an importable file (*.ity). An expiry date and operating restrictions can be added to security keys to be exported.

• Import

Import exported security key files to the personal computer, and registers the security keys.

> **Point** 🔍
>
> • Exercise strict control over exported security key files.
> • If the expiry date for a security key registered at the personal computer expires, it will no longer be possible to view programs, export the security key again, set a security key for program files, or write a security key to the Motion CPU. If continuing to use the same security key after it has expired, first export the security key again from the personal computer from which it was exported, and then import it to the personal computer.

Registering a software security key to a project file

Create a security key at the "Security key management" screen beforehand. Security keys can be registered for each program file, however, the same security key is used for all program files in the project. Refer to following for details on operation.

📖Help of MT Developer2

👆 [Project] ⇨ [Security] ⇨ [Security Key Setting]

Window
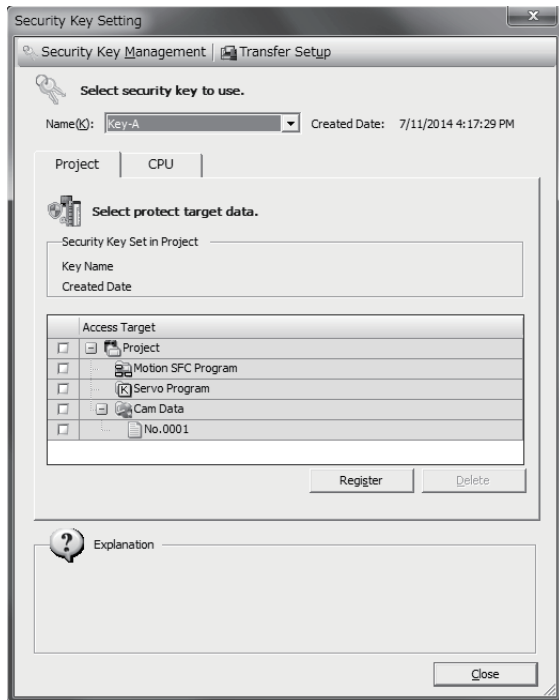
Operating procedure

■Registration procedure

1. Select the security key to be registered for the program file from "Name".

2. Select the check box for the program file for which viewing is to be prohibited from the [Project] tab, and then click the [Register] button. The security key set for the program file becomes valid when the project is saved.

■Deletion procedure

1. Select the security key (same key as the security key registered for the program file to be deleted) from "Name".

2. Select the check box for the program file for which the security key is to be deleted from the [Project] tab, and then click the [Delete] button.

Writing/deleting software security keys to and from the Motion CPU

By writing a security key to the Motion CPU, the execution of programs can be prohibited for Motion CPUs in which a different key from that for the program file is written. A single security key can be written to multiple Motion CPUs. If writing a security key, create a key at the "Security key management" screen beforehand, and then connect to the Motion CPU. (Security keys can only be written or deleted when the Motion CPU is in the STOP status.) Refer to following for details on operation.
📖Help of MT Developer2

👆 [Project] ⇨ [Security] ⇨ [Security Key Setting]

Window
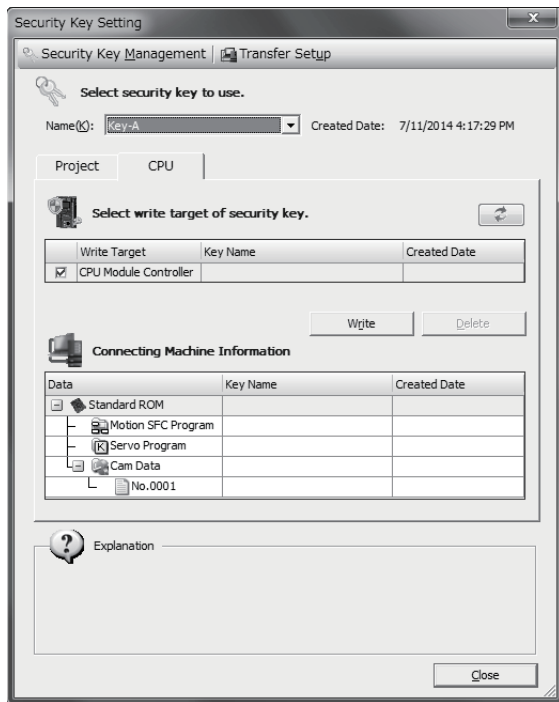
Operating procedure

■Write procedure

1. Select the security key to be written to the Motion CPU from "Name".

2. Click the [Write] button from the [CPU] tab.

■Deletion procedure

1. Click the [Delete] button from the [CPU] tab.

IP filter function

By identifying the IP address of the device with which communication is being performed, access by specifying an unauthorized IP address can be prevented. Access is restricted by allowing or blocking access from IP addresses (of external devices) set in the parameters. By specifying the IP address of external devices to be allowed or blocked in the parameters, access from external devices is restricted. If used in an environment in which a LAN connection is established, use of this function is recommended. Refer to the following for details on IP filters.

MELSEC iQ-R Ethernet User's Manual (Application)

IP filter settings

IP filter settings are read to MT Developer2 when diverting parameters set at GX Works3 [Module Parameter] ⇨ "Application Setting" ⇨ "Security".

Point

If a proxy server exists on the LAN network, block the proxy server IP address. If allowed, it will no longer be possible to prevent access from personal computers capable of accessing the proxy server.

6.3 Remote Operation

Remote operation is used to control operation of Motion CPU from external sources (MT Developer2, RUN contacts, etc.).
Remote operations for which Motion CPU operations are controlled are as follows.

- Remote RUN/STOP

Relationship between Motion CPU status and remote operation

The status after the execution of remote operations based on the Motion CPU status is as follows.

Motion CPU status (switch position)	Remote operation	
	Remote RUN	Remote STOP
RUN	RUN status	STOP status
STOP	STOP status	STOP status

Remote RUN/STOP

The Motion CPU RUN/STOP status can be changed from an external source with RUN/STOP switch of Motion CPU module set to RUN.

Remote RUN/STOP operations

■Remote RUN

When remote RUN is performed when the status is STOP, the "[Rq.1120] PLC ready flag (R: M30000/Q: M2000)" changes from OFF to ON (RUN status), and the "[Rq.1120] PLC ready flag (R: M30000/Q: M2000)" OFF to ON operation is executed.

■Remote STOP

Turns the "[Rq.1120] PLC ready flag (R: M30000/Q: M2000)" OFF (STOP status).

Remote RUN/STOP operation procedure

■Operation with MT Developer2

Select [RUN] or [STOP] on by remote operation to execute. Refer to the following for details of the operation procedure.
📖Help of MT Developer2

👆 [Online] ⇨ [Remote Operation] ⇨ "RUN/STOP"

Window
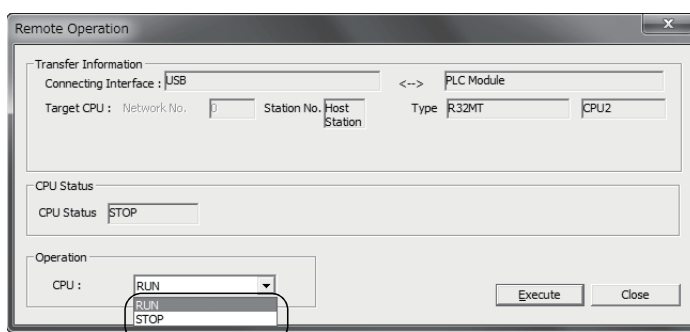
■Operation with RUN contact

Set the X device to be set as the RUN contact at MT Developer2.

🖰 [R series common parameters] ⇨ [Motion CPU module] ⇨ [CPU parameter] ⇨ "Operation related setting" ⇨ "RUN contact"

The settable device range is "X0 to X2FFF". Operations are performed with the set RUN contact ON/OFF and remote RUN/STOP status.

- If the RUN contact is OFF, the status of the Motion CPU will be RUN. By executing a remote RUN/STOP in the RUN status, the Motion CPU RUN/STOP status can be switched.
- If the RUN contact is ON, the status of the Motion CPU will be STOP. The status of the Motion CPU will be STOP, even if remote RUN is performed in the STOP status.

Point

The "[Rq.1120] PLC ready flag (R: M30000/Q: M2000)" can also be turned ON/OFF ("PCPU READY complete flag (SM500)" ON/OFF) in the following methods.
- RUN/STOP switch change

6.4 Communication Function via PERIPHERAL I/F

The Motion CPU can communicate data by connecting built-in PERIPHERAL I/F of the Motion CPU with personal computers and/or display devices, etc. using an Ethernet cable. There are following two ways to communicate between the Motion CPU and MT Developer2.

- "Direct connection" connected with the Ethernet cable
- "Connection via HUB" connected via HUB

Point

The Motion CPU does not support SLMP. PERIPHERAL I/F cannot be used for SLMP communication.

Direct connection

Between the Motion CPU and MT Developer2 can be connected using one Ethernet cable without HUB. The direct connection enables communication with only specifying connection target. IP address setting is not required.

Ethernet cable (crossover cable)

PERIPHERAL I/F

MT Developer2
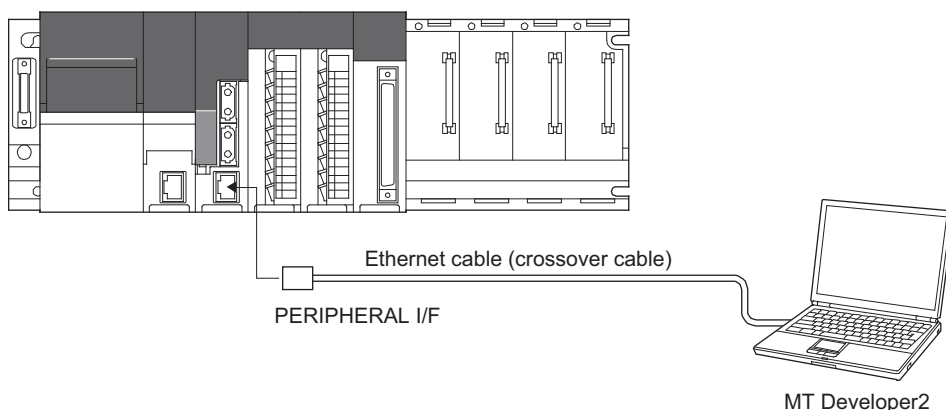
Point

If connecting directly with an Ethernet cable, the wiring will be longer than a USB cable, and therefore it is possible that an unauthorized connection may be established from a distance.
By setting [R Series Common Parameters] ⇨ [Motion CPU Module] ⇨ [Module Parameters] ⇨ "Disable Direct Connection to MELSOFT" to "Disable" in order to prohibit a direct connection to MELSOFT, direct connections are prohibited, enabling unauthorized connections to be prevented.

## Communication setting in MT Developer2 side

Set the items on the Transfer Setup screen in MT Developer2 as shown below.

🖱 [Online] ⇨ [Transfer Setup]

Operating procedure
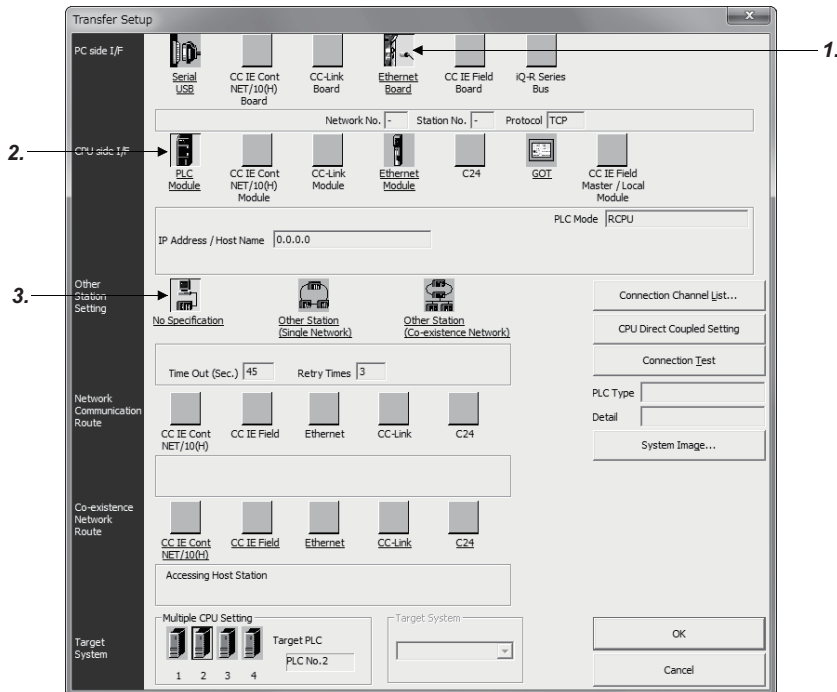
1. Select [Ethernet Board] for PC side I/F.

2. Select [PLC Module] for CPU side I/F. Select the "Ethernet Port Direct Connection" on the CPU side I/F Detailed Setting of PLC Module screen.

3. Make the setting for Other Station Setting. Select it according to the operating environment.

Select "Ethernet port direct connection"
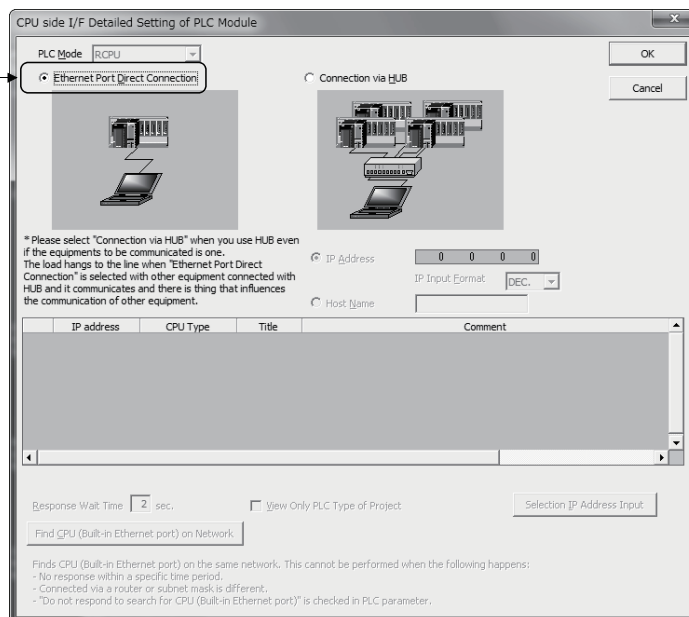
Precautions

Precautions for direct connection are shown below.

■Connection to LAN line

When the Motion CPU is connected to LAN line, do not perform communication using direct connection. If performed, the communication may put a load to LAN line and adversely affect communications of other devices.

■Connection not connected directly

- The system configuration that connects a Motion CPU with an external device using a hub as shown below is not regarded as direct connection.

HUB

MT Developer2
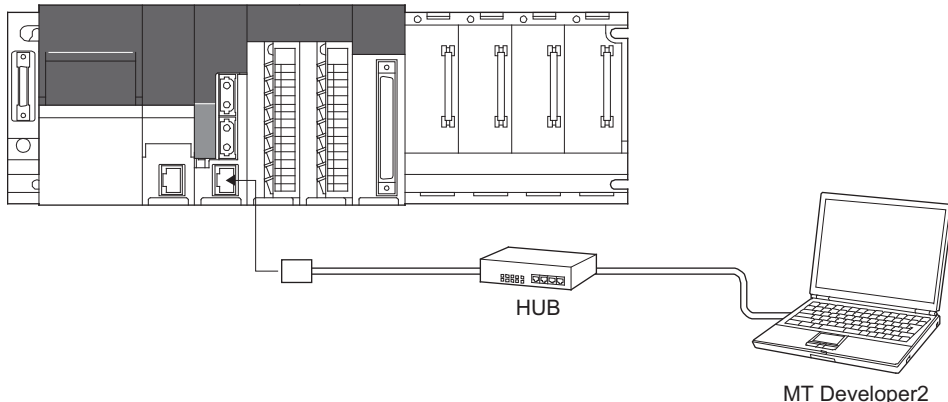
- When two or more Ethernet ports are enables in the network connections setting on the personal computer, communication by direct connection is not possible. In the setting, leave only one Ethernet port enabled for direct connection and disable the other Ethernet ports.

■Condition in which direct connection communication may not be available

Under the following conditions, direct connection communication may not be available. In that case, check the setting of the Motion CPU and/or personal computer.

- In the Motion CPU IP address, bits corresponding to "0" in the personal computer subnet mask are all ON or all OFF.

Ex.
Motion CPU IP address: 64.64.255.255
Personal computer IP address: 64.64.1.1
Personal computer subnet mask: 255.255.0.0

- In the Motion CPU IP address, bits corresponding to the host address for each class in the personal computer IP address are all ON or all OFF.

Ex.
Motion CPU IP address: 64.64.255.255
Personal computer IP address: 192.168.0.1
Personal computer subnet mask: 255.0.0.0

Connection via HUB

Between the Motion CPU and MT Developer2 can be connected via HUB.

Ethernet cable
(straight cable)

PERIPHERAL I/F

Ethernet cable
(straight cable)

MT Developer2

HUB

Panel computer
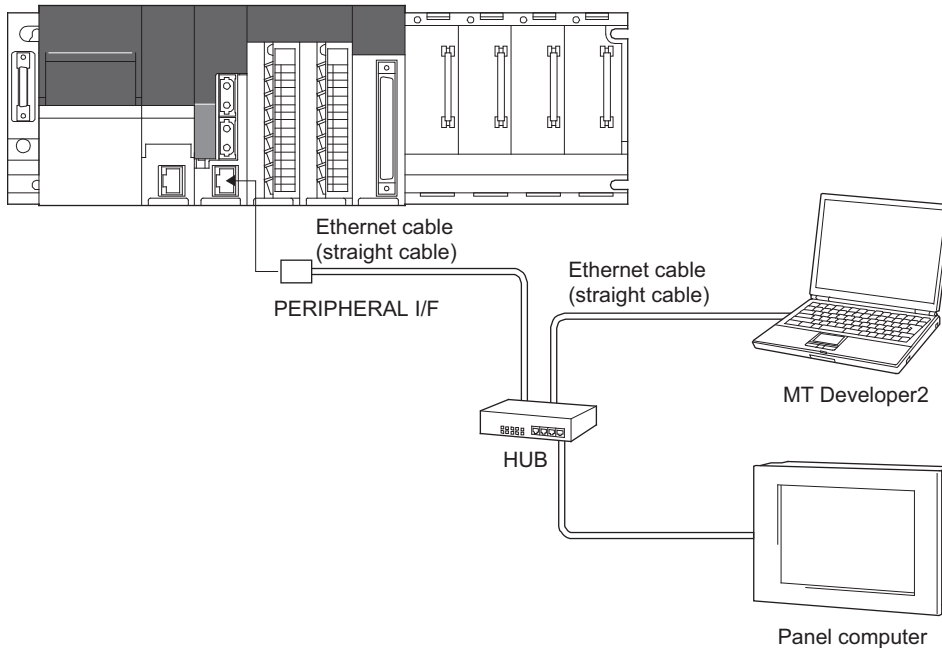
Setting in Motion CPU side

Set the items on the IP address setting as shown below.

[R Series Common Parameter] ⇨ [Motion CPU Module] ⇨ [Module Parameter] ⇨ "IP Address Setting"

Operating procedure
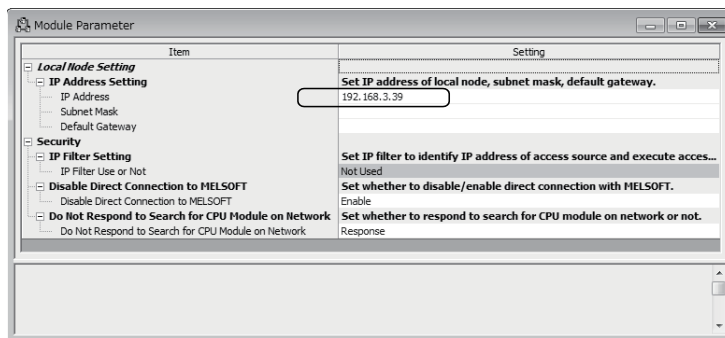
1. Set the Motion CPU IP address. (Default IP address: 192.168.3.39) Change the IP address if required. No need to set "Subnet Mask Pattern" and "Default Router IP Address".

■Enabling the parameters of Motion CPU

Using Ethernet direct connection or USB/RS-232 connection, write the settings in parameter to the Motion CPU by selecting [Online] ⇨ [Write to Motion] in MT Developer2. After writing the parameter settings, power the Multiple CPU system OFF to ON or reset using the RUN/STOP/RESET switch so that the parameters become valid. Connect directly with an Ethernet cable between the personal computer and Motion CPU to write the parameters using the Ethernet cable. (<span>Page 305 Direct connection)

Communication setting in MT Developer2 side

Set the items on the Transfer Setup screen in MT Developer2 as shown below.

👆 [Online] ⇨ [Transfer Setup]

Operating procedure
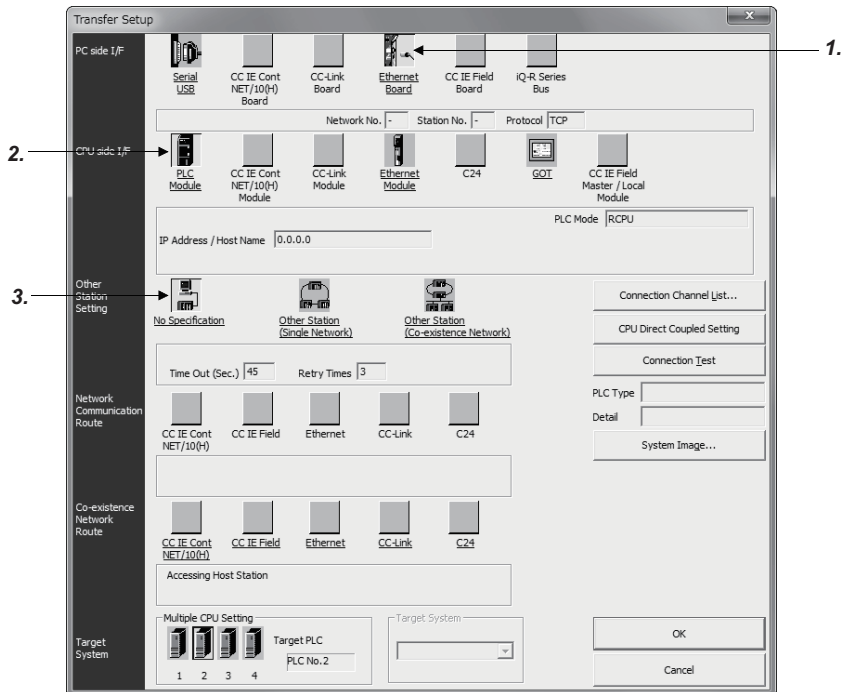
1. Select [Ethernet Board] for PC side I/F.

2. Select [PLC Module] for CPU side I/F. Select the "Connection via HUB" on the CPU side I/F Detailed Setting of PLC Module screen, and set the Motion CPU IP address.

3. Make the setting for Other Station Setting. Select it according to the operating environment.
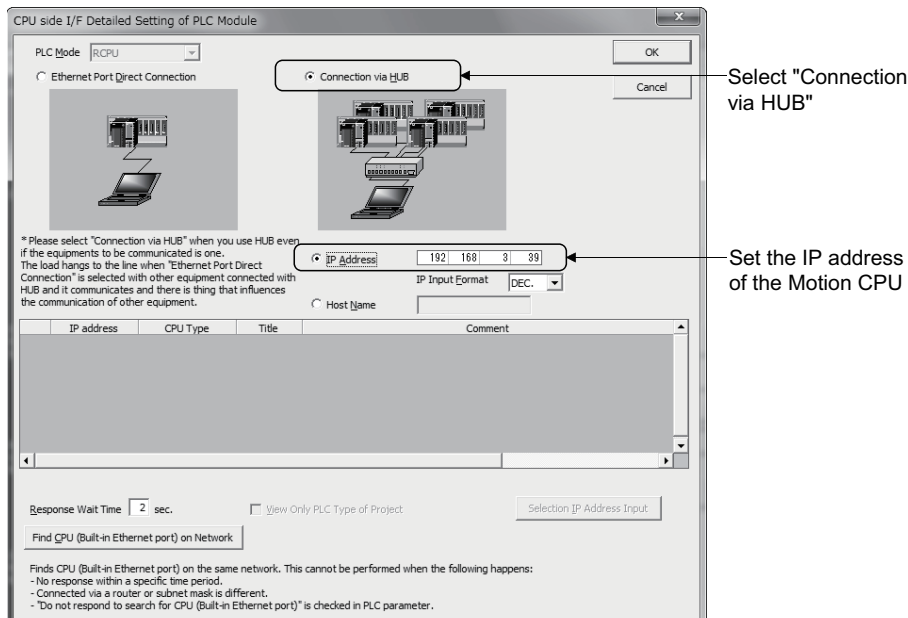
Select "Connection via HUB"

Set the IP address of the Motion CPU

Point

The Find CPU function can be used for specifying the IP address for Motion CPU side in the connection via HUB. This function can be activated in [Find CPU (Built-in Ethernet port) on Network] of CPU side I/F Detailed Setting of PLC Module screen, finds the Motion CPU connected to the same HUB as MT Developer2, and displays a list. Select the connecting Motion CPU and click [Select IP Address Input] button to set the IP address for Motion CPU side.

Found Motion CPU is displayed

[Selection IP address input] button

[Find CPU (Built-in Ethernet port) on network] button
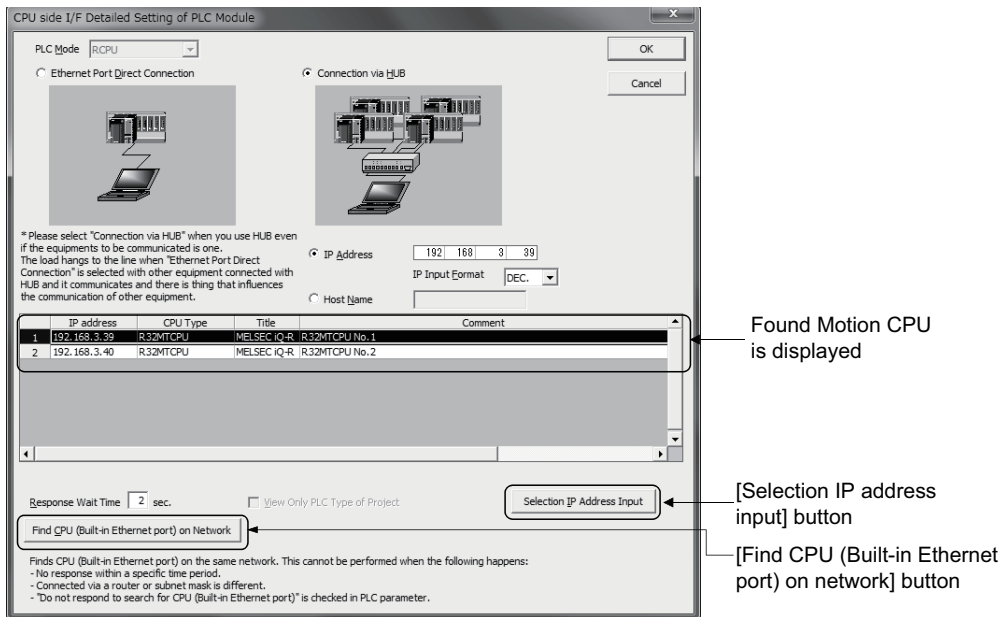
• Set the title and comment of the Motion CPU in name setting. The title and comment set are displayed on the CPU side I/F Detailed Setting of PLC Module screen. (☞ Page 55 CPU parameter)
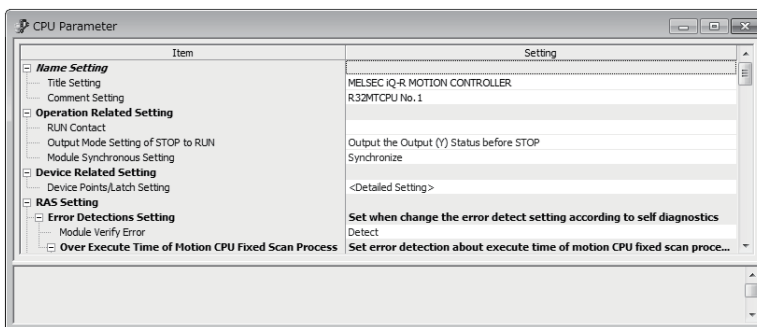
• By setting "Do not respond to search for CPU Module on network" ([R Series Common Parameter] ⇨ [Motion CPU Module] ⇨ [Module Parameter] ⇨ "Do not respond to search for CPU Module on network") to "Not responded" the CPU module does not appear in the list after a search on the network.

Precautions

Precautions for connection via HUB are shown below.

- When the personal computer that can connect to LAN line is used, set the same value for Motion CPU IP address as the following personal computer IP address.

Motion CPU IP address | 192 | 168 | 3 | 39 |

Set the same value as the personal computer IP address

Ex.
Personal computer IP address: "192.168.3.1"

<Setting for Motion CPU side>
Set the same value as the personal computer IP address.
(Example) 192.168.3.□

Set the IP address not used with devices connected to network.
(Example) □.□.□.39

<Setting for MT Developer2 side>
Set the same value as the Motion CPU IP address.
(Example) 192.168.3.39

- The maximum number of devices that can access to one Motion CPU simultaneously is 16.
- Hubs with 10BASE-T or 100BASE-TX ports can be used. (The ports must comply with the IEEE802.3 100BASE-TX or IEEE802.3 10BASE-T standards.)
- The Ethernet cables must to be installed away from power cabling/lines.
- The module operation is not guaranteed if any of the following connection is used. Check the module operation on the user side.
  - Connections using the Internet (general public line)
  - Connections using devices in which a firewall is installed
  - Connections using broadband routers
  - Connections using wireless LAN
- When multiple Motion CPUs are connected to MT Developer2, beware of the below cautions:
  - IP addresses must be different for each Motion CPU.
  - Different projects must be used for each Motion CPUs on MT Developer2.

6

6.5 Vision System Connection Function

The Cognex In-Sight[®] vision system can be connected to the PERIPHERAL I/F of the Motion CPU.

The vision system dedicated functions have been added to the Motion SFC program making it easy to control the vision system from the Motion SFC program.

Refer to the Cognex vision system manual or help sections for details on the In-Sight[®] vision system and Cognex vision system integrating tool In-Sight[®]Explorer.

The following terms are used to explain the vision system connection function.

Term	Description
In-Sight[®] Explorer	Abbreviation for Cognex vision system integrating tool In-Sight[®] Explorer (Version 4.3.0 or later).
Log on/Log off	Procedure to connect/disconnect the communication to the vision system from the Motion CPU.
PoE	Abbreviation for Power over Ethernet. Method of supplying power via an Ethernet cable.
Native mode	Vision system's communication method used to control the vision system from the Motion CPU.
TCP/IP	One of vision system's communication protocol names.
Job (Vision program)	Program that processes images in the vision system.
Load	The process of developing a job file stored in the vision system into the memory in the vision system, and making it an active job.
Trigger	Start signal for acquiring images.
Vision system status storage device	Device that stores the status of the vision system controlled by the Motion CPU.
Program status storage device	Device that stores the status of jobs controlled by the Motion CPU.
Image data	Various data created by the vision system's image process. (Not images acquired by the trigger.)
Read value	Numeric data retrieved in addition to the image data.
Spreadsheet	A table (400 line × 26 row) in which the job is written. The program is created by writing the functions of various image processes, etc., in each spreadsheet cell.
Tag	Symbolic tag associated with the spreadsheet cells.

System configuration

This section explains the system configuration and precautions for using the Cognex vision system connection function.
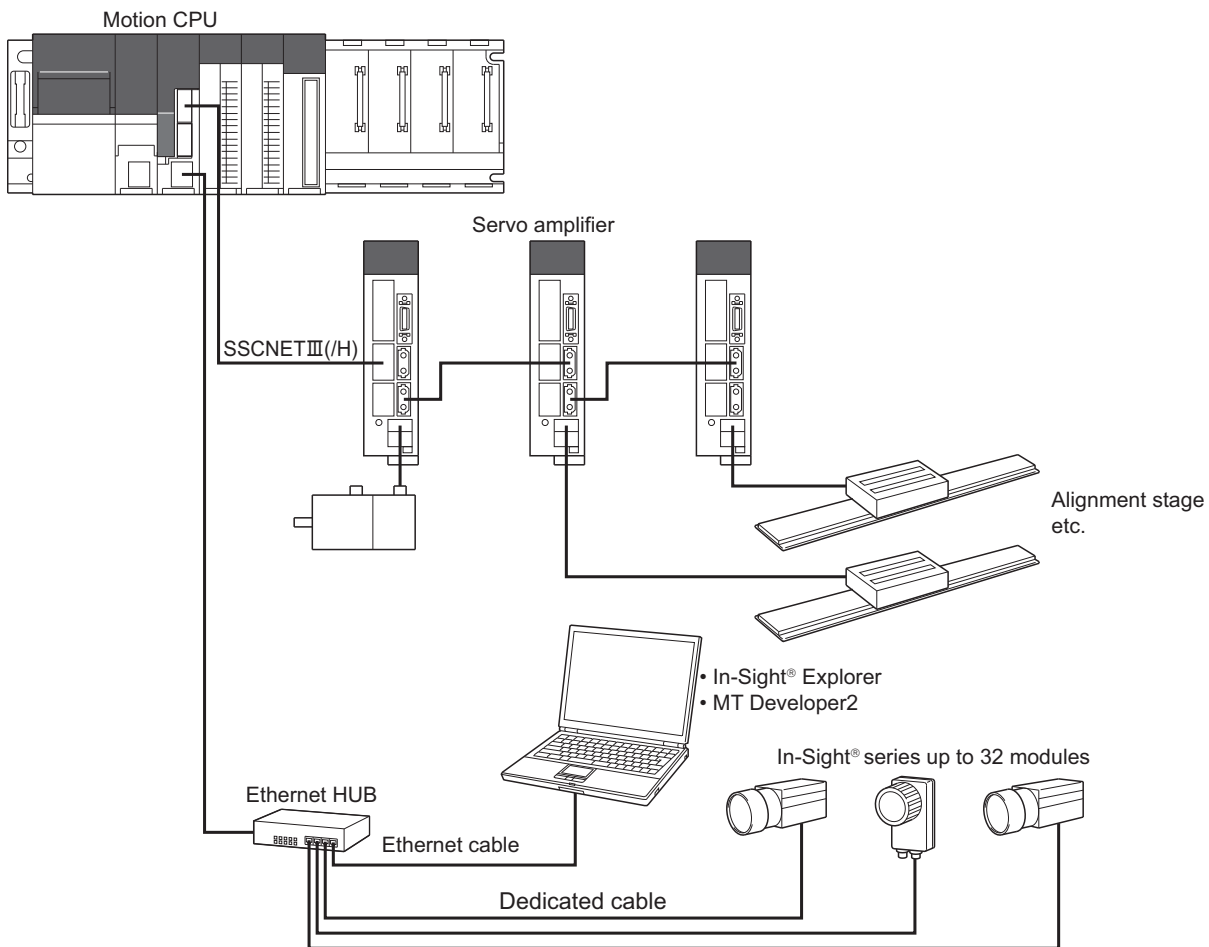
Point

Depending on the vision system used, power supply by Power over Ethernet (PoE) may be required. The Motion CPU's PERIPHERAL I/F does not support PoE, so a PoE power source equipment (PSE) is required.

Features of vision system connection function

This section explains the features of the Cognex vision system connection function.

■Method of connection with vision system

The Motion CPU and vision system are connected with the Motion CPU's PERIPHERAL IF (Ethernet). A dedicated communication module, etc., is not needed.

> **Point**
>
> - The Motion CPU and vision system are connected via Ethernet. The response of vision system dedicated functions may slow down if several devices (MT Developer2, personal computer for In-Sight® Explorer or GOT, etc.) are connected via an Ethernet HUB.
> - When simultaneously controlling two or more vision systems, the execution of commands to other vision systems may be delayed during the log on process (MVOPEN) with a specific vision system.
> - When simultaneously controlling two or more vision systems, if the offline-online state for a specific vision system is switched from an external source, the execution of commands to other vision systems may be delayed.
> - Execution of the vision system dedicated functions may be delayed if the vision system is in the offline state.
> - When the vision system is logged onto, communication is established between the Motion CPU and vision system to check the connection state even if the vision system dedicated functions are not used.

The following two communication methods can be used simultaneously with Ethernet.[1]
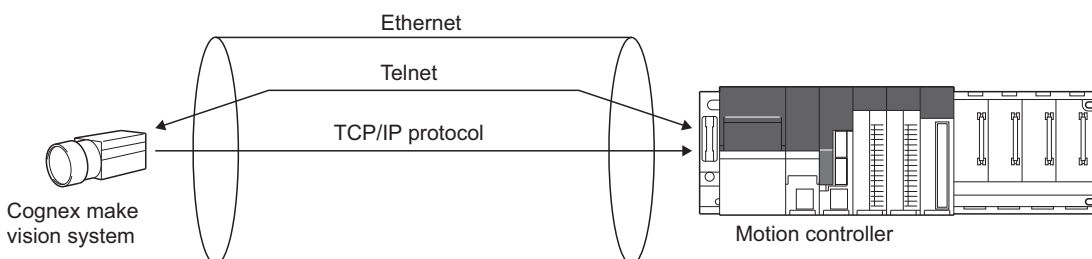
*1   The simultaneous communication cannot be used depending on the vision system's model. Refer to the Cognex vision system manual or help sections to confirm the specifications of vision system.

- Telnet

  The vision system is controlled from the Motion CPU using the native mode. The vision system dedicated functions control the vision system using Telnet.
- TCP/IP protocol

  By using TCP/IP as the vision system communication protocol and setting the output string, the image data are sent in a batch to the Motion CPU immediately after the job is finished with the vision system. High-speed data transfer is possible compared to the other communication methods.

■Vision system parameter

Parameters required for Ethernet communication and job execution must be set beforehand with MT Developer2. The vision system can be controlled just by writing only the vision system dedicated functions in the Motion SFC program.

■Priority of the vision system dedicated function

The priority of the vision system dedicated functions in the Motion CPU are shown below.

Process	Description	Priority
Motion operation process	Servo operation process, Servo data communication process, Event task of Motion SFC, etc.	1 (High)
Vision system dedicated function	Execution of the communication process with the vision system	2
Motion main process	Communication process with the peripheral devices, Auto refresh process, Normal task process of Motion SFC	3 (Low)

Point

- The communication process with the vision system has a lower priority than the motion operation cycle, so the motion operation processing time is not affected.
- Even if the vision system dedicated function is executed from the Motion SFC event task or NMI task, communication process with the vision system is executed after the motion operation process.

6

Vision system parameter setting

This section describes the setting items for vision system parameter system.

> **Point**
>
> When writing the vision system parameters into the Motion CPU, execute one of the following.
> - Select the menu bar [Check/Convert] ⇨ [Vision System Parameter Check].
> - Click [Convert] button of Ethernet communication line setting screen or vision program operation setting screen.

Ethernet Communication Line Setting

Set the parameters related to the vision system Ethernet communication.

👌 [Motion CPU Common Parameter] ⇨ [Vision System Parameter] ⇨ "Ethernet Communication Line"

Window
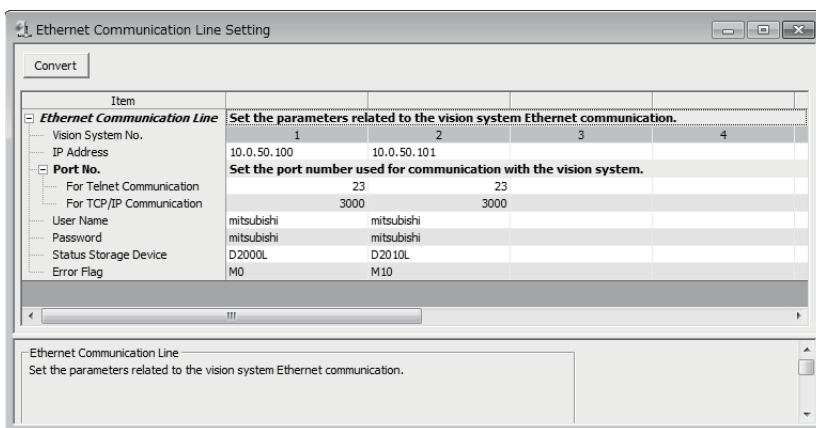
Displayed items

Item		Setting Range
Vision system No.		1 to 32
IP address		0.0.0.1 to 255.255.255.254
Port No.	For telnet communication	1 to 65535
	For TCP/IP communication	*: Cannot use 21, 68, 80, 502, 1069, 1070, 1212, 2222, 44818, 50000
User name		Up to 15 characters
Password		Up to 15 characters
Status storage device		Word device
Error flag		Bit device

■Vision System (camera) No. (Not necessary to set)

This number (1 to 32) is used by the vision system dedicated function to identify the vision system.

■IP Address

Set the IP address set for each vision system.

■Port No.

Set the port number used for communication with the vision system. Set the same number as the port number set for the vision system with In-Sight® Explorer.

 • For Telnet communication

   Set the Telnet connection port number used to control the vision system from the Motion CPU.

   If this number is not set, the Telnet default port number (23) will be used.

 • For TCP/IP communication

   Set the vision system's TCP/IP server port number used to batch send the vision system job execution results with the format output string setting of TCP/IP protocol. This does not need to be set when not using the format output string setting of TCP/IP protocol.

■User Name

Select a user from those set in the vision system to be used when executing the vision system dedicated functions.

> *Point*
>
> Select a user name for which the access level is set to "Full Access" or "Protect" in the In-Sight® Explorer user list.

■Password

Set the password corresponding to the set user name.

■Status Storage Device

Set the word device in which the vision system status and vision system dedicated function error codes are set.

Refer to device list for the range of word devices that can be set. (☞ Page 75 Device List)

> *Point*
>
> Set the device No. as an even-number.

The vision system status and error code of vision system dedicated function are stored in two successive points of the specified device as shown below.

Specified device

Vision system status →	+0
Error code of vision system dedicated function →	+1

6
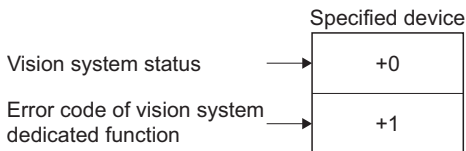
Both of them are set to 0 at the Multiple CPU system's power supply ON.

Refer to error codes for the error code of vision system dedicated function. (☞ Page 377 Error Codes)

The vision system status is indicated with the following values.

Storage value	Status	
0	Not connected	Status before logging onto the vision system.
10	Connecting	Status while executing log onto the vision system.
20	Reception enabled	Status in which the vision system has been logged onto, and the vision system dedicated functions can be executed.
30	Executing	Status in which vision system dedicated functions are being executed. Other vision system dedicated functions cannot be executed in this status.
40	Image data reception completed	Status in which the vision system job executed by the vision system dedicated function has been completed, and batch send of the image data has been completed. The image data storage device value can be used by the Motion SFC.
50	Value cell reception completed	Status in which the Motion CPU has received the data acquired by the job in the vision system. The read data storage device value can be used by the Motion SFC.
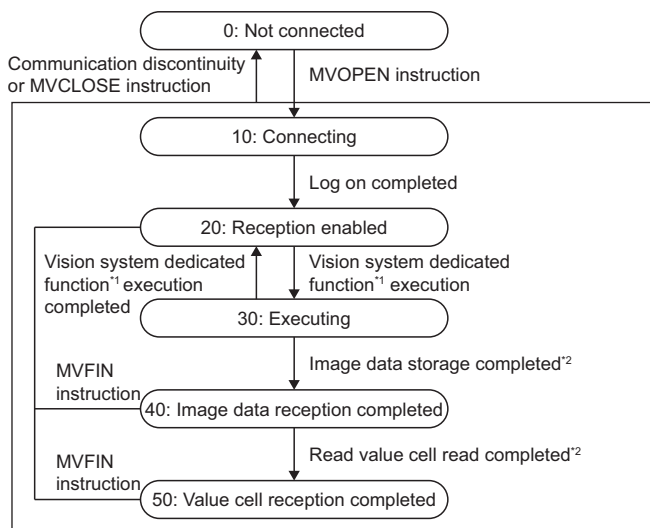
*1 MVLOAD, MVTRG, MVPST, MVIN, MVOUT, MVCLOSE and MVCOM instruction

*2 When the vision system job is started by the MVTRG instruction or MVPST instruction, if the image data storage device or read value storage device is set, the program will jump to line 40 or 50 at a normal completion. If the process ends abnormally, the program will jump to line 20.

■Error Flag

Set the bit device that turns ON if an error is detected when the vision system dedicated function is executed. Refer to device list for the range of bit devices that can be set. (☞ Page 75 Device List)

Vision Program Operation Setting

The job (vision program) set in the vision system is assigned as a program number so that it can be executed from the vision system dedicated functions.

✎ [Motion CPU Common Parameter] ⇨ [Vision System Parameter] ⇨ "Vision Program Operation"

Window
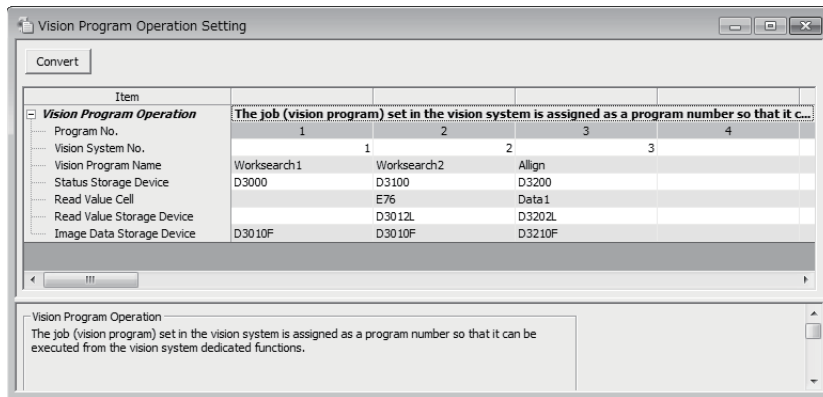
Displayed items

Item	Setting Range
Program No.	1 to 128
Vision system No.	1 to 32
Vision program name	Up to 32 characters
Status storage device	Word device
Read value cell	Up to 32 characters
Read value storage device	Word device
Image data storage device	Word device

■Program No. (Not necessary to set)
This number (1 to 128) is used by the vision system dedicated function to identify the vision system job.

■Vision System (camera) No.
Set the vision system number corresponding to the vision system that is executing the job.

■Vision Program Name
Set the name of the job executed by the vision system dedicated function.

■Status Storage Device

Set the word device that stores the job's load status and the vision system's online/offline status. Refer to device list for the range of word devices that can be set. (☞ Page 75 Device List)

Both of them are set to 0 at the Multiple CPU system's power supply ON. The job's load status is indicated with the following values.

Storage value	Status	
0	Job not loaded or offline	The job is not loaded, or even if loaded is offline. (An error occurs if a trigger is issued.)
1	Job loading completed and online	The job has been loaded and is online. (The job is executed if a trigger is issued.)

> **Point**
>
> The vision program status storage device value is refreshed at the following timing.
> - When a job is loaded by the MVLOAD instruction or MVPST instruction. (Refreshed immediately after loading.)
> - When the vision system's online/offline status changes.
> - When a job is loaded from a source other than the Motion CPU (In-Sight® Explorer, etc.). (Refreshed several seconds after loading.)
> - When job is loaded and an online vision system is logged onto with the MVOPEN instruction. (Refreshed several seconds after logging on.)

■Read Value Cell/Read Value Storage Device

Set this to store the vision system tag or numeric data of spreadsheet in the Motion CPU device. This does not need to be set if the numeric data does not need to be referred to.

> **Point**
>
> - The vision system image data can be stored in the image data storage device by setting the format output string setting of TCP/IP protocol.
> - When the data stored in the set tag or spreadsheet cell is not an integer value, the value after truncation of decimal point is stored in the read value storage device.
> - If a spreadsheet cell is designated when using the vision system In-Sight® EZ series, an error will occur when the job is executed.

The tag or spreadsheet cell is set in the Read Value Cell.

Setting with tag	Write the symbolic tag name in the original state. (Example) Tag: Job.Pass_count → Set "Job.Pass_count".
Setting with cell	Write the spreadsheet row (A to Z) and line (0 to 399). (Example) Cell: A5 → Set "A5".

The device storing the value set in the tag or spreadsheet cell is set in the read value storage word device. Refer to device list for the range of word devices that can be set. (☞ Page 75 Device List)

> **Point**
>
> Set the device No. as an even-number.

The cell or tag value is stored as a 32-bit integer value in two successive points of the set device.

■Image Data Storage Device

Set the word device for storing the image data obtained when the job was executed.

> **Point**
>
> The image data is stored only when the format output string setting of TCP/IP protocol is set in the vision system. (☞ Page 322 Setting batch send (TCP/IP protocol) of multiple data)

This does not need to be set if the format output string setting of TCP/IP protocol is not set in the vision system. Refer to device list for the range of word devices that can be set. (☞ Page 75 Device List)

> **Point**
>
> Set the device No. as an even-number.

The image data is stored as a 64-bit floating point type every four successive points from the specified device equivalent to the output data set with the format output string setting of TCP/IP protocol.
Use the type conversion instruction of Motion SFC according to the application.
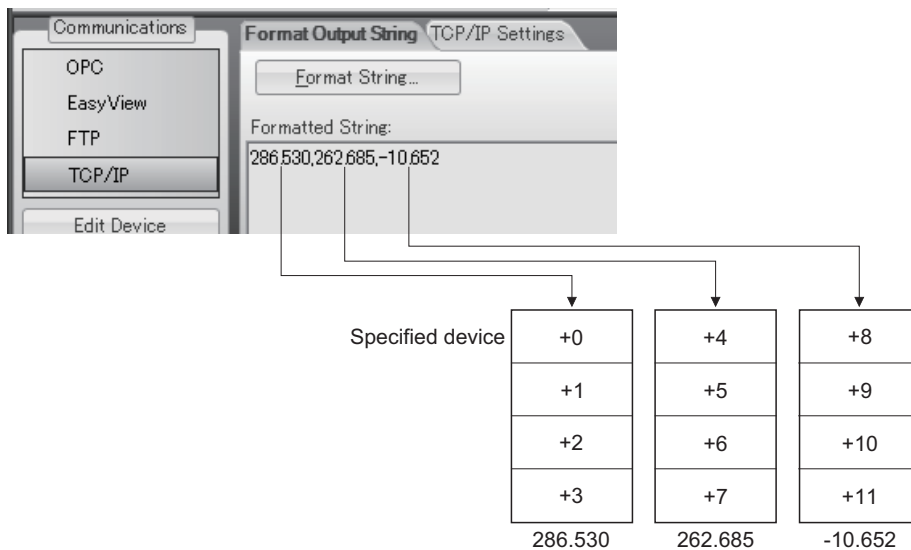
Setting batch send (TCP/IP protocol) of multiple data

By using the format output string setting of TCP/IP protocol, image data after the job is finished can be sent in a batch to the Motion CPU. Set with the following procedure using In-Sight® Explorer.

Operating procedure

1. Click the [Online] icon on the tool bar, and shift to the offline mode.

2. Click the [Communication] button under Application Steps to display the Communications screen.

3. Click the [Add Device] button to display the screen of Device Setup.

4. Select "Other" for "Device".

5. Select "TCP/IP" for "Protocol", and click the [OK] button.

<Screen: In-Sight® Explorer>
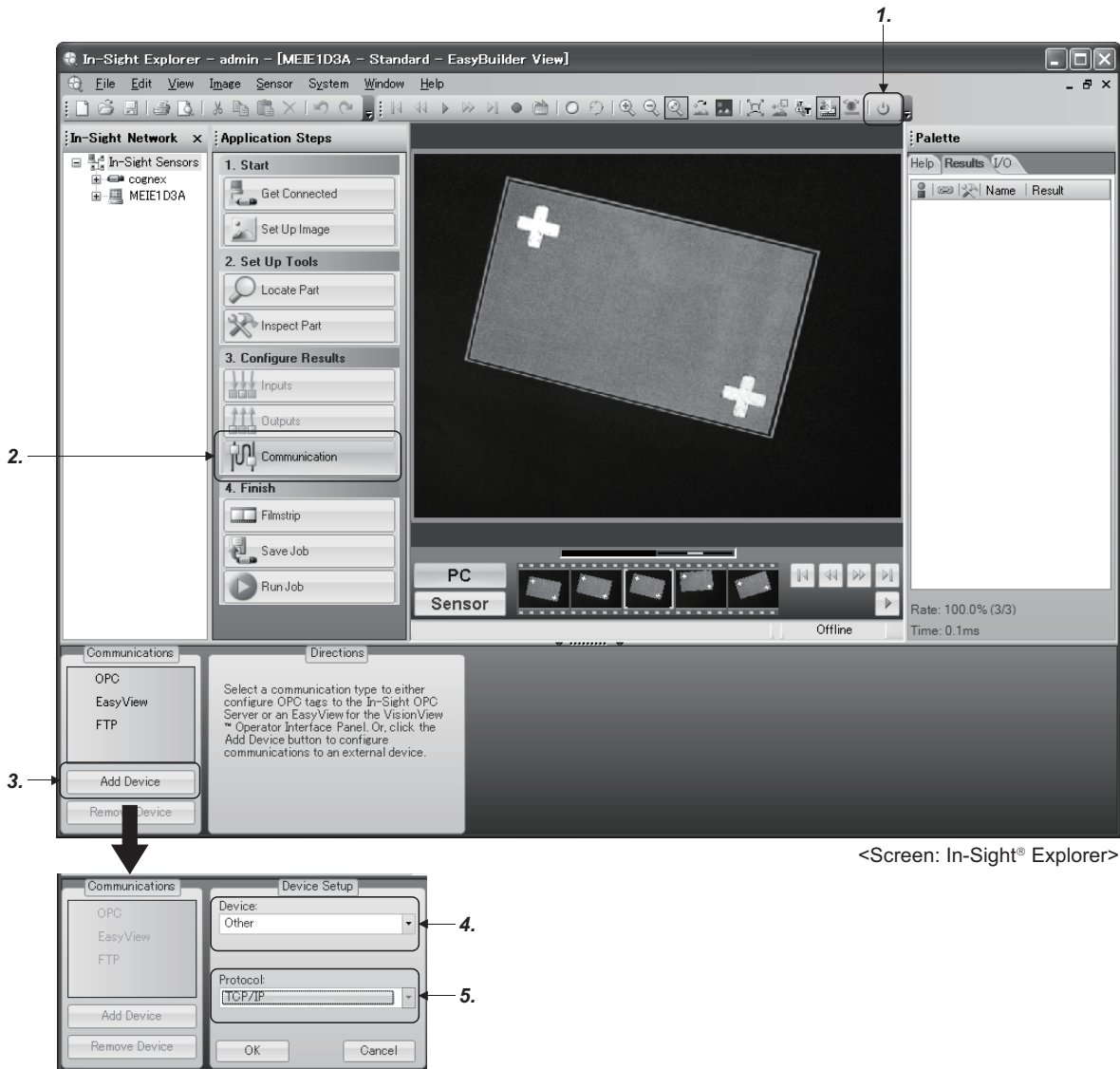
6. The "TCP/IP" device will be added. Click the [Format String] button to display the FormatString dialog.

7. Set "Use Delimiter", and set the selectable character with "Standard".

8. Click the [Add] button to display the Select Output Data dialog.

9. Select the data to be sent to the Motion CPU as the result of the job execution, and then click the [OK] button.


<Screen: In-Sight® Explorer>
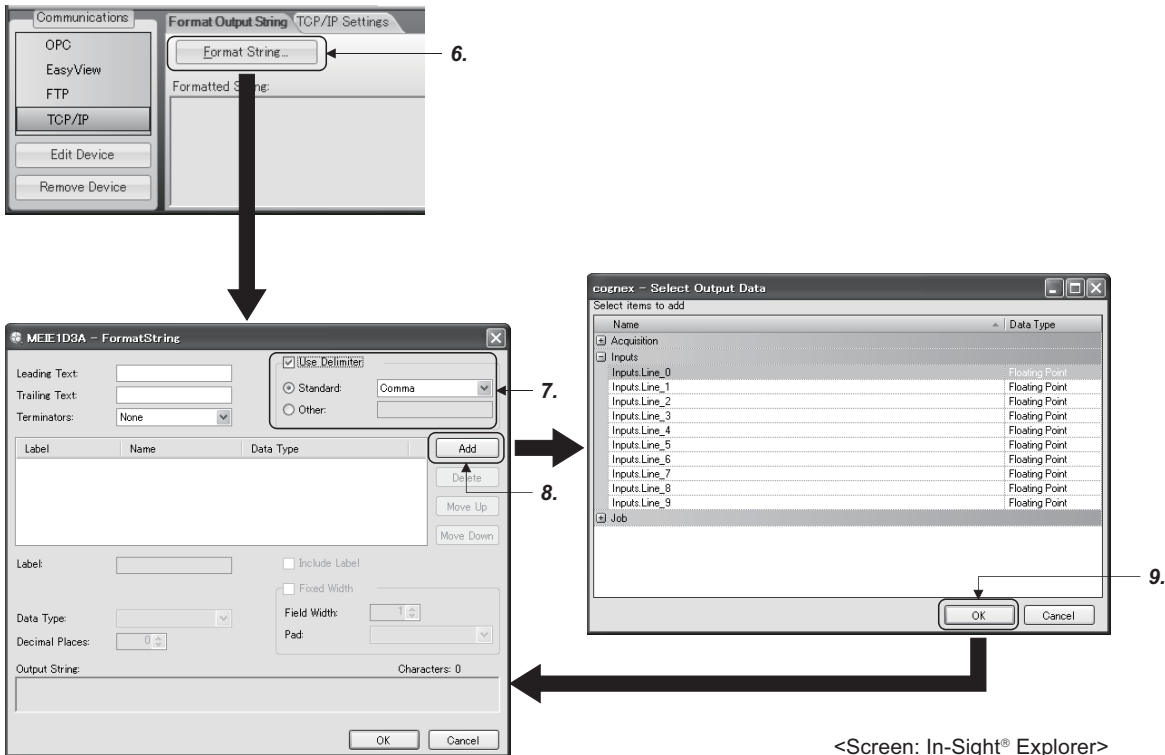
10. Set "Data Type" for the added data. Select "Integer", "Unsigned Integer" or "Floating Point". The data type stored in the Motion CPU device is always a 64-bit floating point type regardless of the data type set here.

11. Click [OK] button to close the FormatString dialog.

<Screen: In-Sight® Explorer>
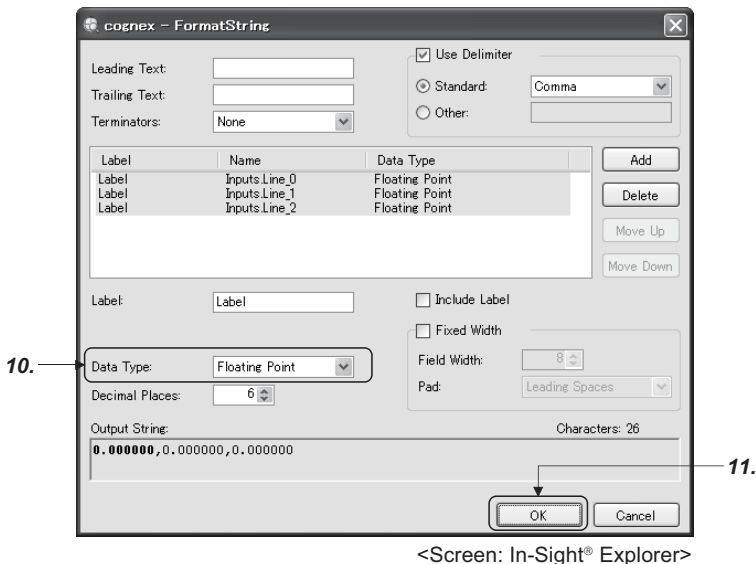
12. Check the "TCP/IP Settings". Leave the Server Host Name blank. (The vision system acts as the TCP/IP server.) The port number must be the same as the port No. for TCP/IP communication set with the Ethernet communication line setting. (☞ Page 316 Ethernet Communication Line Setting)

<Screen: In-Sight® Explorer>
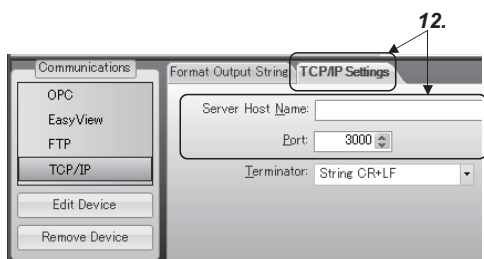
Flow of vision system control

This section explains the basic procedures for controlling the vision system from the Motion CPU.

Setting the vision system

Set the vision system network and create a job (vision program) using In-Sight® Explorer.

Setting the Motion CPU parameters

Set the Ethernet communication line setting and the vision program operation setting using MT Developer2. (☞ Page 316 Vision system parameter setting)

Controlling the vision system with vision system dedicated functions of Motion SFC

1. Log onto the control target vision system using the MVOPEN instruction.

2. Load the job (vision program) to be used using the MVLOAD instruction.

3. Issue a trigger to the vision system using the MVTRG instruction or vision system's image acquire trigger input. When the MVPST instruction is used, the job can be loaded and the trigger issued simultaneously.

4. When the vision system finishes executing the job, the job execution results are stored into the device set with the parameters (image data storage device and read value storage device) of Motion CPU.

In addition to the above procedure, data can be acquired from the vision system using the MVIN instruction or MC protocol. Select the method that suits the required data acquisition time or data type.

○: Enable, ×: Disable

Data acquisition method	Communication protocol	Data acquisition time	Output data type of vision system	Storage data type to the device	Batch acquisition of multiple data
Image data storage device	TCP/IP protocol	Fast ↑ ↓ Slow	Integer value	64-bit floating point type (Automatic conversion)	○
			Floating point value		
Read value storage device	Telnet		Integer value	32-bit integer type (Automatic conversion)	×
MVIN instruction	Telnet		Integer value	32-bit integer type (Automatic conversion)	×
			Floating point value	64-bit floating point type (Automatic conversion)	

5. Motion control is executed using the data acquired from the vision system.

6. Reset the status storage device using the MVFIN instruction to issue the next trigger.

7. If the job is not changed, repeat steps 3 to 6.

8. If necessary, log off the control target vision system using the MVCLOSE instruction.

> **Point**
>
> - If a different vision system dedicated function is executed for a vision system that is processing a vision system dedicated function, moderate error (error code: 38EDH) will occur. Apply the interlock conditions with the vision system's status storage device value to prevent double startup.
> - Depending on the status of the vision system and details of the job process, it may take some time to process the vision system dedicated function. Set the timeout time according to the state.
> - When logged onto the vision system, the vision system or Multiple CPU system's power supply can be turned OFF without logging off using the MVCLOSE instruction.

Sample program

Explanation of the operations

The following section gives an example of a program that executes positioning control using the adjustment data recognized by the vision system as the target data.

This program example is explained in the "Q series Motion compatible device assignment" device assignment method.

Setting the vision system

Complete the following settings with In-Sight® Explorer. Refer to the Cognex vision system manual or help sections for details on operating and setting In-Sight® Explorer.

■Ethernet communication setting

Item		Setting value
IP address		10.0.50.100
Port No.	Telnet	23
	TCP/IP	3000

■Job setting

Item		Setting value	
Job name		Worksearch1	
TCP/IP protocol - Format output string	1	Pattern_1.fIXTURE.x	Floating point
	2	Pattern_1.fIXTURE.y	Floating point

Vision system parameter setting

Complete the vision system parameter setting of MT Developer2.

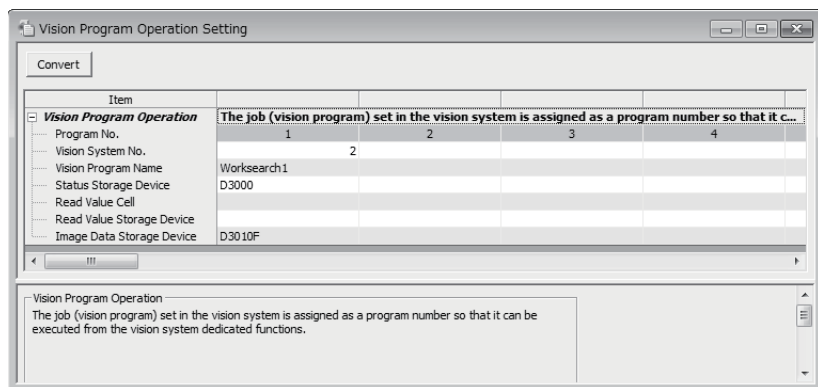### ■Ethernet Communication Line Setting
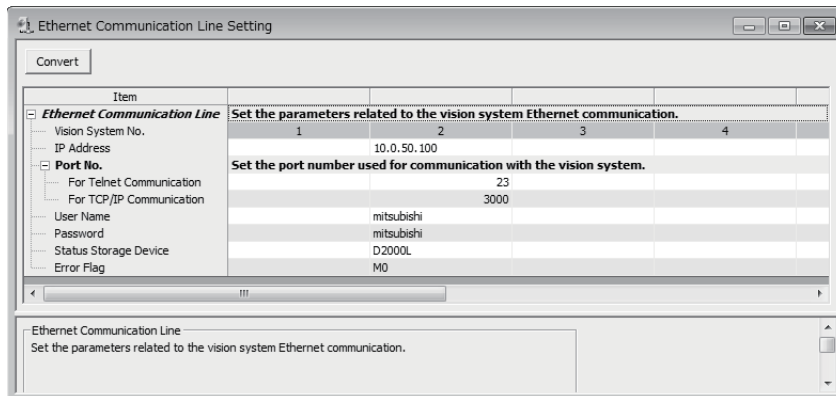
• Vision System No.2

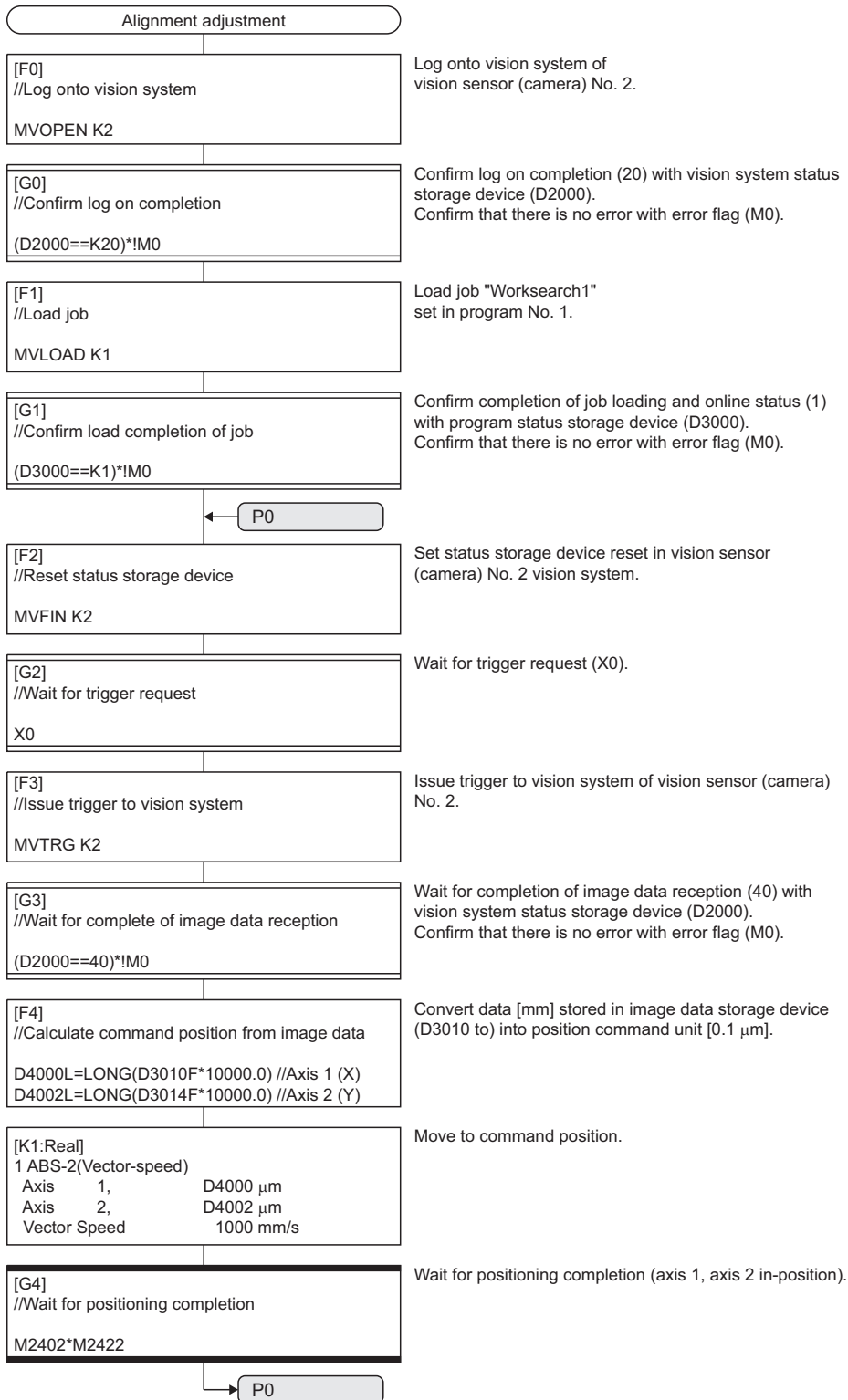| Setting item		Description
IP address		10.0.50.100
Port No.	Telnet	23
	TCP/IP	3000
User name		According to the vision system setting
Password		According to the vision system setting
Status storage device		D2000L
Error flag		M0

■Vision program operation setting

- Program No.1

Setting item	Description
Vision system No.	2
Vision program name	Worksearch1
Status storage device	D3000
Read value cell	Not necessary to set
Read value storage device	
Image data storage device	D3010F

Motion SFC program

```
        ( Alignment adjustment )
                  |
        [F0]
        //Log onto vision system              Log onto vision system of
                                              vision sensor (camera) No. 2.
        MVOPEN K2
                  |
        [G0]                                  Confirm log on completion (20) with vision system status
        //Confirm log on completion           storage device (D2000).
                                              Confirm that there is no error with error flag (M0).
        (D2000==K20)*!M0
                  |
        [F1]                                  Load job "Worksearch1"
        //Load job                            set in program No. 1.

        MVLOAD K1
                  |
        [G1]                                  Confirm completion of job loading and online status (1)
        //Confirm load completion of job      with program status storage device (D3000).
                                              Confirm that there is no error with error flag (M0).
        (D3000==K1)*!M0
                  |
           |←———( P0 )
           |
        [F2]                                  Set status storage device reset in vision sensor
        //Reset status storage device         (camera) No. 2 vision system.

        MVFIN K2
                  |
        [G2]                                  Wait for trigger request (X0).
        //Wait for trigger request

        X0
                  |
        [F3]                                  Issue trigger to vision system of vision sensor (camera)
        //Issue trigger to vision system      No. 2.

        MVTRG K2
                  |
        [G3]                                  Wait for completion of image data reception (40) with
        //Wait for complete of image data reception   vision system status storage device (D2000).
                                              Confirm that there is no error with error flag (M0).
        (D2000==40)*!M0
                  |
        [F4]                                  Convert data [mm] stored in image data storage device
        //Calculate command position from image data   (D3010 to) into position command unit [0.1 μm].

        D4000L=LONG(D3010F*10000.0) //Axis 1 (X)
        D4002L=LONG(D3014F*10000.0) //Axis 2 (Y)
                  |
        [K1:Real]                             Move to command position.
        1 ABS-2(Vector-speed)
          Axis      1,            D4000 μm
          Axis      2,            D4002 μm
          Vector Speed         1000 mm/s
                  |
        [G4]                                  Wait for positioning completion (axis 1, axis 2 in-position).
        //Wait for positioning completion

        M2402*M2422
                  |
             →( P0 )
```

6.6   Test Mode

In test mode, Motion CPUs are connected to a personal computer, and test operation is performed to verify whether servo motors are operating in accordance with design specifications. By starting the MT Developer2 test, a test mode request is issued to the Motion CPU. If the test mode request is successfully accepted, a test screen appears, allowing all test mode functions to be selected. Refer to the following for details on how to operate test mode.

📖Help of MT Developer2

The test mode operation differs depending on the operating system software and MT Developer2 version performing test mode.

The combinations for the operating system software and MT Developer2 version are shown below.

Motion CPU operating system software			MELSOFT MT Works2 (MT Developer2)	Test mode operation
R64MTCPU	R32MTCPU	R16MTCPU		
07 or later			1.120A or later	Multi-axis test operation
—	04 or later		1.115V or later	
			1.112S or earlier	Single axis test operation
	03 or earlier		1.112S or earlier	

Test mode specifications

The test mode specifications are shown below.

Function		Details	
		Multi-axis test operation	Single axis test operation
Operation axes selection		Select up to four axes for performing test operation.	Select one axis for performing test operation.
Operation axes servo ON/OFF	Servo ON	Servo ON the axes performing test operation. When a linear servo or DD motor are included in the operation axes, execute magnetic pole detection one axis at a time.	• All axes servo ON. • Each selected axis Servo ON.
	Servo OFF	Servo OFF the axes performing test operation.	• All axes servo OFF. • Each selected axis Servo OFF.
JOG operation		Perform JOG operation for up to four axes simultaneously.	Perform JOG operation for the specified axis.
Home position return		Perform home position return of the selected start axis.	Perform home position return for the specified axis.
Current value change		Perform current value change for up to four axes simultaneously.	Perform current value change for the specified axis.
Positioning operation		Perform positioning operation for up to four axes simultaneously.	Not available.
Stop		Stop request for axes in test operation.	
Rapid stop		Rapid stop request for axes in test operation.	
Error reset		Cancel error request, and reset the warning/error/servo alarm.	
Software stroke limit		Stroke limit check enabled/disabled can be selected when software stroke limit is valid.	Not available.
Hardware stroke limit		Stroke limit check enabled/disabled can be selected when FLS signal setting or RLS signal setting is valid.	Not available.

6

Differences between normal operation and test operation

The differences between normal operation and multi-axis test operation are shown below.

		Normal operation	Multi-axis test operation
JOG operation		JOG operation is executed based on the set values of JOG operation data and positioning dedicated signals.	JOG operation is executed based on the set values in JOG operation on the test screen.
Home position return	Proximity dog Dog cradle method	When home position return retry function is not set and home position return is performed again, a minor error (error code: 197BH) occurs, and home position return is not performed.	Regardless of the home position retry function setting, home position return can be performed again after home position return completion.
	Stopper method Dogless home position signal reference method	If home position return is performed again after home position return completion, a minor error (error code: 197BH) occurs, and home position return is not performed.	Home position return can be performed again after home position return completion.
Current value change		Current value change is executed based on the set values in the servo program.	Current value change is executed based on the set values in current value change on the test screen.
Positioning operation		Positioning operation is executed based on the set values in the servo program.	Positioning operation is executed based on the set values in positioning operation on the test screen.

Parameters used during test mode

During test mode, multi-axis test operation is performed using the parameters set in the test screen of MT Developer2.

Parameter settings

The parameters set for performing JOG operation and positioning operation are shown below.

Parameter		
JOG operation	Basic setting	JOG operation
		Acceleration time constant
		Deceleration time constant
		Rapid stop deceleration time constant
	Application setting	S-curve ratio
		Torque limit value
	Stroke limit valid/invalid setting	
Positioning control	Basic setting	Command speed
		Travel value
		Acceleration time constant
		Deceleration time constant
		Rapid stop deceleration time constant
	Application setting	S-curve ratio
		Torque limit value
	Stroke limit valid/invalid setting	
	Operation permission for home position return incompletion	

Point

- The set values of parameters other than those above (advanced S-curve acceleration/deceleration, deceleration processing on STOP input, allowable error range for circular interpolation, bias speed at start) are default values during test mode.
- When JOG operation or positioning operation is executed during test mode and the torque limit value of the test mode operation axis is changed, the torque limit value does not change back until it is reset by Motion SFC program, or Motion dedicated PLC instruction.

Test mode transition/cancellation

At a test mode transition request, initial processing is performed, and parameters and programs are read. Refer to initial processing for details of initial processing. (☞ Page 71 Initial processing)

Test mode transition

When transitioning to test mode all axes become servo OFF regardless of the servo ON/OFF status. ("[Rq.1123] All axes servo ON command (R: M30042/Q: M2042)" and "[Rq.1155] Servo OFF command (R: M34495+32n/Q: M3215+20n)" turn ON.)
In the following cases, transition to test mode is not possible.
- "[Rq.1120] PLC ready flag (R: M30000/Q: M2000)" turns ON.
- There is an axis in operation.
- An error occurred in the initial processing at test mode request transition.

> **Point**
>
> Note that at transition to test mode, all servo ON axes will change to servo OFF.

Test mode cancellation

To cancel test mode, request cancellation after stopping all axes. If there is an axis in operation, test mode cannot be cancelled. When test mode is cancelled the servo ON/OFF status of all axes ("[Rq.1123] All axes servo ON command (R: M30042/Q: M2042)", "[Rq.1155] Servo OFF command (R: M34495+32n/Q: M3215+20n)") does not change from that of before cancellation.
To servo ON the servo OFF axes after test mode is cancelled, turn "[Rq.1155] Servo OFF command (R: M34495+32n/Q: M3215+20n)" from ON to OFF.

Stop processing of axes operating in test mode

When the following stop factors occur in an axis in test mode operation, stop processing is performed for all axes performing test operation. When performing test operation for multiple axes and a stop command or stop factor applies to one of the axes in test operation, stop processing is also performed for the axes in test mode operation that the stop command or stop factor does not apply to.

Stop factor	Stop processing
Stop signal input (STOP) external signal turned ON[1]	Deceleration stop
Software stroke limit is reached[2]	
Hardware stroke limit is reached[1][3]	
"[Rq.1140] Stop command (R: M34480+32n/Q: M3200+20n) turned ON"[1]	
"[Rq.1141] Rapid stop command (R: M34481+32n/Q: M3201+20n)" turned ON[1]	Rapid stop
"[St.1068] Servo error detection (R: M32408+32n/Q: M2408+20n)" turned ON[1][5]	
Stop from MT Developer2	Deceleration stop
Rapid stop from MT Developer2	Rapid stop
Communication with MT Developer2 is disconnected	Deceleration stop
CPU stop error[4]	
Reset of multiple CPU system[4][5]	Immediate stop
Motion CPU WDT error[4][5]	
Multiple CPU system power supply OFF[4][5]	
Motion CPU forced stop	
Servo amplifier forced stop[5][6]	
Servo amplifier control circuit power supply OFF[5][6]	

[1] During home position return, stop processing is not performed for axes where the stop factor has not occurred.
[2] When software stroke limit is set to "Disabled", a check of the stroke limit range is not performed.
[3] When hardware stroke limit is set to "Disabled", a check of the stroke limit range is not performed.
[4] Test mode is cancelled when a stop factor occurs.
[5] The servo motor is stopped by dynamic brake.
[6] A deceleration stop is performed on axes where the stop factor does not occur.

Point

When axes in test mode operation are servo OFF ([St.1075] Servo ready (R: M32415+32n/Q: M2415+20n): OFF) by the operation axis servo OFF in the test screen or when a servo error occurs, the "Ready ON (b0)" of "[Md.108] Servo status 1 (R: D32032+48n/Q: #8010+20n)" turns ON, and "Servo ON (b1)" turns OFF.

6.7 Positioning Control Monitor Function

Scroll monitor

The scroll monitor is a function used to monitor up to 256 items of positioning start history such as servo programs, JOG start, and Motion dedicated PLC instructions. This function applies to controls for which the start accept flag turns ON. (G-code control is not recorded in the history.)

Scroll monitor information is retained even when the Multiple CPU system power supply is turned OFF, or when reset. The scroll monitor is cleared by executing the scroll monitor [History clear] or "Motion CPU memory clear" from MT Developer2. The following items are displayed on the scroll monitor.

Item	Displayed content		Remarks
Date/time	Displays the date and time at which control was started.		Year/month/day hour:minute:second. 1/1000 second yyyy/MM/dd hh:mm:ss.ssss (1ms units)
Servo P. No.	Displays the control that was started.	K0 to K8191	Starts the servo program (K).
		JOG	Starts JOG operation.
		TEST	Starts the current value change or home position return in test mode.
		SCPU	Starts M(P).CHGA, D(P).CHGA, M(P).CHGAS, D(P).CHGAS, M(P).SVSTD, and D(P).SVSTD instructions from the PLC.
		Sync	Starts advanced synchronous control.
		□->□ *: □ represents the following. P: Positioning control mode V: Speed control mode T: Torque control mode CT: Continuous operation to torque control mode	Control mode switching
		PRS	Starts pressure control.
		MCNST	Starts MCNST instruction.
		MCNST(SCPU)	Starts M(P).MCNST and D(P).MCNST instructions from the PLC.
		MCNJOG	Starts machine JOG operation.
Axis No./Machine No.	Displays the axis No. or machine No. to be started.		
Servo program instruction	Displays the started servo program command.		• In the case of simultaneous start commands, the number of the servo program to be started is displayed. (Individual servo programs to be started are not registered in the scroll monitor.) • Remains blank for JOG start, machine JOG operation start, synchronous control start, and control mode switching.

Current value history monitor

The current value history monitor is a function used to monitor the encoder position data history for each axis. Current position data, home position return data, and Multiple CPU system power supply ON/OFF data (for past 10 times) can be monitored. Current value history monitor information is always stored, regardless of whether the system is absolute or incremental, and is retained even when the Multiple CPU system power supply is turned OFF, or when reset. The current value history monitor is cleared when clearing the built-in memory with the rotary switch. The following items are displayed on the current value history monitor.

Display item	Displayed content	Remarks
Item	Displays current value history items. • Home position data: Current value when home position return is completed normally. • Monitor value: Current real-time current value[1] • Power supply ON: Current value when servo amplifier initial communication established[1][2] • Power supply OFF: Current value when communication with servo amplifier disconnected[1][2][3]	
Date/time	Displays the date and time at which current value history was recorded.	Year/month/day hour:minute:second. 1/1000 second yyyy/MM/dd hh:mm:ss.ssss (1ms units)
Encoder current value	Displays the motor encoder multi-revolution counter and position within a single revolution.	Decimal notation
Servo command value	Displays the positioning command value sent to the servo amplifier.	Decimal notation
Monitor current value	Displays the current value managed inside the Motion CPU.[4]	Decimal notation
Error code	Displays the error code if an error relating to current value restoration occurs when the servo amplifier power supply is turned ON.	Warning (error code: 093CH, 093FH)

[1] History is not updated if a servo amplifier AL.16 error (encoder initial communication error 1) has occurred at an absolute position system.

[2] "Power supply ON" displays the date and time at which initial communication was established with the servo amplifier, and "Power supply OFF" displays the date and time at which communication with the servo amplifier was disconnected. Consequently, a single item of history is recorded even when communication is interrupted or resumed with the SSCNET connect/disconnect function when the servo amplifier control power supply and Multiple CPU system power supply are ON.

[3] The "Power supply OFF" history is updated at the same time as the "Power supply ON" history when the power supply is subsequently turned ON (when initial communication established with servo amplifier).

[4] A value close to the feed current value is displayed, however, the monitor current value and feed current value are different, and therefore it is not abnormal for a different value to appear.

Speed monitor

By selecting "Target speed" for the display item at the MT Developer2 axis monitor screen, the command speed (displayed in axis control units) specified with the program currently being used for positioning control can be monitored. Successive command speed [pulse/s] can be monitored with "[Md.28] Command speed (R: D32024+48n, D32025+48n/Q: #8004+20n, #8005+20n)". The following table shows whether the monitor speed can be displayed for each type of control.

○: Display possible, ✕: Display not possible, or not possible to update the display

Control details	Target speed	[Md.28] Command speed(R: D32024+48n, D32025+48n/Q: #8004+20n, #8005+20n)
PTP (point to point) control	○[*1]	○
Fixed-pitch feed	○	
Speed control (I)	○	
Speed control (II)	○	
Speed/position switching control	○	
Continuous trajectory control	○[*2]	
Fixed-pitch feed control	○	
Speed control with fixed position stop	○	
JOG operation	○	
Manual pulse generator operation	✕	
Home position return	○	
High-speed oscillation	✕	
Synchronous control output axis	✕	
Speed change (CHGV command, M(P).CHGV command, D(P).CHGV command)	○[*3]	
Speed-torque control	✕	○[*4]
G-code control	✕	○

*1 The speed (vector speed, reference axis speed, long-axis speed) specified in the program is displayed while executing interpolation instructions. The same value displays for each axis.

*2 The speed specified at a midway point in continuous trajectory control is updated as the monitor screen command speed when analyzing point data. Point data analysis is carried out prior to point switching, and therefore the monitor screen command speed is updated prior to point switching.

*3 If the speed specified at speed change exceeds the speed limit value, the actual command speed limited by the speed limit value is displayed.

*4 The speed limit value is stored during torque control.

Point

The "[Md.28] Command speed (R: D32024+48n, D32025+48n/Q: #8004+20n, #8005+20n)" is calculated based on the amount of change in the position command (pulse units) sent to the servo amplifier each operation cycle. Consequently, there are times when the displayed speed for each operation cycle varies due to speed conversion fraction processing.

6.8 Label Access from External Devices

Communication from an external device such as a graphic operation terminal (GOT) to the Motion CPU is possible by specifying label names.

The external device accesses labels by specifying label names in the label allocation information stored in the Motion CPU. Label allocation information defines the label names and data types, as well as where each label is allocated.

This makes it possible for external devices to communicate with the Motion CPU by specifying label names, without having to remember the addresses allocated to each label.
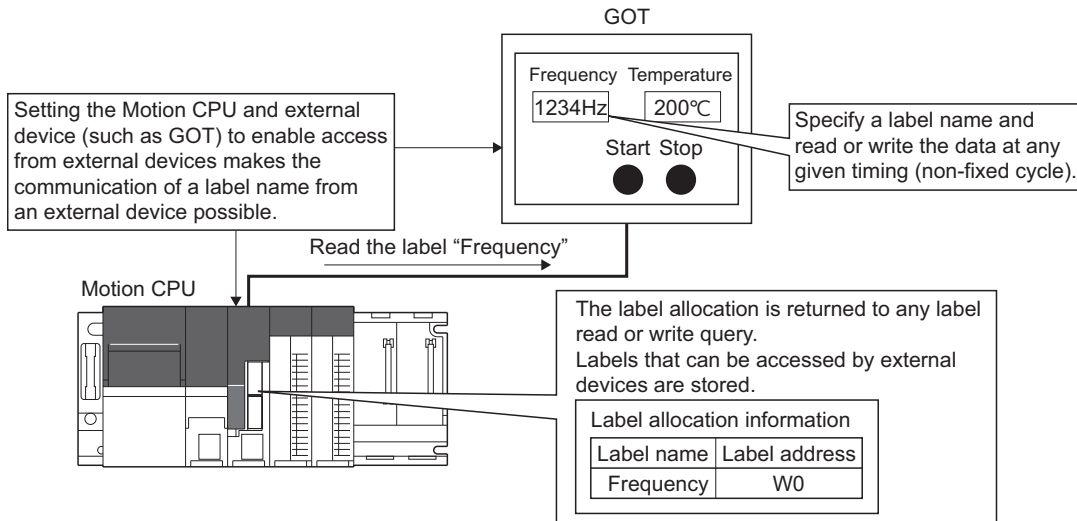
Setting Labels

Set the label to be accessed from an external device in label setting, and check "Access from external device".

Refer to the following for the operation procedures of label setting.

📖Help of MT Developer2
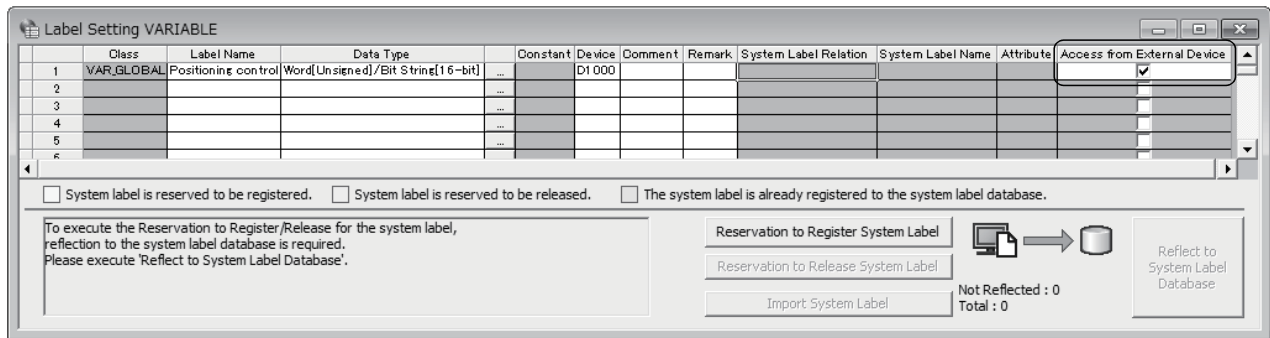
When label allocation is changed

When a device with a label allocated in the label setting is changed, the Motion CPU follows up by automatically making the external device refer to the changed device, therefore changing the label settings at the external device is not required.

However, when data type etc. is changed, an update at the external device is required.

The actions at the external device when a label is changed are shown below.

Change at the Motion CPU	Change at the external device	Remarks
Changed device allocated to label	Change at external device not required	—
Changed the data type of the label	Change at external device required	Change the data type changed at the Motion CPU at the external device.
Deleted the label		Correct the label deleted at the Motion CPU at the external device.

Storing label allocation information

The label allocation information used when accessing labels from external devices is stored in the standard ROM or the SD memory card. When using label allocation information stored in the SD memory card (storing label allocation information in the SD memory card), set the transfer for "label allocation information" in the SD memory card with the file transmission at boot function.

Refer to file transmission at boot function for details on file transmission at boot function. (☞ Page 118 File Transmission at Boot Function)

Not using file transmission at boot	Using file transmission at boot (specify label/structure file control data)	
	Specifying the standard ROM	**Specifying the SD memory card**
Standard ROM	Standard ROM	SD memory card

■Description example for operation file at boot

- When using the label allocation information stored in the SD memory card (label/structure file (GL_LABEL.IF2))

/GL_LABEL.IF2, /sdc, , pathset

- When using the label allocation information stored in the standard ROM (label/structure file (GL_LABEL.IF2)) (initial status)

/GL_LABEL.IF2, /rom, , pathset

6

7 DIGITAL OSCILLOSCOPE

7.1 Features

Analysis is possible with high-accuracy sampling.

Sampling is possible in cycles as short as 0.222ms. Sampling is performed without missing specified control data changes. By reading the sampling result with the MT Developer2 digital oscilloscope and outputting to a waveform, the identification of system startup and the cause of trouble can be analyzed with high accuracy.

Offline sampling is possible with the personal computer.

By writing a setting data file necessary for sampling to the Motion CPU standard ROM or to an SD memory card beforehand, sampling can even be performed offline. This allows sampling to be performed even in environments where there is no personal computer or where the cable connected to the personal computer is damaged. Furthermore, sampling results output and saved to a specified location can be checked and analysed directly without using the MT Developer2 digital oscilloscope.

7.2 Function Overview

With the digital oscilloscope function, data can be sampled in specified cycles, and sampling results can be saved to the standard ROM or to an SD memory card.

7.3 Digital Oscilloscope Specifications

The digital oscilloscope specifications are shown in the following table.

Individual sampling setting specifications

Function			Specification
Sampling settings data storage target			Standard ROM, SD memory card
Sampling type			Trigger sampling
Sampling start setting			User operation
Sampling interval			Operation cycle, 0.222ms × sampling rate interval
No. of channels	Word data		Up to 16 channels
	Bit data		Up to 16 channels
Word size	2 bytes		With sign/Without sign
	4 bytes		With sign/Without sign
Sampling target	Word data	Servo control data	Selected from probe item list.
		Motion dedicated device	
		Advanced synchronous control device	
		Optional device	Word device[1]
	Bit data	Motion dedicated device	Selected from probe item list.
		Advanced synchronous control device	
		Optional device	Bit device[1]
Trigger	Number of sampling points		Up to 133120 points (default: 8192 points)
	Trigger mode	No trigger	—
		Data conditions	OR condition, AND condition
	Setting when trigger mode is data conditions	Trigger pattern (bit)	No setting, OFF, ON, OFF → ON (leading edge), ON → OFF (trailing edge)
		Trigger pattern (word)	No setting, increase direction, decrease direction, increase or decrease direction
		Trigger reference value (word trigger only)	Specified in data type range for each channel.
		Filter specification	0 to 10000 (× rate ms)
Saving	Sampling results save destination		Standard ROM, SD memory card
	File format		CSV
Real-time display	Channels capable of real-time display	Word	Up to 8 channels
		Bit	Up to 8 channels

*1   Refer to device list for the range of devices that can be set. (⌕ Page 75 Device List)

7.4 Digital Oscilloscope Operating Procedure

The digital oscilloscope sampling operating procedure is described below. The digital oscilloscope is operated using MT Developer2. Set clock data before using the digital oscilloscope. File name time information is created based on the clock data setting. (☞ Page 113 Clock Function)

Furthermore, if using an SD memory card, the card must be formatted. (☞ Page 351 SD memory card handling)
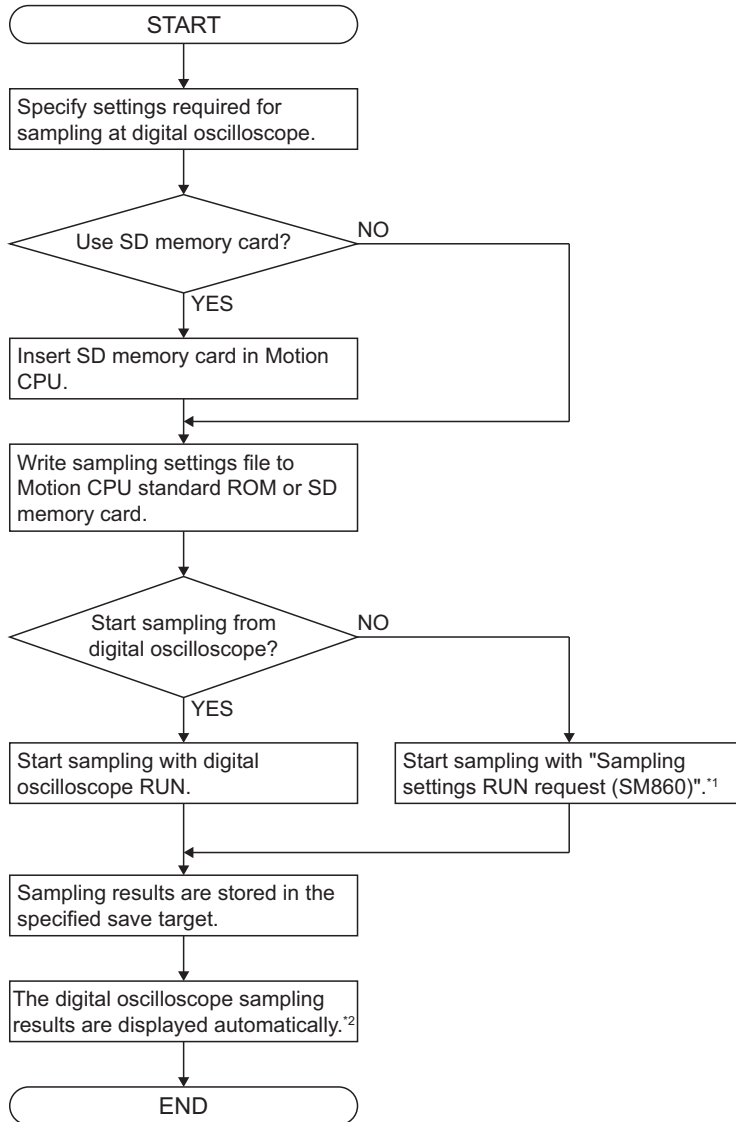
*1 Operation is possible even if not connected to the digital oscilloscope.
*2 Sampling results are displayed automatically, however, sampling results files can also be read later.

7.5 Sampling Settings File

The sampling settings file is a file used to set information required for sampling such as the sampling interval and probe data. The sampling settings file is saved to the standard ROM or to an SD memory card. Sampling is started by specifying the sampling settings file storage target. The sampling settings file setting items are as follows.

File type	Setting item
Sampling settings file	Sampling interval
	Sampling target
	Trigger settings
	Save settings

7.6 Sampling Functions

The functions used to perform sampling with the digital oscilloscope are as follows.

Sampling type

The sampling type sets the sampling method.

Trigger sampling

Values before and after the trigger (when specified conditions established) are sampled only in the specified range. Sampling is complete when saving to the specified save destination is complete.

Sampling start settings

Sampling start settings specify conditions required to start sampling with the digital oscilloscope.

User operation

Sampling of the sampling settings file stored in the standard ROM or SD memory card is started with a digital oscilloscope RUN output, or when the "Sampling settings RUN request (SM860)" turns from OFF to ON.

■RUN from digital oscilloscope
The sampling settings file is specified, and sampling is started with digital oscilloscope RUN. Sampling can be stopped with digital oscilloscope STOP during sampling.

■"Sampling settings RUN request (SM860)" OFF → ON
"Sampling settings storage target (SD860)" is specified, and sampling is started when "Sampling settings RUN request (SM860)" is turned ON. Furthermore, sampling is stopped by turning the "Sampling settings RUN request (SM860)" OFF. Sampling can be performed even when not connected to the personal computer.

Digital oscilloscope request device

Setting item	Setting details	Setting value	Fetch cycle	Device No.
Sampling settings RUN request	Requests sampling. By setting the "Sampling settings storage target" and turning ON the RUN request, sampling is started. Sampling is stopped by turning OFF the request during sampling. This device does not change even when sampling is complete. The RUN request is ignored even if the device is turned from OFF to ON while the "Sampling settings RUN status" is ON.	ON: RUN OFF: STOP	Main cycle	SM860

Digital oscilloscope setting device

Setting item	Setting details	Setting value	Fetch cycle	Device No.
Sampling settings storage target	Set the storage target drive for sampling settings data subject to sampling. Read when the "Sampling setting RUN request" is ON.	0: Standard ROM 1: SD memory card	When "Sampling setting RUN request" is ON	SD860

Sampling interval

Set the interval condition for sampling with the digital oscilloscope.

Operation cycle

Sampling is always performed in the operation cycle interval.

Sampling rate specification

Sampling is performed in "0.222ms × sampling rate interval".

Sampling rate range
1 to 10000

Sampling target

The probe item to be sampled with the digital oscilloscope is set in the probe settings. 16 channels can be set for probe items in word data, and 16 channels can be set for bit data for each sampling settings file. The following data is set in the probe settings.

Type		Range
Word data	Servo control data	Selected from probe item list.
	Motion dedicated device	
	Advanced synchronous control device	
	Optional device	Word device[*1]
Word data size		2 bytes (with sign/without sign), 4 bytes (with sign/without sign)
Bit data	Motion dedicated device	Selected from probe item list.
	Advanced synchronous control device	
	Optional device	Bit device[*1]

*1   Refer to device list for the range of devices that can be set. (☞ Page 75 Device List)

Trigger settings

Trigger condition settings

Trigger conditions are set to turn ON the trigger. The following items are set in the trigger condition settings.

■Data conditions

• Trigger mode setting

Select the conditions used to turn ON the trigger with trigger conditions set for each channel.

The establishment of trigger conditions set for each channel is judged with either the OR condition or AND condition. OR and AND conditions cannot be combined and used for each channel.

Condition	Details
OR condition	The trigger turns ON if any of the conditions for each channel data are established.
AND condition	The trigger turns ON if all of the conditions for each channel data are established.

• Trigger conditions

Trigger conditions are set for each channel. The number of channels for which trigger conditions are set is 16 channels in word data, and 16 channels in bit data. (for number of probe settings)

(1) Bit trigger pattern

Pattern	Details
No setting	—
ON	When the channel value is ON
OFF	When the channel value is OFF
↑	When the channel value changes from OFF to ON
↓	When the channel value changes from ON to OFF

(2) Word trigger pattern

These are the conditions when compared with the value specified for the trigger reference value (trigger value).

Pattern	Details
Increase direction	When the channel value changes from a value smaller than the trigger value to the trigger value or greater
Decrease direction	When the channel value changes from a value greater than the trigger value to the trigger value or smaller
Increase or decrease direction	When the channel value changes from a value smaller than the trigger value to the trigger value or greater, or from a value greater than the trigger value to the trigger value or smaller

- Trigger reference value

  The trigger reference value (trigger value) set with a word trigger sets the range corresponding to the size of each word data.

Word size		Lower limit	Upper limit
2 bytes	Without sign	0	65535
	With sign	-32768	32767
4 bytes	Without sign	0	4294967295
	With sign	-2147483648	2147483647

- Filter specification

  The trigger point is set as the point after time elapsed of the sampling interval × filter specification value after the trigger turns ON. The filter specification can be set for each channel.

Filter setting range
1 to 10000

■No trigger condition settings

No trigger conditions are set. Sampling can be completed with a STOP output during sampling.

Sampling points

The number of sampling points that can be set when specifying trigger condition settings is as follows. By increasing the sampling points, the sampling results file size and time taken to output the results to the save destination increase, and therefore caution is advised.

■Trigger sampling

- Sampling results save destination

Save destination	Save volume
Standard ROM	10 to 8192 points (default: 8192 points)
SD memory card	10 to 133120 points (default: 8192 points)

■Sampling points before trigger

0 to sampling points -1 (default: sampling points/2)

■Sampling points after trigger

1 to sampling points - sampling points before trigger

Saving sampling results

Data sampled with the digital oscilloscope is stored in the Motion CPU internal memory, and when sampling is complete, sampling results are saved to the standard ROM or to an SD memory card.

*: If saving to the standard ROM, only one stored file is saved.
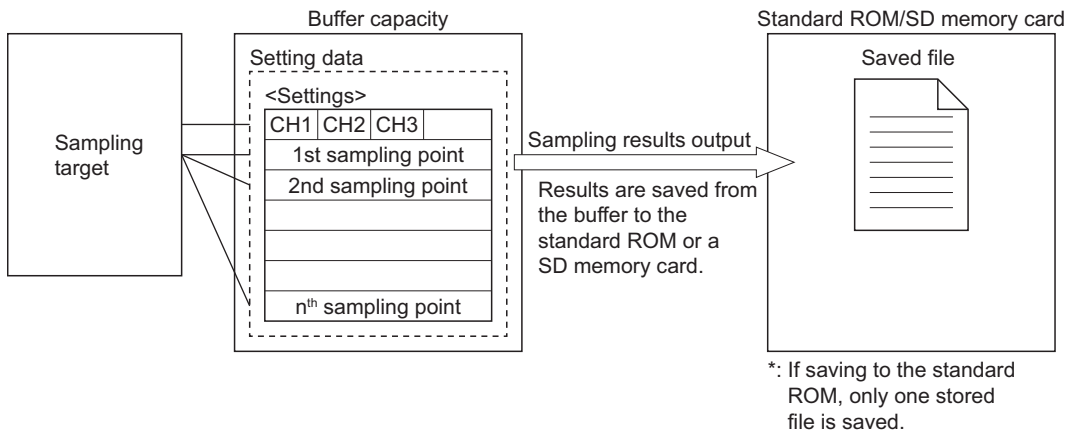
Sampling results save destination

The sampling results save destination is specified from the following.

"Standard ROM" cannot be specified if the save destination for the sampling settings file is SD memory card.

Sampling settings file save destination	Settable save destination
Standard ROM	• Standard ROM (trigger sampling only) • SD memory card
SD memory card	• SD memory card

Save destination folder and file name

Sampling results are stored to a sampling results output folder in the specified save destination (standard ROM or SD memory card), and the system time (hexadecimal notation) is output as the file name in 8 digits when outputting sampling results.

Save destination folder	Save file name (system time [1])
\data\oscout**	********.csv

[1] Elapsed time (seconds) up to the current time using Greenwich Mean Time 00:00:00, January 1st 1970 as the reference.

7.7 Digital Oscilloscope Status

The digital oscilloscope status can be checked at the digital oscilloscope monitor.

Digital oscilloscope monitor data

■Bit device

Monitor item	Stored content	Monitor value	Refresh cycle	Device No.
Sampling settings RUN status	Turns ON when sampling is started. Turns OFF when saving of the sampling results is complete.	OFF: STOP ON: RUN	When sampling status changes (main cycle)	SM760
Sampling settings trigger status	Turns ON when trigger conditions are established. Remains ON even when sampling is complete, and turns OFF when starting sampling.	OFF: Before trigger ON: After trigger	When trigger ON (sampling cycle)	SM761
Sampling settings saving	Turns ON while saving data in the buffer data to the storage target when performing sampling.	OFF: Not while saving ON: While saving	When file save status changes (main cycle)	SM762

■Word device

Monitor item	Stored content	Monitor value	Refresh cycle	Device No.
Sampling settings storage target	The storage target for the sampling settings file being sampled is stored.	0: No sampling 1: Standard ROM 2: SD memory card	When starting sampling (main cycle)	SD760
Sample settings results save target	The sampling results save destination for the data being sampled is stored.	0: No sampling 1: Standard ROM 2: SD memory card		SD761
Sampling settings sampling type	The sampling type being sampled is stored.	0: No sampling 1: Trigger sampling		SD762
Sampling settings sampling results Latest file information	The latest sampling results file information (system time [1]) is stored.	Latest saved file information	When outputting sampling results (main cycle)	SD764, SD765

*1   Elapsed time (seconds) up to the current time using Greenwich Mean Time 00:00:00, January 1st 1970 as the reference can be checked.

7

7.8 Digital Oscilloscope Errors

When digital oscilloscope errors occur

If an error occurs at the digital oscilloscope, the error detection special relay turns ON, the error code is stored in a special register, and this appears in the Motion CPU error batch monitor in MT Developer2. The error is not displayed in the error history. Furthermore, if a self-diagnosis error has occurred, sampling will not be possible. (The cause of this error is also not detected.)

■Bit device

Monitor item	Stored content	Monitor value	Refresh cycle	Device No.
Sampling setting Sampling error	Turns ON when sampling error occurs. Turns OFF when the next sampling is started.	OFF: No error ON: Error	Main cycle	SM765

■Word device

Monitor item	Stored content	Monitor value	Refresh cycle	Device No.
Sampling setting digital oscilloscope error cause	The error code for the sampling error is stored. This is cleared to 0 when the next sampling is performed.	0: No error Other than 0: Error code	Main cycle	SD769

> **Point**
>
> When the communication load is heavy, while automatically reading the sampling result, the MT Developer2 digital oscilloscope may timeout with the dialogue "reading..." displayed, and cancel reading (communication error). When this happens, the sampling result can be read manually by [Online] ⇨ [Sampling Result File Operation].

Digital oscilloscope error list

The following table shows the details and cause of errors occurring at the digital oscilloscope, and the corrective action for those errors.

Error code	Error name	Error details and cause	Corrective action
0032H	Outside settings data storage range	A value outside the setting range for the "Sampling settings storage target" was set when "Sampling setting RUN request" is ON.	Set the "Sampling settings storage target" inside the range.
0033H	Settings file write error	No settings file exists.	Write the settings file again from the digital oscilloscope.
0034H	SD card unusable	Sampling was started with no SD memory card inserted, or with use of the SD memory card forcibly stopped.	• Check whether the SD memory card has been inserted. • If use of the SD memory card has been forcibly stopped, release the stop.
0035H	SD memory card writing not possible	The SD memory card is write protected.	Release the SD memory card write protect.
0064H	Settings file error	There is an error in the settings file.	Write the settings file again from the digital oscilloscope.
0065H	Settings file version not supported	The settings file version is not supported.	Check the versions compatible with the digital oscilloscope, and write the settings file again.
0096H	Sampling results output error	The specified drive (memory) capacity or folder/file configuration is wrong, and therefore it was not possible to complete sampling results output.	Delete any unnecessary files, and secure sufficient memory space.

8 MOTION CPU MEMORY STRUCTURE

Programs and parameters used for Motion CPU control are stored as files in a nonvolatile memory "standard ROM" built in to the Motion CPU, or a "SD memory card" installed in the SD memory card slot of the Motion CPU.

The SD memory card can be removed from the Motion CPU and used with peripheral equipment such as personal computers, facilitating flexible data management.

Furthermore, by saving the system operating system software in a predetermined folder beforehand, it can be installed in the Motion CPU.

8.1 Memory and Files

Standard ROM/SD memory card specifications

The Motion CPU standard ROM and SD memory card specifications are as follows.

Item	Standard ROM	SD memory card
Memory capacity[*1]	12288kbytes	SD memory card capacity (Up to 32Gbytes)
Formatting prior to initial use	Not required[*2]	Required[*3]
Formatting method	• MT Developer2 "Motion CPU memory format" • Initialization with rotary switch	MT Developer2 "Motion CPU memory format"

*1 Total capacity including file management area. The capacity excluding the file management area is smaller. Free memory space can be checked with MT Developer2.

*2 Formatting is completed prior to shipping.

*3 Format SD memory cards with MT Developer2. If formatted with the Windows formatting function or with a device other than a Motion CPU module (PLC, etc.), it will not be possible to use SD memory cards by inserting them into the Motion CPU module.

Available operations

The following operations can be performed for standard ROM and SD memory cards.

Operation			Standard ROM	SD memory card
Motion CPU initialization with rotary switch[*1]			○	—
MT Developer2	Memory formatting[*1]		○	○
	CPU writing/reading	Writing	○	○
		Reading	○	○
		Deletion	○	○
	Digital oscilloscope	Writing	○	○
		Reading	○	○
		Deletion	○	○
File transmission at boot		Writing	○	○
		Reading	○	○
		Deletion	○	○
Motion SFC program cam data operation instructions (CAMRD/CAMWR/CAMMK)		Writing	○	○
		Reading	○	○

*1 Refer to memory initialization for details. (☞ Page 353 Memory Initialization)

Point

• SD memory cards cannot be used if write protected.

• Read-only files cannot be written to or deleted.

• The file update date and creation date is based on the No.1 PLC CPU clock data.

File handling precautions

File reading and file writing processing

File reading and writing processes are performed in the Motion CPU main cycle. The read and write time varies depending on the file size and main cycle length.

Power supply OFF (including reset) when performing file operations

File content is not assured if the Multiple CPU system power supply is turned OFF or the system is reset when performing file operations other than data reading. In order to avoid file corruption, turn OFF the Multiple CPU system power supply or reset the system after completing file operation.

Simultaneous access of the same file

An error occurs when performing the following operations. Ensure that MT Developer2 processing is complete before moving onto subsequent processing.
- The file currently being written is accessed (read/written to) from another MT Developer2.
- The file currently being accessed (read/written to) is written to from another MT Developer2.

Simultaneous access to different files from multiple MT Developer2 applications

Up to 16 different files for the same CPU module can be simultaneously accessed from another MT Developer2.

Stored files

Programs and parameters used for Motion CPU control are stored inside a "$MMTPRJ$" folder created in a root folder in the standard ROM or SD memory card. The "$MMTPRJ$" folder is automatically created at the following times.

 • When the "$MMTPRJ$" folder does not exist when turning ON the Multiple CPU system power supply.
 • When the SD memory card is formatted.

The following files are stored in the "$MMTPRJ$" folder.

```
Standard ROM/SD memory card
  │
  └ $MMTPRJ$ ─┬─ /sys/ ─┬─ SYSTEM.PRM ---- System parameter file          ⎤
              │         ├─ CPU.PRM ---- CPU parameter file                ⎬ R series common parameter
              │         ├─ UNIT.PRM ---- Module parameter file            ⎦
              │         ├─ mot_sys.csv ---- Basic settings file                           ⎤
              │         ├─ motnet01.csv, motnet02.csv ---- Servo network settings file    │
              │         ├─ fsinput.csv ---- High-speed input request signal settings file │
              │         ├─ markdt.csv ---- Mark detection setting file                    │
              │         ├─ limitout.csv ---- Limit switch output settings file            ⎬ Motion CPU common parameter
              │         ├─ mpulser.csv ---- Manual pulse generator connection settings file │
              │         ├─ vs_sys.csv, vs_prg.csv ---- Vision system parameters files     │
              │         ├─ rioref.csv ---- Head module settings file                      │
              │         └─ fastref.csv ---- Multiple CPU refresh (main cycle/operation cycle) settings file ⎦
              │
              ├─ /motpara/ ─┬─ axpara01.csv to axpara64.csv ---- Axis settings parameter file           ⎤
              │             ├─ svpara01.csv to svpara64.csv ---- Servo parameter file (servo amplifier axis) │
              │             ├─ svpara91.csv to svpara98.csv ---- Servo parameter file (sensing module (RIO axis)) │
              │             ├─ para_blk.csv ---- Parameter block file                     │
              │             ├─ mcn_com.csv ---- Machine common parameter file             │
              │             └─ mcn01.csv to mcn08.csv ---- Machine parameter file         │
              │                                                                           ⎬ Motion control parameter
              ├─ /sync/ ─┬─ cam0001.csv to cam1024.csv ---- Cam data file                 │
              │          ├─ in_servo.csv ---- Servo input axis parameter file             │
              │          ├─ in_enc.csv ---- Synchronous encoder axis parameter file       │
              │          ├─ in_cmgen.csv ---- Command generation axis parameter file      │
              │          ├─ out01.csv to out64.csv ---- Synchronous parameter file        │
              │          └─ cpu_sync.csv ---- Multiple CPU advanced synchronous control settings file ⎦
              │
              └─ /prog/ ─┬─ runwt/ ─┬─ df_f0000.prg to df_f4095.prg ---- Online change program file (operation control program)
                         │          ├─ df_g0000.prg to df_g4095.prg ---- Online change program file (transition program)
                         │          ├─ df_k0000.prg to df_k8191.prg*1 ---- Online change program file (servo program)
                         │          └─ df_sf000.prg to df_sf511.prg*2 ---- Online change program file (Motion SFC diagram)
                         ├─ servo2.prg*3 ---- Servo program file
                         ├─ motsfcp2.bin*3 ---- Motion SFC parameter file
                         └─ motsfc2.prg*3 ---- Motion SFC program file (1 file for SFC codes, SFC text, SFC diagrams)
  ↓
 (1)
```

(1)

/gcode/ → prog/ → O001.gcd to O256.gcd ---- G-code control program file

temp/ → O001.gcd to O256.gcd ---- G-code control program file (For program file load while running)

gcdsys01.csv, gcdsys02.csv ---- G-code control system parameter file

gcd1ax1.csv to gcd1ax8.csv ---- G-code control axis parameter file (line 1)

gcd2ax1.csv to gcd2ax8.csv ---- G-code control axis parameter file (line 2)

gcdproc.csv ---- G-code control work parameter

/data/ → oscout01/ → ********.csv *4 ---- Digital oscilloscope sampling data file

osc01.csv ---- Digital oscilloscope settings file

/$LBLDB$/ *5 ---- Database folder (storage path of database for label communication)

/$LDBSYS$/ *5 ---- Database system folder (storage path of database system setting file)

bootlog.txt ---- Boot log file

bootlog.bak ---- Boot log file (previous boot log)

EVENT.LOG ---- Event history file

DEVCMNT.DC2*3 ---- Device comment file

GL_LABEL.IF2*3 ---- Label/structure file

*1   For operating system software version "09" or earlier, df_k0000.prg to df_k4095.prg.
*2   For operating system software version "09" or earlier, df_sf000.prg to df_sf255.prg.
*3   When expansion settings in operating system software version "10" or later are disabled, or for operating system software version "09" or earlier, servo.prg (servo program file), motsfcpr.bin (Motion SFC parameter file), motsfc.prg (Motion SFC program file).
*4   Elapsed time (seconds) up to the current time using Greenwich Mean Time 00:00:00, January 1st 1970 as the reference (hexadecimal notation)
*5   Created when "Access from external device" is set in label setting of MT Developer2. Do not change the files in the folder.
*6   For operating system software version "02" or earlier, the file names are DEVCMNT.IFG (device comment file), and GL_LABEL.DCM (label/structure file).

Point

If the files required by the Motion CPU do not exist in the folder, a moderate error (error code: 2200H) occurs, and the Motion CPU does not RUN.

8.2　SD Memory Card

This section describes functions using a SD memory card.

SD memory card handling

- Formatting is required for all SD memory cards used with the Motion CPU module. Purchased SD memory cards will not have been formatted, and should therefore be used after inserting them in the Motion CPU module and formatting with the MT Developer2 [Online] ⇨ [Motion CPU memory format] ⇨ [SD memory card format]. Do not format SD memory cards at the personal computer.
- Data contained in SD memory cards may be corrupted if the power supply is turned OFF, the system is reset, or the SD memory card is removed while the card is being accessed. If the CARD ACCESS LED is ON, always stop access to the SD memory card with the SD memory card access control switch before turning OFF the power supply, resetting, or removing the SD memory card. Please note that batch stopping is possible for all SD memory cards being used, and the use stop status can be checked with "SD memory card forced disable instruction (SM606)" and "SD memory card forced disable state flag (SM607)".

SD memory card forced stop

Even if the Motion CPU module is performing functions that use a SD memory card, SD memory cards can easily be removed without turning OFF the Multiple CPU system power supply to stop use of the SD memory card.

SD memory card forced stop method

Forced stop of SD memory cards is performed using the following procedure.

■Operation with SD memory card access control switch

1. Press the Motion CPU module SD memory card access control switch for 1 second or longer.

2. The CARD READY LED flickers.[*1]

3. Check that the CARD READY LED is OFF.

4. Remove the SD memory card.

*1 If there are functions that are currently accessing the SD memory card, the CARD READY LED turns OFF after access with that function is complete, and so depending on the function, the time taken for the LED status to change from flickering to OFF will differ.

■Operation with special relay

1. Turn "SD memory card forced disable instruction (SM606)" ON.

2. Ensure that the CARD READY LED is OFF, or that "SD memory card forced disable state flag (SM607)" is ON.

3. Remove the SD memory card.

Cancelling the SD memory card use stop status

The SD memory card use stop status can be cancelled using the following procedure.
- Reinsert the SD memory card. (CARD READY LED changes from flickering to ON.)
- Reboot the Multiple CPU system power supply, or reset the system.

SD memory card forced stop precautions

- If use of the SD memory card is forcibly stopped with the SD memory card access control switch and also with the "SD memory card forced disable instruction (SM606)", the operation executed first will be valid, and the subsequent operation will be invalid. For example, if the "SD memory card forced disable instruction (SM606)" is turned from ON to OFF without removing the card after forced stop with the SD memory card access control switch, the use stop status can be cancelled. If the SD memory card is removed after forced stop with the SD memory card access control switch, and then the "SD memory card forced disable instruction (SM606)" is turned ON, the "SD memory card forced disable instruction request (SM606)" operation will be ignored.
- If the SD memory card is forcibly stopped while writing a file to the SD memory card from an external device, file writing may fail. Write the file again after cancelling the SD memory card use stop status.

8.3 Memory Initialization

The following methods can be used to delete (initialization) data on Motion CPU standard ROM, backup RAM, and SD memory cards.

Supported function			Initialization target					
			Files		Backup data	Device		
						Latch (1)	Latch (2)	Other than latch
			Standard ROM	SD memory card	Backup RAM			
MT Developer2	Motion CPU memory clear[*1]	Latch (1) zero clear	—	—	—	○	—	—
		Zero clear for other than latch (1)/latch (2)[*3]	—	—	—	—	—	○
	Motion CPU memory formatting[*1]	Standard ROM formatting	○	—	—	—	—	—
		SD memory card formatting	—	○	—	—	—	—
Motion CPU initialization with rotary switch[*2]		Standard ROM and backup RAM	○	—	○	○	○	○
		Backup RAM	—	—	○	○	○	○
		Standard ROM	○	—	—	—	—	—

*1 Executed during STOP. Cannot be performed in installation mode.
*2 Executed with built-in memory clear (rotary switch set to "C"). Refer to the following for details.
 📖MELSEC iQ-R Motion Controller User's Manual
*3 The following devices that are used as internal signals of the Motion CPU are not cleared by "zero clears other than Latch(1)/latch(2)".

Device name	Device range	
	MELSEC iQ-R Motion device assignment	Q series Motion compatible device assignment
Internal relay (M)	M16000 to M49151 (33152 points)	M2000 to M3839 (1840 points) M8192 to M12287 (4096 points)
Data register (D)	D32000 to D57343 (25344 points)	D0 to D799 (800 points) D10240 to D19823 (9584 points)
Motion register (#)	—	#8000 to #8751 (752 points)

Point

- Backup data includes the servo parameter open area, absolute position data, current value history data, scroll monitor information, and synchronous control backup data.
- The system operating system software is not deleted even when initializing data.
- If the backup RAM of the Motion CPU is initialized, the device assignment method becomes "Q series Motion compatible device assignment".
- Refer to the following for details on MT Developer2 operation.
 📖Help of MT Developer2

8

8.4 Installing the Operating System Software

The operating system software is installed in the Motion CPU module when the product is shipped. There is therefore no need to install the operating system software, however, installation is required if upgrading to the latest version or changing the version.

Also, the Motion CPU functions can be expanded by additionally installing add-on libraries.

> **Point**
>
> - Be sure to turn OFF the Multiple CPU system power supply before changing rotary switch setting.
> - Even if the operating system software is installed, the programs, parameters and absolute position data written in the Motion CPU module not rewritten.
> - If installation is interrupted by actions such as "power supply of Multiple CPU system being turned OFF", "RUN/STOP/RESET switch of PLC CPU module being changed to RESET", "power supply of the personal computer being turned OFF. (When using MT Developer2)", "personal computer's communication cable being removed. (When using MT Developer2)", and "the SD memory card being removed. (When using a SD memory card)", files being installed will be deleted. Reinstall the operating system software.
> - While the Motion CPU module is in installation mode, a Multiple CPU error will occur at other Multiple CPU system CPUs, and the system will not start up.
> - During installation, install operations from other sources will not be accepted. For example, an error will occur if an attempt is made to install from MT Developer2 while performing installation with a SD memory card.
> - The capacity of the built-in memory in which Motion CPU module operating system software and add-on library files are stored is 8MB. Make sure the total size of operating system software and add-on library files is no more than 8MB.
> - The model name and version of operating system software installed in the Motion CPU module can be checked in MT Developer2. Refer to the following for details.
>   📖 MELSEC iQ-R Motion Controller User's Manual
> - Use MT Developer2 for checking the installed add-on library version, and deleting add-on library files from the Motion CPU module. Refer to the following for details.
>   📖 Help of MT Developer2
> - The operating system software version "05" or earlier cannot be installed in the R64MTCPU. Install operating system software version "07" or later.
> - Restrictions can occur depending on the version of the operating system software installed in the Motion CPU module, and when combining with other add-on libraries already installed. When an add-on library that cannot be combined is installed, a moderate error (error code: 308FH) occurs at the initial processing of the Motion CPU module, and the Motion CPU module does not RUN.

Installation procedure using MT Developer2

The procedure used to install the operating system software, or add-on library using MT Developer2 is as follows.

```
              ┌─────────────────────────┐
              │    Start Installation    │
              └─────────────────────────┘
                           │
      ┌─────────────────────────────────┐        Set to installation mode.
      │ Set the rotary switch of Motion  │------- Refer to the following for rotary switch.
      │ CPU module to "A".               │          📖MELSEC iQ-R Motion Controller User's Manual
      └─────────────────────────────────┘
                           │
      ┌─────────────────────────────────┐        The dot matrix LED display is "INC".
      │ Turn ON the Multiple CPU system  │------- RUN/STOP is ignored.
      │ power supply.                    │
      └─────────────────────────────────┘
                           │
      ┌─────────────────────────────────┐
      │ Start the install of MT Developer2. │
      └─────────────────────────────────┘
                           │
      ┌─────────────────────────────────┐
      │ Set the connection method between │
      │ the personal computer and Multiple │
      │ CPU system in the connection settings. │
      └─────────────────────────────────┘
                           │
Operation in
MT Developer2*1
      ┌─────────────────────────────────┐
      │ Select the operating system software, │
      │ or add-on library to install, and install │
      │ it in the Motion CPU module.     │
      └─────────────────────────────────┘
                           │
      ┌─────────────────────────────────┐        The operating system software can be
      │ Dialog "Installation is completed" is │------- installed normally by dialog display.
      │ displayed.                       │
      └─────────────────────────────────┘
                           │
      ┌─────────────────────────────────┐
      │ Turn OFF the Multiple CPU system  │
      │ power supply.                    │
      └─────────────────────────────────┘
                           │
      ┌─────────────────────────────────┐        Set to normal mode.
      │ Set the rotary switch of Motion CPU │-------
      │ module to "0".                   │
      └─────────────────────────────────┘
                           │
              ┌─────────────────────────┐
              │           END            │
              └─────────────────────────┘
```

*1 Install the operating system software by screen of MT Developer2. Refer to the following for details.
    📖Help of MT Developer2

> **Point**
>
> Files installed in the Motion CPU module can be compared with files on the personal computer with MT Developer2.

Installation procedure using SD memory card

The procedure used to install the operating system software, and add-on library using a SD memory card is as follows.

```
┌─────────────────────┐
│ Start Installation  │
└─────────────────────┘
          │
┌─────────────────────────────┐        Create a "instnew", and "inst" folder in the SD memory
│ Using a personal computer,  │ ------- card root, and store the files inside this folder.
│ store the operating system  │
│ file, and add-on library in │
│ the SD memory card.         │
└─────────────────────────────┘
          │
┌─────────────────────────────┐
│ Insert the SD memory card   │
│ in the Motion CPU module SD │
│ memory card slot.           │
└─────────────────────────────┘
          │
┌─────────────────────────────┐        Set to installation mode.
│ Set the rotary switch of    │ ------- Refer to the following for rotary switch.
│ Motion CPU module to "A".   │        📖 MELSEC iQ-R Motion Controller User's Manual
└─────────────────────────────┘
          │
┌─────────────────────────────┐        The dot matrix LED display is "INC → SDC".
│ Turn ON the Multiple CPU    │ ------- RUN/STOP is ignored.
│ system power supply.        │
└─────────────────────────────┘
          │
┌─────────────────────────────┐
│ The files inside the SD     │
│ memory card are             │
│ automatically read, and     │
│ installation is performed.  │
└─────────────────────────────┘
          │
┌─────────────────────────────┐        The "FIN" display indicates that installation of
│ The dot matrix LED displays │ ------- the operating system software in the Motion
│ "FIN".                      │        CPU has been successful
└─────────────────────────────┘
          │
┌─────────────────────────────┐
│ Turn OFF the Multiple CPU   │
│ system power supply.        │
└─────────────────────────────┘
          │
┌─────────────────────────────┐
│ Set the rotary switch of    │ ------- Set to normal mode.
│ Motion CPU module to "0".   │
└─────────────────────────────┘
          │
┌─────────────────────┐
│        END          │
└─────────────────────┘
```

Installation method with an SD memory card

Create a "instnew" folder or "inst" folder under the root of the SD memory card and store the file to be installed in the folder.

The installation method according to the folder created is shown below.

Folder	Details	Precautions
instnew	When installing a new file	• The folder in the built-in memory that stores the operating system software and add-on library is formatted before writing the files in the SD memory card. • When the operating system software, and add-on library files are not stored in the SD memory card, the files are deleted from the folder in the built-in memory. • Apart from the files for installing, the other files in the built-in memory must be stored in the SD memory card.
inst	When updating (overwriting) a file, or installing an additional add-on library	• Without formatting the folder in the built-in memory that stores the operating system software and add-on library, the files from the SD memory card are written to the built-in memory and the files are overwritten. • When there are files that are not stored in the SD memory card, those files are not deleted from the folder in the built-in memory. • Installation is possible by storing only the files for installing to the SD memory card.

Point

- If the system is unable to recognize the installation target files after turning the Multiple CPU system power supply ON, the dot matrix LED will not display "INC → SDC", and installation with the SD memory card will not start.
- If an error is detected after starting installation, and it is not possible to complete the installation, the dot matrix LED will display "ER0(SD memory card access error)", "ER1(Install file error)", or "ER2(Built-in ROM access error)". Perform the installation again after removing the error.
- The SD memory card forced stop function cannot be used during installation with a SD memory card. Do not remove the SD memory card during installation.

8.5 Add-on Function

Functions of the Motion CPU module can be expanded by installing files supplied as add-on libraries to the Motion CPU module.
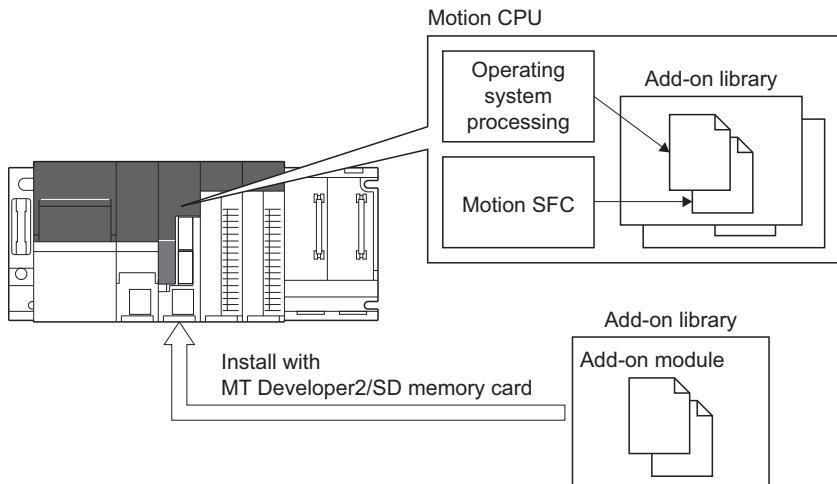
The add-on modules inside the add-on library are executed by the following methods.

Automatically execute at a selected timing

The add-on module is automatically executed at one of the selected timings below.

Refer to the instruction manual of the add-on library installed for details of execution timing.

- At initialization of Motion CPU
- At the switching between OFF/ON of "[Rq.1120] PLC ready flag (R: M30000/Q: M2000)"
- Every operation cycle
- Every main cycle

Call from the user program

With the Motion SFC program MCFUN instruction, the add-on module can be called from the user program.

When calling from the user program, specify the add-on module with the module name that is registered when the add-on module is installed, and deliver the input value and output value by device.

Ex.
Calling the add-on module with the module name "AddonFunc1" with the MCFUN instruction

```
MCFUN "AddonFunc1",D5000,D5100,M0
```

Refer to the following for details of the MCFUN instruction.

MELSEC iQ-R Motion Controller Programming Manual (Program Design)

Refer to the instruction manual of the add-on library installed for details of the MCFUN instruction for each add-on module.

Add-on module structure

An add-on module comprises of the following units.

Name	Details
Add-on module	Module that executes expansion functions.
Add-on library	A file that encompasses one or more add-on modules. The method for calling each add-on module is defined in the add-on library. When installing to the Motion CPU module, the entire add-on library is installed.

Module names

The Motion CPU module identifies add-on modules by module name.

If module names are duplicated when installing several add-on libraries, a moderate error (error code: 308FH) occurs at the initial processing of the Motion CPU module.

Installing add-on library

The add-on library is installed to the built-in memory of the Motion CPU module via MT Developer2, or the SD memory card. Refer to installing the operating system software for the installation method. (☞ Page 354 Installing the Operating System Software)

Add-on function load error

The following describes the details codes and corrective actions when add-on function load error (moderate error (error code: 308FH)) is detected.

Details code	Error name	Corrective action
0500	Device number outside the range	The device number of a device used by the add-on library is outside the range. Correct the device number of the CPU parameter so that it is within the range.
0510	Operating system not supported	An add-on library not supported by the operating system is installed. Check the operating system version that supports the add-on library.
0511	Operating system support ended	An add-on library that the operating system has ended support for is installed. Delete the add-on library.

Add-on library license authentication

There are add-on libraries that are provided free of charge, and add-on libraries that are provided for a fee.
Add-on libraries that are provided for a fee require license authentication.

License authentication

The add-on libraries provided for a fee usually have a license period.

Add-on librarytype	License purchase	License period	Remarks
Free of charge	Not required	—	
Not free of charge	Required	Depends on the add-on library.	The license period (remaining time until license authentication is required) decreases with the time in operation (the time when the Multiple CPU system power supply is ON). The time when the Multiple CPU system power supply is OFF is not counted.

Add-on libraries provided for a fee can no longer be used when the time remaining on the license period is 0. To continue using the add-on library a license must be purchased.

When an add-on library license is purchased, a USB key (USB dongle with license information) is provided. The license key is generated with the provided USB key, and the license is authenticated by writing the generated license key to the Motion CPU.

8

■License key generation

The license key to be written to the Motion CPU is generated in MT Developer2.

Insert the USB key into the USB port of a personal computer, and generate the license key with "Add-on library management" in MT Developer2. The generated license key is saved in the license key file (license.lky).
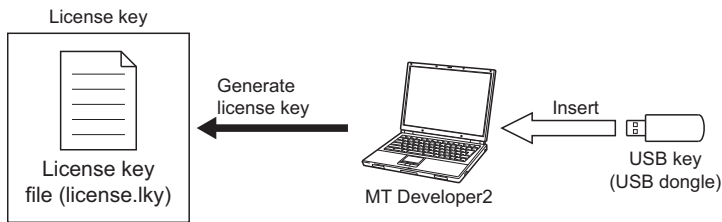
■Writing the license key to the Motion CPU

The license key file (license.lky) is written to the Motion CPU via MT Developer2 or SD memory card.
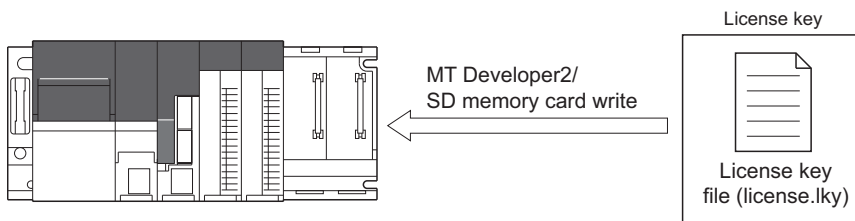
■Checking the add-on library license

For add-on libraries that require a license, the license is checked during the initial processing when the Multiple CPU system power supply is turned ON. If there is no applicable license key in the license key file, a warning (error code: 0EF1H(details code: 0101H)) occurs, and a license period is set.

When the license period is exceeded, a moderate error (error code: 3081H), or a minor error (error code: 1FF1H) occurs, and the add-on library can no longer be used.

■Checking the license authentication information

The add-on library license authentication information can be checked in the license authentication information screen of MT Developer2.

The status of add-on libraries with checked licenses (period check, license authentication) can be checked. Add-on libraries provided free of charge are not displayed.

License authentication method

The license authentication method is different depending on the status of the license purchase, and whether the Motion CPU can be connected online or not.

The following is the license authentication procedures.

◎: Use a personal computer with USB key inserted, ○: Use MT Developer2 or an SD memory card

License authentication method	Add-on library installation	License key generation	License key writing
Purchasing a license and writing to the Motion CPU after trialing the add-on library	○	◎	◎
Installing the add-on library after purchasing a license	◎	◎	◎
Generating a license key offline (when replacing a CPU remotely etc.)	○	◎	○

■Purchasing a license and writing to the Motion CPU after trialing the add-on library

The following procedure is for when the add-on library is installed and trialed before purchasing a license, and a license purchased after trialing is written to the Motion CPU.

```
                        ┌──────────────┐
                        │    START     │
                        └──────────────┘
                               │
Add-on        ┌─────────────────────────────┐
library trial │ Install add-on library.     │
              └─────────────────────────────┘
                               │
              ┌─────────────────────────────┐
              │ Startup the system, and trial│ - - - - - Refer to the add-on library instruction manual.
              │ the add-on library.         │
              └─────────────────────────────┘
                               │
              ┌─────────────────────────────┐
              │ Check the license period in  │
              │ the license authentication   │ - - - - - The license period decreases with operating time
              │ information screen of MT     │          (time the Motion power supply is ON).
              │ Developer2.*1                │
              └─────────────────────────────┘
                               │
License       ┌─────────────────────────────┐    If a license is purchased, a USB license key (USB dongle with
purchase      │ To continue trialing the     │ - - license information) is supplied.
              │ add-on library, purchase a   │    *: To cancel trial, uninstall the add-on library.
              │ license.                     │
              └─────────────────────────────┘
                               │
              ┌─────────────────────────────┐
              │ Insert USB dongle in personal│
              │ computer.                    │
              └─────────────────────────────┘
                               │
              ┌─────────────────────────────┐
              │ Connect the personal computer│
              │ and Motion CPU.             │
              └─────────────────────────────┘
                               │
              ┌─────────────────────────────┐    Set the Motion CPU rotary switch to "A".
              │ Put the Motion CPU in        │ - - Refer to the following for details on rotary switch.
              │ installation mode.           │    📖MELSEC iQ-R Motion Controller User's Manual
              └─────────────────────────────┘
                               │
License key   ┌─────────────────────────────┐
generation/   │ Turn ON the power supply of  │
writing       │ Multiple CPU system.         │
              └─────────────────────────────┘
                               │
              ┌─────────────────────────────┐
              │ In the transfer setup, set   │
              │ the connection               │
              │ (communication) method for   │
              │ the personal computer and    │
              │ Multiple CPU system.         │
              └─────────────────────────────┘
                               │
              ┌─────────────────────────────┐
              │ Perform the following in MT  │
              │ Developer2.*1                │
              │ • Select add-on library.     │ - - - Read the serial No. (production information) of the connected
              │ • Generate license key.      │       Motion CPU, and generate the license key.
              │ • Write the license key to   │
              │   the Motion CPU.            │
              └─────────────────────────────┘
                               │
              ┌─────────────────────────────┐
              │ Turn OFF the power supply of │
              │ Multiple CPU system.         │
              └─────────────────────────────┘
                               │
Confirmation  ┌─────────────────────────────┐    Set the Motion CPU rotary switch to "0".
of license    │ Put the Motion CPU in normal │ - - Refer to the following for details on rotary switch.
authentication│ mode.                        │    📖MELSEC iQ-R Motion Controller User's Manual
              └─────────────────────────────┘
                               │
              ┌─────────────────────────────┐
              │ Turn ON the power supply of  │
              │ Multiple CPU system.         │
              └─────────────────────────────┘
                               │
              ┌─────────────────────────────┐
              │ Check that the license       │
              │ authentication information   │
              │ screen in MT Developer2 is   │
              │ "Authentication complete".*1 │
              └─────────────────────────────┘
                               │
                        ┌──────────────┐
                        │     END      │
                        └──────────────┘
```

*1 Refer to the following for details of MT Developer2 operation.
📖Help of MT Developer2

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■Installing the add-on library after purchasing a license

The procedure for writing the license key at the same time of installing the add-on library, after purchasing a license, is shown below.

```
                        ┌──────────────┐
                        │    START     │
                        └──────────────┘
                               │
License      ┌─────────────────────────────────┐      If a license is purchased, a USB license key (USB dongle with
purchase     │ Purchase the add-on library license. │----- license information) is supplied.
             └─────────────────────────────────┘
                               │
             ┌─────────────────────────────────┐
             │ Insert USB dongle in personal computer. │
             └─────────────────────────────────┘
                               │
             ┌─────────────────────────────────┐
             │ Connect the personal computer and │
             │ Motion CPU.                      │
             └─────────────────────────────────┘
                               │
             ┌─────────────────────────────────┐      Set the Motion CPU rotary switch to "A".
             │ Put the Motion CPU in installation mode. │----- Refer to the following for details on rotary switch.
             └─────────────────────────────────┘        📖MELSEC iQ-R Motion Controller User's Manual
                               │
License key  ┌─────────────────────────────────┐
generation/  │ Turn ON the power supply of Multiple │
writing, and │ CPU system.                      │
add-on       └─────────────────────────────────┘
library                        │
installation ┌─────────────────────────────────┐
             │ In the transfer setup, set the connection │
             │ (communication) method for the   │
             │ personal computer and Multiple CPU │
             │ system.                          │
             └─────────────────────────────────┘
                               │
             ┌─────────────────────────────────┐
             │ Perform the following in MT      │
             │ Developer2.*1                    │
             │ • Select add-on library.         │----- Read the serial No. (production information) of the connected
             │ • Generate license key.          │      Motion CPU, and generate the license key.
             │ • Write the add-on library and license │
             │   key to the Motion CPU.         │
             └─────────────────────────────────┘
                               │
             ┌─────────────────────────────────┐
             │ Turn OFF the power supply of Multiple │
             │ CPU system.                      │
             └─────────────────────────────────┘
                               │
             ┌─────────────────────────────────┐      Set the Motion CPU rotary switch to "0".
             │ Put the Motion CPU in normal mode. │----- Refer to the following for details on rotary switch.
             └─────────────────────────────────┘        📖MELSEC iQ-R Motion Controller User's Manual
                               │
             ┌─────────────────────────────────┐
             │ Turn ON the power supply of Multiple │
             │ CPU system.                      │
Confirmation └─────────────────────────────────┘
of license                     │
authentication┌─────────────────────────────────┐
             │ Startup the system, and operate the │----- Refer to the add-on library instruction manual.
             │ add-on library.                  │
             └─────────────────────────────────┘
                               │
             ┌─────────────────────────────────┐
             │ Check that the license authentication │
             │ information screen in MT Developer2 │
             │ is "Authentication complete".*1  │
             └─────────────────────────────────┘
                               │
                        ┌──────────────┐
                        │     END      │
                        └──────────────┘
```

*1   Refer to the following for details of MT Developer2 operation.
      📖Help of MT Developer2

■Generating a license key offline (when replacing a CPU remotely etc.)

The procedure for generating a license key offline with personal computer A, without connecting a Motion CPU, and writing the license key with personal computer B, is shown below.

```
                    ┌─────────────────┐
                    │      START      │
                    └─────────────────┘
                             │
License                      ▼
purchase        ┌──────────────────────────────┐        If a license is purchased, a USB license key (USB dongle with
                │ Purchase the add-on library  │ ------- license information) is supplied.
                │ license.                     │
                └──────────────────────────────┘

                ┌──────────────────────────────┐
                │ Install the operating system │
                │ software and add-on library. │
                └──────────────────────────────┘

                ┌──────────────────────────────┐
                │ Startup the system, and      │
                │ operate the add-on library.  │ ------- Refer to the add-on library instruction manual.
                └──────────────────────────────┘
Get the
Motion CPU      ┌──────────────────────────────┐        Refer to the following for checking the serial No. (product information).
serial No.      │ Check the serial No. of the  │ ------- 
                │ Motion CPU to write the      │        ▭ MELSEC iQ-R Motion Controller User's Manual
                │ license key.                 │
                └──────────────────────────────┘

                ┌──────────────────────────────┐
                │ Send the serial No.          │
                │ (e-mail etc.)                │
                └──────────────────────────────┘

                ┌──────────────────────────────┐
                │ Receive the Motion CPU       │
                │ serial No.                   │
                └──────────────────────────────┘

                ┌──────────────────────────────┐
                │ Insert USB dongle in         │
                │ personal computer.           │
                └──────────────────────────────┘

                ┌──────────────────────────────┐
                │ Perform the following in MT  │
                │ Developer2.*1                │
Generate        │ • Select add-on library.     │
license         │ • Select Motion CPU model.   │ ------- Use the set serial No. (product information) to generate the license key.
key offline     │ • Set Motion CPU serial No.  │
                │ • Generate license key.      │
                │ • Export the license key to  │
                │   file.                      │
                └──────────────────────────────┘

                ┌──────────────────────────────┐
                │ Send the license key         │
                │ (e-mail etc.)                │
                └──────────────────────────────┘

                ┌──────────────────────────────┐
                │ Receive the license key.     │
                └──────────────────────────────┘

                ┌──────────────────────────────┐
                │ Connect the personal         │
                │ computer and Motion CPU.     │
                └──────────────────────────────┘
                                                        Set the Motion CPU rotary switch to "A".
License key     ┌──────────────────────────────┐        Refer to the following for details on rotary switch.
writing         │ Put the Motion CPU in        │ ------- 
                │ installation mode.           │        ▭ MELSEC iQ-R Motion Controller User's Manual
                └──────────────────────────────┘

                ┌──────────────────────────────┐
                │ Turn ON the power supply of  │
                │ Multiple CPU system.         │
                └──────────────────────────────┘

                ┌──────────────────────────────┐
                │ In the transfer setup, set   │
                │ the connection               │
                │ (communication) method for   │
                │ the personal computer and    │
                │ Multiple CPU system.         │
                └──────────────────────────────┘
                             │
                             ▼
                            (1)
```

Legend:

▣ : Operation on personal computer A (license key generation)

▭ : Operation on personal computer B (license key write)

(1)

License key writing

Perform the following in MT Developer2.[*1]
• Set license key.
• Write license key to Motion CPU.

When writing the license key from the SD memory card, refer to the procedure for writing the license key using an SD memory card.

Turn OFF the power supply of Multiple CPU system.

Put the Motion CPU in normal mode.

Set the Motion CPU rotary switch to "0".
Refer to the following for details on rotary switch.
📖MELSEC iQ-R Motion Controller User's Manual

Confirmation of license authentication

Turn ON the power supply of Multiple CPU system.

Check that the license authentication information screen in MT Developer2 is "Authentication complete".[*1]

END

*1   Refer to the following for details of MT Developer2 operation.
     📖Help of MT Developer2

■Writing the license key using an SD memory card

The procedure for using an SD memory card to write the license key is shown below.

START

License purchase

Purchase the add-on library license. ----- If a license is purchased, a USB license key (USB dongle with license information) is supplied.

Get the Motion CPU serial No.

Check the serial No. of the Motion CPU to write the license key.

Insert USB dongle in personal computer.

Generate license key offline

Perform the following in MT Developer2.[1]
• Select add-on library.
• Select Motion CPU model.
• Set Motion CPU serial No.
• Generate license key.
• Export the license key to file.

----- Use the set serial No. (product information) to generate the license key.

License key writing, and add-on library installation

Use a personal computer to store the license key file in the SD memory card. ----- Create a "inst" folder in the root of the SD memory card, and store the file in that folder.

Use the SD memory card for installation. ----- Refer to installation procedure using SD memory card for details on installation.[2]

Confirmation of license authentication

Turn ON the power supply of Multiple CPU system.

Check that the license authentication information screen in MT Developer2 is "Authentication complete".[1]

END

*1 Refer to the following for details of MT Developer2 operation.
　　📖Help of MT Developer2
*2 ☞ Page 356 Installation procedure using SD memory card

Point

• Create a "instnew" folder in the root of the SD memory card and store the license key file in that folder to execute installation.
• When installing from the "inst" folder in the SD memory card, the files from the SD memory card overwrite the files in the built-in memory without deleting existing files in the built-in memory. When there are multiple license keys written to the existing license key file, be sure to write all the required license keys to the new license key file to be written from the SD memory card.
• When installing from the "instnew" folder in the SD memory card, existing files in the built-in memory are deleted before the files in the SD memory card are written. Therefore, when the operating system and add-on library files do not exist in the SD memory card, the operating system and add-on library will be deleted from the Motion CPU.
• When an error is detected after starting installation and installation is not completed correctly, "ER0 (SD memory card access error)", "ER1 (install file error)", "ER2 (built-in ROM access error)", or "ER3 (license key file error)" are displayed on the dot matrix LED. Install the files again after handling the error.

License authentication error

■Error when loading license key file

The license key file is loaded when the Multiple CPU system power supply is turned ON, or the add-on library is loading.

A moderate error (error code: 3081H) occurs in the following cases.

• When the license key file is abnormal.

■Error when checking the add-on license

• When using an add-on library without a license authentication, a warning (error code: 0EF1H) occurs when the Multiple CPU system power supply is turned ON.

• The license period decreases with the operating time (the time when Multiple CPU system power supply is turned ON). When the time remaining on the license period is 0, a warning (error code: 0EF1H) occurs. The next time the Multiple CPU system power supply is turned ON, license period expired is detected, and a moderate error (error code: 3081H), or minor error (error code: 1FF1H) occurs.

9 RAS FUNCTIONS

9.1 Self-Diagnostics Function

Checks if a problem exists with the Motion CPU.

Self-diagnostics timing

If an error occurs when the Multiple CPU system power supply is turned ON or while it is in the RUN/STOP state, the Motion CPU detects, and displays the error, and stops operation depending on the error details.

However, depending on the error occurrence status or the instruction to execute, the Motion CPU may not be able to detect the error. Configure safety circuits external to the Motion CPU to ensure that the entire system operates safely even in such a case.

Error checking methods

This section describes the check methods when errors occur.

Checking by LED display

Check the following LED displays on the Motion CPU. Refer to the following for LED display details.

📖MELSEC iQ-R Motion Controller User's Manual

■ERROR LED

The ERROR LED is ON (or flickers).

■Dot matrix LED

The dot matrix LED displays ""AL" (flickers 3 times) → "Error code" (4 digits shown 2 at a time)".

Checking by special relay, special register

The following special relays and special registers store the error content. Refer to the following for details on special relays and special registers.

- Special relays()
- Special registers()

	Device name
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)

Checking by GX Works3

The error information list is checked by GX Works3 module diagnostics.

Refer to the following for details of module diagnostics.

📖GX Works3 Operating Manual

Checking by MT Developer2

Motion error history is checked at the MT Developer2 Motion CPU error batch monitor. Refer to the following for details of the Motion CPU error batch monitor.

📖Help of MT Developer2

Checking by axis status signals, and axis monitor devices

Error details detected for each axis is stored for each axis status signal and each axis monitor device.

Refer to error codes stored using the Motion CPU for error details stored for each axis status signal and each axis monitor device. (☞ Page 378 Error codes stored using the Motion CPU)

Checking by event history

Check the operation and error details with the "event history" file saved in the Motion CPU standard ROM, or SD memory card.

Refer to event history function for details of event history. (☞ Page 374 Event History Function)

Operations at error detection

The operations for when an error is detected are shown below.

Modes at error detection

■Stop mode

In this mode, Motion CPU operation is stopped. All programs are stopped the moment the error is detected, and all external outputs are turned OFF for modules set to "Stop" in "I/O Assignment Setting" → "CPU Module Operation Setting at Error Detection" (☞ Page 55 CPU parameter).

However, external outputs are retained for modules set to "Continue" in "CPU Module Operation Setting at Error Detection". In either case, device memory outputs (Y) are retained.

Depending on the error content, positioning of all axes is stopped.

Refer to the following for details on error stop processing.

☐MELSEC iQ-R Motion Controller Programming Manual (Positioning Control)

■Continue mode

In this mode, Motion CPU operation is continued. Depending on the error content, there may be times when the program for which the error was detected or positioning control is stopped, however, execution of unrelated programs and positioning control continues.

Error status at error detection

The error status is categorized into major errors, moderate errors, and minor errors.

The status for which it is not possible to continue program or axis control for the Motion CPU, in full or in part, is categorized as an error.

Error status	Motion CPU operation mode	Multiple CPU system operation	Program execution status	Axis control status[2]	Cause
Major error	Stop mode	Other CPUs can be stopped[1]	All programs stop	All axes stop	There is an error in the Motion CPU hardware, and operation cannot be continued.
Moderate error					Program execution or axis operation cannot be continued due to an incorrect program or parameter setting, or temporary noise, etc.
	Continue mode	Continues	Complete or partial stop depending on error content	Continues	Axis operation continues, however, programs cannot be executed due to an incorrect program or parameter setting.
Minor error			Continues	Relevant axis only stops	Axis operation start/continue is not possible due to incorrect program or parameter settings, or external signal status. Program execution continues.
Warning				Continues	An insignificant error is detected such as an incorrect program or parameter setting, or imperfect control change timing. Axis operation and program execution continue as is.

*1 Stop/continue can be set in the Multiple CPU parameters for other CPUs.
*2 Refer to the following for details on stopping.
   ☐MELSEC iQ-R Motion Controller Programming Manual (Positioning Control)

Setting operation at error detection

Depending on the self-diagnosis content, operation when errors are detected can be set in the CPU parameters.

Refer to CPU parameter for details of setting contents. (☞ Page 55 CPU parameter)

Cancelling errors

Continue errors (minor errors, or continue mode moderate errors) and warnings can be cancelled.

Cancelling errors

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

■Cancelling method with GX Works3

Cancel with GX Works3 "Module diagnostics"

■Cancelling method with MT Developer2

Cancel with MT Developer2 "Motion Monitor"

■Cancelling method with special relay

Cancel with "Error reset (SM50)"

Errors that can be cancelled

The following is a list of errors that can be cancelled.

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) • Error information 1 (SD80 to SD111) • Error information 2 (SD112 to SD143) • Detailed information 1: flag in use (SM80) • Detailed information 2: flag in use (SM112)
Positioning/synchronous control output axis errors/warnings[1]	• Warning code • Error code • Error detection signal
Servo alarms/warnings[1]	• Servo error code • Servo error detection signal
Synchronous control input axis errors/warnings[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 No.
Machine errors/warnings[1]	• Machine error code • Machine warning code • Machine error detection signal
G-code control errors[1]	• G-code control error code • G-code control error details code 1 • G-code control error details code 2 • G-code control error detection signal

*1 Clears errors for all axes at the same time.

After cancelling errors, error-related special relays/special registers, and the LED display return to the condition prior to the error. If the same error occurs again after cancelling the error, the error is registered again in the error history.

Operation when errors cancelled for each axis

• If an axis error reset or servo error reset is performed, the error detection signal for each axis, axis error No., and axis warning No. are reset, however, diagnostic errors are not reset.
• When cancelling a G-code control error, "[St.3208] During G-code control (D54440.0+4s)" stays turned ON depending on the error that occurred in G-code control. When an error is cancelled and operation started while "[St.3208] During G-code control (D54440.0+4s)" is turned ON, the operation is still the same as when the error occurred thus operation can not start correctly. When starting operation with "[St.3208] During G-code control (D54440.0+4s)" turned ON, reset the operation status by turning OFF→ON "[Rq.3380] Reset command (D54226.4+2s)".

9.2 Safety Functions

Processing time monitor and check

The time taken for Motion operation and Motion SFC program execution can be monitored with a special register. The Motion CPU internal processing timing and corresponding processing time monitor devices are shown in the following diagram.
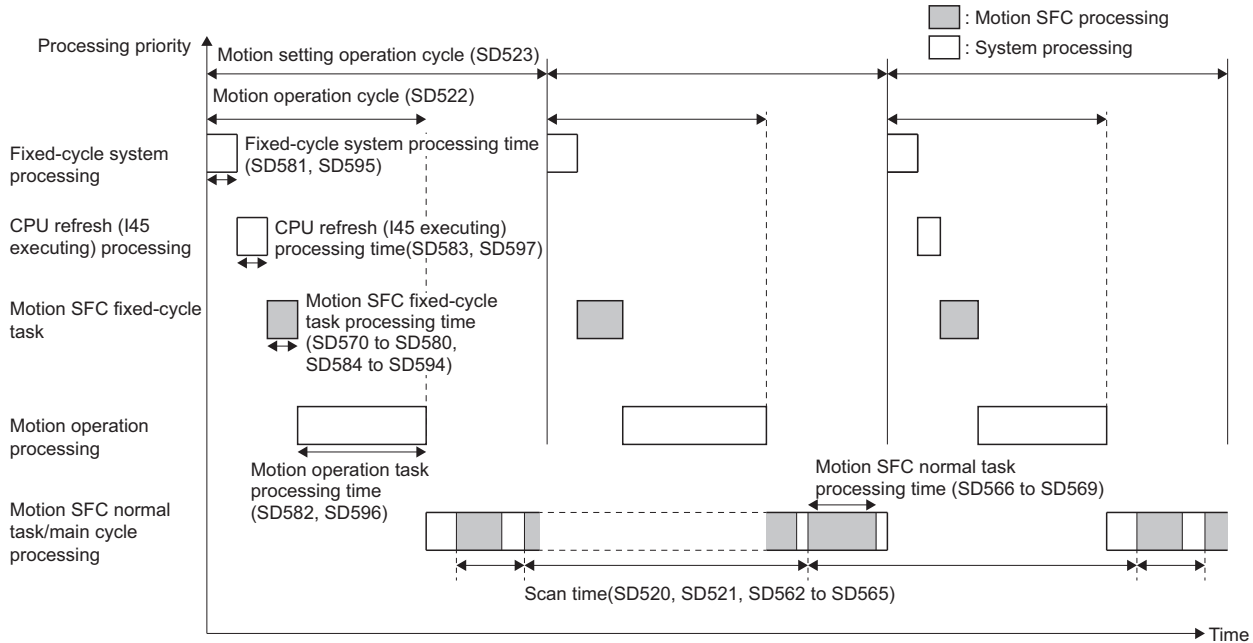
*1: The "Motion operation cycle (SD522)" maximum value latches to the "Motion maximum operation cycle (SD524)".
*2: The "Scan time (SD520)" and "Scan time (SD562, SD563)" maximum values latch to the "Maximum scan time (SD521)" and "Maximum scan time (SD564, SD565)".
*3: The processing time when an operation cycle over occurs latches to the following special registers.
- "Fixed-cycle system processing time (SD581)" → "Fixed-cycle system processing time within operation cycle (SD595)"
- "CPU refresh (I45 executing) processing time (SD583)" → "CPU refresh (I45 executing) time within operation cycle (SD597)"
- "Motion SFC fixed-cycle task (0.222ms to 14.222ms task individually) processing time (SD570 to SD580)" → "Motion SFC fixed-cycle task (0.222ms to 14.222ms task individually) operation cycle (SD584 to SD594)"
- "Motion operation task processing time (SD582)" → "Motion operation task time within operation cycle (SD596)"
*4: The EI/DI status can be monitored as an "EI flag (SM752)" as the Motion SFC event task monitor.

The Motion CPU uses the self-diagnostic function to check the processing time for all processing. Details of the processing time check and the action taken when an error occurs are shown below.

Operation cycle check

If the total time (Motion operation cycle (SD522)) taken for fixed-cycle system processing, Motion SFC fixed-cycle tasks, and Motion operation exceeds the "Motion setting operation cycle (SD523)", the "[St.1046] Operation cycle over flag (R: M30054/Q: M2054)" turns ON. Depending on the control conditions, the amount of time taken for Motion operation may exceed the operation cycle, even if the operation cycle setting is the "Default setting".

- The following operations are performed if an operation cycle over condition is detected.
  - "[St.1046] Operation cycle over flag (R: M30054/Q: M2054)" turns ON
  - Latching (updating stopped) of the time within each operation cycle for processing time monitor devices is performed.

- If an operation cycle over condition is detected, monitor the special register which stores the processing time, and take the following measures to ensure that the time taken for the Motion operation does not exceed the set operation cycle.
  - Change the operation cycle to a larger value in [Motion CPU Common Parameter] ⇨ [Basic Setting] ⇨ "Operation Cycle" setting.
  - Reduce the number of event task and NMI task command executions in the Motion SFC program.

- Use the following procedure to turn the "[St.1046] Operation cycle over flag (R: M30054/Q: M2054)" OFF.
  - Turn the Multiple CPU system power supply from ON to OFF.
  - Reset the Multiple CPU system.
  - Perform a reset with the user program.

Point

Command updating to the servo amplifier stops for cycles for which an operation cycle over condition occurs, leading to abnormal machine noises and vibrations, and impact.

Watchdog timer (WDT)

If the "Scan time (SD520)" exceeds 1.0 [s], the "Motion CPU WDT error (SM512)" turns ON, and axes that have started are stopped immediately without reducing speed.

If the "Motion CPU WDT error (SM512)" turns ON, reset the Multiple CPU system. If the "Motion CPU WDT error (SM512)" turns ON even after resetting, check the cause of the "Motion CPU WDT error (SM512)", and if the cause is a "Main cycle over" condition, take either of the following measures.

 • Change the operation cycle to a larger value in the [Motion CPU Common Parameter] ⇨ [Basic Setting] ⇨ "Operation Cycle" setting.
 • Reduce the number of normal task, event task, and NMI task command executions in the Motion SFC program.

Fixed-cycle system processing time check

This check monitors the time it takes the fixed-cycle system processing to communicate with the servo amplifier, and stores the maximum value in "Fixed-cycle system processing monitor time (SD598)". If "Fixed-cycle system processing monitor time (SD598)" exceeds 222[μs], a warning (error code: 0931H) occurs. Reduce the following settings to prevent "Fixed-cycle system processing monitor time (SD598)" from exceeding 222[μs].

 • Mark detections
 • High-speed input request signals
 • Axis setting parameters (external signal parameters)
 • Operation points of input modules
 • Digital oscilloscope (probe points)

Point

Communication processing with the servo amplifier stops in the cycle that follows after "Fixed-cycle system processing monitor time (SD598)" exceeds 222[μs]. This causes the machine to make abnormal noises, or causes vibrations and collisions.

Devices relating to processing time

The Motion CPU main cycle, Motion operation cycle, and Motion SFC program execution time is monitored with the following special registers. (☞ Page 432 Special Registers)

No.	Name
SD520	Scan time
SD521	Maximum scan time
SD522	Motion operation cycle
SD523	Motion setting operation cycle
SD524	Motion maximum operation cycle
SD562	Scan time
SD563	
SD564	Maximum scan time
SD565	
SD566	Motion SFC normal task processing time
SD567	
SD568	Maximum Motion SFC normal task processing time
SD569	
SD570	Motion SFC event task (14.222ms) processing time
SD571	Motion SFC event task (7.111ms) processing time
SD572	Motion SFC event task (3.555ms) processing time
SD573	Motion SFC event task (1.777ms) processing time
SD574	Motion SFC event task (0.888ms) processing time
SD575	Motion SFC event task (0.444ms) processing time
SD576	Motion SFC event task (0.222ms) processing time
SD578	Motion SFC event task (external interrupt) processing time
SD579	Motion SFC event task (PLC interrupt) processing time
SD580	Motion SFC NMI task processing time
SD581	Fixed-cycle system processing time
SD582	Motion operation task processing time
SD583	CPU refresh (I45 executing) processing time
SD584	Motion SFC event task time within operation cycle (14.222ms)
SD585	Motion SFC event task time within operation cycle (7.111ms)
SD586	Motion SFC event task time within operation cycle (3.555ms)
SD587	Motion SFC event task time within operation cycle (1.777ms)
SD588	Motion SFC event task time within operation cycle (0.888ms)
SD589	Motion SFC event task time within operation cycle (0.444ms)
SD590	Motion SFC event task time within operation cycle (0.222ms)
SD592	Motion SFC event task (external interrupt) time within operation cycle
SD593	Motion SFC event task (PLC interrupt) time within operation cycle
SD594	Motion SFC NMI task time within operation cycle
SD595	Fixed-cycle system processing time within operation cycle
SD596	Motion operation task time within operation cycle
SD597	CPU refresh (I45 executing) time within operation cycle
SD598	Fixed-cycle system processing monitor time

9.3 Event History Function

The Motion CPU stores errors detected by the module, operations done for the module as "event history" in the standard ROM of the Motion CPU, or the SD memory card. Once errors and operations are stored, their occurrence history and other information can be checked chronologically. This function helps to determine the causes of problems that have occurred in the equipment/devices, check the update status of the Motion CPU control data, and detect unauthorized access.

Collects the information of events that occurred in the Motion CPU in a batch and saves it.

Displays the event information retained by the Motion CPU with MT Developer2.

MT Developer2
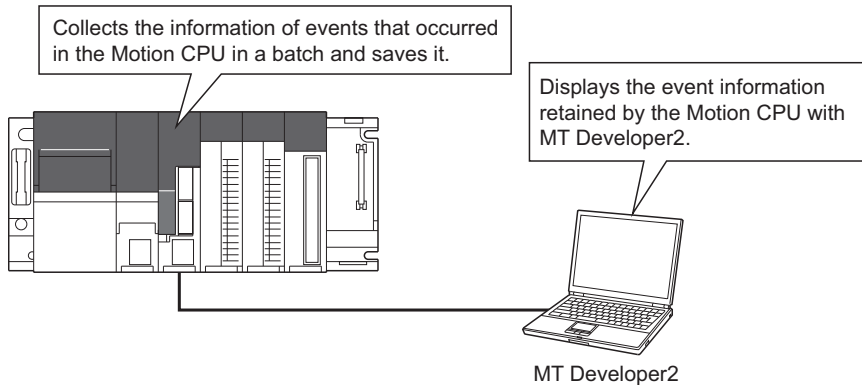
Point

The event history information is constantly collected regardless of the operating state of the Motion CPU. There are occasions, however, when the event history information cannot be collected due to a major error in a module, a base unit error, a cable failure, or some other cause.

Event history settings

Under normal circumstances, the event history function can be used with its default settings and need not be manually configured. The storage memory and size settings for event history files can be changed as needed.(☞ Page 55 CPU parameter)

Saving event history

This section describes events saving for the event history.

Modules from which event history information is collected

For the Motion CPU, only events that occur on the self CPU are saved.
Events on the modules managed by the self CPU are not saved.

Events saved by the CPU module

Information saved in the event history includes operation initiator and other detailed information for troubleshooting purposes.
For events that are saved in the event history on the Motion CPU, refer to event list. (☞ Page 423 Event List)

Event history file

The storage memory and file size for event history files can be changed in event history setting. Refer to CPU parameter for details of the event history setting. (☞ Page 55 CPU parameter)

■Storage memory

Choose either the standard ROM or SD memory card. If the storage memory is the SD memory card, when the write protect switch of the SD memory card is enabled, an event history will not be stored. (It is still possible to read the event history file in the SD memory card using MT Developer2.)

Therefore, if the write protect switch of the SD memory card is changed from disabled to enabled during operation, a write error to the SD memory card occurs when an event for storing in the event history occurs (SD memory card available event is registered) after the write protect switch is enabled. (At the time immediately after an error has occurred, the module diagnostics of GX Works3 can detect it, however, after the Multiple CPU system power supply is turned OFF to ON or after resetting operation, the error that occurred will not be stored in the event history.)

> **Point** 🔑
>
> For a system where file writes occur frequently or the communication conditions are unstable and frequently change, the event history file size should be made large enough to accommodate a greater number of events. If this is the case, the SD memory card is highly recommended as the storage memory.

■File size

The size for event history files can be changed in event history setting. (☞ Page 55 CPU parameter) If the specified size is exceeded, the records are deleted from the oldest one and the latest one is stored. An event history file size is obtained from the following calculation formula.

Event history file size = File header size + Event history management information size + (Number of records × Size per event history record)

Element	Size
File header size	20 bytes
Event history management information size	12 bytes
Size per event history record	At least 40 bytes[1]

[1] Because the contents of detailed information may differ depending on the event to be saved or the detailed information may include a variable-length file name, the size per event history record is variable.

The number of events to be saved in the event history file differs depending on the event type to be saved. An example for when the event history file size is 128K bytes (default) is shown below.

Ex.

Minor error (error code: 1901H)

Because one record is 64 bytes, approximately 2040 events can be registered.

■Timing of file creation

Event history files are created at the following times.

- The Multiple CPU system power supply is turned OFF and ON (if there is no event history file or after the event history settings are changed).
- The Multiple CPU system is reset (if there is no event history file or after the event history settings are changed).
- Initialization of the SD memory card (when no event history file exists)[1]
- Write of parameters (when no event history file exists, or after an event history setting is changed).

[1] When a parameter is stored in the standard ROM, the event history file is created on the SD memory card, according to the event history setting.

> **Point**
>
> When a new event history file is created, that operation is logged into the event file as an event.

The following table shows how the event history is treated depending on operation.

Operation	Operation for the event history
Memory initialization	When this event occurs, the event history is stored into the internal memory. If the internal memory reaches the maximum number of event history records it can store, all subsequent events are lost.
Event history creation	The event history, which has been stored in the internal memory during absence of the event history file, is stored into the standard ROM or the SD memory card. (If any event was lost, it is logged as "*HST LOSS*".)

Indicates the operation of the event history for the SD memory which was removed and mounted in case that the save destination memory is the SD memory.

Operation	Operation for the event history
Removal of the SD memory card	When this event occurs, the event history is stored into the internal memory. If the internal memory reaches the maximum number of event history records it can store, all subsequent events are lost.
Installation of the SD memory card	The event history that has been stored in the internal memory during absence of the SD memory card, is stored to the SD memory card. If the re-inserted SD memory card contains an event history file of the same file size, the CPU module continues to store the event history information. If the file size is different, the CPU module removes the existing event history file and creates a new event history file.

■Timing of parameters taking effect

Any changed parameters take effect at the following times.

- The Multiple CPU system power supply is turned ON.
- The Multiple CPU system is reset

> **Point**
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> Any changed parameters written in the storage memory with the Motion CPU in the STOP state does not take effect when the Motion CPU operating state is changed from STOP to RUN. In this case, the changed parameters will take effect the next time when the Motion CPU is turned OFF and ON or reset.

Loss of event history information

If many events are detected frequently, some events may be lost without being collected. When event loss occurs, "*HST LOSS*" appears in the "Event Code" field of MT Developer2.

Viewing the event history

The Motion CPU event history can be viewed using MT Developer2. For operating procedures and how to interpret the displayed information, refer to the following.

📖 Help of MT Developer2

Clearing the event history

The event history can be cleared using the event history window in MT Developer2. Once the event history is cleared, all the event history information stored in the specified storage memory is deleted. For operating procedures and other details, refer to the following.

📖 Help of MT Developer2

APPENDICES

Appendix 1 Error Codes

When the Motion CPU detects an error with the self-diagnostic function, 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. By checking the error code, the error details and cause can be determined. Refer to error checking methods for how to check the error details and error code. (☞ Page 367 Error checking methods)

Error codes system

Error codes for all modules 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	0001H to 3FFFH	These are errors such as module self-diagnostic errors that are different for each module.
Detection when communicating between modules	4000H to FFFFH	CPU module error
	7000H to 7FFFH	Serial communication module error
	B000H to BFFFH	CC-Link module error
	C000H to CFFFH	Ethernet module error
	D000H to DFFFH	CC-Link IE field network module error
	E000H to EFFFH	CC-Link IE controller network module error
	F000H to FFFFH	MELSECNET/H network module, MELSECNET/10 network module error

Detailed information

When errors are detected during self-diagnosis, detailed information indicating the cause of the error is also stored. Detailed information on each error code can be checked with the engineering tool. The following detailed information is saved for each error code. (Up to two types of detailed information are stored, and the type differs for each error code.)

Detailed information	Item	Details
Detailed information 1	Program positioning information	Displays positioning related information in the program.
	Drive and file name	Displays information relating to the drive No. and file name.
	Parameter information	Displays parameter related information such as the parameter storage target and parameter types.
	System configuration information	Displays system configuration related information such as I/O Nos. and power supply Nos.
	Count information	Displays count related information such the number of times data is written to the memory.
	Time information	Displays time related information.
	G-code control information	Displays G-code control related information such as axis names and program Nos.
	Machine control information	Displays machine control related information such as machine Nos. and machine operations
	Add-on function information	Displays add-on library related information
	Servo error/error at communication failure	Displays servo amplifier related information such as servo amplifier types and error LED displays
	Axis control error	Displays axis control related information such as axis Nos. and axis types
	Motion SFC program	Displays Motion SFC program related information such as program Nos. and program types
Detailed information 2	Drive and file name	Displays information relating to the drive No. and file name.
	Parameter information	Displays parameter related information such as the parameter storage target and parameter types.
	System configuration information	Displays system configuration related information such as I/O Nos. and power supply Nos.

Detailed information on the latest error codes can also be checked from special registers (SD). Detailed information is stored in "Detailed information 1 (SD81 to SD111)" and "Detailed information 2 (SD113 to SD143)". The stored information type is determined with "Detailed information 1 information category (SD80)" and "Detailed information 2 information category (SD112)".(☞ Page 432 Special Registers)

Operations at error occurrence

There are two types of errors, stop errors and continue errors. Refer to operations at error detection for details of stop errors and continue errors. (☞ Page 369 Operations at error detection)

Cancelling errors

Continue errors (minor errors, or continue mode moderate errors) and warnings can be cancelled. Refer to cancelling errors for details of cancelling errors. (☞ Page 370 Cancelling errors)

Error codes stored using the Motion CPU

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

Category			Error code range
Warning			0800H to 0FFFH
Error	Minor	Common	1000H to 17FFH
		Unique	1800H to 1FFFH
	Minor (SFC)	Unique	3100H to 3BFFH
	Moderate	Common	2000H to 2FFFH
		Unique	3000H to 30FFH
	Major	Common	3C00H to 3DFFH
		Unique	3E00H to 3FFFH

• The error detection signal of the error axis turns on at the error occurrence, and the error codes are stored in the error code storage register shown below.

Error class		Error code storage register	Error detection signals	Error reset command
Servo axis	Warning	R: D32006+48n/Q: D6+20n([Md.1003])	R: M32407+32n/Q: M2407+20n ([St.1067])	R: M34487+32n/Q: M3207+20n ([Rq.1147])
	Error	R: D32007+48n/Q: D7+20n([Md.1004])		
	Servo Error	R: D32008+48n/Q: D8+20n([Md.1005])	R: M32408+32n/Q: M2408+20n ([St.1068])	R: M34488+32n/Q: M3208+20n ([Rq.1148])
Command generation axis	Warning	R: D36482+32n/Q: D12602+20n([Md.341])	R: M36567+32n/Q: M9807+20n ([St.344])	R: M40167+32n/Q: M10967+20n ([Rq.346])
	Error	R: D36483+32n/Q: D12603+20n([Md.342])		
Synchronous encoder axis	Warning	R: D36570+32n/Q: D13250+20n([Md.327])	R: M38644+16n/Q: M10444+10n ([St.324])	R: M42240+8n/Q: M11600+4n ([Rq.323])
	Error	R: D36571+32n/Q: D13251+20n([Md.326])		
Machine	Warning	D53171+128m([Md.2023])	M43904+32m([St.2120])	M43616+32m([Rq.2240])
	Error	D53170+128m([Md.2022])		
G-code control	Warning	—	D54440.1+4s([St.3209])	D54226.4+2s([Rq.3380])
	Error	D54504+128s([Md.3019]) D54505+128s([Md.3020]) D54506+128s([Md.3021])		

• If another error occurs after an error code has been stored, the existing error code is overwritten, deleting it. However, the error history can be checked using MT Developer2.
• Error detection signals and error codes are held until the "[Rq.1147] Error reset command (R: M34487+32n/Q: M3207+20n)", "[Rq.1148] Servo error reset command (R: M34488+32n/Q: M3208+20n)", "[Rq.346] Command generation axis error reset command (R: M40167+32n/Q: M10967+20n)", "[Rq.323] Synchronous encoder axis error reset (R: M42240+8n/Q: M11600+4n)", "[Rq.2240] Machine error reset command (M43616+32m)", or "[Rq.3380] Reset command (D54226.4+2s)" turns ON.
• When a servo error or servo warning occurs, a minor error (error code: 1C80H) or warning (error code: 0C80H) is stored in "[Md.1005] Servo error code (R: D32008+48n/Q: D8+20n)", and servo amplifier error codes or warning codes are not stored. Error codes or warning codes read from the servo amplifier are stored in "[Md.1019] Servo amplifier display servo error code (R: D32028+48n/Q: #8008+20n)".

- Even if "[Rq.1148] Servo error reset command (R: M34488+32n/Q: M3208+20n)" turns ON at the servo error occurrence, the same error code might be stored again.
- When a servo error occurs, reset the servo error after removing the error cause on the servo amplifier side.
- Clearing of all the warning codes and error codes stored in the error code storage register, and reset of all error detection signals can be performed with "Error reset (SM50)".

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Warning (0800H to 0FFFH)

Warning details and causes, and corrective action are shown below.

Error code	Error name	Error details and cause	Corrective action
0931H	Fixed scan system process time error	The fixed scan system process time is error.	Please decrease the following settings to make the "fixed scan system process monitor time (SD598)" less than 222[μs]. • Mark detection • High-speed input request signal • Axis setting parameter - External signal parameter (DOG signal) • Operation points of input module • Digital oscilloscope (probe setting number)
093CH	Home position data incorrect	There is a factor that the execution of the home position return is needed in the absolute position system. • The home position return has never been executed after the system start. • The home position return is started, but not completed. • The absolute value data in the Motion CPU disappeared due to the reasons such as battery fault. • Absolute position erase of servo amplifier was detected. • At servo amplifier power-on, a communication error occurred between the servo amplifier and encoder. • "Rotation direction selection" of the servo parameter is changed.	Execute the home position return after checking the batteries of the Motion CPU module and the servo amplifier.
093DH	Control unit incorrect setting	The interpolation control unit of the parameter block is different from the control unit of the fixed parameters.	Combine the control unit of the fixed parameter and parameter block.
093EH	SSCNET communication error	During operation, the "Encoder current value [pulse]" was mismatched with the "Feedback current value [pulse]" (encoder effective bit number). It is always checked after the servo amplifier power supply on (in both servo ON and OFF states).	Check the motor and encoder cables.
093FH	Allowable travel value over during power off	The motor travel value while the power is off exceeded the "Allowable travel during power-off" set in the "Amplifier setting" at servo amplifier power-on.	• Check the position. • Check the battery of the servo amplifier."
0981H	JOG speed limit value	• The set JOG speed is higher than the JOG speed limit value. • The set JOG speed limit value is out of the control unit range.	• Set within the range of 1 to JOG speed limit value. • Set the JOG speed limit value within the range.
0987H	Incorrect simultaneous start of JOG operation	Both of forward and reverse rotations were set at the simultaneous start for the JOG operation.	Set either forward rotation or reverse rotation.
0988H	Manual pulse generator input magnification outside range	The manual pulse generator input magnification is outside the range of 1 to 10000.	Set the manual pulse generator input magnification within the range of 1 to 10000.
098DH	Manual pulse generator start axis control cycle unmatched	The control operation cycle combination of the manual pulse generator start specified axis is unmatched.	Specify the axis No. whose control operation cycle combination can match.
098EH	Manual pulse generator start specified axis number over	The manual pulse generator start specified axis number is more than 4.	Set the manual pulse generator start specified axis number less than 3.
098FH	Manual pulse generator smoothing magnification outside range	The manual pulse generator smoothing magnification is outside the range of 0 to 59.	Set the manual pulse generator smoothing magnification within the range of 0 to 59.
0991H	Speed limit value over	• The speed after the change is out of the range of 0 to Speed limit value. (Unable to change to a minus speed) • The absolute speed value after the change is out of the range of 0 to Speed limit value. • The speed from "command speed of program × override ratio" is out of the range of 0 to Speed limit value. • The speed from "speed change request × override ratio" is out of the range of 0 to Speed limit value.	• Set the speed within the range of 0 to Speed limit value control after change. • Set the speed absolute value within the range of 0 to Speed limit value after change. • Set "command speed of program × override ratio" and "speed change request × override ratio" within the range of 0 to Speed limit value.

Error code	Error name	Error details and cause	Corrective action
099BH	Target position change prohibited	The target position change request (CHGP) was executed for the axis that executes the servo instruction which does not support the target position change.	Change the target position for the axes operated by the following servo instructions. • Linear interpolation control • Fixed-pitch feed control • Continuous trajectory control
09E0H	Servo motor maximum speed outside range	The setting value of servo motor maximum speed is outside the range.	Set the servo motor maximum speed within the range of 0 to 10000000.
09E1H	High-speed oscillation frequency outside range	"Frequency specified by high-speed oscillation function × override ratio" exceeds 5000[CPM].	Set so that "frequency specified by high-speed oscillation function × override ratio" does not exceed 5000[CPM].
09E2H	Illegal override value	• The value set in override ratio setting device is outside the setting range when starting. • The new value of the override ratio setting device is outside the setting range when controlling.	Set the value of the override ratio within the valid range.
09E3H	Pressure control setting value outside range	Necessary setting value for pressure controlling is outside the range.	Correct the setting value.
09E4H	Torque limit value over	The absolute value of command torque is outside the range of 0 to Torque limit value in speed-torque control when the torque or stopper is controlling.	Set the torque within the range of 0 to Torque limit value in speed-torque control after change.
09E7H	Control mode switching during zero speed OFF	The switching request of control mode was executed when the zero speed was turned OFF.	• Switch the control mode when the axis is stopped and the zero speed is turned ON. • Make "Invalid selection during zero speed at control mode switching" valid when not waiting for the stop of the servo motor.
09E8H	Control mode outside range	Specify the incorrect value in the control mode setting device and execute the control mode switching.	• Correct the value of the control mode setting device. • Return to the mode before the continuous mode is changed when switching the continuous control mode to control mode.
09EAH	Control mode switching incorrect	The control mode switching request of speed-torque control was executed for the axis that connects to the drive which do not support the control mode switching.	Do not switch the control mode switching request of speed-torque control for the axis that connects to the drive which does not support the control mode switching.
09EBH	Control mode switching prohibited	Unable to switch during operation when switching to the stopper control was requested.	Request the switching during operation when switching to the stopper control is available.
09ECH	Continuous path control speed limit value over	During continuous path control, the speed at a passing point exceeded the speed limit value.	Set the speed command value within the range of 1 to Speed limit value.
09EDH	Speed change prohibited during home position return	The speed changed against the axis at the timing of the home position return.	Do not change the speed at the timing of the home position return.
09EEH	Speed change prohibited during high-speed oscillation	The speed is changed when the high-speed oscillation starts moving.	Do not change the speed during the high-speed oscillation.
09EFH	Stroke limit invalid axis minus speed change impossible	Changing speed to negative speed is executed in the invalid axis of stroke limit.	Do not change speed to negative speed in the invalid axis of stroke limit.
0A10H	Command speed outside range	• The specified command speed is outside the range of 1 to Speed limit value. • The specified command speed is outside the setting range.	Set the command speed within the range of 1 to Speed limit value.
0A39H	Specify FIN acceleration/deceleration during vibration suppression command filter mode selecting	Set the FIN acceleration/deceleration in the status which specified mode selection device of vibration suppression command filter 1.	Do not specify the mode selection device of vibration suppression command filter 1 when use FIN acceleration/deceleration.
0A3AH	Vibration suppression command filter mode outside the range	The value of mode selection of vibration suppression command filter 1 or 2 was set outside the range.	Revise the mode selection value of vibration suppression command filter.
0A3BH	Vibration suppression command filter frequency setting outside the range	The value of frequency of vibration suppression command filter 1 or 2 was set outside the range.	Revise the frequency setting value of vibration suppression command filter inside the setting range.
0A3CH	Vibration suppression command filter depth setting outside the range	The depth value of vibration suppression command filter 1 was set outside the range.	Revise the depth setting value of vibration suppression command filter 1 inside the setting range.
0A3DH	Parameter block No. setting outside range	Specified parameter block No. is outside the range of 1 to 64.	Set the specified parameter block No. within the range of 1 to 64.

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Error code	Error name	Error details and cause	Corrective action
0A3EH	Dwell time setting outside range	The dwell time is outside the range of 0 to 5000[ms].	Set the dwell time within the range of 0 to 5000[ms].
0A3FH	M code setting outside range	The setting of M code is outside the range of 0 to 32767.	Set the M code within the range of 0 to 32767.
0A40H	Torque limit value setting outside range	The setting of torque limit value is outside the range of 1 to 10000[×0.1%].	The setting of torque limit value is set within the range of 1 to 10000[×0.1%].
0A41H	Auxiliary control unit setting outside range	The auxiliary control unit is outside the range of 0 to 3.	Set the auxiliary control unit within the range of 0 to 3.
0A42H	Speed limit value setting outside range	The speed limit value is outside the setting range.	Set the speed limit value within the valid range.
0A43H	Acceleration time setting outside range	The acceleration time is outside the range of 1 to 8388608[ms].	Set the acceleration time within the range of 1 to 8388608[ms].
0A44H	FIN acceleration/ deceleration setting outside range	The FIN acceleration/deceleration time is outside the range of 1 to 5000[ms].	Set the FIN acceleration/deceleration time within the range of 1 to 5000[ms].
0A45H	Fixed position stop acceleration/deceleration time setting outside range	The fixed position stop acceleration/deceleration time is outside the range of 1 to 8388608[ms].	Set the setting of fixed position stop acceleration/ deceleration time within the range of 1 to 8388608[ms].
0A46H	Deceleration time setting outside range	The deceleration time is outside the range of 1to 8388608[ms].	Set the deceleration time within the range of 1 to 8388608[ms].
0A47H	Rapid stop deceleration time setting outside range	The rapid stop deceleration time is outside the range of 1 to 8388608[ms].	Set the rapid stop deceleration time within the range of 1 to 8388608[ms].
0A48H	P. torque limit value setting outside range	The P. torque limit value is outside the range of 1 to 10000[×0.1%].	Set the P. torque limit value within the range of 1 to 10000[×0.1%].
0A49H	Allowable range of circular interpolation setting outside range	Allowable error range for circular interpolation is outside the setting range.	Set the circular interpolation within the valid range.
0A4AH	Repetition count setting outside range	The repetition count is outside the range of 1 to 32767.	Set the repetition count within the range of 1 to 32767.
0A4BH	S-curve ratio setting outside range	S-curve ratio is set outside the range of 0 to 100[%] at the S-curve acceleration/deceleration specification.	Set the S-curve ratio within the range of 0 to 100[%].
0A4CH	Bias speed at start setting outside range	• The bias speed at start is outside the range of 0 to Speed limit value. • The command speed is outside the range of Bias speed at start to Speed limit value.	• Set the bias speed at start within the range of 0 to Speed limit value. • Set the command speed within the range of Bias speed at start to Speed limit value.
0A4DH	Bias speed at start combined error	The following acceleration/deceleration systems were specified in a servo program whose bias speed at start is not 0. • FIN acceleration/deceleration • Advanced S-curve acceleration/deceleration	When specifying the following acceleration/deceleration systems, set the bias speed at start to 0. • FIN acceleration/deceleration • Advanced S-curve acceleration/deceleration
0A4EH	Advanced S-curve acceleration section 1 setting outside range	Acceleration section 1 ratio is outside the range of 0.0 to 100.0[%].	Set the acceleration section 1 ratio within the range of 0.0 to 100.0[%].
0A4FH	Advanced S-curve acceleration section 2 setting outside range	Acceleration section 2 ratio is outside the range of 0.0 to 100.0[%].	Set the acceleration section 2 ratio within the range of 0.0 to 100.0[%].
0A50H	Advanced S-curve deceleration section 1 setting outside range	Deceleration section 1 ratio is outside the range of 0.0 to 100.0[%].	Set the deceleration section 1 ratio within the range of 0.0 to 100.0[%].
0A51H	Advanced S-curve deceleration section 2 setting outside range	Deceleration section 2 ratio is outside the range of 0.0 to 100.0[%].	Set the deceleration section 2 ratio within the range of 0.0 to 100.0[%].
0A52H	Advanced S-curve acceleration section setting over	(Acceleration section 1 ratio + Acceleration section 2 ratio) > 100.0[%].	Set the ratio of (Acceleration section 1 ratio + Acceleration section 2 ratio) within the range of 0.0 to 100.0[%].
0A53H	Advanced S-curve deceleration section setting over	(Deceleration section 1 ratio + Deceleration section 2 ratio) > 100.0[%].	Set the ratio of (Deceleration section 1 ratio + Deceleration section 2 ratio) within the range of 0.0 to 100.0[%].
0A54H	Deceleration time over in rapid stop deceleration time setting	The rapid stop deceleration time is larger than the deceleration time.	Set the rapid stop deceleration time within the range of 1 to Deceleration time setting value.

Error code	Error name	Error details and cause	Corrective action
0A55H	Speed-torque control operation data incorrect setting	• Any of the devices set in the speed-torque control operation data is outside the range. • In the axes which the torque initial value selection is feedback torque when switching the control mode, the servo parameter "POL reflect setting during the PC29 torque control" is "0: Valid".	• Correct the speed-torque control operation data device. • Use the servo amplifier corresponding to the POL reflect setting during the torque control and set the POL reflect setting as "1: Invalid" at the torque control. Or set the command torque in the torque initial value selection when switching the control mode.
0A56H	Speed limit value outside range during speed-torque control	The value set in speed limit value in speed-torque control is outside the range when switching the control mode.	Set the speed limit value within the range.
0A57H	Torque limit value outside range during speed-torque control	The value set in torque limit value in speed-torque control is outside the range when switching the control mode.	The torque limit value is set to 1 to 10000 [×0.1%].
0A58H	Fixed position stop acceleration/deceleration time incorrect	During the fixed position stop speed control, the fixed position acceleration/deceleration time is outside the range of 1 to 8388608[ms] at the fixed positioning acceleration/deceleration time input.	Set the setting of fixed position stop acceleration/deceleration time within the range of 1 to 838868[ms].
0A59H	Command speed outside range during continuous path control	During continuous path control, the command speed at a passing point is less than 0.	Set the speed command value within the range of 1 to Speed limit value.
0A5AH	Positioning speed error during continuous path control	During continuous path control, the positioning speed at a passing point does not reach the bias speed at start.	• Set the command speed within the range of bias speed at start or more and speed limit value or less. • Set the command speed within the range of Bias speed at start to Speed limit value.
0A5BH	Torque limit change value outside range	When the torque limit value change (D(P).CHGT, M(P).CHGT, CHGT) is requesting, the positive direction torque limit value or the negative direction torque limit value was set outside the range of 1 to 10000 [×0.1%].	When the torque limit value change is requesting, execute the changing request to set the positive direction torque limit value or the negative direction torque limit value within the range of 1 to 10000[×0.1%].
0A5CH	The torque limit value change error to the axis not yet started	The torque limit value change request (D(P).CHGT, M(P).CHGT, CHGT) was made to the axis not yet started.	Make the torque limit value change request to the axis not yet started.
0A5DH	Under bias speed at start when changing speed	• The speed after change does not reach the bias speed at start when changing the speed. • The speed from "command speed of program × override ratio" does not reach the bias speed at start. • The speed from "speed change request × override ratio" does not reach the bias speed at start.	• Set the command speed within the range of Bias speed at start to Speed limit value. • Set "command speed of program × override ratio" and "speed of speed change request × override ratio" within the range of Bias speed at start to Speed limit value.
0A5EH	Torque limit change value incorrect during speed-torque control	The change value according to torque limit value change request (D(P).CHGT, M(P).CHGT, CHGT) during speed-torque control exceeded the torque limit value during speed-torque control.	Specify the change request within the torque limit value during the speed-torque control.
0A5FH	Command speed absolute value outside range during speed-torque control	The absolute value of command speed is outside the range of 0 to Speed limit value in speed-torque control during the speed-torque control.	Set the speed within the range of 0 to Speed limit value in speed-torque control after change.
0BD0H	Input axis phase compensation over	The phase compensation of input axis was below the minimum value (-2147483648) or above the maximum value.	• Shorten the phase compensation advance time. • Decrease the input axis speed.
0BD1H	Input axis rotation direction restriction amount over	The rotation direction restriction amount of input axis was below the minimum value (-2147483648) or above the maximum value (2147483647).	• Check the enabled direction in the rotation direction restriction setting. (The setting may be opposite.) • Check if there is an execution that the input axis moves by a wide margin oppositely to the enabled direction.
0BD2H	Input axis speed display over	The monitor speed display of input axis was below the minimum value (-2147483648) or above the maximum value (2147483647).	• If the number of decimal places is set in the input axis setting, reduce the setting value. • If the speed time unit is set in the input axis setting, Set min → sec. • Slow down the input axis.
0BD3H	Serial ABS synchronous encoder battery warning	The battery voltage dropped in the servo amplifier which connected the synchronous encoder.	Replace the battery.
0BD4H	Synchronous encoder axis control method outside range error	A value outside the range of 0 to 2 was set in "[Cd.321] Synchronous encoder axis control method" at synchronous encoder axis control request.	Set within the range of 0 to 2.
0BD5H	Synchronous encoder axis control method specification error	The control cycle of the high-speed input request signal specified in "[Cd.320] Synchronous encoder axis control start condition" is not set as the operation cycle at synchronous encoder axis control request.	Specify the high-speed input request signal in which the control cycle is set as the operation cycle.

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Error code	Error name	Error details and cause	Corrective action
0BE4H	Main shaft clutch control setting outside range	• The value of synchronous parameter "[Pr.405] Main shaft clutch control setting" is set outside the range in synchronous controlling. • Set the synchronous parameter "[Pr.405] Main shaft clutch control setting" to No Clutch in synchronous controlling.	• Set within the range. • Do not change the setting to No Clutch.
0BE5H	Main shaft clutch control setting error	The control cycle setting of the high-speed input request signal set in synchronous parameter "[Pr.405] Main shaft clutch control setting" does not match the control operation cycle of output axis in synchronous controlling.	Set the high-speed input request signal whose control cycle setting matches the control operation cycle of output axis.
0BF4H	Auxiliary shaft clutch control setting outside range	• The value of synchronous parameter "[Pr.422] Auxiliary shaft clutch control setting" is set outside the range in synchronous controlling. • Set the synchronous parameter "[Pr.422] Auxiliary shaft clutch control setting" to No Clutch in synchronous controlling.	• Set within the range. • Do not change the setting to No Clutch.
0BF5H	Auxiliary shaft clutch control setting error	The control cycle setting of the high-speed input request signal set in synchronous parameter "[Pr.422] Auxiliary shaft clutch control setting" does not match the control operation cycle of output axis in synchronous controlling.	Set the high-speed input request signal whose control cycle setting matches the control operation cycle of output axis.
0C01H	Speed change ratio 1 denominator outside range	Set the value of synchronous parameter "[Pr.437] Speed change ratio 1 denominator" less than 0 in synchronous controlling.	Set within the range of 1 to 2147483647.
0C05H	Speed change ratio 2 denominator outside range	Set the value of synchronous parameter "[Pr.493] Speed change ratio 2 denominator" less than 0 in synchronous controlling.	Set within the range of 1 to 2147483647.
0C10H	Cam No. outside range	A value outside the range of 0 to 1024 was set in synchronous parameter "[Pr.440] Cam No." in synchronous controlling.	Set within the range of 0 to 1024.
0C11H	Cam not registered	Cam data which No. has been changed does not exist in cam open area after changing synchronous parameter "[Pr.440] Cam No." in synchronous controlling.	Specify a cam No. in which cam data exists.
0C12H	Cam axis length per cycle outside range	Set the value of synchronous parameter "[Pr.439] Cam axis length per cycle" less than 0.	Set within the range of 1 to 2147483647.
0C14H	Cam axis phase compensation over	The phase compensation of cam axis was below the minimum value (-2147483648) or above the maximum value (2147483647).	• Shorten the cam axis phase compensation advance time. • Decrease the cam axis input speed.
0C15H	Cam axis length per cycle change invalid	"[Pr.439] Cam axis length per cycle" will be changed when the cam data which is stroke ratio data format and the cam data starting point is other than 0 is used in synchronous controlling.	Use the cam data which the cam data starting position is 0.
0C16H	Control mode switching request error	• Synchronous parameter "[Pr.440] Cam No." switches the control mode to speed-torque-continuous control mode for the output axis except 0 in synchronous controlling. • Switch the control mode to speed-torque-continuous operation to torque control for the output axis that is executing the synchronous control switching function."	• Set the output axis to linear cam (cam No.0) when executing the speed-torque control during advanced synchronous control. • Execute the request switching to the control mode to speed-torque-continuous operation to torque control after executed synchronous control switching function."
0C17H	Cam No. outside range in speed-torque control mode	A value other than 0 was set in output axis synchronous parameter "[Pr.440] Cam No." during speed-torque control mode.	Set the output axis to linear cam (cam No.0) when executing the speed-torque control during advanced synchronous control.
0C20H	Synchronous control change instruction outside range error	A value outside the range of 0 to 4 was set in "[Cd.407] Synchronous control change instruction" at control change request.	Set within the range of 0 to 4.
0C48H	Cam open area size over	There is not enough free area in cam open area.	Delete the unnecessary cam.
0C70H	Cam data error	Cam data is faulty.	Write the cam data again.
0C80H	Servo warning	Warning occurred in servo amplifier.	Check and correct the error details in "[Md.1019] Servo amplifier display servo error code" and "[Md.107] Parameter error No.". (Refer to the servo amplifier technology manual for the details of servo alarm.)"
0C82H	Connection configuration warning	The number of servo amplifier or module connected between Motion CPU and multiple axes servo amplifier is over the specified number.	Check the connection configuration of servo amplifier.

Error code	Error name	Error details and cause	Corrective action
0C85H	Sensing module connection configuration warning	• The connection number in 1 block differs from the system setting. • The number of servo amplifier or module connected between Motion CPU and sensing module is over the specified number.	• Check the connection status of the sensing module. • Review the connection configuration of the sensing module.
0ED0H	Boot log create error	Boot log file cannot be created.	Delete unnecessary file in standard ROM. (Confirm the free space.)
0ED1H	Boot log copy error	Failed to copy to SD memory card of boot log file.	Delete unnecessary file in SD memory card. (Confirm the free space.)
0EE0H	Machine control setting data warning	The setting data is outside the range during machine control.	Confirm the detail code and set the adequate value of parameter within the range. (For the detail code, refer to ▢MELSEC iQ-R Motion Controller Programming Manual (Machine Control).)
0EE1H	Speed control 10 × multiplier setting for degree warning of machine structuring axis	Axis which is valid at speed control 10 × multiplier setting for degree axis exists in machine configuration axis.	Set invalid for speed control 10 × multiplier setting for degree axis of machine configuration axis.
0EF0H	Add-on function warning	Warning has been occurred in add-on function.	Check the detail information and refer to instruction manual of add-on library that supported file name.
0EF1H	Add-on license warning	Warning occurred in add-on license check.	Confirm the detailed code. (For the detailed code, refer to ▢MELSEC iQ-R Motion Controller Programming Manual (Common).)

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Minor error (1000H to 1FFFH)

Minor error details and causes, and corrective action are shown below.

Error code	Error name	Error details and cause	Corrective action
1000H	Power shutoff	• A momentary power failure has occurred. • The power supply has been shut off.	Check the power supply status.
1080H	ROM write count error	The number of writes to the flash ROM exceeded 100000 times. (Number of writes > 100000)	Replace the CPU module.
1200H	Module moderate error	A moderate error has been notified from the intelligent function module connected.	Check the detailed information (system configuration information), identify the error module, and eliminate the error cause.
1210H	Module moderate error	An inter-module synchronous signal error has been notified from the intelligent function module connected.	Check the detailed information (system configuration information), identify the error module, and eliminate the error cause.
1220H	Another CPU module moderate error	A moderate error has been notified from another CPU module.	• Check the detailed information (system configuration information), identify the error CPU module, and eliminate the error cause. • Check the mounting status and reset status of other CPU modules.
1900H	PLC ready OFF during operation	"[Rq.1120] PLC ready flag" is OFF when operating.	When all axes stopped, turn "[Rq.1120] PLC ready flag" ON.
1901H	Servo ready OFF	"[St.1075] Servo ready" was OFF when starting. • Servo amplifier power OFF • In initial processing when the servo amplifier power is ON • Servo amplifier unimplemented • Servo error occurred • Cable faulty • "[Rq.1155] Servo OFF command" is ON	Start when the "[St.1075] Servo ready" is ON.
1902H	Servo ready OFF	Servo amplifier power is OFF when controlling. (Servo not mounted status detection, cable fault, etc.)	• Turn on the power supply of the servo amplifier. Or check the connect cable to the servo amplifier. • Execute gain adjustment.
1904H	Hardware stroke limit +	At a forward direction (address increasing direction) start, the external signal FLS (upper limit switch signal) is OFF.	Perform the home position return after moving to the proximity dog ON by the JOG operation, etc.
1905H	Hardware stroke limit +	At a forward direction (address increasing direction) control, the external signal FLS (upper limit switch signal) is OFF.	Perform the home position return after moving to the proximity dog ON by the JOG operation, etc.
1906H	Hardware stroke limit -	At a reverse direction (Address decreasing direction) start, the RLS external signal (Lower limit switch) is OFF.	Perform the home position return after moving to the proximity dog ON by the JOG operation, etc.
1907H	Hardware stroke limit -	At a reverse direction (Address decreasing direction) controlling, the RLS external signal (Lower limit switch) is OFF.	Perform the home position return after moving to the proximity dog ON by the JOG operation, etc.
1908H	Stop signal ON	• "[Rq.1140] Stop command" is ON when starting. • "[Rq.1140] Stop command" is ON at the timing of home position return. • "[Rq.341] Command generation axis stop command" is ON when starting.	• Turn OFF the "[Rq.1140] Stop command" and then start it. • "[Rq.1140] Stop command" and then perform the home position return. • Turn OFF the "[Rq.341] Command generation axis stop command" and then start it.
1909H	External stop signal ON	• External stopping signal is ON when starting. • External stopping signal is ON at the timing of the home position return.	• Start as the external stop signal is OFF. • Execute the home position return as the external stop signal is OFF.
190BH	Connect to unsupported servo amplifier	Connect to unsupported servo amplifier and driver.	Connect to supported servo amplifier and driver.
1927H	Servo error detection signal ON at start	The "[St.1068] Servo error detection" is ON when starting.	Eliminate the servo error, reset the "[St.1068] Servo error detection" by the "[Rq.1148] Servo error reset command", then start operation.
192AH	Start acceptance flag ON at start	• The "[St.1040] Start acceptance flag" is ON when starting. • The "[St.345] Command generation axis starting acceptance flag" is ON when starting.	• Start when the "[St.1040] Start acceptance flag" is OFF. • Start when the "[St.345] Command generation axis start acceptance flag" is OFF.

Error code	Error name	Error details and cause	Corrective action
192DH	Rapid stop signal ON	• "[Rq.1141] Rapid stop command" is ON when starting. • "[Rq.1141] Rapid stop command" is ON at the timing of home position return. • "[Rq.342] Command generation axis rapid stop command" is ON when starting.	• Turn OFF the "[Rq.1141] Rapid stop command" and then start it. • "[Rq.1141] Rapid stop command" and then perform the home position return. • Turn OFF the "[Rq.342] Command generation axis rapid stop command" and then start it.
192EH	PLC ready ON during deceleration	"[Rq.1120] PLC ready flag" turned from OFF to ON again during deceleration.	When all axes stopped, turn "[Rq.1120] PLC ready flag" ON.
192FH	Servo error detection signal ON during controlling	"[St.1068] Servo error detection" is ON when controlling.	Start after disposal at the servo error.
1940H	Start at home position	Start scale home position signal detection method home position return when "[St.1070] Home position return complete" and "[St.1074] External signals DOG/CHANGE" is ON.	Perform the home position return after moving to the proximity dog ON by the JOG operation, etc.
194BH	Driver home position return method error	Operation error occurred in driver when executing driver home position return to stepping driver.	Check the operation alarm details and then execute home position return again.
194CH	Time out for awaiting home position return mode	Cannot acquire normal data from stepping driver during home position return.	Execute home position again. If the same error happens, hardware of Motion controller and stepping may be error. Explain the error symptom and get advice from our sales representative.
194DH	Time out for awaiting operation ON	Cannot acquire normal data from stepping driver during home position return.	Execute home position again. If the same error happens, hardware of Motion controller and stepping may be error. Explain the error symptom and get advice from our sales representative.
194EH	Time out for awaiting operation completed ON	Cannot acquire normal data from stepping driver during home position return.	Execute home position again. If the same error happens, hardware of Motion controller and stepping may be error. Explain the error symptom and get advice from our sales representative.
1977H	Encoder absolute position data not established	Home position return is started on using direct drive motor when the absolute position data of the encoder has not been established.	Turn the power supply of the system or servo amplifier from OFF to ON after passing the zero point of the motor by the JOG operation, etc.
1978H	Z-phase pass parameter incorrect	• When using the scale home position signal detection method home position return or the dogless home position reference method home position return (operation A), the servo parameter PC17 is other than "Pass Z-phase After AC-ON". • When using the dogless home position reference method home position return (operation B), the servo parameter PC17 is other than "Not Pass Z-phase After AC-ON".	• Set "Pass Z-phase After AC-ON" to the servo parameter PC17. • Set "Not Pass Motor Z-phase After AC-ON" to the servo parameter PC17. • When changing PC17, once the power supply of servo amplifier is turned OFF after changing parameter and then turned ON again.
1979H	Home position return method incorrect error	Home position return is started with the home position return method which is not supported by the connected machine.	Change to the home position return method which is supported by the connected machine.
197AH	Home position return zero not passed	ZCT unset The "[St.1066] zero pass" turned off at the re-movement at the home position return for ZCT unset proximity dog method, count method limit switch combined method, or start in the home position return for data set method.	Perform the home position return when the "[St.1066] Zero pass" is ON.
197BH	Home position return complete signal ON	The "[St.1070] Home position return complete" turned on at the home position return of proximity dog method, dog cradle method, stopper method or dogless home position signal reference method.	• For proximity dog method dog cradle method stopper method: Return to a point before the proximity dog signal ON by JOG operation or positioning operation etc. and perform the home position return. • For dogless home position signal reference method: Return to a point before the proximity dog signal ON by JOG operation or positioning operation etc. and perform the home position return.
197CH	All axes rapid stop during home position return	During a home position return, all axes rapid stop operation was performed in the test mode of MT Developer2.	• In case of proximity dog method, return to a point before the proximity dog signal ON using JOG operation or positioning operation, and perform the home position return again. • In case of proximity dog is off in count method, return to a point before the proximity dog signal ON using JOG operation or positioning operation, and perform the home position return again.

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Error code	Error name	Error details and cause	Corrective action
197DH	External DOG signal ON during home position return	The external dog (proximity dog) signal is ON when the home position return starting.	Perform the home position return after moving to the proximity dog ON by the JOG operation, etc.
197EH	An encoder initial communication error at turning ON servo amplifier power supply	A communication error between the servo amplifier and encoder occurred at the turning on servo amplifier power supply.	• Check the motor and encoder cables. • Execute a home position return at home position return requirement ON.
1980H	JOG speed outside range	The set JOG speed is 0.	Set within the range of 1 to JOG speed limit value.
198DH	Manual pulse generator unset	The unset manual pulse generator axis is started.	Start the set manual pulse generator axis.
198EH	Manual pulse generator multiple start error	The same manual pulse generator started during the manual pulse generator operation (decelerating).	Start the manual pulse generator after checking the manual pulse generator stopped.
198FH	Manual pulse generator control axis unset error	• "Number setting register of the axis to be controlled in [Cd.1098] manual pulse generator 1" is 0. • "Number setting register of the axis to be controlled in [Cd.1099] manual pulse generator 2" is 0. • "Number setting register of the axis to be controlled in [Cd.1100] manual pulse generator 3" is 0.	• Set the "Number setting register of the axis to be controlled in [Cd.1098] manual pulse 1". • Set the "Number setting register of the axis to be controlled in [Cd.1099] manual pulse generator 2". • Set the "Number setting register of the axis to be controlled in [Cd.1100] manual pulse generator 3".
1993H	Software stroke limit +	• The feed current value exceeded the stroke limit range at start. • The feed current value exceeded the stroke limit range when controlling. Only the axes which exceeded the stroke limit range are stored in case of the circular interpolation/helical interpolation. All of the interpolations are stored in case of the linear interpolation.	• Set within the stroke range by the JOG operation. Or set within the stroke range by the home position return or current value change. • Correct the stroke limit range or movement amount setting so that positioning control is within the range of the stroke limit.
1995H	Software stroke limit -	• The feed current value is lower than the stroke lower limit value at start. • The feed current value is lower than the stroke lower limit value when controlling. Only the axes which exceeded the stroke limit range are stored in case of the circular interpolation/helical interpolation. All of the interpolations are stored in case of the linear interpolation.	• Set within the stroke range by the JOG operation. Or set within the stroke range by the home position return or current value change. • Correct the stroke limit range or movement amount setting so that positioning control is within the range of the stroke limit.
1997H	Current value change outside range	The current value was changed outside the range of 0 to 35999999 ($\times 10^{-5}$ [degree]) for the degree axis.	Operate within the range of 0 to 35999999 ($\times 10^{-5}$[degree]).
19A1H	PLC ready OFF start	The "[Rq.1120] PLC ready flag" or the "PCPU preparation completion flag" is OFF.	• Set the Motion CPU to RUN. • Turn the "[Rq.1120] PLC ready flag" on.
19A4H	ABS direction setting error during degree	When software stroke limit is invalid, the value outside the range has been set to "ABS direction setting device during degree".	Set the ABS direction setting device during degree within the range.
19A6H	Start error during home position return incomplete	The "[St.1069] Home position return request" is ON if the "Servo program not executed" is selected in the operation setting when the home position is not completed.	• After the home position return is accomplished, execute the servo program. • For systems that allow the execution of the servo program even if a "[St.1069] Home position return request" is ON, set "Operational setting for home position return incomplete" of the home position return data setting to "Execute servo program".
19DDH	Servo motor maximum speed over	Over the servo motor maximum speed.	Please set the command speed in the range of servo motor maximum speed.
19DEH	Other axis servo motor maximum speed over	The command speed of other axis exceeds the servo motor maximum speed.	Please set the command speed of other axis in order to change it into the range of servo motor maximum speed.
19DFH	Stop function valid setting error for backing side	Enable the stop function valid setting to backing side of servo parameter (Pressure control function selection 1(PT12)).	Disable the stop function valid setting for backing side.
19E0H	Pressure control exceed last address error	• The difference between last address and home position exceed motor encoder pulse unit $\pm$ (2^{-31}[pulse] to motor encoder for 10 rev.). • The difference between last address and actual current value exceed motor encoder pulse unit (2^{-31}[pulse]).	Correct the value of last address to make it within the setting range of limit value.
19E1H	Pressure control start error	Necessary setting value for pressure control starting is outside the range.	Correct the setting value.

Error code	Error name	Error details and cause	Corrective action
19E2H	Command speed acceleration/deceleration time outside range	• The command speed acceleration time of the speed-torque control data is outside the range 0 to 8388608 [ms]. • The command speed deceleration time of the speed-torque control data is outside the range 0 to 8388608 [ms].	• Set the command speed acceleration time of the speed-torque control data within the range 0 to 8388608 [ms]. • Set the command speed deceleration time of the speed-torque control data within the range 0 to 8388608 [ms].
19E3H	Command torque time constant outside range	• The command torque time constant (positive direction) of the speed-torque control data is outside the range of 0 to 8388608 [ms]. • The command torque time constant (negative direction) of the speed-torque control data is outside the range of 0 to 8388608 [ms].	• Set the command torque time constant (positive direction) of the speed-torque control data within the range of 0 to 8388608 [ms]. • Set the command torque time constant (negative direction) of the speed-torque control data within the range of 0 to 8388608 [ms].
19E6H	Target position change request prohibited acceleration/deceleration method	The target position change request (CHGP) is executed to the program where the following acceleration/deceleration system is set. • FIN acceleration/deceleration • Advanced S-curve acceleration/deceleration	• Do not execute the target position change to the program where the FIN acceleration/deceleration or the advanced S-curve acceleration/deceleration is set. • Set the acceleration/deceleration system of the parameter block or the servo program to the trapezoid/S-curve acceleration/deceleration.
19E7H	Unsupported stopper control	Switching to the stopper control was requested to the servo amplifier which unsupported to the stopper control.	Use the available stopper control for servo amplifier.
19E8H	Stroke limit invalid axis circular/helical interpolation execution error	The circular interpolation or helical interpolation was started in the invalid axis of stroke limit.	Make the stroke limit valid for the control unit degree axis starts the circular interpolation or helical interpolation.
19E9H	Speed-position control restart error	The speed-position switching control restart (VPSTART) was performed, although it was not after the stop during operation of the speed-position switching control.	Do not restart except for the stop during speed-position switching control.
19EAH	Fixed position stop speed control start error	Servo axis: • The speed control with fixed position stop was executed for the axis which the unit has been set other than [degree]. • The speed control with fixed position stop was executed for the axis which the stroke limit has been set other than [degree]. Command generation axis: • The speed control with fixed position stop was executed for the axis which the "[Pr.346] Command generation axis 1 cyclic length" is 0.	Servo axis: • Set the unit [degree] for the axis for which fixed position stop speed control is started. • Set the stroke limit to invalid "(lower stroke limit value) = (upper stroke limit value)" for the axis for which fixed position stop speed control is started. Command generation axis: • Set the length per cycle other than 0 for fixed position stop speed control starting axis in command axis.
19EBH	Speed control (Ⅱ) execution impossible	The operation disable instruction (VVF/VVR) was started in an axis that does not support VVF/VVR instructions.	The VVF/VVR instruction cannot be started in an axis that does not support VVF/VVR instructions.
19ECH	External input signal setting error	The positioning control which uses the external input signal was executed for the axis which has not set the external input signal in the system settings.	Set the external input signal in the system setting.
19EDH	Other axes software stroke limit outside range error detection	The feed current value of another axis exceeded the stroke limit value during the circular/helical interpolation or simultaneous manual pulse generator operation. (For detection of other axis errors).	Correct the setting movement amount or the stroke limit range so that the positioning control is within the range of stroke limit.
19EEH	Setting movement amount software stroke limit outside range	The preset movement amount exceeded the stroke limit range when speed-position switching signal (CHANGE) is input.	Correct the setting movement amount or the stroke limit range so that the positioning control is within the range of stroke limit.
19EFH	Interpolation command incorrect after skip during continuous path control	• The next interpolation is ABS arc or ABS helical interpolation upon skip execution under continuous path control. • ABS arc or ABS helical interpolation is executed with passing through only the incremental positioning point after skip is executed under continuous path control.	If ABS arc or ABS helical interpolation is designated at a point after the skip designation point, set an ABS linear interpolation point in the interval.
19F9H	Start axis control operation cycle unmatched error	The control operation cycle of the axis No. set in servo program is unmatched.	Set the axis No. whose control operation cycle can match.
19FAH	No specified servo program	The servo program set in servo program start does not exist.	Set the correct servo program No.
19FBH	Axis No. unmatch error	The axis No. set in servo program start does not match to axis No. set in servo program.	Set the correct axis No.

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Error code	Error name	Error details and cause	Corrective action
19FCH	Servo program instruction code error	• The device number of the device that is set in the servo program is outside the range. • An instruction that cannot be used in D(P).SVSTD/M(P).SVSTD instructions is set.	• Revise the program so that the device number is correct, or revise the CPU parameter device numbers so they are within the range. • Set the correct instruction code.
19FDH	Servo program No. outside range	The servo program No. is outside the range of 0 to 8191. *: The range before Motion controller OS software version"09" is 0 to 4095	Set the servo program No. within the range of 0 to 8191. *: The range before Motion controller OS software version "09" is 0 to 4095
19FEH	Command generation axis start error	The operation disable instruction (VPF, VPR, VPSTART, ZERO, VVF, VVR, OSC) was started in the command generation axis.	Correct the servo program.
19FFH	Axis No. setting error	• An unused axis is set in the servo program. • The axis No. set in servo program is outside the range. Or the axis No. set in servo program is overlapping.	• Set an axis No. that is being used. • Correct the axis No. of servo program.
1A17H	Circular error excessive	The difference between the end point address and ideal end point is outside the allowable error range for circular interpolation.	Correct the address of servo program.
1A18H	Software stroke limit +	• Positioning is outside the range of stroke limit which has exceeded by software upper stroke limit. • When absolute position system is enabled for stepping driver, and software stroke limit is valid with control units as degree, the following instructions were started. (1) Absolute system instructions in continuous trajectory control (2) Position follow-up control	• Execute positioning within the range of stroke limit. • When absolute position system is enabled for stepping driver, if software stroke limit is valid and control units are degree, do not use the following instructions. (1) Absolute system instructions in continuous trajectory control (2) Position follow-up control
1A1AH	Software stroke limit -	Positioning is outside the range of stroke limit which has exceeded by software lower stroke limit.	Execute positioning within the range of stroke limit.
1A23H	Command speed setting error	The specified command speed is less than 0.	Set the command speed within the range of 1 to Speed limit value.
1A27H	Auxiliary point setting error	The address that does not generate an arc is set at the auxiliary point-specified/auxiliary point-specified helical interpolation. (Start point = Auxiliary point)	Correct the address of servo program.
1A28H	Auxiliary point setting error	The address that does not generate an arc is set at the auxiliary point-specified/auxiliary point-specified helical interpolation. (End point = Auxiliary point)	Correct the address of servo program.
1A29H	Auxiliary point setting error	The address that does not generate an arc is set at the auxiliary point-specified/auxiliary point-specified helical interpolation. (Three points are on one linear.)	Correct the address of servo program.
1A2AH	Auxiliary point setting error	• The auxiliary point address is outside the setting range at the positioning start for absolute method. • The auxiliary point address is set to -2147483648 (H80000000) at the positioning start for incremental method. • The start point address + auxiliary point address is outside the range of -2147483648 to 2147483647 at the positioning start for incremental method.	• Set the auxiliary point address within the range of 0 to 35999999 for the axis (unit: degree). • Set the auxiliary point address within the range of 0 to ±(214748364748-1). • Set the start point address + auxiliary point address within the range of -2147483648 to 2147483647."
1A2BH	End point setting error	The circular interpolation/helical interpolation is not to be circular. (Start point = End point)	Correct the address of servo program.
1A2DH	Central point setting error	The address that does not generate an arc is set at the central point specified/central point specified helical interpolation. (Start point = Central point)	Correct the address of servo program.
1A2EH	Central point setting error	The address that does not generate an arc is set at the central point specified/central point specified helical interpolation. (End point = Central point)	Correct the address of servo program.
1A2FH	Central point setting error	• The central point address is outside the setting range at the positioning start for absolute method. • The central point is set to -2147483648 (H80000000) at the positioning start for incremental method. • The start point address + central point address is outside the range of -2147483648 to 2147483647 at the positioning start for incremental method.	• Set the central point address within the range of 0 to 35999999 for the axis (unit: degree). • Set the central point address within the range of 0 to ± (214748364748-1). • Set the start point address + central point address within the range of -2147483648 to 2147483647.
1A30H	Address outside range	The movement amount is set to -2147483648 (H80000000) at the positioning start for incremental data method.	The setting of movement amount is within the range of 0 to ±(2147483648-1).

Error code	Error name	Error details and cause	Corrective action
1A31H	Address outside range	The address is outside the setting range at the positioning start for absolute data method.	Set the address within the range of 0 to 35999999 for the axis (unit: degree).
1A32H	Radius outside range	• The radius is outside the setting range at the positioning control for absolute method. • The radius is set to 0 or a negative number setting at the positioning start for incremental method.	• Set the radius within the range of 0 to 35999999 for the axis (unit: degree). • Set the radius within the range of 0 to ±(2147483648-1).
1A36H	Pitch number outside range	The number of pitches specified in helical interpolation is outside the range of 0 to 999.	Set the specified pitch number within the range of 0 to 999.
1A4FH	START instruction setting error	• Servo program specified with the START instruction does not exist. • There is a "START" instruction in the specified servo program. • The starting axis of the specified servo program is overlapping. • The specified servo program start axis is overlapping. • Self program No. is set in simultaneous start program No. • The real axis program and the command axis program exist together. • Start program does not exist. • All the specified program No. is -1.	• Create the servo program specified with the START instruction. • Delete the servo program specified with the START instruction. • Do not overlap the starting axis. • Do not overlap the simultaneous start program No. • Do not set self program No. in simultaneous start program No. • Please change the setting so that the real axis program and the command axis program do not exist together. • Set to start the program existed. • Do not set all the simultaneous start program number to -1.
1A50H	Point setting error	No point specification exists in the instruction during the continuous trajectory control.	Specify a point between the CPSTART and CPEND.
1A51H	Reference axis speed setting error	The axis except for interpolation axis is set as the reference axis at the linear interpolation of the reference axis speed specification method.	Set the reference in the interpolation axis.
1A52H	High-speed oscillation command amplitude error	Unable to start because the amplitude commanded in the high-speed oscillation function is outside the range of 1 to 2147483647.	Start after setting the command amplitude within the range of 1 to 2147483647.
1A53H	High-speed oscillation start angle error	Unable to start because the starting angle commanded in the high-speed oscillation function is outside the range of 0 to 3599 (× 0.1 [degree]).	Start after setting the starting angle within the range of 0 to 3599 (× 0.1 [degree]).
1A54H	High-speed oscillation frequency error	Unable to start because the frequency commanded in the high-speed oscillation function is outside the range of 1 to 5000 [CPM].	Start after setting the frequency within the range of 1 to 5000 [CPM].
1A55H	Radius setting error	The address that does not generate an arc is set at the R (radius) specified/R (radius) specified helical interpolation. (Relationships among the start point radius and end point.)	Correct the address of servo program.
1A56H	Reference axis movement amount 0	The movement amount of the reference axis is set at "0" in the linear interpolation for reference axis specification.	Set the axis of which the movement amount is not 0 to a reference axis.
1A57H	Movement amount insufficient during speed-position switching control/ count method home position return	Overrun occurred because preset movement amount is less than The deceleration distance at The proximity dog signal input during The speed-position switching signal (Change) input or The home position return of count method during The speed-position switching control.	• Set the speed so that an overrun will not occur. • Set the setting movement amount so that an overrun will not occur.
1A58H	Movement amount insufficient	• During control, an overrun occurred because the deceleration distance for output speed was not reached upon detection of the last positioning address. • During acceleration/deceleration time change control, an overrun occurred because the deceleration distance for output speed was not reached upon detection of the last positioning address.	• Set the speed/setting movement amount so that an overrun will not occur. • Set the speed/setting movement amount/deceleration time so that an overrun will not occur.
1A59H	Command address outside range during position tracking control	When the control unit is "degree" set the command address within the range of 0 to 35999999 during position tracking.	If the control unit is degree, set the command address in the range of 0 to 35999999.
1A5AH	Stroke limit outside range position tracking control	The command address for the position tracking control exceeded the stroke limit range.	Set the address of stroke limit range.

Error code	Error name	Error details and cause	Corrective action
1A5BH	Command address outside range during fixed position stop speed control	Servo axis: • During speed control with fixed position stop, the command address for the fixed position stop command ON exceeds the range of 0 to 35999999. Command generation axis: • During speed control with fixed position stop, the command address for the fixed position stop command ON exceeds the range of 0 to (Cam axis length per cycle-1)	Servo axis: • Set the command address within the 0 to 35999999 range. Command generation axis: • Set the command address within range 0 to (Cam axis length per cycle-1).
1A5CH	Target position outside range	Executed the target position change request (CHGP) of address specified so that the changed target position is outside the range of 0 to 35999999 for the axis (unit: degree).	Set the target position after change in the range of 0 to 35999999 if the change request of address specified for the axis (unit: degree).
1A5DH	Movement amount insufficient during target position change	Overrun occurred since the target position after changing was less than the deceleration distance at target position change request (CHGP).	• Set the speed so that an overrun will not occur. • Specify the target position so that an overrun will not occur.
1A5EH	Stroke limit outside range target position change	The target position after changing has exceeded the range of stroke limit at target position change request (CHGP).	Set the target position after changing or stroke range so that the positioning control is within the range of stroke limit.
1A5FH	Reference axis/long axis movement amount error after target position change	In reference axis-specified linear interpolation or the long axis-specified linear interpolation, the movement amount of the reference axis or the long axis after the target position change request (CHGP) is 0.	Set the target position after change with the Reference axis or Long axis movement amount after the target position change is not 0.
1A9FH	Bias speed at start setting outside range	• At JOG start, the command speed is outside the range of Bias speed at start to Speed limit value. • The Bias speed at start is larger than the speed limit value.	• Set the command speed within the range of Bias speed at start to Speed limit value. • Set the Bias speed at start to a value smaller than the speed limit value.
1B02H	Home position address setting error	The home position address is outside the range of 0 to 35999999 ($\times 10^{-5}$[degree]) at degree axis.	Set the home position within the range of 0 to 35999999.
1B04H	Home position return speed error	The home position return speed is outside the range of 1 to Speed limit value.	Set the home position return value less than the speed limit value.
1B05H	Home position return speed error	The home position return speed is outside the range of Bias speed at start to Speed limit value.	Set the home position return speed within the range of Bias speed at start to Speed limit value.
1B07H	Creep speed error	The creep speed is outside the range of 1 to Home position return speed.	Set the creep speed below the home position return speed.
1B08H	Creep speed error	The creep speed is outside the range of Bias speed at start to Speed limit value.	Set the creep speed within the range of bias speed at speed limit value start.
1B0AH	Movement amount setting error after proximity dog ON	The movement amount after the proximity dog ON is outside the range of 0 to 2147483647 ($\times$ unit).	Set the movement amount after the proximity dog ON within the range of 0 to 2147483647.
1B0DH	Home position return torque limit value error	The creep speed torque limit value is outside the range of 1 to 10000 [$\times$ 0.1%].	Set the creep speed torque limit value within the range of 1 to 10000.
1B14H	Standby time after pulse conversion module clear signal output outside range error	Standby time after pulse conversion module clear signal output is outside the range of 1 to 1000[ms].	Set the standby time after pulse conversion module clear signal within the range of 1 to 1000.
1B3EH	Parameter block No. outside range	Parameter block No. is outside the range of 1 to 64.	Set the parameter block No. within the range of 1 to 64.
1B3FH	Dwell time error during home position return retry	The dwell time is outside the range of 0 to 5000[ms] during the home position return retry.	Set the dwell time within the range of 0 to 5000 during the home position return retry.
1BA0H	Input axis type setting outside range	The value of input axis parameter "[Pr.300] Servo input axis type" and "[Pr.320] Synchronous encoder axis type" was set outside range.	Set "[Pr.300] Servo input axis type", "[Pr.320] Synchronous encoder axis type" within the range.
1BA1H	Input axis module setting outside range	The setting value of input axis parameter "[Pr.321] Synchronous encoder axis unit setting" is outside the setting range.	Set the "[Pr.321] Synchronous encoder axis unit setting" within the range.
1BA2H	Input axis module change denominator outside range	The value of input axis parameter "[Pr.323] Synchronous encoder axis unit conversion denominator" is set less than 0.	Set the "[Pr.323] Synchronous encoder axis unit conversion denominator" within the range of 1 to 2147483647.
1BA3H	Input axis length per cycle outside range	The value of input axis parameter "[Pr.324] Synchronous encoder axis length per cycle" is set less than 0.	Set the "[Pr.324] Synchronous encoder axis length per cycle" within the range of 1 to 2147483647.

Error code	Error name	Error details and cause	Corrective action
1BA4H	Input axis smoothing time constant outside range	The value of input axis parameter "[Pr.301] Servo input axis smoothing time constant" and "[Pr.325] Synchronous encoder axis smoothing time constant" were set outside the range of 0 to 5000.	Set the "[Pr.301] Servo input axis type smoothing time constant", "[Pr.325] Synchronous encoder axis smoothing time constant" within the range of 0 to 5000.
1BA5H	Input axis rotation direction restriction setting outside range	The value of "[Pr.304] Servo input axis rotation direction restriction" and "[Pr.328] Synchronous encoder axis rotation direction restriction" were set outside the range of 0 to 2.	Set the "[Pr.304] Servo input axis rotation direction restriction", "[Pr.328] Synchronous encoder axis rotation direction restriction" within the range of 0 to 2.
1BA6H	Input axis module change overflow	The overflow of internal operation (unit conversion numerator/unit conversion denominator) occurred because the unit conversion ratio of input axis is large.	• Reduce the unit conversion ratio of input axis (unit conversion numerator/unit conversion denominator). • Slow down the input axis.
1BA7H	Servo input axis speed-position switching control start impossible	Start speed-position switching control when the status of "[Rq.1152 Feed current value update request command]" is OFF, or when the input axis parameter "[Pr.300] Servo input axis type" is the feed/actual current value.	• Set the [Pr.300] "Servo input axis type" as the servo command value or the feedback value. • Start the speed-position switching control after setting the "[Rq.1152] feed current value update command" to ON.
1BA8H	Serial ABS synchronous encoder communication error	• Encoder hardware error. • Encoder cable is open. • The synchronous encoder specified in system setting differs from the synchronous encoder actually connected.	• Check (module change) the encoder. • Check the encoder cable. • Set the synchronous encoder actually connected in the system setting.
1BA9H	Serial ABS synchronous encoder battery error	No battery in the servo amplifier which connected the synchronous encoder, or the battery cable is disconnected.	Replace the battery and check the servo amplifier (module replace).
1BAAH	Synchronous encoder via servo amplifier invalid error	The axis set in synchronous encoder via servo amplifier does not support the synchronous encoder via servo amplifier.	Connect the servo amplifier which supports the synchronous encoder via servo amplifier.
1BABH	Serial ABS synchronous encoder initial communication error	• Encoder hardware is failure when the multiple CPU system power is ON. • The encoder cable is disconnected when the multiple CPU system power is ON. • The synchronous encoder specified in system setting differs from the synchronous encoder actually connected when the multiple CPU system power is ON.	• Check (module change) the encoder. • Check the encoder cable. • Set the synchronous encoder connected actually in the system setting.
1BDDH	Synchronous encoder via sensing module communication error	• Encoder hardware error. • Encoder cable is open.	• Check (module change) the encoder. • Check the encoder cable.
1BDEH	Slave CPU synchronous encoder transfer invalid	The axis that input axis parameter "[Pr.320] Synchronous encoder axis type" has been set cannot be connected in master CPU.	Keep the connection status for the input axis of the specified master CPU.
1BDFH	Servo input axis speed control (Ⅱ) start impossible	Start speed control (Ⅱ) when input axis parameter "[Pr.300] Servo input axis type" is not invalid.	Set the "[Pr.300] Servo input axis type to be invalid". (Use the speed-torque control function when operating the speed control that does not include positioning loops.)
1BE0H	Main input axis number outside range	• The setting value of synchronous parameter "[Pr.400] Main input axis number" is outside the setting range. • The same servo input axis number as the output axis is set in the synchronous parameter "[Pr.400] Main input axis number".	• Set within the range. • Set the servo input axis number that is different from the output axis.
1BE1H	Sub input axis number outside range	• The setting value of "[Pr.401] Sub input axis number" is outside the setting range. • The same servo input axis number as the output axis is set in the synchronous parameter "[Pr.401] Sub input axis number".	• Set within the range. • Set the servo input axis number that is different from the output axis.
1BE2H	Main shaft gear denominator outside range	Set the value of synchronous parameter "[Pr.404] Main shaft gear denominator" less than 0.	Set within the range of 1 to 2147483647.
1BE3H	Main shaft gear operation overflow	The input value is overflowed (sign reverse) because the gear ratio of main shaft gear is large.	• Reduce the absolute value of synchronous parameter "[Pr.403] Main shaft gear numerator". • Increase the synchronous parameter "[Pr.404] Main shaft gear denominator". • Slow down the input axis speed.
1BE4H	Main shaft clutch control setting outside range	The value of synchronous parameter "[Pr.405] Main shaft clutch control setting" is set outside range.	Set within the range.

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Error code	Error name	Error details and cause	Corrective action
1BE5H	Main shaft clutch reference address setting outside range	A value outside the range of 0 to 1 was set in synchronous parameter "[Pr.406] Main shaft clutch reference address setting".	Set within the range of 0 to 1.
1BE6H	Main shaft clutch smoothing method outside range	A value outside the range of 0 to 5 was set in synchronous parameter "[Pr.411] Main shaft clutch smoothing system".	Set within the range of 0 to 5.
1BE7H	Main shaft clutch smoothing time constant outside range	A value outside the range of 0 to 5000 was set in synchronous parameter "[Pr.412] Main shaft clutch smoothing time constant".	Set within the range of 0 to 5000.
1BE8H	Composite main shaft gear operation overflow	The composite value is overflowed (sign reverse) because the input values of main input axis and sub input axis are large.	Lower the input values of main input axis and sub input axis.
1BE9H	Main shaft clutch control setting error	The control cycle setting of the high-speed input request signal set in synchronous parameter "[Pr.405] Main shaft clutch control setting" does not match the control operation cycle of output axis.	Set the high-speed input request signal whose control cycle setting matches the control operation cycle of output axis.
1BF0H	Auxiliary shaft number outside range	• The setting value of synchronous parameter "[Pr.418] Auxiliary shaft number" is outside the setting range. • The same servo input axis number as the output axis is set in the synchronous parameter "[Pr.418] Auxiliary shaft number".	• Set within the range. • Do not set the same servo input axis number with output axis.
1BF2H	Auxiliary shaft gear denominator outside range	Set the value of synchronous parameter "[Pr.421] Auxiliary shaft number denominator" less than 0.	Set within the range of 1 to 2147483647.
1BF3H	Auxiliary shaft gear operation overflow	The input value is overflowed (sign reverse) because of the gear ratio of auxiliary shaft gear is large.	• Reduce the absolute value of synchronous parameter "[Pr.420] Main shaft gear numerator ". • Increase the synchronous parameter "[Pr.421] Main shaft gear denominator". • Slow down the input axis speed."
1BF4H	Auxiliary shaft clutch setting outside range	The value of synchronous parameter "[Pr.422] Auxiliary shaft clutch control setting" is outside range.	Set within the range.
1BF5H	Auxiliary shaft clutch reference address setting outside range	A value outside the range of 0 to 1 was set in synchronous parameter "[Pr.423] Auxiliary shaft clutch reference address setting".	Set within the range of 0 to 1.
1BF6H	Auxiliary shaft clutch smoothing method outside range	A value outside the range of 0 to 5 was set in synchronous parameter "[Pr.428] Auxiliary shaft clutch smoothing system".	Set within the range of 0 to 5.
1BF7H	Auxiliary shaft clutch smoothing time constant outside range	A value outside the range of 0 to 5000 was set in synchronous parameter "[Pr.429] Auxiliary shaft clutch smoothing time constant".	Set within the range of 0 to 5000.
1BF8H	Composite auxiliary shaft gear operation overflow	The composite value is overflowed (sign reverse) because the input values of main shaft and auxiliary shaft are large.	Lower the input values of main shaft and auxiliary shaft.
1BF9H	Auxiliary shaft clutch control setting error	The control cycle setting of the high-speed input request signal set in synchronous parameter "[Pr.422] Auxiliary shaft clutch control setting" does not match the control operation cycle of output axis in synchronous controlling.	Set the high-speed input request signal whose control cycle setting matches the control operation cycle of output axis.
1C00H	Speed change gear 1 arrangement outside range	A value outside the range of 0 to 3 was set in synchronous parameter "[Pr.434] Speed change gear 1 arrangement".	Set within the range of 0 to 3.
1C01H	Speed change ratio 1 denominator outside range	Set the value of synchronous parameter "[Pr.437] Speed change ratio 1 denominator" less than 0.	Set within the range of 1 to 2147483647.
1C02H	Speed change gear 1 smoothing time constant outside range	A value outside the range of 0 to 5000 was set in synchronous parameter "[Pr.435] Speed change gear 1 smoothing time constant".	Set within the range of 0 to 5000.
1C03H	Speed change gear 1 operation overflow	The input value is overflowed (sign reverse) because of the speed change ratio of speed change gear 1 is large.	• Reduce the absolute value of synchronous parameter "[Pr.436] Speed change ratio 1 numerator". • Increase the synchronous parameter "[Pr.437] Speed change ratio 1 denominator". • Slow down the input axis speed.
1C04H	Speed change gear 2 arrangement outside range	A value outside the range of 0 to 3 was set in synchronous parameter "[Pr.490] speed change gear 2 arrangement".	Set within the range of 0 to 3.

Error code	Error name	Error details and cause	Corrective action
1C05H	Speed change ratio 2 denominator outside range	Set the value of synchronous parameter "[Pr.493] Speed change ratio 2 denominator" less than 0.	Set within the range of 1 to 2147483647.
1C06H	Speed change gear 2 smoothing time constant outside range	A value outside the range of 0 to 5000 was set in synchronous parameter "[Pr.491] Speed change gear 2 smoothing time constant".	Set within the range of 0 to 5000.
1C07H	Speed change gear 2 operation overflow	The input value is overflowed (sign reverse) because of the speed change ratio of speed change gear 2 is large.	• Reduce the absolute value of synchronous parameter "[Pr.492] Speed change ratio 2 numerator ". • Increase the synchronous parameter "[Pr.493] Speed change ratio 2 denominator". • Slow down the input axis speed.
1C08H	Speed change gear overlapping arrangement disable	The setting value of synchronous parameter "[Pr.434] Speed change gear 1 arrangement" and "[Pr.490] Speed change gear 2 arrangement" are overlapping.	Set the different arrangement for the synchronous parameter "[Pr.434] Speed change gear 1 arrangement" and "[Pr.490] Speed change gear 2 arrangement"
1C10H	Cam No. outside range	A value outside the range of 0 to 1024 was set in synchronous parameter "[Pr.440] Cam No.".	Set within the range of 0 to 1024.
1C11H	Cam not registered	Cam data which the No. is specified by synchronous parameter "[Pr.440] Cam No." does not exist in cam open area.	Specify a cam No. in which cam data exists.
1C12H	Cam axis length per cycle outside range	Set the value of synchronous parameter "[Pr.439] Cam axis length per cycle" less than 0.	Set within the range of 1 to 2147483647.
1C13H	Output axis smoothing time constant outside range	A value outside the range of 0 to 5000 was set in synchronous parameter "[Pr.447] Output axis smoothing time constant".	Set within the range of 0 to 5000.
1C1FH	Synchronous control parameter block No. outside range	A value outside the range of 0 to 64 was set in synchronous parameter "[Pr.448] Synchronous control parameter block No.".	Set within the range of 1 to 64.
1C20H	The setting method of current value per cycle after main shaft gear outside range	A value outside the range of 0 to 2 was set in synchronous parameter "[Pr.460] Current value per cycle after main shaft gear setting method".	Set within the range of 0 to 2.
1C21H	The initial value of current value per cycle after main shaft gear outside range	A value outside the range of 0 to (Cam axis length per cycle-1) was set in synchronous parameter "[Pr.465] Current value per cycle after main shaft gear".	Set in the range of 0 to (Cam axis length per cycle-1).
1C22H	The setting method of current value per cycle after auxiliary shaft gear outside range	A value outside the range of 0 to 2 was set in synchronous parameter "[Pr.461] Current value per cycle after auxiliary shaft gear setting method".	Set within the range of 0 to 2.
1C23H	The initial setting value of current value per cycle after auxiliary shaft gear outside range	A value outside the range of 0 to (Cam axis length per cycle-1) was set in synchronous parameter "[Pr.466] Initial setting value of the current value per cycle after auxiliary shaft gear".	Set in the range of 0 to (Cam axis length per cycle-1).
1C24H	Cam axis position recovery target outside range	A value outside the range of 0 to 2 was set in synchronous parameter "[Pr.462] Cam axis position recovery target".	Set within the range of 0 to 2.
1C25H	Cam reference position setting method outside range	A value outside the range of 0 to 2 was set in synchronous parameter "[Pr.463] Cam reference position setting method"	Set within the range of 0 to 2.
1C26H	Setting method of cam axis current value per cycle outside range	• A value outside the range of 0 to 3 was set in synchronous parameter "[Pr.464] Cam axis current value per cycle setting method". • The "3: Current value per cycle after auxiliary shaft gear" was set when the auxiliary shaft does not exist.	• Set within the range of 0 to 3. • Set other than "3: Current value per cycle after auxiliary shaft gear" if auxiliary shaft does not exist.
1C27H	Initial setting value of cam axis current value per cycle outside range	A value outside the range of 0 to (Cam axis length per cycle-1) was set in "[Pr.468] Initial setting value of the cam axis current value per cycle".	Set in the range of 0 to (Cam axis length per cycle-1).
1C28H	Cam axis current value per cycle recovery disable	If the synchronous parameter "[Pr.462] Cam axis position recovery target" is "0 : Cam axis current value per cycle recovery", cam axis current value per cycle for feed current value cannot be recovered when synchronous control starting. (Occurred in the cam pattern of oscillate.)"	• Start the synchronous control after set a current value that is within the reciprocated cam pattern stroke. • Set a reference position that is within the reciprocated cam pattern stroke.

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Error code	Error name	Error details and cause	Corrective action
1C29H	Cam axis current feed value cannot be restored	If the synchronous parameter "[Pr.462] Cam axis position recovery target" is "2: Cam axis feed current value recovery", the difference (pulse command unit) between the restored cam axis feed current value and the feed value during synchronous control start exceeds the servo parameter "in-position width" and cannot be restored.	• Start the synchronous control after set a current value that the recovery cam axis feed current value is calculated in cam position calculation function. • Set the setting value of servo parameter "In-position range" to a large value when it is very small like 0."
1C80H	Servo error	Error occurred in servo amplifier.	Check and correct the error details in "[Md.1019] Servo amplifier display servo error No." and "[Md.107] Parameter error No.". (Refer to the servo amplifier technology manual for the details of servo alarm.)
1C81H	Communication retry times error	The communication retry count error between motion controller and servo amplifier was detected.	• Check the SSCNETⅢ cable. (Connection error/damage check) • Replace the servo amplifier of the alarm (communication error) occurred. • Replace the module.
1C82H	Watchdog counter receive error	The communication retry count error between motion controller and the watchdog counter of the servo amplifier was detected.	Replace the servo amplifier of the watchdog error occurred.
1C83H	Unsupported operation cycle	The operation cycle setting value which does not support servo amplifier is set.	Please set the supported operation cycle, and switch on the power supply again or reset the multiple CPU system.
1C90H	Number of master axis error	The number of master axis is exceeding the possible setting number in the "Communication setting among drivers (PD15)" of servo parameters.	Check the "Communication setting among drivers (PD15)" of servo parameters and set the master axis less than 4 axes in SSCNETⅢ line, less than 8 axes in SCNET Ⅲ/H line.
1C91H	Master axis No. error	The self axis is set in "Master axis No. selection 1 (PD20) at communication slave setting among drivers" and PD21 to PD23 of servo parameters.	Check "Master axis No. selection 1 (PD20) at communication slave setting among drivers" and PD21 to PD23 of servo parameter in slave axis.
1C92H	Master axis specification error	Master axis which supports the slave axis has not been set.	Check "Master axis No. selection 1 (PD20) at communication slave setting among drivers" and PD21 to PD23 of servo parameter in slave axis.
1C93H	Communication among drivers setting error	For the axes set in the master/slave, a servo amplifier that is not compatible with the driver communication has been connected.	Check the master/slave setting and the connected servo amplifier.
1C95H	Communication operation cycle among drivers setting error	Set the master/slave when the operation cycle is set as 0.222ms.	For SSCNET Ⅲ line, please set the operation cycle more than 0.444ms.
1CB0H	Connected servo amplifier station number overlapping error	• The settings of the servo amplifier station No. (axis selection rotary switch) are overlapping in the same system of SSCNETⅢ. • The axis setting equal to the number of used axes set in the servo amplifier is not set. • Checked the data error of SSCNETⅢ communication.	• Set the settings of the servo amplifier station No. (axis selection rotary switch) so that they are not overlapping in the same system of SSCNETⅢ. • Set the axes equal to the number of used axes set in the servo amplifier. • Check the SSCNETⅢ cable. (Connection error/damage check).
1CB1H	Connected servo amplifier type unmatch error	The series of the servo amplifier specified in the system setting differs from the series of the servo amplifier installed.	Set the series of the actually connected servo amplifier.
1CBEH	The optical hub unit connection error	• Connection number of the optical hub unit exceeds connectable number per system. • The optical hub unit connected to connection route which accessing OUT2 or OUT3.	• Set the numbers that can be connect to the optical hub unit as followings. • When connect the optical hub unit to back part of the optical hub, please connect to diverge path from OUT1.
1CBFH	The optical hub unit communication error	Communication with the optical hub unit is error.	• Check if there exist any error in SSCNETⅢ cable. • Check if there exist any problem in power supply. • Replace the optical hub unit.
1FC0H	G-code control parameter error	• The parameter of G-code control configuration axis is incorrect. • An error has been detected when reading G-code program.	• Confirm the detail code and check the adequate parameter setting. • Confirm the detail code, eliminate the error and execute program writing again. (For the detail code, refer to ⮤MELSEC iQ-R Motion Controller Programming Manual (G-Code Control).)
1FC1H	G-code control operation error	Operation error was detected.	Confirm the detail code and eliminate the error. (For the detail code, refer to ⮤MELSEC iQ-R Motion Controller Programming Manual (G-Code Control).)

Error code	Error name	Error details and cause	Corrective action
1FC2H	G-code control stop code	• Automatic start cannot be executed. • Stopped in "Feed hold" status during automatic operation. • Stopped in "Single block" status during automatic operation.	• Confirm the detail code. (For the detail code, refer to ☐MELSEC iQ-R Motion Controller Programming Manual (G-Code Control).) • Start the automatic operation by turning "[Rq.3377] Automatic operation start (cycle start)" from OFF to ON after disposing the stop cause.
1FC3H	G-code control program error	The G-code programis different from the specification or it is faulty.	• Confirm the detail code and correct the program. (For the detail code, refer to ☐MELSEC iQ-R Motion Controller Programming Manual (G-Code Control).) • Check the specification.
1FE0H	Machine control setting data incorrect	The setting data is outside the range during machine control.	Confirm the detail code and set the adequate value of parameter within the range. (For the detail code, refer to ☐MELSEC iQ-R Motion Controller Programming Manual (Machine Control).)
1FE1H	Machine control machine library error	Error occurred in machine library during machine control.	Confirm and dedicate the error contents in the detail code.(For the detail code, refer to ☐MELSEC iQ-R Motion Controller Programming Manual (Machine Control).)
1FE2H	Machine control status incorrect	• Machine control was requested for the machine which was not configured. (Detail code: H0001) • "[Rq.1120] PLC ready flag" is OFF when at start and during control. (Detail code: H0002) • "[St.2127] Machine start acceptance flag" is ON at start. (Detail code: H0003) • Machine control was executed in the status which "[St.1069] Home position return request" of machine configuration axis is ON. (Detail code: H0004) • "[St.1068] Servo error detection" of machine configuration axis is ON when at start and during control. (Detail code: H0005) • "[St.2128] Machine servo ready" is OFF when at start and during control. (Detail code: H0006) • Servo motor maximum speed over occurred in machine configuration axis during control. (Detail code: H0007)	Confirm the detail code and the adequate machine status.
1FE3H	Machine command signal incorrect	• Machine stop command is ON at start. (Detail code: H0001) • Machine rapid stop command is ON at start. (Detail code: H0002) • Multiple machine JOG start commands were simultaneously ON. (Detail code: H0003)	Confirm the detail code and the adequate status of machine command signal.
1FE4H	Machine configuration axis command signal incorrect	• The stop command of machine configuration axis is ON at start. (Detail code: H0001) • The rapid stop command of machine configuration axis is ON at start. (Detail code: H0002) • The external STOP signal of machine configuration axis is ON when at start. (Detail code: H0003)	Confirm the detail code and the adequate command signal status of machine configuration axis.
1FE5H	XYZ stroke limit over	• XYZ stroke limit is outside the range at start. • XYZ stroke limit range is exceeded during control. • The positioning end point of machine program operation is outside the range of XYZ stroke limit.	• Execute the positioning in the XYZ stroke limit range. • Turn ON "[Rq.2143] Machine XYZ stroke limit invalid command", and set within the XYZ stroke range by the machine JOG operation. • Set within the XYZ stroke range by the JOG operation.
1FE6H	Machine configuration axis stroke limit over	• Software stroke limit over occurred in machine configuration axis. (Detail code: H0001) • Hardware stroke limit over occurred in machine configuration axis. (Detail code: H0002)	• Execute the positioning in the stroke limit range. • Set within the XYZ stroke range by the JOG operation.
1FE7H	Base transformation/tool transformation change error	• Base/Tool transformation change executed when "[St.2127] Machine start acceptance flag" is ON. (Detail code: H0001) • "[Cd.2163] Base/Tool transformation change method" is outside the setting range. (Detail code: H0002) • "[Cd.2164 to Cd.2169] Base/Tool transformation setting" is outside the setting range. (Detail code: H0003)	• Turn OFF "[St.2127] Machine start acceptance flag" and then execute the base/tool transformation. (Detail code: H0001) • Set "[Cd.2163] Base/Tool transformation change method" within the range. (Detail code: H0002) • Set "[Cd.2164 to Cd.2169] Base/Tool transformation setting" within the range. (Detail code: H0003)
1FF0H	Add-on function minor error	Minor error has been occurred in add-on function.	Check the detail information and refer to instruction manual of add-on library that supported file name.

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Error code	Error name	Error details and cause	Corrective action
1FF1H	Add-on license minor error	Minor error occurred in add-on license check.	Confirm the detailed code. (For the detailed code, refer to ▫MELSEC iQ-R Motion Controller Programming Manual (Common).)

Minor error (SFC) (3100H to 3BFFH)

Minor error (SFC) details and causes, and corrective action are shown below.

Error code	Error name	Error details and cause	Corrective action
31F0H	No specified program (Kn)	Servo program (Kn) specified in motion control step does not exist.	Create the specified servo program.
31F1H	No specified program (Fn/FSn)	The program (Fn/FSn) specified in the operation control step does not exist.	Create the specified operation control program.
31F2H	No specified program (Gn)	The program (Gn) specified in the transition does not exist.	Create the specified transition program.
31F3H	Invalid device specification (Fn/FSn/Gn)	The invalid device is set in the operation control step/transition.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
31F4H	Operation/conditional expression unset	No conditional expression is set to the program (Gn) specified in the transition.	Be sure to set the conditional expression in the last block of transition program.
31F5H	Fn/FSn program code Error	Internal code error for the operation control program (Fn/FSn).	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
31F6H	Gn program code error	Internal code error in the transition program (Gn).	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
31F7H	WAITON/WAITOFF setting device	The device number of the device set in WAITON/WAITOFF transition is outside the range.	Correct the program so that the device number is within the range.
31F8H	Repeat control limit count over	The repeated control instructions (FOR) exceed the repeated control limit count set in the parameter and are repeatedly executed in one operation control program or transition program.	Review the program so that the repeated control instruction (FOR) does not exceed the repeated control limit count.
31F9H	Program control execution error	An operation error (indirectly specified device read error/assignment execution error) occurred when the block is executed to the program control instruction (IF/CASE/FOR/NEXT).	• Correct the program so that the device No. which indirectly specifies is proper. • Correct the program so that the substitute (S) data is within the range of the data type of (D).
32F0H	PLC ready OFF	"[Rq.1120] PLC ready flag" or "PCPU ready flag" is OFF when starting by D(P).SFCS/M(P).SFCS instruction.	Insert "[Rq.1120] PLC ready flag" and "PCPU ready flag" being ON into the starting interlock condition.
32F1H	Motion SFC program No. error	Motion SFC program No. is specified outside the range of 0 to 511 when starting the Motion SFC program by D(P).SFCS/M(P).SFCS instruction or GSUB. *: The range before Motion controller OS software version "09" is 0 to 255	Check the Motion SFC program No. and correct it to a correct sequence program.
32F2H	No Motion SFC program	The specified Motion SFC program does not exist when starting the Motion SFC program by D(P).SFCS/M(P).SFCS instruction or GSUB.	Check the Motion SFC program No. and correct it to a correct sequence program. Or create the non-created Motion SFC program.
32F3H	Double start error	Start the same Motion SFC program when starting the Motion SFC program by D(P).SFCS/M(P).SFCS instruction or GSUB.	The double start management is executed in the user side. Insert the user starting signal into the PLC program as the starting interlock.
32F4H	PLC ready OFF	D(P).GINT/M(P).GINT instruction is executed when "[Rq.1120] PLC ready flag" or "PCPU ready flag" is OFF.	Insert the interlock condition of D(P).GINT/M(P).GINT instruction execution when "[Rq.1120] PLC ready flag" and "PCPU ready flag" is ON.
32F5H	No Motion SFC program	The specified motion SFC program does not exist when starting the motion SFC program according to the automatic start setting or GSUB.	Check the Motion SFC program No. and correct it to a correct program. Or create the non-created Motion SFC program.
32F6H	Double start error	The same motion SFC program has already been started when starting the motion SFC program according to the automatic start setting or GSUB.	The double start management is executed in the user side. Insert the user starting signal into the transition condition as the starting interlock condition.
32F7H	Writing during RUN	The motion SFC program to be overwritten during online change is started.	Start after online change is finished.
33F0H	Motion SFC program error	Though not in branch-coupling, the label code/jump code in the selective branch-coupling or the label code/jump code in the parallel branch-coupling exists.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
33F1H	Motion SFC program error	The start selective branching destinations are other than all SFT or WAIT transition.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.

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Error code	Error name	Error details and cause	Corrective action
33F2H	Motion SFC program error	WAITON/WAITOFF is not followed by a motion control step. (However, this is permitted to a pointer (Pn) or jump (Pn).)	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
33F3H	Motion SFC program error	Parallel branching resulted in an END step without parallel coupling.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
33F4H	Motion SFC code error	An impossible code is used. The internal code is corrupted.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
33F5H	Jump code error 1	Internal code in jump destination information List code) fault.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
33F6H	Jump code error 2	Internal code in jump destination information (Label information) fault.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
33F7H	Jump code error 3	Internal code in jump destination information (Label number) fault.	The Motion SFC program code is corrupted Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
33F8H	Jump code error 4	Internal code in jump destination information (Label address) fault.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
33F9H	Jump code destination Error	The specified pointer does not exist at the jump destination.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
33FAH	GSUB setting error 1	The self program was called/started by GSUB.	GSUB cannot call its own program. Correct the Motion SFC program.
33FBH	GSUB setting error 2	The main program was called/started by GSUB.	GSUB cannot call its main program. Correct the Motion SFC program.
33FCH	Parallel branching nesting over	Nesting of parallel branching exceeded 4 levels in the parallel branching route.	The maximum nesting of parallel branching is 4 levels. Check the program to subroutine the branch destination processing.
33FDH	Execution task error	An attempt was made to execute a motion control step K with an event or NMI task.	Motion control steps cannot be executed in the Motion SFC programs executed by the event and NMI tasks.
33FEH	Simultaneously active step count over	The number of simultaneously active steps exceeded 1024 when executing. *: The number before Motion controller OS software version "08" is 256 steps	The maximum number of simultaneously active step count is 1024. Correct the motion SFC program. *: The maximum number before Motion controller OS software version "08" is 256 steps
38E0H	Argument range error	• Any of the value specified in the instruction is outside the range. • For the value specified in the instruction and indirect setting device No. is outside the range, or the device No. of 32-bit type and 64-bit type is odd."	• Check the parameter value and correct the program so that the device No. is within the range. • Correct the program so that the device No. which indirectly specifies is proper.
38E1H	Double open error	MVOPEN instruction was executed to the logged on vision system.	Review the conditions to execute the MVOPEN instruction and correct the program.
38E2H	Unopened error	The instruction is executed to the vision system which is not logged on.	Correct the program to execute the instruction after confirming whether the logon by the MVOPEN instruction has been completed normally or not.
38E3H	Open error	The communication line with the vision system cannot be opened.	• Check the connection of the Ethernet cable. • Correct the IP address and the port No. of the Ethernet communication line setting to the same setting as the connection target vision system.
38E4H	Logon error	The user name or password for logging on the vision system is in error.	Correct the user name and the password of the Ethernet communication line setting to the same setting as the connection target vision system.
38E5H	Communication error	• The communication with the vision system is disconnected. • Communication with MVCLOSE instruction was shut down during instruction execution. • TCP/IP port cannot be open.	• Check the connection of the Ethernet cable. • Correct the program to execute the MVCLOSE instruction after the instruction is completed. • Correct the TCP/IP port No. of the Ethernet communication line setting to the same setting as the connection target vision system. When not using the TCP/IP protocol, delete the TCP/IP port No.

Error code	Error name	Error details and cause	Corrective action
38E6H	No vision program	The specified vision program (job) does not exist in the vision system.	For the vision program name of the vision program operation setting, specify the job name existing in the vision system.
38E7H	Read value error	The data of read value cell is not an integer value.	Check that the cell/tag contents specified in the read value cell of the vision program operation setting are integer. To read the floating-point type data, correct the program to use the TCP/IP protocol or the MVIN instruction.
38E8H	Execute time-out	Execution of the vision system dedicated function does not finish within the specified time.	Review the time-out period specified by the vision system dedicated function and correct the program.
38E9H	Trigger response time-out	The response to the image pickup is not returned within the specified time.	• Review the time-out period specified by the vision system dedicated function and correct the program. • Check if there is an execution error of job in the vision system side by In-Sight® Explorer and correct the job.
38EAH	Offline error	The vision system is in the "Offline" status.	Set the vision system in "Online" status by In-Sight® Explorer.
38EBH	Control authority error	User authorities to control the vision system are not enough.	For the user name which can be specified by the Ethernet communication line setting, specify the user whose access level is "Full access" or "Protect" in the user list setting of In-Sight® Explorer. Also, for "Protect", "Online/Offline switching available" needs to be valid.
38ECH	Vision system number error	The Ethernet communication line setting corresponding to the specified vision system number is not set.	Correct the program to use the vision system number which has the Ethernet communication line setting.
38EDH	Double start error	The vision system dedicated function is already being executed for the same vision system.	Correct the program to execute the following vision system dedicated function after confirming the status storage device of the vision system not in "In execution".
38EEH	Vision program load incomplete error	Trigger is issued before the vision program is loaded.	Correct the program to issue a trigger after confirming the status storage device of the vision program has become "1".
38EFH	Native mode command send error	Send command string specified length in (S2) of the MVCOM instruction is outside the range of 1 to 191 bytes.	Correct the program so that the send command string length specified by (S2) is 1 to 191 bytes.
38F0H	Native command receive error	The data length received by the MVCOM instruction exceeds 256 bytes. Or the storage device space specified in (D) is insufficient.	• Do not use the native mode command where the data length of the result exceeds 256 bytes. • When the data length of the result is within 256 bytes, correct the device No. of (D).
38F1H	Cell/tag name error	• The string length of cell/tag name specified in (S2) of the MVIN/MVOUT instruction is outside the range of 1 to 32 bytes. • The cell/tag specified in (S2) of the MVIN/MVOUT instruction does not exist. • The data type of the cell/tag specified in (S2) of the MVOUT instruction and the transfer data type/range specified in (S3) do not match.	• Correct the program so that the length of cell/tag name specified by (S2) is 1 to 32 bytes. • Confirm that the cell/tag specified by (S2) is defined in vision system side. • Correct the program so that the (S3) data type and the data range are corresponding to the vision system side in MVOUT instruction.
38F2H	Received data conversion error	• Data received by the MVIN instruction cannot be recognized as numeric data. • At the BIN conversion mode of the MVCOM instruction, received data cannot be recognized as numeric data.	Correct the program to specify "0: ASCII" to (S3) of the MVCOM instruction or use the MC protocol when acquiring the data (string etc.) other than numerical value from the vision system.
38F3H	Transfer data error	The transferred data specified by the MVOUT instruction (S3) is incorrect.	When the floating point type is specified in the data of (S3), correct the program so that the data is within the range of the 32-bit floating point type.
3901H	EI execution error	Event task enable was executed at except for the normal task.	Event task enable may be executed in the normal task only. Correct the program.
3902H	DI execution error	Event task disable was executed except for the normal task.	Event task disable may be executed in the normal task only. Correct the program.

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Error code	Error name	Error details and cause	Corrective action
3903H	BMOV execution error	• (S) to (S)+(n-1) is outside the device range. • (S) is a bit device and its device number is not a multiple of 16. • (D) to (D)+(n-1) is outside the device range. • (D) is a bit device and its device number is not a multiple of 16. • (n) is outside the range of 0 to 1000000000. • The combination of (S) and (D) is not correct.	• Change (S) or (n) so that the block transfer range is within the device range. • When (S) is a bit device, correct the program so that the device number to be multiple of 16. • Change (D) or (n) so that the block transfer range is within the device range. • When (D) is a bit device, correct the program so that the device number to be multiple of 16. • Correct the program so that (n) is within the range of 0 to 1000000000. • Correct the program so that the combination of (S) and (D) is correct.
3904H	TIME execution error	The data of (S) is outside the range of 0 to 2147483647.	Correct the program so that the data of (S) is within the range of 0 to 2147483647.
3905H	FMOV execution error	• (D) to (D)+(n-1) is outside the range of the device. • (n) is outside the range of 0 to 1000000000. • (D) is the CPU buffer memory other than self CPU or the module access device of the module other than self CPU management.	• Change (D) or (n) so that the block transfer range is within the device range. • Correct the program so that (n) is within the range of 0 to 1000000000. • Correct the program so that (D) is the CPU buffer memory of self CPU or the module access device of the module of self CPU management.
3908H	CHGV execution error	The specified axis number of (S1) is outside the range.	Correct the specified axis number of (S1) to be within the range.
390AH	CHGP execution error	• The specified axis number of (S1) is outside the range. • (S2) is outside the range of 0 to 1. • The device number of (S3) is an odd number. • (S3) to ((S3)+7) is outside the range of device.	• Correct the specified axis number of (S1) to be within the range. • Correct the program so that the (S2) is within the range of 0 to 1. • Correct the program so that the (S3) is an even number device. • Correct the program so that (S3) to ((S3)+7) is within the range of device.
390BH	CHGT execution error	The specified axis number of (S1) is outside the range.	Correct the specified axis number of (S1) to be within the range.
390CH	CHGVS execution error	The specified axis number of (S1) is outside the range.	Correct the specified axis number of (S1) to be within the range.
390DH	MCNST executing error	Error occurred during machine program operation start request.	• Check the setting of machine program operation. • Check the error content in detailed code and process accordingly. (For the detail code, refer to MELSEC iQ-R Motion Controller Programming Manual (Program Design).)
3910H	Assign (=) execution error	• The (S) data is outside the range of the data type of (D). • The device number which indirectly specifies (D) is illegal.	• Correct the program so that the data of (S) is within the range of the data (D) type. • Correct the program so that to the device number which indirectly specifies (D) is proper.
3911H	Addition (+) execution error	Internal processing error occurred when addition (+) is executing.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
3912H	Subtraction (-) execution error	Internal processing error occurred when subtraction (-) is executing.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
3913H	Multiplication (*) execution error	Internal processing error occurred when multiplication (*) is executing.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
3914H	Division (/) execution error	The divisor is 0.	Correct the program so that the divisor is not 0.
3915H	Remainder (%) execution error	The divisor is 0.	Correct the program so that the divisor is not 0.
3917H	MVOUT execution error	Internal processing error occurred when MVOUT is executing.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
3918H	MVOPEN execution error	Internal processing error occurred when MVOPEN is executing.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.

Error code	Error name	Error details and cause	Corrective action
3919H	MVPST execution error	Internal processing error occurred when MVPST is executing.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
391AH	MVLOAD execution error	Internal processing error occurred when MVLOAD is executing.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
391BH	MVTRG execution error	Internal processing error occurred when MVTRG is executing.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
391CH	MVIN execution error	Internal processing error occurred when MVIN is executing.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
391DH	MVFIN execution error	Internal processing error occurred when MVFIN is executing.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
391EH	MVCLOSE execution error	Internal processing error occurred when MVCLOSE is executing.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
391FH	MVCOM execution error	Internal processing error occurred when MVCOM is executing.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
3920H	SET execution error	The device number which indirectly specifies (D) is illegal.	Correct the program so that the device number which indirectly specifies (D) is proper.
3921H	RST execution error	The device number which indirectly specifies (D) is illegal.	Correct the program so that the device number which indirectly specifies (D) is proper.
3922H	SET= execution error	The device number which indirectly specifies (D) is illegal.	Correct the program so that the device number which indirectly specifies (D) is proper.
3923H	RST= execution error	The device number which indirectly specifies (D) is illegal.	Correct the program so that the device number which indirectly specifies (D) is proper.
3924H	DOUT execution error	The device number which indirectly specifies (D) is illegal.	Correct the program so that the device number which indirectly specifies (D) is proper.
3925H	DIN execution error	The device number which indirectly specifies (D) is illegal.	Correct the program so that the device number which indirectly specifies (D) is proper.
3926H	OUT= execution error	The device number which indirectly specifies (D) is illegal.	Correct the program so that the device number which indirectly specifies (D) is proper.
392EH	FOR (assign) execution error	Internal processing error occurred when FOR (assignment) is executing.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
3930H	Bit opposite (complemented) execution error	Internal processing error occurred when bit which is in a value is flipped to its opposite setting (complemented) is executing.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
3931H	Bit AND execution error	Internal processing error occurred when bit AND is executing.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
3932H	Bit OR execution error	Internal processing error occurred when bit OR is executing.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
3933H	Bit XOR execution error	Internal processing error occurred when bit XOR is executing.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
3934H	Bit right-shifted execution error	Internal processing error occurred when bit right-shifted is executing.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
3935H	Bit left-shifted execution error	Internal processing error occurred when bit left-shifted is executing.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
3940H	NOT/OFF execution error	Internal processing error occurred when NOT/OFF is executing.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
3941H	AND execution error	Internal processing error occurred when AND is executing.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.

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Error code	Error name	Error details and cause	Corrective action
3942H	OR execution error	Internal processing error occurred when OR is executing.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
3950H	SHORT execution error	The data of (S) is outside the range of signed 16-bit integer value.	Correct the program so that the data of (S) is within the range of signed 16-bit integer value.
3951H	USHORT execution error	The data of (S) is outside the range of unsigned 16-bit integer value.	Correct the program so that the data of (S) is within the range of unsigned 16-bit integer value.
3952H	LONG execution error	The data of (S) is outside the range of signed 32-bit integer value.	Correct the program so that the data of (S) is within the range of signed 32-bit integer value.
3953H	ULONG execution error	The data of (S) is outside the range of unsigned 32-bit integer value.	Correct the program so that the data of (S) is within the range of unsigned 32-bit integer value.
3954H	FLOAT execution error	Internal processing error occurred when FLOAT is executing.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
3955H	UFLOAT execution error	Internal processing error occurred when UFLOAT is executing.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
3956H	DFLT execution error	The data of (S) is not in a valid 32-bit floating-point type.	Correct the program so that the data of (S) is valid as the 32-bit floating-point type.
3957H	SFLT execution error	• The data of (S) is not in a valid 64-bit floating-point type. • The converted value exceeded the range of 32-bit floating-point type.	• Correct the program so that the data of (S) is valid as the 64-bit floating-point type. • Correct the program so that the value is within the range of the 32-bit floating-point type.
3962H	TAN execution error	(S) is 90+(180*n). (n is an integer)	Correct the program so that (S) is outside the range of 90+(180*n).
3963H	ASIN execution error	(S) is outside the range of -1.0 to 1.0.	Correct the program so that (S) is within the range of -1.0 to 1.0.
3964H	ACOS execution error	(S) is outside the range of -1.0 to 1.0.	Correct the program so that (S) is within the range of -1.0 to 1.0.
3966H	SQRT execution error	(S) is a negative number.	Correct the program so that (S) is 0 or a positive number.
3967H	BIN execution error	Any digit of (S) has a value other than 0 to 9.	Correct the program so that any digit of (S) is in 0 to 9.
3968H	BCD execution error	The (S) value is outside the range of BCD data conversion.	Correct the program so that the (S) value is within the range of BCD data conversion.
3969H	LN execution error	(S) is 0 or a negative number.	Correct the program so that (S) is a positive number.
396BH	ABS execution error	The (S) value is outside the range of the absolute value conversion.	Correct the program so that the (S) value is within the range of absolute value conversion.
3970H	SCL execution error	• (S1) is outside the range of 0 to 3. • The (S3) device number is an odd number. • (S3) to (S3)+(2N+1) is outside the range of device. • Point number is outside the range of 2 to 4000. • In the sequential search ((S1) is 0 or 1), the points corresponding to the input values (for positive conversion: X0 to XN-1/for inverse conversion: Y0 to YN-1) are not in ascending order. • Conversion result is outside the range of (D) data type.	• Correct the program so that the (S1) is within the range of 0 to 3. • Correct the program so that (S3) is an even number device. • Correct the program so that (S3) to (S3)+(2N+1) into the range of device. • Correct the program so that the point number is within the range of 2 to 4000. • Correct the program so that the points corresponding to the input values (for positive conversion: X0 to XN-1/for inverse conversion: Y0 to YN-1) is monotone increasing. • Correct the program so that the conversion result is within the range of (D) data type.
3971H	DSCL execution error	• (S1) is outside the range of 0 to 3. • The device numbers of (S2), (S3), (D) are odd numbers. • (S3) to (S3)+(4N+1) is outside the range of device. • Point number is outside the range of 2 to 2000. • In the sequential search ((S1) is 0 or 1), the points corresponding to the input values (for positive conversion: X0 to XN-1/for inverse conversion: Y0 to YN-1) are not in ascending order. • Conversion result is outside the range of (D) data type.	• Correct the program so that (S1) is within the range of 0 to 3. • Correct the program so that (S2), (S3), (D) are the even number devices. • Correct the program so that (S3) to (S3)+(4N+1) is within the range of device. • Correct the program so that the point number is within the range of 2 to 2000. • Correct the program so that the points corresponding to the input values (for positive conversion: X0 to XN-1/for inverse conversion: Y0 to YN-1) is monotone increasing. • Correct the program so that the conversion result is within the range of (D) data type.

Error code	Error name	Error details and cause	Corrective action
3972H	CAMRD execution error	Error occurred when CAMRD is executing.	Confirm and dedicate the error contents in the detail code. (For the detail code, refer to ▢▢MELSEC iQ-R Motion Controller Programming Manual (Program Design).)
3973H	CAMWR execution error	Error occurred when CAMWR is executing.	Confirm and dedicate the error contents in the detail code. (For the detail code, refer to ▢▢MELSEC iQ-R Motion Controller Programming Manual (Program Design).)
3975H	CAMMK execution error	Error occurred when CAMMK is executing.	Confirm and dedicate the error contents in the detail code. (For the detail code, refer to ▢▢MELSEC iQ-R Motion Controller Programming Manual (Program Design).)
3976H	CAMPSCL execution error	Error occurred when CAMPSCL is executing.	Confirm and dedicate the error contents in the detail code. (For the detail code, refer to ▢▢MELSEC iQ-R Motion Controller Programming Manual (Program Design).)
397AH	TO execution error	• The number of words (n) to be written is outside the range. • Unable to communicate with the target module when executing the instruction, or errors are detected. • Correct the program so that the address specified in (D2) is within the buffer memory range. • Start device number (S) which stores the writing data + number of words (n) to be written is outside the device range. • (S) is a bit device and its device number is not a multiple of 16. • The combination of (S) and (D1) is not correct.	• Correct the program so that number of words (n) to be written is within the range. • Replace if there is an error in the target module. • Correct the program so that the address specified in (D2) is within the buffer memory range. • Correct the program so that start device number (S) which stores the writing data + number of words (n) to be written is within the device range. • When (S) is specified a bit device, specify a multiple of 16 for the device number. • Correct the program so that the (S) and (D1) are combined properly.
397BH	FROM execution error	• The number of words (n) to be read is outside the range. • Unable to communicate with the target module when executing the instruction, or errors are detected. • The address specified in (S2) is outside the buffer memory range. • Start device number (D) which stores the reading data + number of words (n) to be read is outside the device range. • (D) is a bit device and its device number is not a multiple of 16. • The combination of (S1) and (D) is not correct.	• Correct the program so that number of words (n) to be read is within the range. • Replace if there is an error in the target module. • Correct the program so that the address specified in (S2) is within the buffer memory range. • Correct the program so that start device number (D) which stores the reading data + number of words (n) to be read is within the device range. • When (D) is specified a bit device, specify a multiple of 16 for the device number. • Correct the program so that the (S1) and (D) are combined properly.
397CH	RTO execution error	• The number of words (n) to be written is outside the range of 1 to 32767. • The target SSCNETⅢ/H head module axis No. specified by (D1) is outside the range of 601 to 608. • The target SSCNETⅢ/H head module is not connected during the instruction execution. • Start device number (S) which stores the writing data + number of words (n) to be written is outside the device range. • (S) is a bit device and its device number is not a multiple of 16. • RTO instruction has been executed again before complete bit device was turned on. • The RIO axis No. of the sensing module is specified in (D1).	• Correct the program so that number of words (n) to be written is within the range 1 to 32767. • Correct the program so that the target SSCNETⅢ/H head module axis No. specified by (D1) is within the range of 601 to 608. • Connect the target SSCNETⅢ/H head module. • Correct the program so that start device number (S) which stores the writing data + number of words (n) to be written is within the device range. • When (S) is specified a bit device, specify a multiple of 16 for the device number. • Execute RTO instruction again after the complete bit of RTO instruction is turned on. • Correct the program so that the RIO axis No. of SSCNETⅢ/H head module (LJ72MS15) is specified in (D1).
397DH	RFROM execution error	• The number of words (n) to be read is outside the range of 1 to 32767. • The target SSCNETⅢ/H head module axis No. specified by (S1) is outside the range of 601 to 608. • The target SSCNETⅢ/H head module is not connected during the instruction execution. • Start device number (D) which stores the reading data + number of words (n) to be read is outside the device range. • (D) is a bit device and its device number is not a multiple of 16. • RFROM instruction has been executed again before complete bit device was turned on. • The RIO axis No. of the sensing module is specified in (S1).	• Correct the program so that number of words (n) to be read is within the range 1 to 32767. • Correct the program so that the target SSCNETⅢ/H head module axis No. specified by (S1) is within the range of 601 to 608. • Connect the target SSCNETⅢ/H head module. • Correct the program so that start device number (D) which stores the reading data + number of words (n) to be read is within the device range. • When (D) is specified a bit device, specify a multiple of 16 for the device number. • Execute RFROM instruction again after the complete bit of RFROM instruction is turned on. • Correct the program so that the RIO axis No. of SSCNETⅢ/H head module (LJ72MS15) is specified in (S1).

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Error code	Error name	Error details and cause	Corrective action
3980H	Match (==) execution error	Internal processing error occurred when match (==) is executing.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
3981H	Unmatch (!=) execution error	Internal processing error occurred when unmatch (!=) is executing.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
3982H	Less than (<) execution error	Internal processing error occurred when "less than" (<) is executing.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
3983H	Below (<=) execution error	Internal processing error occurred when following (<=) is executing.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
3984H	Above (>) execution error	Internal processing error when exceeding (>) is executing.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
3985H	Above (>=) execution error	Internal processing error occurred when (<=) over is executing.	The Motion SFC program code is corrupted. Turn "[Rq.1120] PLC ready flag" OFF and write the Motion SFC program again.
3A00H	SDn read error	The directly specified device No. is outside the range.	• Correct the program so that the device No. which directly specifies is proper. • Set the device range according to the device number/ latch setting of relation setting of CPU parameter within the valid range.
3A01H	SDnL read error	The directly specified device No. is outside the range.	• Correct the program so that the device No. which directly specifies is proper. • Set the device range according to the device number/ latch setting of relation setting of CPU parameter within the valid range.
3A02H	SDnF read error	The directly specified device No. is outside the range.	• Correct the program so that the device No. which directly specifies is proper. • Set the device range according to the device number/ latch setting of relation setting of CPU parameter within the valid range.
3A03H	Dn read error	The directly specified device No. is outside the range.	• Correct the program so that the device No. which directly specifies is proper. • Set the device range according to the device number/ latch setting of relation setting of CPU parameter within the valid range.
3A04H	DnL read error	The directly specified device No. is outside the range.	• Correct the program so that the device No. which directly specifies is proper. • Set the device range according to the device number/ latch setting of relation setting of CPU parameter within the valid range.
3A05H	DnF read error	The directly specified device No. is outside the range.	• Correct the program so that the device No. which directly specifies is proper. • Set the device range according to the device number/ latch setting of relation setting of CPU parameter within the valid range.
3A06H	Wn read error	The directly specified device No. is outside the range.	• Correct the program so that the device No. which directly specifies is proper. • Set the device range according to the device number/ latch setting of relation setting of CPU parameter within the valid range.
3A07H	WnL read error	The directly specified device No. is outside the range.	• Correct the program so that the device No. which directly specifies is proper. • Set the device range according to the device number/ latch setting of relation setting of CPU parameter within the valid range.
3A08H	Wn:F read error	The directly specified device No. is outside the range.	• Correct the program so that the device No. which directly specifies is proper. • Set the device range according to the device number/ latch setting of relation setting of CPU parameter within the valid range.

Error code	Error name	Error details and cause	Corrective action
3A09H	#n read error	The directly specified device No. is outside the range.	• Correct the program so that the device No. which directly specifies is proper. • Set the device range according to the device number/latch setting of relation setting of CPU parameter within the valid range.
3A0AH	#nL read error	The directly specified device No. is outside the range.	• Correct the program so that the device No. which directly specifies is proper. • Set the device range according to the device number/latch setting of relation setting of CPU parameter within the valid range.
3A0BH	#nF read error	The directly specified device No. is outside the range.	• Correct the program so that the device No. which directly specifies is proper. • Set the device range according to the device number/latch setting of relation setting of CPU parameter within the valid range.
3A0CH	U□\Gn read error	The directly specified device No. is outside the range.	Correct the program so that the device No. which directly specifies is proper.
3A0DH	U□\GnL read error	The directly specified device No. is outside the range.	Correct the program so that the device No. which directly specifies is proper.
3A0EH	U□\GnF read error	The directly specified device No. is outside the range.	Correct the program so that the device No. which directly specifies is proper.
3A0FH	U□\HGn read error	The directly specified device No. is outside the range.	Correct the program so that the device No. which directly specifies is proper.
3A10H	U□\HGnL read error	The directly specified device No. is outside the range.	Correct the program so that the device No. which directly specifies is proper.
3A11H	U□\HGnF read error	The directly specified device No. is outside the range.	Correct the program so that the device No. which directly specifies is proper.
3A1BH	SD(n) read error	The indirectly specified device No. is outside the range.	Correct the program so that the device No. which indirectly specifies is proper.
3A1CH	SD(n)L read error	The indirectly specified device No. is outside the range or an odd number.	Correct the program so that the device No. which indirectly specifies is proper.
3A1DH	SD(n)F read error	The indirectly specified device No. is outside the range or an odd number.	Correct the program so that the device No. which indirectly specifies is proper.
3A1EH	D(n) read error	The indirectly specified device No. is outside the range.	• Correct the program so that the device No. which indirectly specifies is proper. • Set the device range according to the device number/latch setting of relation setting of CPU parameter within the valid range.
3A1FH	D(n)L read error	The indirectly specified device No. is outside the range or an odd number.	• Correct the program so that the device No. which indirectly specifies is proper. • Set the device range according to the device number/latch setting of relation setting of CPU parameter within the valid range.
3A20H	D(n)F read error	The indirectly specified device No. is outside the range or an odd number.	• Correct the program so that the device No. which indirectly specifies is proper. • Set the device range according to the device number/latch setting of relation setting of CPU parameter within the valid range.
3A21H	W(n) read error	The indirectly specified device No. is outside the range.	• Correct the program so that the device No. which indirectly specifies is proper. • Set the device range according to the device number/latch setting of relation setting of CPU parameter within the valid range.
3A22H	W(n)L read error	The indirectly specified device No. is outside the range or an odd number.	• Correct the program so that the device No. which indirectly specifies is proper. • Set the device range according to the device number/latch setting of relation setting of CPU parameter within the valid range.
3A23H	W(n):F read error	The indirectly specified device No. is outside the range or an odd number.	• Correct the program so that the device No. which indirectly specifies is proper. • Set the device range according to the device number/latch setting of relation setting of CPU parameter within the valid range.

Error code	Error name	Error details and cause	Corrective action
3A24H	#(n) read error	The indirectly specified device No. is outside the range.	• Correct the program so that the device No. which indirectly specifies is proper. • Set the device range according to the device number/latch setting of relation setting of CPU parameter within the valid range.
3A25H	#(n)L read error	The indirectly specified device No. is outside the range or an odd number.	• Correct the program so that the device No. which indirectly specifies is proper. • Set the device range according to the device number/latch setting of relation setting of CPU parameter within the valid range.
3A26H	#(n)F read error	The indirectly specified device No. is outside the range or an odd number.	• Correct the program so that the device No. which indirectly specifies is proper. • Set the device range according to the device number/latch setting of relation setting of CPU parameter within the valid range.
3A40H	SMn read error	The directly specified device No. is outside the range.	• Correct the program so that the device No. which directly specifies is proper. • Set the device range according to the device number/latch setting of relation setting of CPU parameter within the valid range.
3A41H	Xn read error	The directly specified device No. is outside the range.	• Correct the program so that the device No. which directly specifies is proper. • Set the device range according to the device number/latch setting of relation setting of CPU parameter within the valid range.
3A42H	Yn read error	The directly specified device No. is outside the range.	• Correct the program so that the device No. which directly specifies is proper. • Set the device range according to the device number/latch setting of relation setting of CPU parameter within the valid range.
3A43H	Mn read error	The directly specified device No. is outside the range.	• Correct the program so that the device No. which directly specifies is proper. • Set the device range according to the device number/latch setting of relation setting of CPU parameter within the valid range.
3A44H	Bn read error	The directly specified device No. is outside the range.	• Correct the program so that the device No. which directly specifies is proper. • Set the device range according to the device number/latch setting of relation setting of CPU parameter within the valid range.
3A45H	Fn read error	The directly specified device No. is outside the range.	• Correct the program so that the device No. which directly specifies is proper. • Set the device range according to the device number/latch setting of relation setting of CPU parameter within the valid range.
3A46H	SDn.m read error	The directly specified device No. is outside the range.	• Correct the program so that the device No. which directly specifies is proper. • Set the device range according to the device number/latch setting of relation setting of CPU parameter within the valid range.
3A47H	Dn.m read error	The directly specified device No. is outside the range.	• Correct the program so that the device No. which directly specifies is proper. • Set the device range according to the device number/latch setting of relation setting of CPU parameter within the valid range.
3A48H	Wn.m read error	The directly specified device No. is outside the range.	• Correct the program so that the device No. which directly specifies is proper. • Set the device range according to the device number/latch setting of relation setting of CPU parameter within the valid range.
3A49H	#n.m read error	The directly specified device No. is outside the range.	• Correct the program so that the device No. which directly specifies is proper. • Set the device range according to the device number/latch setting of relation setting of CPU parameter within the valid range.

Error code	Error name	Error details and cause	Corrective action
3A4AH	U☐Gn.m read error	The directly specified device No. is outside the range.	• Correct the program so that the device No. which directly specifies is proper.
3A4BH	U☐\HGn.m read error	The directly specified device No. is outside the range.	• Correct the program so that the device No. which directly specifies is proper.
3A54H	SM(n) read error	The indirectly specified device No. is outside the range.	• Correct the program so that the device No. which indirectly specifies is proper.
3A55H	X(n) read error	The indirectly specified device No. is outside the range.	• Correct the program so that the device No. which indirectly specifies is proper.
3A56H	Y(n) read error	The indirectly specified device No. is outside the range.	• Correct the program so that the device No. which indirectly specifies is proper.
3A57H	M(n) read error	The indirectly specified device No. is outside the range.	• Correct the program so that the device No. which indirectly specifies is proper. • Set the device range according to the device number/latch setting of relation setting of CPU parameter within the valid range.
3A58H	B(n) read error	The indirectly specified device No. is outside the range.	• Correct the program so that the device No. which indirectly specifies is proper. • Set the device range according to the device number/latch setting of relation setting of CPU parameter within the valid range.
3A59H	F(n) read error	The indirectly specified device No. is outside the range.	• Correct the program so that the device No. which indirectly specifies is proper. • Set the device range according to the device number/latch setting of relation setting of CPU parameter within the valid range.
3A5AH	SD(n).m Read Error	The indirectly specified device No. is outside the range.	• Correct the program so that the device No. which indirectly specifies is proper. • Set the device range according to the device number/latch setting of relation setting of CPU parameter within the valid range.
3A5BH	D(n).m Read Error	The indirectly specified device No. is outside the range.	• Correct the program so that the device No. which indirectly specifies is proper. • Set the device range according to the device number/latch setting of relation setting of CPU parameter within the valid range.
3A5CH	W(n).m Read Error	The indirectly specified device No. is outside the range.	• Correct the program so that the device No. which indirectly specifies is proper. • Set the device range according to the device number/latch setting of relation setting of CPU parameter within the valid range.
3A5DH	#(n).m Read Error	The indirectly specified device No. is outside the range.	• Correct the program so that the device No. which indirectly specifies is proper. • Set the device range according to the device number/latch setting of relation setting of CPU parameter within the valid range.
3A60H	16-bit batch Xn read error	The directly specified device No. is outside the range.	• Correct the program so that the device No. which directly specifies is proper. • Set the device range according to the device number/latch setting of relation setting of CPU parameter within the valid range.
3A61H	32-bit batch Xn read error	The directly specified device No. is outside the range.	• Correct the program so that the device No. which directly specifies is proper. • Set the device range according to the device number/latch setting of relation setting of CPU parameter within the valid range.
3A62H	16-bit batch Yn read error	The directly specified device No. is outside the range.	• Correct the program so that the device No. which directly specifies is proper. • Set the device range according to the device number/latch setting of relation setting of CPU parameter within the valid range.
3A63H	32-bit batch Yn read error	The directly specified device No. is outside the range.	• Correct the program so that the device No. which directly specifies is proper. • Set the device range according to the device number/latch setting of relation setting of CPU parameter within the valid range.

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Error code	Error name	Error details and cause	Corrective action
3A64H	16-bit batch Mn read error	The directly specified device No. is outside the range.	• Correct the program so that the device No. which directly specifies is proper. • Set the device range according to the device number/latch setting of relation setting of CPU parameter within the valid range.
3A65H	32-bit batch Mn read error	The directly specified device No. is outside the range.	• Correct the program so that the device No. which directly specifies is proper. • Set the device range according to the device number/latch setting of relation setting of CPU parameter within the valid range.
3A66H	16-bit batch Bn read error	The directly specified device No. is outside the range.	• Correct the program so that the device No. which directly specifies is proper. • Set the device range according to the device number/latch setting of relation setting of CPU parameter within the valid range.
3A67H	32-bit batch Bn read error	The directly specified device No. is outside the range.	• Correct the program so that the device No. which directly specifies is proper. • Set the device range according to the device number/latch setting of relation setting of CPU parameter within the valid range.
3A68H	16-bit batch Fn read error	The directly specified device No. is outside the range.	• Correct the program so that the device No. which directly specifies is proper. • Set the device range according to the device number/latch setting of relation setting of CPU parameter within the valid range.
3A69H	32-bit batch Fn read error	The directly specified device No. is outside the range.	• Correct the program so that the device No. which directly specifies is proper. • Set the device range according to the device number/latch setting of relation setting of CPU parameter within the valid range.
3A6AH	16-bit batch SMn read error	The directly specified device No. is outside the range.	• Correct the program so that the device No. which directly specifies is proper. • Set the device range according to the device number/latch setting of relation setting of CPU parameter within the valid range.
3A6BH	32-bit batch SMn read error	The directly specified device No. is outside the range.	• Correct the program so that the device No. which directly specifies is proper. • Set the device range according to the device number/latch setting of relation setting of CPU parameter within the valid range.
3A6CH	16-bit batch X(n) read error	The indirectly specified device No. is outside the range or is not a multiple of 16.	• Correct the program so that the device No. which indirectly specifies is proper. • Set the device range according to the device number/latch setting of relation setting of CPU parameter within the valid range.
3A6DH	32-bit batch X(n) read error	The indirectly specified device No. is outside the range or is not a multiple of 16.	• Correct the program so that the device No. which indirectly specifies is proper. • Set the device range according to the device number/latch setting of relation setting of CPU parameter within the valid range.
3A6EH	16-bit batch Y(n) read error	The indirectly specified device No. is outside the range or is not a multiple of 16.	• Correct the program so that the device No. which indirectly specifies is proper. • Set the device range according to the device number/latch setting of relation setting of CPU parameter within the valid range.
3A6FH	32-bit batch Y(n) read error	The indirectly specified device No. is outside the range or is not a multiple of 16.	• Correct the program so that the device No. which indirectly specifies is proper. • Set the device range according to the device number/latch setting of relation setting of CPU parameter within the valid range.
3A70H	16-bit batch M(n) read error	The indirectly specified device No. is outside the range or is not a multiple of 16.	• Correct the program so that the device No. which indirectly specifies is proper. • Set the device range according to the device number/latch setting of relation setting of CPU parameter within the valid range.

Error code	Error name	Error details and cause	Corrective action
3A71H	32-bit batch M(n) read error	The indirectly specified device No. is outside the range or is not a multiple of 16.	• Correct the program so that the device No. which indirectly specifies is proper. • Set the device range according to the device number/ latch setting of relation setting of CPU parameter within the valid range.
3A72H	16-bit batch B(n) read error	The indirectly specified device No. is outside the range or is not a multiple of 16.	• Correct the program so that the device No. which indirectly specifies is proper. • Set the device range according to the device number/ latch setting of relation setting of CPU parameter within the valid range.
3A73H	32-bit batch B(n) read error	The indirectly specified device No. is outside the range or is not a multiple of 16.	• Correct the program so that the device No. which indirectly specifies is proper. • Set the device range according to the device number/ latch setting of relation setting of CPU parameter within the valid range.
3A74H	16-bit batch F(n) read error	The indirectly specified device No. is outside the range or is not a multiple of 16.	• Correct the program so that the device No. which indirectly specifies is proper. • Set the device range according to the device number/ latch setting of relation setting of CPU parameter within the valid range.
3A75H	32-bit batch F(n) read error	The indirectly specified device No. is outside the range or is not a multiple of 16.	• Correct the program so that the device No. which indirectly specifies is proper. • Set the device range according to the device number/ latch setting of relation setting of CPU parameter within the valid range.
3A76H	16-bit batch SM(n) read error	The indirectly specified device No. is outside the range or is not a multiple of 16.	• Correct the program so that the device No. which indirectly specifies is proper. • Set the device range according to the device number/ latch setting of relation setting of CPU parameter within the valid range.
3A77H	32-bit batch SM(n) read error	The indirectly specified device No. is outside the range or is not a multiple of 16.	• Correct the program so that the device No. which indirectly specifies is proper. • Set the device range according to the device number/ latch setting of relation setting of CPU parameter within the valid range.
3A90H	MCFUN Execution Error	• The add-on module specified in (S1) is not registered. • The string specified in (S1) exceeds the range of the characters number. • The device numbers in (S2) and (D1) are odd. • The device numbers which indirectly specifies (S1), (S2), (D1) and (D2) are illegal. • The called add-on module returns to abnormal termination.	• Specify the registered add-on module. • Correct the program so that it will be within the character range. • Correct the program so that (S2), (D1) is an even number device. • Correct the program so that the device No. which indirectly specifies is proper. • Remove the conditions that may cause add-on module error.

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Moderate error (2000H to 3BFFH)

Moderate error details and causes, and corrective action are shown below.

Error code	Error name	Error details and cause	Corrective action
2000H	Module configuration error	The module type set in the system parameters (I/O assignment setting) differs from that of the module actually mounted.	Re-set the module type in the system parameters in accordance with the CPU module or intelligent function module actually mounted.
2001H	Module configuration error	The I/O numbers set in the system parameters (I/O assignment setting) are overlapping between modules.	Re-set the I/O numbers in the system parameters in accordance with the intelligent function module or I/O module actually mounted.
2002H	Module configuration error	The number of points assigned to the intelligent function module in the system parameters (I/O assignment setting) is smaller than that of the module actually mounted.	Re-set the number of points in the system parameters in accordance with the intelligent function module actually mounted.
2006H	Module configuration error	A module is mounted on the 65th slot or later.	Remove the module mounted on the 65th slot or later.
2007H	Module configuration error	A module is mounted on the slot whose number is later than that specified in parameter (I/O assignment setting).	Remove the module mounted on the slot whose number is later than that specified in system parameter (I/O assignment setting).
2008H	Module configuration error	A module is mounted over or across the maximum number of I/O points (4096).	• Remove the module mounted over or across the maximum number of I/O points (4096). • Replace the module mounted on the last slot to the one that does not exceed the maximum number of I/O points (4096).
2009H	Module configuration error	There is no response from the I/O module or intelligent function module accessed.	• Check and correct the I/O assignment setting in the system parameters. • The possible cause is a hardware failure of the I/O module or intelligent function module accessed. Please consult your local Mitsubishi representative.
2020H	Module configuration error	An unsupported module is mounted.	Remove the unsupported module. If all the modules are supported, the possible cause is a hardware failure of the CPU module, base unit, or module (I/O module or intelligent function module) connected. Please consult your local Mitsubishi representative.
2021H	Module configuration error	In the multiple CPU system, the control CPU of the Q series intelligent function module incompatible with the multiple CPU system is set to other than CPU No.1.	• Replace the Q series intelligent function module with the one (function version B) compatible with the multiple CPU system. • Set the control CPU of the Q series intelligent function module incompatible with the multiple CPU system to CPU No.1.
2040H	CPU module configuration error	• The number of CPU modules set in the system parameters (I/O assignment setting) differs from the number of CPU modules actually mounted. • The CPU module is mounted on the slot different from the one specified in the system parameters (I/O assignment setting).	• Correctly set the number of CPU modules (including the empty setting) in the system parameters in accordance with the number of CPU modules actually mounted. • Correctly set the system parameters so that the setting and actual CPU module mounting status will be the same.
2041H	CPU module configuration error	• The CPU module is not mounted on the slot that is set for the CPU module in the system parameters (I/O assignment setting). • An I/O module or intelligent function module is mounted between the CPU modules.	• Correctly set the number of CPU modules (including the empty setting) in the system parameters in accordance with the number of CPU modules actually mounted. • Remove the I/O module or intelligent function module mounted between the CPU modules.
2043H	CPU module configuration error	The CPU module is mounted on the inapplicable slot.	• Mount the CPU module on the applicable slot (CPU slot or I/O slot 0 to 6). • Remove the CPU module from the inapplicable slot.
2044H	CPU module configuration error	The host CPU No. set in the system parameters (I/O assignment setting) differs from the one determined by the mounting position of the CPU module.	Re-set the host CPU No. in the system parameters in accordance with the mounting position of the CPU module.
2050H	CPU module configuration error	An unsupported CPU module is mounted.	Remove the unsupported CPU module. If all the CPU modules are supported, the possible cause is a hardware failure of the CPU module or base unit. Please consult your local Mitsubishi representative.
2060H	Base unit configuration error	Eight or more extension base units are connected.	Reduce the number of extension base units to seven or less.

Error code	Error name	Error details and cause	Corrective action
2070H	Base unit configuration error	An unsupported base unit is connected.	Disconnect the unsupported base unit. If all the base units are supported, the possible cause is a hardware failure of the CPU module or base unit. Please consult your local Mitsubishi representative.
2080H	Inter-module synchronization configuration error	An inter-module synchronization signal error has been detected.	The possible cause is a hardware failure of the CPU module, base unit, or module (I/O module or intelligent function module) connected. Please consult your local Mitsubishi representative.
20E0H	Invalid module	A module that the CPU module cannot recognize is mounted.	• Mount only applicable modules. • The possible cause is a hardware failure of the I/O module or intelligent function module accessed. Please consult your local Mitsubishi representative.
2120H	Memory card error	The memory card was removed without the card being disabled.	Disable the memory card, and then remove it.
2121H	Memory card error	An error has been detected in the memory card.	Format the memory card, or re-insert the memory card. If the same error code is displayed again, the possible cause is a hardware failure of the memory card. Replace the memory card.
2122H	Memory card error	The CPU module did not start because the memory card was not restored during the startup processing.	Reset the CPU module. If the same error code is displayed again, the possible cause is a hardware failure of the memory card. Replace the memory card.
2180H	Invalid file	An invalid file has been detected.	Check the detailed information (drive/file information), select the correct file name, and write the specified file to the CPU module. If the same error code is displayed again, the possible cause is a hardware failure of the CPU module. Please consult your local Mitsubishi representative.
21A0H	File specification error	The file which specified control data in boot operation file does not exist in the memory card.	Please check the detailed information (Drive/File information) and write the displayed file. If still shows the same error, maybe the memory card hardware is error. Exchange the memory card.
21A1H	File specification error	The file specified in parameter cannot be created.	Check the detailed information (parameter information), and correct the name and size of the file corresponding to the displayed number.
			Check the detailed information (drive/file information), take the following actions. • Format the corresponding drive. • Delete unnecessary files on the corresponding drive to increase free space. • Unlock the corresponding drive if it is locked.
2200H	Parameter error	The parameter file do not exist.	Check the detailed information, select the correct file name, and write the file to the CPU module.
2220H	Parameter error	The parameter setting is corrupted.	Check the detailed information (parameter information), and write the displayed parameter setting to the CPU module. If the same error code is displayed again, the possible cause is a hardware failure of the data memory in the CPU module, the memory card, or the module (I/O module or intelligent function module) connected. Please consult your local Mitsubishi representative.
2221H	Parameter error	The set value is out of range.	Check the detailed information (parameter information), and correct the parameter setting. If the same error code is displayed again, the possible cause is a hardware failure of the data memory in the CPU module, the memory card, or the module (I/O module or intelligent function module) connected. Please consult your local Mitsubishi representative.
2222H	Parameter error	Use of the function that is not supported by the module is enabled in parameter.	Check the detailed information (parameter information), and correct the parameter setting. If the same error code is displayed again, the possible cause is a hardware failure of the data memory in the CPU module, the memory card, or the module (I/O module or intelligent function module) connected. Please consult your local Mitsubishi representative.

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Error code	Error name	Error details and cause	Corrective action
2225H	Parameter error	The CPU module model set to the project using the engineering tool differs from that of the CPU module actually mounted.	Correct the CPU module model set to the project in accordance with the CPU module actually mounted.
2240H	Parameter error (module)	In the multiple CPU system, the I/O module or intelligent function module controlled by another CPU module is specified in the module parameters.	Check the detailed information (parameter information), and correct the parameter setting corresponding to the displayed number. If the same error code is displayed again, the possible cause is a hardware failure of the data memory in the CPU module or the module (I/O module or intelligent function module) connected. Please consult your local Mitsubishi representative.
2241H	Parameter error (module)	• The I/O numbers set in the system parameters differ from those of the module actually mounted. • The target module is not mounted on the slot where the system parameters and module parameters are set. • The module type set in parameter differs from that of the module actually mounted.	• Check if the system configuration displayed on the system monitor window of the engineering tool match the actual system configuration. • Check the detailed information (parameter information), and correct the parameter setting corresponding to the displayed number. If the same error code is displayed again, the possible cause is a hardware failure of the data memory in the CPU module or the module (I/O module or intelligent function module) connected. Please consult your local Mitsubishi representative.
2242H	Parameter error (module)	The intelligent function module has detected a module parameter error.	Check the detailed information (system configuration information), and check the module corresponding to the displayed I/O number. If the same error code is displayed again, the possible cause is a hardware failure of the data memory in the CPU module or the intelligent function module connected. Please consult your local Mitsubishi representative.
2280H	Parameter error (refresh)	The refresh setting is not set correctly.	Check the detailed information (parameter information), and correct the parameter setting corresponding to the displayed number so that the data are refreshed within the specified device range.
2281H	Parameter error (refresh)	A device that cannot be used as a refresh device is specified.	Check the detailed information (parameter information), and correct the parameter setting corresponding to the displayed number.
2282H	Parameter error (refresh)	The number of specified refresh points is invalid.	Check the detailed information (parameter information), and correct the parameter setting corresponding to the displayed number.
22E0H	Parameter verification error	• In the multiple CPU system, the system parameter settings of the host CPU module differ from those of other CPU modules. • In the multiple CPU system, the system parameter settings are overwritten only to the host CPU module, and the settings differ from those of other CPU modules.	• Check the detailed information (parameter information), and correct the system parameter settings corresponding to the displayed number for the CPU No.2 and later. The settings need to be the same between all the CPU modules. (The module synchronization setting and fixed scan communication setting need to be the same between the CPU modules that use these functions.) • When the system parameter settings are changed, update the settings of all the CPU modules connected. (The system parameter settings must be same in all the CPU modules.)
2300H	Security key authentication error	The security key set to the program does not match the one registered to the CPU module.	Check and correct the security key setting.
2301H	Security key authentication error	The security key is set to the program, but it is not registered to the CPU module.	Check and correct the security key setting.
2302H	Security key authentication error	• The security key set to the file is corrupted and does not match the one registered to the CPU module. • The security key registered to the CPU module is corrupted and does not match the one set to the file.	Write the file to the CPU module again. If the same error code is displayed again, the possible cause is a hardware failure of the CPU module. Please consult your local Mitsubishi representative.
2400H	Module verification error	• The I/O module information at power-on differs from the information of modules actually mounted. • The I/O module or intelligent function module is not mounted properly or was removed during operation.	Check the detailed information (system configuration information), and check the module corresponding to the displayed slot number.
2401H	Module verification error	A CPU module, I/O module, or intelligent function module was mounted on the base unit during operation.	• Check the detailed information (system configuration information), and check the module corresponding to the displayed slot number. • Do not mount a CPU module, I/O module, nor intelligent function module during operation.

Error code	Error name	Error details and cause	Corrective action
2440H	Module major error	An error has been detected in the I/O module or intelligent function module during the initial processing.	The possible cause is a hardware failure of the error module. Please consult your local Mitsubishi representative.
2441H	Module major error	An error has been detected in the I/O module or intelligent function module when the instruction was executed.	The possible cause is a hardware failure of the error module. Please consult your local Mitsubishi representative.
2442H	Module major error	An error has been detected in the I/O module or intelligent function module during the END processing.	The possible cause is a hardware failure of the error module. Please consult your local Mitsubishi representative.
2443H	Module major error	An error has been detected in the I/O module or intelligent function module.	The possible cause is a hardware failure of the error module. Please consult your local Mitsubishi representative.
2450H	Module major error	• A major error has been notified from the intelligent function module connected. • The I/O module or intelligent function module is not mounted properly or was removed during operation."	• Check the connection status of the extension cable. • Check the detailed information (system configuration information), and check the module corresponding to the displayed slot number. • Reset the CPU module, and run it again. If the same error code is displayed again, the possible cause is a hardware failure of the error module. Please consult your local Mitsubishi representative.
2460H	Another CPU module major error	An error has been detected in another CPU module during the initial processing.	Reset the CPU module, and run it again. If the same error code is displayed again, the possible cause is a hardware failure of the host CPU module or another CPU module where the error has been detected. Please consult your local Mitsubishi representative.
2463H	Another CPU module major error	An error has been detected in another CPU module.	Reset the CPU module, and run it again. If the same error code is displayed again, the possible cause is a hardware failure of the host CPU module or another CPU module where the error has been detected. Please consult your local Mitsubishi representative.
2470H	Another CPU module major error	A major error has been notified from another CPU module.	Reset the CPU module, and run it again. If the same error code is displayed again, the possible cause is a hardware failure of the host CPU module or another CPU module where the error has been detected. Please consult your local Mitsubishi representative.
2480H	Multiple CPU error	• In the multiple CPU system, an error has been detected in the CPU module where "Stop" is set in the operation mode setting parameter. • Any CPU module other than CPU No.1 is mounted in the inapplicable slot. (An error occurs in the CPU module mounted in the inapplicable slot.)	• Check the detailed information (system configuration information), identify the error CPU module, and eliminate the error cause. • Remove the CPU module from the inapplicable slot.
2481H	Multiple CPU error	In the multiple CPU system, any CPU module other than CPU No.1 was disconnected from the base unit during operation. Or, any CPU module other than CPU No.1 was reset.	Check the mounting status and reset status of the CPU modules other than CPU No.1.
24C0H	System bus error	An error was detected on the system bus.	• Take measures to reduce noise. • Reset the CPU module, and run it again. If the same error code is displayed again, the possible cause is a hardware failure of the CPU module, base unit, extension cable, or module (I/O module or intelligent function module) connected. Please consult your local Mitsubishi representative.
24C1H	System bus error	An error was detected on the system bus.	• Take measures to reduce noise. • Reset the CPU module, and run it again. If the same error code is displayed again, the possible cause is a hardware failure of the CPU module, base unit, extension cable, or module (I/O module or intelligent function module) connected. Please consult your local Mitsubishi representative.

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Error code	Error name	Error details and cause	Corrective action
24C2H	System bus error	An error was detected on the system bus.	• Check the connection status of the extension cable. • Take measures to reduce noise. • Reset the CPU module, and run it again. If the same error code is displayed again, the possible cause is a hardware failure of the CPU module, base unit, extension cable, or module (I/O module or intelligent function module) connected. Please consult your local Mitsubishi representative.
24C3H	System bus error	An error was detected on the system bus.	• Take measures to reduce noise. • Reset the CPU module, and run it again. If the same error code is displayed again, the possible cause is a hardware failure of the CPU module, base unit, extension cable, or module (I/O module or intelligent function module) connected. Please consult your local Mitsubishi representative.
24C4H	System bus error	An error was detected on the system bus.	• Take measures to reduce noise. • Reset the CPU module, and run it again. If the same error code is displayed again, the possible cause is a hardware failure of the base unit, extension cable, or module (I/O module or intelligent function module) connected. Please consult your local Mitsubishi representative.
24C5H	System bus error	An error was detected on the system bus.	• Take measures to reduce noise. • Reset the CPU module, and run it again. If the same error code is displayed again, the possible cause is a hardware failure of the base unit, extension cable, or module (I/O module or intelligent function module) connected. Please consult your local Mitsubishi representative.
24C6H	System bus error	An error was detected on the system bus.	• Take measures to reduce noise. • Reset the CPU module, and run it again. If the same error code is displayed again, the possible cause is a hardware failure of the CPU module or extension cable. Please consult your local Mitsubishi representative.
24C8H	System bus error	An error was detected on the system bus.	• Take measures to reduce noise. • Reset the CPU module, and run it again. If the same error code is displayed again, the possible cause is a hardware failure of the extension cable, or module (I/O module or intelligent function module) connected. Please consult your local Mitsubishi representative.
24D0H	System bus error	An error was detected on the system bus.	• Take measures to reduce noise. • Reset the CPU module, and run it again. If the same error code is displayed again, the possible cause is a hardware failure of the CPU module, base unit, or extension cable. Please consult your local Mitsubishi representative.
24E0H	System bus error	An error was detected on the system bus.	• Take measures to reduce noise. • Reset the CPU module, and run it again. If the same error code is displayed again, the possible cause is a hardware failure of the CPU module or base unit. Please consult your local Mitsubishi representative.
2500H	WDT error	A H/W WDT error caused by the main cycle exceeding 1.0 [s] was detected.	Please take measures below. • Change the operation cycle into a large value. • Reduce the number of command execution of the event task or NMI task in the system setting. If the same error code is displayed again, the possible cause is a hardware failure of the CPU module. Please consult your local Mitsubishi representative.
2501H	WDT error	A S/W WDT error caused by an excessively long Motion operating time ($5 \times$ the operation cycle setting or more, $5 \times$ the low-speed operation cycle or more) was detected.	Please take measures below. • Change the operation cycle into a large value. • Reduce the number of command execution of the event task or NMI task in the system setting. • Change the low-speed operation cycle magnification setting into a large value. If the same error code is displayed again, the possible cause is a hardware failure of the CPU module. Please consult your local Mitsubishi representative.

Error code	Error name	Error details and cause	Corrective action
2520H	Invalid interrupt	Even though an interrupt was requested, there is no interrupt factor.	• Take measures to reduce noise. • Reset the CPU module, and run it again. If the same error code is displayed again, the possible cause is a hardware failure of the CPU module, base unit, or module (I/O module or intelligent function module) connected. Please consult your local Mitsubishi representative.
2522H	Invalid interrupt	An interrupt was requested from the module with no interrupt pointer setting.	• Check and correct the interrupt pointer setting in the module parameters. • Take measures so that no interrupt is requested from the module with no interrupt pointer setting. • Check and correct the interrupt setting in the buffer memory of the intelligent function module.
2600H	Motion operation cycle time over	The Motion CPU fixed-cycle process did not complete within the set Motion operation cycle.	Please take measures below. • Change the operation cycle into a large value. • Reduce the number of command execution of the event task or NMI task in the system setting. If you see the same error again, there or data memory, the CPU module, the risk of hardware failure of the memory card. Please consult your local Mitsubishi representative.
2610H	Inter-module synchronization signal error	An inter-module synchronization error has been detected.	• Take measures to reduce noise. • Reset the CPU module, and run it again. If the same error code is displayed again, the possible cause is a hardware failure of the CPU module, base unit, extension cable, or module (I/O module or intelligent function module) connected. Please consult your local Mitsubishi representative.
2611H	Inter-module synchronization signal error	An inter-module synchronization error has been detected.	• Take measures to reduce noise. • Reset the CPU module, and run it again. If the same error code is displayed again, the possible cause is a hardware failure of the CPU module, base unit, extension cable, or module (I/O module or intelligent function module) connected. Please consult your local Mitsubishi representative.
2622H	Multiple CPU synchronous processing error	The Motion CPU fixed-cycle process did not complete before the fixed-cycle data send section.	Please take measures below. • Change the operation cycle into a large value. • Reduce the number of command execution of the event task or NMI task in the system setting. If you see the same error again, there or data memory, the CPU module, the risk of hardware failure of the memory card. Please consult your local Mitsubishi representative.
2630H	Multiple CPU synchronization signal error	A multiple CPU synchronization error has been detected.	• Take measures to reduce noise. • Reset the CPU module, and run it again. If the same error code is displayed again, the possible cause is a hardware failure of the CPU module or base unit. Please consult your local Mitsubishi representative.
2631H	Multiple CPU synchronization signal error	A multiple CPU synchronization error has been detected.	• Take measures to reduce noise. • Reset the CPU module, and run it again. If the same error code is displayed again, the possible cause is a hardware failure of the CPU module or base unit. Please consult your local Mitsubishi representative.
2800H	I/O number or network number specification error	The specified I/O number in the program or parameter is out of range (other than 000H to FFFH, 3E0H to 3E3H).	Set the I/O number within the valid range.
2801H	I/O number or network number specification error	The I/O number of the module that does not exist was specified in the program or parameter.	Set the input and output number exists the target module.
2803H	I/O number or network number specification error	The I/O number of the module that cannot be specified in the program or parameter was specified.	Set the input and output number of the unit that can be specified in the program or parameter.
2810H	I/O number or network number specification error	The I/O module or intelligent function module specified in the program or parameter cannot execute the instruction.	The possible cause is a hardware failure of the I/O module or intelligent function module specified in the program or parameter. Please consult your local Mitsubishi representative.
2820H	Device, label, or buffer memory specification error	The device or label area used in the program or parameter exceeded the specified range.	Set the label or devices specified in the program or parameter within the usable range.

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Error code	Error name	Error details and cause	Corrective action
2823H	Device, label, or buffer memory specification error	• The buffer memory area of the module specified in the program or parameter exceeded the specified range. • The module specified in the program or parameter does not have buffer memory.	• Set the buffer memory within the valid range. • Set the unit has a buffer memory.
3070H	Boot operation file error	Content of boot operation file is strange.	Confirm boot log file (bootlog.txt) and check the boot operation file.
3071H	Boot function read/write protection error	• Detected the file writing in CPU which set standard ROM write disable. • Detected the file reading from CPU which set standard ROM read disable.	Check the file transmission setting during booting Motion CPU common parameter.
3072H	Boot function security error	• Detected the unmatched verification of file password. • Detected the read to SD memory card etc. of security key set files.	Confirm the bootlog file (bootlog.txt) and check password and security key.
3073H	Boot function execution error	Failed to copy, delete a file and create a folder.	• Check the bootlog file (bootlog.txt) and store the specified file in boot operation files. • Delete the unnecessary file of SD memory card in standard ROM. (Check free space.) • Release the write protect of SD memory card.
3080H	Add-on function moderate error	Moderate error occurs in add-on function.	Check the detail information and refer to instruction manual of add-on library that supported file name.
3081H	Add-on license moderate error	Moderate error occurred in add-on license check.	Confirm the detailed code. (For the detailed code, refer to ⛷MELSEC iQ-R Motion Controller Programming Manual (Common).)
308FH	Add-on function load error	Error occurs in add-on function loading.	Check the error content in detailed code and process accordingly. (Refer to the ⛷MELSEC iQ-R Motion Controller Programming Manual (Common) for detailed code. Or refer to each add-on library instruction manual for detailed add-on library.)
30C0H	Label setting error	• Write label/structure setting only to Motion controller after label setting changed. • Write label allocation information only to Motion controller after access setting from label setting external machine changed.	• Write label/structure setting and label allocation information to Motion controller. • Delete label/structure setting if label is no use. • Please initialize the memory which label allocation information has been written and then write label/structure setting to Motion controller.
30D0H	Servo parameter setting error	Axis type and parameter type do not match in servo network setting.	Set the axis type and parameter type of the servo network setting to be the same type.
30D1H	Synchronous encoder axis setting error	• Specified the amplifier which does not support the synchronous encoder via servo amplifier. • Specified the axis No. which is not in servo network setting. • Specified other than the high-speed counter module. • Set the "[Pr.320] Synchronous encoder axis type" which cannot use in master CPU/independent CPU. • Specified the extension module which does not support the synchronous encoder via sensing module. • The "[Pr.332] CH No." set in the synchronous encoder via sensing module turns to be invalid.	• Specify the amplifier which supports the synchronous encoder via servo amplifier. • Specify the axis No. of servo network setting. • Specify the high-speed counter module. • Correct the "[Pr.320] Synchronous encoder axis type". • Specify the encoder I/F module (MR-MT2400) in the synchronous encoder via sensing module. • Review the channel servo parameter "Encoder I/F input CH.A function selection (PTE009)" or "Encoder I/F input CH.B function selection (PTE065)" set in "[Pr.332] CH No.".
30D2H	External signal parameter setting error	• The corresponding module does not exist. • The input module is not the synchronous setting among the modules.	• Set the input module. • Set the input module in the synchronous setting among the modules.

Error code	Error name	Error details and cause	Corrective action

30D3H	High-speed input request signal parameter setting error	• The corresponding module does not exist.
		• The input module is not the synchronous setting among the modules.
		• High-speed input request signal is set unusable in SSCNETⅢ/H head module (MR-MT2010).
		  (1) The DI signal specified in input signal does not support the high-accuracy (Timing latch input) when the "High-accuracy (Timing latch input)" is specified.
		  (2) The SSCNETⅢ/H head module (MR-MT2010) specified in input module turns to be axis mode when the "High-accuracy (Timing latch input)" is specified.
		  (3) Specified the SSCNETⅢ/H head module (MR-MT2010) in the input module among the axis number other than start station in 1 block.
		• The pulse I/O module (MR-MT2200) specified in input module turns to be axis mode.
			• Set the input module.
			• Set the input module in the synchronous setting among the modules.
			• Review the operation mode or the high-speed input request signal parameter setting of SSCNETⅢ/H head module (MR-MT2010).
			  (1) When "High-accuracy (Timing latch input)" is specified, specify a DI signal supporting the high-accuracy (timing latch input) in the input signal.
			  (2) Review the operation mode of SSCNETⅢ/H head module (MR-MT2010).
			  (3) When SSCNETⅢ/H head module (MR-MT2010) is specified in input module, specify the axis No. of start station in 1 block for the axis No.
			• Review the operation mode of pulse I/O module (MR-MT2200).

30D4H	Manual pulse generator parameter setting error	• Specified other than the high-speed counter module. • The control CPU is not set to self CPU. • The counter type is not set to "Ring Counter". • The counter action mode is not set to "Pulses counter mode". • 0 is not set to the ring counter upper limit value setting and ring counter lower limit value setting.	• Specify the high-speed count module. • Set the control CPU to self CPU. • Set the counter type to "Ring Counter". • Set the counter action mode to "Pulses counter mode". • Set 0 to the ring counter upper limit value setting and ring counter lower limit value setting.
30D5H	Mark detection setting error	The control operation cycle of mark detection data target does not match the control cycle setting of high-speed input request signal.	• When mark detection data is Motion control data, specify the high-speed input request signal whose control cycle setting matches the control operation cycle of axis set in mark detection data axis number. • When mark detection data is word device, specify the high-speed input request signal in which the control cycle is set as the operation cycle.
30E0H	Multiple CPU refresh setting error	Total number of the set transmission points exceeds 256.	Set the total number of transmission points less than 256.
30F0H	Servo amplifier unset error	None of the axes has been set in servo network setting.	Set the axis in servo network setting.
30F1H	Axis number overlapping setting error	Axes have overlapped in servo network setting.	Set in servo network setting so that axis does not overlap.
30F2H	Servo amplifier station No. overlapping setting error	Servo amplifier station No. has overlapped in servo network setting.	Set in servo network setting so that servo amplifier station No. does not overlap.
30F3H	RIO axis configuration setting error	The setting station No. of SSCNETⅢ/H head module or sensing module (station mode) is exceeding the maximum station No. by calculation cycle.	Review the setting station No. or the operation cycle of SSCNETⅢ/H head module or sensing module (station mode).
30F4H	Communication among drivers setting error	Unusable settings that execute communication among drives are specified in motion controller and servo amplifier corresponding to communication among drives.	Check "Master axis No. selection 1 (PD20) at communication slave setting among drivers" and PD21 to PD23 of servo parameter in slave axis.
30F5H	Multiple CPU advanced synchronous control setting error	• Neither fixed scan communication function nor inter-module synchronous function is set. • "Do not Synchronize" is set in inter-module synchronization target module selection. • The same operation cycle is not set in master CPU and slave CPU.	• Set fixed scan communication function or inter-module synchronous function. • Set "Synchronize" in inter-module synchronization target module selection. • Set the same operation cycle in master CPU and slave CPU.
30F6H	Multiple CPU advanced synchronous control detection error	• Multiple master CPUs are set. • Master CPU is not set. • Rising timing in each CPU is different and cannot detect master CPU/slave CPU.	• Set only one master CPU. • Set master CPU. • Set "Synchronize" in all CPUs for synchronous rising setting in Multiple CPU advanced synchronous control system configuration.
30F7H	Pressure control setting error	• The number of valid pressure control axes exceeds 8. • Pressure control is set valid in degree axis. • Pressure control is set valid in SSCNETⅢ line.	Please check the setting.
30F8H	Sensing module configuration setting error	The station No. or the RIO axis No. is discontinuous in 1 block.	Please review the servo network setting.

Error code	Error name	Error details and cause	Corrective action
30F9H	Operation cycle mixed setting error	• The system of SSCNETIII has already existed in network setting when setting low-speed operation cycle magnification setting is valid. • The operation cycle is 0.222[ms] when low-speed operation cycle magnification setting is valid. • The operation cycle is 0.444[ms] when setting low-speed operation cycle magnification setting as 8 times. • "Low-speed operation cycle magnification setting × operation cycle" exceeds 14.222[ms]. • The machine control function is valid when setting low-speed operation cycle magnification setting is valid. • The servo amplifier axis or command generation axis for executing control in low-speed operation cycle does not exist. • G-code control setting is valid when low-speed operation cycle magnification setting is valid.	• Change the network setting to SSCNETIII/H. • Set the operation cycle to 0.444[ms] or more. • Set the operation cycle to 0.888[ms] or more when low-speed operation cycle magnification setting is 8 times. • Check and correct the setting to make "low-speed operation cycle magnification setting × operation cycle" less than 14.222[ms]. • Disable the machine control function. • Check and correct the servo network setting or the control operation cycle setting of command generation axis setting. • Change G-code control setting to "Not Used".
30FAH	Machine configuration error	Machine parameter or the axis setting parameter of the machine configuration axis is incorrect.	Confirm the detail code and check the adequate parameter setting. (For the detail code, refer to ☐MELSEC iQ-R Motion Controller Programming Manual (Machine Control).)
30FBH	Machine control device assignment error	The using device of machine is outside the assignment range of device.	Set the using device of machine within the range of device assignment.
30FDH	G-code control configuration error	• The parameter of G-code control configuration axis is incorrect. • An error has been detected when reading G-code program.	• Confirm the detail code and check the adequate parameter setting. • Confirm the detail code, eliminate the error and execute program writing again. (For the detail code, refer to ☐MELSEC iQ-R Motion Controller Programming Manual (G-Code Control).)
30FEH	G-code control operation cycle setting error	The operation cycle is less than 0.888[ms] when setting G-code control.	Check and correct the operation cycle over 0.888[ms] when using G-code control.
30FFH	G-code control add-on library incorrect	Add-on library is not installed when setting G-code control.	• Install the add-on library of G-code control. • Select "Not Used" in G-code control setting of the basic setting when not using G-code control.

Major error (3C00H to 3FFFH)

Major error details and causes, and corrective action are shown below.

Error code	Error name	Error details and cause	Corrective action
3C00H	Hardware failure	A hardware failure has been detected.	• Take measures to reduce noise. • Reset the CPU module, and run it again. If the same error code is displayed again, the possible cause is a hardware failure of the CPU module. Please consult your local Mitsubishi representative.
3C01H	Hardware failure	A hardware failure has been detected.	• Take measures to reduce noise. • Reset the CPU module, and run it again. If the same error code is displayed again, the possible cause is a hardware failure of the CPU module. Please consult your local Mitsubishi representative.
3C02H	Hardware failure	A hardware failure has been detected.	• Take measures to reduce noise. • Reset the CPU module, and run it again. If the same error code is displayed again, the possible cause is a hardware failure of the CPU module. Please consult your local Mitsubishi representative.
3C03H	Hardware failure	A hardware failure has been detected.	• Take measures to reduce noise. • Reset the CPU module, and run it again. If the same error code is displayed again, the possible cause is a hardware failure of the CPU module. Please consult your local Mitsubishi representative.
3C0FH	Hardware failure	A hardware failure has been detected.	• Take measures to reduce noise. • Reset the CPU module, and run it again. If the same error code is displayed again, the possible cause is a hardware failure of the CPU module. Please consult your local Mitsubishi representative.
3C10H	Hardware failure	A hardware failure has been detected.	• Take measures to reduce noise. • Reset the CPU module, and run it again. If the same error code is displayed again, the possible cause is a hardware failure of the CPU module. Please consult your local Mitsubishi representative.
3C11H	Hardware failure	A hardware failure has been detected.	• Take measures to reduce noise. • Reset the CPU module, and run it again. If the same error code is displayed again, the possible cause is a hardware failure of the CPU module. Please consult your local Mitsubishi representative.
3C12H	Hardware failure	• The waveform of the voltage out of the specified range has been detected in the power supply module. • A hardware failure has been detected in the power supply module, CPU module, base unit, or extension cable.	• Check the waveform of the voltage applied to the power supply module. • Reset the CPU module, and run it again. If the same error code is displayed again, the possible cause is a hardware failure of the power supply module, CPU module, base unit, or extension cable. Please consult your local Mitsubishi representative.
3C20H	Memory error	An error has been detected in the memory.	• Take measures to reduce noise. • Reset the CPU module, and run it again. If the same error code is displayed again, the possible cause is a hardware failure of the CPU module. Please consult your local Mitsubishi representative.
3C21H	Memory error	An error has been detected in the memory.	• Take measures to reduce noise. • Reset the CPU module, and run it again. If the same error code is displayed again, the possible cause is a hardware failure of the CPU module. Please consult your local Mitsubishi representative.
3C22H	Memory error	An error has been detected in the memory.	• Take measures to reduce noise. • Reset the CPU module, and run it again. If the same error code is displayed again, the possible cause is a hardware failure of the CPU module. Please consult your local Mitsubishi representative.
3C2FH	Memory error	An error has been detected in the memory.	• Take measures to reduce noise. • Reset the CPU module, and run it again. If the same error code is displayed again, the possible cause is a hardware failure of the CPU module. Please consult your local Mitsubishi representative.

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Error code	Error name	Error details and cause	Corrective action
3C30H	Memory error	An error has been detected in the memory.	• Take measures to reduce noise. • Reset the CPU module, and run it again. If the same error code is displayed again, the possible cause is a hardware failure of the CPU module. Please consult your local Mitsubishi representative.
3C31H	Memory error	An error has been detected in the memory.	• Take measures to reduce noise. • Reset the CPU module, and run it again. If the same error code is displayed again, the possible cause is a hardware failure of the CPU module. Please consult your local Mitsubishi representative.
3C32H	Memory error	An error has been detected in the memory.	• Take measures to reduce noise. • Reset the CPU module, and run it again. If the same error code is displayed again, the possible cause is a hardware failure of the CPU module. Please consult your local Mitsubishi representative.

Add-on license error details codes

The detail codes for when an add-on license error is detected are shown below.

Detailed information 1

■Add-on license warning (warning (error code: 0EF1H))

The details codes for when add-on license warning (warning (error code: 0EF1H)) is detected are shown below.

Details code	Description	Error details and cause	Corrective action
0101H	License authentication incomplete	• An add-on library with license authentication incomplete is being used. • When the license period (trial period) is exceeded, the add-on library can no longer be used.	• Purchase a license, and write it to the Motion CPU. • The model and serial No. of the license key written to the Motion CPU is incorrect. Create a license key with the correct model and serial No., and write it to the Motion CPU.
0102H	License period expired warning	License period expiration was detected. The next time power supply is turned ON, a license expiration error (details code: 0111H) occurs.	Purchase a license, and write it to the Motion CPU.

■Add-on license minor error (minor error (error code: 1FF1H)), add-on license moderate error (moderate error (error code: 3081H))

The details codes for when add-on license minor error (minor error (error code: 1FF1H)), and add-on license moderate error (moderate error (error code: 3081H)) are detected are shown below.

Details code	Description	Error details and cause	Corrective action
0111H	License period expired	License period expiration was detected.	• Purchase a license, and write it to the Motion CPU. • Delete add-on libraries that are being trialed, but are not needed.
0112H	Number of licenses exceeded	The number of add-on libraries for license authentication has been exceeded.	• Purchase a license, and write it to the Motion CPU. • Delete the add-on libraries that are not needed. • Clear the built-in memory.
0113H	License not registered	At the license check, the license key file or the corresponding add-on library for the license key was not found.	• Purchase a license, and write it to the Motion CPU. • Delete the add-on libraries that are not needed.
0121H	License file load error (license key data error)	When loading the license key file, abnormal license key data was detected.	Write the license key to the Motion CPU.
0123H	License period data error	The license period data is corrupted.	Clear the built-in memory.

Appendix 2 Event List

Information such as errors detected by the Motion CPU, and operations done for the module, are saved as "event history" in the standard ROM of the Motion CPU, or the SD memory card.

Refer to event history function for details of the event history function. (☞ Page 374 Event History Function)

When an event occurs, its event code and description can be read using MT Developer2.

Guide for reference of event list

The event list contains the following information.

Item	Description
Event code	The ID number of each event
Event type	The type of each event
Event category	The category of each event
Detected event	The description of each detected event
Detailed information 1 to 3	Details of each detected event

Detailed information

The contents of detailed information 1 to 3.

Detailed information	Item	Description
Detailed information 1	Operation source information	The following information on the operation source. • Connection port (connection information such as Ethernet or USB) • I/O No. • CPU No. (the CPU No. of each CPU module in a Multiple CPU system) • Network No. • Station No. • IP Address
	Event history file information	Information on the event history file.
	G-code control information	Information on G-code control.
	Machine control information	Information on machine control.
	Axis control event information	Information on axis control.
	Time information	Information on time.
	Home position return information	Information on home position return.
	SSCNETⅢ(/H) communication information	Information on SSCNETⅢ(/H) communication.
	Parameter change information	Information on parameter.
	Transient command information	Information on transient command.
	Operating system version information	Information on version of operating system software.
Detailed information 2	Communication speed and communication mode	Information on the communication speed and the communication mode.
	Communication status	Information on the communication status.
	Security key operation information	Information on security keys.
	Remote password information	Information on the remote password.
	File password information	Information on the file password.
	Disconnected IP address information	Information on the disconnected IP address.
	Drive and file information	Information on drive names and file names.
	Operation target information	Information about the operation target (I/O No.).
Detailed information 3	—	—

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Event history list

The following table lists events related to the Motion CPU.

Event code	Event type	Event category	Detected event	Description	Detailed information		
					Detailed information 1	Detailed information 2	Detailed information 3
0100	System	Information	Link-up	The Motion CPU has been entered into the link-up state as a result of operation such as connection of the network cable from an external device.	Operation source information	Communication speed and communication mode	—
0110			TCP connection communication start/end	Communication with an external device through TCP connection has been started. Or, communication with an external device through TCP connection has been terminated.		Communication status	
0120			FTP connection start/disconnection	FTP connection with an external device has been started. Or, FTP connection with an external device has been disconnected.			
0130			Receive frame error	A receive frame error has been detected.		—	
0140			SNTP server time synchronization failure	Time setting by the time synchronization function time has been failed because there was no response from the SNTP server.			
07FA			G-code control system information	During G-code control, a detailed code event has occurred.	G-code control information		
07FB			Machine control system information	During machine control, a detailed code event has occurred.	Machine control information		
07FC			Override ratio "0"	• The override ratio is "0" when starting. • The override ratio was changed to "0" when controlling.	Axis control event information		
07FD			Operation cycle change	Operation cycle will be changed to the time (measured) [μs] automatically because the servo amplifier which unsupported to setting operation cycle (time (setting value) [μs]) has been connected.	Time information		
07FE			Home position return request OFF to ON[*1]	Home position return request is ON.	Home position return information		
07FF			Disconnect normal connection with SSCNETⅢ(/H)[*2]	SSCNETⅢ(/H) communication has been disconnected by connection function or re-connection after disconnecting function.	SSCNETⅢ(/H) communication information	Communication status	
0800		Warning	Link-down	The Motion CPU has been entered into the link-down state as a result of operation such as disconnection of the network cable from an external device.	Operation source information	Communication speed and communication mode	
0904			Socket communications send error	Sending a message over socket communication failed.		—	
0906			Alive check error	Alive check of the target device could not be completed within the period specified by the response monitoring timer value.			

Event code	Event type	Event category	Detected event	Description	Detailed information 1	Detailed information 2	Detailed information 3
					Detailed information		
0907	System	Warning	Divided message reception timeout error	• All the data could not be received within the period specified by the response monitoring timer value. • Data as long as the data length could not be received. • The remaining part of the message divided at the TCP/IP level could not be received within the period specified by the response monitoring timer value.	Operation source information	—	—
0908			IP composition timeout error	An IP composition timeout error occurred (the remaining part of the divided data could not be received to cause the time-out).			
0909			TCP-specified port number error	A port number being used for opened connection was set (for TCP/IP).			
090A			UDP-specified port number error	A port number being used for opened connection was set (for UDP/IP).			
0FFD			Over Heat Warning	The temperature of Motion CPU module became abnormal status.	—		
0FFE			Disconnected during Ethernet communication	Ethernet has been disconnected.	Operation source information		
0FFF			Disconnected SSCNETⅢ(/H) communication*2	SSCNETⅢ(/H) communication has been disconnected.	SSCNETⅢ(/H) communication information		
1000 -		Error		The error details when a self-diagnostic error occurs are stored as an event.			
10100	Security	Information	Security key registration/deletion	A security key was registered or deleted.	Operation source information	Security key operation information	—
10200			Remote password lock	The lock processing for the remote password was performed.		Remote password information	
10201			Remote password information unlock successful	The unlock processing for the remote password was performed and completed successfully.			
10202			Remote password unlock failed	The lock processing for the remote password was performed and was not completed successfully.			
10300			Access from address prohibited by IP filter setting accepted	Access from an IP address for which access is prohibited by the IP filer setting was accepted.		Disconnected IP address information	
10400			File password registration/change/deletion successful	Registration, change, or deletion of a file password was performed and completed successfully.		File password information	
10401			File password registration/change/deletion failed	Registration, change, or deletion of a file password was performed and was not completed successfully.			
10402			File password clear successful	Clear of a file password was performed and completed successfully.			
10403			File password clear failed	Clear of a file password was performed and was not completed successfully.			
10500			Forced disable applied	Forced disable was enabled.	—	—	
10501			Forced disable clear	Forced disable was disabled.			

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Event code	Event type	Event category	Detected event	Description	Detailed information		
					Detailed information 1	Detailed information 2	Detailed information 3
20100	Operation	Information	Error clear	Error clear was performed.	Operation source information	Operation target information	—
20200			Event history clear	The event history was cleared.		—	
20300			SD memory card enabled	The SD memory card was enabled.	—		
20301			SD memory card forced disabled	The SD memory card forced disable function was performed and the SD memory card is ready for removal.			
27FFC			Parameter change	Switch the parameter file according to parameter switching function.	Parameter change information	Drive and file information	
27FFD			Write transient command	Transient command transmission (write) executes to servo amplifier.	Transient command information	—	
27FFE			Write project*3	Wrote project data.	Operation source information	Drive and file information	
27FFF			Operating system change*4	Changed the operating system.	Operating system version information	—	

*1 For home position return request ON by a servo amplifier connection in an incremental system, the information for several axes is recorded in one record when SSCNETⅢ(/H) is established.

*2 When the disconnection of several axes in the same operation cycle is detected, all disconnected axes are recorded in one record. (Disconnected axis information can be checked as detailed information.)

*3 When project data is written with "CPU write" in MT Developer2, separate file names are not recorded.

*4 After installation, the operating system software is recorded when started up in normal mode. When the operating system software before change does not support this event, the operating system software version before change is not displayed correctly.

Appendix 3 Special Relays

Special relays are internal relays whose applications are fixed in the Motion CPU. For this reason, they cannot be used in the same way as the normal internal relays by the Motion SFC programs. However, they can be turned ON/OFF as needed in order to control the Motion CPU.
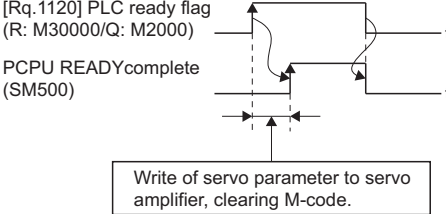
The headings in the table that follows have the following meanings.

Item	Description
No.	Indicates the device No. of the special relay.
Name	Indicates the name of the special relay.
Data stored	Indicates the data stored in the special relay and its meaning.
Details	Indicates detailed information about the data stored in the special relay.
Set by (setting timing)	Indicates whether the relay is set by the system or user, and, if it is set by system, when setting is performed. <Set by> • S: Set by system (Motion CPU). • U: Set by user (Motion SFC program or test operation using MT Developer2). • U/S: Set by both user and system (Motion CPU). <Setting timing> • Main process: Set during main processing (free time processing of the CPU). • Initial process: Set only during initial processing (when power supply is turned ON, or when reset). • Status change: Set only when there is a change in status. • Error: Set when error has occurred. • Request: Set only when there is a user request (Special relay, etc.). • Write: Set when there is writing from a user. • Operation cycle: Set during each operation cycle of the Motion CPU.

No.	Name	Data stored	Details	Set by (setting timing)
SM0	Latest self diagnostics error	OFF: No error ON: Error	• Turn ON if an error occurs as a result of self-diagnosis. • Remains ON even if the condition is restored to normal thereafter. • After confirming the error details, turn OFF by "Error reset (SM50)" ON to OFF except for the stop error.	S (Error)
SM1	Latest self diagnostics error	OFF: No self diagnostic error ON: Self diagnostic error	• Turn ON if an error occurs as a result of self-diagnosis. • Remains ON even if the condition is restored to normal thereafter. • After confirming the error details, turn OFF by "Error reset (SM50)" ON to OFF except for the stop error.	
SM4	Warning detection	OFF: No warning ON: Warning	• Turn ON if a warning occurs as a result of self-diagnosis. • Remains ON even if the condition is restored to normal thereafter. • After confirming the error details, turn OFF by "Error reset (SM50)" ON to OFF except for the stop error.	
SM50	Error reset	OFF to ON: Error reset request ON to OFF: Error reset complete	• Error is reset at OFF to ON. • Turns ON to OFF when error reset is complete.	U/S (Status change)
SM53	AC/DC DOWN	OFF: AC/DC DOWN not detected ON: AC/DC DOWN detected	• Turn ON if an instantaneous power failure of within 20[ms] occurs during use of the AC power supply module. Reset when the power supply is switched OFF, then ON. • Turn ON if an instantaneous power failure of within 10[ms] occurs during use of the AC power supply module. Reset when the power supply is switched OFF, then ON.	S (Error)
SM56	Instruction execution fault	OFF: Normal ON: Instruction execution error	• Turn ON if an instruction execution error type error occurs. • Remains ON even if the condition is restored to normal thereafter.	
SM61	I/O module verify error	OFF: Normal ON: Error	• Turn ON if the I/O module status differs from that registered when the power was turned ON. • Remains ON even if the condition is restored to normal thereafter.	
SM80	Detailed information 1: Flag in use	OFF: Not used ON: Used	"Turns ON if there is any detailed information when "Latest self diagnostics error (SM0)" turns ON.	S (Status change)
SM112	Detailed information 2: Flag in use			
SM203	STOP contact	OFF: Other than STOP status ON: STOP status	Turns ON when the status is STOP.	

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No.	Name	Data stored	Details	Set by (setting timing)
SM213	Clock data read request	OFF: Non-processing ON: Read request	When this relay is ON, clock data is read to SD210 to SD216 as BCD values.	U
SM220 *1	CPU No.1 READY complete	OFF: CPU No.1 READY incompletion ON: CPU No.1 READY completion	Turn ON when access to No. 1 PLC module is enabled from other CPU modules when the Multiple system power supply is turned ON or reset.	S (Status change)
SM221 *1	CPU No.2 READY complete	OFF: CPU No.2 READY incompletion ON: CPU No.2 READY completion	Turn ON when access to No. 2 PLC module is enabled from other CPU modules when the Multiple system power supply is turned ON or reset.	
SM222 *1	CPU No.3 READY complete	OFF: CPU No.3 READY incompletion ON: CPU No.3 READY completion	Turn ON when access to No. 3 PLC module is enabled from other CPU modules when the Multiple system power supply is turned ON or reset.	
SM223 *1	CPU No.4 READY complete	OFF: CPU No.4 READY incompletion ON: CPU No.4 READY completion	Turn ON when access to No. 4 PLC module is enabled from other CPU modules when the Multiple system power supply is turned ON or reset.	
SM230	No.1 CPU error	OFF: CPU No.1 normal ON: CPU No.1 during stop error	• Goes OFF when the CPU No.1 is normal. (Including a continuation error) • Comes ON when the CPU No.1 is during stop error.[2]	
SM231	No.2 CPU error	OFF: CPU No.2 normal ON: CPU No.2 during stop error	• Goes OFF when the CPU No.2 is normal. (Including a continuation error) • Comes ON when the CPU No.2 is during stop error.[2]	
SM232	No.3 CPU error	OFF: CPU No.3 normal ON: CPU No.3 during stop error	• Goes OFF when the CPU No.3 is normal. (Including a continuation error) • Comes ON when the CPU No.3 is during stop error.[2]	
SM233	No.4 CPU error	OFF: CPU No.4 normal ON: CPU No.4 during stop error	• Goes OFF when the CPU No.4 is normal. (Including a continuation error) • Comes ON when the CPU No.4 is during stop error.[2]	
SM240	No.1 CPU resetting	OFF: CPU No.1 reset cancel ON: CPU No.1 resetting	• Goes OFF when reset of the No.1 CPU module is cancelled. • Comes ON when the No.1 CPU module is resetting (including the case where the CPU module is removed from the base). • The other CPUs are also put in reset status.	
SM241	No.2 CPU resetting	OFF: CPU No.2 reset cancel ON: CPU No.2 resetting	• Goes OFF when reset of the No.2 CPU module is cancelled. • Comes ON when the No.2 CPU module is resetting (including the case where the CPU module is removed from the base). • The other CPUs are also put in reset status.	
SM242	No.3 CPU resetting	OFF: CPU No.3 reset cancel ON: CPU No.3 resetting	• Goes OFF when reset of the No.3 CPU module is cancelled. • Comes ON when the No.3 CPU module is resetting (including the case where the CPU module is removed from the base). • The other CPUs are also put in reset status.	
SM243	No.4 CPU resetting	OFF: CPU No.4 reset cancel ON: CPU No.4 resetting	• Goes OFF when reset of the No.4 CPU module is cancelled. • Comes ON when the No.4 CPU module is resetting (including the case where the CPU module is removed from the base). • The other CPUs are also put in reset status.	
SM360	Over heat warning latch	OFF: Normal ON: Abnormal	Turn ON when the temperature of Motion CPU module becomes specified value or more. Remains ON even if normal status is restored.	S (Error)
SM361	Over heat warning	OFF: Normal ON: Abnormal	Turn ON when the temperature of Motion CPU module becomes specified value or more. Turn OFF when the temperature of Motion CPU module returns to normal.	
SM400	Always ON	ON ———— OFF	Normally is ON.	S (Main process)
SM401	Always OFF	ON OFF ————	Normally is OFF.	

No.	Name	Data stored	Details	Set by (setting timing)
SM480	Motion operation cycle over flag	OFF: No motion operation cycle over occurrence (Normal) ON: Motion operation cycle over occurrence	• Turn ON when the motion operation process (including inter-module synchronization process) is not completed within the motion operation cycle. It is equivalent to "[St.1046] Operation cycle over flag (R: M30054/Q: M2054)". This flag is valid even when inter-module synchronization is not used. • Remains ON even if operating within the inter-module synchronization cycle thereafter. (Clear with power supply OFF to ON, or reset)	S (Status change)
SM484	Fixed scan data transmission section over	OFF: No fixed scan data transmission section over occurrence (Normal) ON: Fixed scan data transmission section over	• Turn ON when the motion operation process is not completed by the fixed scan data transmission set in the Multiple CPU synchronous cycle. • Remains ON even if the motion operation cycle is completed by the fixed scan data transmission set in the Multiple CPU synchronous cycle thereafter. (Clear with power supply OFF to ON, or reset)	
SM488	Inter-module synchronization signal error detection	OFF: No inter-module synchronization signal error detection occurrence (Normal) ON: Inter-module synchronization signal error detection occurrence	• Turn ON when the inter-module synchronization signal cannot be confirmed in the inter-module synchronization cycle set by the parameters, or when inter-module synchronization signal is confirmed multiple times in the inter-module synchronization cycle. • Remains ON even if the inter-module synchronization signal is confirmed in the inter-module synchronization cycle thereafter. (Clear with power supply OFF to ON, or reset)	
SM490	Low speed Motion operation cycle over flag	OFF: No low speed motion operation cycle over occurrence (Normal) ON: Low speed motion operation cycle over occurrence	• Turn ON when the time taken for the low speed Motion operation cycle exceeds "Low speed Motion setting operation cycle (SD714)" • Turn ON at the processing of low speed Motion operation cycle when Motion operation cycle has been exceeded.	
SM500	PCPU READY complete	ON: PCPU READY completion OFF: PCPU READY incompletion	• When the "[Rq.1120] PLC ready flag (R: M30000/Q: M2000)" turn OFF to ON, the fixed parameters, servo parameters and limit switch output data, etc., are checked, and if no error is detected, this flag turns ON. Also performs write of servo parameters to the servo amplifier, and clearing of M-codes. • "[Rq.1120] Turn OFF with PLC ready flag (R: M30000/Q: M2000)" OFF. [Rq.1120] PLC ready flag (R: M30000/Q: M2000) PCPU READYcomplete (SM500) Write of servo parameter to servo amplifier, clearing M-code.	S (Request)
SM501	Test mode ON	ON: TEST mode ON OFF: Except TEST mode	• Judge whether TEST mode ON or not using MT Developer2. Used for interlock conditions, etc. when performing servo program start with a Motion SFC program.	
SM502	External forced stop input	ON: Forced stop OFF OFF: Forced stop ON	• Confirm forced stop ON/OFF. • If an external forced stop is input during positioning, the feed current value becomes the same value as the actual current value. Simultaneously, "[Rq.1123] All axes servo ON command (R: M30042/Q: M2042)" turns OFF and so the servo turns OFF. As the rapid stop deceleration time progresses after the forced stop input, the feed current value returns to the current value at the moment the forced stop occurred. • If the forced stop is cancelled while the rapid stop deceleration time isn't progressing, an overspeed or error excessive may occur.	S (Operation cycle)
SM505	Cam data operation flag	OFF: Cam data not operating ON: Cam data operating	• Turn ON during cam data writing by executing the cam data write (CAMWR)/cam auto-generation (CAMMK). • Turns ON during file transfer with the file transfer function.	S (Status change)
SM506	External forced stop input ON latch	ON: External forced stop input is detected OFF: External forced stop input is not detected	• Turn ON when an external forced stop input is detected. • Remains ON even if the condition is cancelled to thereafter. • The forced stop input ON latch flag is reset with the Motion SFC program.	

No.	Name	Data stored	Details	Set by (setting timing)
SM508	Amplifier-less operation status	ON: During amplifier-less operation OFF: During normal operation	Confirm the amplifier-less operation status.	S (Main process)
SM512	Motion CPU WDT error	ON: Abnormal OFF: Normal	• Turn ON when a "watchdog timer error" is detected by the Motion CPU self-diagnosis function. When the Motion CPU detects a WDT error, it executes an immediate stop without deceleration of the operating axes. • The Multiple CPU system is reset when this relay turns ON. If this relay is ON even after resetting, an error occurs at the Motion CPU. • The error cause is stored in the "Motion CPU WDT error cause (SD512)".	S (Error)
SM532	SSCNETⅢ searching flag (Line 1)	OFF: Search complete ON: Searching	• Turns ON when searching axes that have been set to line 1 by system setting. • Turns OFF when all axes that have been set to line 1 by system setting have been searched.	S (Status change)
SM533	SSCNETⅢ searching flag (Line 2)	OFF: Search complete ON: Searching	• Turns ON when searching axes that have been set to line 2 by system setting. • Turns OFF when all axes that have been set to line 2 by system setting have been searched.	
SM561	Multiple CPU advanced synchronous control initial complete flag	OFF: Multiple CPU advanced synchronous initial incomplete ON: Multiple CPU advanced synchronous initial complete	Turns ON when the initial processing of Multiple CPU advanced synchronous control is completed.	S (Initial process)
SM600	Memory card enabled/disabled flag	OFF: Disabled ON: Enabled	This relay is on when an SD memory card is enabled (This relay switches to on when a valid SD memory card is attached and prepared for use).	S (Status change)
SM601	Memory card protect flag	OFF: Not protected ON: Protected	This relay is on when the write protect switch of the SD memory card is set to on.	
SM603	Memory card (drive 2) flag	OFF: No SD memory card inserted ON: SD memory card inserted	This relay is on when an SD memory card is attached (This relay switches to on when an SD memory card is attached regardless of its state (enabled/disabled) and type).	
SM605	Memory card remove/attach prohibit flag	OFF: Allowed to remove/attach ON: Not allowed to remove/attach	This relay can be switched to on when prohibiting the SD memory card from being removed/attached. When this relay is on, if is set to on, the system switches it to off.	U/S
SM606	SD memory card forced disable instruction	OFF: Cancel instruction ON: Forced disable instruction	• This relay can be switched to on to issue the instruction that forces the SD memory card to be disabled. However, whenever any function accesses the SD memory card, the disabling process does not start until the access is completed. • This relay can be switched to off to cancel the instruction that forces the SD memory card to be disabled.	U
SM607	SD memory card forced disable state flag	OFF: Not disabled by the SD memory card forced disable instruction ON: Disabled by the SD memory card forced disable instruction	• This relay switches to on when the SD memory card is disabled by switching SM606 to on. • This relay switches to off when the forcibly disabled SD memory card is enabled by switching SM606 to off.	S (Status change)
SM634	Number of rewriting operations error to data memory flag	OFF: The number of rewriting operations reaches100000 ON: The number of rewriting operations is lower than 100000	This relay switches to on when the number of data memory rewriting operations reaches 100000 (CPU module must be replaced).	S (Write)
SM752	EI flag	OFF: During DI ON: During EI	Turn ON at EI instruction execution.	U

No.	Name	Data stored	Details	Set by (setting timing)
SM760	Sampling settings RUN status	OFF: STOP ON: RUN	Turn ON when sampling is started. Turn OFF when saving of the sampling results is complete.	S (Status change)
SM761	Sampling settings trigger status	OFF: Before trigger ON: After trigger	Turn ON when trigger conditions are established. Remains ON even when sampling is complete, and turn OFF when starting sampling.	
SM762	Saving sampling settings	OFF: Not saving ON: Saving	Turn ON while saving data in the buffer data to the storage target when performing sampling.	
SM765	Sampling settings sampling error	OFF: No error ON: Error	Turn ON when sampling error occurs. Turn OFF when the next sampling is started.	
SM805	Rapid stop deceleration time setting error invalid flag	OFF: Setting error valid ON: Setting error invalid	When this relay is ON, the large value than deceleration time can be set as rapid stop deceleration time. (The servo program setting error (error code: 51) will not occur.)	U
SM860	Sampling settings RUN request	OFF: STOP ON: RUN	Requests sampling. By turning from OFF to ON after setting the "Sampling settings storage target (SD860)", sampling is started. Sampling is stopped by turning the device OFF during sampling. This device does not change even when sampling is complete. This device is ignored even if turned from OFF to ON while the "Sampling settings RUN status (SM760)" is ON.	

*1   Used for interlock conditions to access CPU modules No.1 to 4 if set to asynchronous in the Multiple CPU synchronization settings.

*2   To remove the stop error, remove the error factor then reset and remove reset for CPU No.1.

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Appendix 4 Special Registers

Special registers are internal registers whose applications are fixed in the Motion CPU. For this reason, it is not possible to use these registers in Motion SFC programs in the same way that normal registers are used. However, data can be written as needed in order to control the Motion CPU. Data stored in the special registers are stored as BIN values if no special designation has been made to the contrary.

The headings in the table that follows have the following meanings.

Item	Explanation
No.	Indicates the No. of the special register.
Name	Indicates the name of the special register.
Data stored	Indicates the nature of the special register.
Details	Indicates detailed information about the nature of the special register.
Set by (setting timing)	Indicates whether the register is set by the system or user, and, if it is set by system, when setting is performed. <Set by> • S: Set by system (Motion CPU). • U: Set by user (Motion SFC program or test operation using MT Developer2). • U/S: Set by both user and system (Motion CPU). <Setting timing> • Main process: Set during main processing (free time processing of the CPU). • Initial process: Set only during initial processing (when power supply is turned ON, or when reset). • Status change: Set only when there is a change in status. • Error: Set when error has occurred. • Request: Set only when there is a user request (Special relay, etc.). • Switch change: Set when switch changes. • Remove card: Set when SD memory card is removed. • Write: Set when there is writing from a user. • Operation cycle: Set during each operation cycle of the Motion CPU. • Low speed operation cycle: Set during each low speed operation cycle of the Motion CPU. • Task execution: Set when executing Motion SFC event task. • STOP to RUN: Data is set when the operating status changes from STOP to RUN.

No.	Name	Data stored	Details	Set by (setting timing)
SD0	Latest self diagnostics error code	Latest self diagnostic error code	• Error codes for errors found by diagnosis are stored as hexadecimal notation data. • After confirming the error details, clear SD0 to SD26 by "Error reset (SM50)" OFF to ON except for the stop error.	S (Error)
SD1	Clock time for latest self-diagnostic error occurrence	Clock time for latest self-diagnostic error occurrence	The year (four digits) that SD0 data was updated is stored as BIN code.	
SD2			The month that SD0 data was updated is stored as BIN code.	
SD3			The day that SD0 data was updated is stored as BIN code.	
SD4			The hour that SD0 data was updated is stored as BIN code.	
SD5			The minute that SD0 data was updated is stored as BIN code.	
SD6			The second that SD0 data was updated is stored as BIN code.	
SD7			The day of the week that SD0 data was updated is stored as BIN code. (0:Sunday,1:Monday,2:Tuesday,3:Wednesday,4:Thursday,5:Friday, 6:Saturday)	

No.	Name	Data stored	Details	Set by (setting timing)
SD10	Self-diagnostic error code	Self-diagnostic error code 1	The maximum of 16 types of error codes are stored into SD10 onwards when the diagnostics detects an error. (The same error code as one already stored in SD10 onwards is not stored). The 17th error code onwards are not stored. Also error codes are not stored when 16 types of error codes have already been stored into SD10 to SD25.	S (Error)
SD11		Self-diagnostic error code 2		
SD12		Self-diagnostic error code 3		
SD13		Self-diagnostic error code 4		
SD14		Self-diagnostic error code 5		
SD15		Self-diagnostic error code 6		
SD16		Self-diagnostic error code 7		
SD17		Self-diagnostic error code 8		
SD18		Self-diagnostic error code 9		
SD19		Self-diagnostic error code 10		
SD20		Self-diagnostic error code 11		
SD21		Self-diagnostic error code 12		
SD22		Self-diagnostic error code 13		
SD23		Self-diagnostic error code 14		
SD24		Self-diagnostic error code 15		
SD25		Self-diagnostic error code 16		
SD53	AC/DC DOWN detection	Number of times for AC/DC DOWN detection	• Every time the input voltage fails to or below (85[%] AC power/65[%] DC power) the rating during calculation of the Motion CPU module, the value is incremented by 1 and stored in BIN code. • The counter repeats a 0 to 65535 to 0 pattern.	
SD61	I/O module verify error module number	I/O module verify error module number	The lowest I/O number of the module which has an error detected by the I/O module verification is stored.	
SD80	Detailed information 1 information category	Detailed information 1 information category code	• Detailed information 1 information category code is stored. b15 ──── to ──── b8 b7 ──── to ──── b0 [Not used (fixed to 0)] [Information block code] • The following codes are stored into the information category code. 0: N/A 1: Program position information 2: Drive and file information 4: Parameter information 5: System configuration information 6: Number of times information 7: Time information 129: G-code control information 131: Machine control information 135: Add-on function information 141: Servo error/error at communication failure 142: Axis control error 143: Motion SFC program	
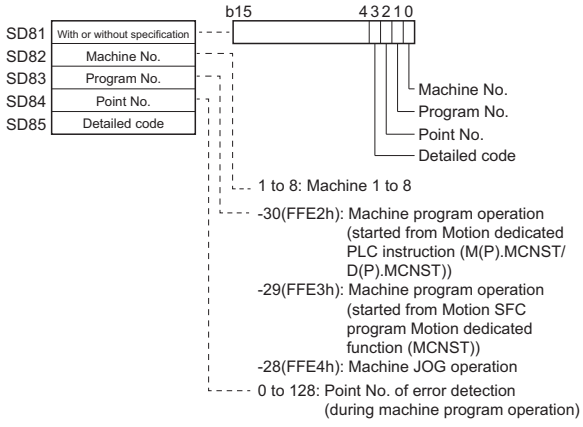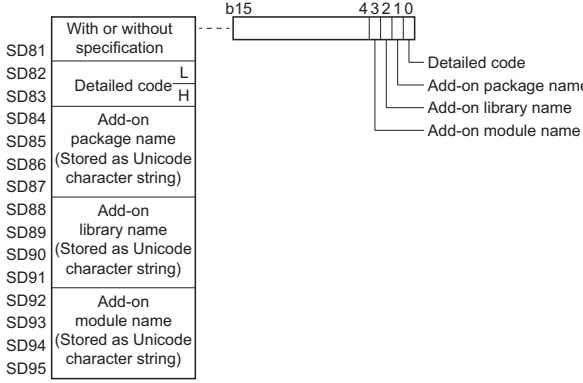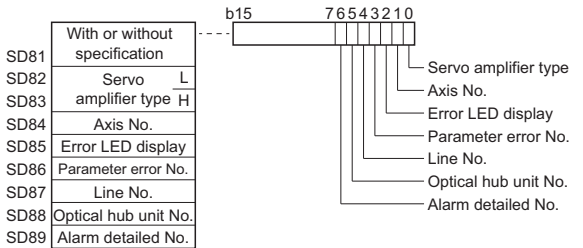
No.	Name	Data stored	Details	Set by (setting timing)
SD81 to SD111	Detailed information 1	Detailed information 1	• Detailed information 1 corresponding to the error code (SD0) is stored. • There are eleven types of information to be stored as shown in the following figures: • The type of the detailed information 1 can be obtained using SD80 (the value of the "Detailed information 1 information category code" stored in SD80 corresponds to the following figures ((1), (2), (4) to (7), (131), (135), (141) to (143)). • SD81 can be used for determining whether there is detailed information stored in SD82 or after. (Detailed information: 1/No detailed information: 0) (1) Program position information SD81 With or without specification — b15 ... 6 5 4 3 2 1 0 — Argument No. (Stored in the range from 1.) / Sequence step No. / FB No. / File name Argument No. Fixed to 0 Fixed to 0 Fixed to 0 Fixed to 0 FB No. File name (First 8 characters of Unicode character string): 1st character, 2nd character, 3rd character, 4th character, 5th character, 6th character, 7th character, 8th character (SD98) (2) Drive and file information SD81 With or without specification — b15 ... 2 1 0 — Drive name / File name Drive name File name (first 8 characters of Unicode character string): 1st character, 2nd character, 3rd character, 4th character, 5th character, 6th character, 7th character, 8th character (SD90) Drive name: 2: SD Memory card, 4: Standard ROM	S (Error)

No.	Name	Data stored	Details	Set by (setting timing)
SD81 to SD111	Detailed information 1	Detailed information 1	(4) Parameter information SD81 With or without specification SD82 Parameter storage target / Parameter type SD83 I/O No.÷10h SD84 Parameter No. SD85 Network No. SD86 Station No. SD87 Number of parameter items SD88 Line No.[*1] SD89 Field No. (column No.)[*1] b15 9876543210 Parameter type Parameter storage target I/O No.÷10h Parameter No. Network No. Station No. Number of parameter items Line No.[*1] Field No. (column No.)[*1] b15 8 7 0 Parameter type 1: System parameter 2: CPU parameter 3: Module parameter 4: Module extension parameter 5: Memory card parameter 101: Servo network setting 102: Head module setting 103: Motion CPU basic setting 104: High-speed input request signal setting 105: Mark detection setting 106: Limit switch output setting 107: Manual pulse generator connection setting 108: Vision system parameter (Ethernet communication line) 109: Vision system parameter (Vision program operation) 110: Multiple CPU refresh setting 111: Servo parameter 112: Axis setting parameter 113: Parameter block 114: Servo input axis parameter 115: Synchronous encoder axis parameter 116: Command generation axis parameter 117: Synchronous parameter 118: Boot operation file 119: Servo program 120: Motion SFC parameter 121: Motion SFC program 122: Cam data 123: Multiple CPU advanced synchronous control 125: Machine common parameter 126: Machine parameter 130: G-code control system parameter 131: G-code control axis parameter 132: G-code control work parameter 133: G-code control program Parameter storage target 2: SD memory card 4: Standard ROM I/O No.÷10h (When parameter type is 3: Module parameter, or 4: Module extension parameter)	S (Error)

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No.	Name	Data stored	Details	Set by (setting timing)
SD81 to SD111	Detailed information 1	Detailed information 1	(5) System configuration information SD81 With or without specification SD82 I/O No.÷10 SD83 Base unit No. / Slot No. SD84 CPU module No. / Power supply module No. SD85 Network No. SD86 Station No. b15 7 6 5 4 3 2 1 0 I/O No.÷10 Slot No. Base unit No. Power supply module No. CPU module No. Network No. Station No. b15 8 7 0 Base unit No. / Slot No. 0 to 11: Slot No. 0 : Main base unit 1 to 7 : Extension base unit 1 to 7 8 : Exceeding 7 extension base units b15 8 7 0 CPU module No. / Power supply module No. 1 to 2: Power supply module1 to 2 1 to 4: CPU No.1 to No.4 (6) Number of times information SD81 With or without specification Time (set value) L / H Time (actual measurement) L / H SD85 b15 2 1 0 Time (set value) Time (actual measurement) (7) Time information SD81 With or without specification SD82 Time (set value) (ms) SD83 Time (set value) (μs) SD84 Time (actual measurement value) (ms) SD85 Time(actual measurement value) (μs) b15 4 3 2 1 0 Time (set value)(ms) Time (set value)(μs) Time (actual measurement value)(ms) Time(actual measurement value)(μs) (129) G-code control information SD81 With or without specification SD82 Line No. SD83 Axis No. within line SD84 Axis name SD85 Axis No. (Output axis No.) SD86 Program No. SD87 Fixed to 0 SD88 Sequence No. SD89 Block No. SD90 Alarm information SD91 Details code 1 SD92 Details code 2 b15 11 10 9 8 7 6 5 4 3 2 1 0 Line No. Axis No. within line Axis name Axis No.(Output axis No.) Program No. Sequence No. Block No. Alarm information Details code 1 Details code 2 1 to 2: Line 1 to 2 1 to 8: Axis 1 to 8 Axis name 1: X 2: Y 3: Z 4: A 5: B 6: C 7: U 8: V 9: W Alarm information 1: Parameter error (moderate) 2: Parameter error (minor) 3: Operation error 4: Stop code (start) 5: Stop code (feed hold) 6: Stop code (block stop) 7: Program error 8: Event	S (Error)

No.	Name	Data stored	Details	Set by (setting timing)
SD81 to SD111	Detailed information 1	Detailed information 1	**(131) Machine control information** SD81 With or without specification SD82 Machine No. SD83 Program No. SD84 Point No. SD85 Detailed code b15 ... 4 3 2 1 0 — Machine No. — Program No. — Point No. — Detailed code 1 to 8: Machine 1 to 8 -30(FFE2h): Machine program operation (started from Motion dedicated PLC instruction (M(P).MCNST/ D(P).MCNST)) -29(FFE3h): Machine program operation (started from Motion SFC program Motion dedicated function (MCNST)) -28(FFE4h): Machine JOG operation 0 to 128: Point No. of error detection (during machine program operation) **(135) Add-on function information** SD81 With or without specification SD82/SD83 Detailed code L/H SD84/SD85/SD86/SD87 Add-on package name (Stored as Unicode character string) SD88/SD89/SD90/SD91 Add-on library name (Stored as Unicode character string) SD92/SD93/SD94/SD95 Add-on module name (Stored as Unicode character string) b15 ... 4 3 2 1 0 — Detailed code — Add-on package name — Add-on library name — Add-on module name **(141) Servo error/error at communication failure** SD81 With or without specification SD82/SD83 Servo amplifier type L/H SD84 Axis No. SD85 Error LED display SD86 Parameter error No. SD87 Line No. SD88 Optical hub unit No. SD89 Alarm detailed No. b15 ... 7 6 5 4 3 2 1 0 — Servo amplifier type — Axis No. — Error LED display — Parameter error No. — Line No. — Optical hub unit No. — Alarm detailed No.	S (Error)

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No.	Name	Data stored	Details	Set by (setting timing)
SD81 to SD111	Detailed information 1	Detailed information 1	(142) Axis control related error (143) Motion SFC program 	S (Error)
SD112	Detailed information 2 information category	Detailed information 2 information category code	• Detailed information 2 information category code is stored. | b15	to	b8	b7	to	b0
Not used (fixed to 0)			Information block code			 • The following codes are stored into the information category code. 0: N/A 2: Drive and file information 4: Parameter information 5: System configuration information	
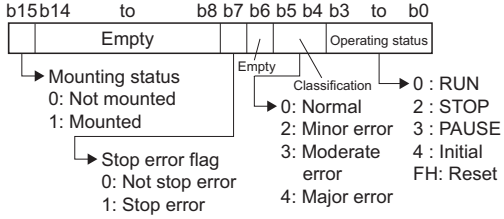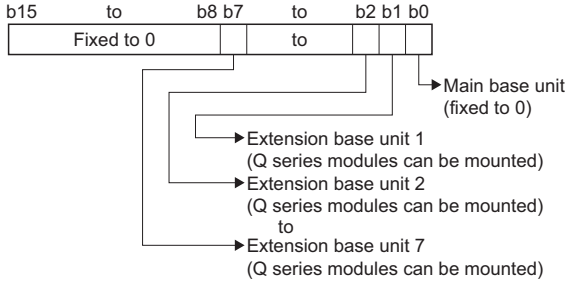
No.	Name	Data stored	Details	Set by (setting timing)
SD113 to SD143	Detailed information 2	Detailed information 2	• Detailed information 2 corresponding to the error code (SD0) is stored. • There are three types of information to be stored as shown in the following figures: • The type of the detailed information 2 can be obtained using SD112 (the value of the "Detailed information 2 information category code" stored in SD112 corresponds to the following figures ((2), (4), (5)). • SD113 can be used for determining whether there is detailed information stored in SD114 or after. (Detailed information: 1/No detailed information: 0) (2) Drive and file information SD113 — With or without specification Drive name File name (first 8 characters of Unicode character string) SD122 b15 .... 2 1 0 Drive name File name 1st character 2nd character 3rd character — Drive name 4th character — 2: SD Memory card 5th character — 4: Standard ROM 6th character 7th character 8th character	S (Error)

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No.	Name	Data stored	Details	Set by (setting timing)
SD113 to SD143	Detailed information 2	Detailed information 2	(4) Parameter information	S (Error)

Details content:

SD113: With or without specification
SD114: Parameter storage target | Parameter type
SD115: I/O No.÷10h
SD116: Parameter No.
SD117: Network No.
SD118: Station No.
SD119: Number of parameter items
SD120: Line No.[*1]
SD121: Field No. (column No.)[*1]

b15 9876543210
- Parameter type
- Parameter storage target
- I/O No.÷10h
- Parameter No.
- Network No.
- Station No.
- Number of parameter items
- Line No.[*1]
- Field No. (column No.)[*1]

b15 8 7 0

Parameter type
1: System parameter
2: CPU parameter
3: Module parameter
4: Module extension parameter
5: Memory card parameter
101: Servo network setting
102: Head module setting
103: Motion CPU basic setting
104: High-speed input request signal setting
105: Mark detection setting
106: Limit switch output setting
107: Manual pulse generator connection setting
108: Vision system parameter (Ethernet communication line)
109: Vision system parameter (Vision program operation)
110: Multiple CPU refresh setting
111: Servo parameter
112: Axis setting parameter
113: Parameter block
114: Servo input axis parameter
115: Synchronous encoder axis parameter
116: Command generation axis parameter
117: Synchronous parameter
118: Boot operation file
119: Servo program
120: Motion SFC parameter
121: Motion SFC program
122: Cam data
123: Multiple CPU advanced synchronous control
125: Machine common parameter
126: Machine parameter
130: G-code control system parameter
131: G-code control axis parameter
132: G-code control work parameter
133: G-code control program

Parameter storage target
2: SD memory card
4: Standard ROM

I/O No.÷10h
(When parameter type is 3: Module parameter, or 4: Module extension parameter)

No.	Name	Data stored	Details	Set by (setting timing)
SD113 to SD143	Detailed information 2	Detailed information 2	(5) System configuration information 	S (Error)
SD200	Status of switch	Status of CPU switch	The Motion CPU switch status is stored as shown below. 0: RUN 1: STOP	S (Switch change)
SD201	LED status	CPU-LED state	This register stores the information that indicates LED status (0: off, 1: on, 2: flashing) of the CPU module in the following bit patterns. (1) READY (2) ERROR (3) CARD READY (4) CARD ACCESS	S (Status change)
SD203	Operating status of CPU	Operating status of CPU	The CPU module operating status is stored as shown below. 0: RUN 2: STOP	S (Main process)
SD210	Clock data	Clock data (Year)	The year (four digits) is stored as BIN code.	U/S (Request)
SD211		Clock data (Month)	The month is stored as BIN code.	
SD212		Clock data (Day)	The day is stored as BIN code.	
SD213		Clock data(Hour)	The hour is stored as BIN code.	
SD214		Clock data(Minute)	The minute is stored as BIN code.	
SD215		Clock data(Second)	The second is stored as BIN code.	
SD216		Clock data(Day of week)	The day of the week is stored as BIN code. (0:Sunday, 1:Monday, 2:Tuesday, 3:Wednesday, 4:Thursday, 5:Friday, 6:Saturday)	
SD218	Time zone setting value	Time zone(in minutes)	The time zone setting value specified in the parameter is stored in increments of minutes. Example: when the setting value of the time zone is "UTC+9": 9×60 (minutes) = 540 SD218 = 540	S (Initial process)

No.	Name	Data stored	Details	Set by (setting timing)
SD228	Multiple CPU system information	Number of CPU modules	The number of CPU modules which constitute a multiple CPU system is stored (one to four, including those reserved).	S (Initial process)
SD229		CPU module number in Multiple CPU system	The number of this CPU No. is stored when a multiple CPU system is configured.	
SD230		CPU No.1 operating status	The operation information for each CPU No. is stored (the amount of stored information depending on the number of CPU modules indicated in SD228 is stored).	S (Main process / Error)
SD231		CPU No.2 operating status		
SD232		CPU No.3 operating status		
SD233		CPU No.4 operating status		
SD241	Number of extension base units	0: base unit only 1 to 7: number of extension base units	The maximum number of implemented extension base units is stored.	S (Initial process)
SD242	Identification for whether or not Q series module can be mounted	Identification of the base type 0: Q series module cannot be mounted (There is no base unit that can mount the Q series unit) 1: Q series module can be mounted (There is a base unit that can mount the Q series unit)	Identify whether or not Q series module can be mounted. When no SD memory card is inserted, the value is fixed to 0.	
SD243	Number of base slots	Number of base slots	The number of slots of the base unit, which is specified in the Base/ power supply /extension cable setting of system parameters, is stored. When the number of slots of the base unit is not specified by the system parameter, that of the mounted base unit is stored.	
SD244				
SD250	Latest I/O for implemented unit	Latest I/O number for implemented unit	The most significant two digits of the value obtained by adding one to the latest I/O number for an implemented unit are stored as a BIN value.	
SD260	Number of points assigned to bit device	X number of points assigned (L)	The number of points of the device X currently set is stored as 32-bit data.	S (Initial process)
SD261		X number of points assigned (H)		
SD262		Y number of points assigned (L)	The number of points of the device Y currently set is stored as 32-bit data.	
SD263		Y number of points assigned (H)		
SD264		M number of points assigned (L)	• The number of points of the device M currently set is stored as 32-bit data. • The number of points assigned is stored even when the number of points assigned to M is 32K points or less.	
SD265		M number of points assigned (H)		
SD266		B number of points assigned (L)	• The number of points of the device B currently set is stored as 32-bit data. • The number of points assigned is stored even when the number of points assigned to B is 32K points or less.	
SD267		B number of points assigned (H)		
SD270		F number of points assigned (L)	The number of points of the device F currently set is stored as 32-bit data.	
SD271		F number of points assigned (H)		

No.	Name	Data stored	Details	Set by (setting timing)
SD280	Word device number of points assigned	D number of points assigned (L)	• The number of points of the device D currently set is stored as 32-bit data. • The number of points assigned is stored even when the number of points assigned to D is 32K points or less.	S (Initial process)
SD281		D number of points assigned (H)		
SD282		W number of points assigned (L)		
SD283		W number of points assigned (H)		
SD350	Accumulative power-on time	Accumulative power-on time (mins)	The accumulative power-on time (mins) of the Motion CPU module is stored.	S (Main process)
SD351				
SD360	Internal temperature of Motion CPU	Internal temperature of Motion CPU (℃)	The internal temperature (℃) of the Motion CPU module is stored. (When -12℃, "-12" is stored.)	
SD480	Motion CPU operation cycle over count	0: Motion operation cycle over not occurrence (Normal) 1 to 65535: Operation cycle over cumulative count	Stores the count for the motion operation process (including inter-module synchronization process) not completed within the motion operation cycle. After exceeding 65535 the count returns to 0 and counts again. The counts are stored regardless of the "CPU module operation setting at error detected" RAS setting. This counter is valid even is inter-module synchronization is not used.	S (Status change)
SD484	Fixed scan data transmission section over count	0: Fixed scan data transmission section over not occurrence (Normal) 1 to 65535: Fixed scan data transmission section over cumulative count	Stores the count for the motion operation process not completed by the fixed-cycle data transmission set in the Multiple CPU synchronous cycle. After exceeding 65535 the count returns to 0 and counts again. The counts are stored regardless of the "CPU module operation setting at error detected" RAS setting. This counter is valid even is inter-module synchronization is not used.	
SD502	Servo amplifier loading information	Servo amplifier loading information	• When power supply of Multiple CPU system is turned ON or reset, servo amplifier loading information is checked and the result is stored as bit data.	S (Operation cycle)
SD503				

For SD502/SD503:

```
         b15  to  b12 b11 to  b8 b7  to  b4 b3  to  b0
SD502 | Axis 16 to Axis 13 | Axis 12 to Axis 9 | Axis 8 to Axis 5 | Axis 4 to Axis 1 |
SD503 | Axis 32 to Axis 29 | Axis 28 to Axis 25 | Axis 24 to Axis 21 | Axis 20 to Axis 17 |
```
→ 0: Non-loaded
  1: Loaded

• The device is reset when communication with the servo amplifier is suspended.
• The loading status for axes that change between non-loaded/loaded after power supply ON are also stored.
• The loaded/non-loaded status of a servo amplifier are described below.

Status	Details
Loaded	The servo amplifier is in a normal state (communication with the servo amplifier can be performed).
Non-loaded	Servo amplifier is not loaded. The servo amplifier control circuit power supply is turned OFF. Because of a failure with the connection cable, communication with the servo amplifier cannot be performed.

• The servo network setting and servo amplifier loading status are shown below.

Servo network setting	Servo amplifier	
	Loaded	Non-loaded
Used(Axis No. settings)	1 is stored	0 is stored
Not used	0 is stored	0 is stored

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No.	Name	Data stored	Details	Set by (setting timing)
SD504	SSCNETⅢ/H compatible optical hub unit loading information (line 1)	SSCNETⅢ/H compatible optical hub unit loading information (line 1)	• Checks the connection status (Installed: 1/Not installed: 0) of the optical hub unit and stores as bit data. SD504: b0 to b15 (Optical hub unit No. 1 to No. 16 on the first line) SD506: b0 to b15 (Optical hub unit No. 1 to No. 16 on the second line) *: No. 1 to No. 16 is the connection order from the Motion CPU • "1" is stored to the installation status of an optical hub unit with a servo amplifier connected. • "0" is stored to the installation status when an optical hub unit is not connected after an optical hub unit that is not connected to a servo amplifier, or when the optical hub unit connected after an optical hub unit is not connected to a servo amplifier either. • For optical hub units connected before an optical hub unit connected to a servo amplifier, "1" is stored to the installation status, regardless of whether there is a servo amplifier connection or not.	S (Operation cycle)
SD506	SSCNETⅢ/H compatible optical hub unit loading information (line 2)	SSCNETⅢ/H compatible optical hub unit loading information (line 2)		
SD508	SSCNET control (Status)	• Connect/disconnect of SSCNET communication • Start/release of amplifier-less operation	SD508 stores the executing state for connect/disconnect of SSCNET communication and start/release of amplifier-less operation. 0: Command accept waiting -1: Execute waiting -2: Executing	S (Main process)
SD509	Boot file transfer information	Boot file transfer information	Stores the status of file transmission at boot when the Multiple CPU system power supply is turned ON. 0: Standard ROM write permission/read protection 1: Standard ROM write protection/read protection 2: Standard ROM write protection/read permission 3: Standard ROM write permission/read permission 256: Boot operation file invalid	S (Initial process)
SD512	Motion CPU WDT error cause	Error meaning of WDT error occurs	The following error codes are stored when an error occurs at the Motion CPU. (see table below)	S (Error)
SD518	G-code control enable information	G-code control enable information	Stores the enabled/disabled status of G-code control. The status is enabled when, at STOP to RUN, a G-code add-on library is installed and "Use line 1 only" or "Use line 1 and line 2" is set in [Motion CPU Common Parameter]⇨[Basic Setting]⇨"G-code Control Setting". 0: Disabled 1: Enabled	S (STOP to RUN)
SD519	Machine control information	Machine control information	Status of machine control setting is stored when power supply of Multiple CPU system is turned ON. 0: Do not use machine control 1: Use machine control	S (Initial process)

Table for SD512:

Error code	Error cause	Error Operation	Corrective action
1	WDT timeout detection (Main processing)	All axes stop immediately, and subsequent starting is not possible.	• Reset the system. • If an operation cycle over condition occurs even after resetting, or if the main cycle is too long (exceeds approx. 1.0 [s]), (1) Change the operation cycle to a larger value in [Motion CPU Common Parameter] → [Basic Setting]. (2) Reduce the number of event task and NMI task command executions in the Motion SFC program. (3) When low speed operation cycle is enabled, change the low speed operation cycle magnification setting to a larger value in [Motion CPU Common Parameter] → [Basic Setting].
2	WDT timeout detection (Operation cycle)		
3	WDT timeout detection (Low speed operation cycle)		
Other than the above	H/W Error		• Reset the system. • If the error occurs even after resetting, contact your nearest system service center, dealer, or branch, and describe the situation.

No.	Name	Data stored	Details	Set by (setting timing)
SD520	Scan time	Scan time (unit: ms)	Main cycle is stored in the unit 1[ms]. Setting range (0 to 65535[ms])	S (Main process)
SD521	Maximum scan time	Maximum scan time (1ms units)	The maximum value of the main cycle is stored in the unit 1[ms]. Setting range (0 to 65535[ms])	
SD522	Motion operation cycle	Motion operation cycle	The time required for motion operations for each motion operation cycle is stored in the [μs] unit.	S (Operation cycle)
SD523	Motion setting operation cycle	Motion setting operation cycle	• Stores the set Motion operation cycle in [μs] units. • If the "Default settings" are specified in the Motion CPU common parameter basic settings, operation cycles are stored based on the number of set axes. If 0.222[ms]/0.444[ms]/0.888[ms]/1.777[ms]/3.555[ms]/7.111[ms] is set, the operation cycle corresponding to each setting is stored. *: If 25 axes or more are connected to 1 line on SSCNETⅢ/H, or nine servo amplifiers or more are connected to 1 line on SSCNETⅢ, the 0.444[ms] operation cycle is not supported. Even if the operation cycle setting in the basic settings is 0.444[ms], the actual set operation cycle will be 0.888[ms].	S (Initial process)
SD524	Motion maximum operation cycle	Motion maximum operation cycle	• After turning ON the Multiple CPU system power supply, the maximum time taken for motion operation cycle for each motion operation cycle is stored in [μs] units. • When "0" is written, the maximum value is reset.	S (Operation cycle)
SD526 SD527 SD528 SD529	Servo amplifier loading information	Servo amplifier loading information	• When power supply of Multiple CPU system is turned ON or reset, servo amplifier loading information is checked and the result is stored as bit data. |	b15 to b12	b11 to b8	b7 to b4	b3 to b0
SD526	Axis 16 to Axis 13	Axis 12 to Axis 9	Axis 8 to Axis 5	Axis 4 to Axis 1
SD527	Axis 32 to Axis 29	Axis 28 to Axis 25	Axis 24 to Axis 21	Axis 20 to Axis 17
SD528	Axis 48 to Axis 45	Axis 44 to Axis 41	Axis 40 to Axis 37	Axis 36 to Axis 33
SD529	Axis 64 to Axis 61	Axis 60 to Axis 57	Axis 56 to Axis 53	Axis 52 to Axis 49	 → 0: Non-loaded / 1: Loaded • The device is reset when communication with the servo amplifier is suspended. • The loading status for axes that change between non-loaded/loaded after power supply ON are also stored. • The loaded/non-loaded status of a servo amplifier are described below. 	Status	Details
Loaded	The servo amplifier is in a normal state (communication with the servo amplifier can be performed).
Non-loaded	Servo amplifier is not loaded. The servo amplifier control circuit power supply is turned OFF. Because of a failure with the connection cable, communication with the servo amplifier cannot be performed.	 • Servo network setting and servo amplifier loading status are shown below. 	Servo network setting	Servo amplifier Loaded	Servo amplifier Non-loaded
Used(axis No. setting)	1 is stored	0 is stored
Not used	0 is stored	0 is stored		S (Operation cycle)

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No.	Name	Data stored	Details	Set by (setting timing)
SD544 SD545	Motion control parameter write/read request	Parameter read value	• The read value of parameter which executed "2: 2 word read request" in "Motion control parameter write/read request flag (SD840)" is stored. • The read value (low 2 word) of parameter which executed "4: 4 word read request" in "Motion control parameter write/read request flag (SD840)" is stored.	S (Request)
SD546 SD547			The read value (high 2 word) of parameter which executed "4: 4 word read request" in "Motion control parameter write/read request flag (SD840)" is stored.	
SD552	Servo parameter write/read request	Servo parameter read value	• The read value of servo parameter which executed "2: Read request" in "Servo parameter write/read request flag (SD804)" is stored. • The read value (low 1 word) of servo parameter which executed "4: 2 word read request" in "Servo parameter write/read request flag (SD804)" is stored.	
SD553			The read value (high 1 word) of servo parameter which executed "4: 2 word read request" in "Servo parameter write/read request flag (SD804)" is stored.	
SD554	File transfer status(status)	Data transfer status	The status of data transfer between the file and built-in memory is stored. 0: Awaiting request acceptance -1: Awaiting execution -2: Executing -1□□: Error completion *: □□ represents the following. • When servo parameters set: Axis No. at which error occurred Servo amplifier axis: 1 to 64 Sensing module (RIO axis): 91 to 98 (601 to 608) • When cam file set: fixed at 00	S (Main process)
SD555	Servo parameter change flag (RIO)	Servo parameter change flag (RIO)	• The content of the servo parameter open area inside the Motion CPU changes, and number of the RIO axis for which servo parameter file update is required is stored as bit data. b15 to b12 b11 to b8 b7 to b4 b3 to b0 SD555 | Fixed to 0 | Fixed to 0 | Axis 608 to Axis 605 | Axis 604 to Axis 601 | • When the Multiple CPU system power is next turned ON, the content of the servo parameter open area for the relevant axis is automatically updated to a file. • The servo parameter files can be reflected with "File transmission request (SD820)". (After file is reflected, the bit for the relevant axis turns OFF)	S (Main process)
SD556 SD557 SD558 SD559	Servo parameter change flag	Servo parameter change flag	• The content of the servo parameter open area inside the Motion CPU changes, and number of the axis for which servo parameter file update is required is stored as bit data. b15 to b12 b11 to b8 b7 to b4 b3 to b0 SD556 | Axis 16 to Axis 13 | Axis 12 to Axis 9 | Axis 8 to Axis 5 | Axis 4 to Axis 1 | SD557 | Axis 32 to Axis 29 | Axis 28 to Axis 25 | Axis 24 to Axis 21 | Axis 20 to Axis 17 | SD558 | Axis 48 to Axis 45 | Axis 44 to Axis 41 | Axis 40 to Axis 37 | Axis 36 to Axis 33 | SD559 | Axis 64 to Axis 61 | Axis 60 to Axis 57 | Axis 56 to Axis 53 | Axis 52 to Axis 49 | • When the Multiple CPU system power is next turned ON, the content of the servo parameter open area for the relevant axis is automatically updated to a file. • The servo parameter files can be reflected with "File transmission request (SD820)" (After file is reflected, the bit for the relevant axis turns OFF)	
SD560	Operation method	Operation method	The device assignment method information is stored. 0: Q series Motion compatible device assignment 1: MELSEC iQ-R Motion device assignment	S (Initial process)
SD561	Multiple CPU advanced synchronous control setting status	Multiple CPU advanced synchronous control setting status	The CPU setting status of Multiple CPU advanced synchronous control is stored. 0: Independent CPU 1: Master CPU 2: Slave CPU	

No.	Name	Data stored	Details	Set by (setting timing)
SD562	Scan time	Scan time (1μs units)	The current main cycle is stored in 1[μs] units. 1 to 2147483647[μs]	S (Main process)
SD563				
SD564	Maximum scan time	Maximum scan time (1μs units)	• The main cycle maximum value is stored in 1[μs] units. 1 to 2147483647[μs] • If "0" is written, the maximum value is reset.	
SD565				
SD566	Motion SFC normal task processing time	Normal task processing time	The Motion SFC normal task processing time during main cycles is stored in [μs] units. 1 to 2147483647[μs]	
SD567				
SD568	Maximum Motion SFC normal task processing time	Normal task maximum processing time	• The Motion SFC normal task processing maximum time during main cycles is stored in [μs] units. 1 to 2147483647[μs] • If "0" is written, the maximum value is reset.	
SD569				
SD570	Motion SFC event task (14.222ms) processing time	Event task (14.222ms) processing time	The processing time for each motion SFC task is stored in [μs] units. 0 to 65535[μs]	S (Task execution)
SD571	Motion SFC event task (7.111ms) processing time	Event task (7.111ms) processing time		
SD572	Motion SFC event task (3.555ms) processing time	Event task (3.555ms) processing time		
SD573	Motion SFC event task (1.777ms) processing time	Event task (1.777ms) processing time		
SD574	Motion SFC event task (0.888ms) processing time	Event task (0.888ms) processing time		
SD575	Motion SFC event task (0.444ms) processing time	Event task (0.444ms) processing time		
SD576	Motion SFC event task (0.222ms) processing time	Event task (0.222ms) processing time		
SD578	Motion SFC event task (external interrupt) processing time	Event task (external interrupt) processing time		
SD579	Motion SFC event task (PLC interrupt) processing time	Event task (PLC interrupt) processing time		
SD580	Motion SFC NMI task processing time	NMI task processing time		
SD581	Fixed-cycle system processing time	Fixed-cycle system processing time	The processing time for each process is stored in [μs] units. 0 to 65535[μs]	S (Operation cycle)
SD582	Motion operation task processing time	Motion operation task processing time		
SD583	CPU refresh (I45 executing) processing time	CPU refresh (I45 executing) processing time		

No.	Name	Data stored	Details	Set by (setting timing)
SD584	Motion SFC event task time within operation cycle (14.222ms)	Event task time within operation cycle (14.222ms)	• The processing time for each Motion SFC task is stored in [μs] units. 0 to 65535[μs] • The time within the operation cycle indicates the time used for each process in one operation cycle (start of fixed-cycle system processing to end of motion operation processing). • If "[St.1046] Operation cycle over flag (R: M30054/Q: M2054)" turns ON, the processing time when "[St.1046] Operation cycle over flag (R: M30054/Q: M2054)" turns from OFF to ON is latched as the time within the operation cycle.	S (Operation cycle)
SD585	Motion SFC event task time within operation cycle (7.111ms)	Event task time within operation cycle (7.111ms)		
SD586	Motion SFC event task time within operation cycle (3.555ms)	Event task time within operation cycle (3.555ms)		
SD587	Motion SFC event task time within operation cycle (1.777ms)	Event task time within operation cycle (1.777ms)		
SD588	Motion SFC event task time within operation cycle (0.888ms)	Event task time within operation cycle (0.888ms)		
SD589	Motion SFC event task time within operation cycle (0.444ms)	Event task time within operation cycle (0.444ms)		
SD590	Motion SFC event task time within operation cycle (0.222ms)	Event task time within operation cycle (0.222ms)		
SD592	Motion SFC event task (external interrupt) time within operation cycle	Event task (external interrupt) time within operation cycle		
SD593	Motion SFC event task (PLC interrupt) time within operation cycle	Event task (PLC interrupt) time within operation cycle		
SD594	Motion SFC NMI task time within operation cycle	NMI task time within operation cycle		
SD595	Fixed-cycle system processing time within system operation cycle	Fixed-cycle system processing time within system operation cycle	• The processing time for each process is stored in [μs] units. 0 to 65535[μs] • The time within the operation cycle indicates the time used for each process in one operation cycle (start of fixed-cycle system processing to end of motion operation processing). • If "[St.1046] Operation cycle over flag (R: M30054/Q: M2054)" turns ON, the processing time when "[St.1046] Operation cycle over flag (R: M30054/Q: M2054)" turns from OFF to ON is latched as the time within the operation cycle.	
SD596	Motion operation task time within operation cycle	Motion operation task time within operation cycle		
SD597	CPU refresh (I45 executing) time within operation cycle	CPU refresh (I45 executing) time within operation cycle		
SD598	Fixed-cycle system processing monitor time	Fixed-cycle system processing monitor time	The maximum value of the fixed-cycle processing monitor time is stored in [μs] units. 0 to 65535[μs]	
SD599	Low speed Motion operation cycle task processing time	Low speed Motion operation cycle task processing time	• The time from execution of low speed Motion operation cycle task until completion is stored in [μs] units. 0 to 65535[μs] • When low speed Motion operation cycle is disabled, "0" is always stored.	S (Low speed operation cycle)

No.	Name	Data stored	Details	Set by (setting timing)
SD600	Memory card mounting status	SD memory card type	This register indicates the type of mounted SD memory cards. b15　to　b8 b7　to　b4 b3　to b0 [Fixed to 0][ ][ ] → Fixed to 0 → 0: Does not exist 4: SD memory card	S (Initial process or card inserted)
SD604	SD memory card usage status	SD memory card usage status	The status of the SD memory card usage is stored as the following bit data patterns. (Being used when turned ON) b0: Event history b1: Not used b2: Data for renewing labels b3 to b15: Not used	S (Status change)
SD606	SD memory card capacity	SD memory card capacity: the lower digits (unit: k bytes)	The capacity of the SD memory card is stored in increments of 1k byte (the amount of free space for a formatted memory card is stored).	S (Initial process or card inserted)
SD607		SD memory card capacity: the higher digits (unit: k bytes)		
SD610	SD memory card free space	SD memory card free space: the lower digits (unit: k bytes)	The amount of free space of the SD memory card is stored in increments of 1k byte.	S (Status change)
SD611		SD memory card free space: the higher digits (unit: k bytes)		
SD620	Standard ROM usage status	Standard ROM usage status	The status of the standard ROM usage is stored as the following bit data patterns. (Being used when turned ON) b0: Event history b1: Not used b2: Data for renewing labels b3 to b15: Not used	
SD622	Standard ROM capacity	Standard ROM capacity: lower (unit: k bytes)	Standard ROM capacity is stored in increments of 1k byte. (The free space after format is stored.)	S (Initial process)
SD623		Standard ROM capacity: higher (unit: k bytes)		
SD624	Standard ROM free space	Standard ROM capacity: lower (unit: k bytes)	Standard ROM free space is stored in increments of 1k byte.	S (Status change)
SD625		Standard ROM capacity: higher (unit: k bytes)		
SD634	Index for the number of standard ROM write operations	Index of the number of write operations up to now	• Indicates the index value for the number of write operations to the standard ROM up to now (stored as a 32-bit BIN value). However, the number of write operations is not equal to the index value. • When the index value exceeds 100000, an error is generated (the index value is continued to be counted even when it exceeds 100000). If the index value exceeds 100000, the CPU module must be replaced.	S (Write)
SD635				
SD700	Device assignment	Number of points assigned for #	Stores the number of points for device # used in the Motion CPU.	S (Initial process)
SD701				
SD714	Low speed Motion setting operation cycle	Low speed Motion setting operation cycle	• Stores the set low speed Motion operation cycle in [µs] units. • Except for when low speed operation cycle magnification setting is set to "Not used", the value of "Motion setting operation cycle (SD523)" multiplied by the low speed operation cycle magnification setting is stored. • When low speed operation cycle magnification setting is set to "Not used", or a mixed operation cycle setting error is occurring, "0" is stored.	

No.	Name	Data stored	Details		Set by (setting timing)
SD715	Low speed Motion operation cycle	Low speed Motion operation cycle	The time taken for low speed Motion operation cycle is stored in [μs] units. 0 to 65535[μs]		S (Low speed operation cycle)
SD716	Low speed Motion maximum operation cycle	Low speed Motion maximum operation cycle	• The maximum time taken for low speed Motion operation cycle is stored in [μs] units. 0 to 65535[μs] • When "0" is written, the maximum value is reset.		
SD717	Operation cycle counter	Operation cycle counter	• Incremented by 1 each time the Motion operation cycle is executed, and when 65535 is exceeded the count returns to 0 and starts again. 0 to 65535 • When low speed Motion operation cycle is enabled, the count returns to 1 and starts again if the low speed operation cycle magnification setting is exceeded. (The low speed Motion operation cycle is executed when this counter is 1.) 1 to low speed operation cycle magnification setting		S (Operation cycle)
SD718 SD719	888μs free-running timer	888μs free-running timer	Current value (SD718, SD719) is incremented by 1 every 888μs. Read SD718 device in 2 word unit. 	Item	Specification
---	---
Data size	2 word (-2147483648 to 2147483647)
Latch	Cleared to zero at power supply on or reset, counting is continued thereafter.
Usable tasks	Normal, event, NMI
Access	Read enabled only
Timer specifications	888μs timer			S (Every 888μs)
SD720 SD721	444μs free-running timer	444μs free-running timer	Current value (SD720, SD721) is incremented by 1 per 444μs. Read SD720 device in 2 word unit. 	Item	Specification
---	---
Data size	2 word (-2147483648 to 2147483647)
Latch	Cleared to zero at power supply on or reset, counting is continued thereafter.
Usable tasks	Normal, event, NMI
Access	Read enabled only
Timer specifications	444μs timer			S (Every 444μs)
SD722 SD723	222μs free-running timer	222μs free-running timer	Current value (SD722, SD723) is incremented by 1 per 222μs. Read SD722 device in 2 word unit. 	Item	Specification
---	---
Data size	2 word (-2147483648 to 2147483647)
Latch	Cleared to zero at power supply on or reset, counting is continued thereafter.
Usable tasks	Normal, event, NMI
Access	Read enabled only
Timer specifications	222μs timer			S (Every 222μs)

No.	Name	Data stored	Details	Set by (setting timing)
SD732 SD733 SD734 SD735	Low speed operation cycle control axis information	Low speed operation cycle control axis information	Stores the servo amplifier axes being controlled at the low speed Motion operation cycle as bit data. b15 to b12 b11 to b8 b7 to b4 b3 to b0 SD732 Axis 16 to Axis 13 | Axis 12 to Axis 9 | Axis 8 to Axis 5 | Axis 4 to Axis 1 SD733 Axis 32 to Axis 29 | Axis 28 to Axis 25 | Axis 24 to Axis 21 | Axis 20 to Axis 17 SD734 Axis 48 to Axis 45 | Axis 44 to Axis 41 | Axis 40 to Axis 37 | Axis 36 to Axis 33 SD735 Axis 64 to Axis 61 | Axis 60 to Axis 57 | Axis 56 to Axis 53 | Axis 52 to Axis 49	S (Initial process)
SD736 SD737 SD738 SD739	Command generation axis low speed operation cycle control axis information	Command generation axis low speed operation cycle control axis information	Stores the command generation axes being controlled at the low speed Motion operation cycle as bit data. b15 to b12 b11 to b8 b7 to b4 b3 to b0 SD736 Axis 16 to Axis 13 | Axis 12 to Axis 9 | Axis 8 to Axis 5 | Axis 4 to Axis 1 SD737 Axis 32 to Axis 29 | Axis 28 to Axis 25 | Axis 24 to Axis 21 | Axis 20 to Axis 17 SD738 Axis 48 to Axis 45 | Axis 44 to Axis 41 | Axis 40 to Axis 37 | Axis 36 to Axis 33 SD739 Axis 64 to Axis 61 | Axis 60 to Axis 57 | Axis 56 to Axis 53 | Axis 52 to Axis 49	
SD740 SD741 SD742 SD743 SD744 SD745 SD746 SD747	Operating system software version	Operating system software version	Stores the Motion CPU operating system software model and version in ASCII. SD740 SD741 SD742 SD743 SD744 SD745 SD746 SD747 R | M | T | F | W | ␣ | ␣ | ␣ | ␣ | ␣ | ␣ | ␣ | 0 | 1 | ␣ | ␣ Model name (12 characters) Version (4 characters) ␣: Space	
SD760	Sampling settings storage target	Sampling settings storage target	Stores the storage target for the sampling settings file being sampled.	S (Status change)
SD761	Sampling settings results save target	Sampling settings results save target	Stores the sampling results save destination for the data being sampled. 0: No sampling 1: Standard ROM 2: SD memory card	
SD762	Sampling settings sampling type	Sampling settings sampling type	Stores the sampling type being sampled. 0: No sampling 1: Trigger sampling	
SD764 SD765	Sampling settings latest file information	Sampling settings latest file information	Stores the latest sampling results file information (system time). (Note): Elapsed time (seconds) up to the current time using Greenwich Mean Time 00:00:00, January 1st 1970 as the reference is stored.	
SD769	Sampling settings digital oscilloscope error cause	Sampling settings digital oscilloscope error cause	The error code for the sampling error is stored. This is cleared to 0 when the next sampling is performed. 0: No error Other than 0: Error code	
SD803	SSCNET control (Command)	• Connect/disconnect of SSCNET communication • Start/release of amplifier-less operation	Requests the connect/disconnect of SSCNET communication and start/release of amplifier-less operation. 0: No command 1 to 64: Disconnect command of SSCNET communication -10: Connect command of SSCNET communication -20: Start command of amplifier-less operation -25: Release command of amplifier-less operation -2: Execute command	U

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No.	Name	Data stored	Details	Set by (setting timing)
SD804 *2	Servo parameter write/read request	Servo parameter write/read request flag	• The "write/read request" is executed after setting of the axis No. and servo parameter No. 1: Write request 2: Read request 3: 2 word write request[*3] 4: 2 word read request[*3] • "0" is automatically set by Motion CPU after completion of servo parameter write/read request. ("-1" is stored by Motion CPU at write/read error.)	U/S
SD805		Axis No.	The axis No. to write/read servo parameter is stored. R64MTCPU: 1 to 64 R32MTCPU: 1 to 32 R16MTCPU: 1 to 16 Sensing module (station mode): 601 to 608	U
SD806		Servo parameter No.	The servo parameter No. to be written/read is stored in hexadecimal. H □□□□ → Parameter No. → Parameter group No. • 0: PA • 5: PF • 1: PB • 9: Po • 2: PC • A: PS • 3: PD • B: PL (MR-J4(W)-□B only) • 4: PE • C: PT (MR-J4(W)-□B only) → Fixed to 0 • Sensing module (station mode) use H □□□□ → Parameter No. → Parameter group No. • 0: Sensing SSCNETⅢ/H head module (MR-MT2010) • 1: Sensing extension module (MR-MT2100, MR-MT2200, MR-MT2300, MR-MT2400) • VCⅡ series/VPH series use H □□□□ → Parameter No. → Parameter group No. • 0: Group 0 • 5: Group 5 • 1: Group 1 • 6: Group 6 • 2: Group 2 • 7: Group 7 • 3: Group 3 • 8: Group 8 • 4: Group 4 • 9: Group 9 • AlphaStep/5-phase use H □□□□ → Parameter ID *: Refer to AlphaStep/5-phase instruction manual for details of parameter ID • IAI electric actuator controller use H □□□□ → Parameter No. *: Refer to the IAI electric actuator controller instruction manual for details of parameter No.	
SD807		Servo parameter value	The setting value of servo parameter to be written is stored when "1: Write request" is set in SD804.	
SD808		Servo parameter setting value (2 word)	The setting value of servo parameter to be written is stored when "3: 2 word write request" is set in SD804.	
SD809				

No.	Name	Data stored	Details	Set by (setting timing)

SD820	File transmission request (command)	Read/write target data specification	Synchronizes the data in the file and the built-in memory, and requests file transfer. The type of data to be synchronized is set in hexadecimal notation.
			H0000: No request
			H1000 to H9062: Servo parameter read/write command
			
			H☐☐☐☐
			
			    Target axis No.(Axis No.: 1 to 64,
			    RIO axis No.: 601 to 608)
			    • 00 to 40H: Servo amplifier axis
			    • 5B to 62H: Sensing module (RIO axis)
			    *: "00H" applies to all axes
			    Read/write target file
			    • 10: built-in memory to file (standard ROM)
			    • 20: built-in memory to file (SD memory card)
			    • 80: file (standard ROM) to built-in memory
			    • 90: file (SD memory card) to built-in memory
			
			HA000 to HB400: Cam file read/write command
			
			H☐☐☐☐
			
			    Target cam No.(1 to 1024)
			    000 to 400H
			    *: "000H" applies to all cam files
			    Read/write target file
			    • A: File (standard ROM) to built-in memory
			    • B: file (SD memory card) to built-in memory
			
			HFFFE: Execution command
				U

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No.	Name	Data stored	Details	Set by (setting timing)
SD840	Motion control parameter write/read request	Parameter write/read request flag	• Requests the write/read of parameter after axis No., parameter No., and parameter ID are set. 1: 2 word write request 2: 2 word read request 3: 4 word write request 4: 4 word read request • At the completion of parameter write/read the Motion CPU automatically stores "0". (At a write/read error, the Motion CPU store "-1") • After a request is stored, it cannot be cancelled nor can another request be made until processing is completed.	U/S
SD841		Parameter No.[*1]	Stores the parameter No. to be write/read.	U

SD842		Axis No.	When the parameter No. specified in SD841 is "2(servo network setting)", "11(axis setting parameter)", "17(synchronous parameter)", "20(machine parameter)", "21(G-code control system parameter)", or "22(G-code control axis parameter)", the axis No., line No., and machine No. to write/read the parameter is stored.
			Specify 0 if not specifying any of the parameter Nos. above.
			• Parameter No.2(servo network setting)
			  Stores the line No. to write/read parameter
			1: SSCNETⅢ line 1
			2: SSCNETⅢ line 2
			• Parameter No.11(axis setting parameter), 17(synchronous parameter)
			  Stores the axis No. to write/read parameter
			R64MTCPU: 1 to 64
			R32MTCPU: 1 to 32
			R16MTCPU: 1 to 16
			• Parameter No.20(machine parameter)
			  Stores the machine No. to write/read parameter
			1 to 8
			• Parameter No.21 (G-code control system parameter)
			  Stores the line No. of G-code control to write/read parameter
			1 to 2
			• Parameter No.22 (G-code control axis parameter)
			  Stores the axis Nos. of each line of G-code control to write/read parameter
			1 to 8: Line 1, axis 1 to 8
			9 to 16: Line 2, axis 1 to 8	

SD844		Parameter ID[*1]	Stores the column No. of the parameter ID.	
SD845			Stores the line No. of the parameter ID.	
SD846		Parameter setting value	• Stores the setting value of the parameter to write when "1: 2 word write request" is set to SD840. • Stores the setting value(low 2 word) of the parameter to write when "3: 4 word write request" is set to SD840.	
SD847				
SD848			Stores the setting value(high 2 word) of the parameter to write when "3: 4 word write request" is set to SD840.	
SD849				
SD860	Sampling settings storage target	Sampling settings storage target	Set the storage target drive for sampling settings data subject to sampling. Read when the "Sampling settings RUN request (SM860)" is ON. 0: Standard ROM 1: SD memory card	U

*1 For details on the content stored, refer to parameters used with parameter change. (☞ Page 130 Parameters used with parameter change)

*2 Do not execute the automatic refresh.

*3 This can be set only in VCⅡ series/VPH series, and IAI electric actuator controller.

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REVISIONS

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

Revision date	*Manual number	Description
July 2014	IB(NA)-0300237-A	First edition
March 2015	IB(NA)-0300237-B	■Added functions Label access from external devices, File transmission at boot function, Event history function, Optional data monitor function (transient command), Optical hub unit (MR-MV200) connection, Expansion of the number of connections for vision system, Add-on function, Servo amplifier (MR-J4□-B-LL) compatible ■Added or modified parts SAFETY PRECAUTIONS, RELEVANT MANUALS, TERMS, Section 1.3, 2.1, 2.2, 2.3, 2.4, 3.1, 3.9, 4.5, 4.6, 4.7, 4.8, 5.2, 5.3, 5.4, 5.5, 5.6, 6.2, 6.5, 6.7, 6.8, Chapter 8, Section 8.1, 8.5, Chapter 9, Section 9.1, 9.2, 9.3, Appendix 1, 2, 3
June 2015	IB(NA)-0300237-C	■Added or modified parts Terms, Section 1.1, 2.1, 2.4, 4.4, 4.8, 5.2, 5.6, 6.6, 6.8, 7.7, Appendix 1, 2, 3, 4
February 2016	IB(NA)-0300237-D	■Added models R64MTCPU ■Added functions Device assignment method, Parameter change function, Servo driver VPH series manufactured by Nikki Denso Co., Ltd. compatible, Inverter FR-A800 series compatible, Stepping motor driver AlphaStep/5-phase manufactured by ORIENTAL MOTOR Co., Ltd. compatible ■Added or modified parts SAFETY PRECAUTIONS, INTRODUCTION, RELEVANT MANUALS, TERMS, MANUAL PAGE ORGANIZATION, Section 1.1, 2.1, 2.3, 2.4, 3.1, 3.7, 3.8, 4.1, 4.2, 4.3, 4.4, 4.5, 4.7, 4.8, 4.9, 5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 6.2, 6.3, 6.5, 6.6, 6.7, 8.1, 8.3, 8.4, 8.5, 9.2, Appendix 1, Appendix 3, Appendix 4, WARRANTY
June 2016	IB(NA)-0300237-E	■Added functions IAI electric actuator controller manufactured by IAI Corporation compatible ■Added or modified parts SAFETY PRECAUTIONS, INTRODUCTION, Section 2.3, 3.1, 4.3, 4.9, 5.2, 5.6, 6.2, Appendix 1, Appendix 2, Appendix 4
September 2016	IB(NA)-0300237-F	■Added models MR-MT2010, MR-MT2100, MR-MT2200, MR-MT2300, MR-MT2400 ■Added functions Sensing module connection ■Added or modified parts TERMS, Section 1.1, 1.3, 2.1, 2.3, 3.1, 4.2, 4.3, 4.7, 4.8, 4.9, 5.1, 5.3, 5.5, 5.6, 5.7, 6.2, 6.7, 8.1, Appendix 1, Appendix 3, Appendix 4
December 2016	IB(NA)-0300237-G	■Added functions Mixed operation cycle function ■Added or modified parts SAFETY PRECAUTIONS, Section 1.1, 2.3, 4.2, 4.3, 4.8, 4.9, 4.10, 5.6, 6.7, 7.8, 8.1, Appendix 1, Appendix 3, Appendix 4
December 2017	IB(NA)-0300237-H	■Added functions File transmission via FTP server, Virtual servo amplifier function, Add-on library license authentication ■Added or modified parts SAFETY PRECAUTIONS, RELEVANT MANUALS, MANUAL PAGE ORGANIZATION, Section 2.1, 2.3, 2.4, 3.1, 4.8, 4.9, 4.10, 4.11, 5.3, 5.4, 5.8, 6.4, 6.7, 8.1, 8.4, 8.5, 9.1, Appendix 1, Appendix 2, Appendix 4
June 2018	IB(NA)-0300237-J	■Added or modified parts SAFETY PRECAUTIONS, Section 4.3, 4.10, 5.3, 5.4, 5.7, 5.8, Appendix 1

Japanese manual number: IB-0300236-J

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.

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