MITSUBISHI ELECTRIC

Personal Computer Embedded Type
Servo System Controller

Motion Control Board
User's Manual (Motion Control)

-MR-EM441G

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.

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 personal computer to ensure that the entire system operates safely even when a fault occurs in the external power supply, the personal computer or the Motion control board. 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 Motion control board.

  (2) When the Motion control board detects an abnormal condition, it stops the operation and all outputs are:
   • Held the parameter setting if the self-diagnostic function of the Motion control board 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 Motion control board cannot detect any error. To ensure safety operation in such a case, provide a safety mechanism or a fail-safe circuit external to the Motion control board.

  (4) Outputs may remain on or off, or the output status may become undefined 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 Motion control board 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.

● Configure a circuit so that the external power supply is turned off first and then turned off the Motion control board or reboot the software. If the Motion control board is turned off 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 for the network used. For the manuals, please consult your local Mitsubishi representative. Incorrect output or malfunction due to a communication failure may result in an accident.
- When connecting an external device with a Motion control board to modify data of a running Motion control board, 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 Motion control board, 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 Motion control board is controlled by an external device, immediate action cannot be taken if a problem occurs in the Motion control board 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 Motion control board in case of a communication failure.
- Do not write any data to the "system area" or "area for manufacturer setting" of the buffer memory in the Motion control board. Also, do not use any "use prohibited" signals as an output signal from the Motion control board to each module. Doing so may cause malfunction of the Motion control board system. For the "system area", "area for manufacturer setting", and the "use prohibited" signals, refer to the user's manual, this manual, and the relevant manuals 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. Incorrect output or malfunction due to a communication failure may result in an accident.
- Configure safety circuits external to the personal computer to ensure that the entire system operates safely even when a fault occurs in the external power supply, the personal computer, or the Motion control board. Failure to do so may result in an accident due to an incorrect output or malfunction.
  - (1) OPR (Original Point Return) is controlled by two kinds of data: an OPR direction and an OPR speed. Deceleration starts when the near-point dog signal turns on. If an incorrect OPR direction is set, motion control may continue without deceleration. To prevent machine damage caused by this, configure an interlock circuit external to the Motion control board.
  - (2) When the Motion control board detects an error, the motion slows down and stops or the motion suddenly stops. Set the parameter to meet the specifications of a positioning control system. In addition, set the OPR parameter and positioning data within the specified setting range.
  - (3) Outputs may remain on or off, or become undefined due to a failure of a component such as an insulation element and transistor in an output circuit, where the Motion control board cannot detect any error. In a system that the incorrect output could cause a serious accident, configure an external circuit for monitoring output signals.
    - If safety standards (ex., robot safety rules, etc.,) apply to the system using the Motion control board, module, and drive unit, and servo motor, make sure that the safety standards are satisfied.
    - Construct a safety circuit externally of the Motion control board, module, or drive unit if the abnormal operation of the module or drive unit differs from the safety directive operation in the system.

[Design Precautions]

⚠CAUTION

- Do not install the control lines or communication cables together with the main circuit lines or power cables. Doing so may result in malfunction due to electromagnetic interference. Keep a distance of 100mm or more between those cables.
- 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 Motion control board is powered on or the software is rebooted, the time taken to enter the system startup 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 Motion control board or reboot the software while the settings are being written. Doing so will make the data in the flash ROM undefined. The values need to be set in the buffer memory and written to the flash ROM again. Doing so also may cause malfunction and failure of the Motion control board.

[Security Precautions]

⚠WARNING

- To maintain the security (confidentiality, integrity, and availability) of the Motion control board and the system against unauthorized access, denial-of-service (DoS) attacks, computer viruses, and other cyberattacks from external devices via the network, take appropriate measures such as firewalls, virtual private networks (VPNs), and antivirus solutions.

[Installation Precautions]

⚠WARNING

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

[Installation Precautions]

⚠CAUTION

- Use the Motion control board in an environment that meets the general specifications in this manual. Failure to do so may result in electric shock, fire, malfunction, or damage to or deterioration of the product.
- Use board fixing screws and securely tighten the Motion control board. 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. For the specified torque range, refer to the attached manual for the personal computer.
- Beware that the Motion control board and the heat sink could be very hot while power is on and immediately after power-off.
- Do not directly touch any conductive parts and electronic components of the Motion control board or connector. Hold the front panel or edge of the print board. Doing so can cause malfunction or failure of the Motion control board.
- Do not disassemble or modify the Motion control board. Doing so may cause failure, malfunction, injury, or a fire.
- Before handling the Motion control board, 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 Motion control board to fail or malfunction.
- Install the Motion control board to a personal computer which is compliant with PCI Express® standard. Failure to do so may cause a failure or malfunction.
- Securely insert the Motion control board into the slot following the board installation instruction of the personal computer. Incorrect insertion of the Motion control board may cause malfunction, failure, or drop of the board.
- When installing the Motion control board, take care not to contact with other boards.
- When installing the Motion control board, take care not to get injured by an implemented component or a surrounding member.
- Handle the Motion control board in a place where static electricity will not be generated. Failure to do so may cause a failure or malfunction.
- The Motion control board is included in an antistatic envelope. When storing or transporting it, be sure to put it in the antistatic envelope. Failure to do so may cause a failure or malfunction.
- Do not drop or apply a strong impact to the Motion control board. Doing so may cause a failure or malfunction.

[Wiring Precautions]

⚠WARNING

- Shut off the external power supply (all phases) used in the system before installation and wiring. Failure to do so may result in electric shock or damage to the Motion control board.
- After installation and wiring, attach the cover of the equipment the Motion control board is installed to before turning it on for operation. Failure to do so may result in electric shock.

[Wiring Precautions]

⚠CAUTION

- Individually ground the FG terminals, the controllers, servo amplifiers and servo motors embedded with a Motion control board with a ground resistance of 100 ohms or less. Failure to do so may result in electric shock or malfunction. Do not use a common grounding with other equipment.
- 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 Motion control board, 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 Motion control board. Poor contact may cause malfunction.
- Do not install the control lines or communication cables together with the main circuit lines or power cables. Doing so may result in malfunction due to noise. Keep a distance of 100 mm or more between those cables.
- Place the wires and the cables to connect the Motion control board in a duct or clamp them. If not, dangling cables may swing or inadvertently be pulled, resulting in malfunction or damage to the Motion control board or cables.
  In addition, the weight of the wires and the cables may put stress on the Motion control board in an environment of strong vibrations and shocks.
- Check the interface type and correctly connect the cable. Incorrect wiring (connecting the cable to an incorrect interface) may cause failure of the Motion control board and the 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 the Motion control board, resulting in drop, short circuit, fire, or malfunction.
- When disconnecting the cable from the Motion control board, do not pull the cable by the cable part. For the cable with the 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 Motion control board may result in malfunction or damage to the Motion control board or the cable.
- Prevent foreign matter such as dust or wire chips from entering the personal computer embedded with a Motion control board. Such foreign matter can cause a fire, failure, or malfunction.
- For Ethernet cables to be used in the system, select the ones that meet the specifications in this manual. If not, normal data transmission is not guaranteed.

[Startup and Maintenance Precautions]

⚠WARNING

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

[Startup and Maintenance Precautions]

⚠CAUTION

- When connecting an external device with a Motion control board or an intelligent function module to modify data of a running Motion control board, configure an interlock 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 Motion control board, 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 Motion control board is controlled by an external device, immediate action cannot be taken if a problem occurs in the Motion control board due to a communication failure. To prevent this, configure an interlock in the program, and determine corrective actions to be taken between the external device and Motion control board 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) 25cm or more away in all directions from the Motion control board. Failure to do so may cause malfunction.
- Shut off the external power supply (all phases) used in the system before mounting or removing the module. Failure to do so may cause the module to fail or malfunction.
- Tighten the screws within the specified torque range. Undertightening can cause drop of the component or wire, short circuit, or malfunction. Overtightening can damage the screw and/or module, resulting in drop, short circuit, or malfunction.
- After the first use of the product, do not mount/remove the Motion control board more than 50 times. Exceeding the limit may cause malfunction.
- 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 Motion control board, touch a conducting object such as a grounded metal to discharge the static electricity from the human body. Wearing a grounded antistatic wrist strap is recommended. Failure to discharge the static electricity may cause the module to fail or malfunction.
- Use a clean and dry cloth to wipe off dirt on the Motion control board.
- 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.

[Startup and Maintenance Precautions]

⚠ CAUTION

● When using the absolute position system function, on starting up, and when the Motion control board 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.

● The Motion control board is included in an antistatic envelope. When storing or transporting it, be sure to put it in the antistatic envelope. Failure to do so may cause a failure or malfunction.

● The microprocessor built in the Motion control board will reach a high temperature during operation. Do not touch the heat sink directly when replacing the Motion control board. Doing so may result in a burn.

[Operating Precautions]

⚠ CAUTION

● When changing data and operating status, and modifying program of the running Motion control board from an external device such as a personal computer connected to an intelligent function module, read the 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 Motion control board or reboot the software while the setting values in the buffer memory are being written to the flash ROM in the Motion control board. Doing so will make the data in the flash ROM undefined. The values need to be set in the buffer memory and written to the flash ROM again. Doing so also may cause malfunction or failure of the Motion control board.

● 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.

[Computer Connection Precautions]

⚠ CAUTION

● For Ethernet cables to be used in the system, select the ones that meet the specifications in this manual. If not, normal data transmission is not guaranteed.

[Disposal Precautions]

⚠ CAUTION

● When disposing of this product, treat it as industrial waste.

[Transportation Precautions]

⚠CAUTION

● 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.

● The Motion control board is a precision machine, so do not drop or apply strong impacts on it.

INTRODUCTION

Thank you for purchasing the personal computer embedded type servo system controllers.

This manual describes the performance specifications, procedures before operations, wiring, functions, programming, and troubleshooting.

Before using this product, please read this manual and the relevant manuals carefully and develop familiarity with the functions and performance of the personal computer embedded type servo system controller to handle the product correctly. Please make sure that the end users read this manual.

Relevant product

MR-EM441G

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RELEVANT MANUALS

Manual name [manual number]	Description	Available form
Motion Control Board User's Manual (Motion Control) [IB-0300599ENG] (This manual)	Specifications, procedures before operation, system configuration, wiring, functions, table maps, parameters, and troubleshooting of the Motion control board	Print book
		e-Manual PDF
Motion Control Board User's Manual (Network) [IB-0300600ENG]	Functions, parameter settings, troubleshooting, and buffer memory of CC-Link IE TSN	Print book
		e-Manual PDF
Motion Control Board User's Manual (Motion API) [IB-0300601ENG]	API functions to control the Motion control board from the host personal computer	Print book
		e-Manual PDF

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e-Manual refers to the Mitsubishi Electric 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.
- Sample programs can be copied to an engineering tool.

TERMS

Unless otherwise specified, this manual uses the following terms.

Term	Description
Axis	A motion control target, referring to a station with axis No. allocation. The Motion control board exchanges the data of cyclic transmission.
Buffer memory	Memory to store data such as setting values and monitor values. The Motion control board also uses it for data communication with the user program. The buffer memory No. (indicating the buffer memory address) given in this manual is prefixed with "G". The buffer memory No. is given on a 1-word basis.
CC-Link IE TSN Class	A group of devices and switching hubs compatible with CC-Link IE TSN, classified according to the functions and performance by the CC-Link Partner Association. For CC-Link IE TSN Class, refer to the CC-Link IE TSN Installation Manual (BAP-C3007ENG-001) published by the CC-Link Partner Association.
CPU module device	A memory of the CPU module for storing data. Devices include X/Y/M/D, etc., depending on application.
Cyclic data	Data that are sent by cyclic transmission.
Cyclic transmission	A function by which data is periodically exchanged among stations on the same network.
Device station	A station (local or remote station) that is connected on CC-Link IE TSN excluding the master station.
Disconnection	A process of stopping data link if a data link error occurs.
Edgecross	A software platform that implements specifications and concepts for realizing manufacturing solutions by the FA-IT collaboration centering on the edge computing.
Edgecross Basic Software	The name of the software product that implements the Edgecross function.
Event history	Event data groups which are saved in a Motion control board.
Event information	Event data which before being saved in a Motion control board.
General-purpose hub	A CC-Link IE TSN Class A switching hub authorized by CC-Link Partner Association.
Grandmaster	A source device or station to synchronize clocks in the time synchronization via PTP (Precision Time Protocol).
Intelligent function module	A module that has functions other than input and output, such as an A/D converter module and D/A converter module.
Link device	An internal device (RX/RY/RWr/RWw/LB/LW) of the Motion control board and the device station. The station set to the motion control station uses the I/O device (RX/RY/RWr/RWw) on the dual port memory as a link device.
Local station	A station that performs cyclic transmission and transient transmission with the master station and other local stations. The local station can receive cyclic data of other stations in the multicast mode.
Master station	A station that controls the entire network. This station can perform cyclic transmission and transient transmission with all stations. Only one master station can be used in a network.
Motion control board	Another term for MR-EM441G.
Motion control station	A device station that exchanges cyclic data by an I/O device and motion control.
Motion system monitor	A monitor tool to confirm the Motion control board status, such as LED display or error codes.
MR Configurator2	A product name of servo setup software.
MR-EM441G	Another term for the Motion control board connectable to CC-Link IE TSN.
MR-J5-G	Servo amplifier model MR-J5-_G_(-RJ).
MR-J5-_G_-LL	Servo amplifier model MR-J5-_G_ that enables the pressure control using a pressure sensor (load cell).
MR-J5W-G	Servo amplifier model MR-J5W_-_G_.
Multicast filter	A filter function that selects whether to send cyclic data of multicast mode received by the own station to the subsequent stations. Parameter setting for this function is not required because the master station automatically sets the parameters according to the system configuration.
Multicast mode	A communication mode used to send cyclic data to multiple stations.
Necessary objects	Necessary objects in order to operate the function of a Motion control board without limit. If the necessary objects are not set at the PDO mapping, limited functions are operated.
Network diagnosis (CC-Link IE TSN diagnosis)	[Tool] of "Setting Network Parameter". The display is shown when selecting the Network Diagnosis.
Network parameter setting	Settings of device station, communication cycle, IP filter, IP address, cyclic, and device parameter, etc.
Object	Various data of a device station compatible with CANopen.
pos units	A unit of the position where data is exchanged between the Motion control board and the device compatible with CANopen.
Priority	A value that is assigned to devices or stations in a network to determine the grandmaster for time synchronization. The smaller the value, the higher the priority.

Term	Description
Profile mode	A control mode for the drive unit. In this mode, the drive unit is connected to the Motion control board as the remote I/O, and the motor is driven by using the I/O device.
Remote I/O	An I/O device or a link device control target, referring to a station without axis No. allocation (a station not used as an axis). The Motion control board exchanges the data of cyclic transmission.
Remote station	A station that exchanges I/O signals (bit data) and I/O data (word data) with another station by cyclic transmission. This station can perform transient transmission.
Return	A process of restarting data link when a faulty station recovers from an error.
SLMP	A SeamLess Message Protocol. This protocol is used to access an SLMP-compatible device or a programmable controller connected to an SLMP-compatible device from an external device.
Standard station	A device station other than the motion control station.
Transient transmission	A function of data communication unperiodically among nodes (station) on network.
TSN hub	A CC-Link IE TSN Class B switching hub authorized by CC-Link Partner Association.
Unicast mode	A communication mode used to send cyclic data to one station.
User program	A user created program (by using the Motion API) which is operated by the host personal computer.

GENERIC TERMS AND ABBREVIATIONS

Unless otherwise specified, this manual uses the following generic terms and abbreviations.

Generic term/abbreviation	Description
CPU module	An abbreviation for the MELSEC iQ-R series CPU module.
Data link	A generic term for cyclic transmission and transient transmission.
Drive unit	A generic term for motor drive devices such as a servo amplifier.
Dual port memory	A generic term for a communication area in order to execute especially the motion control in the buffer memory. The dual port memory address is the offset value from the start address of the dual port memory (buffer memory No.G12000000). Also, the dual port memory address is noted in byte unit.
EM Motion SDK	An abbreviation for the MELSOFT EM Motion SDK which is the software development kit for motion control.
Engineering tool	A generic term for the motion test tool and MR Configurator2.
Ethernet device	A generic term for the devices supporting IP communication (such as a personal computer, a vision sensor, and a bar code reader).
Host personal computer	A generic term for the personal computer mounted with the Motion control board on which the user program for controlling the Motion control board operates.
I/O device	A generic term for the link device on the dual port memory. It is used at the station set as the motion control station.
LB	An abbreviation for a link relay of a link device. Bit data sent from each station of the network.
LW	An abbreviation for a link register of a link device. 16-bit (1-word) data sent from each station of the network.
Module	A generic term for devices of the master station (Motion control board) and device stations.
Motion API	A generic term for library functions to control the Motion control board from the host personal computer.
Motion parameter	A generic term for the system parameter, the control parameter, and the axis control parameter.
Motion test tool	An abbreviation for the start-up and examination tool for Motion control board.
MR-J5(W)-G	A generic term for servo amplifier models MR-J5-_G_(-RJ)/MR-J5W_-_G_/MR-J5-_G_-LL.
P1	An abbreviation for the CC-Link IE TSN connector (line 1).
P2	An abbreviation for the CC-Link IE TSN connector (line 2).
PDO	An abbreviation for Process Data Object. It is a group of application objects that are periodically transferred among multiple CANopen nodes.
PTP	An abbreviation for Precision Time Protocol. A predefined protocol for time synchronization between devices on a network.
RAS	An abbreviation for Reliability, Availability, and Serviceability. This term refers to the overall usability of automated equipment.
RWr	An abbreviation for a remote register of the link device. 16-bit (1-word) data input from a device station to the master station. (Not applicable to some local stations.)
RWw	An abbreviation for a remote register of the link device. 16-bit (1-word) data output from the master station to a device station. (Not applicable to some local stations.)
RX	An abbreviation for a remote input of the link device. Bit data input from a device station to the master station. (Not applicable to some local stations.)
RY	An abbreviation for a remote output of the link device. Bit data output from the master station to a device station. (Not applicable to some local stations.)
SB	An abbreviation for a link special relay. Bit data that indicates the operating status and data link status of a module on CC-Link IE.
Servo amplifier	A generic term for servo amplifiers connectable to CC-Link IE TSN.
SW	An abbreviation for a link special register. 16-bit (1-word) data that indicates the operating status and data link status of a module on CC-Link IE.

1 OVERVIEW

The Motion control board (MR-EM441G) is mounted to the PCI Express system, and controls our servo amplifiers (MR-J5(W)-G) and the remote I/O module. The Motion control board and the servo amplifiers are connected via CC-Link IE TSN, which is an open integrated network.
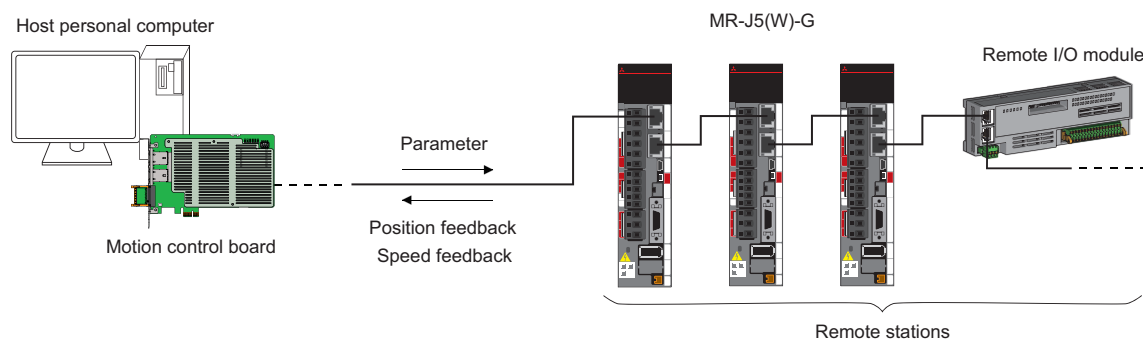
The Motion control board can control the positioning for up to 64 axes. The positioning is performed using a point table mapped on the dual port memory of the Motion control board. The arbitrary positioning is available by writing data to this point table from the host personal computer connectable to the PCI Express bus.
Also, the startup of the JOG operation and the home position return, etc. as well as the parameter changing, and the monitoring are available by accessing from the host personal computer to the dual port memory of the Motion control board. The dual port memory maps to the memory space of the PCI Express bus.

1.1 Features

The Motion control board has the following features.

Structuring of the CC-Link IE TSN communication servo system by the personal computer control

The Motion control board can be connected to the Mitsubishi Electric servo amplifiers of MR-J5-G(W) series using CC-Link IE TSN.

- Saving of wires can be achieved by connecting between the Motion control board and the servo amplifier, and between the servo amplifiers with a high speed synchronous network by CC-Link IE TSN. The maximum distance between the Motion control board and the servo amplifier, or the servo amplifier and the servo amplifier for the CC-Link IE TSN cable is 100m (328.08ft.). This increases flexibility at system design.
- By writing the servo parameters which are created by MR Configurator2 to the Motion control board, the parameters can be written to the servo amplifier using CC-Link IE TSN.
- The current feedback position and the alarm description contained in the servo amplifier can be confirmed by the dual port memory of the Motion control board.

Programming in C or C# programming language with the Motion API

The positioning control for the servo amplifier in C or C# programming language is enabled with the Motion API included with the EM Motion SDK.

Supports event-driven programming

The host personal computer is notified by the interrupt via the PCI Express bus when the conditions for an interrupt such as passing through a preset point or positioning complete are met. The user program can create event-driven programs according to the interrupt factors.

High-speed operation startup time

The high-speed operation startup time within the operation cycle (62.5μs fastest) is achieved when the number of axes is less than or equal to the maximum number of synchronous startup axes.

Wide variety of positioning control functions

The main functions such as the home position return control and the standard mode (positioning control) which are required for any positioning system and the sub functions which limit and add functions to those controls are supported.

■Wide variety of control methods
The control methods shown below are provided for the positioning control.
- Independent positioning of each axis
  The positioning control can be performed independently for each axis at the arbitrary timing.
- Interpolation control
  The interpolation control using multiple axes can be performed.
- Tandem drive
  The tandem drive for 2 axes can be performed.

■Continuous processing of multiple positioning data
The multiple positioning data can be processed continuously by the positioning startup at once.

■Acceleration/deceleration processing
Acceleration/deceleration processing methods are provided: linear acceleration/deceleration, S-curve acceleration/deceleration (sine acceleration/deceleration), smoothing filter, jerk ratio acceleration/deceleration, and vibration suppression command filter 1. The acceleration/deceleration curve can be selected according to the machine characteristic.

Supports other axes start function

With the other axes start function, the Motion control board can determine the conditions and automatically start other axes, and turn ON/OFF output signals. The Motion control board does not go through the user program processing so there are no delays or dispersions. This also lessens the load on the user program.

High maintainability

The maintainability is enhanced in the Motion control board by the following.

■Event history collection function

The event details when an event such as an alarm occurs are automatically stored in the Motion control board. Storing the event information allows the user to confirm the event contents from the motion test tool even after the Motion control board is powered OFF or reset.

Setting, monitoring, and testing through the motion test tool

Using the motion test tool, the user can check the validity of the preset parameters and the point table by performing the test operation of the Motion control board before creating a user program. The control monitor/graph function allows the user to debug programs efficiently.

Forced stop function

The forced stop per axis is available for connected servo amplifiers by the forced stop input signal of the external input.

Easy application to the absolute position system

- MR-J5-G(W) series servo amplifiers and the servo motors support the absolute position system.
  (To configure an absolute position detection system by using a direct drive motor, the battery for the backup of the absolute position data is required.)
- Once the home position has been established, the home position return operation is unnecessary at the system's power supply ON.

Supports the remote I/O module

The Motion control board is connected to the remote I/O module via CC-Link IE TSN, and can control the remote I/O module using the dual port memory.

2 NAME OF EACH SECTION

No.	Name			Description
(1)	DIP Switch	Switch 1	Board ID setting	Set a board ID in order to distinguish between multiple Motion control boards. For details, refer to the following. ☞ Page 63 Board ID
		Switch 2		
		Switch 3[*1]	For manufacturer setting	This switch is provided for manufacturer setting.
		Switch 4[*2]		
(2)	RUN LED[*3]			Display the system status. • ON: Operating normally • OFF: Error, Initializing
(3)	ERR LED[*3]			Display the error status. • OFF: Operating normally • ON: Error, At data link error in all stations • Flashing: (200ms interval): Error • Flashing: (500ms interval): A data link faulty station detected
(4)	P RUN LED (PROGRAM RUN)			OFF (fixed)
(5)	D LINK LED			Display the data link status. • ON: Data link (cyclic transmission being performed) • Flashing: Data link (cyclic transmission stopped) • OFF: Data link not performed (disconnection)
(6)	SD/RD LED			Display the data communicating status. • ON: Communicating data • OFF: Not communicating data
(7)	PCIe LED			Display the status of the PCI Express communication. • ON: PCI Express link-up • OFF: PCI Express link-down
(8)	CC-link IE TSN connecter (P1)			Connector for communication with CC-Link IE TSN.
(9)	CC-link IE TSN connecter (P2)			
(10)	LINK LED			Display the link status. • ON: Link-up • OFF: Link-down
(11)	L ER LED			Display the port status. • ON: Abnormal data received • OFF: Normal data received
(12)	General-purpose I/O connector			Connector for controlling I/O signals via the PCI Express bus. For details, refer to the following. ☞ Page 37 General-purpose I/O Specifications

*1 When turning ON the Switch 3, "Manufacturer Setting Switch Detected as ON (error code: 1C9AH)" occurs.

*2 When turning ON the Switch 4, "Manufacturer Setting Switch Detected as ON (error code: 0F11H)" occurs.

*3 The error status can be determined by the status of the RUN LED and the ERR LED.

RUN LED	ERR LED	Error status	Description
OFF	ON, Flashing	Major error	An error such as a hardware failure or a memory failure. The Motion control board stops the operation.
ON	Flashing	Moderate error	An error, such as a parameter error, which affects the operation of the Motion control board. The Motion control board stops the operation.
ON	ON	Minor error	An error such as communication, the positioning control, and a program error. The Motion control board continues the operation.

3 SPECIFICATIONS

3.1 General Specifications

The general specifications of the Motion control board are shown below.

Item	Specification
Operating ambient temperature	0 to 55°C (32 to 131°F) (secure an airflow)[*1]
Storage ambient temperature	-25 to 75°C (-13 to 167°F)
Operating ambient humidity	5 to 95%RH, non-condensing
Storage ambient humidity	5 to 95%RH, non-condensing
Operating ambience	Indoors (where not subject to direct sunlight), no corrosive gas[*2], no significant amount of dirt or dust
Operating altitude[*3]	2000m (6561.68ft.) or less
Mounting location	Inside control panel
Overvoltage category[*4]	Ⅱ or less
Pollution level[*5]	2 or less
Recommended size of a cooling fan	60mm square or more (10CFM or more)[*6]
Power supply	Power supply voltage: 3.3VDC ± 9% Leakage current: 1.0A or less
	Power supply voltage: 12VDC ± 9% Leakage current: 1.0A or less

*1 For the host personal computer which is equipped with the Motion control board, be sure to induce an airflow in the personal computer case by the cooling fans for the CPU, the power supply of the personal computer, and the personal computer case.

*2 Corrosive gas stands for hydrogen sulfide and chlorine.

*3 Do not use or store under pressure higher than the atmospheric pressure of altitude 0m (0ft.). Doing so can cause an operation failure. When using under pressure, please contact our sales representative.

*4 This indicates the section of the power supply to which the equipment is assumed to be connected between the public electrical power distribution network and the machinery within premises. Category Ⅱ applies to the equipment for which electrical power is supplied from fixed facilities. The surge voltage withstand level for up to the rated voltage of 300V is 2500V.

*5 This index indicates the degree to which conductive material is generated in terms of the environment in which the equipment is used. The pollution level 2 is when only non-conductive pollution occurs. A temporary conductivity caused by condensing must be expected occasionally.

*6 Confirm with the manufacturer of the cooling fan to be used.

3.2 Specifications of Motion Functions

The specifications of motion functions are shown below.

Function		Specification
System function	Operation cycle	62.50μs/125.00μs/250.00μs/500.00μs/1000.00μs/2000.00μs (select using parameters)[1]
	Controllable axes	Up to 64 axes (Only MR-J5(W)-G can be allocated as an axis.)
	Connectable stations	Up to 120 stations (Even if the station is the multi-axis drive unit device (which can control two axes or more), the number of stations is counted as one station when it is recognized as one station.)
	Number of connectable devices	Up to 120 devices (When using the extension modules which are connectable to CANopen communication, one module is counted as one device.)
	Axes and stations per line	Up to 120 stations per 2 lines. Up to 64 axes can be selected from 120 stations.
	Control mode	Standard mode: Positioning control method by the Motion control board
	Communication method	CC-Link IE TSN
Operational function[2][3]	JOG operation	Provided
	Incremental feed	Provided
	Automatic operation	Method	Point table method, 1 axis control, continuous operation to torque control, pressure control
		Point table size	48bytes/point
		Number of point tables	2048 points for all axes
	Interpolation operation	Point table method Linear interpolation control for up to 4 axes Circular interpolation for 2 axes
	Home position return	Driver method
		Home position reset (data set) (The current command position can be reset to the home position.)
Application function	Position command unit[2][3]	Unit: Defined by the user program so as to match the electronic gear setting Range: -2147483648 to 2147483647
	Electronic gear	Electronic gear numerator: 1 to 5242879 Electronic gear denominator: 1 to 589823
	Speed units	Unit: Selectable from command unit/min and command unit/s Range: 1 to speed limit
	Acceleration/ deceleration	Command speed range	1 to speed limit
		Time constant range	0 to 20000ms/speed limit
		Separate setting of acceleration/ deceleration constant	Provided
		Time constant setting by points	Provided
		Acceleration/ deceleration method	Linear acceleration/deceleration, smoothing filter, S-curve acceleration/deceleration (sine acceleration/deceleration), jerk ratio acceleration/deceleration, vibration suppression command filter 1
	Servo ON/servo OFF	Provided (When the servo is OFF, the dynamic brake is canceled.)
	Stop function	Forced stop (select a signal, emergency stop option using parameters), stop operation, rapid stop operation
	Limit switch	Provided (hardware stroke limit)
	Software limit	Provided (software stroke limit)
	Interlock	Provided
	Rough match output	Provided
	Torque limit	Provided (always valid)
	Command change	Location, speed, time constant

Function			Specification
Application function	Backlash		Provided Unit: pos units Range: 0 to 16777215
	Position switch		Provided
	Completion of operation signal		Provided
	Gain switching		Provided (Control using the device station object I/O)
	PI-PID switching		Provided (Control using the device station object I/O)
	Absolute position detection system		Provided
	Home position return request		Provided
	Other axes start	Data	Up to 64
		Condition size	40bytes
		Operation details size	88bytes
		General-purpose output control	Provided
		Output device control	Provided
	High response interface		Provided
	In-position signal		Provided (The in-position range setting of the control parameter is required.) Unit: command unit
	I/O device		Link device format (Use the I/O device at the station which is set as the motion control station.) ■Input bit device Remote input (RX): Up to 16384 points ■Input word device Remote register (RWr): Up to 8192 points ■Output bit device Remote output (RY): Up to 16384 points ■Output word device Remote register (RWw): Up to 8192 points
	Drive unit general-purpose I/O		Provided (Control using the device station object I/O) (MR-J5(W)-G is supported by the general-purpose input only.)
	Dual port memory exclusive control		Provided
	Pass position interrupt		Pass position conditions: Up to 128
	Continuous operation to torque control		Provided
	Pressure control		Provided
	No home position function		Provided
	Device station object I/O		Provided
	Driver command discard		Provided
	High speed operation mode		Provided

Function		Specification
Auxiliary function	Reading/writing parameters	Provided (For reading/writing the parameters of the device station, use the device station parameter automatic setting or the transient transmission.)
	Alarm/system error	Provided
	Monitor	Current command position, current feedback position, speed command, position droop, electrical current command, drive unit alarm No., external signal status, etc.
		Can be latched, updated every few milliseconds.
	High speed monitor	Current command position, current feedback position, moving speed, feedback moving speed, external signal, electrical current feedback, position droop
		Can be latched, updated every operation cycle. (When using the monitor of the drive unit, map the object to be used to the PDO.)
	Interrupt	When start operation/stop operation (operation processing/in-position/smoothing stop/rough match, etc.), alarm occurrence (drive unit alarm/operation alarm, etc.)
		Interrupt conditions during the start operation/stop operation can be selected.
	User watchdog function	Provided
	Software reboot function	Provided
	Sampling	Maximum sampling points: 65536 points. (Ring buffer of 65536 points)
	Operation cycle monitor function	Provided (in nanosecond units)
	Drive-unit-less	Provided
	File control	Provided
	Time control	Provided
	Link-down detection function	Provided
	Event history	Provided (The occurring timing of the event can be confirmed with the time of the host personal computer.)
Tandem drive		Up to 2 axes × 8 groups (For the home position return method of the drive unit, the data set method is recommended.)
Board ID		0 to 3 (set with DIP switch)
DI	Forced stop	1 point (Depending on the parameter setting, general-purpose input/input bit device/input word device are allocated, and input is performed via general-purpose input/input device. The setting of the parameter initial value is to use the general-purpose input.)
	General-purpose input	Provided (4 points (Depending on the parameter setting, common to the forced stop signal))
DO	General-purpose output	Provided (4 points)
	Exclusive control	Provided

*1 The operation cycle 62.50μs/1000.00μs/2000.00μs are supported in the basic system software version "03" or later.

*2 The Motion control board can move within the limits of "-2147483648 to 2147483647". Movement outside the limits is not covered with the warranty. If software limits have been disabled, be careful not to move it outside of the physical limits.

*3 For the absolute position detection system, the command limits of the position after a calculation using the electronic gear are also "-2147483648 to 2147483647". It is possible for the movable limits to be narrower than "-2147483648 to 2147483647", depending on the electronic gear.

3.3 Specifications of Network Function

The performance specifications of network functions are shown below.

Performance Specifications of CC-Link IE TSN

The performance specifications of CC-Link IE TSN are shown below.

Item			Specification
Maximum number of link points per network[1]	RX/RY (Link device, I/O device)		16K points each (16384 points, 2Kbytes)
	RWr/RWw (Link device, I/O device)		8K points each (8192 points, 16Kbytes)
	LB		32K points (32768 points, 4Kbytes)
	LW		16K points (16384 points, 32Kbytes)
Maximum number of links	Master station	RX/RY (Link device, I/O device)	16K points each (16384 points, 2Kbytes)
		RWr/RWw (Link device, I/O device)	8K points each (8192 points, 16Kbytes)
		LB	32K points (32768 points, 4Kbytes)
		LW	16K points (16384 points, 32Kbytes)
Transient transmission capacity			Up to 1920bytes
Communication speed			1Gbps
Minimum synchronization cycle			62.50µs
Time synchronization accuracy			±1µs
CC-Link IE TSN Class			CC-Link IE TSN Class B device[2]
CC-Link IE TSN protocol version			1.0
Network topology[3]			Line topology, star topology, coexistence of line and star topologies
Communication cable			Ethernet cable which satisfies standard (☞ Page 58 CC-Link IE TSN wiring)
Maximum station-to-station distance			100m
Overall cable	Line topology		12000m (39370.08 ft.) (when 121 stations[6] are connected)
	Others		Depends on the system configuration
Maximum number of connectable stations[4]			121 stations[5][6]
Maximum number of connectable devices			121 devices[6][7]
Maximum number of networks			1
Communication method			Time sharing method
Multicast filter			Usable[8]

*1 The maximum number of points for all link devices may not be used simultaneously depending on the number of device stations, or the number of points and assignments of the link devices that are set in "Network Configuration Settings" of "Basic Settings".
*2 The CC-Link IE TSN Class A device station cannot be connected to the network.
*3 When the communication cycle is 62.50µs, only the line topology is available. When connecting with the star topology and the coexisting of line and star topologies, the communication cycle must be set to 125.00µs or more.
*4 An error is not occurred even if there is no station and axis in the network setting.
*5 Even if the station is a multi-axis drive unit device (a device which can control two axes or more), the number of stations is counted as one station when it is recognized as one station.
*6 Includes the master station.
*7 Also includes the number of extension modules.
*8 Due to the automatic setting by the master station according to the system configuration, the parameter setting is not required.

Performance Specifications of Ethernet

The performance specifications of Ethernet are shown below.

Item			Description
Transmission specifications	Data transmission speed		1Gbps
	Communication mode		1000BASE-T (Full-duplex)
	Interface		RJ45 connector (AUTO MDI/MDI-X)
	Maximum frame size		1518bytes
	Jumbo frame		Not available
	Maximum segment length		100m (328.08ft.) (distance between a switching hub and a station)[1]
	Number of cascade connections		[2]
	IP version		Compatible with IPv4
Sending/receiving data storage memory	Number of simultaneous open connections (maximum number of connections)	Connection with MELSOFT products	1 connection

[1] For the maximum segment length (length between switching hubs), consult the manufacturer of the switching hub used.

[2] Consult the manufacturer of the switching hub used.

> **Point**
>
> The operation of commercial devices used for the following applications is not guaranteed. Confirm the operation before using them.
> - Internet (general public line) (Internet-access service offered by an Internet service provider or a telecommunications carrier)
> - Firewall device(s)
> - Broadband router(s)
> - Wireless LAN

List of Network Function

■Cyclic transmission

This function allows periodic data communications among stations on the network using link devices.

○: Connection available, ×: Connection not available

Function		Description	Availability	
			Standard station	Motion control station
Communications using RX, RY, RWr, RWw		Exchanging data in units of bits and words between the master station and device stations.	○	○
Communications using LB, LW		Exchanging data in units of bits and words between the master station and device stations.	○	×
Communications using RX, RY, RWr, RWw, LB, LW		Communications using link devices (RX, RY, RWr, RWw) and communications using link devices (LB, LW) can be performed at the same time.	○	×
Direct access to link devices		Directly read or write the corresponding data to/from link devices (RX/RY/ RWr/RWw/SB/SW/LB/LW) and I/O devices (RX/RY/RWr/RWw) of the CC-Link IE Network module using the Motion API.	○	○
Cyclic data assurance		Assure the cyclic data integrity in units of 32 bits.	○	○
Output Hold/ Clear Settings	Output mode upon error	Set whether to hold or clear the output when an error occurs in the Motion control board on the sending side.	○	×
	Data link error station setting	Set whether to hold or clear the input data from the device station which was disconnected on the receiving side.	○ (Fixed to "Hold")	○ (Fixed to "Hold")
CANopen communication		Control a servo amplifier that supports the CANopen profile.	○	○

■Transient transmission

This function is used for communications at any timing and has the following two functions.

○: Connection available

Function	Description	Availability	
		Standard station	Motion control station
Communications using Motion API	Read/write data to the CPU module device of the remote station and the buffer memory of the remote station from the master station via the Motion API.	○	○
Communications using engineering tool	Configure the settings of or monitors each station using an engineering tool.	○	○

■Ethernet connection

This function connects an Ethernet device to a module without interfering with CC-Link IE TSN.

○: Connection available

Function	Description	Availability	
		Standard station	Motion control station
Connection with MELSOFT products	Allow monitoring and testing of the Motion control board using the engineering tool via Ethernet.	○	○

■Security

This function ensures the optimal security according to the network environment by restricting access for each communication path to the Motion control board.

○: Connection available

Function	Description	Availability	
		Standard station	Motion control station
IP filter	Identify the IP address of the access source to limit the access to the Motion control board.	○	○

■RAS

This function improves Reliability, Availability, and Serviceability and makes the automated equipment easy to use comprehensively.

○: Connection available

Function	Description	Availability	
		Standard station	Motion control station
Device station disconnection	Stop the data link of the device station where an error occurred, and continue the data link only for device stations that are operating normally.	○	○
Automatic return	Restart the data link automatically when the device station that was disconnected due to an error becomes normal again.	○	○[1]
Master station duplication detection	When one network has multiple master stations, detect the duplication.	○	○
IP address duplication detection	When one network has stations with the same IP address, detect the duplication.	○	○
Time synchronization	Synchronize the time of device stations with the time synchronization source (CPU module of the master station).	○	○

*1   The automatic return is not supported for MR-J5(W)-G in which an axis is allocated.

■Synchronization function

This function adjusts the timing with the timing of different device stations connected to the same network.

○: Connection available, ×: Connection not available

Function	Description	Availability	
		Standard station	Motion control station
CC-Link IE TSN Network synchronous	Synchronize the control cycle of device stations according to the communication cycle of the master station.	○	○
	Match the motion operation of the Motion control board and the operation timing of the device station.	×	○

■Troubleshooting

This function shows the status of the Motion control board and network by using the Network Diagnosis (CC-Link IE TSN Diagnosis).

○: Connection available

Function	Description	Availability	
		Standard station	Motion control station
Network Diagnosis (CC-Link IE TSN Diagnosis)	Monitor the CC-Link IE TSN status. The network statuses such as cyclic status and station status are displayed on the motion test tool.	○	○

■Others

○: Connection available

Function	Description	Availability	
		Standard station	Motion control station
Device station parameter automatic setting	Parameters of the device station on CC-Link IE TSN set using the motion test tool are written in the memory of the Motion control board, and they are automatically set via the master station when the device station is returned/connected by power ON or replaced.	○	○
Data collection using the CC-Link IE TSN Communication Software	The cyclic data of CC-Link IE TSN station is received using the CC-Link IE TSN Communication Software. For details about the CC-Link IE TSN Communication Software, refer to the following. ◻CC-Link IE TSN Communication Software for Windows User's Manual	○	○

3.4 Bus Specifications

PCI Express bus specifications

Item	Specification
Bus specification	PCI Express 2.0
Shape	Half length: 167.65mm × 111.15mm (6.60inch × 4.37inch)
Link width	×1
Transfer rate	5.0Gbps
System voltage	+3.3V, +12V
Power management (ASPM)	Not supported
Base address	Set the configuration register by BIOS
Memory size	Approx. 37Mbytes

Point

Disable the power saving setting of PCI Express at the power settings of the host personal computer. If the power saving setting is enabled, the Motion control board may not be recognized properly by the host personal computer.

3.5   Performance Specifications

The reference of the settable number of axes for each function is shown below. Adjust the operation cycle setting depending on the system load status.

Each function increases the operation cycle, so use them depending on the system load status.

Maximum number of connectable stations

Communication cycle [μs]	Maximum number of connectable stations	Number of usable axes as the control axis in the connectable stations
62.50	4	4
125.00	12	12
250.00	34	32
500.00	78	64
1000.00	120	64
2000.00	120	64

Point

> The reference of the maximum number of connectable stations is under the condition when setting the link device (RWr/RWw) of MR-J5(W)-G to the maximum points and allowing a margin of 10% of the communication cycle interval.

Maximum number of controllable axes

Communication cycle [μs]	Normal operation mode	High speed operation mode					
	MR-J5-G	2 group			3 group		
		MR-J5-G	MR-J5W2-G	MR-J5W3-G	MR-J5-G	MR-J5W2-G	MR-J5W3-G
62.50	2	4	4	—	4	4	—
125.00	12	12	18	18	12	22	22
250.00	32	34	48	48	34	60	60
500.00	64	64	64	64	64	64	64
1000.00	64	64	64	64	64	64	64
2000.00	64	64	64	64	64	64	64

Point

> - The reference of the maximum number of controllable axes is under the condition when starting up the trapezoidal acceleration/deceleration to all axes simultaneously in the automatic operation.
> - The number of controllable axes is limited depending on the processing time and the communication cycle interval. When there is a limit due to the communication cycle interval, it is available to increase the number of controllable axes by using the multi-axis drive unit. The communication cycle interval can be confirmed with "Communication Period Interval (Min.)" of "Cyclic Settings"
> - The column of MR-J5W2-G/MR-J5W3-G indicates the number of controllable axes when using the multi-axis drive units as much as possible.
>   <Example> In case of controlling 22 axes with MR-J5W3-G
>   Use 7 stations with MR-J5W3-G and 1 station with MR-J5-G
> - The maximum number of axes to perform the pressure control function at the same time is 16.

3.6 General-purpose I/O Specifications

The Motion control board is equipped with the general-purpose I/O connector. This is for controlling I/O signals via the PCI Express bus. The DI/DO are equipped with 4 points for each.

> **Point**
> - To input the external forced stop signal (EMI) from the general-purpose input pin, for the DI, only 3 points are available.
> - Specify the assignment destination for the external forced stop signal (EMI) with "Specification of sensor signal (EMI) connection (parameter No.0015)". The initial setting is "DI0".
> - When using the external forced stop signal (EMI), make sure that the forced stop operates properly beforehand.
>   For confirming the operation, use the monitor function. Confirm whether "Being executed external forced stop (bit0)" of "Cause of forced stop (monitor No.00000401H)" is turned ON when the external forced stop signal (EMI) is turned OFF to ON.

⚠ CAUTION

- This function operates only during the system running. Import the setting value of "General output (DO) option (parameter No.0006)" at the time of system startup (system command code: 000Ah), and switch sink/source of the DO common. Before the system startup, the function operates by the sink setting regardless of the parameter setting.
- When the external circuit of the general-purpose output (sink circuit or source circuit) and the sink/source setting of "General output (DO) option (parameter No.0006)" (fixed to sink before system startup) do not match, the general-purpose output signal is always OFF.
- As described above, the operation of the general-purpose output signal changes when the Motion control board is powered on or after the system startup. To prevent malfunction when the operation changes, turn ON the external power supply of the general-purpose output signal after the system startup.

Interface

The interface of the general-purpose I/O connector is shown below.

Board
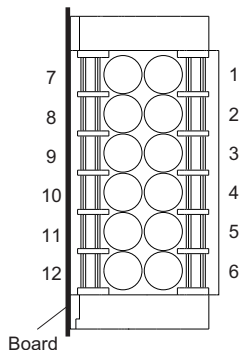
Pin No.[*1]	Signal name	Description
1	DI0	Input 0 (independent common)
2	DI2	Input 2
3	DICOM0	Common for DI0
4	DO0	Output 0
5	DO2	Output 2
6	DOCOM0	Common for DO0 to DO3
7	DI1	Input 1
8	DI3	Input 3
9	DICOM1	Common for DI0 to DI3
10	DO1	Output 1
11	DO3	Output 3
12	FG	FG (for shielded cable connection)

*1 The pin Nos. are printed on the bracket (the side of the general-purpose I/O connector).

Input specification

Item		Specification
Number of input points		4 points
Isolation method		Isolator isolation
Input method		Plus common/minus common
ON voltage/ON current		17VDC or more/3mA or more
OFF voltage/OFF current		8VDC or less/1.3mA or less
Input response time (digital filter)	OFF to ON	200μs or less
	ON to OFF	200μs or less

Output specification

Item			Specification
Number of output points			4 points
Isolation method			Isolator isolation
Output method			Sink/Source[1]
Rated voltage			24VDC (ripple ratio 5% or less) (Acceptable voltage range 21.6VDC to 26.4VDC)
Maximum load current			0.1A/1 point
Output response time	Sink output	OFF to ON	1μs or less
		ON to OFF	1μs or less
	Source output	OFF to ON	1μs or less
		ON to OFF	1μs or less

[1] Select Sink/Source in "General output (DO) option (parameter No.0006)".

I/O cable specification

Wire size	Type	Length
AWG16 to AWG24 (sq=1.5 to 0.2mm^2)	Shielded	Within 10m (32.81ft.)

Wiring

■Input Signal

<Input with plus common and minus common>

- It is not available to input the signal which is only for contact without having an external power supply.
- Since the signal is input through the diode bridge, any side of the common polarity can be chosen. However, 1 point is for the independent common, and 3 points are for the common in the 4 signal points.

Input method	Wiring
Minus common	
Plus common	

■Output Signal

<In case of sink output>

- A sink output is the type of output that the current flows into output terminals (DC0 to DC3) when turning ON the output FET.
- It can drive a lamp, relay, or photocoupler. Install a diode for the inductive load, and an inrush current limiter for the lamp load.
- All 4 signal points are common.

Element	Wiring
Inductive load	
Photocoupler	
Lamp load	

Precautions

The incorrect polarity of the diode causes a damage to the control unit.

<In case of source output>
- A type of source output that the current flows from output terminals (DC0 to DC3) when turning ON the output FET.
- It can drive a lamp, relay, or photocoupler. Install a diode for the inductive load, and an inrush current limiter for the lamp load.
- All 4 signal points are common.

Element	Wiring
Inductive load	
Photocoupler	
Lamp load	

Precautions

The incorrect polarity of the diode causes a damage to the control unit.

Control of general-purpose I/O

The general-purpose I/O can be controlled from the user program. When the general-purpose output control by the other axes start of the Motion control board and the general-purpose output control by a user program may be performed at the same timing, perform the control by using the function of the general-purpose output exclusive control. For details, refer to the following.

☞ Page 43 General-purpose output exclusive control

> **Point**
>
> - Controlling the general-purpose I/O is available during system running (system status code: 000Ah). If the status is not turned to the during system running, the signal control cannot be performed what it is intended.
> - For the procedure until the system startup, refer to the following.
>   ☞ Page 60 PROCEDURES BEFORE OPERATIONS
> - For the other axes start, refer to the following.
>   ☞ Page 199 Other Axes Start
> - The general-purpose output control is supported in the basic system software version "05" or later.

> **Point**
>
> [Motion API]
> - To get the general-purpose input, use the sscGetGeneralInputDataBit function/ sscGetGeneralInputDataWord function.
> - To set the general-purpose output, use the sscSetGeneralOutputDataBitExclusively function/ sscSetGeneralOutputDataWordExclusively function/sscSetGeneralOutputDataBit function/ sscSetGeneralOutputDataWord function.
> - The sscSetGeneralOutputDataBitExclusively function/sscSetGeneralOutputDataWordExclusively function perform the general-purpose output exclusive control within the function.

■System data (high speed) (system status data)

The status of the general-purpose I/O can be confirmed with the system status data (high speed).

Address (hexadecimal)	Name	Units	Output limits	Description
00000828 00000829	General-purpose input status	—	—	Output the input status of the general-purpose I/O. • Bit0: DI00 • Bit1: DI01 • Bit2: DI02 • Bit3: DI03 The signal status varies depending on the obtained value (input status). • Obtained value 0: OFF • Obtained value 1: ON
0000082A 0000082B	General-purpose output status	—	—	Output the output status of the general-purpose I/O. • Bit0: DO00 • Bit1: DO01 • Bit2: DO02 • Bit3: DO03 The signal status varies depending on the obtained value (output status).[1] • Obtained value 0: OFF • Obtained value 1: ON

*1 The signal status is the same for both sink/source output.

General-purpose output exclusive control

The general-purpose output exclusive control is a function that keeps the consistency of the memory data by temporarily limiting the Motion control board and user program to write data to the general-purpose output.

If the general-purpose output signal is updated from the user program during controlling of the general-purpose output signal by the other axes start function, the consistency of the data may not be kept. Write the general-purpose output signal using the exclusive control function after controlling the possessory right of the general-purpose output signal.

Point

- The general-purpose output control is supported in the basic system software version "05" or later.
- For the other axes start, refer to the following.
  ☞ Page 199 Other Axes Start

Point

[Motion API]
The sscSetGeneralOutputDataBitExclusively function/sscSetGeneralOutputDataWordExclusively function perform the general-purpose output exclusive control within the function. Thus processing by the user program is unnecessary.

Interface

Address (hexadecimal)	Description	Detail[*1]	User program data writing
0008C808	Request for general output signal occupation by user	• 0: No request • 1: Request	○
0008C809			
0008C80A	Requesting general output signal occupation by system[*2][*3]	• 0: No request • 1: Request	×
0008C80B			
0008C80C	Selection for output signal occupation	• 0: System[*2] • 1: User	○
0008C80D			
0008C80E	For manufacturer setting	—	—

*1 When the data out of the range is written after the system startup, "General output exclusion control error (system status code error: E505H)" occurs.
*2 "System" indicates the control by the internal processing of the Motion control board.
*3 This is the area where the data can be written only from the Motion control board. When the data is written from the user program to this area, misjudgment may occur in the check for occupation permission, and the status unintentionally becomes permitted/not permitted.

Point

The general-purpose output signal control continues after the general-output exclusive control error occurs. Shut off the output signal as necessary.

Exclusive control procedure on host personal computer

The following shows the procedure to control the general-purpose output signal exclusively.
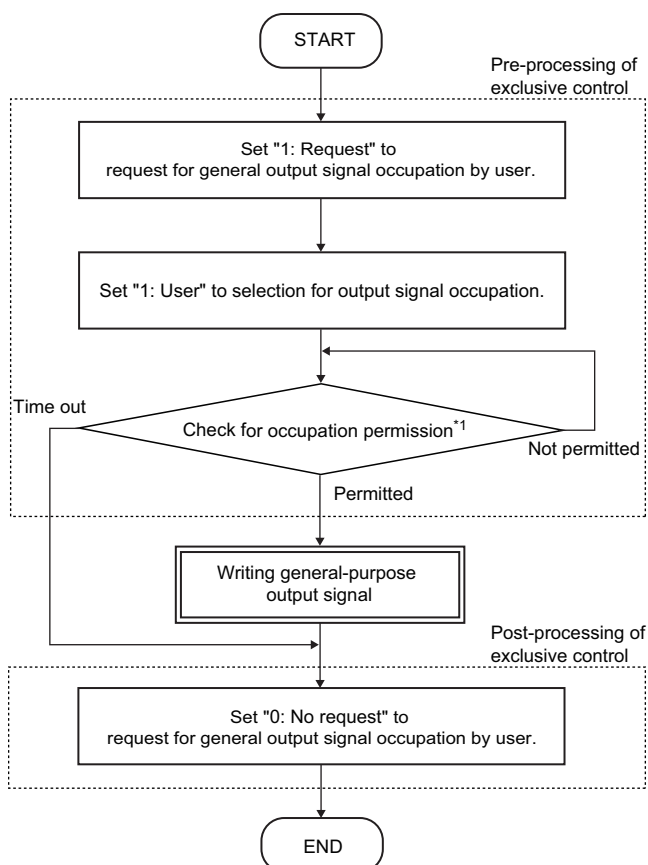
*1   Condition for occupation permission:
When the requesting general output signal occupation by system is "0: No request" or the selection for output signal occupation is "0: System".
Condition for occupy non-permission:
When the requesting general output signal occupation by system is "1: Request" or the selection for output signal occupation is "1: User".

■Condition for occupation permission of general-purpose output

Request for general output signal occupation by user	Requesting general output signal occupation by system	Selection for output signal occupation	Occupy status of general-purpose output signal	Occupy permitted/not permitted
0	0	0	No occupy.	No occupy request from user.
0	0	1		
0	1	0	Occupied by system.	
0	1	1		
1	0	0	Occupied by user.	Occupy permitted.
1	0	1		
1	1	0	Occupied by user. (Waiting for permission from system program)	
1	1	1	Occupied by system. (Waiting for permission from user program)	Occupy not permitted.

Restrictions

At the timing when the Motion control board accesses the general-purpose output signal, if the possessory right is not shifted to the Motion control board even after the waiting time[1] to obtain the possessory right elapses, the other axes start output signal control delay signal (OSDDL□) of the other axes start command/status table turns ON. The access to the general-purpose output signal is canceled, and the access to the general-purpose output signal is put on hold until the next operation cycle.

If the other axes start output signal control delay signal (OSDDL□) turns ON, high load on the user program is considered the cause. Review the program to lessen the load on the user program.

 *1   The waiting time to obtain the possessory right is as follows.
- When the operation cycle is 62.50μs: 1.25μs
- When the operation cycle is 125.00μs: 2.50μs
- When the operation cycle is 250.00μs: 5.00μs
- When the operation cycle is 500.00μs: 5.00μs
- When the operation cycle is 1000.00μs: 5.00μs
- When the operation cycle is 2000.00μs: 5.00μs

3

4 SYSTEM CONFIGURATION

This section describes the system configuration and equipment settings for the Motion control board.
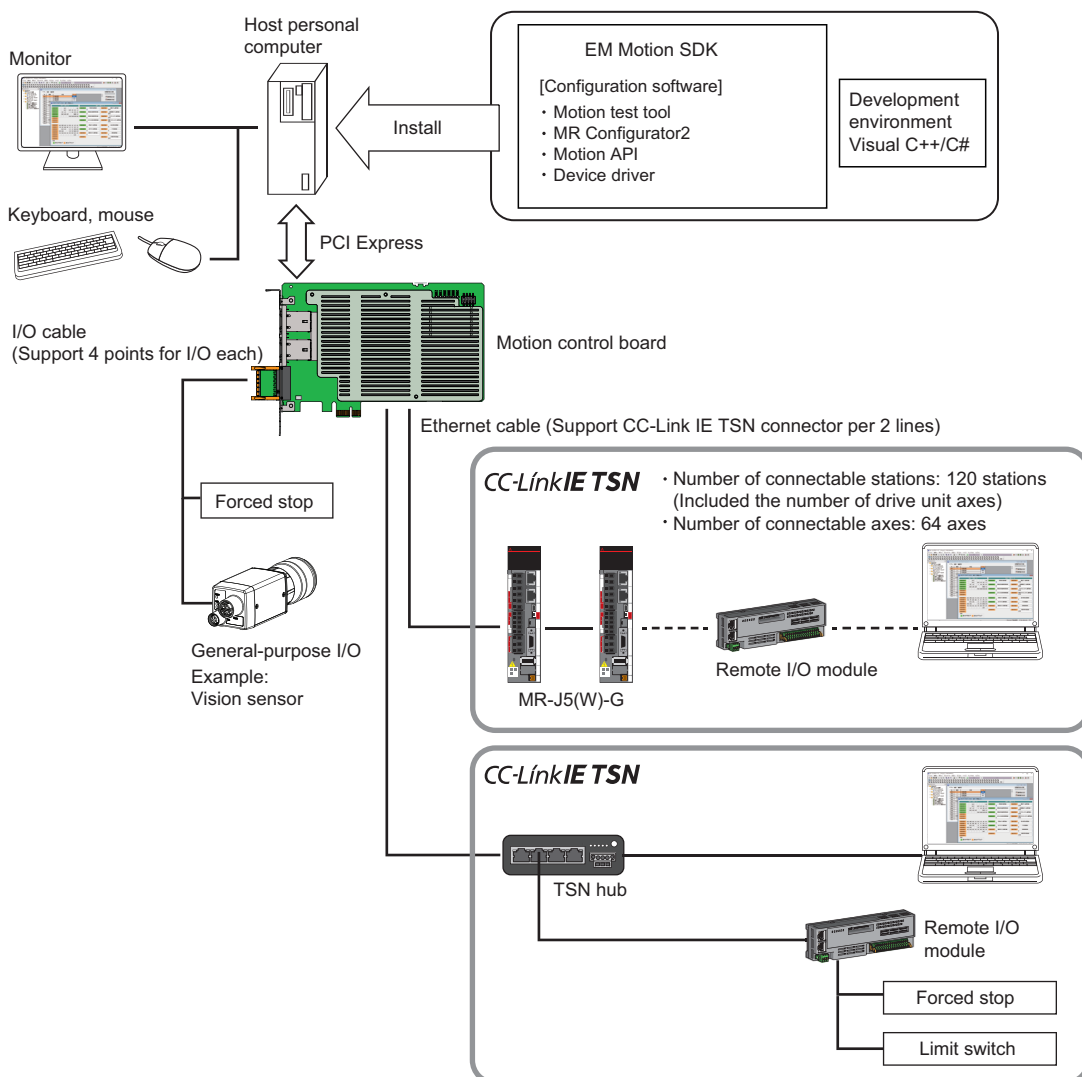
List of system configuration

The following shows the list of system configuration.

Configuration	Reference
Configuration of CC-Link IE TSN Class B devices and Ethernet devices	Page 48 Configuration of CC-Link IE TSN Class B Devices and Ethernet Devices
Configuration when CC-Link IE TSN Communication software is used	Page 54 Configuration when CC-Link IE TSN Communication Software is Used

Precautions

A dedicated TSN hub may be required depending on parameter settings or the network topology for connecting modules on CC-Link IE TSN. For details, refer to the following.

☞ Page 58 Wiring

Unicast mode and multicast mode

Cyclic transmission differs depending on the communication mode set by the network parameter of the master station. The types of communication modes are as follows.

- Unicast mode
- Multicast mode

CC-Link IE TSN Class Setting

Set the following by "CC-Link IE TSN Class Setting" under "Required Settings" of the motion test tool.

CC-Link IE TSN Class Setting	System configuration	Supported standard
CC-Link IE TSN Class B Only	Set this if the system is to be configured without connecting the CC-Link IE TSN Class A device. ☞ Page 51 Configuration of modules on CC-Link IE TSN only ☞ Page 52 Configuration of modules on CC-Link IE TSN and Ethernet devices	IEEE802.1AS

Point

- For the communication speed, the Motion control board is only supported with 1Gbps. When using the Ethernet device of which the communication speed is 100Mbps, assign the general-purpose hub between the CC-Link IE TSN Class B and the Ethernet device.
- It is not necessary to connect the module in order of station No. The No. in the following illustration shows the station No.
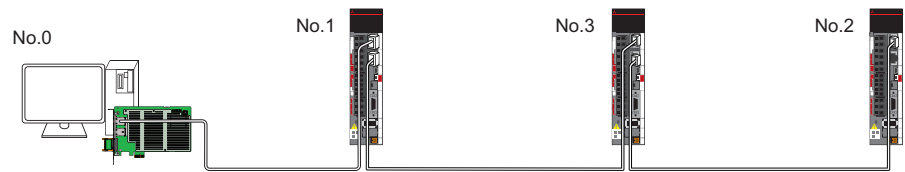
Ethernet connection

For the connection with MELSOFT products, refer to "Ethernet Connection" in the following manual.

📖 Motion Control Board User's Manual (Network)

4.1 Configuration of CC-Link IE TSN Class B Devices and Ethernet Devices

The following shows the system configuration when setting "CC-Link IE TSN Class Setting" under "Required Settings" to "CC-Link IE TSN Class B Only" in the motion test tool.

When setting "CC-Link IE TSN Class Setting" under "Required Settings" to "CC-Link IE TSN Class B Only", up to 121 stations (master station: 1, device station: 120) can be connected.
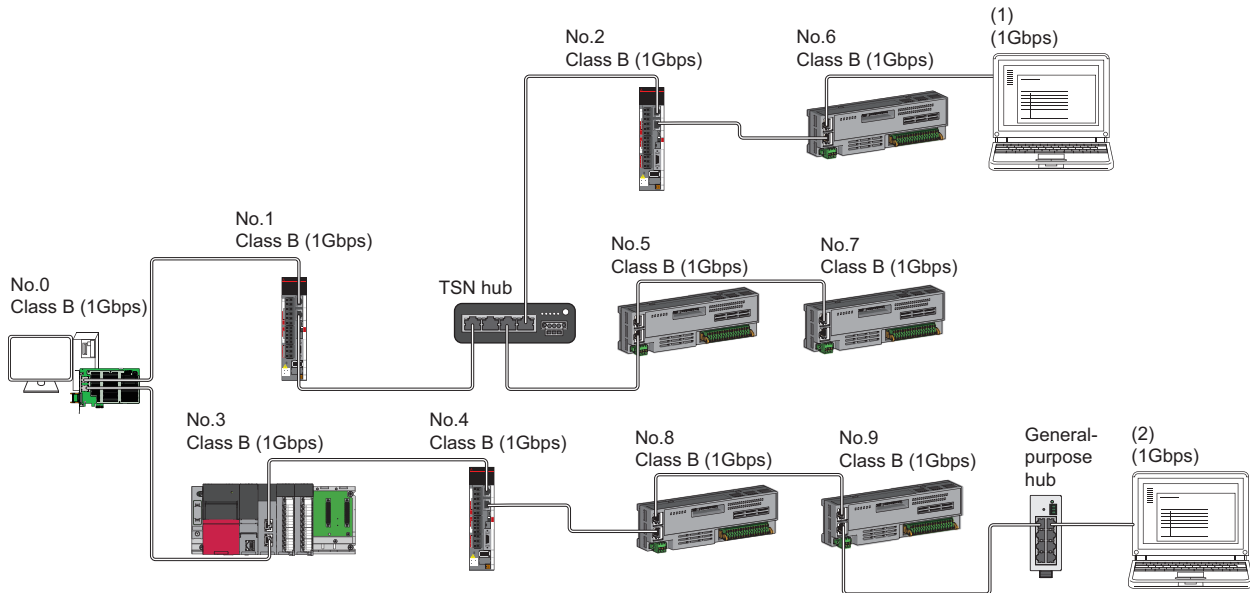
No.0: Master station
No.3: Local station
No.1, No.2, No.4, No.5, No.6, No.7, No.8, No.9: Remote station
(1), (2) Ethernet device
Class B: CC-Link IE TSN Class B device

The availability of connection of network configuration devices varies depending on the communication mode and the communication speed.

- Unicast mode
- Multicast mode

The following terms are used to describe the terms in the tables referenced.
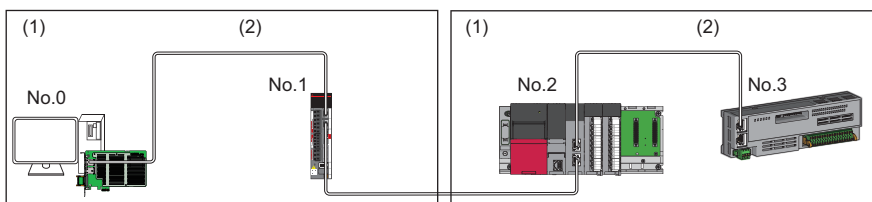
No.0: Master station
No.2: Local station
No.1, No.3: Remote station
(1) Device on the master station side (The master station or a device near the master station)[1]
(2) Device on the end side (A device far from the master station)[1]

*1   Categorization of 2 devices surrounded by each line

Configuration of unicast mode

The following shows the availability of connection with network configuration devices when "Mode" under "Communication Mode" of "Application Settings" is set to "Unicast".

When the communication speed for the master station is set to 1Gbps

The following table lists the availability of connection with a network configuration device when the communication speed for the master station is set to 1Gbps.

○: Connection available, ●: Connection available via a switching hub, ×: Connection not available

△: Connection available only when a device on the end side is a standard station

S: TSN hub available

H: general-purpose hub available

Device on the master station side (A device near the master station)		Device on the end side (A device far from the master station)					
		Local station (CC-Link IE TSN Class B device)		Remote station (CC-Link IE TSN Class B device)		Ethernet device	
		1Gbps	100Mbps	1Gbps	100Mbps	1Gbps	100Mbps
Master station (CC-Link IE TSN Class B device)	1Gbps	△S	×	○S	×	○SH	●H
Local station (CC-Link IE TSN Class B device)	1Gbps	△S	×	○S	×	○SH	●H
	100Mbps	×	×	×	×	×	×
Remote station (CC-Link IE TSN Class B device)	1Gbps	△S	×	○S	×	○SH	●H
	100Mbps	×	×	×	×	×	×

Precautions

When using a TSN hub, be sure to confirm the TSN hub specifications on the CC-Link Partner Association website (www.cc-link.org).

Configuration of multicast mode

The following shows the availability of connection with network configuration devices when "Mode" under "Communication Mode" of "Application Settings" is set to "Multicast".

When the communication speed for the master station is set to 1Gbps

The following table lists the availability of connection with a network configuration device when the communication speed for the master station is set to 1Gbps.

○: Connection available, ●: Connection available via a switching hub, ×: Connection not available

△: Connection available only when a device on the end side is a standard station

S: TSN hub available

H: general-purpose hub available

Device on the master station side (A device near the master station)		Device on the end side (A device far from the master station)					
		Local station (CC-Link IE TSN Class B device)		Remote station (CC-Link IE TSN Class B device)		Ethernet device	
		1Gbps	100Mbps	1Gbps	100Mbps	1Gbps	100Mbps
Master station (CC-Link IE TSN Class B device)	1Gbps	△S[*1]	×	○S[*1]	×	○SH[*1]	●H[*1]
Local station (CC-Link IE TSN Class B device)	1Gbps	△S[*1]	×	○S[*1]	×	○SH[*1*2]	●H[*1*2]
	100Mbps	×	×	×	×	×	×
Remote station (CC-Link IE TSN Class B device)	1Gbps	△S[*1]	×	○S[*1]	×	○SH[*1*2]	●H[*1*2]
	100Mbps	×	×	×	×	×	×

*1 When the device is connected on the end side via the switching hub as shown below, communication may not be possible depending on the type of the device.
  - A local station and Ethernet device coexist.
  - A remote station and Ethernet device coexist.
  The communication will be enabled by configuring settings with the switching hub so that the multicast frame (with multicast MAC address 09:00:70:00:10:02 and 09:00:70:00:10:05) will not be transferred to the ports specified below.

*2 For a local station or remote station of a device on the master station side, use a device supporting the multicast filter.

Precautions

When a TSN hub is used, be sure to check the TSN hub specifications on the CC-Link Partner Association website (www.cc-link.org).

Configuration of modules on CC-Link IE TSN only

Connection with modules on CC-Link IE TSN only

■ Line topology

The network is configured in a line topology. A TSN hub is not required.

When an error occurs in a device station, the stations connected after the faulty station are disconnected.
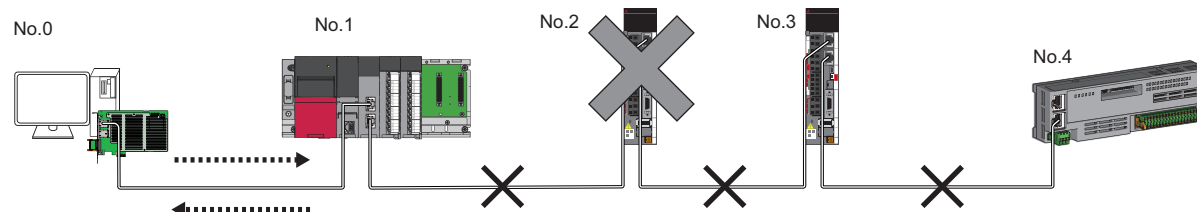
No.0: Master station
No.1: Local station
No.2, No.3, No.4: Remote station

■ Star topology

The network is configured in a star topology via a TSN hub. This allows devices to be added easily.
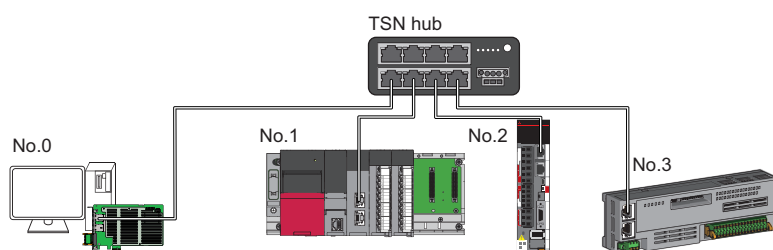
No.0: Master station
No.1: Local station
No.2, No.3: Remote station

Even when an error occurs in a device station, a data link can be continued with the stations that are operating normally.

■ Coexistence of line and star topologies

Line and star topologies are mixed.
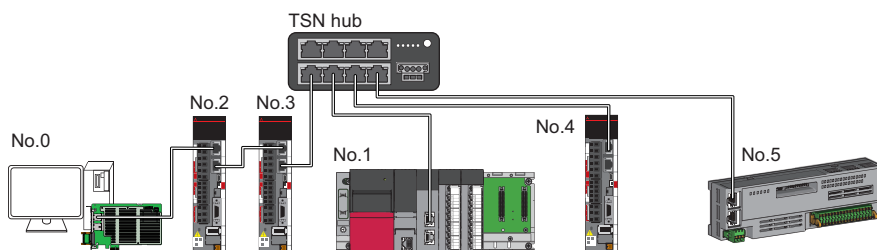
No.0: Master station
No.1: Local station
No.2, No.3, No.4, No.5: Remote station

Even when an error occurs in a device station, a data link can be continued with the stations that are operating normally.

Configuration of modules on CC-Link IE TSN and Ethernet devices

Connection with modules on CC-Link IE TSN and Ethernet devices

■ Line topology

The network with modules and devices is configured in a line topology. A TSN hub is not required.

Connect an Ethernet device to the end of the network.
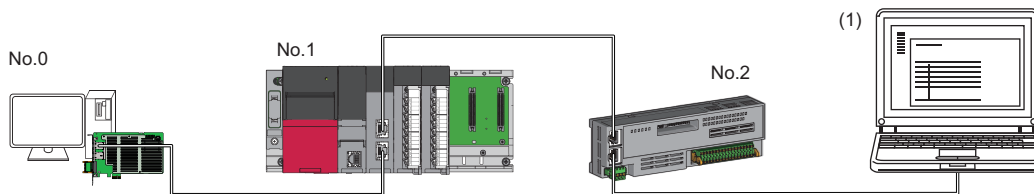
No.0: Master station
No.1: Local station
No.2: Remote station
(1) Ethernet device (such as a personal computer)

When an error occurs in a device station, the stations connected after the faulty station are disconnected.

■ Star topology

The network is configured in a star topology via a switching hub.

Device stations cannot be connected with a general-purpose hub. Line and star topologies should be mixed in the same network configuration.
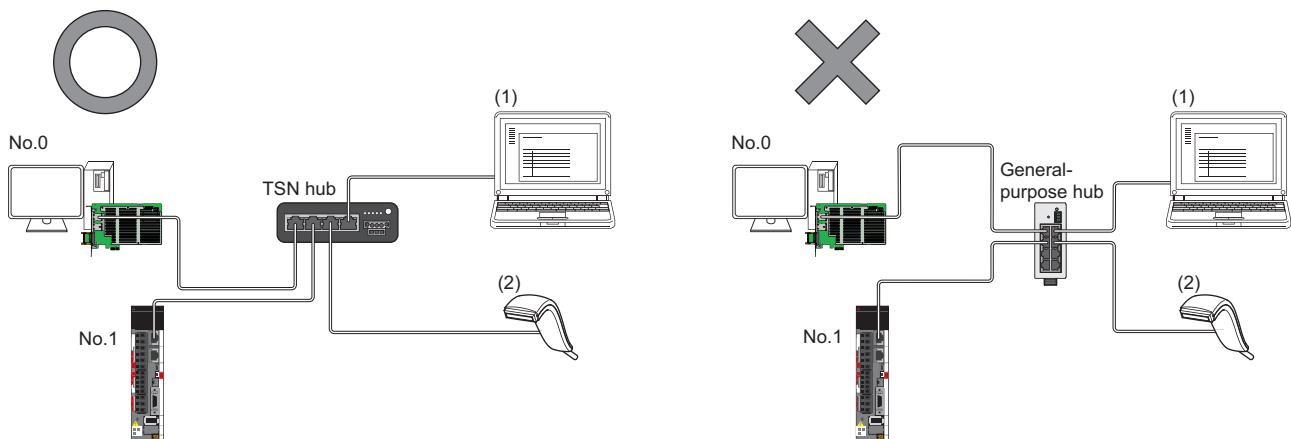
No.0: Master station
No.1: Remote station
(1) Ethernet device (such as a personal computer)

■ Coexistence of line and star topologies

Line and star topologies can be mixed in the same network configuration.

Connect Ethernet devices to the end of the network.
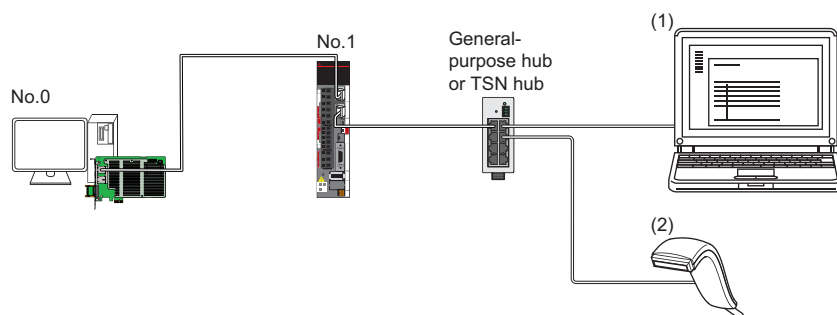
No.0: Master station
No.1: Remote station
(1), (2) Ethernet device (such as a personal computer)

4

4.2 Configuration when CC-Link IE TSN Communication Software is Used

Connection specifications

The system configuration of CC-Link IE TSN Communication Software is equivalent to the system configuration of local station (CC-Link IE TSN Class B). For the system configuration, refer to the following.

☞ Page 48 Configuration of CC-Link IE TSN Class B Devices and Ethernet Devices

Up to 2 personal computers on which CC-Link IE TSN Communication Software is installed can be connected to a free port of the CC-Link IE TSN Class B device (supporting CC-Link IE TSN) or a TSN hub.

■Line topology

Connect a personal computer on which CC-Link IE TSN Communication Software is installed to the end of the network.
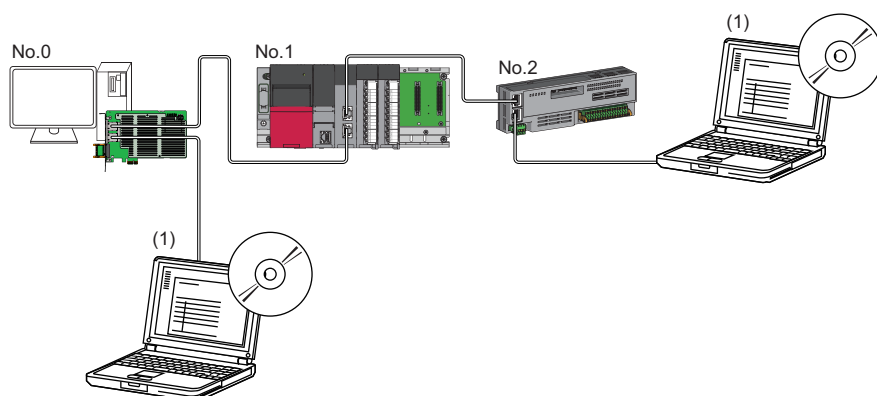
No.0: Master station
No.1: Local station
No.2: Remote station
(1) CC-Link IE TSN Communication Software

■Star topology

Connect a personal computer on which CC-Link IE TSN Communication Software is installed to a free port of the TSN hub.
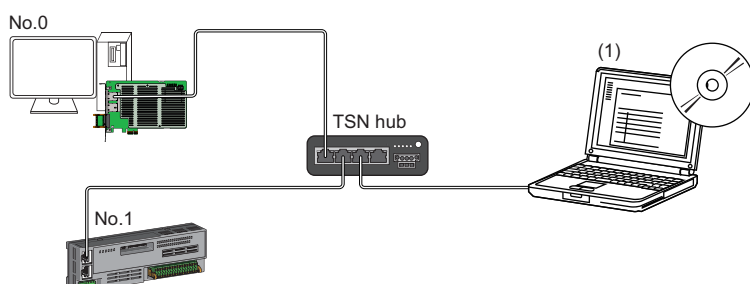
No.0: Master station
No.1: Remote station
(1) CC-Link IE TSN Communication Software

■Coexistence of line and star topologies

Connect a personal computer on which CC-Link IE TSN Communication Software is installed to a free port of the TSN hub or the end of the network.
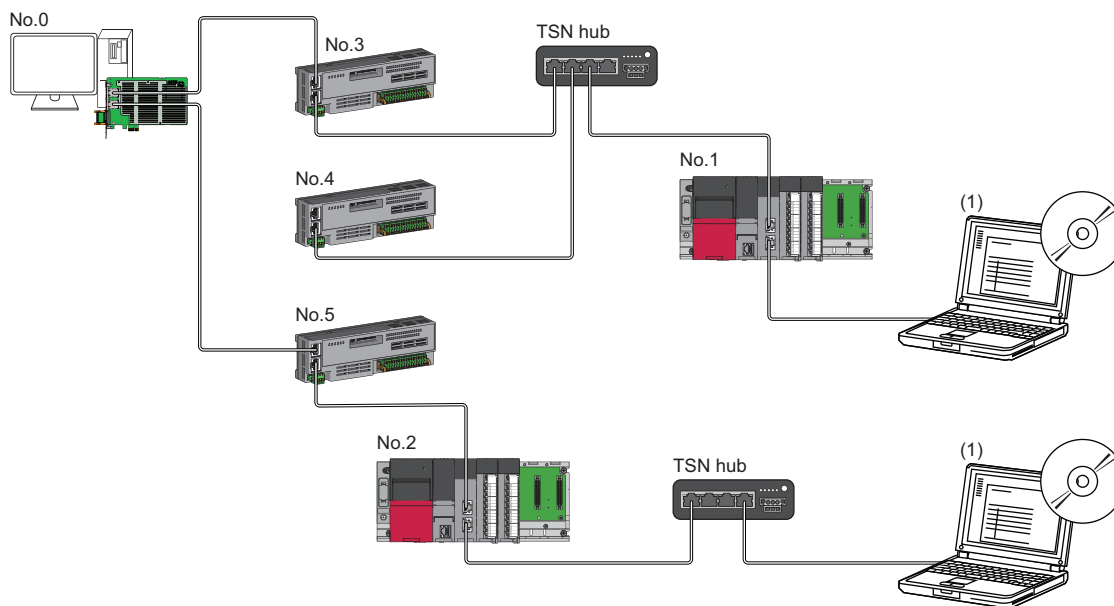
No.0: Master station
No.1, No.2: Local station
No.3, No.4, No.5: Remote station
(1) CC-Link IE TSN Communication Software

4.3 Precautions for System Configuration

Local station connection and multicast setting restrictions

Local station connection and multicast setting have the following version restrictions.

EM Motion SDK version	Base system software version of Motion control board
	"03" or earlier
"1.015R" or later	A network parameter error occurs in the Motion control board if any one of the following conditions is met. • A local or standard remote station exists in the network configuration. • The communication mode is set to multicast. • The link device is set to LB or LW.

Devices connected to the same network

Do not connect the devices as described below. Doing so may cause the disconnection of all stations.
• A module on CC-Link IE TSN and a device having different network types (such as CC-Link IE Controller Network or CC-Link IE Field Network) other than an Ethernet device are connected to the same network.
• A module on CC-Link IE TSN and an Ethernet device (such as a personal computer), both of which are on different networks, are connected to one switching hub.

Adding a device station with no IP address setting

In a line topology, do not connect the device station with no IP address setting at a place other than the end of the line. The data link may not be performed in the device stations after the device station with no IP address setting.

Network Diagnosis (CC-Link IE TSN Diagnosis)

The order which is displayed on "Detailed Information" under the Network Diagnosis (CC-Link IE TSN Diagnosis) does not always match with the actual network configuration.

5 INSTALLATION AND WIRING

5.1 Motion Control Board Installation

This section explains instructions for the handling and the installation environment of the Motion control board.

Instructions for handling

The following explains instructions for the handling.

- Shut off the external power supply (all phases) used in the system before mounting or removing the host personal computer of the Motion control board. Failure to do so may cause an electric shock, failure, or malfunction of the Motion control board.
- Do not touch any connectors while power is ON. Doing so may cause an electric shock or malfunction.
- Do not directly touch any conductive parts and electronic components of the Motion control board. Doing so may cause a failure or malfunction of the Motion control board.
- Do not disassemble or modify the Motion control board. Doing so may cause a failure, malfunction, injury, or fire.
- Use Motion control board fixing screws and securely tighten the Motion control board. Tighten the screws within the specified torque range. Undertightening can cause a drop, short circuit, or malfunction. Overtightening can damage the screw and/or the Motion control board, resulting in a drop, short circuit, or malfunction. For the tightening torque for the Motion control board fixing screws, refer to the manual attached to the host personal computer.
- Before handling the Motion control board, touch a conducting object such as a grounded metal to discharge the static electricity from the human body. Failure to do so may cause a malfunction or failure of the Motion control board.
- Install the Motion control board to a host personal computer which is compliant with PCI Express® standard. Failure to do so may cause a failure or malfunction.
- Securely insert the Motion control board into the PCI Express slot following the board installation instruction of the host personal computer. Incorrect insertion of the Motion control board may cause a malfunction, failure, or drop of the Motion control board.
- When installing the Motion control board, take care not to get injured by an implemented component or a surrounding member.
- When installing the Motion control board, take care not to contact with other Motion control boards.
- Handle the Motion control board in a place where static electricity will not be generated. Failure to do so may cause a failure or malfunction.
- The Motion control board is included in a static electricity preventing vinyl bag. When storing or transporting it, be sure to put it in the static electricity preventing vinyl bag. Failure to do so may cause a failure or malfunction.
- Do not drop or apply a strong impact to the Motion control board. Doing so may cause a failure or malfunction.
- Disable the power saving setting of PCI Express at the power settings of the host personal computer. If the power saving setting is enabled, the Motion control board may not be recognized properly by the host personal computer.

Installation environment

For the installation of the host personal computer in which the Motion control board is installed, refer to the manual for the host personal computer.

Instructions for Motion control board installation environment

- Use the Motion control board in an environment that meets the general specifications (☞ Page 27 General Specifications). Failure to do so may result in an electric shock, fire, malfunction, or damage to or deterioration of the product.
- Always ground the host personal computer with a ground resistance of 100 ohms or less. Failure to do so may cause a malfunction.

5.2 Wiring

CC-Link IE TSN wiring

This section describes wiring methods, wiring products, and wiring precautions.

Wiring methods

The following describes connection and disconnection of the Ethernet cable.

■Connecting the cable

1. Push the Ethernet cable connector into the Motion control board until it clicks. Pay attention to the direction of the connector.

2. Lightly pull it to confirm that it is securely connected.

3. Confirm whether the LINK LED of the Ethernet port P1 or P2 connected with an Ethernet cable is on. For details about the LED display specifications, refer to the following.
☞ Page 25 NAME OF EACH SECTION

> **Point**
>
> The time between the cable connection and the LINK LED turning on may vary. The LINK LED usually turns on in a few seconds. Note, however, that the time may be extended further if the link-up processing is repeated depending on the status of the device on the line. If the LINK LED does not turn on, refer to "Confirmation with LED" in the following manual and take corrective actions.
> 📖 Motion Control Board User's Manual (Network)

■Disconnecting the cable

1. Press the latch down and unplug the Ethernet cable.

Precautions

Be sure to follow the precautions for wiring. Otherwise, some functions may not operate normally. (In other words, some functions may operate normally temporarily.)

- Place the Ethernet cable in a duct or clamp it. If not, dangling cable may swing or inadvertently be pulled, resulting in damage to the Motion control board or cables or a malfunction due to a poor contact.
- Do not touch the core of the cable-side or the Motion control board-side connector, and protect it from dirt or dust. If oil from your hand, dirt or dust is attached to the core, it can increase transmission loss, arising a problem in a data link.
- Confirm that the Ethernet cable is not disconnected or not shorted and there is no problem with the connector connection.
- When connecting the Ethernet cable, refer to the CC-Link IE TSN Cable Installation Manual available from the website of CC-Link Partner Association (www.cc-link.org). The cable installation not following the contents of the manual may cause a malfunction.
- Do not use Ethernet cables with broken latches. Doing so may cause the cable to be unplugged or a malfunction.
- Hold the connector part when connecting and disconnecting the Ethernet cable. Pulling the cable connected to the Motion control board may result in a malfunction or damage to the Motion control board or the connector.
- For connectors without Ethernet cables, attached connector covers should be placed to prevent foreign matter such as dirt or dust.
- The maximum station-to-station distance of the Ethernet cable is 100m (328.08ft.). However, the length may be shorter depending on the operating environment of the cable. For details, contact the manufacturer of the cable used.
- The bend radius of the Ethernet cable is limited. For details, confirm the specifications of the Ethernet cable to be used.
- In a line topology, do not connect the device station with no IP address setting between the master station and the device stations, or between device stations. A data link may not be performed in the device stations connected from the device station with no IP address setting onwards. However, if the device station with no IP address setting is connected at the end of the line topology, the device stations between the master station and the device station at the end perform a data link.

- Communication with the Ethernet device may not be possible depending on the specifications of the connected Ethernet device or switching hub. If the communication is not possible, reduce the communication data volume of the Ethernet device.

Wiring products

The following describes the devices used for CC-Link IE TSN.

■Ethernet cable

Use the Ethernet cable that meets the following standards.

Communication speed	Ethernet cable	Connector	Standard
1Gbps	Category 5e or later, straight cable (shielded, STP)	RJ45 connector	The following conditioning cables: • IEEE 802.3 (1000BASE-T) • ANSI/TIA/EIA-568-B (Category 5e)

Cables for CC-Link IE TSN are available from Mitsubishi Electric System & Service Co., Ltd. (Catalogs for cable are also available.)

In addition, the connector processing of cable length is available for your preference. Please consult your local Mitsubishi representative.

Communication speed	Type	Model (Manufacturer)
1Gbps	Category 5e or higher, straight cable (double shielded, STP)	SC-E5EW series (Mitsubishi Electric System & Service Co., Ltd.)

Point

The communication error can occur with the high-frequency noise from the surrounding devices depending on the connecting environment. The following indicates the countermeasure of the Motion control board side to prevent the effect of the high-frequency noise.

Wiring connection
- Use a duplex shield type cable.
- In wiring process, do not install the cables together with the main circuit lines or power cables and keep them in distance.
- Place the cable in a duct.

■Switching hub

Use the following industrial switching hub.

Term	Description	CC-Link IE TSN Class
TSN hub[1]	For the models and usage methods of the switching hubs, refer to the CC-Link Partner Association website (www.cc-link.org).	CC-Link IE TSN Class B device
General-purpose hub		CC-Link IE TSN Class A device

[1]   For TSN hub, it is recommended to use the following specification.

Type	Model (Manufacturer)	Reference
CC-Link IE TSN industrial managed switch	NZ2MHG-TSNT□ (Mitsubishi Electric Corporation)	口CC-Link IE TSN Industrial Managed Switch User's Manual

A switching hub can be used for cascade connection.

When the switching hub is used for cascade connection, confirm the specifications of the switching hub used.

Precautions

- Since there are different restrictions for the system configuration using a TSN hub and the system configuration using a general-purpose hub, setting with an engineering tool is required. (☞ Page 46 SYSTEM CONFIGURATION)
- For the restrictions of the switching hub, refer to the manual of each product.
- Do not configure a ring topology when modules are connected to a switching hub. When a ring topology is configured, an error occurs in all stations, and data links cannot be performed.

6 PROCEDURES BEFORE OPERATIONS

This chapter describes the procedures before the operation of the Motion control board.

1. EM Motion SDK installation

Install the software development kit for motion control (EM Motion SDK) to the host personal computer. (☞ Page 61 EM Motion SDK)

2. Confirmation of wiring and ambient environment

Visually confirm whether the Motion control board and the servo amplifier are wired correctly. Also confirm the ambient environment. (☞ Page 62 Confirmation of Wiring and Ambient Devices)

3. Motion control board setting

Set a board ID by the board ID setting switch (switch 1/switch 2) of the Motion control board. (☞ Page 63 Motion Control Board Setting)

4. Drive unit setting

Set the IP address of MR-J5(W)-G by MR Configurator2, and write it to the servo amplifier.

For details, refer to "Application function"

📖MR-J5-G/MR-J5W-G User's Manual (Communication Function)

5. Parameter setting

Set each parameter by the motion test tool, and write it to the Motion control board. (☞ Page 64 Parameter Setting)

6. System startup

After setting each parameter, start the system startup. (☞ Page 79 System Startup Processing)

7. Perform operation

Then operate where necessary.

> *Point*
>
> When a test operation is necessary before creating a user program, the parameter settings, the system startup, the operation and such can be performed using the motion test tool.

6.1 EM Motion SDK

Install the EM Motion SDK to the host personal computer.

Installation method

For details about the installation method of the EM Motion SDK, refer to the following manual.
📖 MELSOFT EM Motion SDK Installation method

Precautions

Install the EM Motion SDK before installing the Motion control board to the host personal computer.
Without installation of the EM Motion SDK, the Motion control board does not operate. (The Motion control board cannot connect to the motion test tool either.)

■Control the Motion control board by the user program

When controlling the Motion control board by the user program, use the following.
- Device driver
- Motion API

■Status confirmation of the Motion control board

When confirming the status of the Motion control board, use the following.
- Motion system monitor (It is installed at the time of installing the device driver.)

■Parameter setting

When setting the parameter, use the following.
- Motion test tool

> **Point** 🔑
>
> When the Motion control board does not operate with the EM Motion SDK installed, confirm the status of the Motion control board by displaying the motion system monitor. When time setting is set to "Not Set", the device driver may not operate properly. Reboot the host personal computer. If the issue still persists, reinstall the EM Motion SDK.

6.2 Confirmation of Wiring and Ambient Devices

Wiring

For wiring, refer to the following.

⚠ CAUTION

Confirm that signal cables and buses of the host personal computer are not shorted by wire offcuts and metallic dust. Failure to do so may cause a breakage of the host personal computer and the Motion control board.

Cable treatment

Confirm that the wiring cables and the connector part should not be strained.

Environment

For environment, refer to the following.

6.3 Motion Control Board Setting

The board ID is set by the board ID setting switch (switch 1/switch 2) of the Motion control board.

> **Point**
> - Do not turn ON the switch 3. When turning ON the switch 3 by mistake, "Manufacturer Setting Switch Detected as ON (error code: 1C9AH)" occurs. When the switch 3 is ON, accessing to the dual port memory (such as writing system command codes and parameter settings) cannot be performed.
> - Do not turn ON the switch 4. When turning ON the switch 4 by mistake, "Manufacturer Setting Switch Detected as ON (error code: 0F11H)" occurs.

Board ID

The board ID and the board ID setting switch (switch 1/switch 2) Nos. are correlated as shown in the table below. Set the board ID so that it does not duplicate. If it is duplicated, it may interfere with the board identification on the host personal computer.

Board ID	Switch 1	Switch 2
0	OFF	OFF
1	ON	OFF
2	OFF	ON
3	ON	ON

The following is a setting example for controlling four Motion control boards.

Ex.

Bus on host personal computer

Motion control board	Motion control board	Motion control board	Motion control board
Board ID: 0	Board ID: 2	Board ID: 1	Board ID: 3
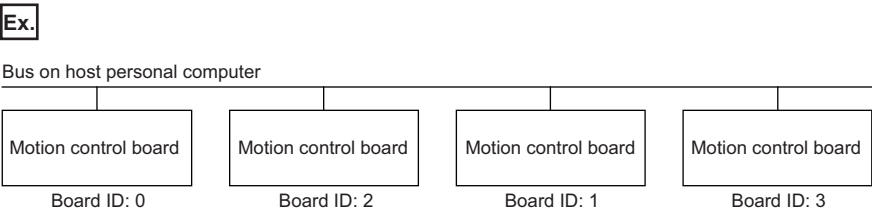
> **Point**
> - The board ID may be in no particular order, and can be arbitrarily selected from 0 to 3.
> - The number of connectable Motion control boards varies by the bus specifications of the host personal computer (up to 4).

6.4 Parameter Setting

After the system preparation is completed, set the parameters according to the system such as the operation cycle and the input option of the external signal (limit switch (LSP/LSN), proximity dog (DOG), external forced stop signal (EMI)).

The setting parameters vary whether controlling the device as "axis" or "other than axis".

When controlling the device station as "axis"

The parameter settings when controlling the device station as "axis" are as follows.
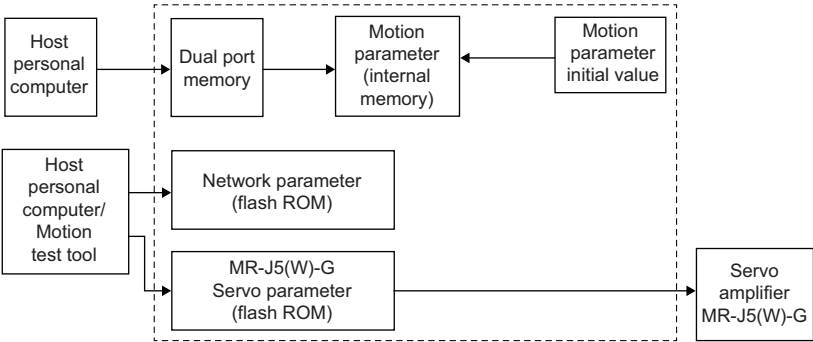
The following shows the parameters.

Parameter		Reference
Motion parameter	System parameter	Page 564 PARAMETERS
	Control parameter	
	Axis control parameter	
Network parameter		Motion Control Board User's Manual (Network)
Servo parameter		MR-J5-G/MR-J5W-G User's Manual (Parameters)

When controlling the device station as "other than axis"

For the parameter settings when controlling the device station as "other than axis", refer to "Connectable device to CC-Link IE TSN" in the following manual.

Motion Control Board User's Manual (Network)

Setting Network Parameter

These parameters are required that the Motion control board communicates with other stations.

For details about the network parameter setting and the setting procedure, refer to "Setting Parameters" in the following manual.

📖 Motion Control Board User's Manual (Network)

In order to control MR-J5(W)-G, set the following parameters.

> **Point** 🖉
>
> The network parameter becomes valid at the time of next startup. After setting the network parameter, turn on the power again or reboot the software.

Required Settings

■CC-Link IE TSN Class settings

Set "CC-Link IE TSN Class B Only".

Basic Settings

■Communication cycle settings

Communication cycle is a cycle in which the Motion control board controls the operation such as command import, position control, status output, and communication with MR-J5(W)-G.

Select the communication cycle interval settings from the following table. The number of controllable axes depends on the selected communication cycle.

Communication cycle [µs]	Maximum number of controllable axes (rough standard)	Maximum number of controllable axes when using high speed operation mode (reference)
62.50	2 axes	4 axes
125.00	12 axes	22 axes
250.00	32 axes	60 axes
500.00	64 axes	64 axes
1000.00	64 axes	64 axes
2000.00	64 axes	64 axes

> **Point** 🖉
>
> • The reference of the maximum number of controllable axes is measured under the condition when only connecting with MR-J5-G and starting up all axes simultaneously in the automatic operation (trapezoidal acceleration/deceleration).
> • The reference of the maximum number of controllable axes when using the high speed operation mode is measured under the condition when connecting with MR-J5W3-G as much as possible and starting up all axes simultaneously in the automatic operation (trapezoidal acceleration/deceleration).

Network Configuration Settings

Add MR-J5(W)-G to be connected. Add MR-J5(W)-G by dragging and dropping from "Device selection" window on the right of the screen. Set the network configuration setting in order to correspond with the system configuration.

When controlling MR-J5(W)-G to be connected as "axis", the setting for the axis No. allocation of the motion parameter is required. For the setting method, refer to the following.

■Disabling control axis switch settings (MR-J5(W)-G)

MR-J5(W)-G is equipped with the disabling control axis switch in the DIP switch (SW3), and the switch can disable the certain axis. In order to correspond with the system configuration of MR-J5(W)-G, set the extension module with the Network Configuration Settings.

> **Point** 🖉
>
> • For details about the disabling control axis switch, refer to the following manual.
>   📖 MR-J5-G/MR-J5W-G User's Manual (Introduction)
> • When the system configuration does not match the Network Configuration Settings (multidrop No. setting), the unmatched MR-J5(W)-G cannot be connected.

Ex.
Example of system configuration
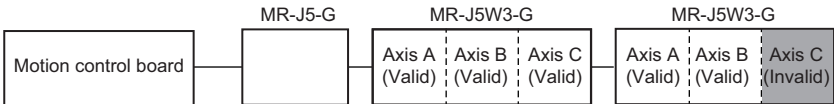
Example of Network Configuration Settings

StaNo.	No.	Instance Name	Model Name	IP Address	Station Type	Multidrop ...	Motion Control Station	Parameter ...	Reserved S...	Station-specific mo...	Comment
		▼ Motion Control Board	MR-EM441G	192.168.3.253	Master station						
1	1	🖳 MR-J5-G	MR-J5-G	192.168.3.1	Remote station		✓	☐	☐	Motion Mode ▼	General-Purpose AC Servo
2	2	▼ 🖳 MR-J5W3-G	MR-J5W3-G	192.168.3.2	Remote station	0	✓	☐	☐	Motion Mode	General-Purpose AC Servo
	3	🖳 MR-J5W3-G_BC_Axis	MR-J5W3-G_BC_Axis			1					General-Purpose AC Servo
	4	🖳 MR-J5W3-G_BC_Axis_2	MR-J5W3-G_BC_Axis			2					General-Purpose AC Servo
3	5	▼ 🖳 MR-J5W3-G_2	MR-J5W3-G	192.168.3.3	Remote station	0	✓	☐	☐	Motion Mode	General-Purpose AC Servo
	6	🖳 MR-J5W3-G_BC_Axis_3	MR-J5W3-G_BC_Axis			1					General-Purpose AC Servo

■Motion Control Station

Check Motion Control Station.

Cyclic Settings

■NetworkSync

Select "Do" for synchronization.

■CANopen

Set the PDO mapping as necessary.

- TPDO

When using the sensor (LSP/LSN/DOG) of MR-J5(W)-G (when setting "Sensor input system" of "Sensor input options (parameter No.0219)" to "1: Driver input"), add "Digital inputs (Obj. 60FDh)".

<PDO mapping setting screen>

Add "Digital inputs (Obj. 60FDh)".

■Necessary objects

When performing system startup (system command code: 000Ah) without setting the objects which the Motion control board requires, "Slave Object Setting Error (operation alarm No.0080H)" occurs. Confirm the cause of the operation alarm. When not setting the objects intentionally, reset the operation alarm and continue the control.

The necessary objects of the Motion control board are shown below.

 • MR-J5(W)-G

1st PDO Map: 1st Receive PDO Mapping or 1st Transmit PDO Mapping (Use it when selecting "Motion Mode" in "Station-specific mode setting".)

2nd PDO Map: 2nd Receive PDO Mapping or 2nd Transmit PDO Mapping (Use it when selecting "Motion Mode (High-Speed)" in "Station-specific mode setting")

◎: Necessary object of the Motion control board (Setting the object is a must.)

 When not setting the object, MR-J5(W)-G cannot be connected.

○: Object which exists in the default mapping

—: Object which does not exist in the default mapping (Set as necessary.)

[ ]: Detail function in the certain function

( ): Supplementary explanation such as a condition

Index	RPDO object	1st PDO Map	2nd PDO Map	Motion control board related function (function which defines the necessary object)	Remarks (example of servo amplifier related function)[1]
1D01h	Watch dog counter DL	○	○	—	—
6060h	Modes of operation	◎/○	◎/○	Operational function [operational common]	—
607Ah	Target position	◎/○	◎/○	Operational function [operational common]	—
60FFh	Target velocity	○	—	—	—
6040h	Controlword	◎/○	◎/○	• Operational function [operational common] • Servo ON/Servo OFF • Forced stop • Stop operation (only when driver homing method) • Rapid stop operation (only when driver homing method) • Alarm/system error [drive unit alarm reset] • User watchdog function[2]	—
60E0h	Positive torque limit value	○	—	• Torque limit [normal revolution torque limit] • Continuous operation to torque control	—
60E1h	Negative torque limit value	○	—	• Torque limit [reverse revolution torque limit] • Continuous operation to torque control	—
6071h	Target torque	○	—	Continuous operation to torque control	—
2D20h	Velocity limit value	○	—	• Continuous operation to torque control • Pressure control	—
2D01h	Control DI 1	○	—	—	• Gain switching • Fully closed loop control switching
2D02h	Control DI 2	○	—	—	Proportional control
2D03h	Control DI 3	○	—	—	—
2D04h	Control DI 4	○	○	—	—
2D05h	Control DI 5	○	—	Operational function [driver homing method] (when inputting LSP signal/LSN signal/DOG signal via a controller)	Gain switching2
2E50h	Target pressure	○	—	Pressure control	—
2E56h	Pressure forward end position	○	—	Pressure control	—

*1 This is an example of a servo amplifier function. For other functions, refer to the following manuals.
　　📖MR-J5-G/MR-J5W-G User's Manual (Communication Function)
　　📖MR-J5-G/MR-J5W-G User's Manual (Object Dictionary)
*2 This function is supported in the basic system software version "02" or later.

Index	TPDO object	1st PDO Map	2nd PDO Map	Motion control board related function (function which defines the necessary object)	Remarks (example of servo amplifier related function)[1]
1D02h	Watch dog counter UL	○	○	—	—
6061h	Modes of operation display	◎/○	◎/○	Operational function [operational common, control mode status]	—
6064h	Position actual value	◎/○	◎/○	• Operational function [operational common] • High speed monitor function [current feedback position, feedback moving speed]	—
606Ch	Velocity actual value	○	○	—	—
60F4h	Following error actual value	○	—	• High speed monitor function [position droop] • Deviation monitoring function	—
6041h	Statusword	◎/○	◎/○	• Operational function [operational common] • Servo ON/servo OFF • Forced stop • Stop operation (only when driver homing method) • Rapid stop operation (only when driver homing method) • Absolute position detection system [ABSE signal] • Alarm/system error [SALM signal, SWRN signal] • Interrupt [SALM signal, SWRN signal] • Driver command discard detection[2]	—
6077h	Torque actual value	○	○	• Continuous operation to torque control • High speed monitor function [current feedback]	—
2D11h	Status DO 1	○	○	• Torque limit [TLC signal] • Absolute position detection system [ABSE signal] • In-position signal [SINP signal] • Interrupt [TLC signal, ABSE signal, SINP signal]	• Gain switching • Fully closed loop control switching
2D12h	Status DO 2	○	—	Interrupt [ZSP signal, ZPAS signal]	Proportional control
2D13h	Status DO 3	○	—	—	—
2D14h	Status DO 4	○	○	—	—
2D15h	Status DO 5	○	—	—	Gain switching2
2A41h	Current alarm	○	○	Alarm/System error [drive unit alarm No./detail No.]	—
2D21h	Reserved	○	—	—	—
2D22h	Reserved	○	—	—	—
60FDh	Digital inputs	—	—	External signal setting [LSP signal, LSN signal] (only when driver input) High speed monitor function [external signal status] (only when driver input)	—
2E52h	Pressure actual value	○	—	Pressure control	—

*1 This is an example of a servo amplifier function. For other functions, refer to the following manuals.
📖MR-J5-G/MR-J5W-G User's Manual (Communication Function)
📖MR-J5-G/MR-J5W-G User's Manual (Object Dictionary)
*2 This function is supported in the basic system software version "02" or later.

■**IP address setting**

Set the IP address of MR-J5(W)-G.

For the IP address setting of the Motion control board, set it within the same network group with MR-J5(W)-G, and do not overlap with the IP address of MR-J5(W)-G.

■**Device station parameter automatic setting**

For the servo parameter of MR-J5(W)-G, set it by using the device station parameter automatic setting function. For details, refer to "Device station parameter automatic setting" in the following manual.

📖Motion Control Board User's Manual (Network)

Motion parameter setting

After turning on the Motion control board power, set the motion parameter before the system startup starts.
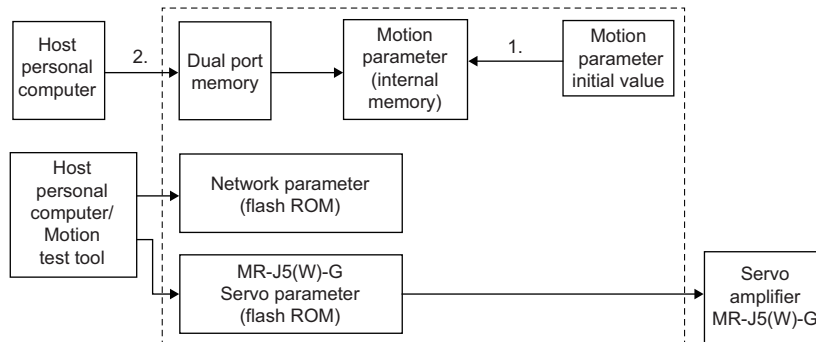
1. Confirm system preparation completion (system status code: 0001h).

2. Write the motion parameter from the host personal computer if required.

> **Point**
>
> For details about network parameter and servo parameter setting methods, refer to the following manual.
> 📖 Motion Control Board User's Manual (Network)

> **Point**
>
> [Motion API]
> - To confirm the system preparation completion, use the sscGetSystemStatusCodeEx function.
> - To write the motion parameter, use the sscChangeParameter function/sscChange2Parameter function.

Drive unit control setting

When controlling MR-J5(W)-G, set "1: Controlled" for "Control axis" of "Control option 1 (parameter No.0200)". Control axis settings are imported in at the time of system startup (system command code: 000Ah), and during system running (system status code: 000Ah) cannot be changed.

Control parameter

Parameter No.	Symbol *1	Name	Initial value	Units	Setting range	Description	When in tandem drive
0200	*OPC	Control option 1	0000h	—	0000h to 1111h	■■■□ (Control axis) Set "1: Controlled" when controlling the drive unit. • 0: Not controlled • 1: Controlled ■■□■ (Drive-unit-less) Set "1: Valid" when not communicating with the drive unit. When setting "1" with "Control axis", the operation without the drive unit (simulation) is available. • 0: Invalid • 1: Valid ■□■■ (No home position) Set "1: Valid" when setting the position at the time of power on as the home position. After returning to the home position, the home position becomes the position where the home position return is performed. • 0: Invalid • 1: Valid □■■■ (Speed unit) Set the speed command unit. • 0: Position command unit/min • 1: Position command unit/s	Same value

*1 The settings for the parameters with a * mark at the front of the symbol become valid when the system is started.

Axis No. assignment

Assign the station address of MR-J5(W)-G to the axis No. from 1 to 64 on the Motion control board to be able to control the specified MR-J5(W)-G as an axis.

When performing the axis No. assignment, set the following motion parameters.

Point

- When the setting value of the axis No. assignment (parameter No.0403 to 040E) is the initial value, "System Setting Error (operation alarm No.0038H, detail No.0002H)" occurs.
- When the station address is set outside the valid range, "System Setting Error (operation alarm No.0038H, detail No.0003H)" occurs.
- When setting the same station address to the multiple axes, "System Setting Error (operation alarm No.0038H, detail No.0004H)" occurs.
- When the station which is set by axis No. assignment is non-motion control station or non-supportive station for CANopen, "System Setting Error (operation alarm No.0038H, detail No.0005H)" occurs.
- When the station which is set by axis No. assignment does not exist in the network parameter, "System Setting Error (operation alarm No.0038H, detail No.0005H)" occurs.

⚠ CAUTION

- Make sure that the axis No. assignment is correct beforehand. Use the monitor function and confirm the following monitor Nos. of the selected axis.
  IP address (IPv4) (monitor No.00001132H)
  Station No. (monitor No.00000130H)
  Multidrop No. (monitor No.00000131H)
- When connected with another axis by mistake, it may cause a malfunction of the device.

Axis management parameter

Parameter No.	Symbol[1]	Name	Initial value	Units	Setting range	Description	When in tandem drive
0400	*AXALCOP	Axis No. option	0000h	—	0000h	Set the designation method of the station address which is assigned to the axis No. • 0000h: IP address (IPv4), multidrop No.	Each axis
0403	*IPV41	IPv4 first & second octet	0000h	—	0000h to FFFFh	Set the station address of the device station which is assigned to the axis No. of the Motion control board. Set the first and second octet of the IP address (IPv4). (The range of the IP address is "1.0.0.1 to 223.255.255.254".) <Example> IP address "192.168.3.1" Set C0A8h (C0h=192, A8h=168).	Each axis
0404	*IPV42	IPv4 third & fourth octet	0000h	—	0000h to FFFFh	Set the station address of the device station which is assigned to the axis No. of the Motion control board. Set the third and fourth octet of the IP address (IPv4). (The range of the IP address is "1.0.0.1 to 223.255.255.254".) <Example> IP address "192.168.3.1" Set 0301h (03h=3, 01h=1).	Each axis
040F	*MDNUM	Multidrop station No.	0	—	0 to 7	Set the station address of the device station which is assigned to the axis No. of the Motion control board. Set the multidrop No. ■For a single axis device <Example> MR-J5-G Set "0". ■For a multi-axis device <Example> MR-J5W3-G Set the following axis No. Axis A: 0 Axis B: 1 Axis C: 2	Each axis

*1 The settings for the parameters with a * mark at the front of the symbol become valid when the system is started.

Setting example

The following is an axis management parameter example when setting MR-J5(W)-G as below by "Network Configuration Settings" of "Setting Network Parameter".

■Network Configuration Settings

StaNo.	No.	Instance Name	Model Name	IP Address	Station Type	Multidrop Number	Motion Control Station	Parameter Automatic Setting	Reserved Station	Station-specific mode setting	Comment
		▼ Motion Control Board	MR-EM441G	192.168.3.253	Master station						
1	1	MR-J5-G	MR-J5-G		Remote station		☑	☐	☐	Motion Mode ▼	General-Purpose AC Servo
2	2	▼ MR-J5W2-G	MR-J5W2-G		Remote station	0	☑	☐	☐	Motion Mode	General-Purpose AC Servo
	3	MR-J5W2-G_B_Axis	MR-J5W2-G_B_Axis			1					General-Purpose AC Servo
3	4	▼ MR-J5W3-G	MR-J5W3-G		Remote station	0	☑	☐	☐	Motion Mode	General-Purpose AC Servo
	5	MR-J5W3-G_BC_Axis	MR-J5W3-G_BC_Axis			1					General-Purpose AC Servo
	6	MR-J5W3-G_BC_Axis_2	MR-J5W3-G_BC_Axis			2					General-Purpose AC Servo

■Axis management parameters

• When assigning MR-J5-G (IP address: 192.168.3.1, multidrop No.: 0) to axis 1

Set each axis management parameter of axis 1 as follows.

Parameter No.	Symbol[1]	Name	Setting value	Description
			Axis 1	
0400	*AXALCOP	Axis No. option	0000h	Set "0000h: IP address (IPv4), multidrop No.".
0403	*IPV41	IPv4 first & second octet	C0A8h	Set the first and second octet of the IP address. • First octet (192): C0h • Second octet (168): A8h
0404	*IPV42	IPv4 third & fourth octet	0301h	Set the third and fourth octet of the IP address. • Third octet (3): 03h • Fourth octet (1): 01h
040F	*MDNUM	Multidrop station No.	0	Set the multidrop No.

*1 The settings for the parameters with a * mark at the front of the symbol become valid when the system is started.

• When assigning MR-J5W2-G (IP address: 192.168.3.2, multidrop No.: 0, 1) to axis 2 and axis 3

Set each axis management parameter of axis 2 and axis 3 as follows.

Parameter No.	Symbol[1]	Name	Setting value		Description
			Axis 2	Axis 3	
0400	*AXALCOP	Axis No. option	0000h	0000h	Set "0000h: IP address (IPv4), multidrop No.".
0403	*IPV41	IPv4 first & second octet	C0A8h	C0A8h	Set the first and second octet of the IP address. • First octet (192): C0h • Second octet (168): A8h
0404	*IPV42	IPv4 third & fourth octet	0302h	0302h	Set the third and fourth octet of the IP address. • Third octet (3): 03h • Fourth octet (2): 02h
040F	*MDNUM	Multidrop station No.	0	1	Set the multidrop No. • Axis 2: 0 (axis A) • Axis 3: 1 (axis B)

*1 The settings for the parameters with a * mark at the front of the symbol become valid when the system is started.

• When assigning MR-J5W3-G (IP address: 192.168.3.3, multidrop No.: 0 to 2) to axis 4 to axis 6

Set each axis management parameter of axis 4 to axis 6 as follows.

Parameter No.	Symbol[1]	Name	Setting value			Description
			Axis 4	Axis 5	Axis 6	
0400	*AXALCOP	Axis No. option	0000h	0000h	0000h	Set "0000h: IP address (IPv4), multidrop No.".
0403	*IPV41	IPv4 first & second octet	C0A8h	C0A8h	C0A8h	Set the first and second octet of the IP address. • First octet (192): C0h • Second octet (168): A8h
0404	*IPV42	IPv4 third & fourth octet	0303h	0303h	0303h	Set the third and fourth octet of the IP address. • Third octet (3): 03h • Fourth octet (3): 03h
040F	*MDNUM	Multidrop station No.	0	1	2	Set the multidrop No. • Axis 4: 0 (axis A) • Axis 5: 1 (axis B) • Axis 6: 2 (axis C)

*1   The settings for the parameters with a * mark at the front of the symbol become valid when the system is started.

General-purpose I/O

Set the following motion parameters when using the general-purpose I/O (DIO) such as the external forced stop signal (EMI).

System parameters

Parameter No.	Symbol[1]	Name	Initial value	Units	Setting range	Description
0006	*DOOP	General output (DO) option	0000h	—	0000h to 0001h	■■■□ (DO common selection) Set sink/source of the DO common. • 0: Sink • 1: Source
0014	*EMIDI	Input signal settings for emergency stop	0000h	—	0000h to 00F2h	■■■□ (Input signal setting) Set the input signal for emergency stop. • 0: General-purpose input specification • 1: Input bit device specification • 2: Input word device specification ■■□■ (Bit selection) When specifying the input word device, set the bit No. to use. <Example>When using fifth bit Set 5.
0015	*EMIS	Specification of sensor signal (EMI) connection	0000h	—	0000h to 3FFFh	■For "0: General-purpose input specification" (DI□□□□) Set the general-purpose input (DI) No. to which EMI is connected. • 0000h to 0003h: DI0 to DI3 ■For "1: Input bit device specification" (RX□□□□) Set the input bit device (RX) No. to which EMI is connected. • 0000h to 3FFFh: RX0000 to RX3FFF ■For "2: Input word device specification" (RWr□□□□) Set the input word device (RWr) No. to which EMI is connected. • 0000h to 1FFFh: RWr0000 to RWr1FFF

*1   The settings for the parameters with a * mark at the front of the symbol become valid when the system is started.

> **Point**
>
> For the specifications of general-purpose I/O connector, refer to the following.
> ☞ Page 37 General-purpose I/O Specifications

External signal setting

The external signal (limit switch (LSP/LSN), proximity dog signal (DOG)) is connected by setting "Sensor input options (parameter No.0219)".

> **Point**
>
> It is recommended to set "Limit switch enabled status selection (PD41.2)" to "1: Enabled only for homing mode" when using the limit switch (LSP/LSN) with the Motion control board and MR-J5(W)-G combination by the basic system software version "01". For details about "Limit switch enabled status selection (PD41.2)" of the servo parameter, refer to "Stroke limit function [G]" in the following manual.
> 📖 MR-J5 User's Manual (Function)

Control parameter

Parameter No.	Symbol *1	Name	Initial value	Units	Setting range	Description	When in tandem drive
0219	*SOP	Sensor input options	0000h	—	0000h to 0304h[2]	■■■□ (Sensor input system) Set the input system of the sensor (LSP, LSN, DOG). • 0: Not use • 1: Driver input • 3: Not connected (It does not detect LSP, LSN, DOG.) • 4: Axis command bit input ■□■■ (Limit switch signal selection) Set valid/invalid of the limit switch. • 0: LSP/LSN are valid • 1: LSP is valid, LSN is invalid • 2: LSP is invalid, LSN is valid • 3: LSP/LSN are invalid	Each axis

*1 The settings for the parameters with a * mark at the front of the symbol become valid when the system is started.

*2 When the parameter is set outside the setting range, "Parameter Error (operation alarm No.0037H, detail No.0001H)" occurs. The Sensor input options becomes the during system running in a state of an initial value.

When setting to "1: Driver input"

When setting "Sensor input system" of "Sensor input options (parameter No.0219)" to "1: Driver input" as the sensor destination, the status of the sensor (LSP/LSN/DOG) which is connected to the driver is imported via CC-Link IE TSN. When using "1: Driver input", it is required to set "Digital inputs (Obj. 60FDh)" to the TPDO by Setting Network Parameter. For details, refer to the following.

☞ Page 67 Cyclic Settings

> **Point**
> - When setting "Sensor input system" of "Sensor input options (parameter No.0219)" to "1: Driver input" without setting "Digital inputs (Obj. 60FDh)", "Slave Object Setting Error (operation alarm No.0080H, detail No.0003H)" occurs.
> - When setting "Drive-unit-less axis function" of "Control option 1 (parameter No.0200)" to "1: Valid", "Slave Object Setting Error (operation alarm No.0080H, detail No.0003H)" does not occur.
> - Since the status of the sensor (LSP/LSN/DOG) cannot be received while "Slave Object Setting Error (operation alarm No.0080H, detail No.0003H)" occurs, the operation cannot start.

■MR-J5(W)-G is used as a servo amplifier
- MR-J5-G

Signal name	Destination connector pin No.	Symbol
LSP	CN3-2	DI1
LSN	CN3-12	DI2
DOG	CN3-19	DI3

- MR-J5W2-G

Signal name	Destination connector pin No.		Symbol[*1]
	A-axis	B-axis	
LSP	CN3-7	CN3-20	DI1□
LSN	CN3-8	CN3-21	DI2□
DOG	CN3-9	CN3-22	DI3□

*1 □: A, B
- MR-J5W3-G

Signal name	Destination connector pin No.			Symbol[*1]
	A-axis	B-axis	C-axis	
LSP	CN3-7	CN3-20	CN3-1	DI1□
LSN	CN3-8	CN3-21	CN3-2	DI2□
DOG	CN3-9	CN3-22	CN3-15	DI3□

*1 □: A, B, C

> **Point**
> - For the sensor connection to the MR-J5(W)-G, refer to the following manual.
>   📖 MR-J5 User's Manual (Hardware)
> - When the connection with MR-J5(W)-G is disconnected due to a communication error, the input status of the sensor (LSP/LSN/DOG) is turned OFF.

When setting to "3: Not connected"

When setting "Sensor input system" of "Sensor input options (parameter No.0219)" to "3: Not connected" as the sensor destination, the sensor (LSP/LSN/DOG) is not detected. Limit switch functions are always invalid. In the home position return using the proximity dog, the Motion control board operates without the detected proximity dog.

When setting to "4: Axis command bit input"

When setting "Sensor input system" of "Sensor input options (parameter No.0219)" to "4: Axis command bit input" as the sensor destination, + side limit switch input signal (LSPC), - side limit switch input signal (LSNC) and proximity dog input signal (DOGC) are imported as substitutes for sensors.

Address (hexadecimal)[*1]	Bit	Symbol	Signal name	When in tandem drive
00001004	0	ITL	Interlock	Master
	1	RMONR	High speed monitor latch command	Each axis
	2	—	For manufacturer setting	—
	3			
	4	LSPC	+ side limit switch input	Each axis
	5	LSNC	- side limit switch input	Each axis
	6	DOGC	Proximity dog input	Each axis
	7	—	For manufacturer setting	—

*1 The address in the table is the address for the first axis. For the second axis and after, add "10h" for each axis.

Point

When the sensor input command (LSPC, LSNC, DOGC) is turned ON, a normally-open contact turns ON (a normally-closed contact turns OFF). The polarity of the limit switch input command is the normally-closed contact.

⚠ CAUTION

When setting "Sensor input system" of "Sensor input options (parameter No.0219)" to "1: Driver input", a delay occurs due to the communication to detect the signal status. In addition to the time until the device to be used detects the input signal, take the delay time due to the communication into consideration when installing each sensor.
- Communication delay time when the communication cycle is 62.50µs: 62.50µs
- Communication delay time when the communication cycle is 125.00µs: 125.00µs
- Communication delay time when the communication cycle is 250.00µs: 250.00µs
- Communication delay time when the communication cycle is 500.00µs: 500.00µs
- Communication delay time when the communication cycle is 1000.00µs: 1000.00µs
- Communication delay time when the communication cycle is 2000.00µs: 2000.00µs

6.5 System Startup Processing

System startup procedure

After setting each parameter, start the system startup before performing operations.

The system startup procedure is shown below.

1. Perform start system startup command (system command code: 000Ah).

2. Confirm during system running (system status code: 000Ah).

The Motion control board performs axis controlling according to the parameters set (☞ Page 70 Motion parameter setting), and during system running (system status code: 000Ah) occurs. To start the system startup and confirm the during system running, use the sscSystemStart function.

> *Point*
>
> The communication with MR-J5(W)-G starts automatically after turning the Motion control board's power supply on, and execute the association with the axis of the Motion control board after the system startup. (Preparing to be able to control the axis.)
>
> After the system startup, confirm whether MR-J5(W)-G is controllable with "Controlling axis information 1 (address: 00000408H to 0000040BH)" and "Controlling axis information 2 (address: 0000040CH to 0000040FH)" of System Configuration.

> *Point*
>
> [Motion API]
>
> To start the system startup, use the sscSystemStart function.

Interface

■System data (low speed) (system command data)

Address (hexadecimal)	Name	Description
00000860, 00000861	System command code	Start up the system by setting "000Ah: System startup" before the operation.[1] • 0000h: Initial value • 000Ah: System startup

[1] When setting the system command code other than the above, "System Command Code Error (system status code error: EF01H)" occurs. When setting "000Ah: System startup" again at this time, the error can be removed.

■System data (low speed) (system status data)

Address (hexadecimal)	Name	Description
00000900, 00000901	System status code	Display the current system status. • 0000h: During system preparation • 0001h: System preparation completion • 0008h: During control axis initialization 1 • 0009h: During control axis initialization 2 • 000Ah: During system running • 000Fh: Software rebooting • E□□□h: System status code error

■System configuration information

Address (hexadecimal)	Name	Remarks
00000408	Controlling axis information 1	The bit corresponding to the currently controllable axis (the axis under the CC-Link IE TSN communication or the drive-unit-less axis) is turned ON. The bit is from axis 1 (bit0) to axis 32 (bit31).
00000409		
0000040A		
0000040B		
0000040C	Controlling axis information 2	The bit corresponding to the currently controllable axis (the axis under the CC-Link IE TSN communication or the drive-unit-less axis) is turned ON. The bit is from axis 33 (bit0) to axis 64 (bit31).
0000040D		
0000040E		
0000040F		

Sequence example
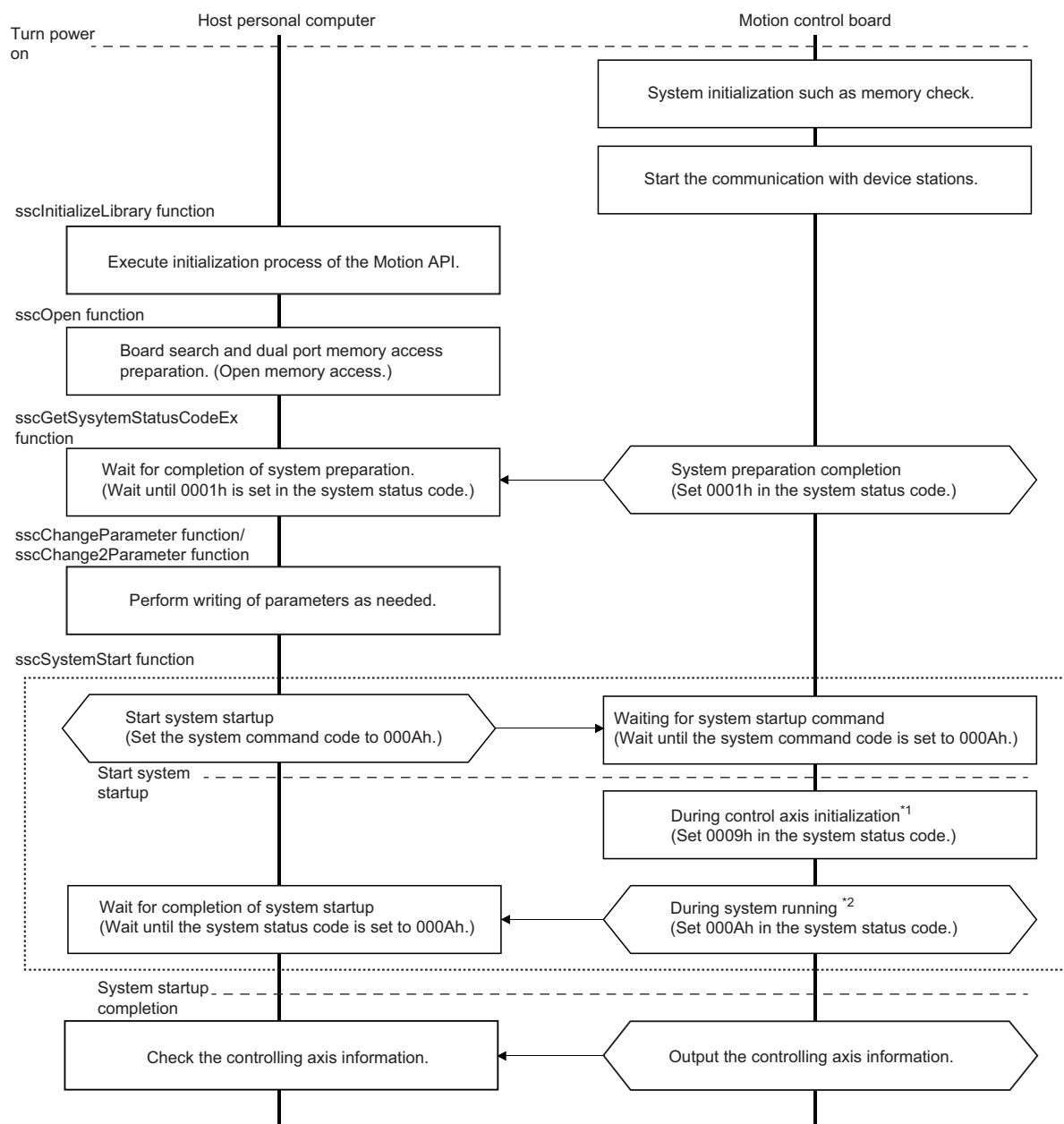
*1 Initialization is implemented for the axes for which "Control axis" of "Control option 1 (parameter No.0200)" is set to "1: Controlled", therefore, be sure to set the control axis parameters.

*2 If an error occurs during the system startup, an error code is set in the system status code. For the error codes, refer to the following.

Point

For details about the sequence before the sscSystemStart function, refer to the following.

7 OPERATIONAL FUNCTIONS

7.1 Operational Function Mode

There are six modes in operational functions of the Motion control board.

Operation mode	Description	Control mode of the drive unit used by the operational function
JOG operation	Operate while the start operation signal (ST) is ON.	Cyclic synchronous position mode (csp)
Incremental feed	Feed constant	Cyclic synchronous position mode (csp)
Automatic operation	Position according to the point table.	• Cyclic synchronous position mode (csp) • Continuous operation to torque control mode (ct) • Cyclic synchronous pressure mode (cspr)
Interpolation operation	Perform the linear interpolation control for up to 4 axes and the circular interpolation control[1] for 2 axes according to the point table.	Cyclic synchronous position mode (csp)
Home position return	Move to the home position, and establish the home position.	Home position return mode (hm)
Home position reset	Set the current command position as the home position.	Cyclic synchronous position mode (csp)

*1 This function is supported in the basic system software version "02" or later.

After selecting the operation mode, the operation is started by turning ON the start operation signal (ST)/fast start operation signal (FST). The operation processing signal (OP) turns ON during the operation, and when the operation is completed, the operation completed signal (OPF) turns ON.

Interface

The common axis data (high speed) command/status bits for operational functions are as follows.

Axis data (high speed) (command bit)

The addresses in the table are the addresses for the first axis. For the second axis and after, add "+10h" for each axis.

Address (hexadecimal)	Bit	Symbol	Signal name	When in tandem drive
00001001	0	ST	Start operation	Master
	1	DIR	Movement direction	Master
	2	STP	Stop operation	Master
	3	RSTP	Rapid stop	Master
	4	—	For manufacturer setting	—
	5	ORST	Operation alarm reset	Master
	6	—	For manufacturer setting	—
	7			

Address (hexadecimal)	Bit	Symbol	Signal name	When in tandem drive
00001002	0	AUT	Automatic operation mode	Master
	1	ZRN	Home position return mode	Master
	2	JOG	JOG operation mode	Master
	3	S	Incremental feed mode	Master
	4	—	For manufacturer setting	—
	5	LIP	Interpolation operation mode	Master
	6	DST	Home position reset mode	Master
	7	—	For manufacturer setting	—

Address (hexadecimal)	Bit	Symbol	Signal name	When in tandem drive
00001006	0	FST	Fast start operation	Master
	1	—	For manufacturer setting	—
	2			
	3			
	4			
	5			
	6			
	7			

■Details concerning command bit

Symbol	Signal name	Function details	
		Function	Operation
ST	Start operation	Start the operation.	When the start operation signal (ST) turns ON while the operation is stopped, the selected operation mode starts. For the JOG operation, the deceleration starts when the start operation signal (ST) turns OFF. For the other operation modes, the operation does not stop even when the start operation signal (ST) turns OFF. When the start operation signal (ST) turns ON during the operation, it is invalid.
DIR	Movement direction	Specify the movement direction. Use in the JOG operation mode/ incremental feed mode.	When the movement direction signal (DIR) turns ON, and the start operation signal (ST) turns ON, the operation starts in the reverse direction. When the movement direction signal (DIR) turns OFF, and the start operation signal (ST) turns ON, the operation starts in the forward direction.
AUT	Automatic operation mode	Specify the automatic operation mode.	When the automatic operation mode signal (AUT) turns ON, the automatic operation mode is specified. When the automatic operation mode signal (AUT) turns OFF, the automatic operation mode is canceled.
ZRN	Home position return mode	Specify the home position return mode.	When the home position return mode signal (ZRN) turns ON, the home position return mode is specified. When the home position return mode signal (ZRN) turns OFF, the home position return mode is canceled.
JOG	JOG operation mode	Specify the JOG operation mode.	When the JOG operation mode signal (JOG) turns ON, the JOG operation mode is specified. When the JOG operation mode signal (JOG) turns OFF, the JOG operation mode is canceled.
S	Incremental feed mode	Specify the incremental feed mode.	When the incremental feed mode signal (S) turns ON, the incremental feed mode is specified. When the incremental feed mode signal (S) turns OFF, the incremental feed mode is canceled.
LIP	Interpolation operation mode	Specify the interpolation operation mode.	When the interpolation operation mode signal (LIP) turns ON, the interpolation operation mode is specified. When the interpolation operation mode signal (LIP) turns OFF, the interpolation operation mode is canceled.
DST	Home position reset mode	Specify the home position reset mode.	When the home position reset mode signal (DST) turns ON, the home position reset mode is specified. When the home position reset mode signal (DST) turns OFF, the home position reset mode is canceled.
FST	Fast start operation	Start the operation. Instead of using the start operation signal (ST), by using the fast start operation signal (FST), the time taken to start the operation from the second time and after can be reduced. This is not supported in the JOG operation.	When the fast start operation signal (FST) turns ON while the operation is stopped, the selected operation mode starts. When the start operation is accepted, the fast start operation signal (FST) is tuned OFF. When the fast start operation signal (FST) turns ON during the operation, it is invalid.

Point

[Motion API]

The fast start operation signal (FST) is used in the internal processing of all start operational functions (sscAutoStart function etc.), except for the JOG operation.

Axis data (high speed) (status bit)

The addresses in the table are the addresses for the first axis. For the second axis and after, add "+10h" for each axis.

Address (hexadecimal)	Bit	Symbol	Signal name	When in tandem drive
00006001	0	OP	Operation processing	Master
	1	CPO	Rough match	Master
	2	PF	Positioning completed	Master
	3	ZP	Home position return completed	Master
	4	SMZ	Smoothing stop	Master
	5	OALM	Operation alarm	Master
	6	OPF	Operation completed	Master
	7	PSW	Position switch	Each axis

Address (hexadecimal)	Bit	Symbol	Signal name	When in tandem drive
00006002	0	AUTO	In automatic operation mode	Master
	1	ZRNO	In home position return mode	Master
	2	JO	In JOG operation mode	Master
	3	SO	In incremental feed mode	Master
	4	—	For manufacturer setting	—
	5	LIPO	In interpolation operation mode	Master
	6	DSTO	In home position reset mode	Master
	7	—	For manufacturer setting	—

Address (hexadecimal)	Bit	Symbol	Signal name	When in tandem drive
00006004	0	ISTP	Interlock stop	Master
	1	RMRCH	High speed monitor being latched	Each axis
	2	POV	Exceeded stop position	Master
	3	STO	Start up acceptance completed	Master
	4	—	For manufacturer setting	—
	5			
	6	ZREQ	Home position return request	Master
	7	DCDD	Driver command discard detected	Master

■Details concerning status bit

Symbol	Signal name	Function details		
		Function	**Operation**	
			Conditions for turning ON	**Conditions for turning OFF**
OP	Operation processing	Notify that the axis is in the operation.	The start operation signal (ST)/fast start operation signal (FST) turned ON, and the operation started.	The operation is completed.
PF	Positioning completed	Notify that the positioning of the end point in the operation that uses the point table is completed normally. Unlike the operation completed signal (OPF), it does not turn ON due to the alarm and the stop operation signal (STP) etc.	The positioning of the end point is completed normally.	The start operation signal (ST)/fast start operation signal (FST) turned ON, and the next operation started. The operation mode was changed.
ZP	Home position return completed	Notify that the home position return is completed normally.	The home position return is completed normally.	The start operation signal (ST)/fast start operation signal (FST) turned ON, and the next operation started. The operation mode was changed.
SMZ	Smoothing stop	Notify the drive unit that the output of command pulse is stopped. For the interpolation operation mode, notify the drive unit that the output of command pulses for all axes which are set to the same group is stopped.	All of the conditions below have been established, and the output of command pulses has stopped. (1) The operation of command pulses (before the filter) has completed, or is temporarily stopped. (during pauses such as positioning complete and interlocks) (2) The command pulse to the drive unit is "0". (3) When using the smoothing filter, or the vibration suppression command filter 1, the droop of the internal operation of the filter (for command pulses that have not been output) is "0". (4) During the interpolation operation, the conditions (1) to (3) above have been established in each axis in the group.	When one of the conditions for turning ON has not been established, and the output of command pulses has started. Or the driver homing method is in the operation.[1]
OPF	Operation completed	Notify that the axis has completed the operation.	The operation has completed.	The start operation signal (ST)/fast start operation signal (FST) turned ON, and the next operation started.
AUTO	In automatic operation mode	Notify that the axis is in the automatic operation mode.	The automatic operation mode signal (AUT) turns ON.	The automatic operation mode signal (AUT) turns OFF. Multiple operation modes are selected. An unsupported operation mode is selected.
ZRNO	In home position return mode	Notify that the axis is in the home position return mode.	The home position return mode signal (ZRN) turned ON.	The home position return mode signal (ZRN) turns OFF. Multiple operation modes are selected. An unsupported operation mode is selected.
JO	In JOG operation mode	Notify that the axis is in the JOG operation mode.	The JOG operation mode signal (JOG) turned ON.	The JOG operation mode signal (JOG) turns OFF. Multiple operation modes are selected. An unsupported operation mode is selected.
SO	In incremental feed mode	Notify that the axis is in incremental feed mode.	The incremental feed mode signal (S) turned ON.	The incremental feed mode signal (S) turns OFF. Multiple operation modes are selected. An unsupported operation mode is selected.

Symbol	Signal name	Function details		
		Function	**Operation**	
			Conditions for turning ON	**Conditions for turning OFF**
LIPO	In interpolation operation mode	Notify that the axis is in the interpolation operation mode.	The interpolation operation mode signal (LIP) turned ON.	The interpolation operation mode signal (LIP) turns OFF. Multiple operation modes are selected. An unsupported operation mode is selected.
DSTO	In home position reset mode	Notify that the axis is in home position reset mode.	The home position reset mode signal (DST) turns ON.	The home position reset mode signal (DST) turns OFF. Multiple operation modes are selected. An unsupported operation mode is selected.
POV	Exceeded stop position	Notify that the stop position was exceeded by continuous operation, or position change.	The stop position is exceeded.	The start operation signal (ST) turned ON, and the next operation started. The operation mode was changed.
STO	Start up acceptance completed	Notify that the start operation signal (ST) has been accepted.	The start operation signal (ST) turns ON.	The start operation signal (ST) turns OFF.

*1   When the basic system software version is "02" or later, the condition which the driver homing method is in the operation is included in the condition for turning OFF.

Precautions

The precautions common to each operation mode are described below.

- When the operation is started before selecting the operation mode, "Operation Mode Error (operation alarm No.0020H, detail No.0002H)" occurs, and the operation is not performed. Be sure to select the operation mode before starting the operation.

- When multiple operation modes are selected and the operation is started, "Operation Mode Error (operation alarm No.0020H, detail No.0001H)" occurs, and the operation is not performed. Be sure to select one operation mode and start the operation.

- When the operation mode is changed during the operation, "Mode Change During Operation (operation alarm No.0023H, detail No.0001H)" occurs, and the operation is stopped. Do not change the operation mode during the operation.

- When starting the operation, be sure to confirm that the start up acceptance completed signal (STO) (or the fast start operation signal (FST)) is turned OFF before turning ON the start operation signal (ST) (or the fast start operation signal (FST)). The signals are read every operation cycle, therefore the rise of the start operation signal (ST) (or the fast start operation signal (FST)) may not be able to be confirmed.⋯(1)

Point

[Motion API]

With regard to (1) of Precautions above, confirming that the start up acceptance completed signal (STO) (or the fast start operation signal (FST)) are OFF is performed in the internal processing of all start operation functions (sscAutoStart function etc.), therefore this process is not required in the user program.

Point

For the table bit for each signal, refer to the following.

Maximum number of simultaneous start axes

There are restrictions for the number of axes which can start simultaneously in each operational function and in start operation using other axes start. When the number of started axes exceeds the maximum number of simultaneous start axes, the start operation is performed for the rest of axes in the next operation cycle or later.

Operation cycle [μs]	Maximum number of simultaneous start axes
62.50	2
125.00	4
250.00	12
500.00	32
1000.00	64
2000.00	64

Point

- For the start operation of the interpolation operation, one group is regarded to consist of four axes, irrespective of the number of axes in the group.
- For the start operation of the tandem drive, one group is regarded to consist of one axis.
- The start operation by other axes start takes priority, the other axes start in order.
- When the number of axes which is set in the start axis designation of the other axes start table exceeds the maximum number of simultaneous start axes, other axes start error occurs when the other axes start conditions are fulfilled.
- When setting the high speed operation mode, only the maximum number of synchronous startup axes becomes the value of each operation group.

Necessary objects

The necessary objects for operational functions are as follows.

Operation mode	Necessary objects (Not setting the object is not available.)	
	TPDO	**RPDO**
JOG operation	• Modes of operation display (Obj. 6061h)	• Modes of operation (Obj. 6060h)
Incremental feed	• Position actual value (Obj. 6064h)	• Controlword (Obj. 6040h)
Automatic operation	• Statusword (Obj. 6041h)	• Target position (Obj. 607Ah)
Interpolation operation		
Home position return		
Home position reset		

Point

If the necessary objects are not set at the PDO mapping, "Necessary Slave Object Unset (error code: 1AA8H)" occurs, and MR-J5(W)-G cannot be connected.

7.2 JOG Operation

When the movement direction is specified and the start operation signal (ST) is input, it starts in the designated direction and movement continues until the start operation signal (ST) turns OFF. When the start operation signal (ST) turns OFF, it slows and comes to a stop.

The JOG operation can be used without completing the home position return (the home position return request signal (ZREQ) is ON).
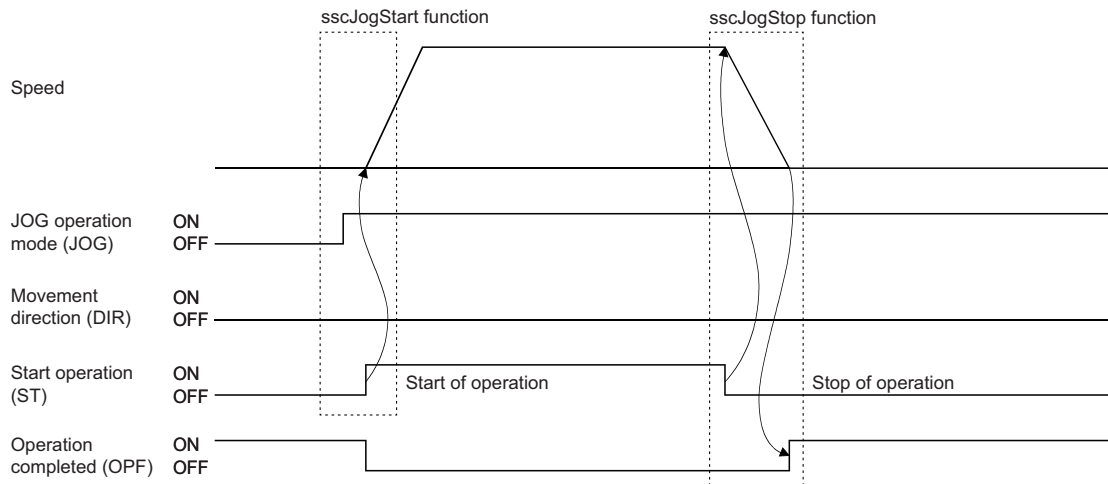
Start operation method

The start operation is performed according to the following procedure.

Operating procedure

1. Turn ON the JOG operation mode signal (JOG).

2. Set the manual feed speed, the manual feed acceleration time constant, and the manual feed deceleration time constant.

3. Use the movement direction signal (DIR) to set the movement direction of the axis. When the movement direction signal (DIR) is OFF, the axis moves in the + direction. And when it is ON, the axis moves in the - direction.

4. Turn ON the start operation signal (ST).

> **Point**
>
> The manual feed speed, the manual feed acceleration time constant, the manual feed deceleration time constant, and the movement direction signal (DIR) are read at the startup of the start operation signal (ST). Therefore, even if there are changes to the data or signal after the start operation, they are ignored.

> **Point**
>
> [Motion API]
> • To perform the procedures 1. to 4., use the sscJogStart function.
> • To perform the stop operation, use the sscJogStop function/sscJogStopNoWait function.

Resuming operation

When the start operation signal (ST) turns OFF, the deceleration is started; however, if the start operation signal (ST) turns back ON while decelerating, it does not completely stop but reaccelerates.
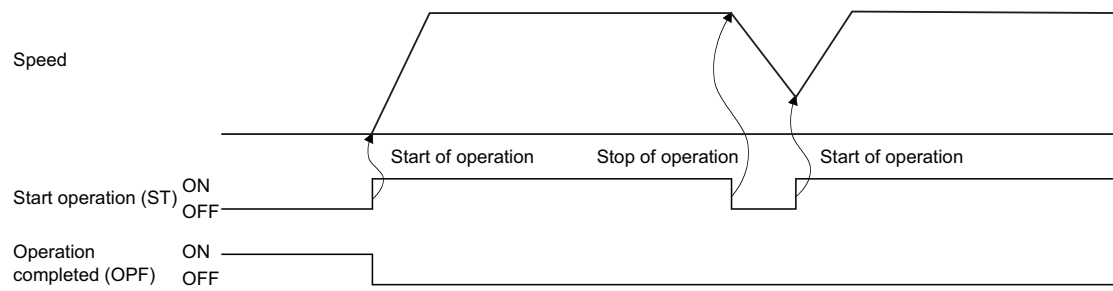
7.3   Incremental Feed

The constant feed is implemented for each fast start operation signal (FST). The feed amount is specified using the incremental feed movement amount.

The incremental feed also can be used in the state without completing the home position return (the home position return request signal (ZREQ) is ON).
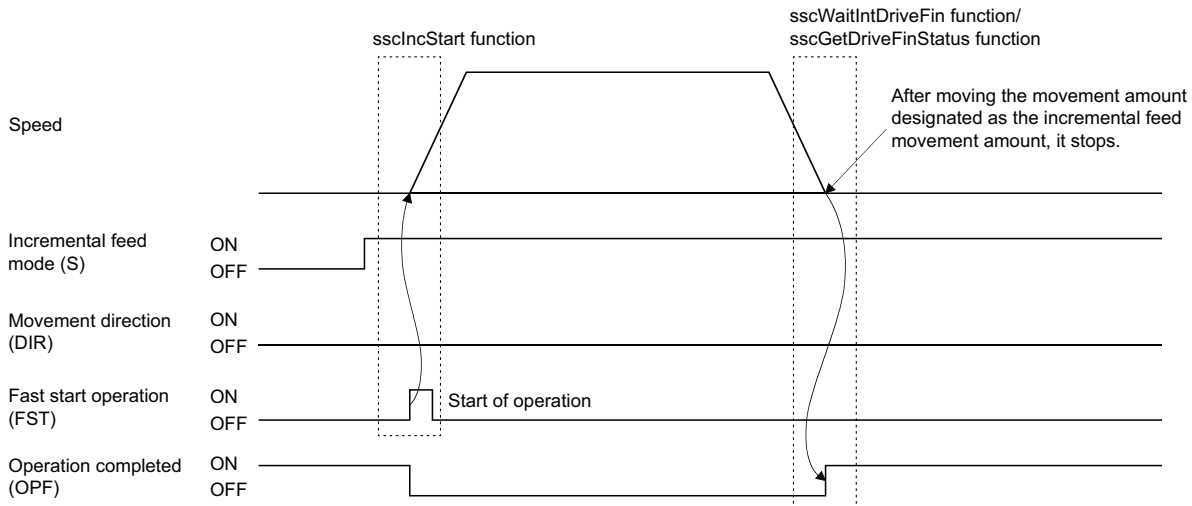
Start operation method

The start operation is performed according to the following procedure.

Operating procedure

1. Turn ON the incremental feed mode signal (S).

2. Set the manual feed speed, the manual feed acceleration time constant, and the manual feed deceleration time constant.

3. Set the incremental feed movement amount.

4. Use the movement direction signal (DIR) to set the movement direction of the axis. When the movement direction signal (DIR) is OFF, the axis moves in the + direction and when it is ON, the axis moves in the - direction.

5. Turn ON the fast start operation signal (FST).

Point
- The fast start operation signal (FST) writes to the dual port memory by the host personal computer.
- The manual feed speed, the manual feed acceleration time constant, the manual feed deceleration time constant, the movement direction signal (DIR), and the incremental feed movement are read at the rise of the fast start operation signal (FST). It follows that after the start operation, even if there are changes to the data or the signal, they are ignored.
- Only positive numbers are valid for the incremental feed movement amount. The movement direction is designated by the movement direction signal (DIR).

Point
[Motion API]
- To perform the procedures 1. to 5., use the sscIncStart function.
- To confirm the completion of the operation, use the sscGetDriveFinStatus function/sscWaitIntDriveFin function.
- To perform the stop operation, use the sscDriveStop function/sscDriveStopNoWait function.

7.4 Automatic Operation

The automatic operation (positioning) uses the point table method for the operation. The position data and the feed speed designation are set in the point table. When turning ON the fast start operation signal (FST), the instructions are executed in order from the instruction set at the start point No. to the end point No. If the automatic operation is started prior to the completion of home position return (the home position return request signal (ZREQ) is ON), "Home Position Return Not Complete (operation alarm No.0090H, detail No.0001H)" occurs upon starting the operation, and the operation is stopped.

Point

- The start point No. for each of the axis point tables is "0000h".
- The start point for each of the axis point tables can be designated using the point No. offset. For the point No. offset, refer to the following.

Point table

Point	Position data [command unit]	Feed speed [speed unit]	Acceleration time constant [ms][1]	Deceleration time constant [ms][1]	Dwell/ predwell [ms][1]	Auxiliary command	Other axes start specification	S-curve ratio [%]	Pressure control profile No.
	4bytes	4bytes	2bytes	2bytes	2bytes	2bytes	4bytes	1byte	1byte
0000	2000	2000	20	30	0	0000h	00000000h	0	1
0001	5000	2000	30	50	0	0000h	00000000h	0	2
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮

...	For manufacturer setting	Interpolation axis No.[2]	Arc coordinate [2]	Acceleration/ deceleration data 1	Acceleration/ deceleration data 2	Acceleration/ deceleration data 3	Acceleration/ deceleration data 4	Auxiliary command 2	For manufacturer setting
	2bytes	4bytes	4bytes	2bytes	2bytes	2bytes	2bytes	2bytes	6bytes
...	0	00000000h	0	200	200	20	30	0000h	0
...	0	00000000h	0	500	200	30	50	0000h	0
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮

[1] The time specified by the acceleration constant, the deceleration constant and the dwell are rounded off based on the operation cycle. (The value is rounded to the nearest integer.)
    <Example> When the dwell is specified to 5ms with the operation cycle of 2.0ms
    The time until the running point is completed after the completion of the point movement is 2 operation cycles (4.0ms).
[2] Not used in the automatic operation. The setting is invalid.

Speed

sscAutoStart function

sscWaitIntDriveFin function/
sscGetDriveFinStatusfunction

Stops after moving
to the end point
position.

Rough match
output limits
(parameter No.
0230, 0231)

Automatic operation mode (AUT)	ON / OFF
Fast start operation (FST)	ON / OFF — Start of operation
Operation completed (OPF)	ON / OFF
Rough match (CPO)*1	ON / OFF
Positioning completed (PF)	ON / OFF
Operation point No.	0 · 1 · 2 · 0

*1 The rough match signal (CPO) is determined when the end point is executed. Therefore, it does not turn ON when passing points on the way.

Start operation method

The start operation is performed according to the following procedure.

Operating procedure

1. Set up the point table.

2. Set the start point No. and the end point No.

3. Turn ON the automatic operation mode signal (AUT).

4. Turn ON the fast start operation signal (FST).

Point

- When stopping the operation midway, turn ON the stop operation signal (STP).
- The current operation point No. can be confirmed through the operation point No. of the axis data (high speed) (status data) (☞ Page 486 Status data) (same as the operation point No. (monitor No.0000030AH)).
- The point No. starts from "0".
- The point table is a total of 2048 points for all axes. The number of points distributed to each axis can be adjusted using the point No. offset. For details, refer to the following.
  ☞ Page 504 Point No. Offset

Point

[Motion API]

- To set up the point table in 1. above, use the sscSetPointDataEx function.
- To perform the procedures 2. to 4. above, use the sscAutoStart function.
- To confirm the completion of the operation, use the sscGetDriveFinStatus function/sscWaitIntDriveFin function.
- To perform the stop operation, use the sscDriveStop function/sscDriveStopNoWait function.
- To set/get the point No. offset, use the sscSetPointOffset function/sscCheckPointOffset function.
- For details about the procedure from startup of the automatic operation to confirm the completion of the operation, refer to the sample programs (InterruptDrive/PollingDrive) contained in the EM Motion SDK.

Auxiliary command

The auxiliary command can be set in the following procedure.
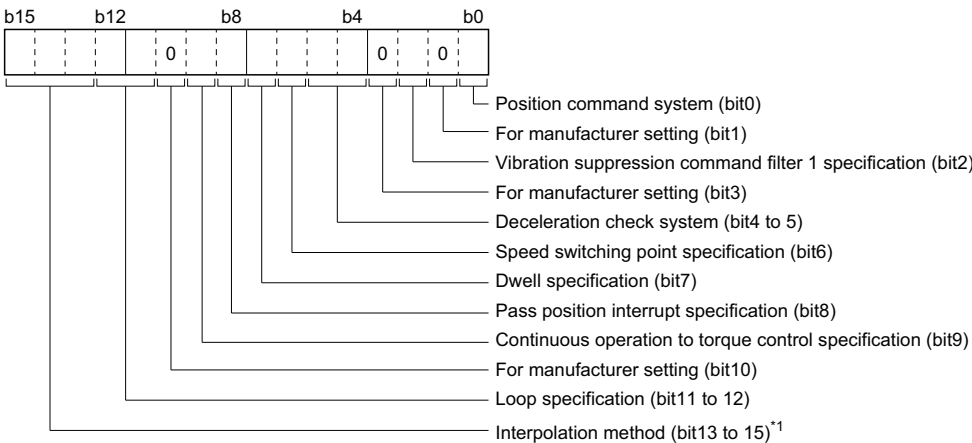
*1   The interpolation method cannot be used with the automatic operation. The setting is invalid.

Ex.

For designation of the position command system (bit0) as "1: Relative position command" and the deceleration check system (bit4 to 5) as "2: Continue operation"
Set to "0021h".

Position command system (bit0)

Select the position data command system.

Setting value	Description
0: Absolute position command	The position data is the position from the home position.
1: Relative position command	The position data is the movement distance from the current command position.

Vibration suppression command filter 1 specification (bit2)

Select whether to enable/disable the vibration suppression command filter 1.

0: Vibration suppression command filter 1 disabled

1: Vibration suppression command filter 1 enabled
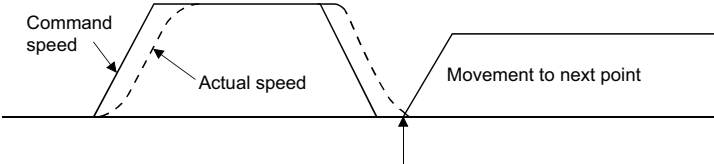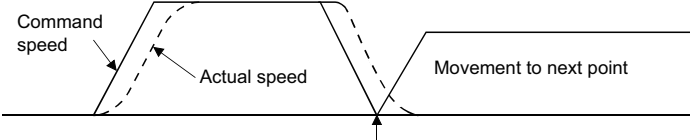
Point
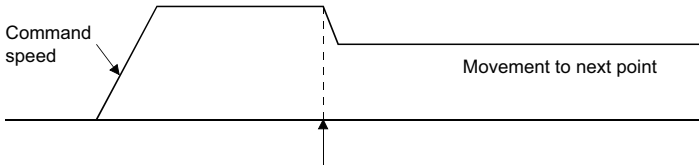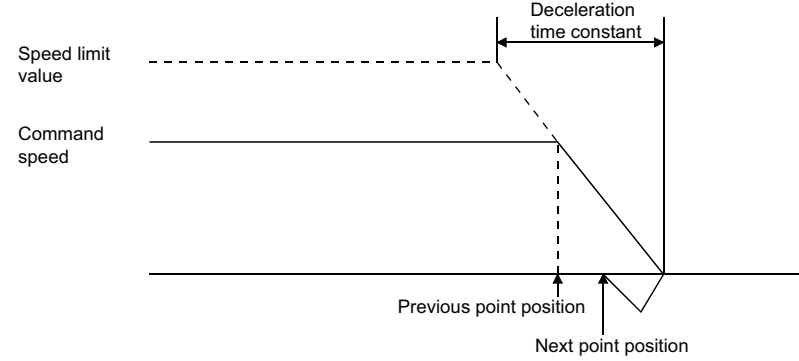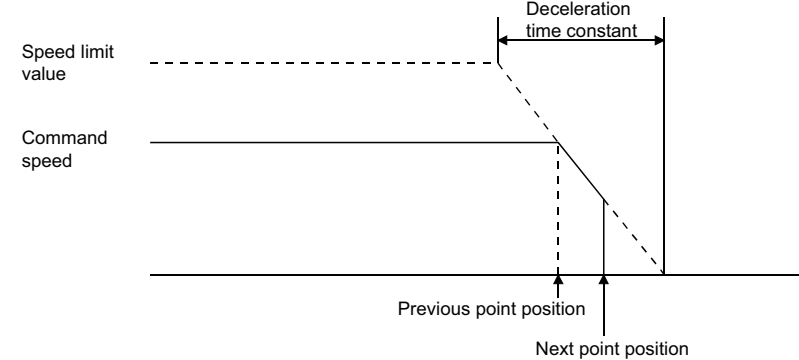
- For the vibration suppression command filter 1, refer to the following.
  ☞ Page 153 Vibration suppression command filter 1
- The vibration suppression command filter 1 function is supported in the basic system software version "02" or later.

Deceleration check system (bit4 to 5)

Designate the point movement completion conditions.

Point

If the setting of the deceleration check system (bit4 to 5) is incorrect, "Point Table Setting Error (operation alarm No.0025H, detail No.0002H)" occurs, and the operation is stopped.

Setting value	Description
0: In-position stop	After the completion of the command pulse output, the point movement is completed when the actual position reached in-position. When the actual position is within the in-position boundaries, the movement to the next point is started.
1: Smoothing stop	After the completion of the command pulse output, the point movement is completed. If the command is 0, the movement to the next point is started.

Setting value	Description
2: Continue operation	After arriving at the command position, the speed is changed to the command speed for the next point, and the movement to the next point is started. The acceleration/deceleration time constants for changing speeds are set to the acceleration/deceleration time constants of the next point. However, the continuous operation is not performed under the following conditions. ■When a dwell is set After the smoothing stop and the time which is set by the dwell is elapsed, the movement to the next point is started. ■When there is an end point Operates in the same way as the smoothing stop. Command speed Movement to next point After arriving at the command position, the speed is changed to the command speed for the next point and the movement to the next point is started. For the end point of the continuous operation, if the position after the deceleration stop exceeds the command position, a selection can be made from the following. The following can be selected from "Continuous operation position over-bound processing" of "Control option 2 (parameter No.0201)". • 0: Alarm (Stop by the alarm.) • 1: Return to command position (After completion of the deceleration stop, return to the command position.) • 2: Stop firmly at command position (Stop at the command position.) When selecting "1: Return to command position", the exceeded stop position signal (POV) turns ON. The exceeded stop position signal (POV) turns OFF at the next start up. "1: Return to command position" Deceleration time constant Speed limit value Command speed Previous point position Next point position "2: Stop firmly at command position" Deceleration time constant Speed limit value Command speed Previous point position Next point position

Point

The deceleration position may exceed the command position in the following cases. In those cases, "Position Exceeded During Positioning (operation alarm No.0024H, detail No.0001H)" occurs, and the operation is stopped.

- In the case the movement direction is reversed when positioning the next point of the point in which the continuous operation is specified by the deceleration check system (bit4 to 5).
- In the case the table point is continued in order which the (point n) deceleration check method (bit4 to 5) moves "2: Continue operation" to (point n+1) "1: Smoothing stop" or "0: In-position stop" to (point n+2) reversing the movement direction, but the positioning distance of the point n+1 is not satisfied with the required deceleration distance.

Speed switching point specification (bit6)

When selecting "2: Continue operation" in the deceleration check system (bit4 to 5), specify the point to be completed the speed change.
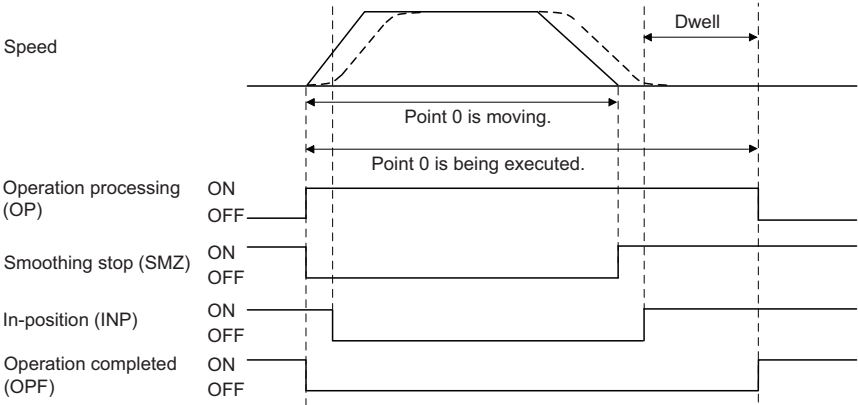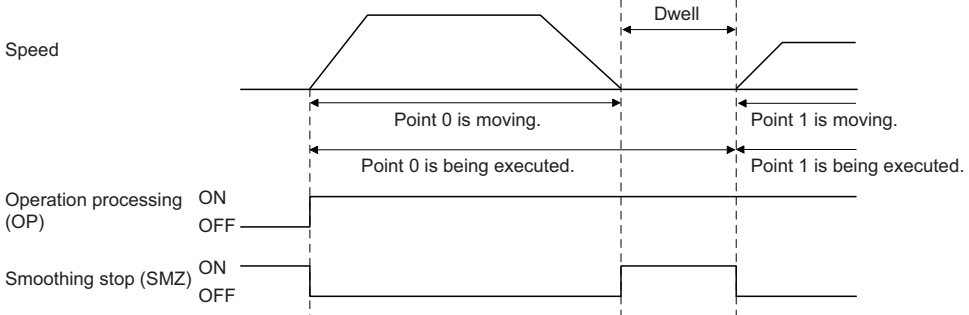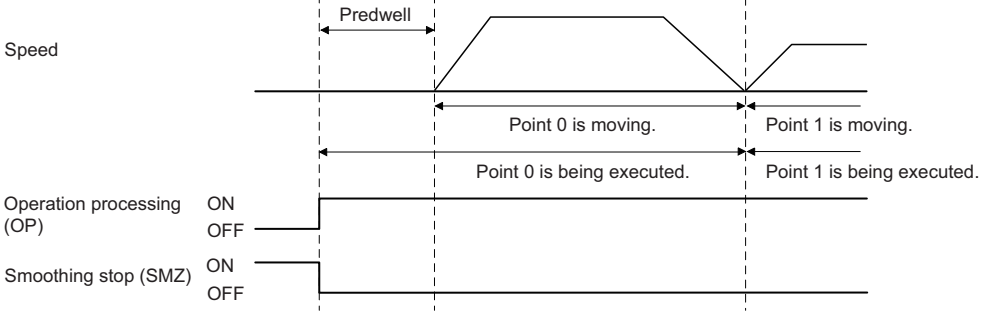
Setting value	Description
0: After point switching	
1: Before point switching	

 • When setting "1: Before point switching", the point table (feed speed) of the next point is imported (read) at the start operation or the timing when the point switches to the next point. If the setting of the point table of the next point is incorrect, "Point Table Setting Error (operation alarm No.0025H, detail No.0008H)" occurs, and the operation is stopped.
 • When setting "1: Return to command position" at "Continuous operation position over-bound processing" of "Control option 2 (parameter No.0201)" and performing the position change at the point which is not the final point, ignore the position change and move to the next position in the case that the next point moves to the same direction.
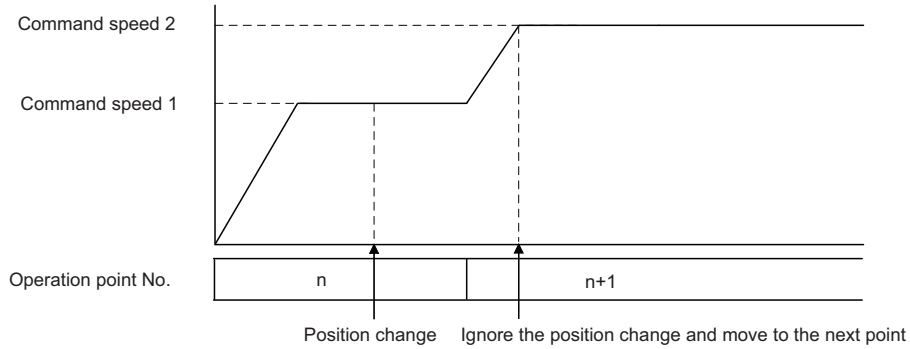
Dwell specification (bit7)

Specify the system of dwell.

Setting value	Description
0: Dwell	Specify the time until the running point is completed after the point movement is completed. For the pass point, after the time specified with the dwell has elapsed, the next point starts moving. For the end point, after the time specified with the dwell has elapsed, the operation completed signal (OPF) turns ON. • The setting range of dwell is "0 to 65535ms". ■When the deceleration check system (bit4 to 5) is "0: In-position stop" Count the lapsed time from after the in-position signal (INP) turns ON after the smoothing stop signal (SMZ) turns ON. The following shows the case for the end point. ■When the deceleration check system (bit4 to 5) is "1: Smoothing stop" Count the lapsed time from the smoothing stop signal (SMZ) turns ON. The following shows the case for the pass point. ■When the deceleration check system (bit4 to 5) is "2: Continue operation" When the dwell is set, the condition of the point movement completion is the smoothing stop. Therefore, the control is the same as when "1: Smoothing stop" is set to the deceleration check system (bit4 to 5).
1: Predwell	The point starts moving after the time specified with the predwell has elapsed. • The setting of the predwell is valid only in the start point. If the predwell is set in the other points, "Point Table Setting Error (operation alarm No.0025H, detail No.000AH)" occurs, and the operation is stopped. • In the initial setting, the setting range of the predwell is "0 to 3000ms". When setting the value outside the range, "Point Table Setting Error (operation alarm No.0025H, detail No.000AH)" occurs, and the operation is stopped. To remove the limit of the setting range, set "1: 0 to 65535ms" to "Predwell setting range" of "Control option 4 (parameter No.0206)".

⚠ CAUTION

If the large value is set to the predwell by mistake, the wait time of the axis is long unexpectedly, and it may look as if the axes do not start the operation. In that case, it is dangerous to approach the moving part because the axes operate unexpectedly. Do not approach the moving parts even when the axes do not operate while the operation processing signal (OP) is ON because the axes may operate.

Pass position interrupt specification (bit8)

Select valid or invalid for the pass position interrupt.

0: Pass position interrupt invalid

1: Pass position interrupt valid

> **Point**
>
> For this setting, only the point data of the start point No. is valid. When setting the point data after the start point No., "Point Table Setting Error (operation alarm No.0025H, detail No.000CH)" occurs, and the operation is stopped.

Continuous operation to torque control specification (bit9)

Select valid or invalid for the continuous operation to torque control.

0: Continuous operation to torque control invalid

1: Continuous operation to torque control valid

> **Point**
>
> For the continuous operation to torque control, refer to the following.
> ☞ Page 251 Continuous Operation to Torque Control

Loop specification (bit11 to 12)

Specify the start and end when using the point table in the loop method.

0: Not using point table method

1: Loop start point

2: Loop end point

> **Point**
>
> For the loop specification, refer to the following.
> ☞ Page 100 Point table loop method

Other axes start specification

Set other axes start data No. (1 to 64). When setting the other axes start data No., the Motion control board starts the other axes according to the other axes start conditions and the operation details.

Up to 2 other axes start data No. can be set. For details about the other axes start function, refer to the following.

☞ Page 199 Other Axes Start

> **Point**
>
> When the setting of the other axes start specification is incorrect, "Point Table Setting Error (operation alarm No.0025H, detail No.0009H)" occurs, and the operation is stopped.

S-curve ratio

Perform the S-curve acceleration/deceleration for "Acceleration/deceleration method" selected in "Speed options (parameter No.0220)". For the automatic operation, this setting is valid regardless of the setting of "S-curve ratio (parameter No.0221)".

- 0 to 29: S-curve acceleration/deceleration invalid
- 30 to 100: S-curve acceleration/deceleration

Pressure control profile No.

Set the pressure control profile No. (1 to 32) to be started.

When the pressure control specification (bit8) of AuxCmd. 2 is set to "1: Pressure control valid" and the pressure control profile No. is set, the pressure control is performed according to the corresponding pressure control profile.

> **Point**
>
> For details about the pressure control, refer to the following.
> ☞ Page 270 Pressure Control

Point table loop method

The point table loop method can be used by setting the loop specification (bit11 to 12) of the auxiliary command. When using the point table in the loop method, refer to/set the following data.

Axis data (high speed) (command data/status data)

■Command data
The addresses in the table are the addresses for the first axis. For the second axis and after, add "+40h" for each axis.

Address (hexadecimal)	Content	Setting range	When in tandem drive
0000200C	Start point No.	0 to 2047	Master
0000200D			
0000200E	End point No.	0 to 2047	Master
0000200F			
00002010	Latest command point No.[*1]	1 to 2048	Master
00002011			

*1 Set the latest command point No. to the value of "point No. + 1".

■Status data
The addresses in the table are the addresses for the first axis. For the second axis and after, add "+40h" for each axis.

Address (hexadecimal)	Content	Output limits	When in tandem drive
0000700C	Operation point No.	0 to 2047	Master
0000700D			

Axis data (high speed) (status bit)

The addresses in the table are the addresses for the first axis. For the second axis and after, add "+10h" for each axis.

Address (hexadecimal)	Bit	Symbol	Signal name	When in tandem drive
00006007	0	PPIOP	Operating pass position interrupt	Master
	1	PPIFIN	Pass position interrupt completed	Master
	2	PPIERR	Pass position interrupt incompleted	Master
	3	—	For manufacturer setting	—
	4			
	5			
	6			
	7	AUTLO	In point table loop	Master

■Details on status bit

Symbol	Signal name	Function details		
		Function	Operation	
			Conditions for turning ON	Conditions for turning OFF
AUTLO	In point table loop	Indicate that the point table is being used in the loop method.	The operation of "1: Loop start point" set to the auxiliary command loop specification (bit11 to 12) of the operation start point has started.	One of the following conditions is satisfied. • The operation of "2: Loop end point" set to the auxiliary command loop specification (bit11 to 12) is completed. • During the operation of the point set to the auxiliary command loop specification (bit11 to 12), the operation is completed due to the alarm or the stop.

Controlling method for using the point table in the loop method

The controlling method for using the point table in the loop method is as follows.

1. Set the point table and the latest command point No.

2. Set the start point No. and the end point No. of the loop to the start point No. and the end point No.

3. Turn ON the automatic operation mode signal (AUT).

4. Turn ON the fast start operation signal (FST).

5. After the completion of the operation for each point, update (overwrite) the point table, and set the latest command point No.

6. At the completion of the operation, set "2: Loop end point" to the auxiliary command loop specification (bit11 to 12), and set the latest command point No.

Point

- When the operation point No. matches the latest command point No., the operation waits until the latest command point No. is updated. (The operation is not completed, and remains in a stopped state.)
- When the speed change is conducted during the standby, the speed change error signal (SCE) turns ON, and the speed cannot be changed.
- When the time constant change is conducted during the standby, the acceleration time constant change error signal (TACE), or the deceleration time constant change error signal (TDCE) turns ON, and the time constant cannot be changed.
- When the loop start point is specified but the latest command point No. is "0", "Point Table Loop Error (operation alarm No.005FH, detail No.0001H)" occurs, and the operation does not start.
- When the loop start point is set in the one-point operation (the start No. matches the end No.), "Point Table Loop Error (operation alarm No.005FH, detail No.0002H)" occurs, and the operation does not start.
- When inputting the value smaller than "start point No. + 1", or the value larger than "end point No. + 1" to the latest command point No., "Point Table Loop Error (operation alarm No.005FH, detail No.0003H)" occurs, followed by the deceleration stop.
- Only the point data for the start point No. is valid for the loop start point of this setting. The point data after the loop start point that is set to the loop start point is invalid.
- After the operation of the point in which the continuous operation is specified, when the next point has not been updated, "Point Table Loop Error (operation alarm No.005FH, detail No.0004H)" occurs, and the operation is canceled with the deceleration stop.
- During the operation that does not use the loop method, when the loop end point is specified, "Point Table Loop Error (operation alarm No.005FH, detail No.0005H)" occurs, and the operation is canceled with the deceleration stop.
- When specifying the before point switching in the speed switching point specification, use three points or more.
- When specifying the before point switching in the speed switching point specification, update the next point before the start of the operation for the specified point. When the next point is not updated before the start of the operation of the specified point, "Point Table Loop Error (operation alarm No.005FH, detail No.0006H)" occurs, and the operation is canceled with the deceleration stop.
- The settings for which only the point of the start point No. is valid (pass position interrupt specification, etc.) are only valid for the start operation point. When setting the point other than the start operation point, the operation is the same as when setting point data after the start point No.

Point

[Motion API]
- To set the point table, use the sscSetPointDataEx function.
- To set the latest command point No., use the sscSetLatestPointNumber function.
- To perform the procedures 2. to 4. described above, use the sscAutoStart function.
- To confirm the completion of the operation, use the sscGetDriveFinStatus function/sscWaitIntDriveFin function.
- To perform the stop operation, use the sscDriveStop function/sscDriveStopNoWait function.
- To set/get the point No. offset, use the sscSetPointOffset function/sscCheckPointOffset function.

Operation example

The following is the operation example of using the point No.0 to 7.

■Before start of operation

Loop start point is specified to start operation point

Point table

0	1	2	3	4	5	6	7	8	9	10

Write before operation start[1]

Set point No. + 1

Start point No.	0
End point No.	7
Latest command point No.	8
Operation point No.	0
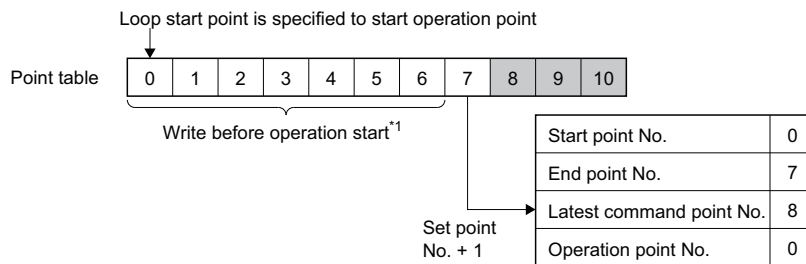
*1 Writing point data for the entire area used in the loop before the operation start is not necessary.

■During operation

Loop from start point to end point

Point table

0	1	2	3	4	5	6	7	8	9	10

After conducting the operation, the point table is updated successively

Start point No.	0
End point No.	7
Latest command point No.	2
Operation point No.[1]	5

*1 Do not update the point table of the operation point No.

■At operation completion

After operating to point 5, the operation is completed.

Loop end point is specified to end point

Point table

0	1	2	3	4	5	6	7	8	9	10

Start point No.	0
End point No.	7
Latest command point No.	6
Operation point No.	2
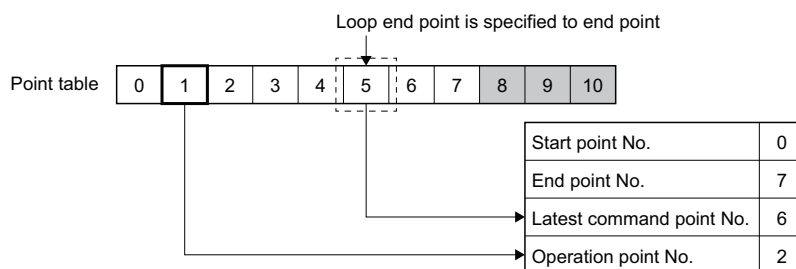
Acceleration/deceleration data

Set the acceleration/deceleration data 1 to 4.

The acceleration/deceleration data 1 to 4 uses at the jerk ratio acceleration/deceleration.

Name	Setting range	Description
Acceleration/deceleration data 1	0 to 1000	Set a ratio [0.1%] for the section of increasing acceleration.
Acceleration/deceleration data 2		Set a ratio [0.1%] for the section of decreasing acceleration.
Acceleration/deceleration data 3		Set a ratio [0.1%] for the section of increasing deceleration.
Acceleration/deceleration data 4		Set a ratio [0.1%] for the section of decreasing deceleration.

Auxiliary command 2

The following can be specified in the auxiliary command 2.

Acceleration/deceleration method (bit0 to 2)
For manufacturer setting (bit3 to 7)
Pressure control specification (bit8)
For manufacturer setting (bit9 to 15)
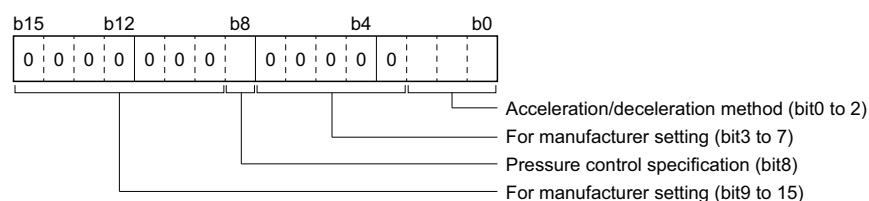
Acceleration/deceleration method (bit0 to 2)

Select the acceleration/deceleration method.
- 0: Linear acceleration/deceleration, S-curve acceleration/deceleration
- 1: Jerk ratio acceleration/deceleration

Point

- For the jerk ratio acceleration/deceleration, refer to the following.
  ☞ Page 150 Jerk ratio acceleration/deceleration
- The jerk ratio acceleration/deceleration function is supported in the basic system software version "02" or later.

Pressure control specification (bit8)

Select valid or invalid for the pressure control.
- 0: Pressure control invalid
- 1: Pressure control valid

When "1: Pressure control valid" is set and the pressure control profile No. is set, the pressure control is performed according to the corresponding pressure control profile.

Point

For details about the pressure control, refer to the following.
☞ Page 270 Pressure Control

7.5 Interpolation Operation

The interpolation operation performs the interpolation control for multiple axes. This system enables a maximum of 4-axis linear interpolation control and the circular interpolation control for 2 axes.

When the feed speed and the position data are set in the point table and the fast start operation signal (FST) is input after changing to the interpolation operation mode, all of the axes set up in the group perform the interpolation operation. The axis that has the fast start operation signal (FST) input into it is referred to as "primary axis", and all other axes are referred to as an "auxiliary axis".

For details about the interpolation control, refer to the following.

☞ Page 107 Linear Interpolation
☞ Page 116 Circular Interpolation
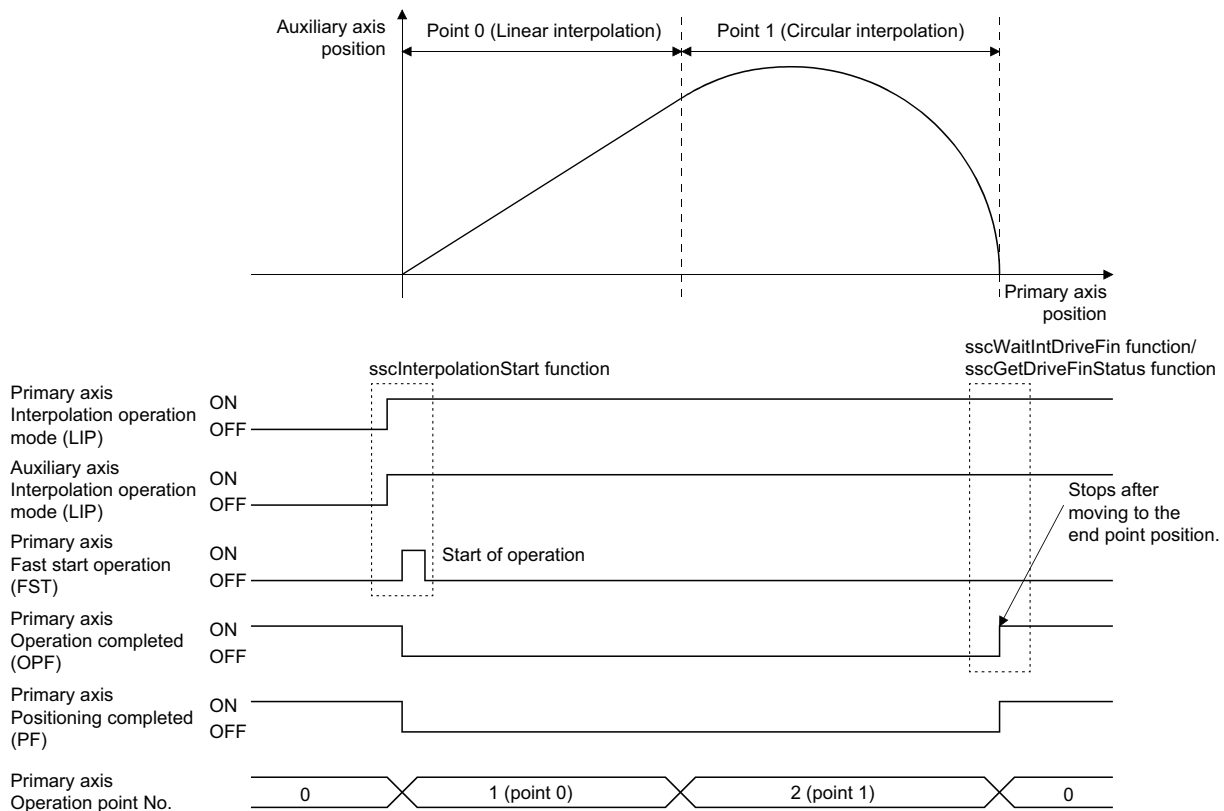
> **Point**
> - It is available to switch between the linear interpolation and the circular interpolation at each point during the interpolation operation for 2 axes.
> - The interpolation group cannot be changed during the operation.
> - This function is supported in the basic system software version "02" or later.
> - When the operation cycle is 62.50µs, the interpolation operation cannot be used.

Proximity pass function

The proximity pass function suppresses machine vibrations that occur at the point data switching when performing the continuous operation via the interpolation control. To enable the proximity pass, set "1: Proximity pass" in "Interpolation options (parameter No.0261)" of "Trajectory processing during continuous operation".

While the proximity pass is enabled, the surplus movement amount at the end of each successively executed point data is transferred over to the next point data. By not performing the position adjustment, the output speed losses can be reduced, and the machine vibrations at the speed changes can be suppressed.

As the position adjustment is not performed, the trajectory that passes through the proximity of the position set as the position data for the point table serves as the control.

The following shows the trajectory when the continuous operation has been performed using the 2-axis linear interpolation control.

"Trajectory processing during continuous operation" of "Interpolation options (parameter No.0261)"

■"0: Position adjustment" (initial value)

As maintaining the constant speed exceeds the position data (target position) of point 0, speed is reduced and the position adjustment is executed.

■"1: Proximity pass"

The trajectory control is executed so that the total vector movement amount before and after the point switch (B+C) is equal to the vector movement amount of each operation cycle (A)

Suppresses the speed decline.
If the changes in the vector speed direction are small, the speed decline is lessened.
When there are no changes in the vector speed direction, the speed decline is eliminated.

Point

- When performing the continuous operation, if the movement amount specified in the position data is small, the output speed may fail to reach the command speed.
- Because the movement direction check is not performed during the interpolation operation, the deceleration stop does not occur even if the movement direction changes. Therefore, the rapid reversal may occur if the movement direction changes. To avoid the rapid reversal, do not select the continuous operation when using the deceleration check method on the point data for the pass point. Instead, use either the in-position stop or the smoothing stop.
- When the target position is reached within the operation cycle where the position change/speed change/ time constant change was executed, the trajectory processing through the position adjustment is performed.

7.6 Linear Interpolation

The linear interpolation operation has the linear interpolation control performed for the axes set up as a group. This system enables a maximum of 4-axis linear interpolation control. When the feed speed and the position data are set in the point table and the fast start operation signal (FST) is input, all of the axes set up in the group perform the linear interpolation operation. If the linear interpolation operation is started prior to the completion of the home position return (the home position return request signal (ZREQ) is ON), "Home Position Return Not Complete (operation alarm No.0090H, detail No.0001H)" occurs upon starting the operation, and the operation is stopped.

From this point on, the axis in which the fast start operation signal (FST) is input is referred to as "primary axis", and all other axes are referred to as an "auxiliary axis".

- When "Interpolation axis setting method" of "System option 5 (parameter No.004C)" is "0: Use control parameter", the group setting is set using "Group No." of "Interpolation group (parameter No.0260)". If the group No. is set to "00h", the axis becomes an independent axis, and the linear interpolation operation cannot be performed. The valid number of groups varies by the operation cycle. When "Interpolation axis setting method" of "System option 5 (parameter No.004C)" is "1: Use point table", the axis set to the interpolation axis No. of the point table becomes a linear interpolation group, and the interpolation control can be executed simultaneously for the valid number of groups.
  Valid group No. when the operation cycle is 125.00μs: 1 to 4
  Valid group No. when the operation cycle is 250.00μs: 1 to 8
  Valid group No. when the operation cycle is 500.00μs: 1 to 16
  Valid group No. when the operation cycle is 1000.00μs: 1 to 16
  Valid group No. when the operation cycle is 2000.00μs: 1 to 16
- Even when the linear interpolation group is within the valid group No. range, the cycle over of the operation cycle monitor may turn ON depending on the combination of functions used.
- For the fast start operation signal (FST), input on a primary axis only.
- When the number of interpolation operation groups exceeds the valid number of groups, "Interpolation Point Data Error (operation alarm No.0041H, detail No.0004H)" occurs.
- When satisfying the following conditions, "Interpolation Point Data Error (operation alarm No.0041H, detail No.0004H)" may occur to the axis of another operation group.
  - When using the high speed operation mode.
  - When "Interpolation axis setting method" of "System option 5 (parameter No.004C)" is "1: Use point table".
  - When starting the interpolation operation to the same operation cycle from multiple operation groups.

Ex.

When interpolating axis 1 and axis 2
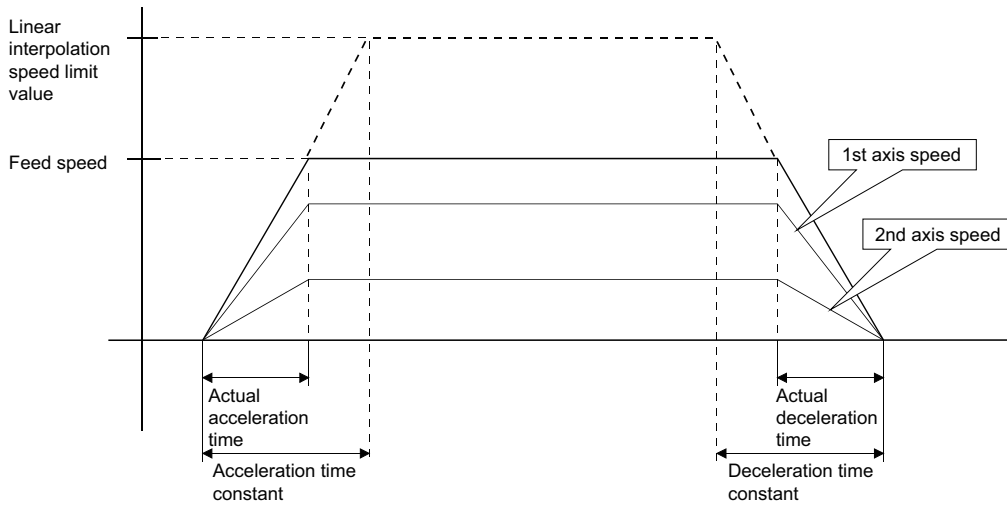
The speed for each axis is figured out by dividing the feed speed by the distance ratio.
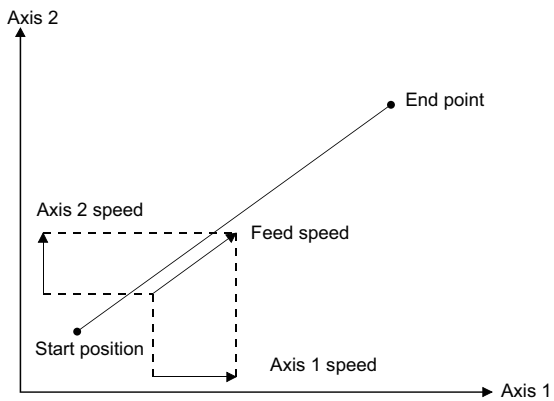
Settings

Set the following items when performing the linear interpolation. For details about the point table, refer to the following.

Setting 1: Items set for system parameter

Items	Content	Remarks
System parameter	Interpolation axis setting method (System option 5 (parameter No.004C))	Set the input method of the interpolation axis No. for the interpolation operation.

Setting 2: Items set for all axes to be interpolated

Items	Content	Remarks
Point table	Position data	Set within maximum moveable limits. (Maximum moveable limit 999999999)
	Other axes start specification	Set when using the other axes start.
	Pass position interrupt specification (auxiliary command (bit8))	Set when using the pass position interrupt.
Axis data	Start point No. End point No.	Set such that the number of points between start and end is the same for all axes in the group configuration.
Axis data (high speed) (command bit)	Interpolation operation mode signal (LIP)	Turn ON the applicable bit.
Control parameter	Interpolation group (parameter No.0260)	When "Interpolation axis setting method" of "System option 5 (parameter No.004C)" is "0: Use control parameter", set the linear interpolation group No. Up to 4 axes can be set up for the same group. For the tandem drive axes, only the master axis must be set.
	Speed limit value (parameter No.0222, 0223)	Set the speed limit for each axis. Use when selecting "0: Speed clamp" or "1: Alarm stop" for "Excessive speed processing" of "Interpolation options (parameter No.0261)".

Setting 3: Items set for the primary axis

Items	Content	Remarks
Point table for primary axis	• Feed speed • Acceleration time constant (ms) • Deceleration time constant (ms) • Dwell (ms) • Auxiliary command • S-curve ratio [%] • Interpolation axis No. • Interpolation method • Vibration suppression command filter1 specification (auxiliary command (bit2))[1]	The interpolation axis No. is only required when "Interpolation axis setting method" of "System option 5 (parameter No.004C)" is "1: Use point table". Only the start point No. setting is valid. This setting cannot be changed during the operation.
Control parameters for the primary axis	• Speed units (Control option 1 (parameter No.0200)) • Speed units multiplication factor (parameter No.020E, 020F) • Interpolation options (parameter No.0261) • Interpolation speed limit value (parameter No.0262, 0263)	The r/min of the speed unit cannot be specified.
Axis data (high speed) for the primary axis (command data)	Latest command point No.	Set when using the point table loop method.

[1] Set when using the vibration suppression command filter1 function. This function is supported in the basic system software version "02" or later.

Point table

Point	Position data [command unit]	Feed speed [speed unit]	Acceleration time constant [ms][*1]	Deceleration time constant [ms][*1]	Dwell/ predwell [ms][*1]	Auxiliary command	Other axes start specification	S-curve ratio [%]	Pressure control profile No.
	4bytes	4bytes	2bytes	2bytes	2bytes	2bytes	4bytes	1byte	1byte
0000	2000	2000	20	30	0	0000h	00000000h	0	1
0001	5000	2000	30	50	0	0000h	00000000h	0	2
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮

...	For manufacturer setting	Interpolation axis No.	Arc coordinate [*2]	Acceleration/ deceleration data 1[*2]	Acceleration/ deceleration data 2[*2]	Acceleration/ deceleration data 3[*2]	Acceleration/ deceleration data 4[*2]	Auxiliary command 2[*2]	For manufacturer setting
	2bytes	4bytes	4bytes	2bytes	2bytes	2bytes	2bytes	2bytes	6bytes
...	0	00000000h	0	200	200	20	30	0000h	0
...	0	00000000h	0	500	200	30	50	0000h	0
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮

*1 The time specified by the acceleration constant, the deceleration constant and the dwell are rounded off based on the operation cycle. (The value is rounded to the nearest integer.)
   <Example> When the dwell is specified to 5ms with the operation cycle of 2.0ms
   The time until the running point is completed after the completion of the point movement is 2 operation cycles (4.0ms).
*2 Not used in the linear interpolation.

■Interpolation axis No.

b31	b24	b16	b8	b0
For manufacturer setting	Interpolation axis No.3	Interpolation axis No.2	Interpolation axis No.1	

Bit	Name	Description
0 to 7	Interpolation axis No.1	Specify the axis Nos. of auxiliary axes set to the same group during the linear interpolation.
8 to 15	Interpolation axis No.2	
16 to 23	Interpolation axis No.3	
24 to 31	For manufacturer setting	—

Ex.

When setting the axis 2, 3, and 4 to the interpolation axis No.1 to 3 respectively which have the axis 1 as the primary axis Set "00040302h".

<Cause of alarm>
• When an axis No. exceeding the maximum number of controllable axes is set to the interpolation axis No.1 to 3, "Interpolation Point Data Error (operation alarm No.0041H, detail No.0003H)" occurs, and the operation is stopped.
• When the number of interpolation operation groups operating simultaneously exceeds the valid number of groups, "Interpolation Point Data Error (operation alarm No.0041H, detail No.0004H)" occurs, and the operation is stopped.
• When the axis No. of the linear interpolation operation auxiliary axis overlaps with the primary axis No. or another auxiliary axis No., "Interpolation Point Data Error (operation alarm No.0041H, detail No.0005H)" occurs, and the operation is stopped.
• When the Interpolation axis No. is not set from the start, "Interpolation Point Data Error (operation alarm No.0041H, detail No.0006H)" occurs, and the operation is stopped.

■Auxiliary command

Bit	Name	Description
0	Position command system	☞ Page 92 Position command system (bit0)
1	For manufacturer setting	—
2	Vibration suppression command filter 1 specification	☞ Page 92 Vibration suppression command filter 1 specification (bit2)
3	For manufacturer setting	—
4 to 5	Deceleration check system	☞ Page 93 Deceleration check system (bit4 to 5)
6	Speed switching point specification	☞ Page 95 Speed switching point specification (bit6)
7	Dwell specification	☞ Page 97 Dwell specification (bit7)
8	Pass position interrupt specification	☞ Page 98 Pass position interrupt specification (bit8)
9	Continuous operation to torque control specification	☞ Page 98 Continuous operation to torque control specification (bit9)
10	For manufacturer setting	—
11 to 12	Loop specification	☞ Page 98 Loop specification (bit11 to 12)
13 to 15	Interpolation method	Select the control method for interpolation operation. • 0: Linear interpolation • 1: Auxiliary point-specified circular interpolation[1] • 2: Central point-specified circular interpolation (CW)[1] • 3: Central point-specified circular interpolation (CCW)[1]

*1 Not used in the linear interpolation.

Point

If the interpolation method is set outside the range, "Point Table Setting Error (operation alarm No.0025H, detail No.0011H)" occurs, and the operation is stopped.

Start operation method

The start operation is performed according to the following procedure.

Operating procedure

1. Set the interpolation group, the interpolation speed limit value, and the interpolation options in the control parameters. The group No. is only required when "Interpolation axis setting method" of "System option 5 (parameter No.004C)" is "0: Use control parameter", and is valid during system startup. Other than that, it is valid during writing of parameters.

2. Set the point table. At this time, all items are set up for the primary axis and only the position data is set up for the auxiliary axes. Settings for other items are invalid.

3. Set the start point No. and the end point No. for all of the axes in the group configuration. Set the setting so that the number of points for all of the axes is the same.

4. Turn ON the interpolation operation mode signal (LIP) for all of the axes in the group.

5. Turn ON the fast start operation signal (FST) for the primary axis.

> **Point**
>
> - To stop the operation, turn ON the stop operation signal (STP) of any axis in the linear interpolation group.
> - The current operation point No. can be confirmed through the operation point No. of the axis data (high speed) (status data) (☞ Page 486 Status data) (same as the operation point No. (monitor No.0000030AH)).
> - The start point No. for the point table is "0".
> - The point table is a total of 2048 points for all axes. The number of points distributed to each axis can be adjusted using the point No. offset. For details, refer to the following.
>   ☞ Page 504 Point No. Offset
> - When using the point table in the loop method, the primary axis setting values are valid for the latest command point No. and the start point No. /end point No. of the loop. Update the latest command point No. after writing the point tables of all axes in the group.
> - The specifications when using "1: Use point table" as "Interpolation axis setting method" of "System option 5 (parameter No.004C)" are shown below.
>   The specification of the interpolation axis No. is only valid for the starting point.
>   "Interpolation group (parameter No.0260)" is invalid even when specified.
>   The startup method does not change.
>   The changeable interpolation group signal (IPCH) turns ON.
>   The interpolation group No. being executed is output to the primary axis and the auxiliary axis for which the linear interpolation is being executed.
>   The interpolation group No. being executed for the primary axis and the auxiliary axis for which the linear interpolation has ended is cleared and becomes "0".

> **Point**
>
> [Motion API]
> - To set up the point data as shown 2. in above, use the sscSetPointDataEx function
> - To perform the procedures 3. to 5. above, use the sscLinearStart function.
> - To perform the stop operation, use the sscDriveStop function/sscDriveStopNoWait function.
> - To confirm the completion of the operation, use the sscGetDriveFinStatus function/sscWaitIntDriveFin function.
> - To set/get the point No. offsets, use the sscSetPointOffset function/sscCheckPointOffset function.
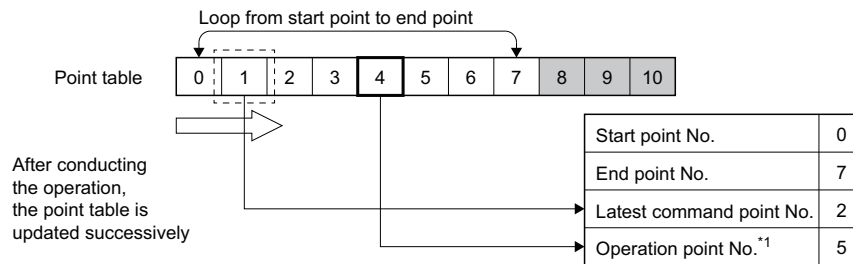
Processing for exceeding speed limit for each axis

The processing is different concerning exceeding the speed limit for each axis depending on the setting for "Excessive speed processing" of "Interpolation options (parameter No.0261)".

Using a speed clamp

When "Excessive speed processing" of "Interpolation options (parameter No.0261)" is set to "0: Speed clamp", if there is an axis that exceeds the speed limit, other axes grouped with the axis are also clamped.
The actual acceleration/deceleration time is the time until reaching the feed speed after clamping.
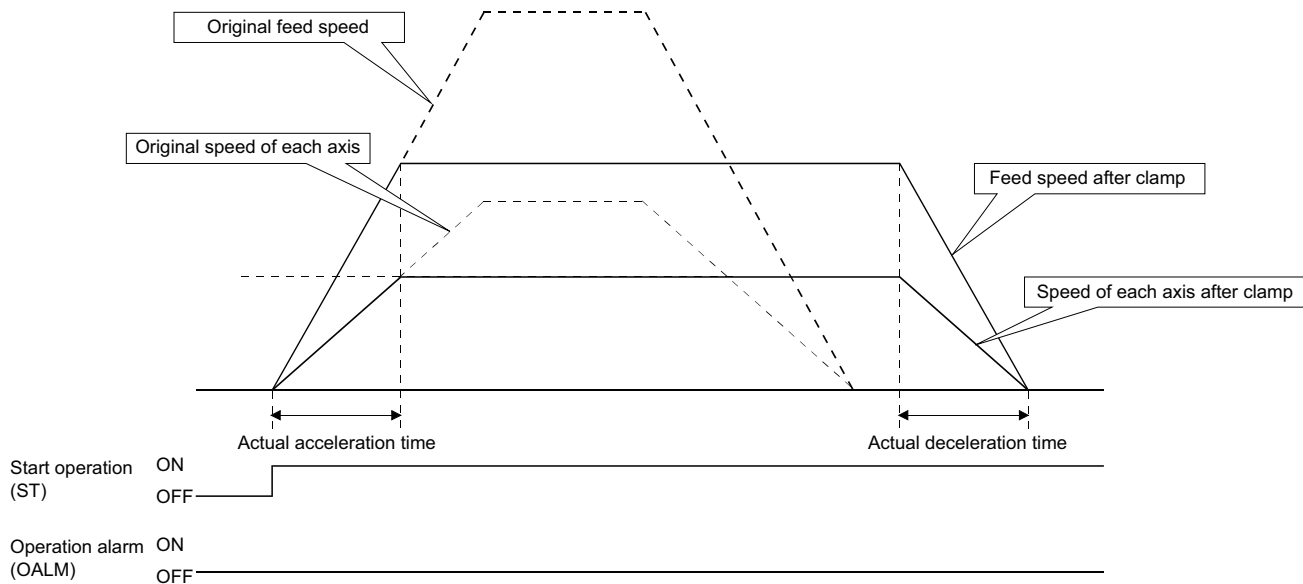
For using alarm stop (example for the continuous operation point change)

When "Excessive speed processing" of "Interpolation options (parameter No.0261)" is set to "1: Alarm stop", if there is an axis that exceeds the speed limit for each axis for the point change other than the start up or the continuous operation, an alarm is set and the start up cannot be performed.
During the continuous operation, if there is an axis that exceeds the speed limit for each axis, an alarm is set and the deceleration to a stop is performed.
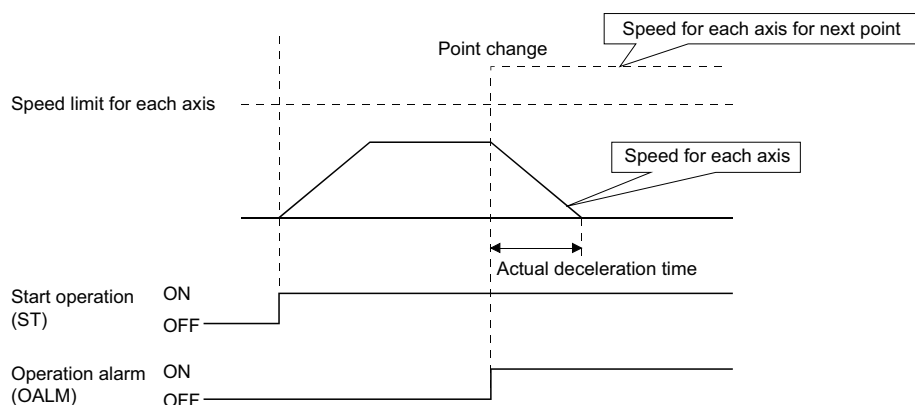
No processing

When "Excessive speed processing" of "Interpolation options (parameter No.0261)" is set to "2: No processing", the normal operation is continued even if the speed limit is exceeded.
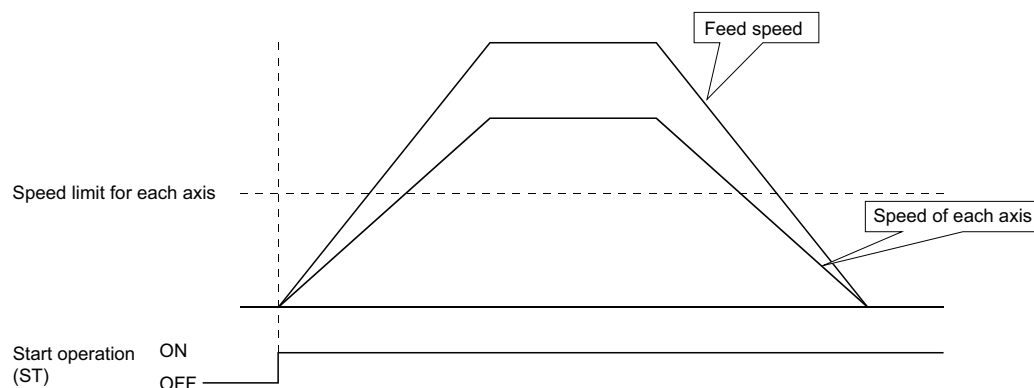
Point

This enables the operation at the limits of the motor; however, there is the possibility of occurring overload or over speed alarms.

Restrictions

The following restrictions apply concerning use of the linear interpolation.

- "Interpolation Start Up Error (operation alarm No.0040H)" occurs in a primary axis for the following.

Description	Alarm No.	Detail No.
If an axis with anything other than the interpolation operation mode signal (LIP) selected exists in the same group.	0040H	0001H
If 5 or more axes are set in the same group.		0002H
If a group No. that exceeds the valid group No. is set when performing the start operation for the linear interpolation.		0003H
If the axes in the group are set with a varying number of points.		0004H
When "Operation mode setting" of "Operation mode setting (parameter No.0011)" is set to "1: High speed operation mode", and the axis of the different operation group is set to the interpolation group.		0006H

- "Interpolation Point Data Error (operation alarm No.0041H)" occurs in a primary axis and "Group Error (operation alarm No.0016H, detail No.0001H)" occurs in an auxiliary axis for the following.

Description	Alarm No.	Detail No.
If there is an axis within the group whose movement amount exceeds the maximum of 999999999.	0041H	0001H
If the speed limit for the group configured axis is exceeded. (If "Excessive speed processing" of "Interpolation options (parameter No.0261)" is set to "1: Alarm stop".)		0002H

- If the auxiliary axis is in the operation or it has an alarm occur when in the interpolation operation mode, "Can't Start Interpolation Auxiliary Axis Error (operation alarm No.0042H)" occurs in the primary axis.
- If an alarm occurs during the operation, the corresponding alarm occurs in the axis where an error occurred, and "Group Error (operation alarm No.0016H, detail No.0001H)" occurs in all the other axes in the group.
- If the axis within the group moves from within the bounds of software limit to the beyond, "Out of Software Limit Boundaries (operation alarm No.00A1H, detail No.0001H)" occurs.
- The command change signal is input to the primary axis for the following. The input of the signal into auxiliary axes is invalid.
  - When changing speeds
  - When changing time constants
  - When changing position

7.7 Circular Interpolation

The circular interpolation operation performs the circular interpolation control for axes set to the group. This system can perform the circular interpolation control for 2 axes. There are the arc specification methods, "auxiliary point-specified method" and "central point-specified method".

When the position data and the feed speed are set in the point table and the fast start operation signal (FST) is input, the interpolation operation (circular interpolation) of the 2 axes set up in the group is performed. If the circular interpolation operation is performed prior to the completion of the home position return (the home position return request signal (ZREQ) is ON), "Home Position Return Not Complete (operation alarm No.0090H, detail No.0001H)" occurs at the operation start-up and the operation is stopped.

From this point on, the axis in which the fast start operation signal (FST) is input is referred to as "primary axis", and all other axes are referred to as an "auxiliary axis".


Trajectory determined by circular interpolation

sscInterpolationStart function

Start of operation

sscWaitIntDriveFin function/
sscGetDriveFinStatus function

Stops after moving to the end point position.
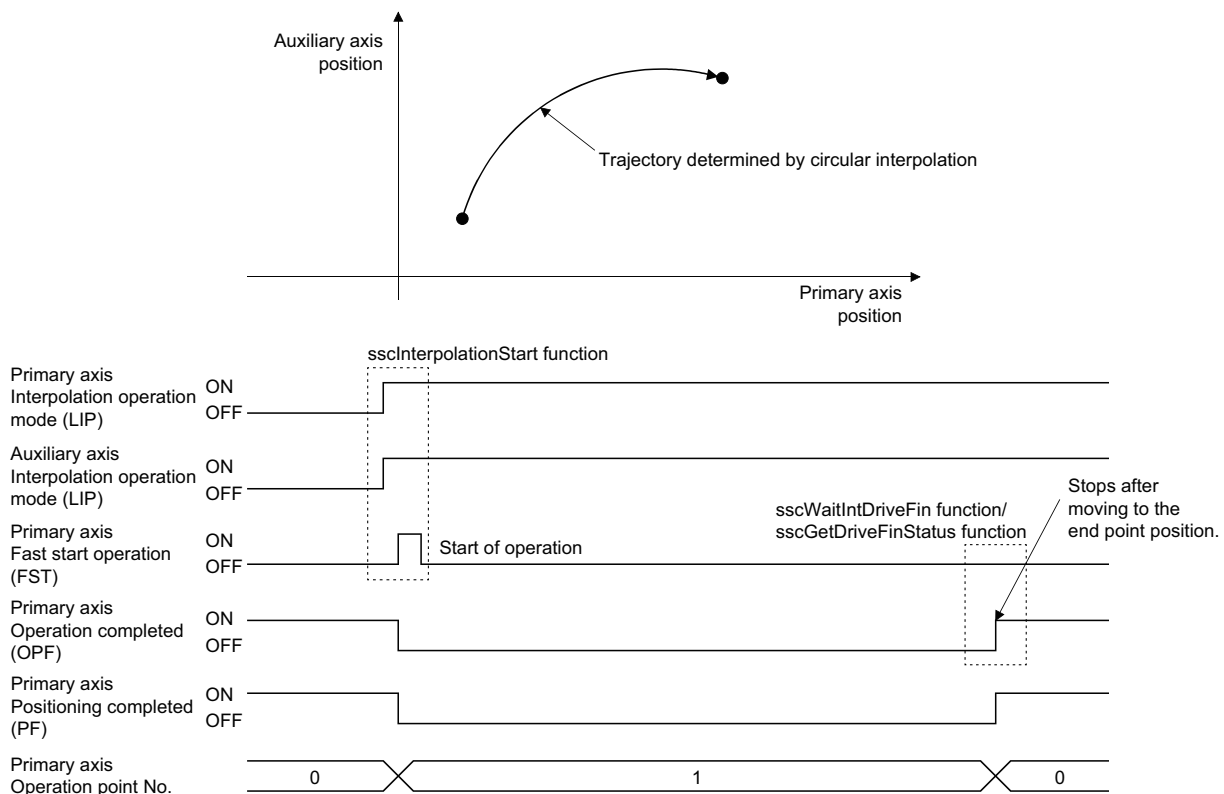
> **Point**
>
> This function is supported in the basic system software version "02" or later.

Settings

Set the following items when performing the circular interpolation. For details about the point table, refer to the following.

Setting 1: Items set for system parameter

Items	Content	Remarks
System parameter	Interpolation axis setting method (System option 5 (parameter No.004C))	Set the input method of the interpolation axis No. for the interpolation operation.

Setting 2: Items set for all axes to be interpolated

Items	Content	Remarks
Point table	Position data	Set within the end point range.
	Arc coordinate	■Auxiliary point-specified circular interpolation Set the position for the auxiliary point. ■Central point-specified circular interpolation Set the position for the central point.
	Other axes start specification	Set when using the other axes start.
	Pass position interrupt specification (auxiliary command (bit8))	Set when using the pass position interrupt.
Axis data	Start point No. End point No.	Set such that the number of points between start and end is the same for all axes in the group configuration.
Axis data (high speed) (command bit)	Interpolation operation mode signal (LIP)	Turn ON the applicable bit.
Control parameter	Interpolation group (parameter No.0260)	When "Interpolation axis setting method" of "System option 5 (parameter No.004C)" is "0: Use control parameter", set the circular interpolation group No. Up to 2 axes can be set up for the same group. For the tandem drive axes, only the master axis must be set.

Setting 3: Items set for the primary axis

Items	Content	Remarks
Point table for primary axis	• Feed speed • Acceleration time constant (ms) • Deceleration time constant (ms) • Dwell (ms) • Auxiliary command • S-curve ratio [%] • Interpolation axis No. • Interpolation method • Vibration suppression command filter1 specification (auxiliary command (bit2))[1]	■Auxiliary point-specified circular interpolation Set "Interpolation method (bit13 to 15)" of the auxiliary command as "1: Auxiliary point-specified circular interpolation". ■Central point-specified circular interpolation Set "Interpolation method (bit13 to 15)" of the auxiliary command as either "2: Central point-specified circular interpolation (CW)" or "3: Central point-specified circular interpolation (CCW)" so as to match the rotation direction.
		The interpolation axis No. is only required when "Interpolation axis setting method" of "System option 5 (parameter No.004C)" is "1: Use point table". Only the start point No. setting is valid. This setting cannot be changed during the operation. The feed speed is clamped according to the interpolation speed limit value.
Control parameters for the primary axis	• Speed units (Control option 1 (parameter No.0200)) • Speed units multiplication factor (parameter No.020E, 020F) • Interpolation options (parameter No.0261) • Interpolation speed limit value (parameter No.0262, 0263) • Allowable error range for circular interpolation (parameter No.02CC, 02CD)[2]	The r/min of the speed unit cannot be specified.
Axis data (high speed) for the primary axis (command data)	Latest command point No.	Set when using the point table loop method.

[1] Set when using the vibration suppression command filter1 function. This function is supported in the basic system software version "02" or later.

[2] Use only when performing the central point-specified circular interpolation control.

Point table

Point	Position data [command unit]	Feed speed [speed unit]	Acceleration time constant [ms][1]	Deceleration time constant [ms][1]	Dwell/ predwell [ms][1]	Auxiliary command	Other axes start specification	S-curve ratio [%]	Pressure control profile No.
	4bytes	4bytes	2bytes	2bytes	2bytes	2bytes	4bytes	1byte	1byte
0000	2000	2000	20	30	0	0000h	00000000h	0	1
0001	5000	2000	30	50	0	0000h	00000000h	0	2
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮

...	For manufacturer setting	Interpolation axis No.	Arc coordinate [2]	Acceleration/ deceleration data 1[2]	Acceleration/ deceleration data 2[2]	Acceleration/ deceleration data 3[2]	Acceleration/ deceleration data 4[2]	Auxiliary command 2[2]	For manufacturer setting
	2bytes	4bytes	4bytes	2bytes	2bytes	2bytes	2bytes	2bytes	6bytes
...	0	00000000h	0	200	200	20	30	0000h	0
...	0	00000000h	0	500	200	30	50	0000h	0
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮

[1] The time specified by the acceleration constant, the deceleration constant and the dwell are rounded off based on the operation cycle. (The value is rounded to the nearest integer.)
   <Example> When the dwell is specified to 5ms with the operation cycle of 2.0ms
   The time until the running point is completed after the completion of the point movement is 2 operation cycles (4.0ms).
[2] Not used in the circular interpolation.

■Interpolation axis No.

b31	b24	b16	b8	b0
For manufacturer setting	Interpolation axis No.3	Interpolation axis No.2	Interpolation axis No.1	

Bit	Name	Description
0 to 7	Interpolation axis No.1	Specify the axis Nos. of auxiliary axes set to the same group during the interpolation operation.
8 to 15	Interpolation axis No.2[1]	
16 to 23	Interpolation axis No.3[1]	
24 to 31	For manufacturer setting	—

[1] Not used.

Ex.
When setting the axis 2 to the interpolation axis No.1
Set "00000002h".

Point

The interpolation axis No. is only required when "Interpolation axis setting method" of "System option 5 (parameter No.004C)" is "1: Use point table".

■Auxiliary command

Bit	Name	Description
0	Position command system	☞ Page 92 Position command system (bit0)
1	For manufacturer setting	—
2	Vibration suppression command filter 1 specification	☞ Page 92 Vibration suppression command filter 1 specification (bit2)
3	For manufacturer setting	—
4 to 5	Deceleration check system	☞ Page 93 Deceleration check system (bit4 to 5)
6	Speed switching point specification	☞ Page 95 Speed switching point specification (bit6)
7	Dwell specification	☞ Page 97 Dwell specification (bit7)
8	Pass position interrupt specification	☞ Page 98 Pass position interrupt specification (bit8)
9	Continuous operation to torque control specification	☞ Page 98 Continuous operation to torque control specification (bit9)
10	For manufacturer setting	—
11 to 12	Loop specification	☞ Page 98 Loop specification (bit11 to 12)
13 to 15	Interpolation method	Select the control method for interpolation operation. • 0: Linear interpolation[1] • 1: Auxiliary point-specified circular interpolation • 2: Central point-specified circular interpolation (CW) • 3: Central point-specified circular interpolation (CCW)

*1   Not used in the circular interpolation.

Point

If the interpolation method is set outside the range "Point Table Setting Error (operation alarm No.0025H, detail No.0011H)" occurs, and the operation is stopped.

■Arc coordinate

Set the coordinates of the auxiliary point or the central point for the arc.

The settings vary by the interpolation method. For details about the circular interpolation by the auxiliary point-specified or the central point-specified, refer to the following.

☞ Page 122 Auxiliary point-specified 2-axis circular interpolation control

☞ Page 124 Central point-specified 2-axis circular interpolation control

Group settings

The group settings for the circular interpolation are set in either control parameters or the point table depending on "System option 5 (parameter No.004C)" being used.

When setting in the control parameters, the group cannot be changed after the system start. When setting in the point table it is possible to change the group even after the system start, but to do so the interpolation axis Nos. of the point table must be set through a user program or other means.

> **Point**
>
> - The valid number of groups varies by the operation cycle. When "Interpolation axis setting method" of "System option 5 (parameter No.004C)" is set to "1: Use point table", the axis set to the interpolation axis Nos. of the point table becomes an interpolation operation group, and the valid number of groups can simultaneously execute the interpolation control.
>   Valid group No. when the operation cycle is 125.00μs: 1 to 4
>   Valid group No. when the operation cycle is 250.00μs: 1 to 8
>   Valid group No. when the operation cycle is 500.00μs: 1 to 16
>   Valid group No. when the operation cycle is 1000.00μs: 1 to 16
>   Valid group No. when the operation cycle is 2000.00μs: 1 to 16
> - When the number of interpolation operation groups exceeds the valid number of groups, "Interpolation Point Data Error (operation alarm No.0041H, detail No.0004H)" occurs.
> - When satisfying the following conditions, "Interpolation Point Data Error (operation alarm No.0041H, detail No.0004H)" may occur to the axis of another operation group.
>   - When using the high speed operation mode.
>   - When "Interpolation axis setting method" of "System option 5 (parameter No.004C)" is "1: Use point table".
>   - When starting the interpolation operation to the same operation cycle from multiple operation groups.

Control parameters

When "Interpolation axis setting method" of "System option 5 (parameter No.004C)" is "0: Use control parameter", set the group No. for the primary axis and the auxiliary axis in "Interpolation group (parameter No.0260)".

Parameter No.	Symbol[1]	Name	Initial value	Units	Setting range	Description	When in tandem drive
0260	*LGRP	Interpolation group	0000h	—	0000h to 0010h	■■□□ (Group No.) Set the group for the interpolation operation. • 00h: Invalid • 01h to 10h: Group No.1 to 16 <Example> 0Ah Group No.10	Master

[1] The settings for the parameters with a * mark at the front of the symbol are validated when the system is started.

Point table

When "Interpolation axis setting method" of "System option 5 (parameter No.004C)" is "1: Use point table", set the group axis (auxiliary axis) to the interpolation axis No. of the point table for the primary axis.

Point

- The specification of the interpolation axis No. is only valid for the starting point.
- "Interpolation group (parameter No.0260)" is invalid even when specified.
- The startup method does not change.
- The changeable interpolation group signal (IPCH) turns ON.
- The interpolation group No. being executed is output to the primary axis and the auxiliary axis for which the circular interpolation is being executed.
- The interpolation group No. being executed for the primary axis and the auxiliary axis for which the circular interpolation has ended is cleared and becomes "0".

<Cause of alarm>

- When an axis No. exceeding the maximum number of controllable axes is set to the interpolation axis No.1 to 3, "Interpolation Point Data Error (operation alarm No.0041H, detail No.0003H)" occurs, and the operation is stopped.
- When the number of interpolation operation groups operating simultaneously exceeds the valid number of groups, "Interpolation Point Data Error (operation alarm No.0041H, detail No.0004H)" occurs, and the operation is stopped.
- When the axis No. of the interpolation operation auxiliary axis overlaps with the primary axis No. or another auxiliary axis No., "Interpolation Point Data Error (operation alarm No.0041H, detail No.0005H)" occurs, and the operation is stopped.

7

Auxiliary point-specified 2-axis circular interpolation control

The auxiliary point-specified 2-axis circular interpolation control performs the positioning from the current command position (start point) to the position set as the position data for the point data (end point) using an arc trajectory which passes through the auxiliary point set as the arc coordinate.

The control trajectory is the center of the arc of the point of intersection from the perpendicular bisectors of either the start point (current command position) to the auxiliary point (arc coordinate) or the auxiliary point (arc coordinate) to the end point (position data).

Auxiliary point-specified position command method

■When absolute position command is used
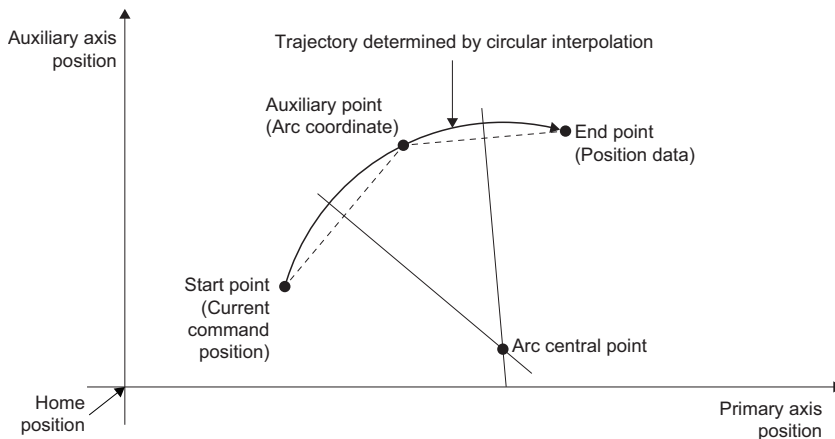
■When relative position command is used

The auxiliary point and the end point are specified by their relative position (incremental value) from the start point.
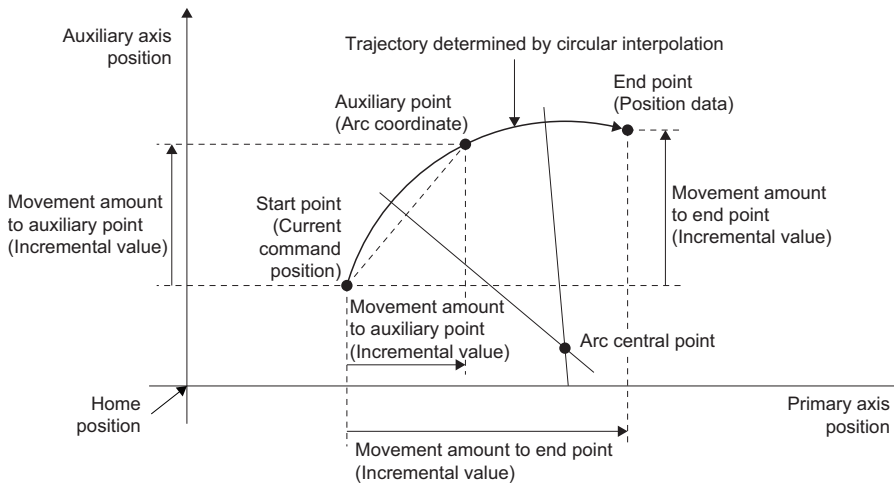
Restrictions

The following restrictions apply concerning use of the auxiliary point-specified 2-axis circular interpolation.
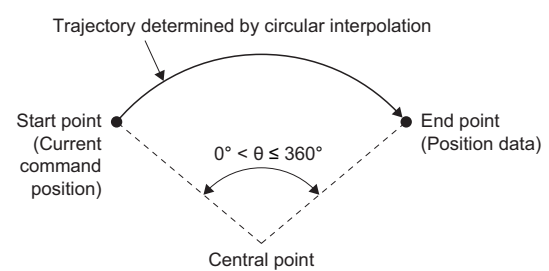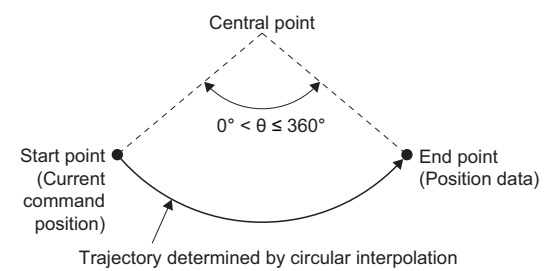
- In the cases below, "Interpolation Point Data Error (operation alarm No.0041H)" occurs and the operation cannot be started. For cases that occur during the operation, an immediate stop occurs when an operation alarm is detected.

Description	Alarm No.	Detail No.
When the radius exceeds "536870912 (=2^{29})".	0041H	001AH
When the position of the auxiliary point is outside the range of "-2147483648 (-2^{31}) to 2147483647 (2^{31}-1)".		0014H
When the position of the end point is outside the range of "-2147483648 (-2^{31}) to 2147483647 (2^{31}-1)".		0016H
When the position of the central point is outside the range of "-2147483648 (-2^{31}) to 2147483647 (2^{31}-1)".		0019H
When the start point = end point.		0015H
When the start point = auxiliary point.		0011H
When the end point = auxiliary point.		0012H
When the start point, the auxiliary point, and the end point form a straight line.		0013H

7

Central point-specified 2-axis circular interpolation control

The central point-specified 2-axis circular interpolation control performs the position control using an arc trajectory with the arc coordinate at its center while interpolating in accordance with the designated arc direction.

The following shows a trajectory determined by the circular interpolation that has a controllable arc angle and the rotation direction set according to the interpolation method.

Interpolation method	Rotation direction	Controllable arc angle	Positioning path
Central point-specified circular interpolation (CW)	Clockwise	$0° < θ ≤ 360°$	
Central point-specified circular interpolation (CCW)	Counterclockwise		

Central point-specified position command method

■When absolute position command is used

The interpolation control is performed from the current command position (start point coordinate) to the position set as the position data for the point data (end point coordinate) using an arc trajectory with the central point coordinate set as the arc coordinate at its center.
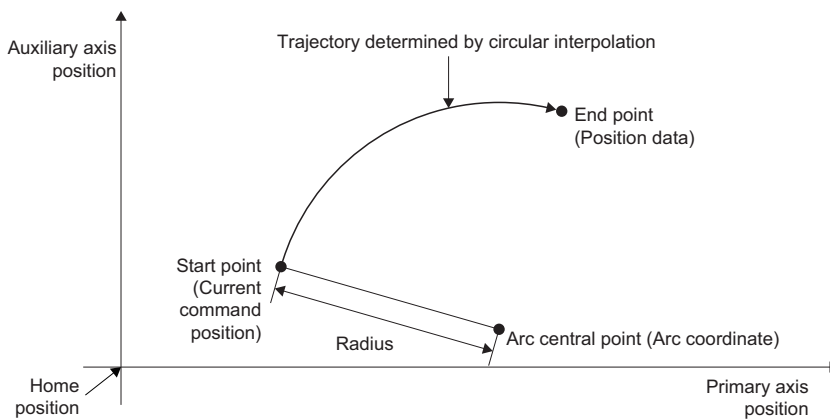
If the end point coordinate (position data) is set to be identical to the start point coordinate, the interpolation control for a perfect circle that has a radius comprised of the start point coordinate and the arc central point is possible.
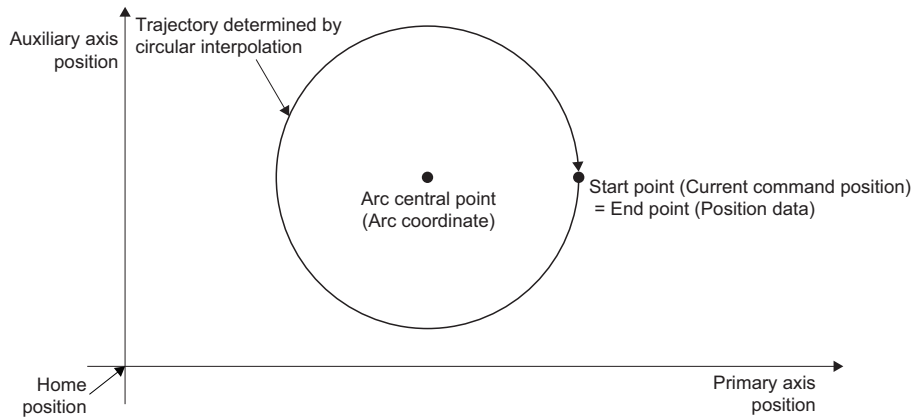
■When relative position command is used

The interpolation control is performed from the current command position (start point) to the movement amount (incremental value) position(s) set as the position data for the point data using an arc trajectory with the central point coordinate set as the arc coordinate at its center.
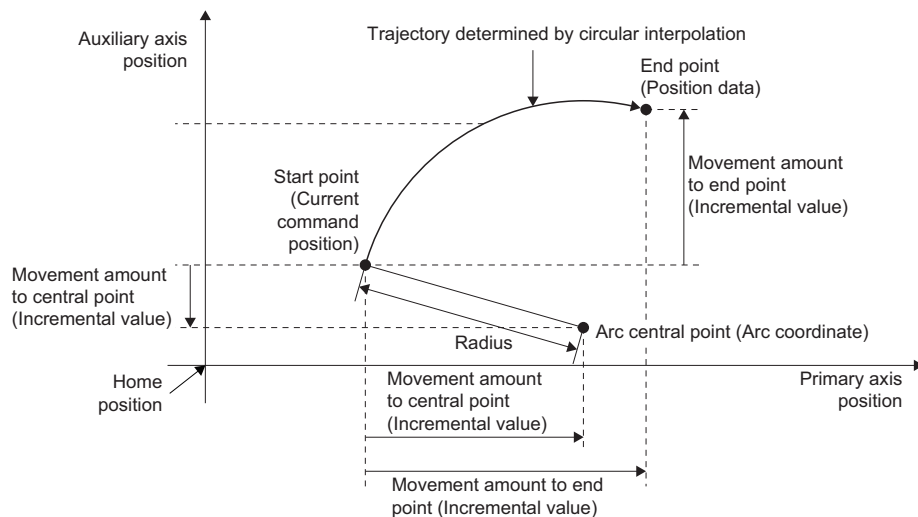
By setting the position data for the point data to "0", the interpolation control for a perfect circle that has a radius comprised of the start point and the central point is possible.
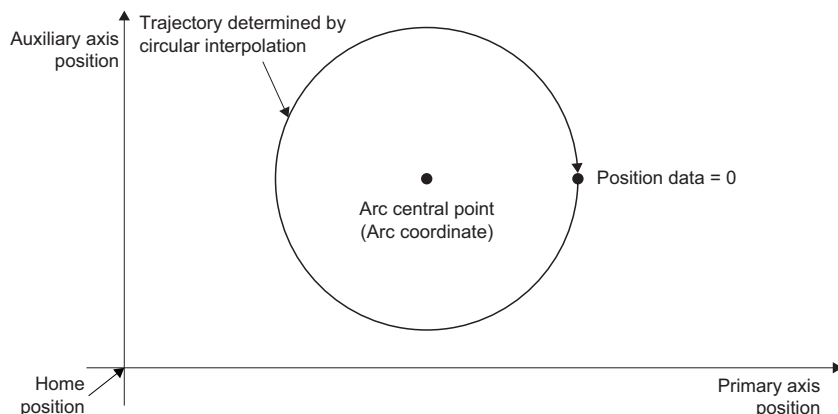
Error compensation

For the central point-specified 2-axis circular interpolation control, the arc trajectory calculated from the start point and the central point may be out of the position of the end point set as the position data for the point data.

When the calculated error is within "Allowable error range for circular interpolation (parameter No.02CC, 02CD)", both the interpolation control to the set end point and the error compensation are performed simultaneously. (This is known as "spiral interpolation".)
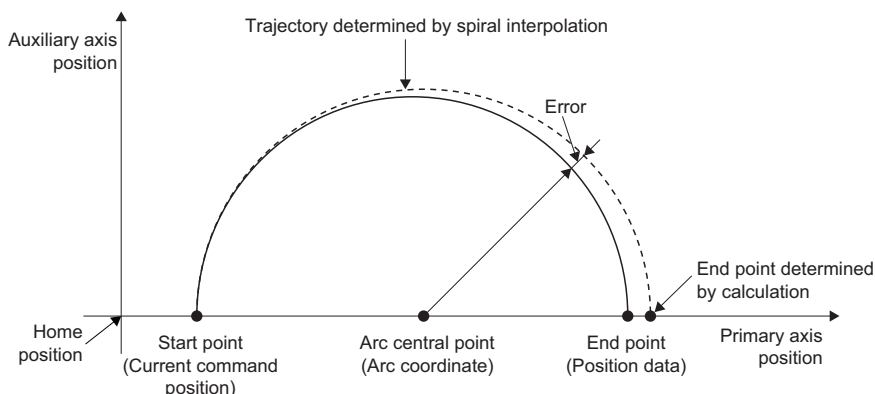
For the central point-specified 2-axis circular interpolation control, the radius is calculated from the start and the central points; the top of this radius is then used to calculate the angular speed on the assumption that it is operating at the feed speed, following which radius compensation is performed in proportion to the angular speed by which it moved from the start point. Therefore, when there is a difference (error) between "radius calculated from the start point and the central point (start point radius)" and "radius calculated from the end point and the central point (end point radius)", the vector speed and the feed speed vary as shown below.

■When the start point radius > end point radius
Compared to the case without an error, the speed gets slower as the end point is approached.

■When the start point radius < end point radius
Compared to the case without an error, the speed gets faster as the end point is approached.

Restrictions

The following restrictions apply concerning use of the central point-specified 2-axis circular interpolation.

• In the cases below, "Interpolation Point Data Error (operation alarm No.0041H)" occurs and the operation cannot be started. For cases that occur during the operation, an immediate stop occurs when an operation alarm is detected.

Description	Alarm No.	Detail No.
When the radius exceeds "536870912 (=2^{29})".	0041H	001AH
When the start point coordinate = central point coordinate.		0017H
When the end point coordinate = central point coordinate.		0018H
When the central point coordinate is outside the range of "-2147483648 (-2^{31}) to 2147483647 (2^{31}-1)".		0019H
When the position of the end point is outside the range of "-2147483648 (-2^{31}) to 2147483647 (2^{31}-1)".		0016H
When the difference between the radius of the start/central points and the radius of the end/central points exceeds "Allowable error range for circular interpolation (parameter No.02CC and 02CD)".		0010H

Start operation method

The start operation is performed according to the following procedure.

Operating procedure

1. Set the interpolation group, the interpolation speed limit value, and the interpolation options in the control parameters. The group No. is only required when "Interpolation axis setting method" of "System option 5 (parameter No.004C)" is "0: Use control parameter", and is valid during system startup. Other than that, it is valid during writing of parameters.

2. Set the point table. At this time, all items are set up for the primary axis and only the position data is set up for the auxiliary axes. Settings for other items are invalid.

3. Set the start point No. and the end point No. for all of the axes in the group configuration. Set the setting so that the number of points for all of the axes is the same.

4. Turn ON the interpolation operation mode signal (LIP) for all of the axes in the group.

5. Turn ON the fast start operation signal (FST) for the primary axis.

> **Point**
>
> - For the fast start operation signal (FST), input on a primary axis only.
> - To stop the operation, turn ON the stop operation signal (STP) of any axis in the circular interpolation group.
> - The current operation point No. can be confirmed through the operation point No. of the axis data (high speed) (status data) (☞ Page 486 Status data) (same as the operation point No. (monitor No.0000030AH)).
> - The start point No. for the point table is "0".
> - The point table is a total of 2048 points for all axes. The number of points distributed to each axis can be adjusted using the point No. offset. For details, refer to the following.
>   ☞ Page 504 Point No. Offset
> - When using the point table in the loop method, the primary axis setting values are valid for the latest command point No. and the start point No./end point No. of the loop. Update the latest command point No. after writing the point tables of all axes in the group.

> **Point**
>
> [Motion API]
> - To set up the point data as shown 2. in above, use the sscSetPointDataEx function.
> - To perform the procedures 3. to 5. above, use the sscInterpolationStart function.
> - To perform the stop operation, use the sscDriveStop function/sscDriveStopNoWait function.
> - To confirm the completion of the operation, use the sscGetDriveFinStatus function/sscWaitIntDriveFin function.
> - To set/get the point No. offsets, use the sscSetPointOffset function/sscCheckPointOffset function.

Exceeding speed limits for each axis

The setting for "Excessive speed processing" of "Interpolation options (parameter No.0261)" is invalid for the circular interpolation. In the feed speed, set the value for each axis so that the speed does not exceed the speed limit value. (The speed calculated by the Motion control board is not restricted by the speed limit value.)

Restrictions

The following restrictions apply concerning use of the circular interpolation.

• "Interpolation Start Up Error (operation alarm No.0040H)" occurs in a primary axis for the following.

Description	Alarm No.	Detail No.
If an axis with anything other than the interpolation operation mode signal (LIP) selected exists in the same group.	0040H	0001H
If a single group is set with either 1 axis or 3 or more axes.		0002H
If a group No. that exceeds the valid group No. is set when performing the start operation for the interpolation operation.		0003H
If the axes in the group are set with a varying number of points.		0004H
When "Operation mode setting" of "Operation mode setting (parameter No.0011)" is set to "1: High speed operation mode", and the axis of the different operation group is set to the interpolation group.		0006H

• If the auxiliary axis is in the operation or it has an alarm occur when in the interpolation operation mode, "Can't Start Interpolation Auxiliary Axis Error (operation alarm No.0042H)" occurs in the primary axis.

• If an alarm occurs during the operation, the corresponding alarm occurs in the axis where an error occurred, and "Group Error (operation alarm No.0016H, detail No.0001H)" occurs in all the other axes in the group.

• If any of the axes set below is within the group, "Out of Software Limit Boundaries (operation alarm No.00A1H)" or "Reached Software Limit (operation alarm No.00A2H)" occurs.

Description	Alarm No.	Detail No.
If the start point coordinate is outside software limits and there is movement away from the direction of the movement allowed area.	00A1H	0001H
If either the end point or auxiliary point (when using auxiliary point-specification) coordinates are outside software limits.		
If software limits are reached during the operation.[*1]	00A2H	0001H

*1 In this case, a deceleration stop occurs when the limit is reached.

• The command change signal is input into the primary axis for the following. The input of the signal into auxiliary axes is invalid. (Not compatible when changing position. The position change error occurs.)
  • When changing speeds
  • When changing time constants

• The continuous operation position over-bound processing operates through "2: Stop firmly at command position" regardless of "Continuous operation position over-bound processing" of "Control option 2 (parameter No.0201)" settings.

• When using the other axes start, if the self-axis pass data for the other axis start is either "start point coordinate ≤ end point coordinate < axis pass position data" or "axis pass position data < end point coordinate ≤ start point coordinate", the axis judgement coordinate is judged as being outside limits. ("Other Axes Start Setting Error (operation alarm No.004DH, detail No.0012H)")
Segment the arc trajectory and set the point table as necessary.

7.8 Home Position Return

The home position return enables the establishment of a start position (home position) in the positioning control. By performing the home position return, the instructed coordinates can match with the machine coordinates. When the incremental system method is used, the home position return is required whenever tuning ON the power supply. On the other hand, when the absolute positioning detection system is used, performing the home position return restores the current command position even after the power supply is turned OFF. This makes a home position return unnecessary after the power is turned ON again. For the absolute position detection system, refer to the following.

☞ Page 193 Absolute Position Detection System

The home position return method is as follows.

Method	Description
Driver homing method	A method that switches the drive unit to the Homing mode, and performs the home position return based on the positioning pattern set on the drive unit side.

> **Point**
>
> When performing the home position return in the time of using the drive-unit-less axis function, the movement is same as "37 (Homing on current position)" of "Homing method (Obj. 6098h)". For details about the movement, refer to the manual of the drive unit.

Interface

Control parameters

Parameter No.	Symbol *1	Name	Initial value	Units	Setting range	Content	When in tandem drive
0240	*OPZ1	Home position return option 1	000Fh	—	000Fh	■■■□ (Home position return method) Set the method for the home position return. • F: Driver method	Master
0246	ZPSL	Home position coordinates (lower)	0	Command Unit	-2147483648 to 2147483647	Set the home position coordinates (the position after completing the home position return).	Master
0247	ZPSH	Home position coordinates (upper)					

*1 The settings for the parameters with a * mark at the front of the symbol are validated when the system is started.

Home position return method

The home position return method is set with "Home position return option 1 (parameter No.0240)".

> **Point**
>
> For the home position return method, other settings are required in addition to "Home position return option 1 (parameter No.0240)". For details, refer to the following.
> ☞ Page 133 Driver homing method

Selected home position return method

The home position return method which is set into "Home position return method option 1 (parameter No.0240)" is output to the selected home position return method.

> **Point**
>
> - The selected home position return method is updated when writing the parameter. However, if the method is changed during the operation, the method is updated after the completion of the operation.
> - When the change of the home position return method is not supported during the system startup, "000h" is displayed.
> - When "Parameter Error (operation alarm No.0037H, detail No.0001H)" occurs in "Home position return option 1 (parameter No.0240)", the driver homing method is displayed. Also, when the setting range is within the home position return method and the home position return method which is set is not existed, the home position return error occurs.

■Axis data (high speed) (status data)

The addresses in the table are the addresses for the first axis. For the second axis and after, add "+40h" for each axis.

Address (hexadecimal)	Symbol	Name	Description	When in tandem drive
00007008 00007009	SELZRET	Selected home position return method	Display the home position return method which is set to the home position return option 1. ■ ■ □ □ (Home position return method) Display the method for home position return. • 0F: Driver method □ ■ ■ ■ (Selected home position return method availability) Display supported/not supported of the selected home position return method. • 0: Not supported • 1: Supported	Master

Control mode status

For the driver homing method, the control mode is switched from the csp mode to the Homing mode during the home position return. The current control mode of MR-J5(W)-G is output to the control mode status.

> **Point**
>
> - When the driver homing method is performed at the device station which does not support the Homing mode, "Driver Homing Method Start Not Possible (operation alarm No.009EH, detail No.0001H)" occurs at the operation startup.
> - When the csp mode is not set at the operation startup of the home position return, "Driver Homing Method Start Not Possible (operation alarm No.009EH, detail No.0002H)" occurs at the operation startup.
> - For switching from the csp mode to the Homing mode or the Homing mode to the csp mode, when the control mode does not switch even after 1 second or mode lapsed, "Control Mode Switch Error (operation alarm No.002EH, detail No.0003H)" occurs.

■Axis data (high speed) (status data)

The addresses in the table are the addresses for the first axis. For the second axis and after, add "+40h" for each axis.

Address (hexadecimal)	Symbol	Name	Description	When in tandem drive
00007012 00007013	CMS	Control mode status	Display the current control mode status. • 0: No mode change/No mode assigned • 1: Profile position mode (pp) • 3: Profile velocity mode (pv) • 4: Profile torque mode (tq) • 6: Homing mode (hm) • 8: Cyclic synchronous position mode (csp) • 9: Cyclic synchronous velocity mode (csv) • 10: Cyclic synchronous torque mode (cst) • -1: Test Operation mode: JOG Operation • -2: Test Operation mode: Positioning Operation • -4: Test Operation mode: DO forced output • -6: Test Operation mode: Machine analyzer • -9: Test Operation mode: Test Exit • -104: Continuous operation to torque control mode (ct) • -111: Cyclic synchronous pressure mode (cspr)	Master

*1   Described for the control mode specification of MR-J5(W)-G.

■Necessary objects

Function	Necessary objects	
	TPDO	**RPDO**
Control mode status	Modes of operation display (Obj. 6061h)	—

Start operation method

The start operation is performed according to the following procedure.

Operating procedure

1. Set "Home position coordinates (parameter No.0246, 0247)". For the driver homing method, it is required to set parameters of the drive unit such as the home position return speed and the home position return acceleration time constant. For details, refer to the following.

☞ Page 133 Driver homing method

2. Turn ON the home position return mode signal (ZRN).

3. Turn ON the fast start operation signal (FST).

4. When the home position return is completed, the home position return request signal (ZREQ) turns OFF and the home position return completed signal (ZP) turns ON.
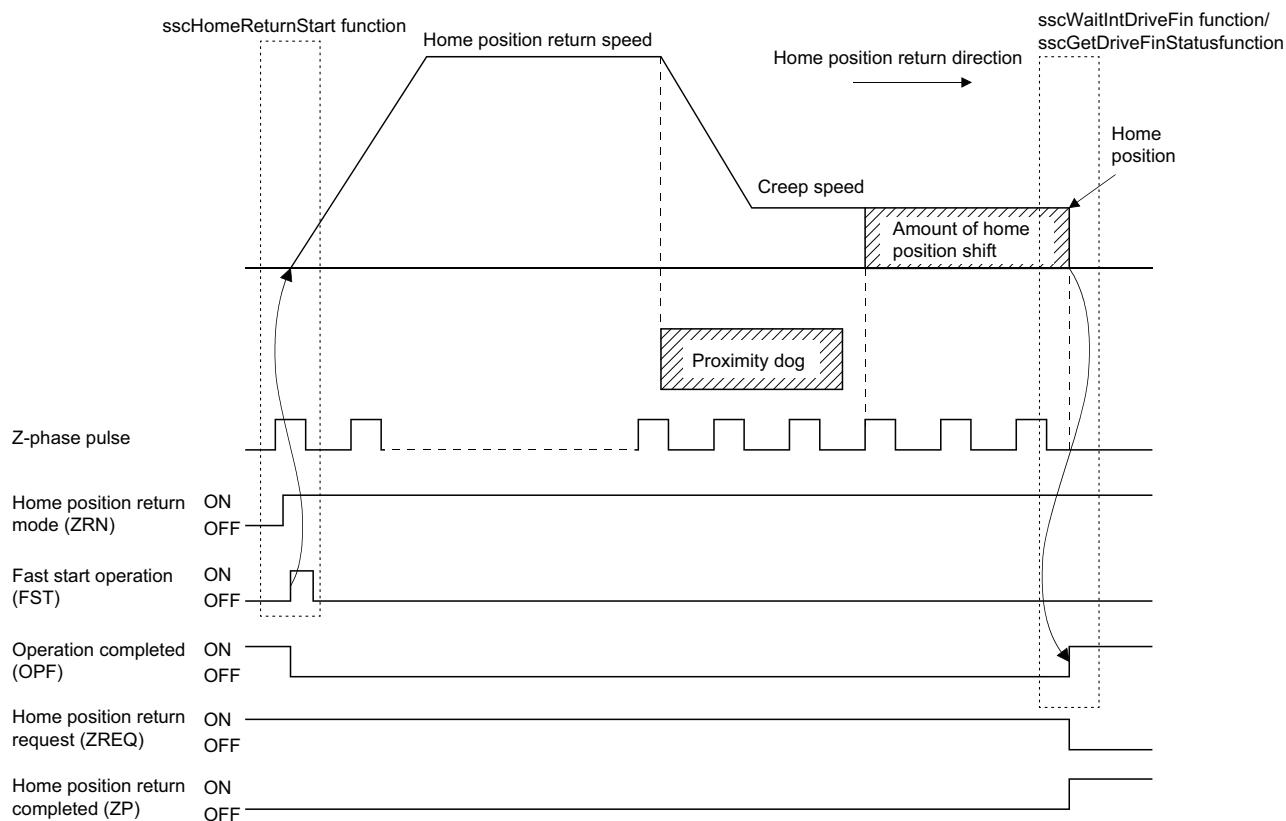
> **Point**
> - The start operation signal (ST) is written to the dual port memory by the host personal computer.
> - When the home position return is completed, the home position return completed signal (ZP) turns ON. The home position return completed signal (ZP) turns OFF at the next start operation or at the operation mode change.
> - The home position return request signal (ZREQ) turns ON when the home position return starts.

> **Point**
>
> [Motion API]
> - To perform the procedures 2. to 3. above, use the sscHomeReturnStart function.
> - To confirm the completion of the operation, use the sscGetDriveFinStatus function/sscWaitIntDriveFin function.
> - To perform the stop operation, use the sscDriveStop function/sscDriveStopNoWait function.
> - For a detailed procedure from the startup of the home position return to confirm the completion of the operation, refer to the sample programs (InterruptDrive/PollingDrive) contained on the EM Motion SDK.

Driver homing method

The driver homing method switches the drive unit to the Homing mode, and performs the home position return based on the positioning pattern set on the drive unit side. The home position return operation and the parameters depend on the specification of the drive unit. For details, refer to the following manual.

📖MR-J5 User's Manual (Function)

> **Point**
> - The transient transmission is performed inside in order to get the home position information during the home position return. Therefore, do not use the transient transmission during the home position return. Doing so may cause the failure of the home position return, and "Driver Homing Method Operation Error (operation alarm No.009FH, detail No.0003H)" occurs.
> - For switching from the csp mode to the Homing mode or the Homing mode to the csp mode, when the control mode does not switch even after 1 second or mode lapsed, "Control Mode Switch Error (operation alarm No.002EH, detail No.0003H)" occurs.

Setting method

■For MR-J5(W)-G

- Set the following servo parameters by MR Configurator2.

Parameter No.	Symbol[1]	Name	Detail No.	Detail name	Description
PA14	*POL	Travel direction selection[2]	—	—	Set the rotation/travel direction. <When the servo motor rotation direction/linear servo motor travel direction is "Positioning address increasing direction"> • 0: CCW or positive direction • 1: CW or negative direction <When the servo motor rotation direction/linear servo motor travel direction is "Positioning address decreasing direction"> • 0: CW or negative direction • 1: CCW or positive direction
PD41	*DOP4	Function selection D-4	PD41.3	Sensor input method selection[2]	Set the input method for the proximity dog and the limit switches. • 0: Input from servo amplifier (LSP/LSN/DOG) • 1: Input from controller (C_FLS/C_RLS/C_DOG)
PT01	**CTY	Command mode selection	PT01.1	Speed/ acceleration/ deceleration unit selection[3]	Set the unit of speed and the unit of acceleration/deceleration. <Speed> • 0: r/min, mm/s • 1: Command unit/s <Acceleration/deceleration> • 0: ms • 1: Command unit/s^2
PT08	ZPS	Homing position data	—	—	Set the address that is to be the reference point of the machine coordinate system. (Unit: pulse) • -2147483648 to 2147483647(The initial value is "0".)
PT45	HMM	Homing method	—	—	Set the homing method. For details, refer to the following. 📖MR-J5-G/MR-J5W-G User's Manual (Parameters)
PT55	*TOP10	Function selection T-10	PT55.0	Homing deceleration time constant selection	Set the value to be used for the acceleration time constant and the deceleration time constant at the home position return. For details, refer to the following. 📖MR-J5-G/MR-J5W-G User's Manual (Parameters)

[1] For the settings for the parameters with a * mark at the front of the symbol, turn ON the power again after the settings, or reset either the controller or the software.
For the settings for the parameters with a ** mark at the front of the symbol, turn ON the power again after the settings, or reset the software.

[2] This is the parameter concerning the polarity of the limit switch. When setting the parameter by mistake, it may cause a malfunction. For details, refer to "Stroke limit function [G]" in the following manual.
📖MR-J5 User's Manual (Function)

*3 Depending on the setting of "Speed/acceleration/deceleration unit selection (PT01.1)" of the servo parameter, the following parameter settings are required. For details, refer to the following manual.

📖MR-J5-G/MR-J5W-G User's Manual (Parameters)

Speed/acceleration/ deceleration unit selection (PT01.1)	No.	Name	Description
When setting to "0"	PT05	Homing speed	Set the servo motor speed at the home position return.
	PT06	Creep speed	When performing the home position return, set the servo motor speed after the proximity dog.
	PT07	Home position shift distance	Set the home position shift travel distance at the home position return.
	PT56	Homing acceleration time constant	Set the acceleration time constant at the home position return.
	PT57	Homing deceleration time constant	Set the deceleration time constant at the home position return.
When setting to "1"	PV11	Homing speed extension setting	Set the servo motor speed at the home position return.
	PV13	Creep speed extension setting	When performing the home position return, set the servo motor speed after the proximity dog.
	PV15	Homing acceleration	Set the acceleration at the home position return.
	PV17	Homing deceleration	Set the deceleration at the home position return.

• Add the necessary objects from the Setting Network Parameter. For the procedure of adding objects, refer to the following.

☞ Page 67 CANopen

For the necessary objects, refer to the following.

☞ Page 86 Necessary objects

Also, when "Sensor input method selection (PD41.3)" is set to "1: Input from controller (C_FLS/C_RLS/C_DOG)", add the following object.

Function	Necessary objects	
	TPDO	RPDO
Sensor input	—	Control DI 5 (Obj. 2D05h)

7.9 Home Position Reset Function (Data Set Function)

The home position reset function (data set function) is a function that resets the current command position to the home position. Prior to executing the home position reset function, set "Home position coordinates (parameter No.0246, 0247)". The current command position is changed to "Home position coordinates (parameter No.0246, 0247)". This function can be used independently of the home position return method.

The home position reset function is valid after the home position return is completed. When the home position reset function is used prior to the home position return finish (home position return request signal (ZREQ) is ON), "Home Position Return Not Complete (operation alarm No.0090H, detail No.0001H)" occurs.

> **Point**
> - When using the absolute position detection system, the home position reset function (data set function) cannot be used.
> - Perform the home position reset after the motor settling. When performing the home position reset before the motor settling, "Home Position Setting Error (operation alarm No.0096H, detail No.0001H)" occurs.

Start operation method

The start operation is performed according to the following procedure.

Operating procedure

1. Move to an arbitrary position using the JOG operation or something similar.

2. Set the home position coordinates for resetting.

3. Turn ON the home position reset mode signal (DST).

4. Turn ON the fast start operation signal (FST).
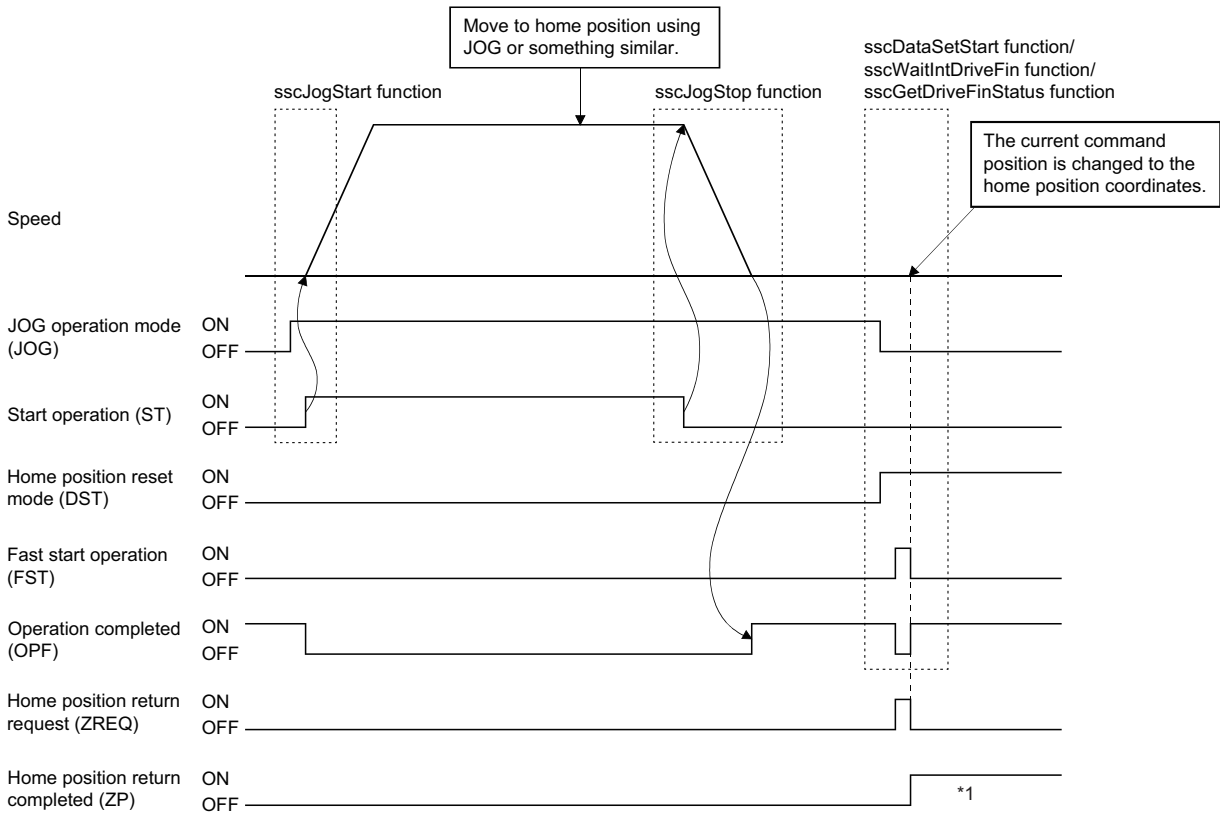
*1 The home position return complete signal (ZP) is turned OFF at the next start operation.

Point

[Motion API]
 • To perform the procedures 3. to 4. above, use the sscDataSetStart function.
 • To confirm the completion of the operation, use the sscGetDriveFinStatus function/sscWaitIntDriveFin function.

8 APPLICATION FUNCTIONS

8.1 Command Units

Position command unit - electronic gear

Set the position command (such as the position data of the point table and the incremental movement amount) by the position command unit.

"Electronic gear numerator (parameter No.020A, 020B)" and "Electronic gear denominator (parameter No.020C, 020D)" are used to adjust the position command unit. Through making changes to the electronic gears, it is possible to move the equipment using an arbitrary multiplication constant for the movement amount.

$$\text{Electronic gear} = \frac{\text{Electronic gear numerator (CMX)}}{\text{Electronic gear denominator (CDV)}}$$

Item		Setting range	Number of encoder pulses per revolution [pulse][1]	Maximum revolution speed [r/min][2]
Electronic gear	CMX	$1 \leq CMX \leq 5242879$ (When the speed unit is position command unit/s or position command unit/min)	To 67108864 (The resolution of up to 26bit is supported.)	Limit the speed to $2160000 \times$ (262144/number of encoder pulses per revolution) $\times$ (CMX/CDV) or less, and to $4893355 \times$ (262144/number of encoder pulses per revolution) or less.
	CDV	$1 \leq CDV \leq 589823$		
	CMX/CDV	$1/16 \leq CMX/CDV \leq 100000$		

[1]   When a linear servo motor of MR-J5(W)-G is used, this becomes the value which is set in the servo parameter "Homing stop interval setting (PL01.2)".
[2]   When a linear servo motor of MR-J5(W)-G is used, this is converted into maximum revolution speed [r/min] by the following formula.

$$\text{Maximum revolution speed [r/min]} = \frac{\text{Monitor maximum speed [m/s]} \times 1000 \times 1000 \times 60}{\text{Linear encoder resolution [µm/pulse]} \times \text{Stop interval setting for home position return [pulse]}}$$

However,

$$\text{Linear encoder resolution [µm/pulse]} = \frac{\text{Servo parameter "Linear encoder resolution - Numerator (PL02)"}}{\text{Servo parameter "Linear encoder resolution - Denominator (PL03)"}}$$

Point

• If the number of encoder pulses per revolution is outside the range or the setting range of the electronic gears is outside the range, adjust "Encoder pulses per revolution $\times$ Electric gear denominator (PA07) $\div$ Electric gear numerator (PA06)" to be within "67108864".
• Only "pulse" is supported for the unit between the drive units in the Motion control board.

Point

[Motion API]
To set/get the electronic gear, use the sscChange2Parameter function/sscCheck2Parameter function.

Ex.

Relationship between the setting range of the electronic gear and the corresponding maximum revolution speed

Number of encoder pulses per revolution [pulse]	Electronic gear (CMX/CDV)[1]	Maximum revolution speed (limited) [r/min][2]
262144	1/16	135000
	1/1	2160000
	10/1	4893355
	10000/1	4893355
1048576	1/16	33750
	1/1	540000
	10/1	1223338
	10000/1	1223338
4194304	1/16	8437
	1/1	135000
	10/1	305834
	10000/1	305834
16777216	1/16	2109
	1/1	33750
	10/1	76458
	10000/1	76458
67108864	1/16	527
	1/1	8437
	10/1	19114
	10000/1	19114

*1 The smaller the setting value of the electronic gear (CMX/CDV) is, the more the maximum revolution speed is limited. If the maximum revolution speed is limited and the enough speed cannot be output, reexamine the command unit of the host personal computer and make sure the setting value of the electronic gear (CMX/CDV) becomes larger. (The command unit becomes rough.)

*2 The maximum revolution speed controllable from the Motion control board. For the actual maximum revolution speed of the motor, refer to the specifications of the motor to be used.

Settings

Control parameters

Parameter No.	Symbol *1	Name	Initial value	Units	Setting range	Function	When in tandem drive
020A	*CMXL	Electronic gear numerator (lower)	0001h	—	1 to 5242879 (32bits)	Set the numerator of the electronic gear.	Master
020B	*CMXH	Electronic gear numerator (upper)	0000h				
020C	*CDVL	Electronic gear denominator (lower)	0001h	—	1 to 589823 (32bits)	Set the denominator of the electronic gear.	Master
020C	*CDVH	Electronic gear denominator (upper)	0000h				

*1 The settings for the parameters with a * mark at the front of the symbol are validated when the system is started.

Setting example of electronic gears

The following is a setup example for use of "μm" as a command unit for a piece of equipment that uses MR-J5(W)-G and ball screws.

When servo parameters "Electric gear numerator (PA06)", "Electric gear denominator (PA07)" are not used

■Equipment specification

Item	Symbol	Value	Unit	Remarks
Ball screw lead	Pb	20	mm	20mm = 20000μm
Deceleration ratio	n	1/2	—	—
Number of encoder pulses per revolution	Pt	67108864	pulse/rev	—
Electronic gear (servo parameter)	CMXSP/CDVSP	1	—	—

Deceleration constant n = 1/2

Servo motor

Ball screw pitch Pb = 20 [mm]

Number of encoder pulses per revolution
Pt = 67108864
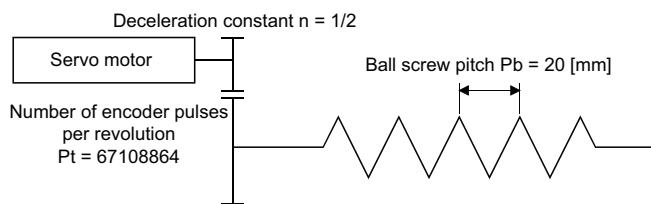
■Calculation of the electronic gear

$$\frac{CMX}{CDV} = \frac{Pt}{\Delta S^{*1}} = \frac{Pt}{n \times Pb \times CMXSP/CDVSP} = \frac{67108864}{1/2 \times 20000 \times 1} = \frac{67108864}{10000} = \frac{4194304}{625} = \frac{400000h}{271h}$$

*1 ΔS is the movement amount for 1 revolution of the servo motor.

■Parameter settings

Because the numerator (67108864) of the value obtained by calculating the electronic gear is outside the setting range, set the value by reducing the fraction.

- Control parameters

Parameter No.	Symbol[*1]	Name	Setting value
020A	*CMXL	Electronic gear numerator (lower)	0000h
020B	*CMXH	Electronic gear numerator (upper)	0040h
020C	*CDVL	Electronic gear denominator (lower)	0271h
020D	*CDVH	Electronic gear denominator (upper)	0000h

*1 The settings for the parameters with a * mark at the front of the symbol are validated when the system is started.

8

When servo parameters "Electric gear numerator (PA06)", "Electric gear denominator (PA07)" are used

■Equipment specification

Item	Symbol	Value	Unit	Remarks
Ball screw lead	Pb	10	mm	10mm = 10000μm
Deceleration ratio	n	1/2	—	—
Number of encoder pulses per revolution	Pt	67108864	pulse/rev	—
Electronic gear (servo parameter)	CMXSP/CDVSP	1	—	—

Deceleration constant n = 1/2

Servo motor

Ball screw pitch Pb = 10 [mm]

Number of encoder pulses
per revolution
Pt = 67108864
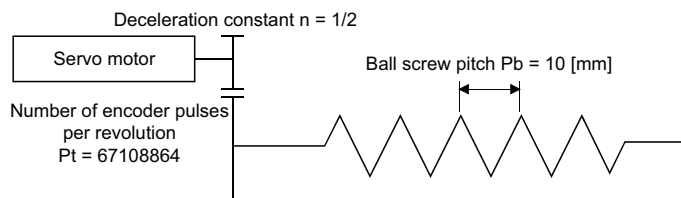
■Calculation of the electronic gear

$$\frac{CMX}{CDV} = \frac{Pt}{\Delta S^{*1}} = \frac{Pt}{n \times Pb \times CMXSP/CDVSP} = \frac{67108864}{1/2 \times 10000 \times 2} = \frac{67108864}{10000} = \frac{4194304}{625} = \frac{400000h}{271h}$$

*1 ΔS is the movement amount for 1 revolution of the servo motor.

■Parameter settings

• Servo parameters

Parameter No.	Symbol[*1]	Name	Setting value
PA06	*CMX	Electronic gear numerator	2
PA07	*CDV	Electronic gear denominator	1

*1   For the settings for the parameters with a * mark at the front of the symbol, turn on the power again after the settings, or reset either the controller or the software.

• Control parameters

Parameter No.	Symbol[*1]	Name	Setting value
020A	*CMXL	Electronic gear numerator (lower)	0000h
020B	*CMXH	Electronic gear numerator (upper)	0040h
020C	*CDVL	Electronic gear denominator (lower)	0271h
020D	*CDVH	Electronic gear denominator (upper)	0000h

*1   The settings for the parameters with a * mark at the front of the symbol are validated when the system is started.

Restrictions

The restrictions on electronic gears are shown below.

• When the setting of an electronic gear (CMX, CDV, CMX/CDV) is incorrect, "Electronic Gear Setting Error (system status code error: E500H)" occurs at the system startup and the electronic gear setting is treated as "CMX: CDV = 1: 1". The operation cannot be performed since the electronic gear is in forced stop status at this time. Reexamine the setting of an electronic gear and start the system again.

• When an electronic gear setting error occurs while using the absolute position detection system, the absolute position erased signal (ABSE) and the home position return request signal (ZREQ) turn ON. For the absolute position detection system, refer to the following.

• When an electronic gear setting error occurs, it is possible to confirm which axis was set to an incorrect electronic gear by confirming with "Electronic gear setting error axis information 1 (monitor No.00001488H)" and "Electronic gear setting error axis information 2 (monitor No.0000148AH)."

8.2 Speed Unit

The speed command (the feed speed of the point table, the manual feed speed, etc.) is set by the speed unit.

Speed units are adjusted using "Speed unit" of "Control option 1 (parameter No.0200)" and "Speed units multiplication factor (parameter No.020E, 020F)". Through changing the speed units, movement can be performed at an arbitrary unit and multiplication of speed.

> **Point**
>
> [Motion API]
>
> To set/get the speed unit, use the sscChange2Parameter function/sscCheck2Parameter function.

Settings

Control parameters

Parameter No.	Symbol *1	Name	Initial value	Units	Setting range	Function	When in tandem drive
0200	*OPC	Control option 1	0000h	—	0000h to 1111h	☐■■■ (Speed unit) Set the speed command unit. • 0: Position command unit/min • 1: Position command unit/s	Same value
020E	SUML	Speed units multiplication factor (lower)	2000h	—	1 to 32768	Set the multiplication factor for the speed command.	Master
020F	SUMH	Speed units multiplication factor (upper)	0000h	—			

*1 The settings for the parameters with a * mark at the front of the symbol are validated when the system is started.

Setting example of speed units

The following is a setup example for use of mm/min as a speed unit for a piece of equipment that uses ball screws.

Equipment specification

For the equipment specification, refer to the following.

☞ Page 137 Position command unit - electronic gear

Parameter setting for the speed unit

As the position command unit is "µm", set "1000" to the speed units multiplication factor to use "mm/min" as a speed unit.

1000µm/min = 1mm/min

■Control parameters

Parameter No.	Symbol[*1]	Name	Setting value
0200	*OPC	Control option 1	0☐☐☐h
020E	SUML	Speed units multiplication factor (lower)	03E8h
020F	SUMH	Speed units multiplication factor (upper)	0000h

*1 The settings for the parameters with a * mark at the front of the symbol are validated when the system is started.

Speed setting

The following restrictions apply to the command speed. Reexamine the command speed according to the following.

 • When the speed command exceeds "Speed limit value (parameter No.0222, 0223)", the speed is limited to the speed limit.

Control parameters

Parameter No.	Symbol	Name	Initial value	Units	Setting range	Function	When in tandem drive
0222	SPLL	Speed limit value (lower)	3000	Speed units	0 to 2147483647	Set the value for the moving speed limit.	Master
0223	SPLH	Speed limit value (upper)					

 • The Motion control board calculates the command speed of the drive units using the speed setting, the speed units multiplication factor and the electronic gears; however, if an overflow occurs in the calculation process due to the high command speed etc., the speed is limited to the calculable maximum value. The calculable maximum value is confirmed in "Maximum output pulse rate (monitor No.00001122H)" of the drive unit information.

8.3 Acceleration/Deceleration

The following methods are available for acceleration/deceleration.

- Linear acceleration/deceleration
- Smoothing filter
- S-curve acceleration/deceleration (sine acceleration/deceleration)
- Jerk ratio acceleration/deceleration
- Vibration suppression command filter 1

The setting method for acceleration/deceleration differs according to the operation mode.

During automatic operation/interpolation operation

Set with "Speed options (parameter No.0220)" and the point table.

The actual acceleration/deceleration depends on the combinations shown in the table below.

Operation modes other than automatic operation/interpolation operation

Set with speed options.

○: Set, —: Not set

Speed options		S-curve ratio[1]	Auxiliary command 2		Auxiliary command	Actual acceleration/deceleration method
Linear acceleration/deceleration	Smoothing filter		Linear acceleration/deceleration/S-curve acceleration/deceleration	Jerk ratio acceleration/deceleration [2]	Vibration suppression command filter 1	
○	—	—	○	—	—	Linear acceleration/deceleration
○	—	○	○	—	—	S-curve acceleration/deceleration
○	—	—	—	○	—	Jerk ratio acceleration/deceleration
○	—	○	—	○	—	
—	○	—	○	—	—	Smoothing filter
—	○	○	○	—	—	Smoothing filter + S-curve acceleration/deceleration
—	○	—	—	○	—	Smoothing filter + jerk ratio acceleration/deceleration
—	○	○	—	○	—	
○	—	—	○	—	○	Vibration suppression command filter 1
○	—	○	○	—	○	S-curve acceleration/deceleration + vibration suppression command filter 1
○	—	—	—	○	○	Jerk ratio acceleration/deceleration + vibration suppression command filter 1
○	—	○	—	○	○	
—	○	—	○	—	○	Smoothing filter + vibration suppression command filter 1
—	○	○	○	—	○	Smoothing filter + S-curve acceleration/deceleration + vibration suppression command filter 1
—	○	—	—	○	○	Smoothing filter + Jerk ratio acceleration/deceleration + vibration suppression command filter 1
—	○	○	—	○	○	

*1 When the S-curve ratio is less than 30%, the cell is "—", "○" only applies when the S-curve ratio is 30 to 100%.

*2 The jerk ratio acceleration/deceleration cannot be used during the interpolation operation.

- The setting at starting the operation is valid for the method of acceleration/deceleration of speed options. If the method of acceleration/deceleration is changed during the operation, the change is not made. It is validated (changed) from the next time the operation is started.
- When the smoothing filter and the vibration suppression command filter 1 are set together, the vibration suppression command filter 1 is processed before processing the smoothing filter.
- When using the acceleration/deceleration function other than the linear acceleration/deceleration in the operation cycle 62.50µs, use the high speed operation mode.

[Motion API]

- To set/get the acceleration/deceleration method of speed options, use the sscChange2Parameter function.
- To set the point table, use the sscSetPointDataEx function.

Linear acceleration/deceleration

The linear acceleration/deceleration provides acceleration/deceleration linearly as shown in the following drawing. For the acceleration time constant and the deceleration time constant, set the time before reaching "Speed limit value (parameter No.0222, 0223)".
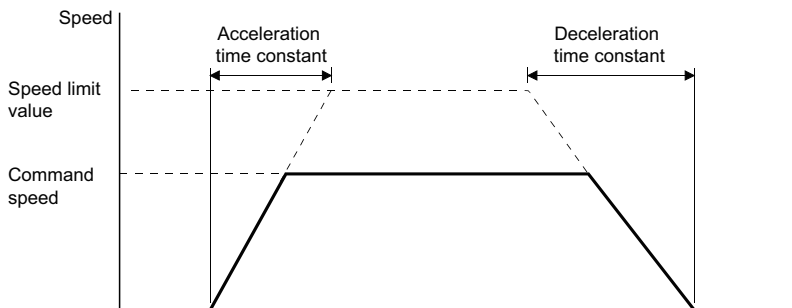
Smoothing filter

Setting the smoothing filter makes smooth acceleration/deceleration.
The smoothing time constants are set using "Smoothing time constant (parameter No.0226)". The acceleration time and the deceleration time get longer as much as the smoothing time constant.
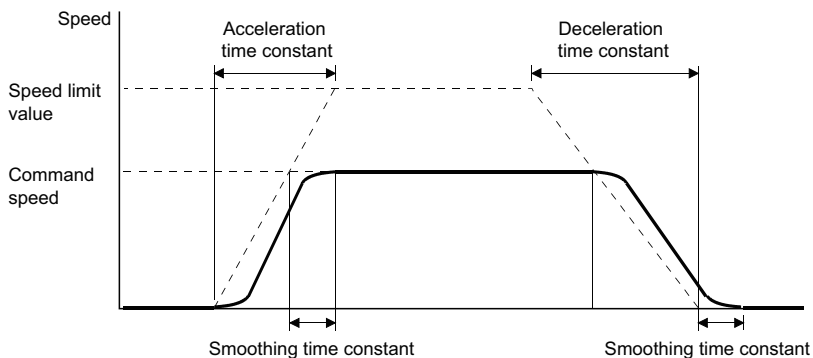
Point

- The setting at starting the operation is valid for the smoothing time constants. If the smoothing time constants are changed during the operation, the change is not made. It is validated (changed) from the next time the operation is started.
- The smoothing filter is supported in the basic system software version "02" or later.

S-curve acceleration/deceleration (Sine acceleration/deceleration)

This is a method where acceleration/deceleration is performed gradually based on the Sin-curve. To make the S-curve acceleration/deceleration valid, set the S-curve ratio (30 to 100%). At this time, the acceleration time and the deceleration time are the same as in the case of the linear acceleration/deceleration.
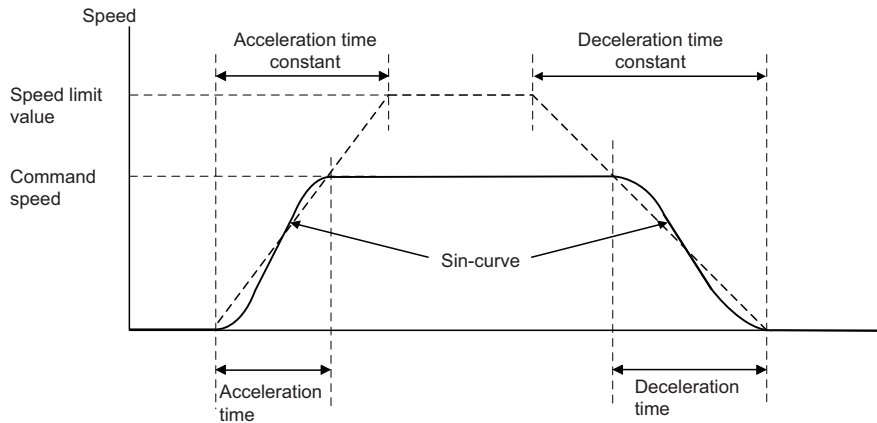
Point

When using the S-curve acceleration/deceleration for the JOG operation, the incremental feed operation, and the home position return, set the S-curve ratio in "S-curve ratio (parameter No.0221)". For the automatic operation and the interpolation operation, set the S-curve ratio in the point table.

Point

[Motion API]
- When using the S-curve acceleration/deceleration for the JOG operation, the incremental feed operation, and the home position return, use the sscChange2Parameter function/sscCheck2Parameter function to set "S-curve ratio (parameter No.0221)".
- When using the S-curve acceleration/deceleration for the automatic operation and the interpolation operation, set the S-curve ratio in the point table using the sscSetPointDataEx function.

Control parameters

Parameter No.	Symbol	Name	Initial value	Units	Setting range	Function	When in tandem drive
0221	SRATE	S-curve ratio	0	%	0 to 100	Set the S-curve ratio of the S-curve acceleration/deceleration (sine acceleration/deceleration).[1][2] • 0 to 29: S-curve acceleration/deceleration invalid • 30 to 100: S-curve acceleration/deceleration	Master

*1 The S-curve acceleration/deceleration is performed for the acceleration/deceleration method selected in "Speed options (parameter No.0220)".

*2 The S-curve ratio set by this parameter is used in the JOG operation, the incremental feed operation, and the home position return. For the automatic operation and the interpolation operation, set the S-curve ratio in the point table.

S-curve ratio

The S-curve ratio indicates which part of the Sin-curve is used to draw the acceleration/deceleration curve as shown in the figure below.
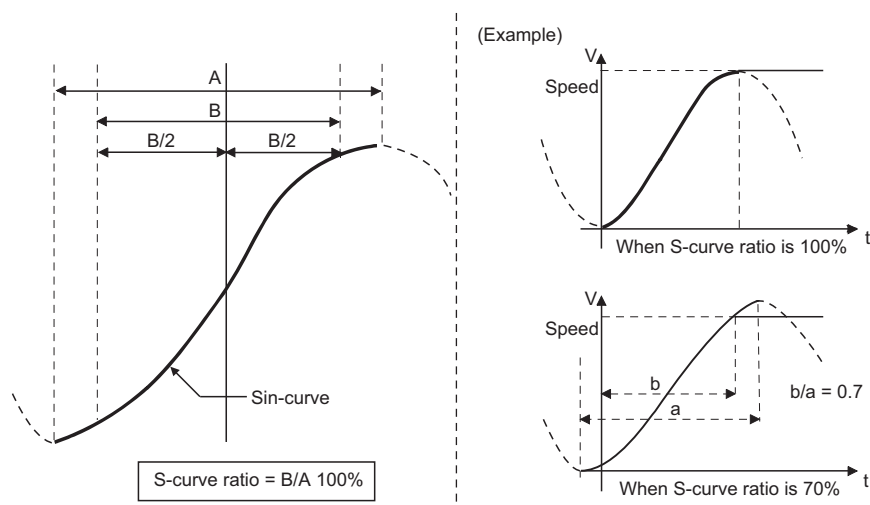
> **Point**
> - The valid limits of the S-curve ratio are "30 to 100%". When less than 30% is set, the command waveform is the same as the one of the setting of 0%.
> - The setting at starting the operation is valid for the S-curve ratio. If the S-curve ratio is changed during the operation, the change is not made. It is validated (changed) from the next time the operation is started.

When the change speed is performed, the acceleration/deceleration based on the Sin-curve to the set speed is performed again from the time of the completion of the preparation for changing speed completed.
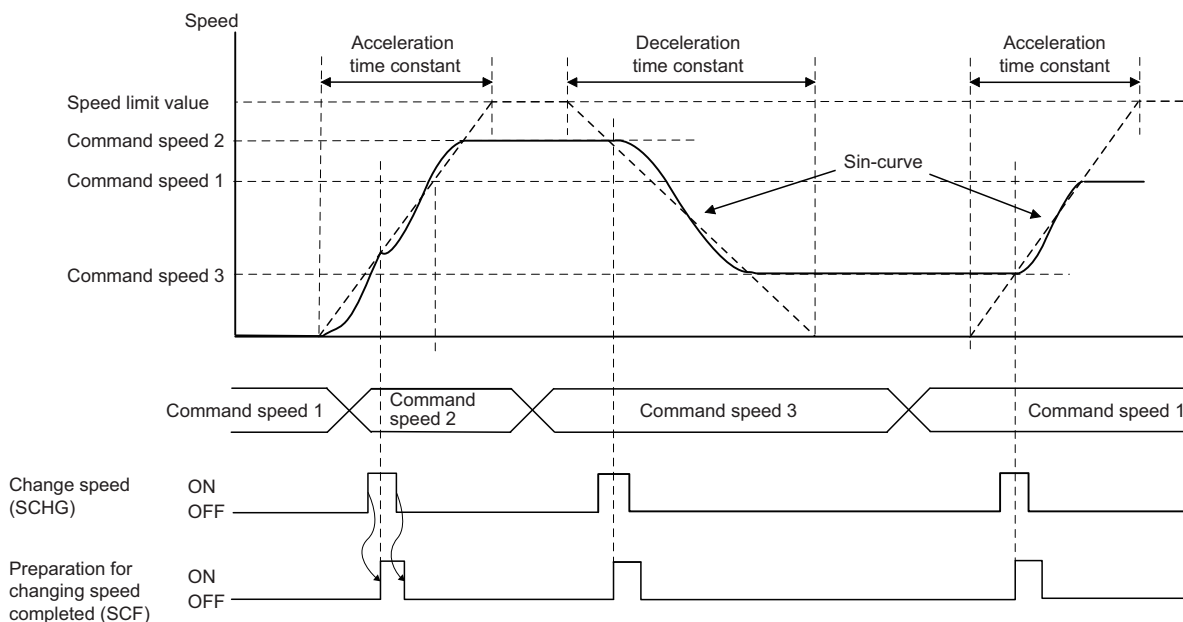
When the change acceleration time constant is performed during the acceleration, the acceleration based on the Sin-curve is performed again from the time of the preparation for changing acceleration time constant completed.
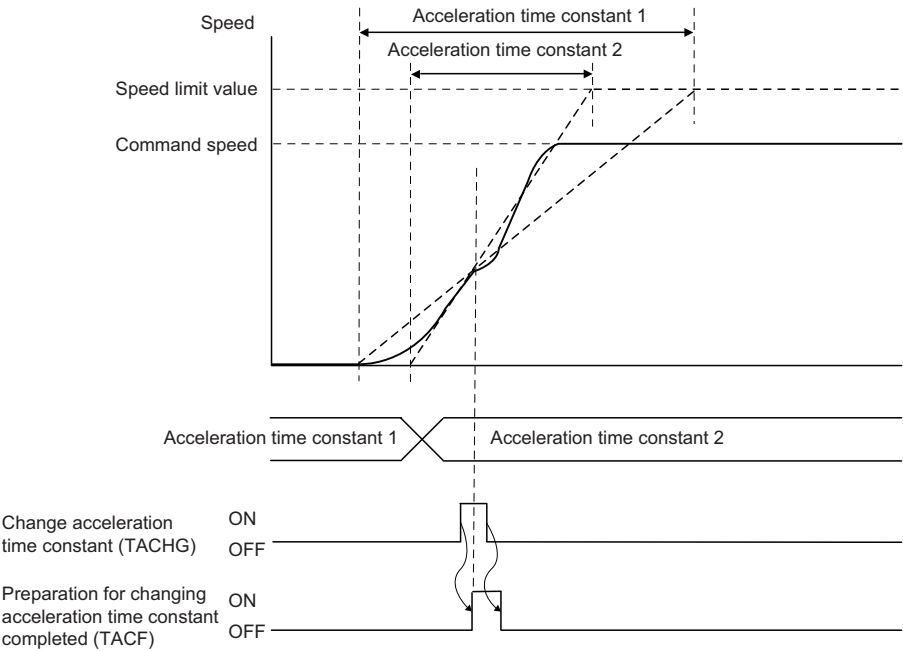
When deceleration stops are made with the rapid stop time constants such as the rapid stop signal (RSTP) and the interlock signal (ITL), the S-curve acceleration/deceleration is canceled and the speed is decelerated with the linear acceleration/deceleration. When deceleration stops are made with the deceleration time constants such as operation alarms, the speed is decelerated with the S-curve acceleration/deceleration.

However, when the overrun occurs (for example, the rapid stop time constant is longer than the deceleration time constant.), the deceleration stops are performed with the S-curve acceleration/deceleration.
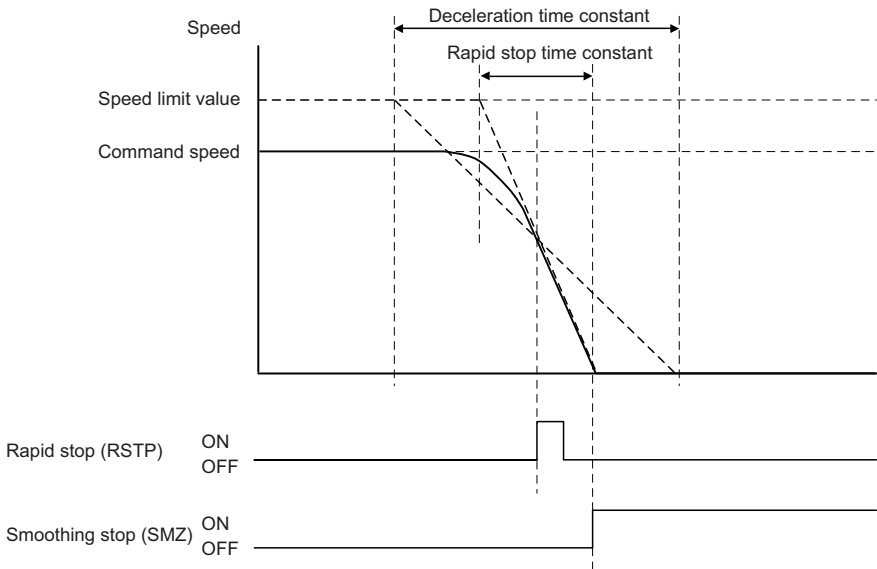
When the original command shape is not trapezoidal but triangle (for example, the travel distance is small.), the acceleration/deceleration is performed based on the Sin-curve that peaks at the maximum command speed for the triangle command.
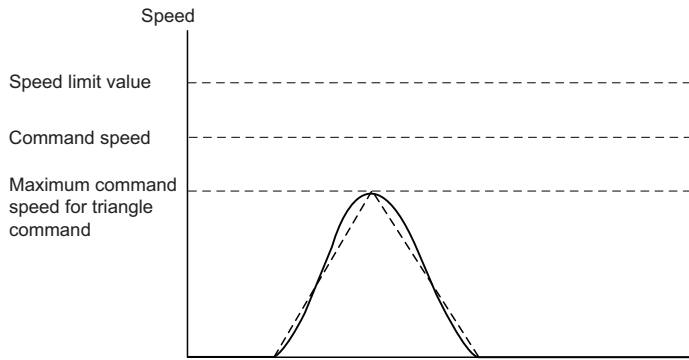
The smoothing filter and the S-curve acceleration/deceleration can be used together. When the S-curve acceleration/deceleration and the smoothing filter are used together, the acceleration/deceleration as shown in the figure below is performed.
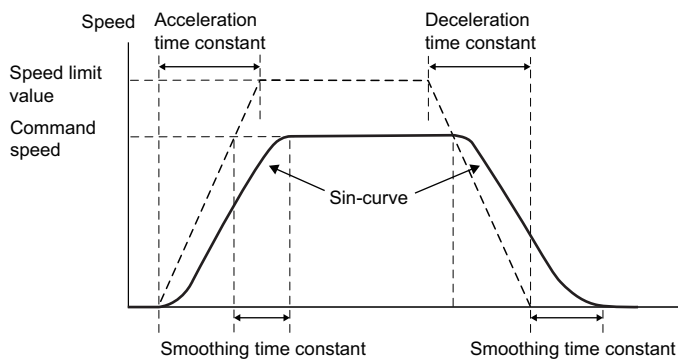
Jerk ratio acceleration/deceleration

The jerk ratio acceleration/deceleration is an acceleration/deceleration method that uses a trapezoidal pattern.
When using this function, the acceleration time and the deceleration time are longer compared to the linear acceleration/deceleration.

> **Point**
> - The jerk ratio acceleration/deceleration can only be used in the automatic operation.
> - The jerk ratio acceleration/deceleration is supported in the basic system software version "02" or later.
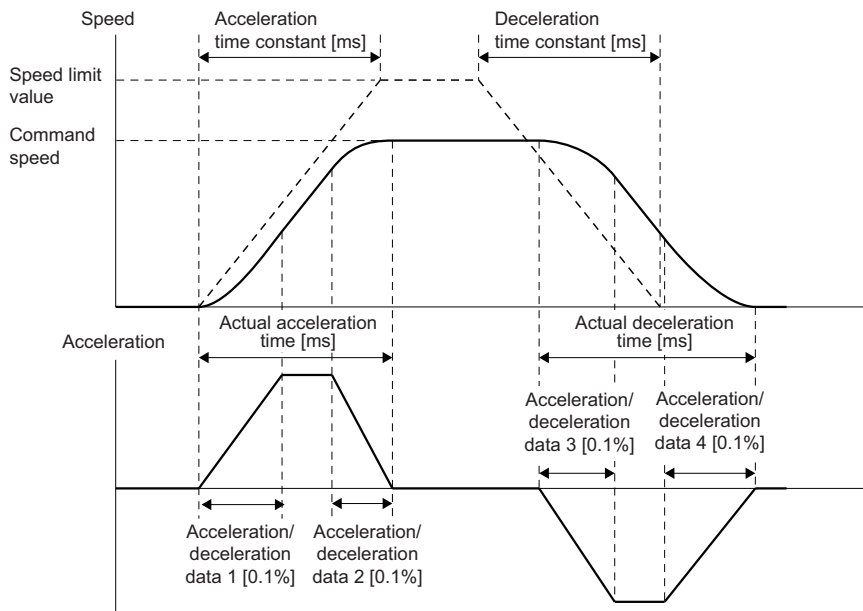
The actual acceleration/deceleration time increases for the following amount.
- Actual acceleration time = (1 + (Acceleration/deceleration data 1 + Acceleration/deceleration data 2) ÷ 1000) × Command speed ÷ Speed limit value × Acceleration time constant
- Actual deceleration time = (1 + (Acceleration/deceleration data 3 + Acceleration/deceleration data 4) ÷ 1000) × Command speed ÷ Speed limit value × Deceleration time constant

When the commanded shape is not trapezoidal but a triangle, such as when the movement amount is small, the deceleration starts before the command speed is reached. The ratio for each section during the acceleration/deceleration is maintained at the values set to the acceleration/deceleration data area.
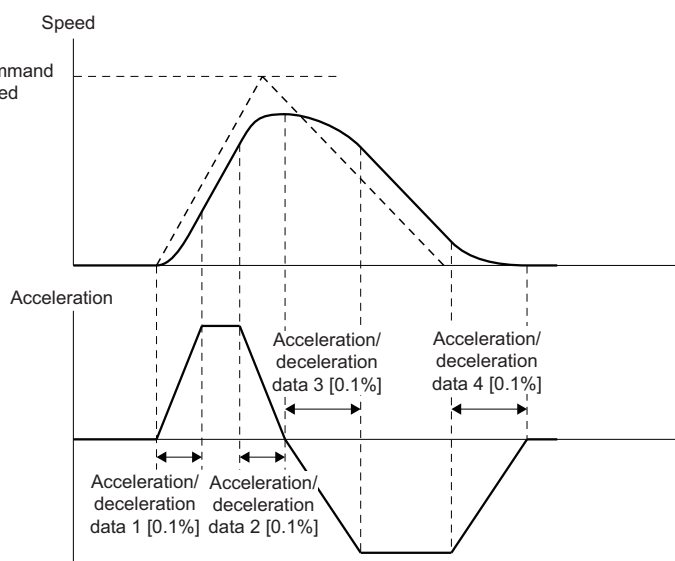
Point table

The jerk ratio acceleration/deceleration sets the following in the point table.
- Acceleration/deceleration data (☞ Page 103 Acceleration/deceleration data)
- Auxiliary command 2 (☞ Page 103 Auxiliary command 2)

For details about the point table, refer to the following.

> **Point**
>
> - The continuous operation cannot be specified in the deceleration check system. When the continuous operation is set, "Point Table Setting Error (operation alarm No.0025H, detail No.0002H)" occurs.
> - When the acceleration/deceleration method setting value is outside of the setting range, "Point Table Setting Error (operation alarm No.0025H, detail No.0012H)" occurs.
> - When the value of any of acceleration/deceleration data 1 to 4 is outside of the setting range, "Point Table Setting Error (operation alarm No.0025H, detail No.0013H)" occurs.
> - When the total of the values of acceleration/deceleration data 1 and 2, or acceleration/deceleration data 3 and 4 exceeds "1000 [0.1%]", "Point Table Setting Error (operation alarm No.0025H, detail No.0014H)" occurs.
> - When the setting values of all acceleration/deceleration data are "0", the jerk ratio acceleration/deceleration is invalid for the applicable sections.
> - When the setting values of the acceleration time constant or the deceleration time constant exceeds "1000 [ms]", the jerk ratio acceleration/deceleration is invalid for the applicable sections.

Operation mode combinations

Only the automatic operation is supported.
The jerk ratio acceleration/deceleration function is invalid in other operation modes.

> **Point**
>
> When the jerk ratio acceleration/deceleration is set in the acceleration/deceleration method during the interpolation operation, "Point Table Setting Error (operation alarm No.0025H, detail No.0015H)" occurs.

Command change combinations

All command changes are not available for the speed change, the change of time constants, and the position change.

Operation rapid stop and interlock combinations

When deceleration stops are made with rapid stop time constants such as the rapid stop signal (RSTP) and the interlock signal (ITL), the jerk ratio acceleration/deceleration is canceled, and the acceleration/deceleration method in speed options is used for the deceleration.

When deceleration stops are made with the deceleration time constant such as operation alarms, the acceleration/deceleration method is used for the deceleration. (☞ Page 143 Acceleration/Deceleration)
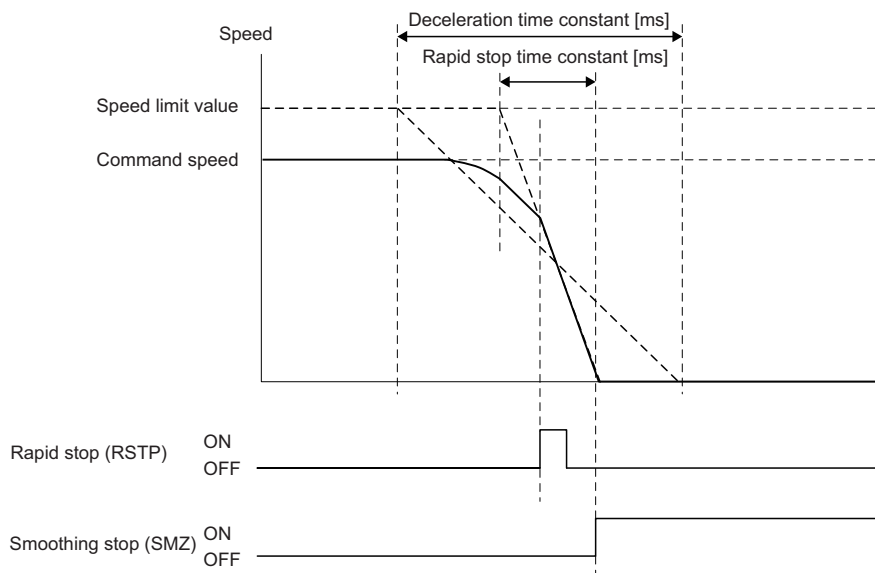
Vibration suppression command filter 1

The vibration suppression command filter 1 removes only designated frequency components by superimposing waveforms whose phase is delayed by only half of the vibration cycle for the position command. Acceleration times and deceleration times are longer by only delay from the filter "1/(frequency × 2) [s]". The attenuation of the filter can be set. When the filter's effect is small, the attenuation can be set to increase the effect of the filter.
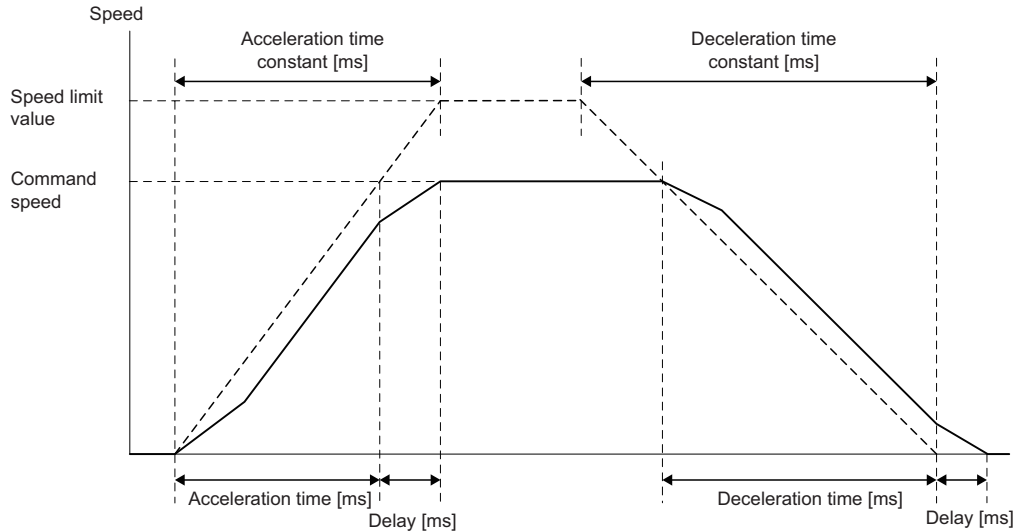
> **Point**
> • While the vibration suppression command filter 1 can be set to an interpolation operation axis, because the mechanical vibration frequency for each axis performing the interpolation operation is generally different, the setting values for parameters are also different. Consequently, the path during the interpolation operation cannot be maintained.
> • The vibration suppression command filter 1 is supported in the basic system software version "02" or later.

Control parameters

Set the following parameters to use the vibration suppression command filter 1.

When the parameters in the table are changed during the operation, the set values become valid the next time operation is start up.

Parameter No.	Symbol	Name	Initial value	Units	Setting range	Function	When in tandem drive
025C	FREQ	Vibration suppression command filter 1 frequency	0	0.1Hz	0 to 20000	Set the vibration suppression command filter 1 frequency in increments of 0.1Hz. The setting range for each operation cycle is shown below. When a frequency outside the range is set, the vibration suppression command filter 1 becomes invalid. • 62.50µs: 160 to 20000 • 125.00µs: 80 to 20000 • 250.00µs: 40 to 20000 • 500.00µs: 20 to 10000 • 1000.00µs: 10 to 5000 • 2000.00µs: 5 to 2500	Master
025D	ATT	Vibration suppression command filter 1 attenuation	0	—	0 to 32	Set the attenuation of the vibration component. • 0: Maximum filter attenuation	Master
025E	EDRP	Vibration suppression command filter 1 operation ending droop	0	pulse	0 to 10000	Set the operation ending droop for when the operation finishes. When the amount of droop by the vibration suppression command filter 1 is equal to or less than the set value, all remaining pulses are output and the operation ends. • 0: 5 [pulse]	Master

Point table

The vibration suppression command filter 1 sets the following in the point table.

- Auxiliary command (☞ Page 92 Auxiliary command)

For details about the point table, refer to the following.

☞ Page 90 Point table

> **Point**
>
> For an operation using more than one point, the vibration suppression command filter 1 set to the start point is specified to perform the operation also after the second point.

Operation mode combinations

The automatic operation and the interpolation operation are supported.

The vibration suppression command filter 1 function is invalid in other operation modes.

Command change combinations

The speed change, the time constant change, and the position change are all available.

8.4 Servo ON/Servo OFF

The servo is turned ON/OFF in the axis connected to the Motion control board. By turning OFF the servo, the axis can be operated.

> **Point**
>
> Connect the drive unit to CC-Link IE TSN when the status is Switched on (ready ON/servo OFF for MR-J5(W)-G). For details about Switched on, refer to "PDS state transitions" in the following manual Chapter1 Appendix "Drive profile".
> 📖 MR-J5-G/MR-J5W-G User's Manual (Communication Function)

If the servo on signal (SON) is turned OFF during the operation, an alarm occurs, the movement is rapid stopped, and the servo is turned OFF.

Even if the servo on signal (SON) is turned back ON, the operation does not resume.
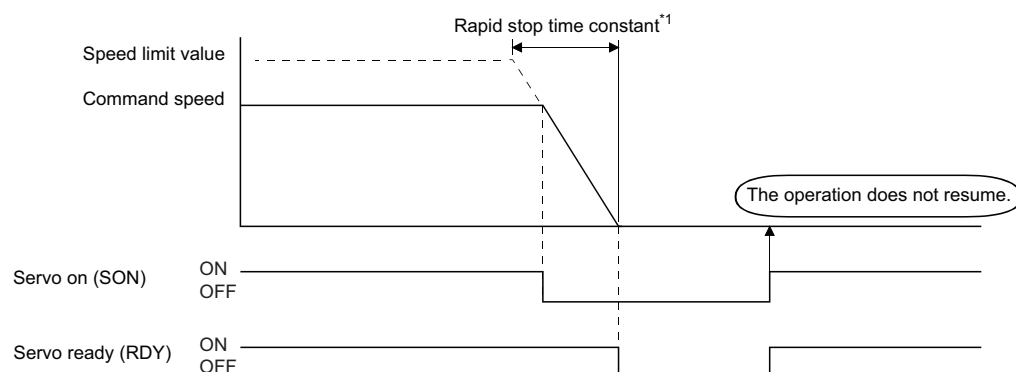
*1 If "1: Smoothing filter" is set in "Acceleration/deceleration method" of "Speed options (parameter No.0220)", the smoothing time constant is always valid. Therefore, the rapid stop is performed as well by the deceleration using the smoothing filter.
The smoothing filter function is supported in the basic system software version "02" or later.

> **Point**
>
> [Motion API]
> - To turn ON/OFF the servo on signal (SON), set "SSC_CMDBIT_AX_SON" to the command bit No. of the sscSetCommandBitSignalEx function.
> - To confirm if the servo ready signal (RDY) is ON/OFF, set "SSC_STSBIT_AX_RDY" to the status bit No. with the sscGetStatusBitSignalEx function/sscWaitStatusBitSignalEx function.

Necessary objects

The necessary object for servo ON/servo OFF is shown below.

Function	Necessary objects	
	TPDO	RPDO
Servo ON/servo OFF	Statusword (Obj. 6041h)	Controlword (Obj. 6040h)

Follow up

The follow up is the function that updates the current command position in accordance with the movement (current feedback position) if an axis is moved due to an external force while the servo is OFF. After the servo is turned OFF, the coordinate return processing such as returning to the home position is not necessary.

The current command position is updated in accordance with the distance moved while the servo is OFF.
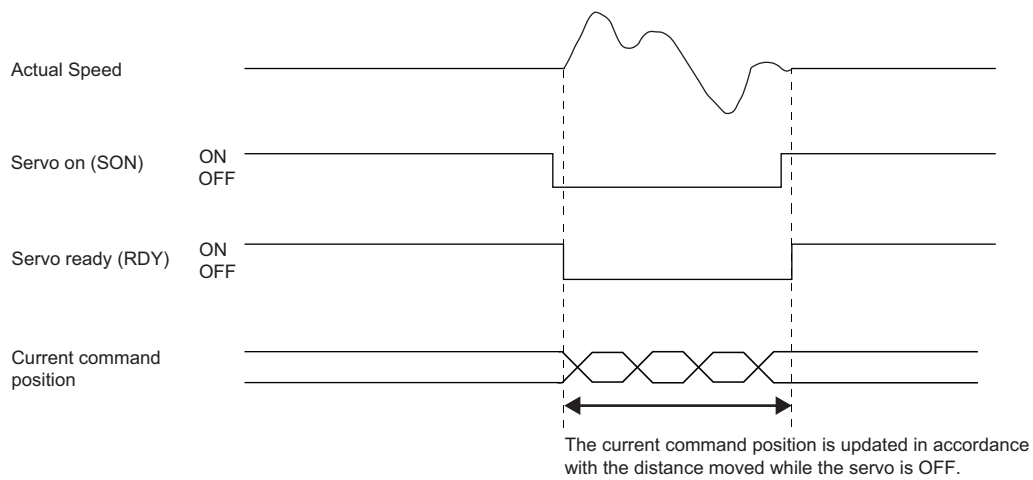
8.5 Forced Stop

External forced stop/Software forced stop

Commands are turned to "0" at the forced stop. Drive units become free from the control of the Motion control board and stop according to their specifications or settings such as the dynamic brake stop and the deceleration to a stop. For details, refer to the drive unit manual on your drive unit.

During the forced stop, the current command position is updated according to the movement (current feedback position).

Therefore, after resetting the forced stop, the origin coordinate processing such as the home position return is not necessary.
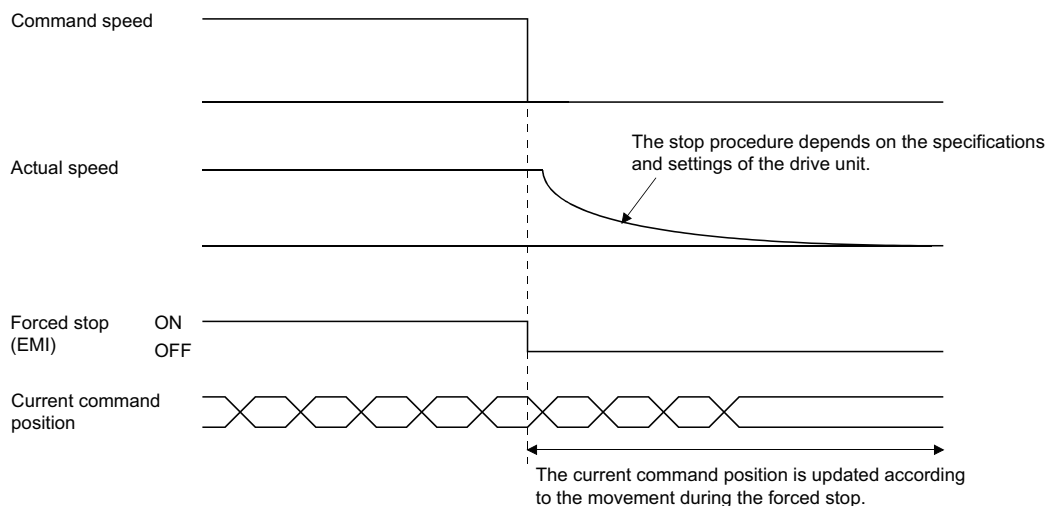
For forced stops, there are an external forced stop using an input signal through the forced stop input connector and a software forced stop signal (SEMI) from a system command bit.

Also, "System Error Occurs (system status code error: E300H)" activates the forced stop. The cause of the forced stop can be confirmed using "Forced stop factor (monitor No.00000401H)".

Point

- If the forced stop is input, this function stops the axis using the Quick stop function of the drive unit.
- For "Quick stop option code (Obj. 605Ah)", only "2" is supported for the Motion control board.
- This function is valid only for an axis. (Invalid for others such as I/O devices including the profile mode.)
- For the profile mode, confirm the input signal from the general-purpose I/O connector by the user program and perform the stop.
- The external forced stop signal (EMI) is a normally-closed contact.

Point

[Motion API]
- To turn ON/OFF the software forced stop signal (SEMI), set "SSC_CMDBIT_SYS_SEMI" to the command bit No. of the sscSetCommandBitSignalEx function.
- To confirm if the being executed forced stop signal (EMIO) is ON/OFF, set "SSC_STSBIT_SYS_EMIO" with the sscGetStatusBitSignalEx function/sscWaitStatusBitSignalEx function.

interface

■System data (high speed) (system command bit)

Address (hexadecimal)	Bit	Symbol	Signal name
00000801	0	SEMI	Software forced stop
	1	—	For manufacturer setting
	2		
	3		
	4		
	5		
	6		
	7		

• Details concerning system command bit

Symbol	Signal name	Function details	
		Function	Operation
SEMI	Software forced stop	The command speed becomes 0.	When the software forced stop signal (SEMI) is turned ON, the command speed becomes 0.

■System data (high speed) (system status bit)

Address (hexadecimal)	Bit	Symbol	Signal name
00000821	0	EMIO	Being executed forced stop
	1	—	For manufacturer setting
	2		
	3	PPIAL	Batch judgment of passing position interrupt condition
	4	SEO	System error detected
	5	—	For manufacturer setting
	6	EMID	External forced stop disabled
	7	—	For manufacturer setting

• Details concerning system status bit

Symbol	Signal name	Function details		
		Function	Operation	
			Conditions for turning ON	Conditions for turning OFF
EMIO	Being executed forced stop	Notify that the forced stop occurs.	The forced stop signal (EMI) is OFF or the software forced stop signal (SEMI) turns ON.	The forced stop signal (EMI) is ON and the software forced stop signal (SEMI) turns OFF.

■System data (low speed) (system status bit)

Address (hexadecimal)	Bit	Symbol	Signal name
000008EC	0	EMC0	Forced stop factor 0 (Being executed external forced stop)
	1	EMC1	Forced stop factor 1 (Being executed software forced stop)
	2	EMC2	Forced stop factor 2 (User watchdog error detected)
	3	—	For manufacturer setting
	4		
	5	EMC5	Forced stop factor 5 (Preparing reboot)
	6	EMC6	Forced stop factor 6 (System status code error detected)
	7	—	For manufacturer setting

• Details concerning system status bit

Symbol	Signal name	Function details		
		Function	Operation	
			Conditions for turning ON	Conditions for turning OFF
EMC0	Forced stop factor 0 (Being executed external forced stop)	Notify of the forced stop due to the forced stop signal (EMI) turning OFF.	The forced stop signal (EMI) turns OFF.	The forced stop signal (EMI) turns ON.
EMC1	Forced stop factor 1 (Being executed software forced stop)	Notify of the forced stop due to the software forced stop signal (SEMI) turning ON.	The software forced stop signal (EMI) turns ON.	The software forced stop signal (EMI) turns OFF.
EMC2	Forced stop factor 2 (User watchdog error detected)	Notify of the forced stop due to the user watchdog error occurring.	The value of the user watchdog timer becomes "0" when the value other than "0" is set to the watchdog timer start counter.	The value "0" is set to the watchdog timer start counter. (An arbitrary value is set when using the watchdog timer function again.)
EMC5	Forced stop factor 5 (Preparing reboot)	Notify of the forced stop due to the transfer during preparing the software reboot.	The reboot preparation completed signal (RBOK) turns ON.	• The reboot preparation signal (RBR) turns OFF. • Reboot the software.
EMC6	Forced stop factor 6 (System status code error detected)	Notify of the forced stop due to the system status code error occurring.	"System Status Code Error (error code: 3216H)" is stored in the system error.	Reboot the software.

■System parameters

Parameter No.	Symbol *1	Name	Initial value	Units	Setting range	Description
0014	*EMIDI	Input signal settings for emergency stop	0000h	—	0000h to 00F2h	■■■□ (Input signal setting) Set the input signal for emergency stop. • 0: General-purpose input specification • 1: Input bit device specification • 2: Input word device specification ■■□■ (Bit selection) When specifying the input word device, set the bit No. to use. <Example> When using fifth bit Set 0052h.
0015	*EMIS	Specification of sensor signal (EMI) connection	0000h	—	0000h to 3FFFh	■For "0: General-purpose input specification" (DI□□□□) Set the general-purpose input (DI) No. to which EMI is connected. • 0000h to 0003h: DI0 to DI3 ■For "1: Input bit device specification" (RX□□□□) Set the input bit device (RX) No. to which EMI is connected. • 0000h to 3FFFh: RX0000 to RX3FFF ■For "2: Input word device specification" (RWr□□□□) Set the input word device (RWr) No. to which EMI is connected. • 0000h to 1FFFh: RWr0000 to RWr1FFF

*1 The settings for the parameters with a * mark at the front of the symbol are validated when the system is started.

Point

When the combination of "Input signal setting" of "Input signal settings for emergency stop (parameter No.0014)" and the input signal No. of "Specification of sensor signal (EMI) connection (parameter No.0015)" is out of the range, "Parameter Error (system alarm No.0037H, detail No.0001H)" occurs.

8

Necessary objects

The necessary object for the forced stop is shown below.

Function	Necessary objects	
	TPDO	**RPDO**
Forced stop	Statusword (Obj. 6041h)	Controlword (Obj. 6040h)

External forced stop disabled

The external forced stop disabled function disables the external forced stop by the input signal (EMI) from the general-purpose I/O connector.

⚠ CAUTION

When disabling the external forced stop function, make sure to use the forced stop signal of the drive unit and configure a safety circuit so that the entire system works safely outside the Motion control board.

> **Point**
>
> The software forced stop signal (SEMI) by the system command bit and forced stops due to the system status code error are not disabled.

System data (high speed) (system status bit)

Address (hexadecimal)	Bit	Symbol	Signal name
00000821	0	EMIO	Being executed forced stop
	1	—	For manufacturer setting
	2		
	3	PPIAL	Batch judgment of passing position interrupt condition
	4	SEO	System error detected
	5	—	For manufacturer setting
	6	EMID	External forced stop disabled
	7	—	For manufacturer setting

■Details on system status bit

Symbol	Signal name	Function details		
		Function	Operation	
			Conditions for turning ON	Conditions for turning OFF
EMID	External forced stop disabled	Notify that the external forced stop signal (EMI) is disabled.	"External forced stop disabled (parameter No.000E)" becomes "0000h: Forced stop enabled".	"External forced stop disabled (parameter No.000E)" becomes "5AE1h: Forced stop disabled".

System parameters

Parameter No.	Symbol *1	Name	Initial value	Units	Setting range	Description
000E	*EMID	External forced stop disabled	0000h	—	0000h, 5AE1h	Disable the forced stop by EMI signal. • 0000h: Forced stop enabled • 5AE1h: Forced stop disabled

*1   The settings for the parameters with a * mark at the front of the symbol are validated when the system is started.

Setting method

To disable the external forced stop, set "5AE1h: Forced stop disabled" to "External forced stop disabled (parameter No.000E)", and start the system. When the external forced stop is disabled, the external forced stop disabled signal (EMID) turns ON.

> **Point**
>
> • "External forced stop disabled (parameter No.000E)" settings are imported at the system startup. Changes while the system is running are invalid.
> • The external forced stop disabled signal (EMID) turns ON at the system startup.
> • When the value outside the setting range is set to "External forced stop disabled (parameter No.000E)", "Parameter Error (operation alarm No.0037H, detail No.0001H)" occurs.

Forced stop option

Operation for a forced stop can be set by "Emergency stop option (parameter No.02A0)".

When setting the forced stop option, set "Forced stop option selection" of "System option 3 (parameter No.0003)" to "1: Valid". If the input signal turns OFF, perform a stop operation according to the setting of "Emergency stop option (parameter No.02A0)".

⚠ CAUTION

- When setting "Forced stop option" of "Emergency stop option (parameter No.02A0)" to "4: Forced stop invalid" , make sure to use the forced stop signal of the drive unit and configure a safety circuit so that the entire system works safely outside the Motion control board.
- For a drive unit that does not support the Halt function, do not set "Forced stop option" of "Emergency stop option (parameter No.02A0)" to "1: Rapid stop" or "3: Stop after operation completed if any one of the condition axes is operating toward the judgement direction of condition axes settings. Rapid stop if other than the above".

Point

- The forced stop option is supported in the basic system software version "05" or later.
- When "Forced stop option" of "Emergency stop option (parameter No.02A0)" is set to "0: Quick stop", "1: Rapid stop", "2: Stop after operation completed", or "3: Stop after operation completed if any one of the condition axes is operating toward the judgement direction of condition axes settings. Rapid stop if other than the above." and the start operation is performed during emergency stop, "During Forced Stop (operation alarm No.0012H, detail No.0001H)" occurs, and the start operation is canceled.
- When "Forced stop option" of "Emergency stop option (parameter No.02A0)" is set to "4: Forced stop invalid" and the start operation is performed during forced stop, an operation alarm does not occur and the operation is started.
- When "Forced stop option" of "Emergency stop option (parameter No.02A0)" is set to "0: Quick stop" for the primary axis and "4: Forced stop invalid" for the auxiliary axis, if the start operation is performed for the linear interpolation during emergency stop, "Can't Start Interpolation Auxiliary Axis Error (operation alarm No.0042H, detail No.0002H)" occurs in the primary axis. Because the servo ready signal (RDY) is OFF in the primary axis, "Servo Is Not Controllable (operation alarm No.00B0H, detail No.0003H)" occurs in the auxiliary axis, and the start operation is canceled.
- When a forced stop occurs during the operation, "During Forced Stop (operation alarm No.0012H, detail No.0001H)" occurs, and the operation stops according to the setting of the forced stop option. However, "During Forced Stop (operation alarm No.0012H, detail No.0001H)" does not occur and the following operation is performed if the axis is set as follows.
  - If "Forced stop option" of "Emergency stop option (parameter No.02A0)" is set to "4: Forced stop invalid" in the axis, the operation continues.
  - If "Driver command discard detection" of "Control option 5 (parameter No.0212)" is set to "0: Detection valid" in the axis and "Forced stop option selection" of "System option 3 (parameter No.0003)" is set to "0: Invalid" in the same axis, "Drive Unit Command Discard Detected (operation alarm No.00C0H, detail No.0001H)" occurs, and the operation is stopped.
- When a forced stop occurs while the other axes start conditions are monitored, the other axes start incomplete occurs.
- When the forced stop occurs by the software forced stop signal (SEMI) of system command bit, the operation is performed with Quick stop regardless of the setting of "Forced stop option" of "Emergency stop option (parameter No.02A0)".
- Set the axes to be equal when they are specified in the same linear interpolation group. If they are set differently, the forced stop occurs as follows during the linear interpolation operation.
  - If any axis rapidly stops in the linear interpolation group, all axes in the group rapidly stop.
  - Regardless of the above, if "Forced stop option" of "Emergency stop option (parameter No.02A0)" is set to "0: Quick stop" in any axis, the other axes rapidly stop even if they are set differently.
- The input signal set by "Input signal settings for emergency stop (parameter No0014))" is a normally-closed contact.

- The forced stop option cannot be used when "External forced stop disabled (parameter No.000E)" is set to "5AE1h: Forced stop disabled". Also, the forced stop by the input signal can be used only when "Forced option selection" of "System option 3 (parameter No.0003)" is set to "1: Valid", and "External forced stop disabled (parameter No.000E)" is set to "0000h: Forced stop enabled".

System parameter

Parameter No.	Symbol[1]	Name	Initial value	Units	Setting range	Description
0003	*SYSOP3	System option 3	0000h	—	0000h, 0010h	■■□■ (Forced stop option selection) Set valid/invalid of the forced stop option. • 0: Invalid • 1: Valid

*1 The settings for the parameters with a * mark at the front of the symbol are validated when the system is started.

Control parameter

Parameter No.	Symbol[1]	Name	Initial value	Units	Setting range	Description
02A0	*EMIOP	Emergency stop option	0000h	—	0000h to 0304h	■■■□ (Forced stop option) Set the operation of forced stop. • 0: Quick stop • 1: Rapid stop • 2: Stop after operation completed • 3: Stop after operation completed if any one of the condition axes is operating toward the judgement direction of condition axes settings. Rapid stop if other than the above. • 4: Forced stop invalid ■□■■ (Condition axis setting) Set valid/invalid of a condition axis and the judgement direction when the axis is valid. • 0: Invalid • 1 to 3: Valid (1: + direction, 2: - direction, 3: Both directions)

*1 The settings for the parameters with a * mark at the front of the symbol are validated when the system is started.

Setting example

The setting example is as follows for the following conditions.
- Set 3 axes, 4 axes, and 5 axes to the condition axes. If any one of the condition axes is operating to the - direction, stop 1 axis and 2 axes after the operation is completed. In other cases, stop 1 axis and 2 axes rapidly.
- Stop 3 axes, 4 axes, and 5 axes after the operation is completed.

Axis No.	Setting value of "Emergency stop option (parameter No.02A0)"	Operation content
1	0003h	When any one of 3 axes, 4 axes, and 5 axes is operating to the - direction, an axis stops after the operation is completed. In other cases, an axis stops rapidly.
2		
3	0202h	The axes stop after the operation is completed.
4		
5		

8

Timing chart at forced stop

The timing chart for the forced stop is shown below.

■Quick stop

The stop procedure depends on the specifications and settings of the drive unit.
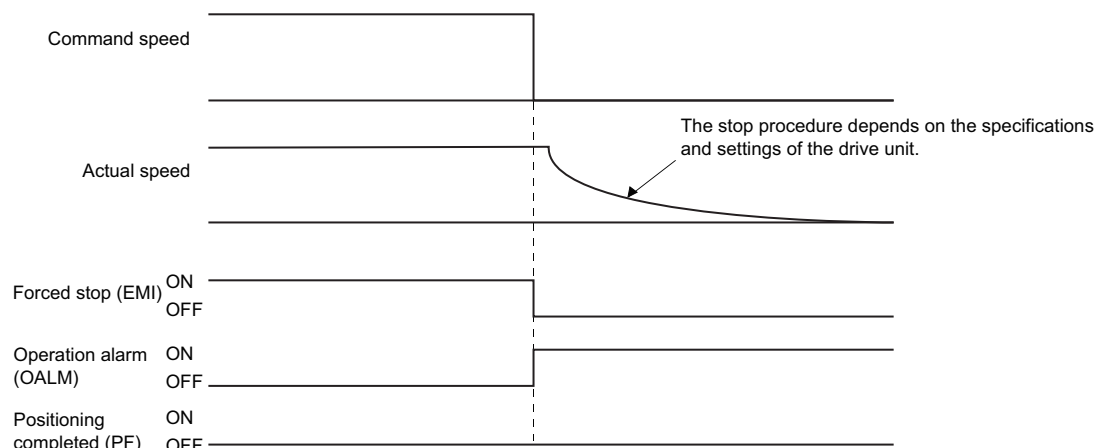
■Rapid stop
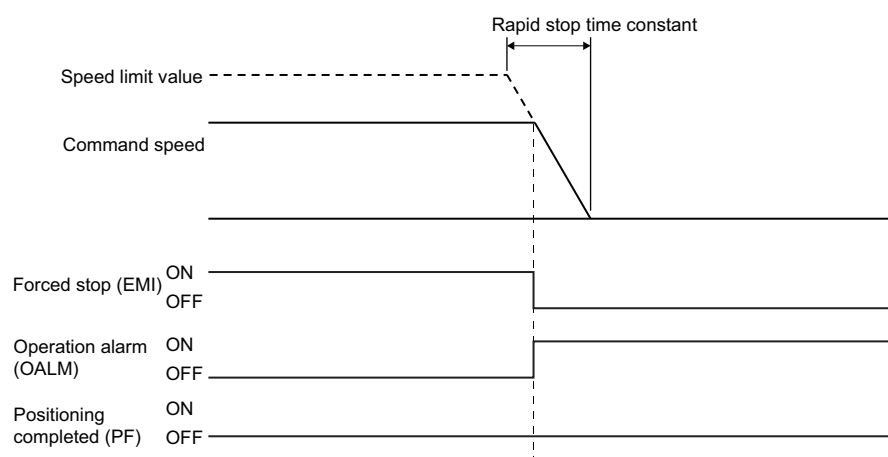
■Stop after operation is completed
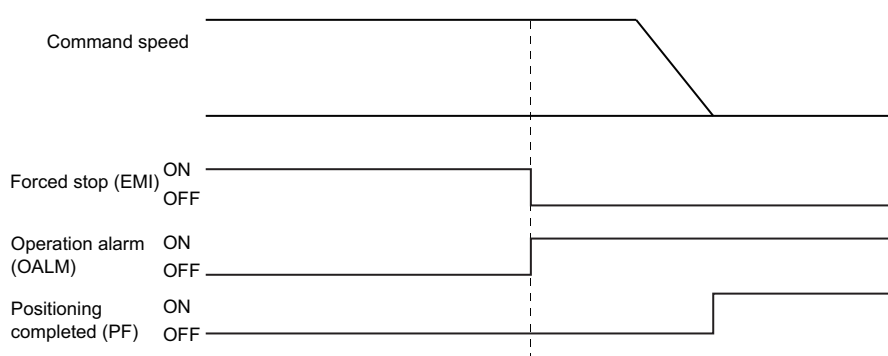
■Forced stop disabled
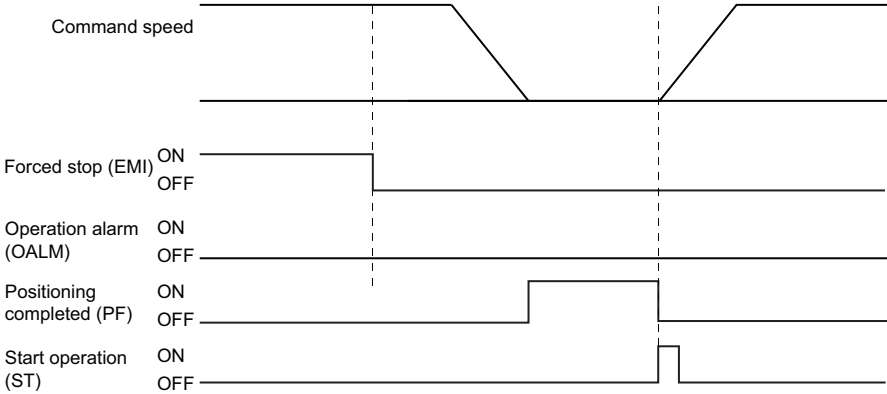
8.6 Stop Operation

When the stop operation signal (STP) is turned ON, the movement is stopped. (Alarms and warnings are not set.) Even if the stop operation signal (STP) is turned back OFF, the operation is not resumed. The time constant used for stopping for the stop operation is the deceleration time constant. If the operation is stopped during the automatic operation/interpolation operation, they do not turn ON the positioning completed signal (PF).
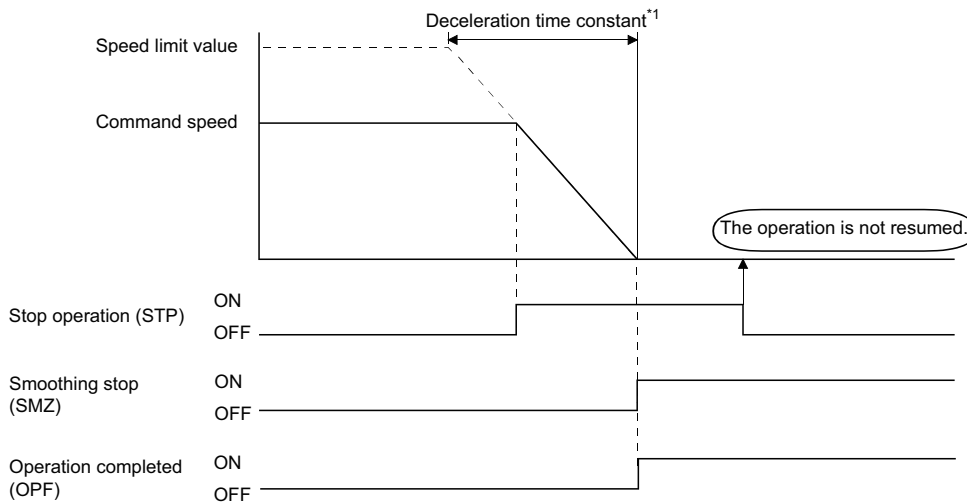
*1 Deceleration by the set acceleration/deceleration method.

Point

If the stop operation is input during the operation of the driver homing method, this function stops the axis using the Halt function of the drive unit. When using the drive unit which does not support the Halt function, perform the forced stop. A malfunction of the device may occur.

Point

[Motion API]
To perform the stop operation, use the sscDriveStop function/sscDriveStopNoWait function.

Necessary objects

The necessary object for the stop operation during the driver homing method is shown below.

Function	Necessary objects	
	TPDO	**RPDO**
Stop operation (Driver homing method only)	Statusword (Obj. 6041h)	Controlword (Obj. 6040h)

8.7 Rapid Stop Operation

When the rapid stop signal (RSTP) is turned ON, the movement is stopped abruptly. (Alarms and warnings are not set.) Even if the rapid stop signal (RSTP) is turned back OFF, the operation is not resumed. The deceleration time constant used for stopping for the rapid stop operation is "Rapid stop time constant (parameter No.0227)". If the operation is abruptly stopped during the automatic operation/interpolation operation, they do not turn ON the positioning completed signal (PF).
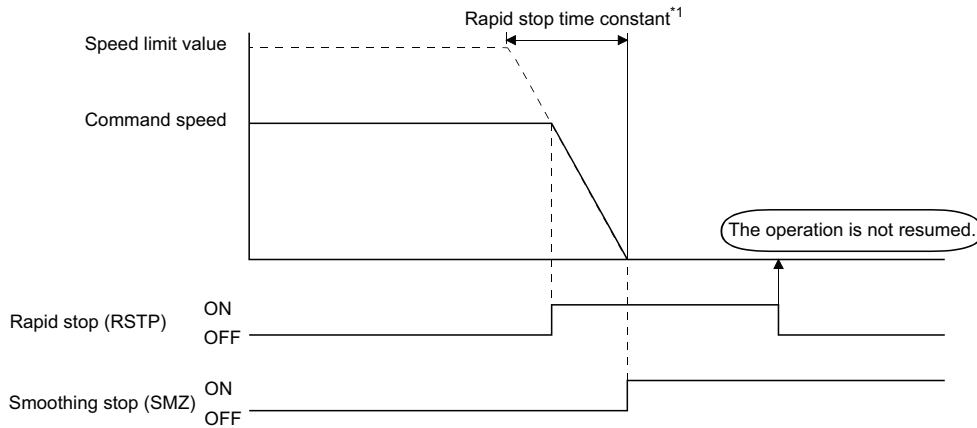
*1   Deceleration by the set acceleration/deceleration method.

Point

If the stop operation is input during the operation of the driver homing method, this function stops the axis using the Halt function of the drive unit. When using the drive unit which does not support the Halt function, perform the forced stop. A malfunction of the device may occur.

Point

[Motion API]
To perform the rapid stop operation, use the sscDriveRapidStop function/sscDriveRapidStopNoWait function.

Necessary objects

The necessary object for the rapid stop operation during the driver homing method is shown below.

Function	Necessary objects	
	TPDO	RPDO
Rapid stop operation (Driver homing method only)	Statusword (Obj. 6041h)	Controlword (Obj. 6040h)

8.8 Limit Switch (Stroke End)

When the limit switch signal corresponding to the movement direction is turned OFF, an alarm occurs and the movement is stopped.

The deceleration time constant used for stopping by the limit switch is the rapid stop time constant.
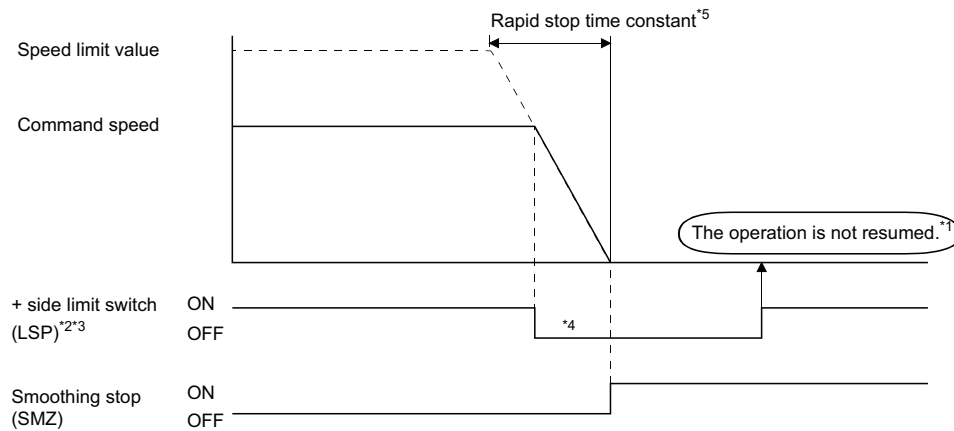
*1   Even if the limit switch signal is turned back ON, the operation does not resume.
*2   The limit switch signal is a signal that is input through the general-purpose I/O connector or something similar. The method for inputting an external signal can be set up using "Sensor input options (parameter No.0219)".
*3   The limit switch signal is a normally-closed contact.
*4   If the operation stopped by the limit switch during the automatic operation/interpolation operation, they do not turn ON the positioning completed signal (PF).
*5   Deceleration by the set acceleration/deceleration method.

If the servo is stopped with the limit switch in the OFF position (prohibited area), the servo can be moved in the movement allowed area. However, execute the start operation after resetting the alarm that has been set.
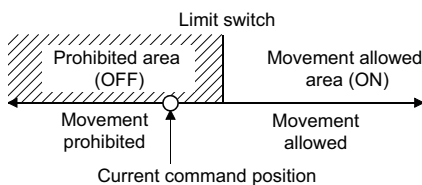
> **Point**
>
> [Motion API]
> To confirm if the limit switch (LSP or LSN) is ON/OFF, use the sscGetIoStatusFast function.

8.9 Software Limit

The operations of the software limit in each operation mode are as follows.

Operation mode	Description
JOG operation	During the JOG operation, if the software limit is reached, "Reached Software Limit (operation alarm No.00A2H, detail No.0001H)" occurs, the deceleration of the servo is started, and the servo is stopped not to exceed the software limit.
Incremental feed	If the movement amount designated by an incremental feed exceeds the software limit, "Out of Software Limit Boundaries (operation alarm No.00A1H, detail No.0001H)" occurs and the start operation is not performed.
Automatic operation	If the point designated by a position command exceeds the software limit, "Out of Software Limit Boundaries (operation alarm No.00A1H, detail No.0001H)" occurs and the start operation is not performed. Also, if the point is designated during the operation, "Out of Software Limit Boundaries (operation alarm No.00A1H, detail No.0001H)" occurs when the point is designated and the servo is decelerated and stopped.
Interpolation operation	If the point designated by a position command for an axis within the group exceeds the software limit, "Out of Software Limit Boundaries (operation alarm No.00A1H, detail No.0001H)" occurs and the start operation is not performed. Also, if the point is designated during the operation, an alarm occurs when the point is designated and the servo is decelerated and stopped.

If the current command position is outside the software limit boundaries (prohibited area), the servo can be moved in the direction of the movement allowed area. However, execute the start operation after resetting the alarm that has been set.
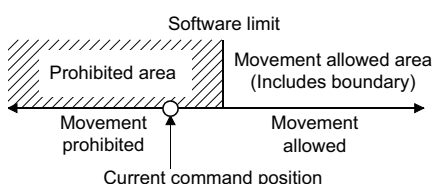
Point

- If the deceleration check method is in the continuous operation and the position command after the point switching exceeds the software limit, "Out of Software Limit Boundaries (operation alarm No.00A1H, detail No.0001H)" occurs and a deceleration stop occurs. In this case, if the distance to the software limit is shorter than the distance necessary to make a deceleration stop, the operation may stop outside the software limit.
- The software limit boundaries are set using "Software limit Upper limit (parameter No.0228, 0229)" and "Software limit Lower limit (parameter No.022A, 022B)".
- If an alarm is set due to exceeding the software limit, the operation is stopped using the deceleration time constant.
- If the movement amount [command unit] per 1 operation cycle due to a follow up exceeds 8388607 (approx. 8m/s, with command unit nm and operation cycle 1ms), the amount is clamped at the maximum value. Therefore, the follow up delays, and the function to refer to the current command position is affected by a follow up delay. When using a function such as the software limit that refers to the current position to perform the stop processing, lower the speed limit when setting the speed limit value.
- If the upper boundary and the lower boundary of the software limit are the same value, the software limit is invalid.
- If the lower boundary of the software limit is a higher value than the upper limit, "Software Limit Parameter Error (operation alarm No.00A4H, detail No.0001H)" occurs upon the start of the operation.
- Software limits are invalid when the home position return has not been completed.

Point

[Motion API]
To set/get the software limit, use the sscChange2Parameter function/sscCheck2Parameter function.

Precautions

The range of the movement of the Motion control board is "-2147483648 to 2147483647". The movement outside the limits is not covered with the warranty. If the software limits have been disabled, make sure that the operation does not exceed the physical limits.

8.10 Interlock

When the interlock signal (ITL) is turned ON, the movement is temporarily stopped. During the stoppage of movement, the interlock stop signal (ISTP) is turned ON. When the interlock signal (ITL) is turned OFF, the operation is resumed. The interlock signal (ITL) for a normally-open contact or a normally-closed contact can be selected using "Control option 3 (parameter No.0202)". (The explanation in this section is for a normally-open contact.)

When using the interlock to stop the servo, the deceleration is performed using the rapid stop time constant.
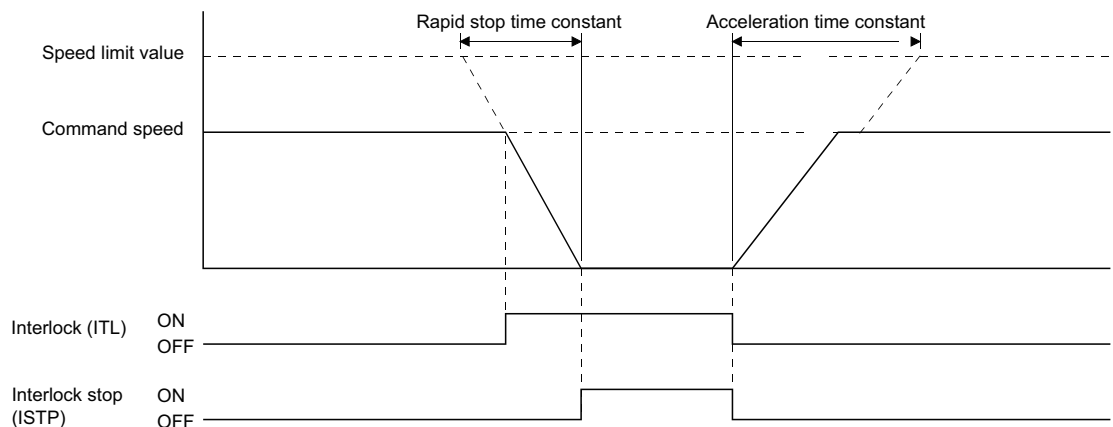
If the interlock signal (ITL) is canceled during the deceleration, the operation is re-started after the command speed decreases to 0. For this case, the interlock stop signal (ISTP) does not turn ON.
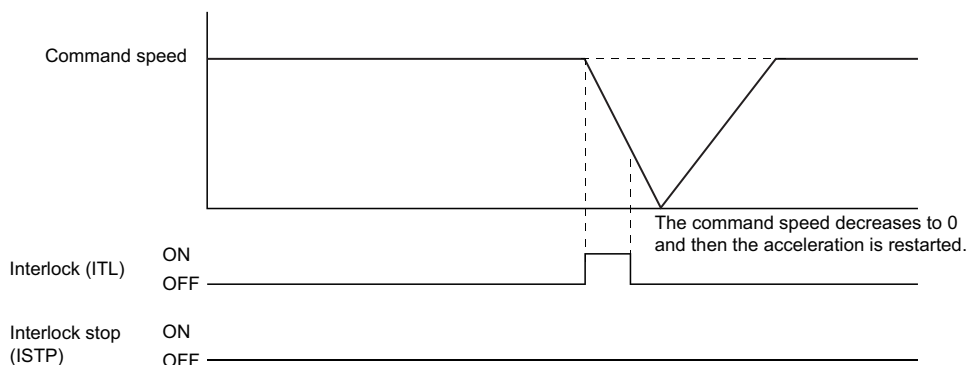
> **Point**
>
> - If the stop operation signal (STP) or the rapid stop signal (RSTP) is turned ON during the interlock stop, the operation is not resumed even if the interlock signal (ITL) is turned OFF.
> - If the smoothing filter is set, the smoothing time constant is always valid. Therefore, the rapid stop is performed as well by the deceleration using the smoothing filter.
> - If the start up is executed while the interlock signal (ITL) is ON, "Interlock Is On (operation alarm No.0013H, detail No.0001H)" occurs and the start operation is not performed. Execute the start operation after canceling the interlock.
> - During the interpolation operation, if the interlock signal (ITL) for any of the axes in the group is turned ON, all of the axes in the group are stopped. Also, when the interlock signal (ITL) for all of the axes within a group is canceled, the operation is resumed.
> - If the interlock signal (ITL) is turned ON during the driver homing method, the axis is stopped by using the Halt function of the drive unit. When using the drive unit which does not support the Halt function, perform the forced stop. Also, the driver homing method is not resumed even by canceling the interlock signal (ITL). To resume the operation, execute the start operation after canceling the interlock.
> - The interlock is supported in the basic system software version "02" or later.

Point

[Motion API]
 • To turn ON/OFF the interlock signal (ITL), set "SSC_CMDBIT_AX_ITL" to the command bit No. of the sscSetCommandBitSignalEx function.
 • To confirm if the interlock stop signal (ISTP) is ON/OFF, set "SSC_STSBIT_AX_ISTP" to the status bit No. with the sscGetStatusBitSignalEx function/sscWaitStatusBitSignalEx function.

8.11 Rough Match Output

When the command remaining distance (difference between the command position and the current command position) is less than "Rough match output limits (parameter No.0230, 0231)", the rough match signal (CPO) is output. The rough match output is only valid at the end points while operating using the automatic operation or the interpolation operation. Therefore, it does not turn ON when passing the points on the way.
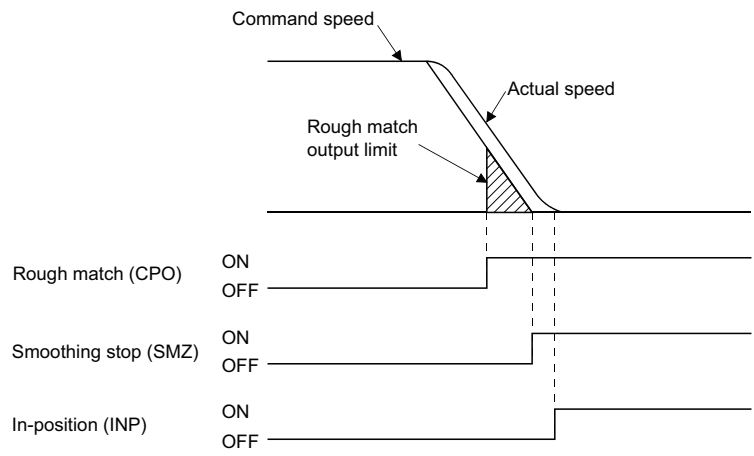
Point

The rough match output is supported in the basic system software version "02" or later.

Point

[Motion API]

To set/get the rough match output limit, use the sscChange2Parameter function/sscCheck2Parameter function.

8.12 Torque Limit

The torque is limited by the torque limit values set in "Forward rotation torque limit value (parameter No.0210)" and "Reverse rotation torque limit value (parameter No.0211)". When the torque is limited by the torque limit values, the torque limit effective signal (TLC) is turned ON.
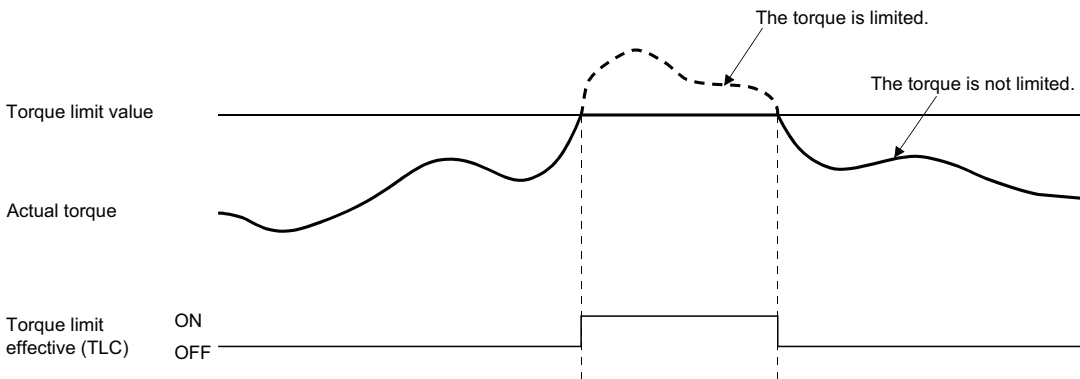
Point

[Motion API]
- To set/get "Forward rotation torque limit value (parameter No.0210)" and "Reverse rotation torque limit value (parameter No.0211)", use the sscChange2Parameter function/sscCheck2Parameter function.
- To confirm if the torque limit effective signal (TLC) is ON/OFF, set "SSC_STSBIT_AX_TLC" to the status bit No. with the sscGetStatusBitSignalEx function/sscWaitStatusBitSignalEx function.

Interface

■Control parameters

Parameter No.	Symbol	Name	Initial value	Units	Setting range	Function	When in tandem drive
0210	TLP	Forward rotation torque limit value	10000	0.1%	0 to 32767	Set the forward rotation torque limit value that is sent to the drive unit in the operation cycle.	Master
0211	TLN	Reverse rotation torque limit value	10000	0.1%	0 to 32767	Set the reverse rotation torque limit value that is sent to the drive unit in the operation cycle.	Master

Necessary objects

The necessary objects for the torque limit are shown below.

Function	Necessary objects	
	TPDO	**RPDO**
Forward rotation torque limit value	—	Positive torque limit value (Obj. 60E0h)
Reverse rotation torque limit value	—	Negative torque limit value (Obj. 60E1h)
Torque limit effective signal (TLC)	Status DO 1 (Obj. 2D11h) (MR-J5(W)-G)	—

Point

- By adding "Torque actual value (Obj. 6077h)" to the PDO mapping, the current torque value can be confirmed with the electrical current feedback of the high speed monitor.
- Change "Positive torque limit value (Obj. 60E0h)" and "Negative torque limit value (Obj. 60E1h)" by the control parameters. It takes time to change these objects because the parameters must be changed. The time taken for changing the parameters is "operation cycle to several ms", and it differs depending on the control status.
- When changing "Positive torque limit value (Obj. 60E0h)" and "Negative torque limit value (Obj. 60E1h)" for each operation cycle, assign the object to the I/O device by using the device station object I/O function, and perform the direct access. For details, refer to the following.
  ☞ Page 339 Device Station Object I/O
- Between the changes by the control parameter and the changes by the I/O device, prioritize the changes by the I/O device.
- When "Positive torque limit value (Obj. 60E0h)" or "Negative torque limit value (Obj. 60E1h)" is not set and the setting of "Forward rotation torque limit value (parameter No.0210" or "Reverse rotation torque limit value (parameter No.0211) is not the initial value, "Slave Object Setting Error (operation alarm No.0080H, detail No.0006H or No.0007H)" occurs.
- When setting "1: Valid" to "Drive-unit-less" of "Control option 1 (parameter No.0200)", "Slave Object Setting Error (operation alarm No.0080H, detail No.0006H or No.0007H)" does not occur.

⚠ CAUTION

When controlling the torque limit value by using the device station object I/O function, before starting the system, be sure to set the initial value which is notified to the drive unit for the output word device to which "Positive torque limit value (Obj. 60E0h)" or "Negative torque limit value (Obj. 60E1h)" is assigned. When the initial value is not set, the operation is done with the torque limit value "0".

8.13 Command Change

Speed change

Rewriting the command speed followed by turning ON the change speed signal (SCHG) changes the speed.

Rewrite the feed speed for each operation mode as follows.

Operation mode	Description
Automatic operation	Rewrite the feed speed in the operating point table.
Interpolation operation	
JOG operation	Rewrite the manual feed speed.
Incremental feed	

The speed change can also be implemented during the acceleration or the deceleration.
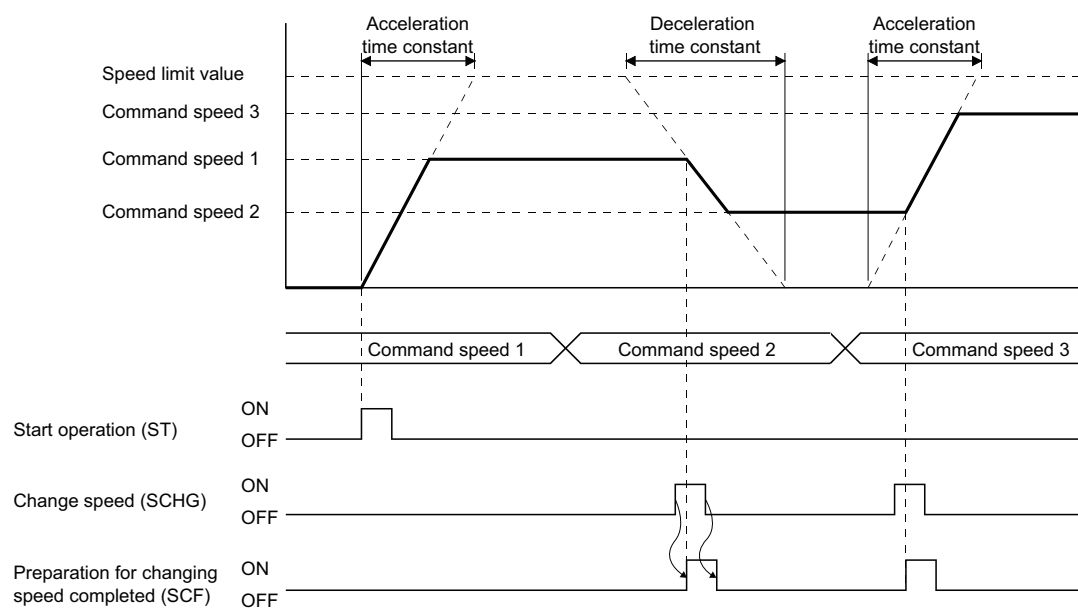
During the following cases, the speed change error signal (SCE) turns ON, and the speed is not changed.
- Operation stop
- Deceleration due to the stop command, the rapid stop command, the alarm etc.
- Home position return
- Home position reset
- The command speed after change is zero or below

> **Point**
>
> If the speed is changed to 0, "Command Speed Zero (operation alarm No.0021H, detail No.0001H)" occurs, and the operation stops.

> **Point**
>
> [Motion API]
> - To perform the speed change for the automatic operation and the interpolation operation, use the sscChangeAutoSpeed function.
> - To perform the speed change for the JOG operation and the incremental feed, use the sscChangeManualSpeed function.

Change of time constants

After rewriting the time constant, turning the change time constant signal (TACHG, TDCHG) ON causes the time constant to change. Time constants can be designated separately as the acceleration time constant and the deceleration time constant. Rewrite the time constants for each operation mode as follows.

Operation mode	Description
Automatic operation	Rewrite the time constant in the operating point table.
Interpolation operation	
JOG operation	Rewrite the manual feed time constant.
Incremental feed	
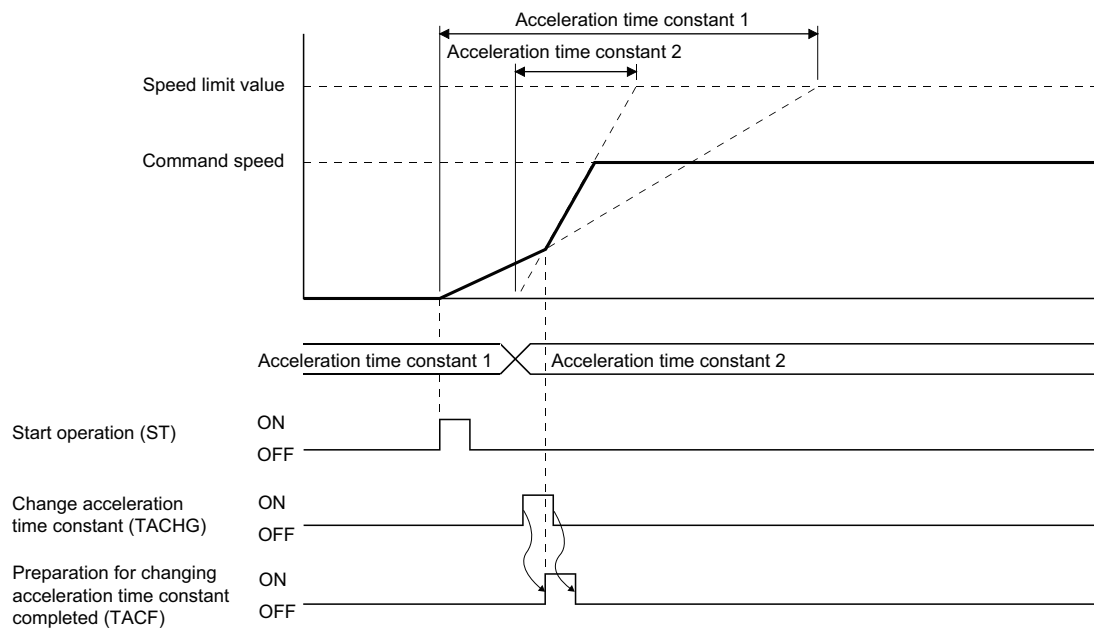
During the following cases, the acceleration time constant change error signal (TACE) or the deceleration time constant change error signal (TDCE) turns ON, and time constant is not changed.

- Operation stop
- Deceleration
- Home position return
- Home position reset

Point

[Motion API]
- To perform the change of time constants for the automatic operation and the interpolation operation, use the sscChangeAutoAccTime function/sscChangeAutoDecTime function.
- To perform the change of time constants for the JOG operation and the incremental feed, use the sscChangeManualAccTime function/sscChangeManualDecTime function.

Position change

After rewriting the command position, turning the change position signal (PCHG) ON causes the command position to be changed.

Rewrite the position data for each operation mode as follows.

Operation mode	Description
Automatic operation	Rewrite position data in the operating point table.
Incremental feed	Rewrite the incremental feed movement amount.
Interpolation operation	Rewrite the position data in each point table of the axes in the group.

Point

The circular interpolation is not compatible with the position change.

To change the command position to the position which is not yet passed

■For automatic operation and incremental feed

An example of the position change from the command position 1 to the command position 2 is shown below.

Point
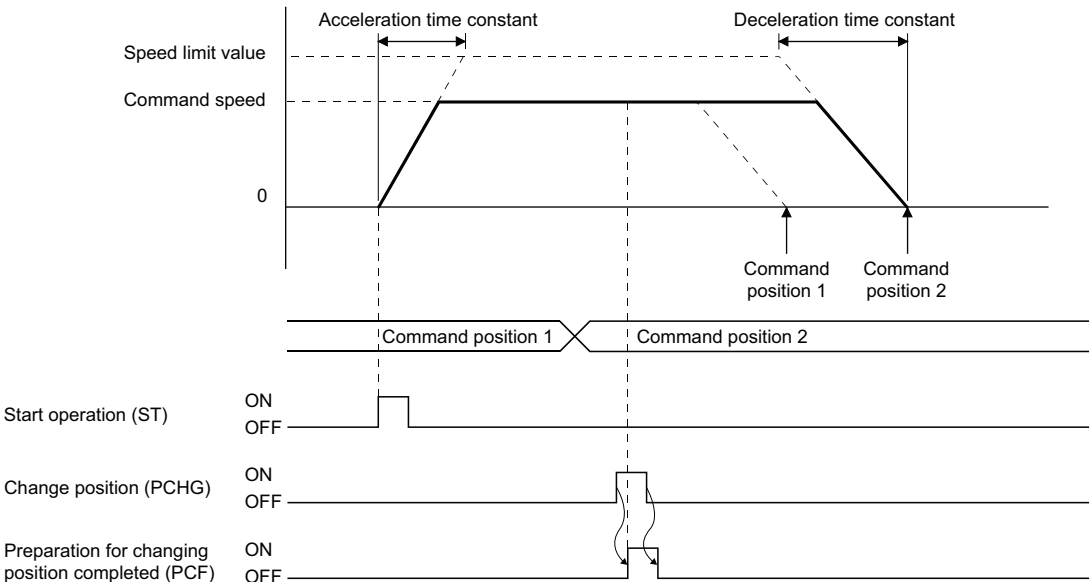
[Motion API]
- To perform the position change for the automatic operation, use the sscChangeAutoPosition function.
- To perform the position change for the linear interpolation operation, use the sscChangeLinearPosition function.
- To perform the position change for the incremental feed, use the sscChangeManualPosition function.

■For interpolation operation

An example of the position change when axis 1 and 2 are linearly interpolated is shown below.

The tracks of axis 1 and 2 to each current command position when the position P1 is changed to the position P2 are shown below. At this time, the tracks move to the end position, forming a curve from the position where the position change is performed, to keep the speed continuity.
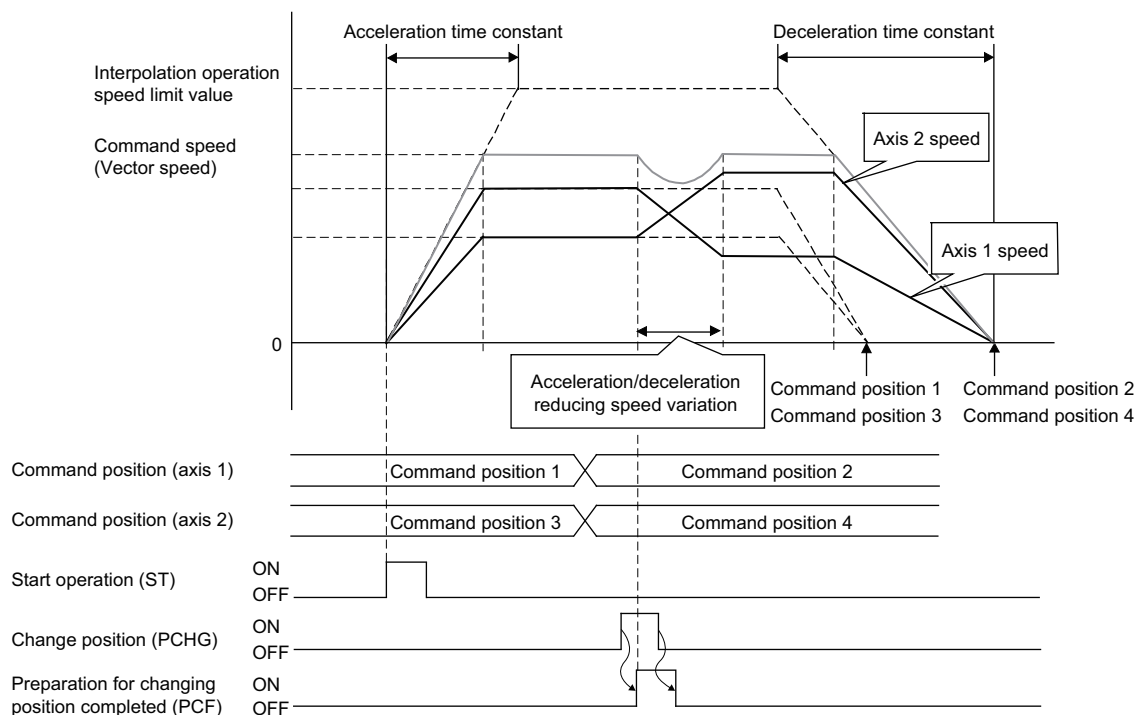
> **Point**
>
> The acceleration/deceleration of each axis from the current command speed to the command speed after the position change is determined by distributing the acceleration amount, which is determined by the acceleration time constant, to each axis according to the speed variation ratio of the axes. During this time, the smoothing filter is valid, the S-curve acceleration/deceleration is invalid, and acceleration/deceleration reducing the speed variation at the position change is performed. (That the acceleration/deceleration is similar to the linear acceleration/deceleration.)
>
> The smoothing filter function is supported in the basic system software version "02" or later.

When position change is performed during deceleration

When the position change is performed during the deceleration, the following operations occur depending on the setting of "Re-acceleration setting for position change during deceleration" of "Control option 4 (parameter No.0206)".

- When setting "Re-acceleration setting for position change during deceleration" of "Control option 4 (parameter No.0206)" to "0: Invalid"

  The deceleration continues, and after the axis stops, the positioning to the new position is performed.
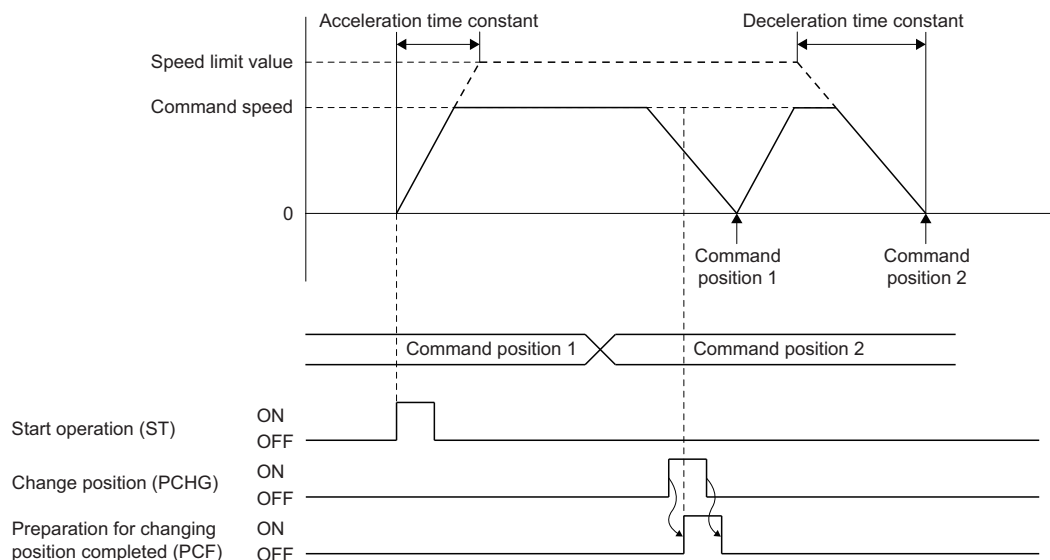
- When setting "Re-acceleration setting for position change during deceleration" of "Control option 4 (parameter No.0206)" to "1: Valid"

  The axis re-accelerates before stopping, and stops after reaching the new position.
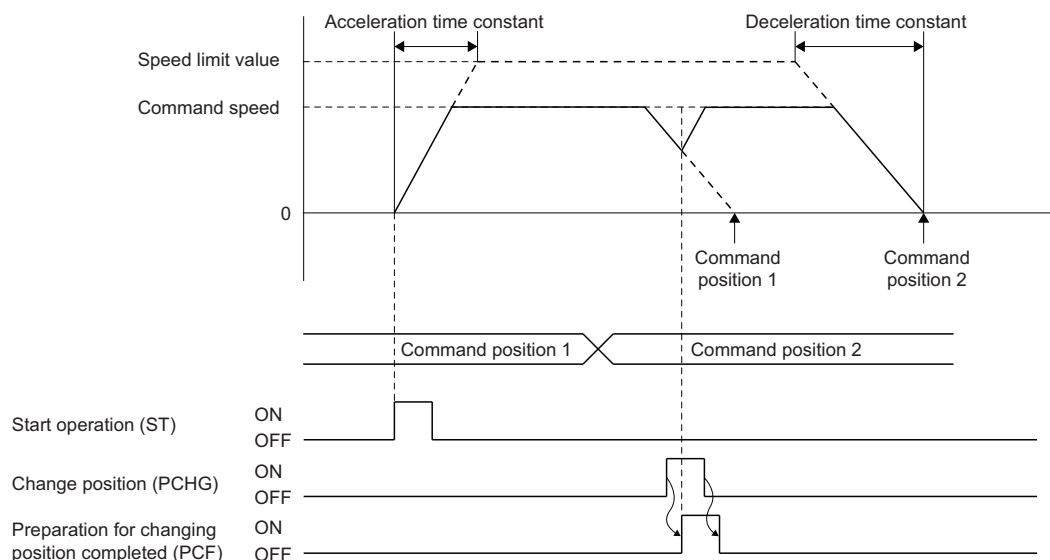
> **Point**
>
> The linear interpolation does not support the re-acceleration setting for the position change during the deceleration.

⚠ CAUTION

When conducting the position change during the deceleration with the S-curve acceleration/deceleration enabled and there is only a minor difference between the end points before and after the change, an overrun may occur. In this case, the operation is performed according to "Control option 2 (parameter No.0201)" "Change of position over-bound processing"

When the new position is already passed

For cases that the new position has already been passed or if the stop position after the deceleration passes the new position, the operation depends on operation modes.

■For automatic operation and incremental feed

The operation can be selected as follows using "Change of position over-bound processing" of "Control option 2 (parameter No.0201)".

 • Stop with an alarm (0: Alarm)
 • After deceleration and stop return to new position (1: Return to command position)

The case for returning to the new position after the deceleration and stopping is shown in the next diagram. At this time, the exceeded stop position signal (POV) is turned ON (the exceeded stop position signal (POV) is turned OFF at the next start up).
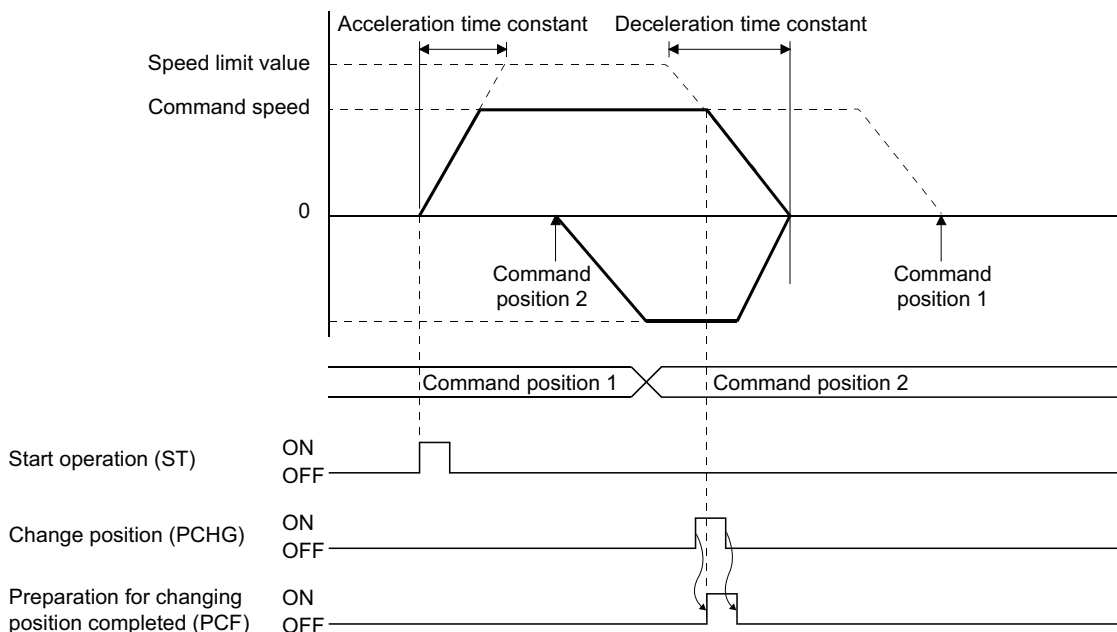
Point

When setting "Continuous operation position over-bound processing" of "Control option 2 (parameter No.0201)" to "1: Return to command position" and changing the position to the already passed position other than the end point during the continuous operation, the position is switched to the next point immediately.

■For interpolation operation

When one or more axes in a group reverse the movement direction because of the position change, all axes in the group automatically decelerate and stop. After the stop, the axes return to the new position. The setting of "Control option 2 (parameter No.0201)" is invalid. At this time, the exceeded stop position signal (POV) remains OFF.
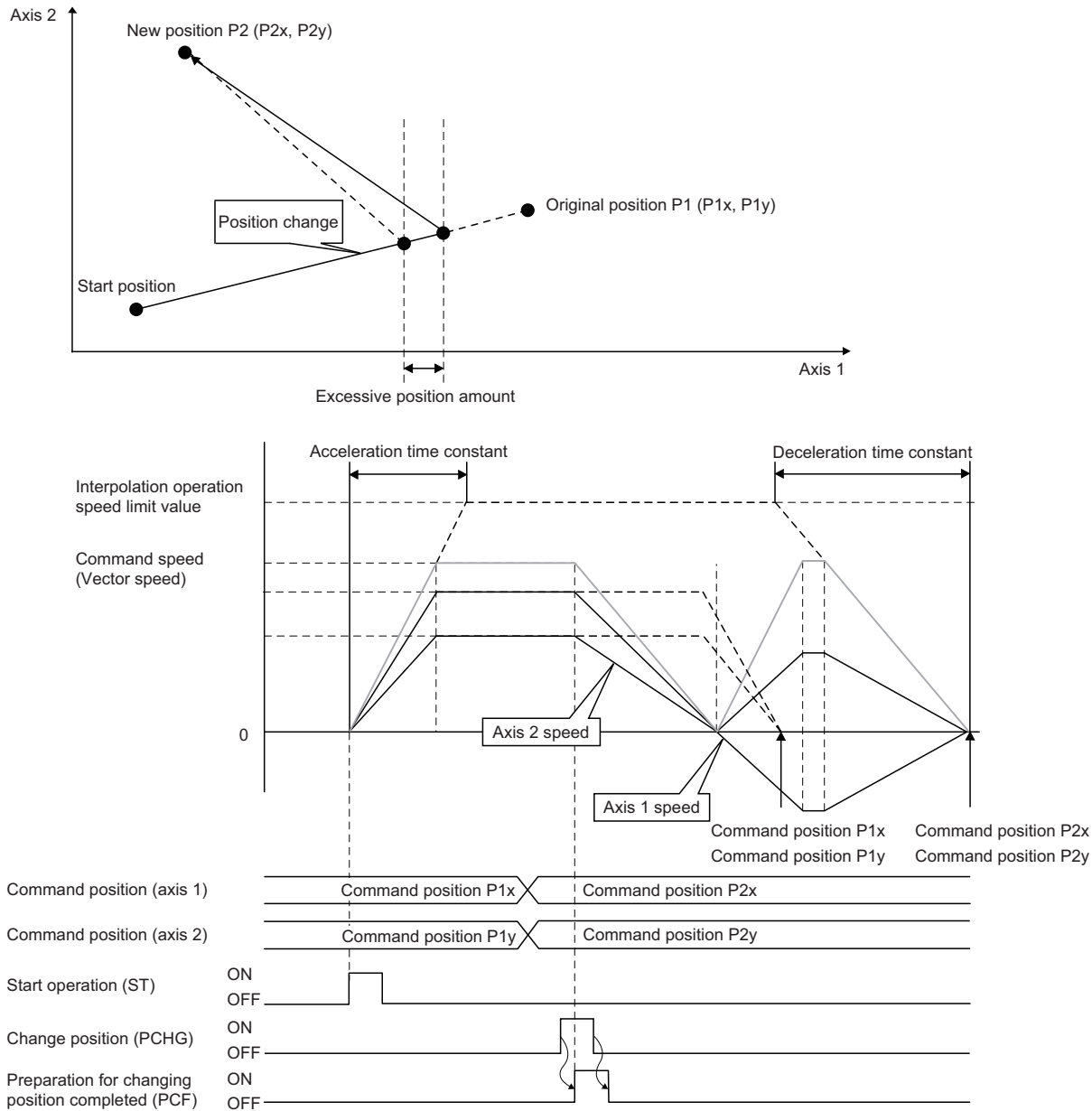
In the example above, the current command position of the axis 1 exceeds the new position. The following formulas provide the approximate calculation of the excessive travel distance (excessive position amount).[1]

- Deceleration quantity [speed unit/s] = Linear interpolation speed limit [speed unit] ÷ Deceleration time constant [ms] ÷ 1000
- Deceleration time [s] = Vector speed [speed unit] ÷ Deceleration quantity
- Vector travel distance [command unit] = $\sqrt{(\text{Axis 1 travel distance [command unit]})^2 + (\text{Axis 2 travel distance [command unit]})^2}$
- Axis 1 moving speed [speed unit] = Axis 1 travel distance [command unit] ÷ Vector travel distance × Vector speed [speed unit]
- Axis 1 excessive position amount [command unit] = Axis 1 moving speed × Axis 1 speed units multiplication factor × Deceleration time ÷ 2

*1 The same feature is applied to the linear interpolation for more than 3 axes.

When position change error occurs

During the following cases, the position change error signal (PCE) turns ON, and the position is not changed.
- Operation stop (When the position change during the stop is invalid)
- JOG operation, home position return, home position reset
- Deceleration due to the stop command, the rapid stop command, the alarm etc.
- The specified value is out of the software limit setting value.
- A position change command is input to an auxiliary axis in the linear interpolation.
- A position change command is input to an axis in the circular interpolation.
- A position change command is input to an axis after the interpolation operation.
- After starting the system, the automatic operation, the linear interpolation operation, and the incremental feed are never performed (When the position change during the stop is valid).
- After the completion of the operation, the operation mode is changed (When the position change during the stop is valid).

8.14 Backlash

A function that corrects the mechanical error (backlash) when the movement direction is reverse.

The compensation amount for backlash is set in "Backlash compensation amount (parameter No.0208, 0209)".

The backlash compensation direction is set in "Backlash compensation direction (parameter No.0207)".
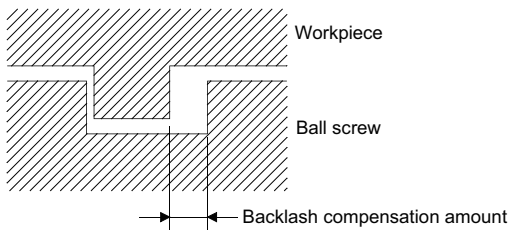
Operation mode	Processing details
JOG operation	The compensation amount is added at the timing of switching movement direction.
Incremental feed	
Automatic operation	
Interpolation operation	
Home position return (driver homing method)	The backlash compensation is not performed.

> **Point**
>
> - Set the backlash compensation direction to match the reverse direction of the last movement direction of the home position return of the drive unit. For details about the home position return direction, refer to "CONTROL MODE" in the following manual.
>   📖 MR-J5 User's Manual (Function)
> - The backlash is supported in the basic system software version "02" or later.

Precautions

- For the driver homing method, the backlash compensation is not performed.
- After the completion of the driver homing method, when the movement direction of the axis is the same with the backlash compensation direction, the movement amount is corrected for the backlash compensation amount to the movement direction of the axis.
- If the movement amount is small at the home position return, the machine backlash may occur for both directions as shown in the figure below (Incorrect example). Perform the home position return to the machine backlash occur for one direction as shown in the figure below (Correct example). Also, for a home position return method in which the current command position is set as the home position such as the home position return using a data set method, make sure to confirm that the machine backlash occurs for one direction after the home position return. If the backlash compensation is performed when the machine backlash is occurring for both directions, the backlash compensation is not performed correctly.
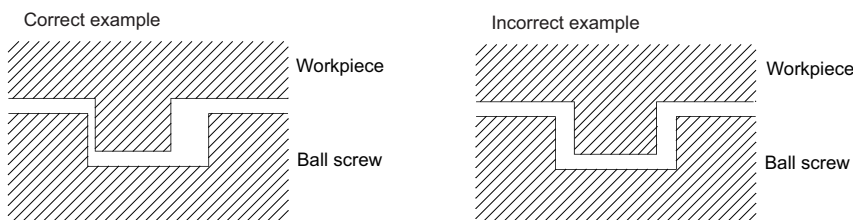
Interface

■Control parameters

Parameter No.	Symbol *1	Name	Initial value	Units	Setting range	Function	When in tandem drive
0207	*BKCD	Backlash compensation direction	0000h	—	0000h to 0001h	■■■□ (Backlash compensation direction) Set the direction for the backlash compensation. • 0: + direction • 1: - direction	Same value
0208	*BKCL	Backlash compensation amount (lower)	0000h	pos units	0000h to FFFFh	Settings for performing the compensation of the machine backlash. • Range: 0 to 16777215	Same value
0209	*BKCH	Backlash compensation amount (upper)	0000h		0000h to 00FFh		

*1 The settings for the parameters with a * mark at the front of the symbol are validated when the system is started.

Point

- The unit pos units is defined by "SI unit position (Obj. 60A8)".
- Because pos units is not an encoder pulse unit, when using the electronic gear function of MR-J5(W)-G, the unit does not match the encoder resolution.
- If the backlash compensation amount is set too large, the over speed occurs in the drive unit, and "Drive unit alarm [AL. 035_Command frequency error]" occurs. Set the backlash compensation amount smaller than the current setting value.
- Even when the drive-unit-less axis function is valid, the backlash compensation is valid.
- When performing the tandem drive, set "Backlash compensation direction (parameter No.0207)" and "Backlash compensation amount (parameter No.0208, 0209)" individually for the master axis and the slave axis.

Point

[Motion API]
To set/get the backlash compensation amount, use the sscChange2Parameter function/sscCheck2Parameter function.

8.15 Position Switch

The position switch is the signal turned ON when the axis is within the setting range (including the boundary line) which is set by "Position switch Upper limit (parameter No.022C, 022D)", "Position switch Lower limit: parameter No.022E, 022F)".
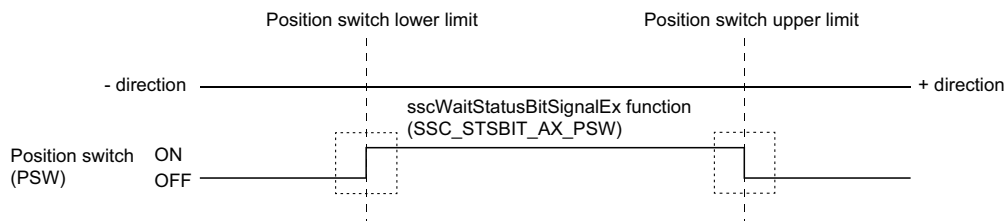
For judging the condition for the position switch signal (PSW), set "0: Current command position" or "1: Current feedback position" to "Position switch judgment conditions" of "Control option 2 (parameter No.0201)".

Point

- If the upper limit and the lower limit of the position switch are the same value, the position switch signal (PSW) is invalid.
- If the lower limit of the position switch is a higher value than the upper limit, "Position Switch Parameter Error (operation alarm No.00A5H, detail No.0001H)" occurs upon the start of the operation.
- The position switch signal (PSW) becomes valid after the completion of the home position return.
- If the judgment condition of the position switch signal (PSW) is set by the current feedback position, when the current feedback position reached around the position switch range, depending on the variation of the current feedback position, a chattering may occur in the position switch signal (PSW). Therefore, when the in-position signal (INP) is ON, judge the condition by the value of the current command position.
- The position switch is supported in the basic system software version "02" or later.

Point

[Motion API]
- To set/get the upper limit or lower limit of the position switch signal (PSW), use the sscChange2Parameter function/sscCheck2Parameter function.
- To confirm if position switch (PSW) is ON/OFF, set "SSC_STSBIT_AX_PSW" to the status bit No. with the sscGetStatusBitSignalEx function/sscWaitStatusBitSignalEx function.

8

8.16 Completion of Operation Signal

The operation completed signal (OPF) shows a completion of the operation status. At the startup, the operation completed signal (OPF) turns OFF, and the operation completed signal (OPF) turns ON when the positioning operation is complete. The interruption of the operation due to an alarm also turns ON the operation completed signal (OPF).

A summary of the operation for each operation mode is shown as follows.

> **Point**
>
> [Motion API]
> To confirm the completion of operation, use the sscWaitIntDriveFin function/sscGetDriveFinStatus function.

Using a JOG operation
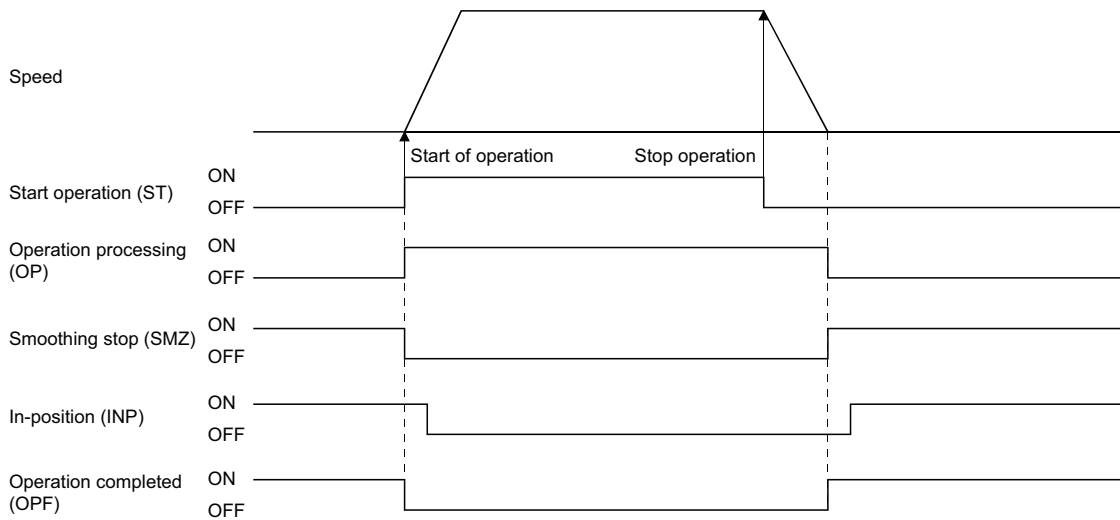
Using an incremental feed

Using an automatic operation

Speed

Moves to the end point and then stops.

Start of operation

Start operation (ST)	ON / OFF
Operation processing (OP)	ON / OFF
Positioning completed (PF)	ON / OFF
Smoothing stop (SMZ)	ON / OFF
In-position (INP)	ON / OFF
Operation completed (OPF)	ON / OFF
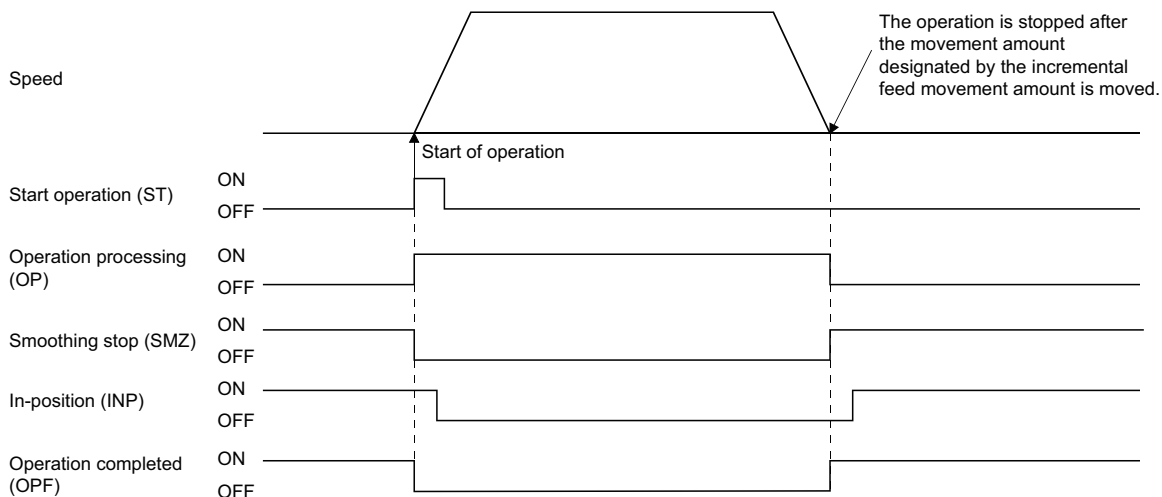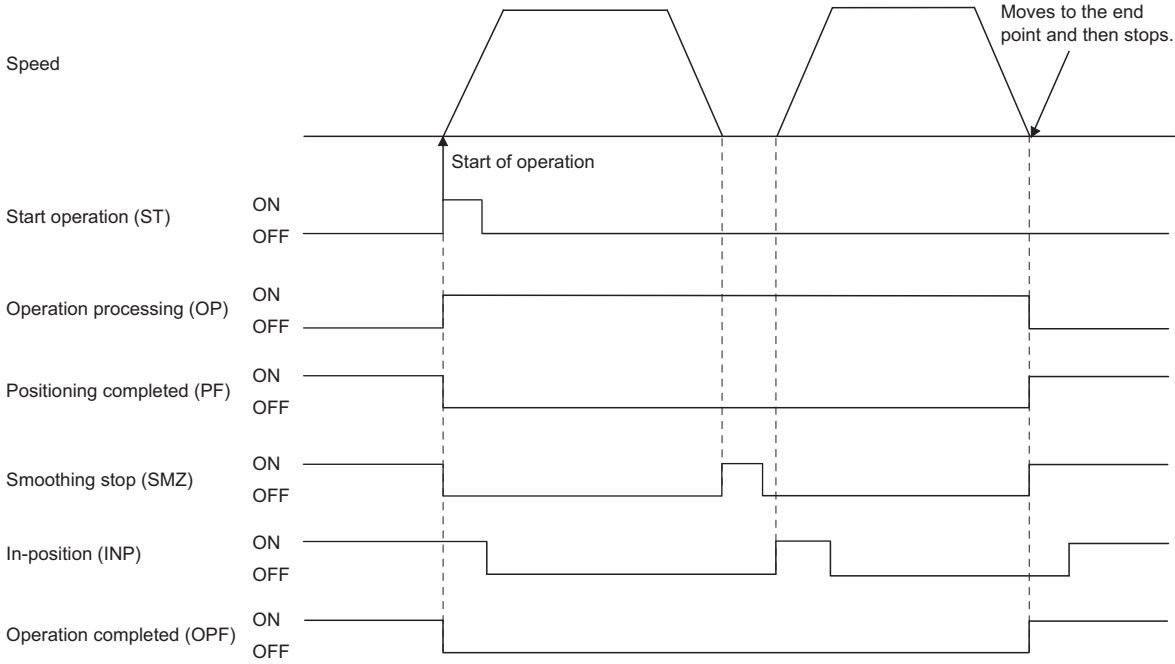
Stop by the stop operation signal

Speed

Decelerates and stops.

Stop operation (STP)	ON / OFF
Operation processing (OP)	ON / OFF
Smoothing stop (SMZ)	ON / OFF
In-position (INP)	ON / OFF
Operation completed (OPF)	ON / OFF
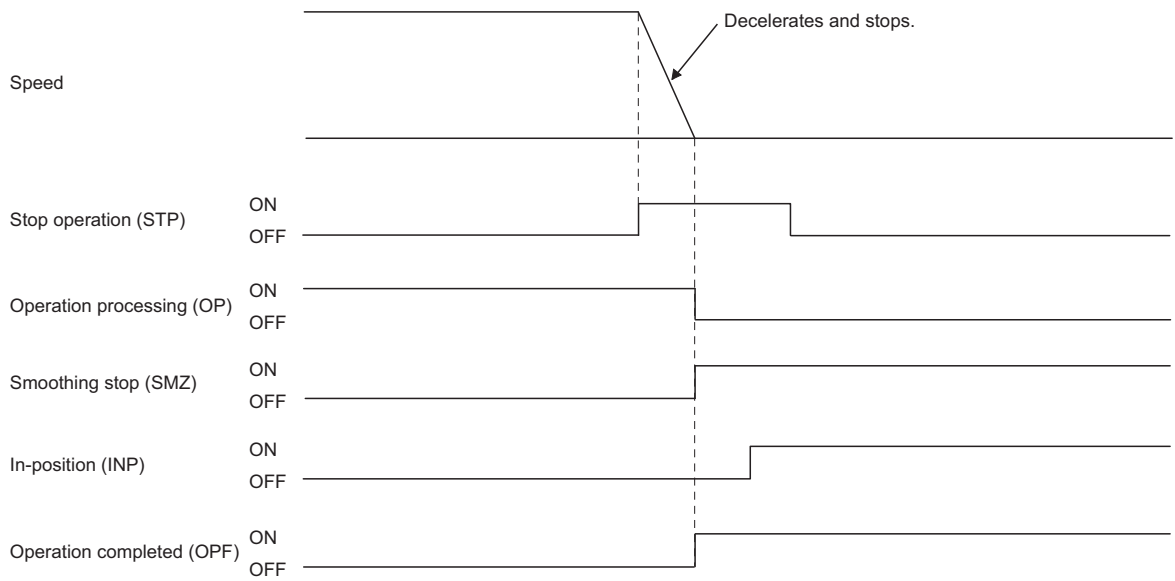
Stop by the rapid stop signal
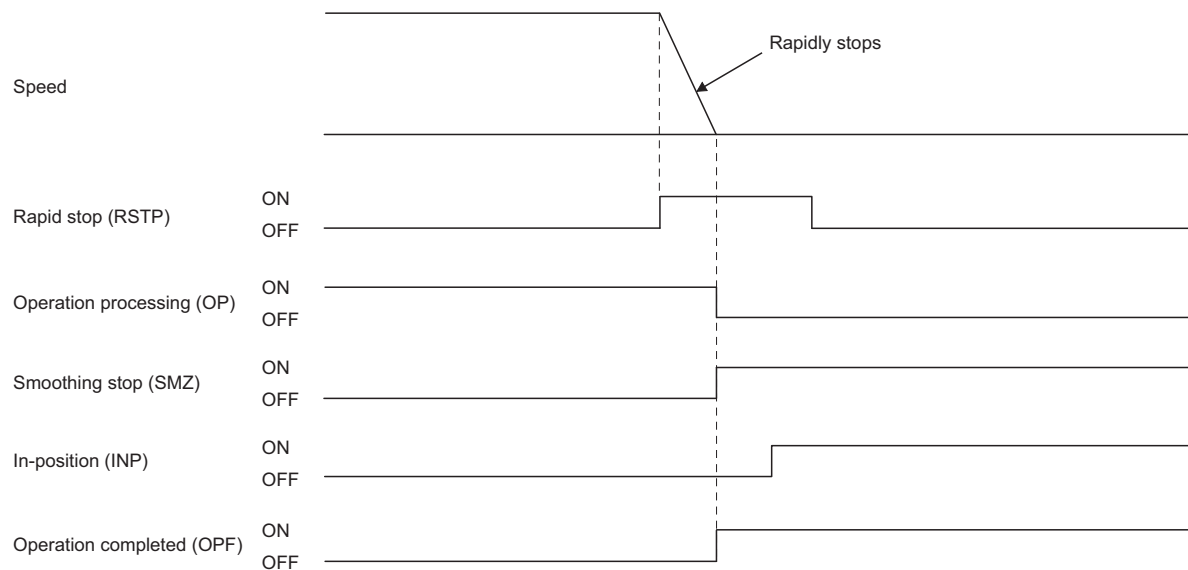
Stop by the limit switch
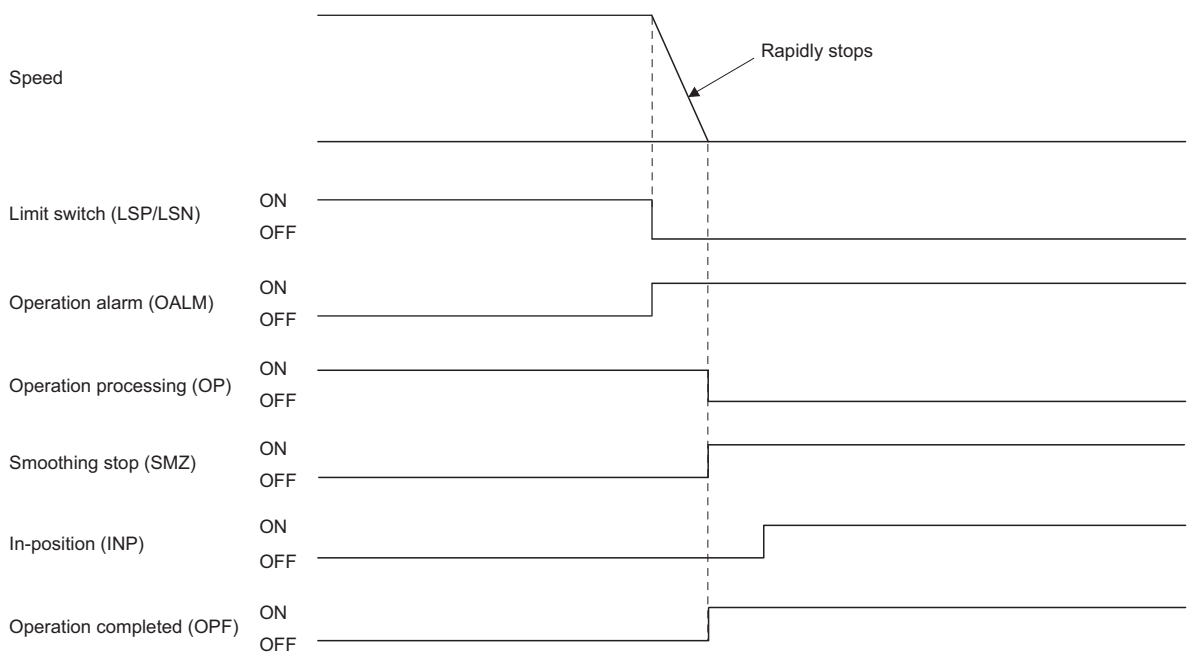
Stop by the drive unit alarm occurrence

Speed
(Dashed line: actual speed)

Stops by the dynamic brake, or
decelerates and stops by the drive unit control.
(Depending on the setting of the drive unit)

Drive unit alarm (SALM) ON / OFF

Operation alarm (OALM) ON / OFF

Operation processing (OP) ON / OFF

Servo ready (RDY) ON / OFF

Operation completed (OPF) ON / OFF

Stop by the operation alarm occurrence

Speed

Decelerates and stops, or rapidly stops.
(Depending on the cause of the operation alarm)

Operation alarm (OALM) ON / OFF

Smoothing stop (SMZ) ON / OFF

Operation processing (OP) ON / OFF

Operation completed (OPF) ON / OFF

8

Stop by the servo OFF

Speed — Rapidly stops

Signal		
Servo ON (SON)	ON	OFF
Servo ready (RDY)	ON	OFF
Operation alarm (OALM)	ON	OFF
Smoothing stop (SMZ)	ON	OFF
Operation processing (OP)	ON	OFF
Operation completed (OPF)	ON	OFF

Stop by a software limit

Ex.
In JOG operation

Speed — Decelerates and stops.

Signal		
Operation alarm (OALM)	ON	OFF
Operation processing (OP)	ON	OFF
Smoothing stop (SMZ)	ON	OFF
In-position (INP)	ON	OFF
Operation completed (OPF)	ON	OFF
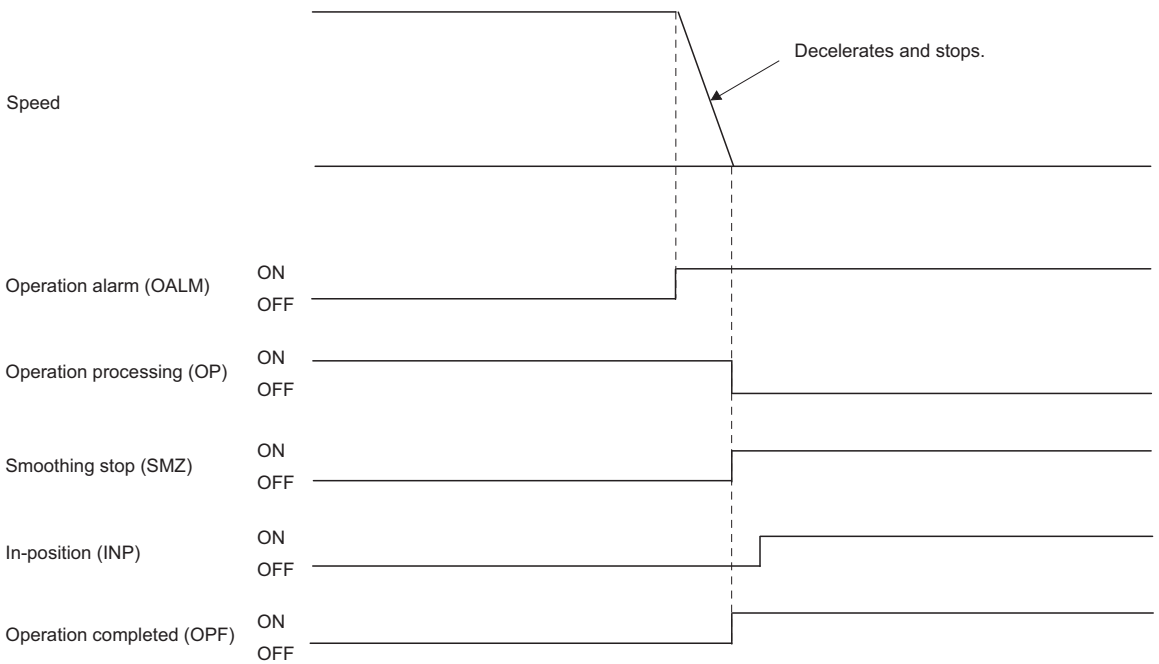
Stop by the forced stop occurrence

Speed
(Dashed line: actual speed)

Stops by the dynamic brake, or decelerates and stops by the drive unit control.
(Depending on the setting of the drive unit)

	ON / OFF
Drive unit warning (SWRN)	ON / OFF
Operation alarm (OALM)	ON / OFF
Operation processing (OP)	ON / OFF
Being executed forced stop (EMIO)	ON / OFF
Operation completed (OPF)	ON / OFF
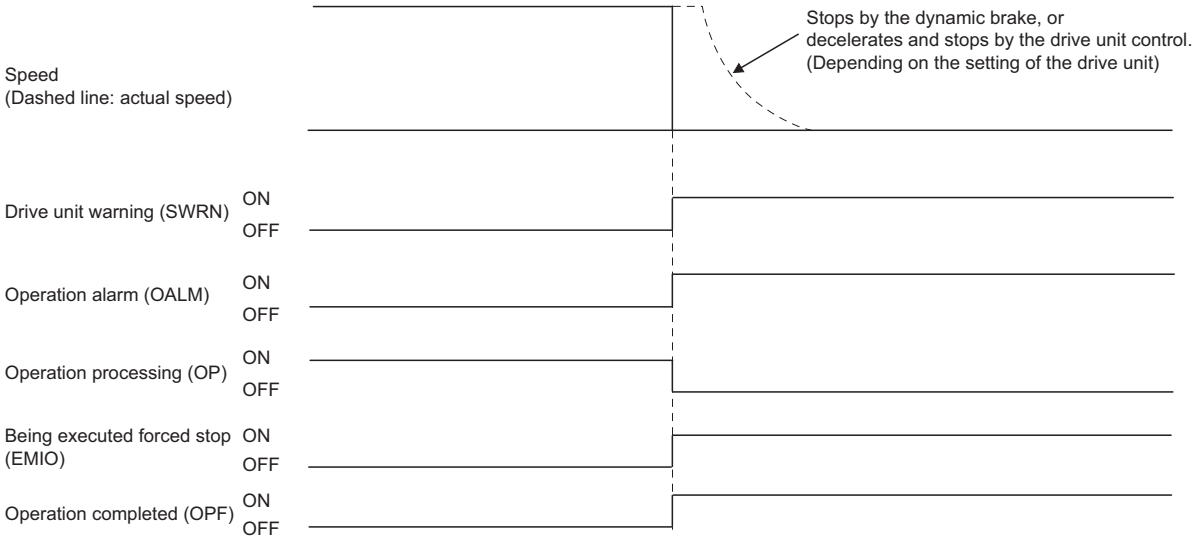
Stop by the driver command discard detection

Ex.

When the driver command discard is detected during the connection with MR-J5(W)-G[1]
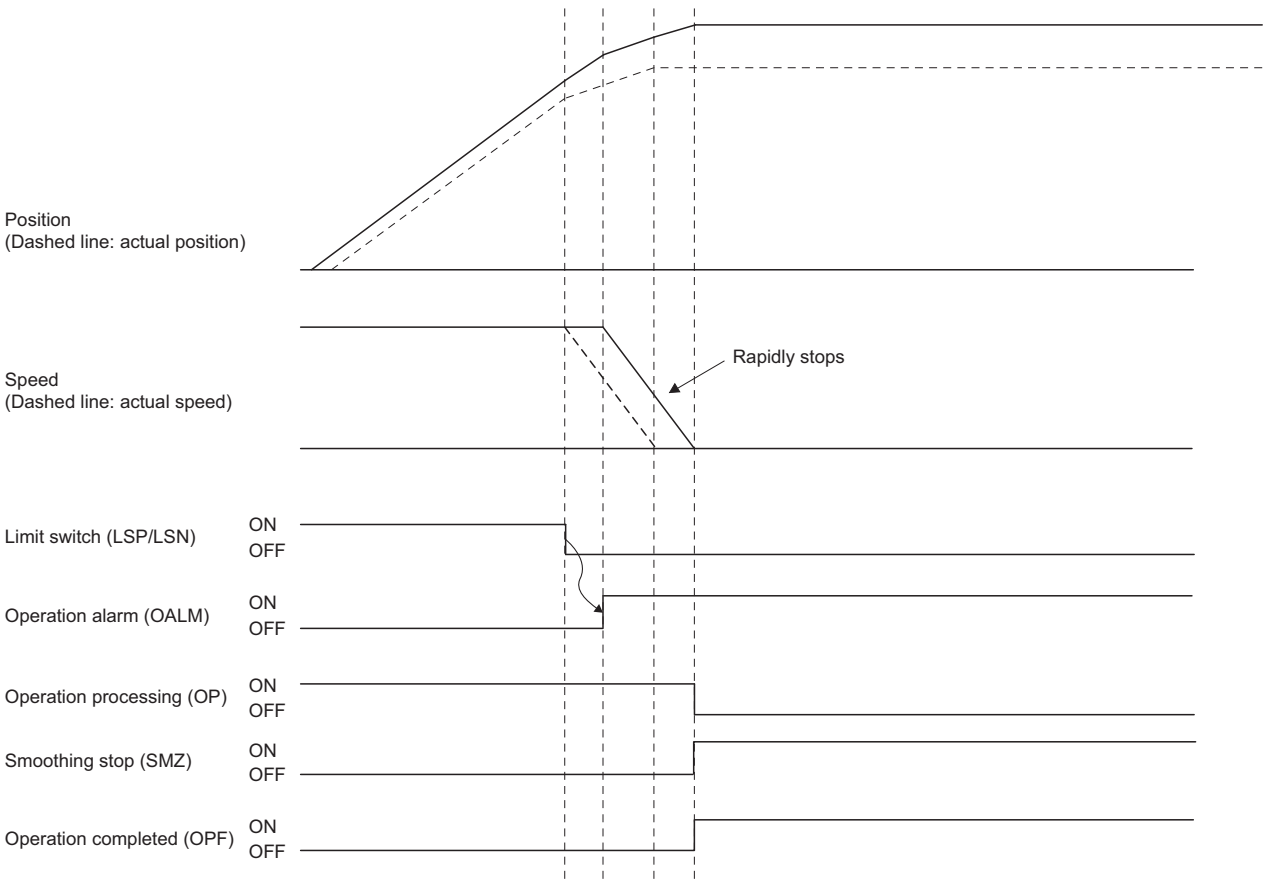
Position
(Dashed line: actual position)

Speed
(Dashed line: actual speed)

Rapidly stops

	ON / OFF
Limit switch (LSP/LSN)	ON / OFF
Operation alarm (OALM)	ON / OFF
Operation processing (OP)	ON / OFF
Smoothing stop (SMZ)	ON / OFF
Operation completed (OPF)	ON / OFF

*1   When setting "0: Limit switch always enabled" to "Limit switch enabled status selection (PD41.2)" of the servo parameter.

Point

This function is supported in the basic system software version "02" or later.

Stop by the user watchdog error detection
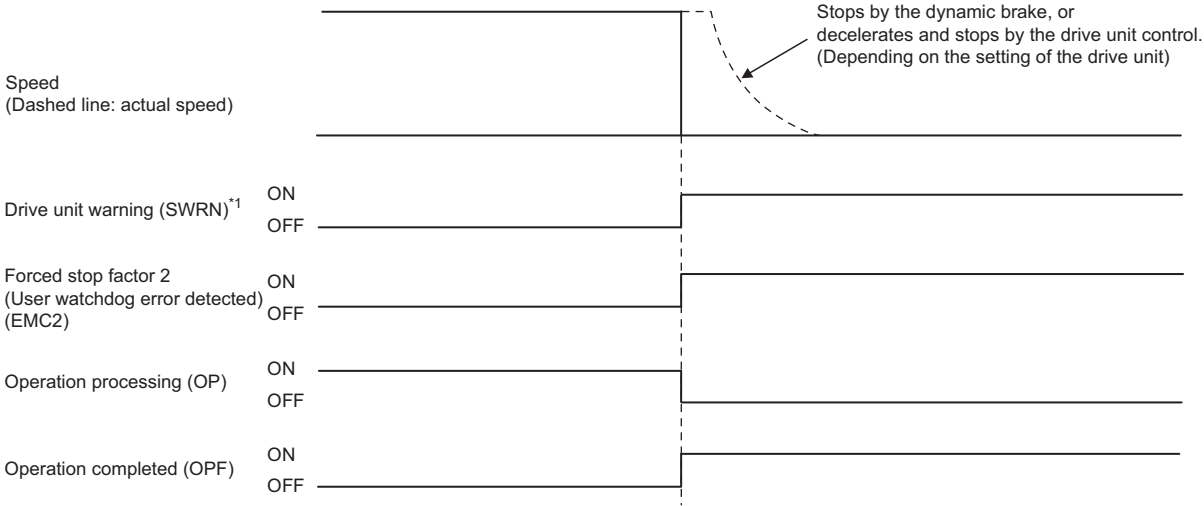
*1 When MR-J5(W)-G is connected.

Point

This function is supported in the basic system software version "02" or later.

8.17 Absolute Position Detection System

By using a servo motor compatible with the absolute position detection system, the positioning control can be made by the absolute position detection system. In the absolute position detection system, if the machinery position is determined at the system startup, there is no need to execute the home position return because the absolute position is restored at the system startup.

The determination of the machinery position is made by the home position return. At the home position return and the power on, be sure to execute the operation referring to the procedures (☞ Page 194 Processing procedure).

> **Point**
> • For restoring the absolute position, the home position information saved in MR-J5(W)-G (home position multiple revolution counter, home position within 1 revolution) is used.
> • For MR-J5(W)-G, the home position information is saved in a nonvolatile memory. Performing the home position return and saving the home position information frequently affect the life of a nonvolatile memory.

> **Point**
> [Motion API]
> To set/get the absolute position detection system, use the sscChange2Parameter function/ sscCheck2Parameter function.

Parameters

The parameters related to the absolute position detection system are shown below.

Control parameters

Parameter No.	Symbol *1	Name	Initial value	Units	Setting range	Function	When in tandem drive
0241	*OPZ2	Home position return option 2	0000h	—	0000h to 0001h	■■■□ (Absolute position data) Set the validity/invalidity of restoring the absolute position. • 0: Invalid (The position at the system startup is defined to be 0. The home position return must be executed prior to performing the automatic operation or the interpolation operation.) • 1: Valid (The absolute position is restored at the system startup based on the home position multiple revolution data and the home position within 1 revolution position.)	Master

*1 The settings for the parameters with a * mark at the front of the symbol are validated when the system is started.

Servo parameters (MR-J5(W)-G)

Parameter No.	Symbol *1	Name	Detail No.	Detail name	Units
PA03	*ABS	Absolute position detection system	PA03.0	Absolute position detection system selection	• 0: Disabled (incremental system) • 1: Enabled (absolute position detection system)

*1 For the settings for the parameters with a * mark at the front of the symbol, turn ON the power again after the settings, or reset either the controller or the software.

Processing procedure

Be sure to execute the operation referring to the following procedures at the home position return and the power on.

Processing procedure for returning to home position

1. For MR Configurator2 or the device station parameter automatic setting, set "Absolute position detection system (PA03.0)" of the servo parameter to "1: Enabled (absolute position detection system)".

2. If setting the parameter in step 1 for the first time, "Drive unit alarm [AL.025_Absolute position erased]" occurs. After turning OFF the power supply of the drive unit, turn the power supply ON again and start the system again.

3. Execute the home position return.

4. When the home position return is completed, the home position return request signal (ZREQ) turns OFF and the home position return completed signal (ZP) turns ON.

Point

When setting "No home position" of "Control option 1 (parameter No.0200)" to "1: Valid", the absolute position erased for the first time after the absolute position detection system is enabled can be ignored, and the operation is possible without the home position return.

Processing procedure for turning on the power

After executing the backup of the home position at the processing procedure for returning to home position, execute the following processing before the system startup (before setting the system command code to "Start system startup (000Ah)". Performing of this process restores the system to the absolute positioning at the system startup.

1. Set the "Absolute position data" of "Home position return option 2 (parameter No.0241)" to "1: Valid".

Cautions for use of absolute position detection system

In the case of the following, the absolute position erased signal (ABSE) is turned ON and "Absolute position data" of "Home position return option 2 (parameter No.0241)" is changed to "0: Invalid". Furthermore, the servo is not yet finished with the home position return, and the home position return request signal (ZREQ) turns ON. Therefore when performing the automatic operation, execute the home position return again.

- If "Drive unit alarm [AL.025_Absolute position erased]" or "Drive unit warning [AL.0E3_Absolute position counter warning]" occurs, note that these drive unit alarm/drive unit warning are cleared by power OFF/ON the drive unit.
- An overflow occurs when calculating the absolute position restoration.
- "Tandem Drive Synchronous Alignment Valid Width Error (operation alarm No.0054H, detail No.0001H)" or "Tandem Drive Synchronous Alignment Error (operation alarm No.0058H, detail No.0001H)" occurs.
- "Electronic Gear Setting Error (system status code error: E500H)" occurs.
(This error causes a forced stop status to prevent the operation. Reexamine the setting of an electronic gear and start the system again.)

Point

- If the absolute position erased signal (ABSE) is turned ON, re-execute the home position return and read the home position multiple revolution data and the home position within one-revolution position.
- In MR-J5(W)-G, if "Current alarm (Obj. 2A41h)" is not set, the absolute position erased signal (ABSE) turns ON with the following condition.
"Warning (bit7)" or "Fault (bit3)" of "Statusword (Obj. 6041h)" is ON, and "Absolute position erased (bit14)" of "Status DO 1 (Obj. 2D11h)" is ON.

Sequence example

Prepare a home position return complete memo showing that the home position has been established on the host personal computer. Turn the home position return complete memo ON when the home position return is complete. When the home position return complete memo is turned ON, the execution of the home position return is not necessary. If the absolute position erased signal (ABSE) is turned ON, turn the home position return complete memo OFF, and re-execute the home position return.

Startup procedure

Host personal computer	Motion control board

Turn Power on

sscGetSystemStatusCodeEX function

Wait for the completion of the system preparation
(Wait until the system status code is set to 0001h.)

System preparation completion
(Set the system status code to 0001h.)

sscChangeParameter function

Perform writing of parameters as needed.

Is the home position return complete memo ON? — No

Yes

sscChangeParameter function

Set "Absolute position data" of "Home position return option 2 (parameter No.0241)" to "1: Valid".

sscSystemStart function

Start up the system
(Set the system command code to 000Ah.)

Waiting for the system startup command
(Wait until the system command code is set to 000Ah.)

System startup

Wait for the completion of the system startup
(Wait until the system status code is set to 000Ah.)

Complete the system startup
(Set the system status code to 000Ah.)

While the system is running

Is the home position return complete memo ON? — Yes

No

sscHomeReturnStart function

Execute the home position return operation

Wait for the operation command

sscWaitIntDriveFin function /sscGetDriveFinStatus function

Wait for the home position return complete
(Wait until the home position return completed signal (ZP) is turned ON.)

Complete return to position
(Turn ON the home position return completed signal (ZP).)

Turn ON the home position return complete memo.

After this, execute the normal operation.

Procedure for when absolute position erases

If the absolute position erased signal (ABSE) is turned ON, turn OFF the home position return complete memo being held at the host personal computer.
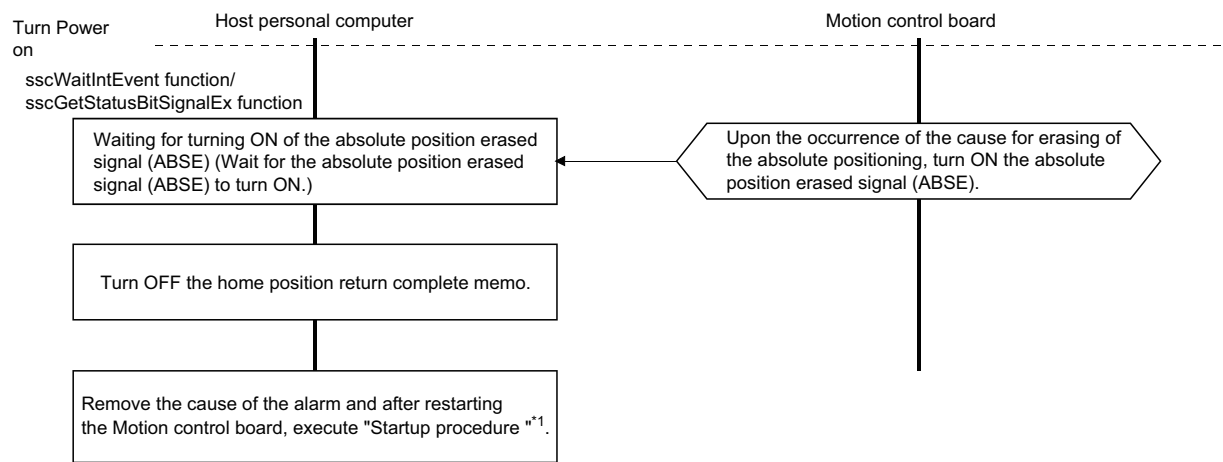
*1 For startup procedure, refer to the following.
   ☞ Page 195 Startup procedure

8.18 Home Position Return Request

The home position return request signal (ZREQ) shows the home position return incomplete status. In the home position return incomplete status, the home position return request signal (ZREQ) turns ON. When it is necessary to determine the home position, perform the home position return. When the home position return is completed properly and the home position is determined, the home position return request signal (ZREQ) turns OFF.

Interface

Axis data (high speed) (status bit)

The addresses in the table are the addresses for the first axis. For the second axis and after, add "+10h" for each axis.

Address (hexadecimal)	Bit	Symbol	Signal name	When in tandem drive
00006004	0	ISTP	Interlock stop	Master
	1	RMRCH	High speed monitor being latched	Each axis
	2	POV	Exceeded stop position	Master
	3	STO	Start up acceptance completed	Master
	4	—	For manufacturer setting	—
	5			
	6	ZREQ	Home position return request	Master
	7	DCDD	Driver command discard detected	Master

Ex.

*1   The home position return request signal (ZREQ) turns ON when a home position return starts.

Point

[Motion API]

To confirm if the home position return request signal (ZREQ) is ON/OFF, set "SSC_STSBIT_AX_ZREQ" to the status bit No. with the sscGetStatusBitSignalEx function/sscWaitStatusBitSignalEx function.

Conditions for the home position return request signal (ZREQ) to turns ON/OFF

The following shows the conditions for the home position return request signal (ZREQ) to turns ON/OFF.

At system startup

■Condition of turning ON
- When setting "No home position" of "Control option 1 (parameter No.0200)" to "0: Invalid"
- When "Drive unit alarm [AL.025_Absolute position erased]" or "Drive unit warning [AL.0E3_Absolute position counter warning]" occurs
- An overflow occurs when calculating the absolute position restoration.
- When "Drive unit alarm [AL.037_Parameter error]" occurs
- When "Electronic Gear Setting Error (system status code error: E500H)" occurs
- When setting "Absolute position data" of "Home position return option 2 (parameter No.0241)" to "0: Invalid" and the system is started

■Condition of turning OFF
- When the absolute position is restored properly at the use of the absolute position detection system
- When "No home position" of "Control option 1 (parameter No.0200)" is "1: Valid"

While system is running

■Condition of turning ON
- When the home position return is started
- "Tandem Drive Synchronous Alignment Valid Width Error (operation alarm No.0054H, detail No.0001H)" or "Tandem Drive Synchronous Alignment Error (operation alarm No.0058H, detail No.0001H)" occurs
- When "Drive unit alarm [AL.025_Absolute position erased]" occurs

■Condition of turning OFF
- When the home position return is completed properly

Restrictions

The following shows the restrictions at the home position return incomplete status (home position return request signal (ZREQ): ON).

Operational functions

The following operation modes are unavailable. At the start operation, "Home Position Return Not Complete (operation alarm No.0090H, detail No.0001H)" occurs and the start operation is canceled.
- Automatic operation
- Linear interpolation
- Home position reset

Application functions

The following function are invalid.
- Software limit
- Rough match output
- Backlash
- Position switch

Tandem drive

The synchronization for turning the servo ON is not performed.

8.19 Other Axes Start

The other axes start function is a function that automatically performs the start operation for other axes and ON/OFF of the output device signal according to the conditions for starting other axes (start conditions) and other axes start data consisting of operation (operation content) that is performed when the conditions are satisfied. When using the other axes start, set the other axes start data No. (1 to 64) to the other axes start specification of the point table.

The start operation for other axes internally turns ON the start operation signal (ST). Therefore, before the start operation, set the operation mode and the point table for an axis for which the other axes start is performed.

This function can only be used in the automatic operation and the interpolation operation.

> ⚠ **CAUTION**
>
> ■For the basic system software version "05" or later
> - The output device signal can be controlled by the other axes start.
> - The output device signal can be controlled by the other axes start only for the motion control station. Set the control target device station to the motion control station.
> - If the output device signal is updated from the host personal computer during controlling of the output device signal by the other axes start function, the consistency of the data may not be kept. This condition is applied to the case when the host personal computer and the Motion control board perform read/write for the same output device area No. In this case, read/write the output device signal after controlling the possessory right of the output device signal using the exclusive control function.
> - For the exclusive control, refer to the following.
>   ☞ Page 37 General-purpose I/O Specifications
>   ☞ Page 231 Dual Port Memory Exclusive Control

> **Point**
>
> When using the other axes start in the operation cycle 62.50μs, use the high speed operation mode.

> **Point**
>
> [Motion API]
> - In the system in which the output signal is controlled by the other axes start, to control the general-purpose output also by the user program, use the following functions. The exclusive control of the general-purpose output is performed within the functions.
>   - sscSetGeneralOutputDataBitExclusively function
>   - sscSetGeneralOutputDataWordExclusively function
> - In the system in which the output signal is controlled by the other axes start, to control the output device also by the user program, use the following function.
>   - sscSetOutputDeviceBit function

Settings

When using the other axes start function, set the following data.

Point

- When "1: Specified position pass specification" is set to the axis judgment condition, a specified position opposite from the movement direction is judged to be already passed, and therefore the condition is satisfied at the start operation. When using together with the circular interpolation, segment the arc trajectory and set the point table as necessary so that there is a specified position for the self-axis movement direction.
- For tandem drive axes, set this function for the master axes. This function does not operate when set to the slave axis. However, the slave axis can be set as an observed axis.

Point table

Set the other axes start data No. for the other axes start specification.

Point	Position data [command unit]	Feed speed [speed unit]	Acceleration time constant [ms]	Deceleration time constant [ms]	Dwell/predwell [ms]	Auxiliary command	Other axes start specification	S-curve ratio [%]	Pressure control profile No.
	4bytes	4bytes	2bytes	2bytes	2bytes	2bytes	4bytes	1byte	1byte
0000	2000	2000	20	30	0	0000h	00000000h	0	1
0001	5000	2000	30	50	0	0000h	00000000h	0	2
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮

...	For manufacturer setting	Interpolation axis No.	Arc coordinate	Acceleration/deceleration data 1	Acceleration/deceleration data 2	Acceleration/deceleration data 3	Acceleration/deceleration data 4	Auxiliary command 2	For manufacturer setting
	2bytes	4bytes	4bytes	2bytes	2bytes	2bytes	2bytes	2bytes	6bytes
...	0	00000000h	0	200	200	20	30	0000h	0
...	0	00000000h	0	500	200	30	50	0000h	0
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮

■Other axes start specification

b31	b24	b16	b8	b0
For manufacturer setting	For manufacturer setting	Other axes start specification 2	Other axes start specification 1	

Bit	Name	Description
0 to 7	Other axes start specification 1	Set the other axis start data No.
8 to 15	Other axes start specification 2	• 0: Other axis start specification invalid • 1 to 64: Other axis start data No.
16 to 31	For manufacturer setting	—

Ex.

When setting 1 and 4 for the other axes start specification 1 and 2, respectively

Set "00000401h".

<Cause of alarm>

• When the other axes start data set in the other axes start specification at the point switching or the start of the operation is being used[*1], "Using Other Axes Start Data (operation alarm No.005BH, detail No.0001H)" occurs and the operation is canceled.

• When the other axes start data set in the other axes start specification is being used[*2], "Using Other Axes Start Data (operation alarm No.005BH, detail No.0001H)" occurs and the operation is canceled.

• If the setting of the other axes start specification is incorrect, "Point Table Setting Error (operation alarm No.0025H, detail No.0009H)" occurs and the operation is stopped.

*1   It indicates any of the following cases.
        - The other axes start notice signal (OSOP□) is ON.
        - Other axes in a different operation group is importing the other axes start data by specifying the same number of other axes start data.

*2   It indicates any of the following cases.
        - The other axes start output signal timer control signal (OSDTO□) is ON.
        - The possessory right for the exclusive control of the general-purpose output cannot be got, and the monitoring of the possessory right for the output signal by the other axes start continues.
        - The possessory right for the dual port memory exclusive control cannot be got, and the monitoring of the possessory right for the output signal by the other axes start continues.

> **Point**
>
> The setting range of the other axes start data No. differs depending on the operation cycle. A maximum of 1 to 64 can be set. When the setting is out of the range of the valid other axes start data No., "Point Table Setting Error (operation alarm No.0025H, detail No.0009H)" occurs.
> • Operation cycle 62.50μs: 1 to 8
> • Operation cycle 125.00μs: 1 to 16
> • Operation cycle 250.00μs: 1 to 32
> • Operation cycle 500.00μs: 1 to 64
> • Operation cycle 1000.00μs: 1 to 64
> • Operation cycle 2000.00μs: 1 to 64

> **Point**
>
> [Motion API]
> • To set/get the point table, use the sscSetPointDataEx function/sscCheckPointDataEx function.
> • For a detailed procedure for the other axes start, refer to the sample programs (InterruptOas/PollingOas/OasDigitalOutput) contained on the EM Motion SDK.

8

Other axes start data

For the other axes start data (1 to 64), set the conditions for starting other axes (start conditions) and the operation (operation content) performed when the condition is satisfied. When the other axes start No. (1 to 64) is set to the other axes start specification (other axes start specification 1 and 2) of the point table, the other axes are started according to the settings of the corresponding other axes start data.

For the list of other axes start data, refer to the following.

☞ Page 532 Other Axes Start Data

> **Point**
>
> All axes start data specified in the other axes start specification of the point table upon the start of the operation are imported. When the other axes start data is changed after the start operation (after the other axes start notice signal (OSOP□) is turned ON) the changes are invalid.

> **Point**
>
> [Motion API]
> To set/get the other axes start data, use the sscSetOtherAxisStartData function/sscGetOtherAxisStartData function.

■Start condition

The addresses in the table are the addresses for the first other axes start data 1. For the second other axis start data 2 and after, add 80h for each data.

Address (hexadecimal)	Name	Initial value	Units	Setting range	Description
00062200 00062201 00062202 00062203	Axis option	00000000h	—	00000000h to 00000011h	■■■■■■□ (Axis judgment condition) Set the judgment condition for the axis. • 0: Remaining distance specification (The condition is satisfied when the axis remaining distance is equal to or shorter than the axis remaining distance data.) • 1: Specified position pass specification (The condition is satisfied when the axis position exceeds the axis pass position data.) ■■■■■□■ (Axis judgment coordinate) Set the judgment coordinate for the axis. • 0: Current feedback position • 1: Current command position
00062204 00062205 00062206 00062207	Observed axis option	00000000h	—	00000000h to 00FF1111h	Set here to monitor axes. ■■■■■■□ (Observed axis specification) Validate the observed axis. • 0: Invalid • 1: Valid ■■■■■□■ (Observed axis judgment condition) Set the judgment condition for the observed axis. • 0: Not use • 1: Observed axis specified position pass specification (Observed axis specified position pass judgment condition) ■■■■■□■■ (Observed axis judgment coordinate) Set the judgment coordinate for the observed axis. • 0: Current feedback position • 1: Current command position ■■■■□■■■ (Observed axis specified position pass judgment condition) Set the specified position pass judgment condition for the observed axis. • 0: The condition is satisfied when the observed axis position is less than or equal to the observed axis specified position data. • 1: The condition is satisfied when the observed axis position is more than or equal to the observed axis specified position data. ■■□□■■■ (Observed axis No.) Set the observed axis No. • 00h to 3Fh: Axis No. - 1 <Example> 0Ah • Axis No.11

Address (hexadecimal)	Name	Initial value	Units	Setting range	Description
00062208 00062209 0006220A 0006220B	Axis remaining distance data/Axis pass position data	0	Command units	■"0: Remaining distance specification" 0 to 2147483647 ■"1: Specified position pass specification" -2147483648 to 2147483647	Select any one of the following for "Axis judgment condition" of the axis option (00062200 to 00062203). ■"0: Remaining distance specification" Set the axis remaining distance data. ■"1: Specified position pass specification" Set the axis pass position data.
0006220C 0006220D 0006220E 0006220F	Observed axis specified position data	0	Command units	-2147483648 to 2147483647	Set the specified position data of the observed axis set in the observed axis option.
00062210 ⋮ 00062227	For manufacturer setting	—	—	—	—

<Cause of alarm>

An incorrect setting of the other axes start condition causes "Other Axes Start Setting Error (operation alarm No.004DH)" at the start operation or the point switching. The operation alarm detail No. is as follows.

- The axis judgment condition of the other axes start condition is outside limits. (operation alarm No.004DH, detail No.0010H)
- The axis remaining distance data of other axes start condition is a negative value. (operation alarm No.004DH, detail No.0011H)
- The position specified in the axis pass position data of other axes start condition cannot be passed. (operation alarm No.004DH, detail No.0012H)[*1]
- The axis judgment coordinates of other axes start condition is outside limits. (operation alarm No.004DH, detail No.0013H)
- The observed axis No. of other axes start condition is outside limits. (operation alarm No.004DH, detail No.0014H)
- The observe judgment condition of other axes start condition is outside limits. (operation alarm No.004DH, detail No.0015H)
- The observed axis judgment coordinates of other axes start condition is outside limits. (operation alarm No.004DH, detail No.0016H)
- The specified position pass judgment condition of observed axis of other axes start condition is outside limits. (operation alarm No.004DH, detail No.0017H)
- The observed axis specification of other axes start condition is outside limits. (operation alarm No.004DH, detail No.0018H)
- A non-existent axis[*2] is set in the observed axis No. of other axes start condition. (operation alarm No.004DH, detail No.0019H)

*1 When using the circular interpolation, if "start point coordinate ≤ end point coordinate < axis pass position data" or "axis pass position data < end point coordinate ≤ start point coordinate", the axis judgement coordinate is judged as being outside limits. Segment the arc trajectory and set the point table as necessary.

*2 A non-existent axis means an axis for which "0: Not controlled" is set to "Control axis" of "Control option 1 (parameter No.0200)", or a temporarily uncontrollable axis due to, for example, the power OFF of the control power supply of the drive unit.

■Operation content

The addresses in the table are the addresses for the first other axes start data 1. For the second other axis start data 2 and after, add "+80h" for each data.

Address (hexadecimal)	Name	Units	Setting range	Description
00062228 00062229 0006222A 0006222B	Start axis designation 1[*1]	—	00000000h to FFFFFFFFh	Set the axis for which the start operation is performed when the other axes start condition is satisfied. Bit0 to 31: axis 1 to axis 32 • 0: Start operation invalid • 1: Start operation valid
0006222C 0006222D 0006222E 0006222F	Start axis designation 2[*1]	—	00000000h to FFFFFFFFh	Set the axis for which the start operation is performed when the other axes start condition is satisfied. Bit0 to 31: axis 33 to axis 64 • 0: Start operation invalid • 1: Start operation valid
00062230 00062231	Start axis start point No.	—	0 to 2048	Set the start point No. of the other axes start axis.
00062232 00062233	Start axis end point No.	—	0 to 2048	Set the end point No. of the other axes start axis.
00062234 ⋮ 00062263	For manufacturer setting	—	—	—

8

Address (hexadecimal)	Name	Units	Setting range	Description
00062264 00062265	Output signal specification	—	0000h to 0003h	Select the output signal to control output when the other axes start conditions are satisfied. ■ ■ ■ □ (Output signal control) Set valid/invalid for the output signal control. • 0: Invalid • 1: Valid (Output bit device specification) • 2: Valid (Output word device specification) • 3: Valid (General-purpose output specification)
00062266 00062267	Output signal No.	—	0000h to 1FFFh	Set the output signal No. in units of 16 points. ■For "1: Valid (Output bit device specification)" (RY□□□□) • 0000 to 03FFh <Example> 0000h: RY0 to RYF 03FFh: RY3FF0 to RY3FFF ■For "2: Valid (Output word device specification)" (RWw□□□□) • 0000 to 1FFFh <Example> 0000h: RWw0 1FFFh: RWw1FFF ■For "3: Valid (General-purpose output specification)" Unused and setting is not necessary. • Fixed to 0000h (Specify DO0 to DO3.)
00062268 00062269	Output signal enable selection	—	0000h to FFFFh	Set valid/invalid for the output signal selected in the output signal specification. ■For "1: Valid (Output bit device specification)" (RY□□□□) RY□□□0 (bit0) to RY□□□F (bit15)[2] • 0: Invalid • 1: Valid ■For "2: Valid (Output word device specification)" (RWw□□□□) RWw□□□□.0 (bit0) to RWw□□□□.F (bit15)[3] • 0: Invalid • 1: Valid ■For "3: Valid (General-purpose output specification)" DO0 (bit0) to DO3 (bit3) • 0: Invalid • 1: Valid
0006226A 0006226B	Output signal command	—	0000h to FFFFh	Set the output command (ON/OFF) of the output signal selected in the output signal enable selection. ■For "1: Valid (Output bit device specification)" (RY□□□□) RY□□□0 (bit0) to RY□□□F (bit15)[2] • 0: OFF • 1: ON ■For "2: Valid (Output word device specification)" (RWw□□□□) RWw□□□□.0 (bit0) to RWw□□□□.F (bit15)[3] • 0: OFF • 1: ON ■For "3: Valid (General-purpose output specification)" DO0 (bit0) to DO3 (bit3) • 0: OFF • 1: ON
0006226C ⋮ 0006226F	For manufacturer setting	—	—	—
00062270 00062271	Output signal timer control	—	0000h to FFFFh	Set valid/invalid for the timer control of the output signal selected in the output signal specification. ■For "3: Valid (General-purpose output specification)" DO0 (bit0) to DO3 (bit3) • 0: Invalid • 1: Valid
00062272 00062273	Output signal timer	ms	0 to 65535	Set the time to keep the output status set in the output signal command.
00062274 ⋮ 0006227F	For manufacturer setting	—	—	—

*1 Set so that the total number of axes for the start axis designation1 and the start axis designation 2 does not exceed the maximum number of synchronous startup axes.
*2 Set □□□ in the output signal No.
*3 Set □□□□ in the output signal No.

Point

- When the operation cycle is 2.0ms, the time of output signal timer is the time divided by the operation cycle, and a fraction is rounded up.
  <Example> When the operation cycle is 2.0ms and the output signal timer is 1ms, monitoring is performed with the output signal timer 2ms.
- When the operation cycle is 2.0ms and a value smaller than the operation cycle is written to the output signal timer, the value of the output signal timer is considered equal to the operation cycle.
- Because the output signal control depends on the control timing of the other axes start, an error occurs in the control timing within 1 operation cycle. Due to this, compared to the setting time of the output signal timer, the signal width of the general-purpose output signal or the output device signal may change.

<Setting example of output signal>

The following is the setting example when the output device signals RY1F0 to RY1F3 are turned ON after the other axes start conditions are satisfied.

Address (hexadecimal)	Name	Setting value	Setting contents
00062264	Output signal specification	0001h	Output signal control • 1: Valid (Output bit device specification)
00062266	Output signal No.	001Fh	RY1F0 to RY1FF: Valid
00062268	Output signal enable selection	000Fh	bit0 to 3 • 1: Valid bit4 to 15 • 0: Invalid
0006226A	Output signal command	000Fh	bit0 to 3 • 1: ON

<Cause of alarm>

An incorrect setting of the other axes operation content causes "Other Axes Start Setting Error (operation alarm No.004DH)" at the start operation or the point switching. The operation alarm detail No. is as follows.

- A self-axis or non-existent axis[1] was set in the start axis designation of the other axes operation content. (operation alarm No.004DH, detail No.0020H)
- The start axis starting point No. and start axis end point No. settings of other axes operation content are outside limits. (operation alarm No.004DH, detail No.0021H)
- The output device signal control of other axes operation content is outside limits. (operation alarm No.004DH, detail No.0022H)
- The output signal No. of other axes operation content is outside the limits. (operation alarm No.004DH, detail No.0023H)
- The selection for output signal validation of other axes operation content is out of range. (operation alarm No.004DH, detail No.0024H)
- The output signal command of other axes operation content is out of range. (operation alarm No.004DH, detail No.0025H)
- The output signal timer control of other axes operation content is out of range. (operation alarm No.004DH, detail No.0026H)
- The timer control is enabled to the output signal which is not enabled in setting of selection for output signal validation of other axes operation content. (operation alarm No.004DH, detail No.0027H)
- Any signal is enabled by output signal timer control of other axes operation content and 0ms is set to output signal timer. (operation alarm No.004DH, detail No.0028H)

*1 A non-existent axis means an axis for which "0: Not controlled" is set to "Control axis" of "Control option 1 (parameter No.0200)", or a temporarily uncontrollable axis due to, for example, the power OFF of the control power supply of the drive unit.

Point

Even if the output status is the same as the setting of the output signal command at the start operation or the point switching, an operation alarm does not occur.

8

■Usage methods and required settings

The settings required for the main usage methods of the other axes start are as follows.

○: Required, —: Optional

Name	Main use		
	Starting operation of other axis at specified position	**Turning ON/OFF output signal**	**Using observed axis**
Axis option	○	○	○
Observed axis option	—	—	○
Axis remaining distance data/Axis pass position data	○	○	○
Observed axis specified position data	—	—	○
Start axis designation 1	○	—	○
Start axis start point No.	○	—	○
Start axis end point No.	○	—	○
Output signal specification	—	○	—
Output signal No.	—	○	—
Output signal enable selection	—	○	—
Output signal command	—	○	—
Output signal timer control	—	—	—
Output signal timer	—	—	—

Interface

Other axes start (Other axes start command bit/other axes start status bit)

The other axes start commands/other axes start statuses related to the other axes start function are shown below.

For the list of the other axes start, refer to the following.

■Other axes start command bit

The addresses in the table are the addresses for the other axes start command/status table 1. Add "+4h" for each other axes start command/status table 2 and after.

Address (hexadecimal)	Bit	Symbol[*1]	Signal name
00062000	0	OSSTP□	Other axes start cancel
	1	—	For manufacturer setting
	2		
	3		
	4		
	5		
	6		
	7		
	8		
	9		
	10		
	11		
	12		
	13		
	14		
	15		

*1 □: Other axes start No. (1 to 64)

• Details concerning other axes start command bits

Symbol[*1]	Signal name	Function details	
		Function	Operation
OSSTP□	Other axes start cancel	Cancel the other axes start.	Turn ON this signal to cancel the other axes start when the other axes notice signal (OSOP□) is ON for waiting for the other axes start condition satisfaction.

*1 □: Other axes start No. (1 to 64)

> **Point**
>
> [Motion API]
> To turn ON/OFF the other axes start cancel signal (OSSTP□), use the sscOtherAxisStartAbortOn function/ sscOtherAxisStartAbortOff function.

■Other axes start status bit

The addresses in the table are the addresses for the other axes start command/status table 1. Add "+4h" for each other axes start command/status table 2 and after.

Address (hexadecimal)	Bit	Symbol[1]	Signal name
00062002	0	OSOP□	Other axes start notice
	1	OSFIN□	Other axes start completed
	2	OSERR□	Other axes start incompleted
	3	—	For manufacturer setting
	4		
	5		
	6		
	7		
	8		
	9		
	10		
	11		
	12	OSDTO□	Other axes start output signal timer control
	13	OSDCE□	Other axes start output signal control error
	14	OSDDL□	Other axes start output signal control delay
	15	—	For manufacturer setting

[1] □: Other axes start No. (1 to 64)

• Details concerning other axes start status bits

Symbol[1]	Signal name[1]	Function details		
		Function	Operation	
			Conditions for turning ON	Conditions for turning OFF
OSOP□	Other axes start notice	Notify of the monitoring for the other axes start condition.	The other axis start data is specified in the other axes start specification of the point table for the automatic operation and the interpolation operation, and the axis is monitored for the other axes start condition.	• The other axes start condition is satisfied. • During monitoring for the other axes start condition (when the other axes start notice signal (OSOP□) is ON), the other axes start cancel signal (OSSTP□) is turned ON.
OSFIN□	Other axes start completed	Notify that the other axes start operation content is executed.	The other axes start condition is satisfied, and the other axes start operation content is executed.	The other axes start data is specified in the other axes start specification in the point table for the automatic operation or the interpolation operation.

Symbol[1]	Signal name[1]	Function details		
		Function	**Operation**	
			Conditions for turning ON	**Conditions for turning OFF**
OSERR□	Other axes start incompleted	Notify that the other axes start has failed.	• The axis specified in the start axis designation is being operated when the other axes start operation content should be executed. • The operation mode of the axis specified in the start axis designation is other than the automatic operation and the interpolation operation when the other axes start operation content should be executed. • During monitoring for the other axes start condition (when the other axes start notice signal (OSOP□) is ON), the operation is canceled due to an operation alarm on the axis or the stop operation signal (STP)/rapid stop signal (RSTP) turned ON. • During monitoring for the other axes start condition (when the other axes start notice signal (OSOP□) is ON), the other axes start cancel signal (OSSTP□) is turned ON. • The number of axes set in the start axis designation exceeds the maximum number of simultaneous start axes.	The other axes start data is specified in the other axes start specification in the point table for the automatic operation or the interpolation operation.
OSDTO□	Other axes start output signal timer control	Notify that the other axes start operation content becomes the output signal timer control status.	The output signal command is output after the other axes start condition is satisfied, and the other axes start operation content becomes the output signal timer control status.	• The output signal timer elapses, and the output status is controlled for the opposite of the output signal command. • The other axes start cancel signal (OSSTP□) is turned ON.
OSDCE□	Other axes start output signal control error	Notify that the other axes start operation content that controls the same output signal is executed during the output signal timer control.	During the output signal timer control after the other axes start condition is satisfied, the other axes start operation content that performs the output control for the same output signal is executed.	The other axis start data is specified in the other axes start specification of the point table for the automatic operation and the interpolation operation.
OSDDL□	Other axes start output signal control delay	Notify that the other axes start output signal control is delayed.	Because the possessory right of the exclusive control cannot be got, the other axes start output signal control is delayed.	The other axis start data is specified in the other axes start specification of the point table for the automatic operation and the interpolation operation.

*1   □: Other axes start No. (1 to 64)

Point

[Motion API]

To confirm if the following other axes start statuses are ON/OFF, use the sscGetOtherAxisStartStatus function.

• Other axes start notice signal (OSOP□)

• Other axes start complete signal (OSFIN□)

• Other axes start incomplete signal (OSERR□)

• Other axes start output signal timer control signal (OSDTO□)

• Other axes start output signal control error signal (OSDCE□)

• Other axes start output signal control delay signal (OSDDL□)

8

Operation example

When other axes start is complete

The other axes start notice signal (OSOP□) turns ON between the axis start and the completion of the other axis start.

The other axes start complete signal (OSFIN□) turns ON when the other axes start notice signal (OSOP□) is turned OFF on the completion of the other axes start.

■Output device signal
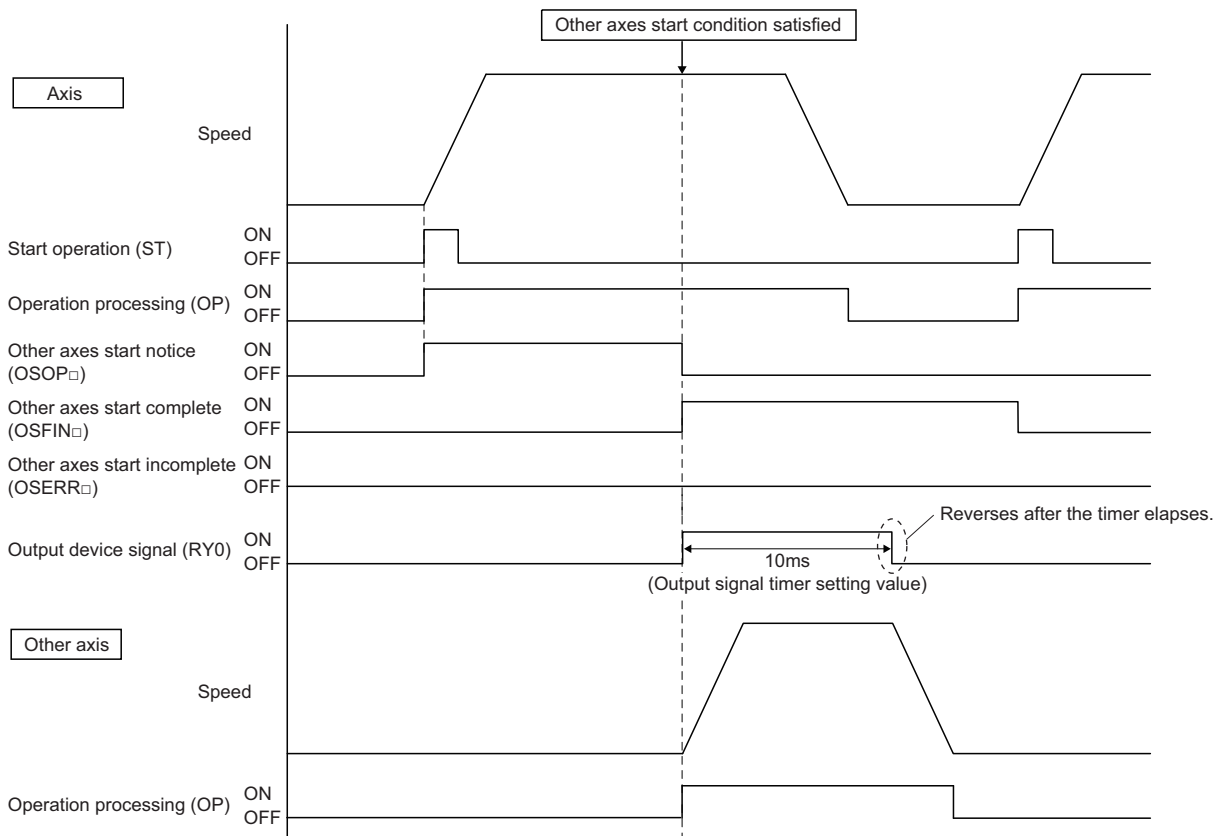
<Setting example of output signal>

Address (hexadecimal)	Name	Setting value	Setting contents
00062264	Output signal specification	0001h	Output signal control • 1: Valid (Output bit device specification)
00062266	Output signal No.	0000h	RY0 to RYF: Valid
00062268	Output signal enable selection	0001h	bit0 • 1: Valid bit1 to 15 • 0: Invalid
0006226A	Output signal command	0001h	bit0 • 1: ON
00062270	Output signal timer control	0001h	bit0 • 1: Valid bit1 to 15 • 0: Invalid
00062272	Output signal timer	10	10ms

Point

- When the output signal timer control is "1: Valid" and the operation is completed before the output signal timer elapses, the elapse of the output signal timer is monitored after the operation is completed. After the output signal timer elapses, the output signal is reversed.
- To confirm if the output signal control operates appropriately, after the operation is completed or the output signal is controlled, confirm the other axes start status of the output signal as necessary.
- When the same output signal is controlled from multiple tables within the same control cycle, the output is controlled multiple times within 1 cycle. For the output device status, the output signal command of the maximum number of the other axes start table in which the other axes start condition is satisfied is output.

8

■General-purpose output signal

<Setting example of output signal>
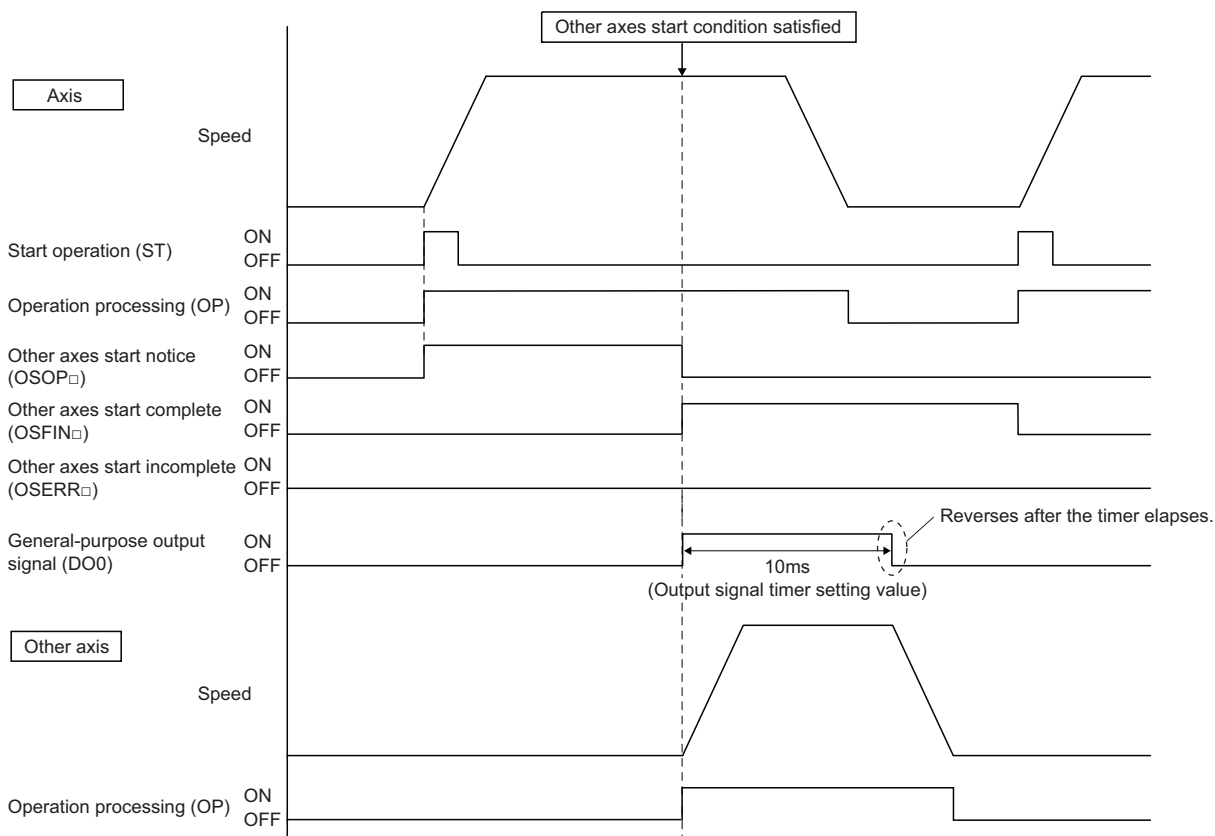
Address (hexadecimal)	Name	Setting value	Setting contents
00062264	Output signal specification	0003h	Output signal control • 3: Valid (General-purpose output specification)
00062266	Output signal No.	0000h	Fixed to 0000h
00062268	Output signal enable selection	0001h	bit0 • 1: Valid bit1 to 15 • 0: Invalid
0006226A	Output signal command	0001h	bit0 • 1: ON
00062270	Output signal timer control	0001h	bit0 • 1: Valid bit1 to 15 • 0: Invalid
00062272	Output signal timer	10	10ms

Point

- When the output signal timer control is "1: Valid" and the operation is completed before the output signal timer elapses, the elapse of the output signal timer is monitored after the operation is completed. After the output signal timer elapses, the output signal is reversed.
- To confirm if the output signal control operates appropriately, after the operation is completed or the output signal is controlled, confirm the other axes start status of the output signal as necessary.
- When the same output signal is controlled from multiple tables within the same control cycle, the output is controlled multiple times within 1 cycle. For the general-purpose output status, the output signal command of the maximum number of the other axes start table in which the other axes start condition is satisfied is output.

When the observed axis is valid

When "1: Valid" is set to the observed axis specification (in the observed axis option of the other axes start condition), the other axes content is not operated until both the axis judgment condition and the observed axis judgment condition are satisfied.

Ex.

Example of when the monitor axis judgment condition are satisfied after the axis judgment condition is satisfied
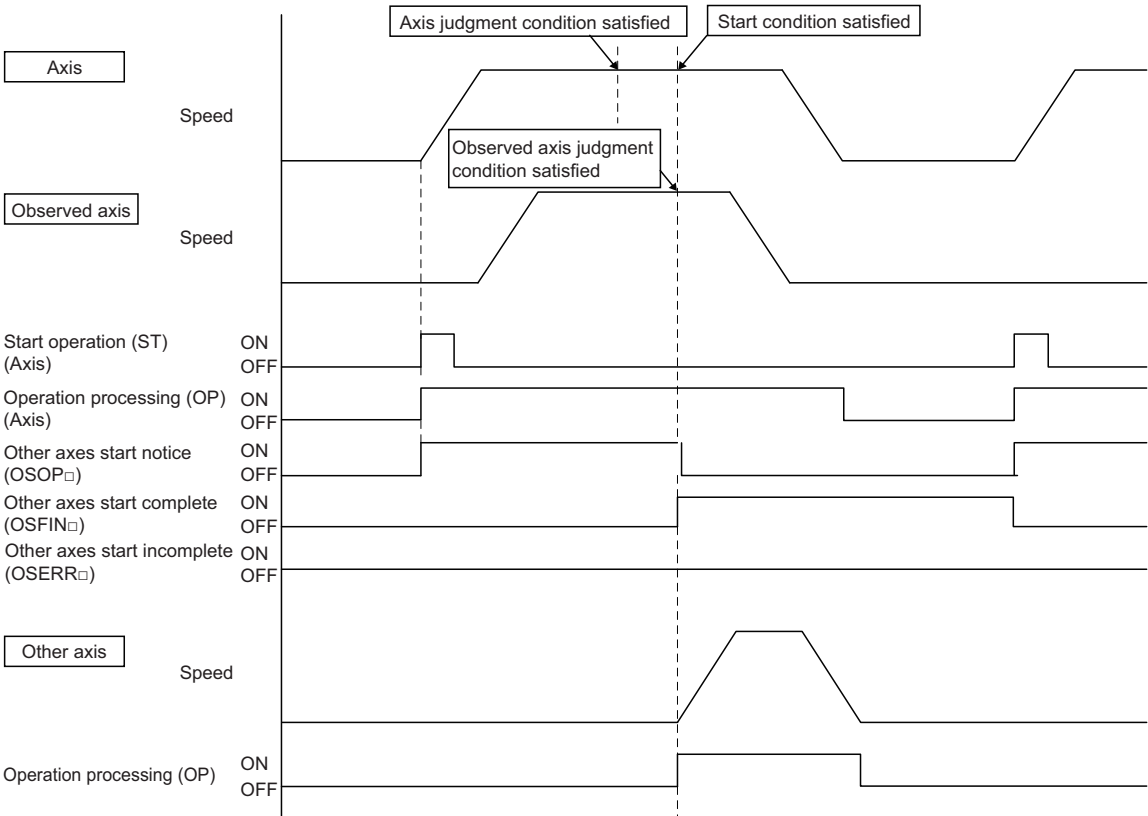
When other axes start fails

When the other axes start fails due to, for example, an operation alarm on the axis preceding the satisfaction of other axes start condition, the other axes start incompleted signal (OSERR□) turns ON. The other axes start incompleted signal (OSERR□) turns ON when:

- The axis set in the start axis designation 1 or the start axis designation 2 is being operated when the other axes start condition is satisfied.
- The operation mode of the axis set in the start axis designation 1 or the start axis designation 2 is other than the automatic operation and the interpolation operation when the other axes start condition is satisfied.
- The operation is canceled by turning ON the stop operation signal (STP) or the rapid stop signal (RSTP) before the other axes start condition is satisfied
- The operation is canceled by an operation alarm, etc. before the other axis start condition is satisfied.
- The operation of the axis is completed and the in-position signal (INP) is turned ON before the other axes start condition is satisfied.

Ex.
When an operation alarm occurs
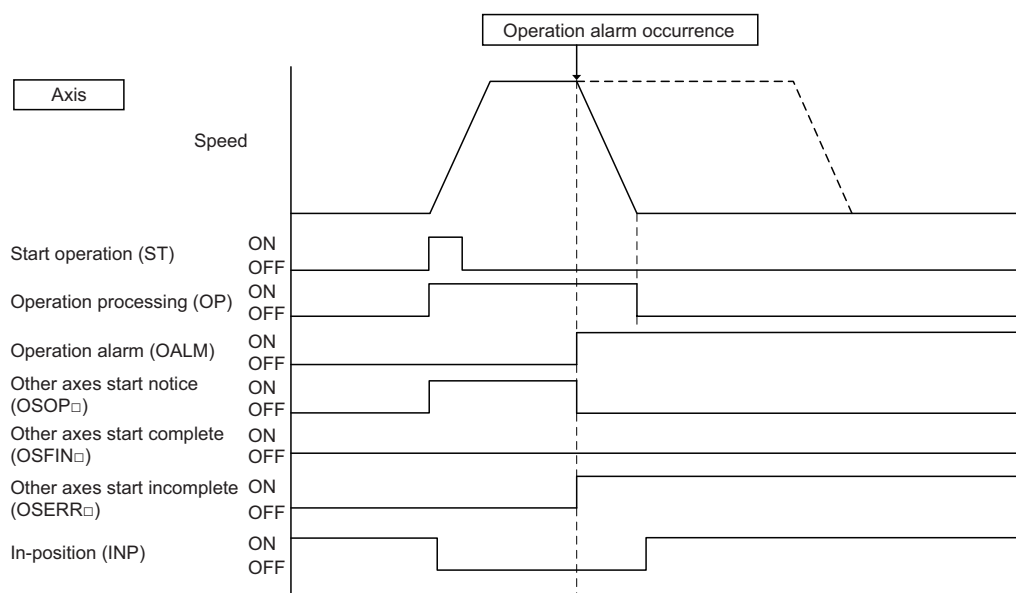
Ex.
When operation of the axis is completed
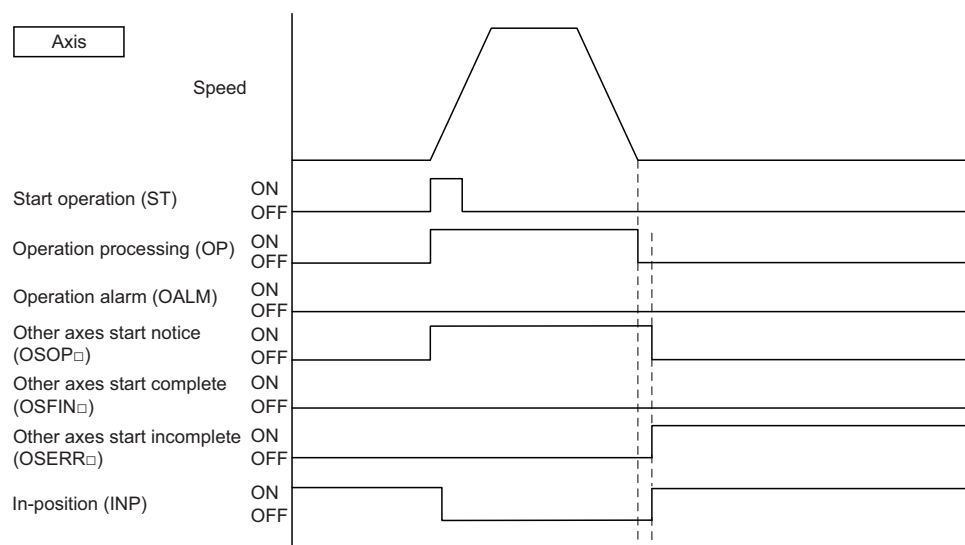
When other axes start is canceled

When the other axes start cancel signal (OSSTP□) is turned ON before the other axes start condition is satisfied, the other axes start incompleted signal (OSERR□) turns ON.

Ex.
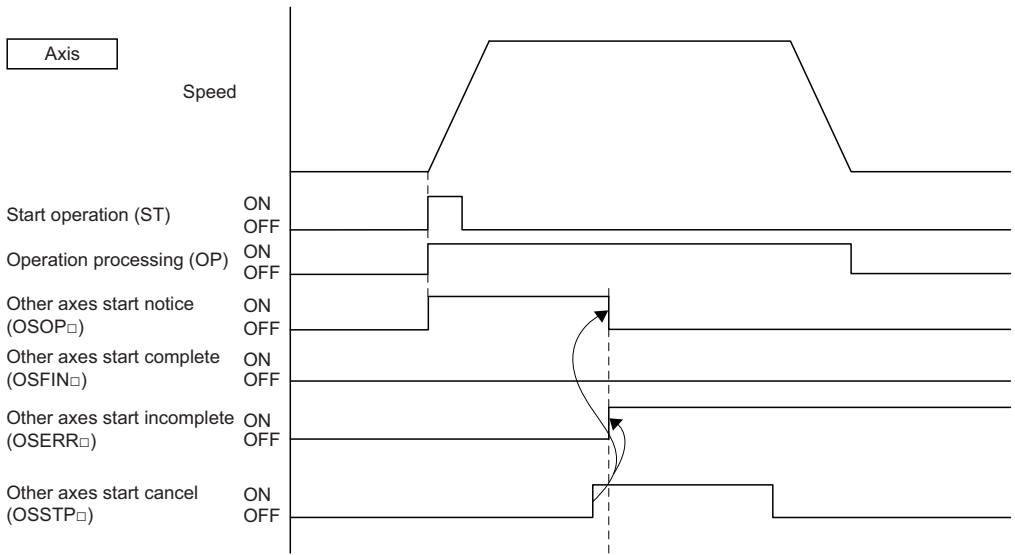
When the output signal is the same as the output signal command setting before the other axes start condition is satisfied

The other axes start is completed when the other axes start condition is satisfied.
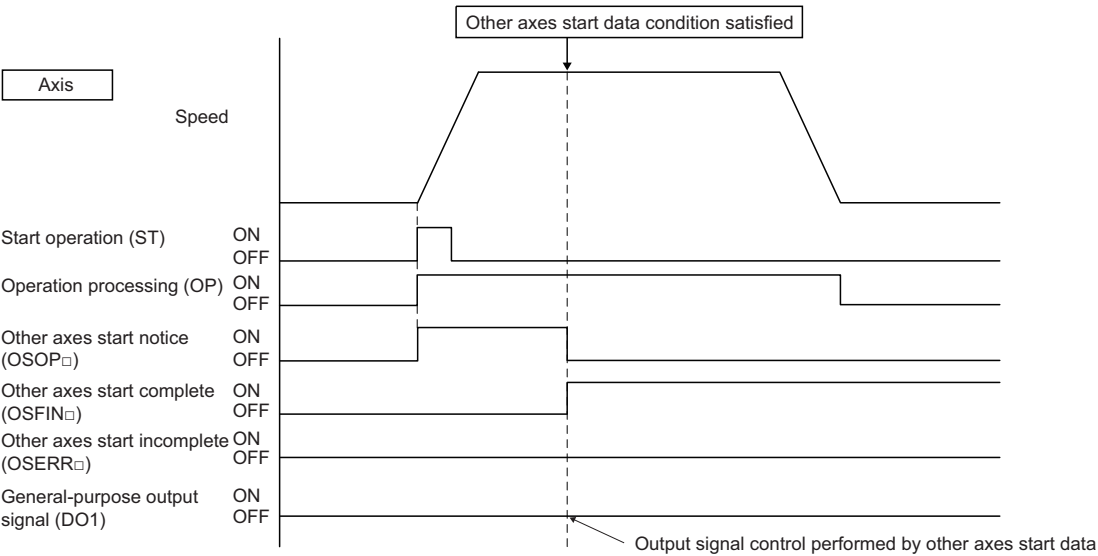
When the output signal is the same as the output signal command setting before the other axes start condition is satisfied, and the output signal timer control is "1: Valid"

The other axes start is completed when the other axes start condition is satisfied.
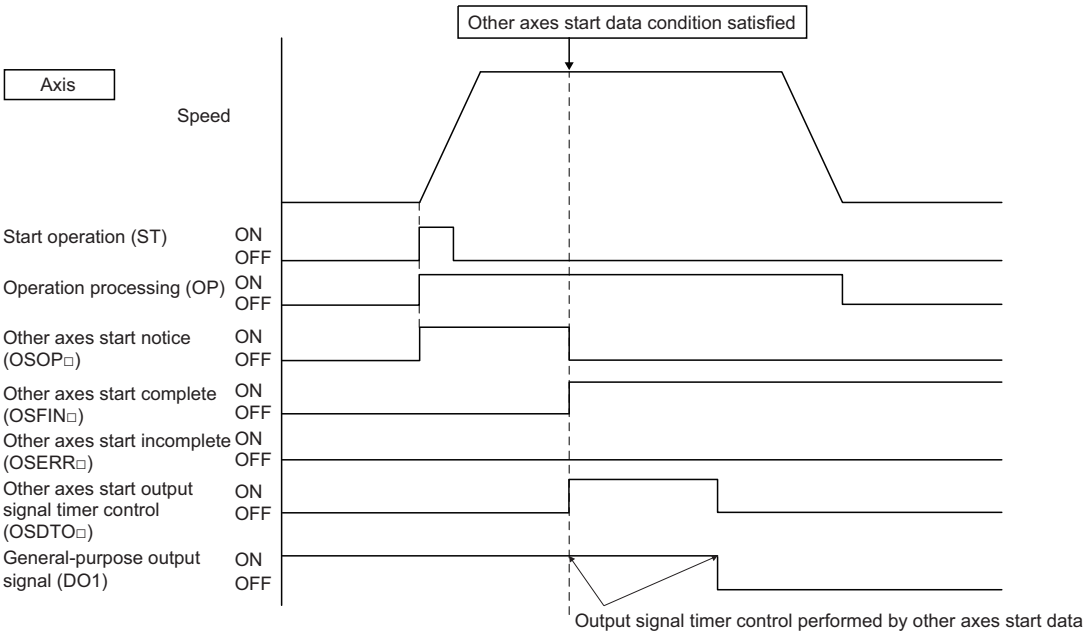
When the output signal control is delayed by the exclusive control

■Dual port memory exclusive control

After the other axes start condition is satisfied, if the occupy status of the dual port memory exclusive control is in occupation by user, the output signal control is put on hold.

*1   For details, refer to the following.
      ☞ Page 231 Dual Port Memory Exclusive Control

> **Point**
>
> • When the output signal control is put on hold according to the occupy status of the dual port memory exclusive control, the output signal timer indicates the elapsed time, not including hold time, after the output signal is output.
> • When the output signal control is put on hold after the timer elapses according to the occupy status of the dual port memory exclusive control, the status of the output signal command continues until the exclusive control possessory right is got.
> • To confirm if the output signal control operates appropriately, after the operation is completed or the output signal is controlled, confirm the other axes start status of the output signal as necessary.
> • Even when the access of the output device signal is delayed, the exclusive control enables only the axis start when the other axes start condition is satisfied. Also, even if the start axis designation is not set, the other axes start complete signal (OSFIN□) and the other axes start output signal control delay signal (OSDDL□) turn ON.

■General-purpose output exclusive control

After the other axes start condition is satisfied, if the occupy status of the general-purpose output exclusive control is in occupation by user, the output signal control is put on hold.

*1   For details, refer to the following.
    ☞ Page 43 General-purpose output exclusive control

> **Point**
> - When the output signal control is put on hold according to the occupy status of the general-purpose output exclusive control, the output signal timer indicates the elapsed time, not including hold time, after the output signal is output.
> - When the output signal control is put on hold after the timer elapses according to the occupy status of the general-purpose output exclusive control, the status of the output signal command continues until the exclusive control possessory right is got.
> - To confirm if the output signal control operates appropriately, after the operation is completed or the output signal is controlled, confirm the other axes start status of the output signal as necessary.
> - Even when the access of the general-purpose output signal is delayed, the exclusive control enables only the axis start when the other axes start condition is satisfied. Also, even if the start axis designation is not set, the other axes start complete signal (OSFIN□) and the other axes start output signal control delay signal (OSDDL□) turn ON.

When the other axes start is set in operations at more than one point

After the other axes start condition is satisfied, the timer monitor continues even when a point is switched while the output signal timer elapses. The output signal status is switched after the timer elapses.
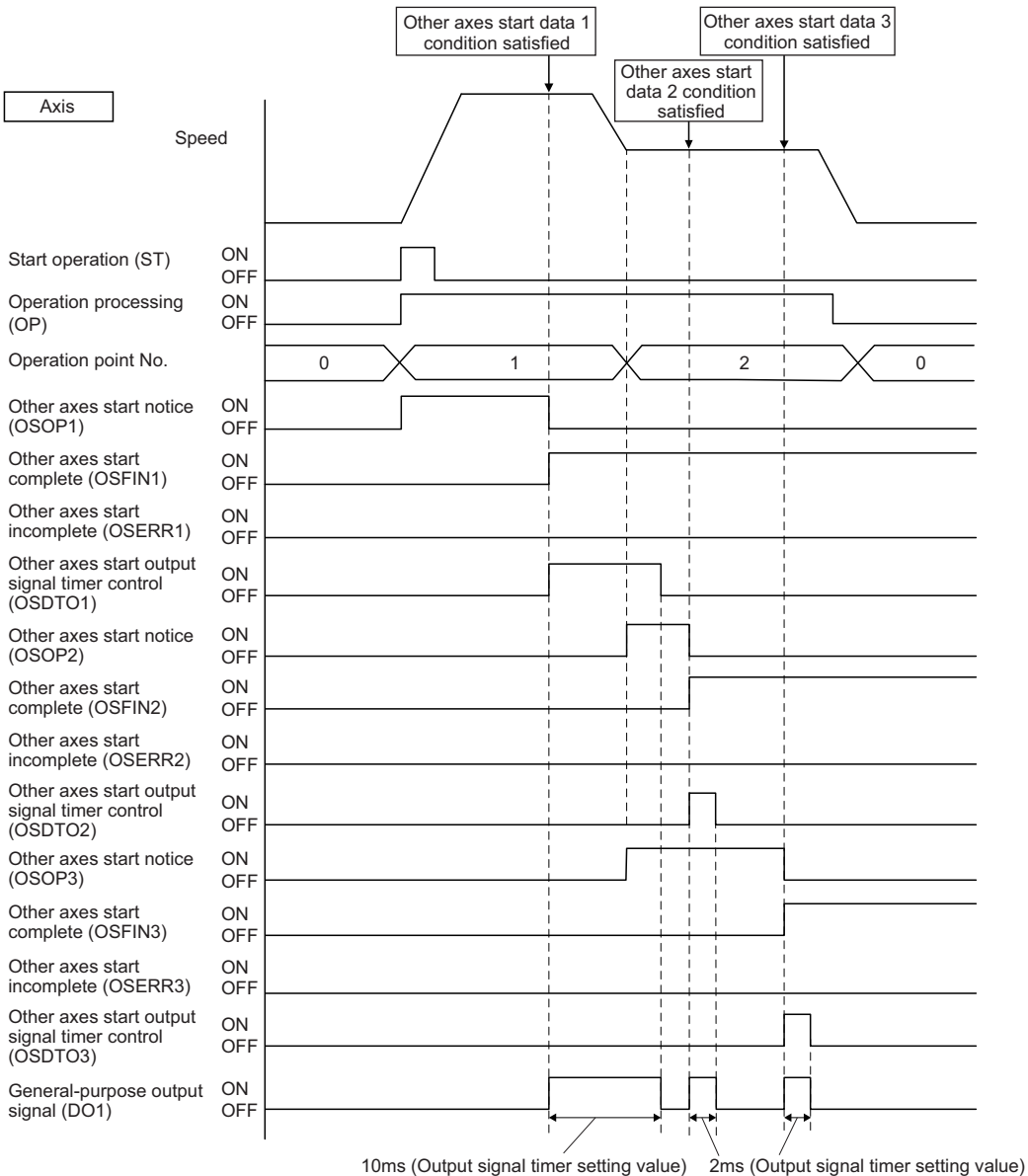
Setting example

• Point data for operation example[1]

Point No.	Name	Setting value	Setting contents
1	Position data	100000	Specify the position up to point No.2.
	Auxiliary command	0020h	Absolute position command continuous operation
	Other axes start designation	0001h	Use the other axes data 1.
2	Position data	180000	Specify the absolute position.
	Auxiliary command	0000h	Absolute position command
	Other axes start designation	0302h	Use the other axes data 2, 3.

• Other axes start data for operation example[1]

Other axes start data No.	Name	Setting value	Setting contents
1	Axis option	00000000h	Axis judgment condition • 0: Remaining distance specification Axis judgment coordinate • 0: Current feedback position
	Axis remaining distance data	65000	Remaining distance data
	Output signal specification	0003h	Output signal control • 3: Valid (General-purpose output specification)
	Output signal No.	0000h	Fixed to 0000h
	Output signal enable selection	0001h	bit0 • 1: Valid bit1 to 15 • 0: Invalid
	Output signal command	0001h	bit0 • 1: ON
	Output signal timer control	0001h	bit0 • 1: Valid bit1 to 15 • 0: Invalid
	Output signal timer	10	10ms
2	Axis option	00000000h	Axis judgment condition • 0: Remaining distance specification Axis judgment coordinate • 0: Current feedback position
	Axis remaining distance data	60000	Remaining distance data
	Output signal specification	0003h	Output signal control • 3: Valid (General-purpose output specification)
	Output signal No.	0000h	Fixed to 0000h
	Output signal enable selection	0001h	bit0 • 1: Valid bit1 to 15 • 0: Invalid
	Output signal command	0001h	bit0 • 1: ON
	Output signal timer control	0001h	bit0 • 1: Valid bit1 to 15 • 0: Invalid
	Output signal timer	2	2ms

Other axes start data No.	Name	Setting value	Setting contents
3	Axis option	00000000h	Axis judgment condition • 0: Remaining distance specification Axis judgment coordinate • 0: Current feedback position
	Axis remaining distance data	30000	Remaining distance data
	Output signal specification	0003h	Output signal control • 3: Valid (General-purpose output specification)
	Output signal No.	0000h	Fixed to 0000h
	Output signal enable selection	0001h	bit0 • 1: Valid bit1 to 15 • 0: Invalid
	Output signal command	0001h	bit0 • 1: ON
	Output signal timer control	0001h	bit0 • 1: Valid bit1 to 15 • 0: Invalid
	Output signal timer	2	2ms

*1 The examples that are not directly related to the settings mentioned in the previous pages are omitted.

Point

During operation, do not use the same other axes start data multiple times. If the same other axes start data is used, the other axes start status bit in the previous operation is updated.

8

Restrictions

When performing the timer control for the same output signal in operations at more than one point, set the control setting to perform control after 1 operation cycle or more from the elapse of the output signal timer by the previous axes start data until the next other axes start condition is satisfied. If the timer control timing for the same signal is overlapped, the other axes start operation content that has been timer controlled first is performed. The other axes start output signal control error signal (OSDCE□) turns ON for the other axes start status of the other axes start condition satisfied later, and at this time, the output signal is not controlled.
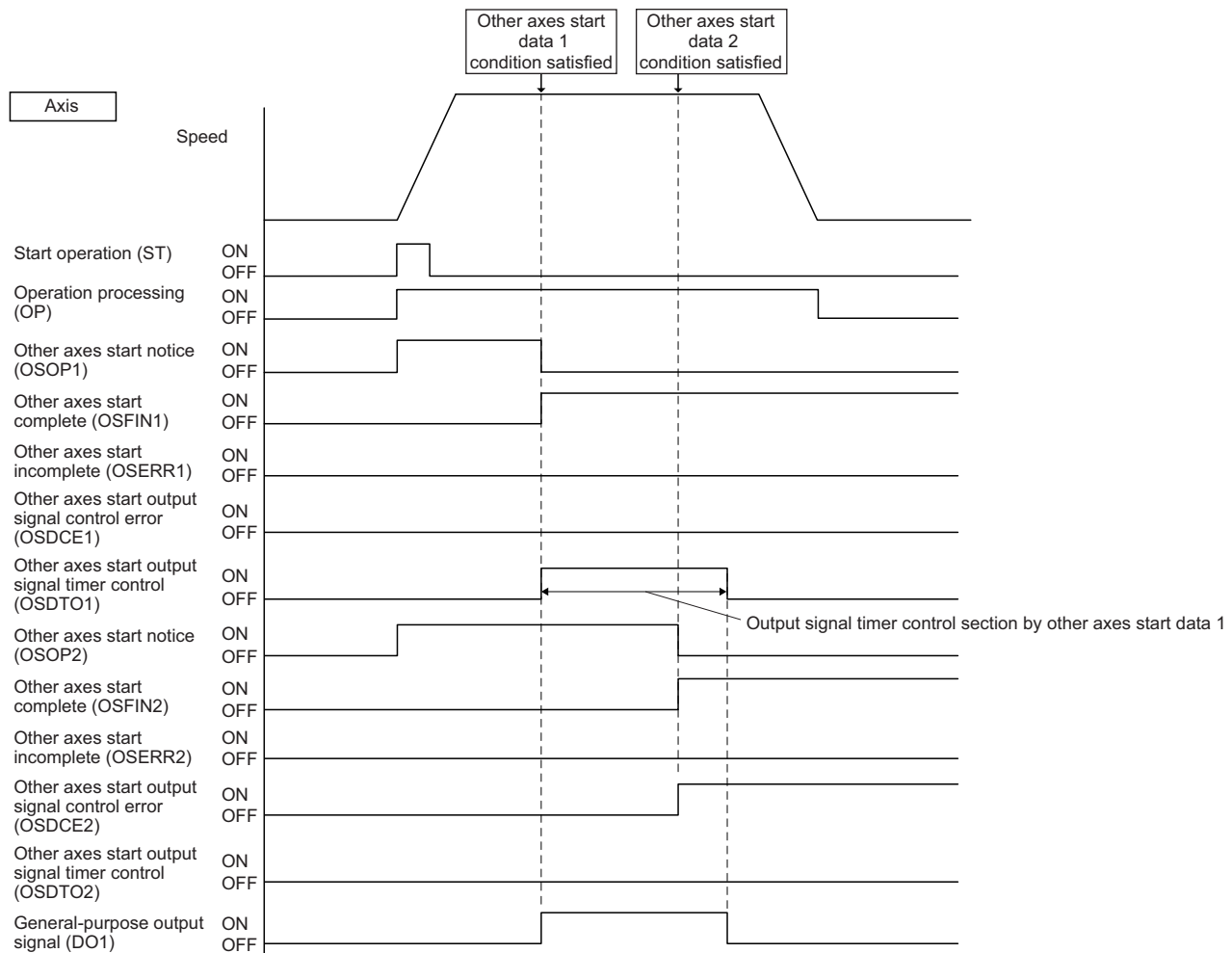
8.20 High Response I/F

The high response I/F function is a function for shortening the time required to confirm commands and statuses by simplifying the process between the Motion control board and the host personal computer. The high response I/F function is always valid. This function simplifies the following processes.

- Start operation signal (ST)
- Interrupt processing stop signal (ITE)

Point

- The conventional I/F function which uses the start operation signal (ST) and the interrupt processing stop signal (ITE) can also be used. However, use either of the high response I/F function or the conventional I/F function to unify the process between the Motion control board and the host personal computer.
- The Motion API uses the high response I/F (except for the JOG operation).

Point

[Motion API]
The high response I/F is implemented by the internal processing of each start operation function (sscAutoStart functions etc.), and thus processing by the user program is unnecessary.

Interface

System data (high speed) (system command bit)

Address (hexadecimal)	Bit	Symbol	Signal name
00000802	0	ITFE	Interrupt processing fast stop
	1	—	For manufacturer setting
	2		
	3		
	4		
	5		
	6		
	7		

System data (high speed) (system status bit)

Address (hexadecimal)	Bit	Symbol	Signal name
00000820	0	ITO	Outputting factor of interrupt
	1	—	For manufacturer setting
	2		
	3	HRIF	Highly response I/F enabled
	4	—	For manufacturer setting
	5	MSIO	MSI enabled
	6	HSMO	High speed operation mode enabled
	7	—	For manufacturer setting

Axis command bit

The addresses in the table are the addresses for the first axis. For the second axis and after, add "+10h" for each axis.

Address (hexadecimal)	Bit	Symbol	Signal name	When in tandem drive
00001006	0	FST	Fast start operation	Master
	1	—	For manufacturer setting	—
	2			
	3			
	4			
	5			
	6			
	7			

Fast start operation

Using the fast start operation signal (FST) as a substitute of the start operation signal (ST) shortens the time required for the second and subsequent start operations.

> **Point**
>
> The fast start operation cannot be used in the JOG operation. Use the start operation signal (ST).

High response start operation using the fast start operation signal (FST)

In the start operation, the host personal computer turns ON the fast start operation signal (FST) as a substitute of the start operation signal (ST). On receiving the fast start operation signal (FST), the Motion control board turns OFF the fast start operation signal (FST), and the operation is started.
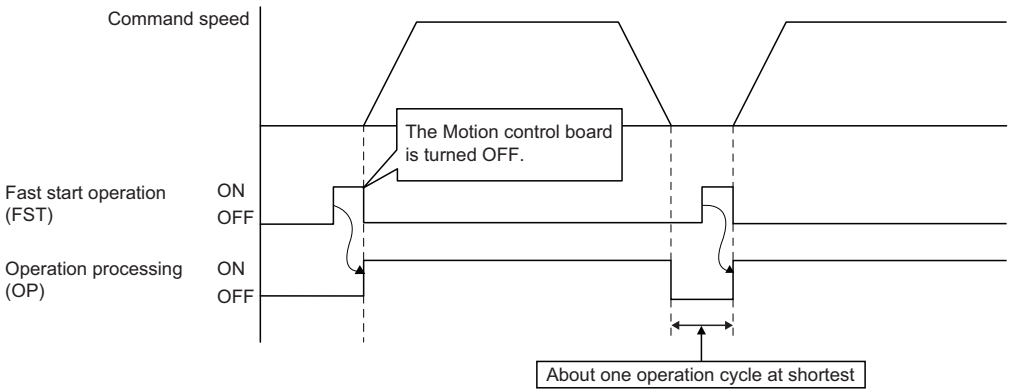
Conventional start operation using the start operation signal (ST)

In the conventional start operation, the next start operation cannot be performed until the start up acceptance completed signal (STO) is turned OFF by turning OFF the start operation signal (ST). Therefore, the start operation signal (ST) must be turned OFF before the next start operation. This procedure, when performed after the operation is completed, delays the start operation by about one operation cycle until the start up acceptance completed signal (STO) is turned OFF. In addition, when the start operation signal (ST) is turned OFF in the operation, the start up acceptance completed signal (STO) is OFF after the operation is completed, which provides the same responsiveness as in the start operation using the fast start operation signal (FST).
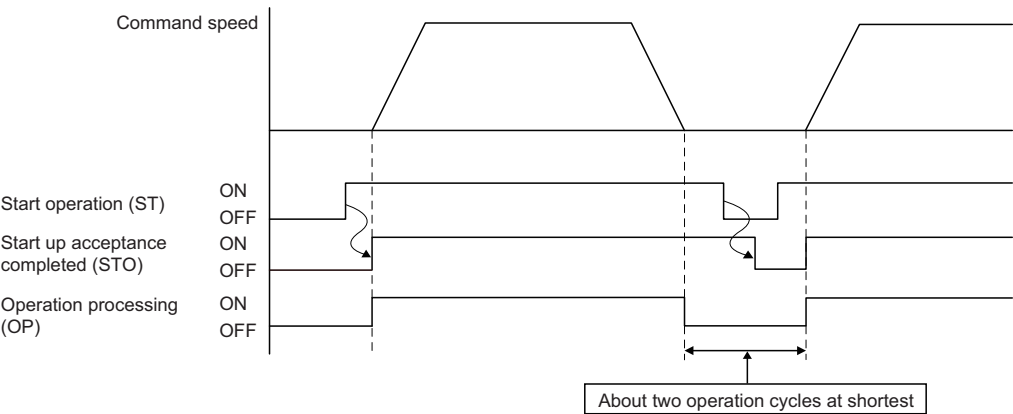
Interrupt processing high speed completion

Using the interrupt processing fast stop signal (ITFE) as a substitute of the interrupt processing stop signal (ITE) shortens the time for the interrupt processing completion.

High response interrupt processing completion using the interrupt processing fast stop signal (ITFE)

For the interrupt processing completion, the host personal computer turns ON the interrupt processing fast stop signal (ITFE) as a substitute of the interrupt processing stop signal (ITE). On receiving the interrupt processing fast stop signal (ITFE), the Motion control board turns OFF the interrupt processing fast stop signal (ITFE), and the interrupt processing is completed. The host personal computer does not need to wait until the outputting factor of interrupt signal (ITO) is turned OFF, and the next operation can be performed.
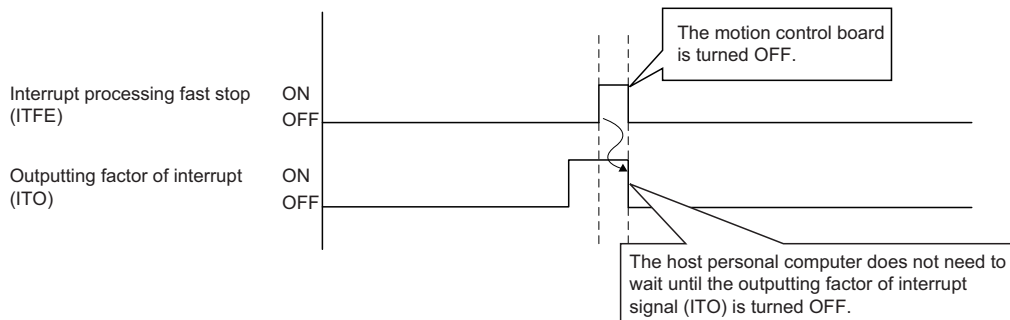
Conventional interrupt processing completion using the interrupt processing stop signal (ITE)

The conventional interrupt processing requires the interrupt processing stop signal (ITE) to be ON, then waiting until the outputting factor of interrupt signal (ITO) is turned OFF, and then the interrupt processing stop signal (ITE) to be OFF. Therefore, the interrupt processing completion is delayed by about one operation cycle until the outputting factor of interrupt signal (ITO) is turned OFF.
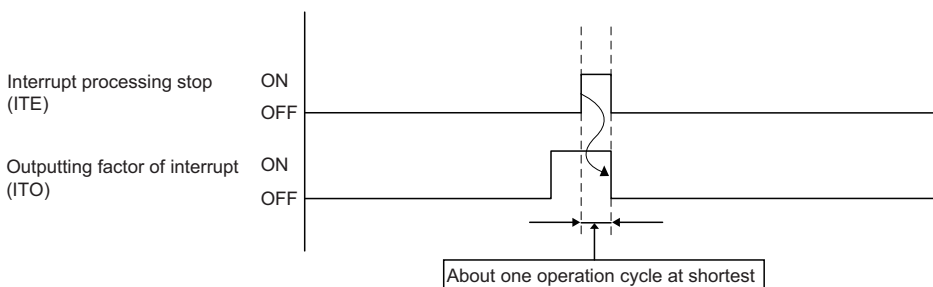
8.21　In-position Signal

For the in-position signal (INP), the Motion control board checks the in-position range and controls turning ON or OFF the signal.
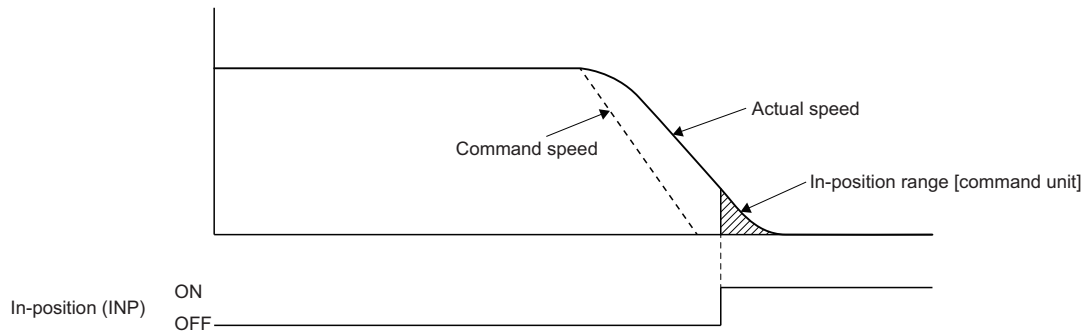
Point

- When using the drive-unit-less axis function, the in-position signal (INP) is turned ON/OFF according to with or without the movement amount F∆T [command unit] per 1 operation cycle.
- Set the appropriate value for "In-position width (parameter No.0232, 0233)" according to the position command unit.
- "In-position width (parameter No.0232, 0233)" can be changed during the system startup.

Point

[Motion API]
To confirm if the in-position signal (INP) is ON/OFF, confirm whether SSC_STSBIT_AX_INP is ON/OFF with the sscGetStatusBitSignalEx function/sscWaitStatusBitSignalEx function.

Interface

Control parameters

Parameter No.	Symbol	Name	Initial value	Units	Setting range	Function	When in tandem drive
0232	INPCL	In-position width (lower)	25600	Command unit	0 to 16777215	Set the in-position width which is judged by the Motion control board.	Each axis
0233	INPCH	In-position width (upper)					

Axis data (high speed) (status bit)

The addresses in the table are the addresses for the first axis. For the second axis and after, add "+10h" for each axis.

■In-position signal

Address (hexadecimal)	Bit	Symbol	Signal name	When in tandem drive
00006000	0	RDY	Servo ready	Each axis
	1	INP	In-position	Each axis
	2	ZSP	Zero speed	Each axis
	3	ZPAS	Passed Z-phase	Each axis
	4	TLC	Torque limit effective	Each axis
	5	SALM	Drive unit alarm	Each axis
	6	SWRN	Drive unit warning	Each axis
	7	ABSE	Absolute position erased	Each axis

■Drive unit in-position signal

Address (hexadecimal)	Bit	Symbol	Signal name	When in tandem drive
00006009	0	—	For manufacturer setting	—
	1	SINP	Drive unit in-position	Each axis
	2	—	For manufacturer setting	—
	3			
	4			
	5			
	6			
	7			

8.22 I/O Device

The I/O device function controls the objects of the motion control station and I/O devices assigned to the link device. The host personal computer can confirm the output of output bit devices and output word devices, and confirm the status of input bit devices and input word devices using the I/O device. The number of I/O signals is as follows.

I/O device name	Link device name		Point	Range
Input device	Input bit device	Remote input (RX)	Up to 16384 points	RX0 to RX3FFF
	Input word device	Remote register (RWr)	Up to 8192 points	RWr0 to RWr1FFF
Output device	Output bit device	Remote output (RY)	Up to 16384 points	RY0 to RY3FFF
	Output word device	Remote register (RWw)	Up to 8192 points	RWw0 to RWw1FFF

⚠ CAUTION

- Before the system startup, make sure to set the initial value which is notified to the device station to the output device. If the initial value is not set, the output device operates with all the status 0 at the system startup.

■For the basic system software version "05" or later

- If the output bit device signal is updated from the host personal computer during controlling of the output bit device signal by the other axes start function, the consistency of the data may not be kept. This condition is applied to the case when the host personal computer and the Motion control board simultaneously perform read/write for the same output bit device area No. In this case, read/write the output bit device signal after controlling the possessory right of the output bit device signal using the exclusive control function.
- For the exclusive control and the possessory right control, refer to the following.
☞ Page 231 Dual Port Memory Exclusive Control

> **Point**
> - For the method of assigning the link device of the remote I/O module, refer to "Connectable device to CC-Link IE TSN" in the following manual.
> 📖 Motion Control Board User's Manual (Network)
> - For numbers/points of the I/O device controlled from the host personal computer, confirm the start offset/points of the link device set by the Cyclic Settings of the Setting Network Parameter.
> - The refresh cycle of the I/O device is the operation cycle.
> - Update the I/O device of the axis after the controlling axis information 1 or the controlling axis information 2 is controllable. Update the I/O device other than the axis (such as a remote I/O unit) after 'Data link status of each station' (SW00B0 to SW00B7) becomes the data link normally operating station.

> **Point**
> [Motion API]
> - To get the input bit device, use the sscGetInputDeviceBit function.
> - To get the input word device, use the sscGetInputDeviceWord function/sscGetInputDeviceDword function.
> - To set the output bit device (with exclusive control) use the sscSetOutputDeviceBit function.
> - To set the output bit device (without exclusive control) use the sscSetOutputDeviceBitNonExclusively function.
> - To set the output word device (with exclusive control) use the sscChangeOutputDeviceWord function/sscChangeOutputDeviceDword function.
> - To set the output word device (without exclusive control) use the sscSetOutputDeviceWord function/sscSetOutputDeviceDword function.
> - To set the output word device, use the sscSetOutputDeviceWord function/sscSetOutputDeviceDword function.
> - To get the output bit device, use the sscGetOutputDeviceBit function.
> - To get the output word device, use the sscGetOutputDeviceWord function/sscGetOutputDeviceDword function.

Input bit device (remote input (RX))

Address (hexadecimal)	Input bit device No.	Symbol	Remarks
001F7000, 001F7001	Input bit device 0 to input bit device F	RX0 to RXF	Notify the status of the bit device input signal. The bits are RX0 (bit0) to RXF (bit15).
⋮	⋮	⋮	⋮
001F77FE 001F77FF	Input bit device 3FF0 to input bit device 3FFF	RX3FF0 to RX3FFF	Notify the status of the bit device input signal. The bits are RX3FF0 (bit0) to RX3FFF (bit15).

For the list of the input bit device (remote input (RX)), refer to the following.

Output bit device (remote output (RY))

Address (hexadecimal)	Output bit device No.	Symbol	Remarks
001F7800, 001F7801	Output bit device 0 to output bit device F	RY0 to RYF	Turn ON/OFF the bit device output signal. The bits are RY0 (bit0) to RYF (bit15).
⋮	⋮	⋮	⋮
001F7FFE 001F7FFF	Output bit device 3FF0 to output bit device 3FFF	RY3FF0 to RY3FFF	Turn ON/OFF the bit device output signal. The bits are RY3FF0 (bit0) to RY3FFF (bit15).

For the list of the output bit device (remote output (RY)), refer to the following.

Output word device (remote register (RWw))

Address (hexadecimal)	Output word device No.	Symbol	Remarks
001F8000, 001F8001	Output word device 0	RWw0	Turn ON/OFF the word device output signal.
⋮	⋮	⋮	
001FBFFE 001FBFFF	Output word device 1FFF	RWw1FFF	

For the list of the output word device (remote register (RWw)), refer to the following.

Input word device (remote register (RWr))

Address (hexadecimal)	Input word device No.	Symbol	Remarks
001FC000, 001FC001	Input word device 0	RWr0	Notify the status of the word device input signal.
⋮	⋮	⋮	
001FFFFE 001FFFFF	Input word device 1FFF	RWr1FFF	

For the list of the input word device (remote register (RWr)), refer to the following.

8.23 Dual Port Memory Exclusive Control

The dual port memory exclusive control function is a function that keeps the consistency of the memory data by temporarily limiting the Motion control board and user program to read/write data to the limited area of the dual port memory. The output signals in this section refer to output device signals. The target output signal is selected in the link device.

Exclusive control of output signals

If the output signal is updated from the user program during controlling of the output signal by the other axes start function, the consistency of the data may not be kept. Read/write the output signal using the exclusive control function after controlling the possessory right of the output signal.

> **Point**
> - The dual port memory exclusive control is supported in the basic system software version "05" or later.
> - For the other axes start, refer to the following.
>   ☞ Page 199 Other Axes Start

> **Point**
> [Motion API]
> In the system in which the output signal is controlled by the other axes start, to control the output device also by the user program, use the following functions. The exclusive control of the output device is performed within the functions.
> - sscSetOutputDeviceBit function
> - sscChangeOutputDeviceWord function
> - sscChangeOutputDeviceDword function

Interface

Address (hexadecimal)	Description	Detail[1]	User program data writing
0008C800	Request for output signal occupation by host	• 0: No request • 1: Request	○
0008C801			
0008C802	Requesting output signal occupation by motion control board[2]	• 0: No request • 1: Request	×
0008C803			
0008C804	Selection for output signal occupation	• 0: Motion control board • 1: User program	○
0008C805			
0008C806	For manufacturer setting	—	—

[1] When the data out of the range is written, "Exclusive Control Error (system status code error: E503H)" occurs, which stops the import of the output signal and the control of the output signal by the other axes start function.

[2] This is the area where the data can be written only from the Motion control board. When the data is written from the user program to this area, misjudgment may occur in the check for occupation permission, and the status unintentionally becomes permitted/not permitted.

> **Point**
> The output signal control continues after the dual port memory exclusive control error occurs. Shut off the output signal as necessary.

Exclusive control procedure on host personal computer side

The following shows the procedure to control the output signal exclusively.

■Exclusive control procedure
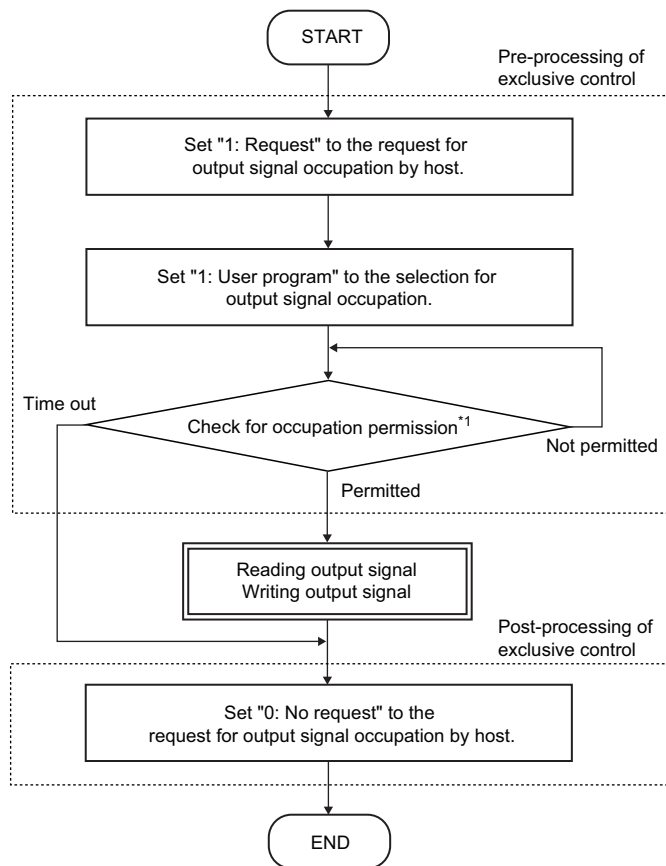
*1 Condition for occupation permission:
    When the during output signal board occupy request is "0: No request" or the output signal occupy selection is "0: Motion control board"
    Condition for occupy non-permission:
    When the during output signal board occupy request is "1: Request" and the output signal occupy selection is "1: User program"

■Condition for occupation permission of output signal

Request for output signal occupation by host	Requesting output signal occupation by motion control board	Selection for output signal occupation	Occupy status of output signal	Occupy permitted/not permitted
0	0	0	No occupy.	No occupy request from user program.
0	0	1		
0	1	0	Occupied by Motion control board.	
0	1	1		
1	0	0	Occupied by user program.	Occupy permitted.
1	0	1		
1	1	0	Occupied by user program. (Waiting for permission from Motion control board)	
1	1	1	Occupied by Motion control board. (Waiting for permission from user program)	Occupy not permitted.

Restrictions

At the timing when the Motion control board accesses the output signal, if the possessory right is not shifted to the Motion control board even after the timing[1] to obtain the possessory right elapses, the other axes start output signal control delay signal (OSDDL□) of the other axes start command/status table turns ON. The access to the output signal is canceled, and the access to the output signal is put on hold until the next operation cycle.

If the other axes start output signal control delay signal (OSDDL□) turns ON, high load on the user program may be the cause. Review the program to lessen the load on the user program.

  [1]   The time to obtain the possessory right is as follows.
         - When the operation cycle is 62.50μs: 1.25μs
         - When the operation cycle is 125.00μs: 2.50μs
         - When the operation cycle is 250.00μs: 5.00μs
         - When the operation cycle is 500.00μs: 5.00μs
         - When the operation cycle is 1000.00μs: 5.00μs
         - When the operation cycle is 2000.00μs: 5.00μs

8.24 Pass Position Interrupt

The pass position interrupt function is a function that outputs an interrupt when the pass position condition set in the interrupt table is satisfied. Up to 128 pass position conditions can be specified (total for all 128 axes) per operation.

To use this function, set the pass position interrupt valid to the auxiliary command of the point table. The pass position condition of the corresponding No. is imported and the pass position is judged. "Pass position interrupt condition judgement method" of "System option 5 (parameter No.004C)" allows for selecting whether to judge each condition from the pass position condition start No. or to judge all conditions in one batch. When the pass position condition is satisfied, the factor of an interrupt corresponding to the pass position condition No. is output. When judging each condition is selected, the next pass position condition is imported and judged in addition.

The judgement of the pass position condition varies depending on the cancel condition of the pass position option. If the cancel condition is set to "0: In-position signal (INP) is ON", the pass position condition is judged until the in-position signal (INP) turns ON. If the cancel condition is set to "1: No cancel", the pass position condition is judged until the pass position interrupt cancel signal (PPISTP) turns ON.

The pass position condition is judged until the in-position signal (INP) turns ON. To output the interrupt, set the pass position interrupt to "System interrupt conditions (system parameter No.0004)" and turn ON the interrupt output start signal (ITS).

> **Point**
>
> - This function can be used only in the automatic operation and the interpolation operation. For the interpolation operation, the pass position condition can be set per axis.
> - During the pass position interrupt, the pass position interrupt condition Nos. from the start to the end are in use. When the pass position condition is in use in other axes, "Pass Position Interrupt Error (operation alarm No.005CH, detail No.0005H)" occurs and the start operation is stopped.
> - When the operation is started again or the servo is turned OFF before all the interrupts by the pass position interrupt are output, "Pass Position Interrupt Error (operation alarm No.005CH, detail No.0006H)" occurs and the pass position interrupt is stopped.
> - When an operation alarm occurs during the pass position interrupt, even if the cancel condition of the pass position option is "1: No cancel", the pass position interrupt is canceled.
> - In the synchronous mode of the tandem drive, only the setting of the master axis is valid and this function outputs the interrupt based on the operation of the master axis.
> - When using the pass position interrupt function in the operation cycle 62.50µs, use the high speed operation mode.

Pass position interrupt setting method

The pass position interrupt setting procedure is as follows.

Operating procedure

1. Set the pass position conditions.

2. Validate the pass position interrupt specifications of the point data.

3. Set the pass position condition start No. and end No.

4. Start the automatic operation or the interpolation operation.

5. Wait until the conditions of the pass position interrupt are fulfilled.

> **Point**
>
> [Motion API]
> - To set the pass position interrupt in 1. above, use the sscSetIntPassPositionData function.
> - To set the point table in 2. above, use the sscSetPointDataEx function.
> - To set the pass position condition start No. and end No. in 3. above, use the sscSetStartingPassNumber function.
> - To start the automatic operation in 4. above, use the sscAutoStart function/sscInterpolationStart function.
> - To wait for the pass position interrupt in 5. above, use the sscWaitIntPassPosition function.

8

Interface

Pass position interrupt table

The pass position condition (the pass position option and the pass position data) is set to the pass position interrupt table. If "Pass position interrupt condition judgement method" of "System option 5 (parameter No.004C)" is set to "0: Judge each condition from the pass position condition start No.", the pass position condition is imported when the corresponding pass position condition No. is started to be judged. If "Pass position interrupt condition judgement method" of "System option 5 (parameter No.004C)" is set to "1: Judge all conditions in one batch", all conditions corresponding to the pass position condition start No./end No. are imported.

For the list of the pass position interrupt condition, refer to the following.

☞ Page 537 Pass Position Interrupt Condition

> **Point**
> • When the pass position condition setting is incorrect, "Pass Position Interrupt Error (operation alarm No.005CH, detail No.0004H)" occurs and the operation is stopped.
> • When "Pass position interrupt condition judgement method" of "System option 5 (parameter No.004C)" is set to "1: Judge all conditions in one batch", the operation cycle over may occur. To avoid the operation cycle over, review the number of settings, or set "Pass position interrupt condition judgement method" of "System option 5 (parameter No.004C)" to "0: "Judge each condition from the pass position condition start No." and review the order of the pass position conditions.

> **Point**
> [Motion API]
> To set/get the pass position interrupt data, use the sscSetIntPassPositionData function/ sscCheckIntPassPositionData function.

■ Pass position option

The addresses in the table are the addresses for the pass position condition 1. For the pass position condition 2 and after, add "+8h" for each pass position condition.

Address (hexadecimal)	Name	Initial value	Units	Setting range	Description
00066200 00066201 00066202 00066203	Pass position option	00000000h	—	00000000h to 00001011h	■■■■■■□ (Pass direction) Set the pass direction for the pass position data. • 0: + direction pass position interrupt output • 1: - direction pass position interrupt output ■■■■■□■ (Judgment condition) Set the judgment condition for the pass position data.[1] • 0: Current command position • 1: Current feedback position ■■■□■■■ (Cancel condition) Set the cancel condition for the judgement of the pass position condition.[2] • 0: In-position signal (INP) is ON Cancel the judgement of the pass position condition by turning ON the in-position signal (INP) after the operation is completed. • 1: No cancel The judgement of the pass position condition is not canceled automatically. If the judgement of the pass position condition is canceled, turn ON the pass position interrupt cancel signal (PPISTP).

*1 Only the setting for the pass position condition start No. is valid.
*2 When using the batch judgement, only the setting for the pass position condition start No. is valid.

> **Point**
> When a judgment condition other than the start No. is within the setting range, a setting error does not occur.

■ Pass position data

The addresses in the table are the addresses for the pass position condition 1. For the pass position condition 2 and after, add "+8h" for each pass position condition.

Address (hexadecimal)	Name	Initial value	Units	Setting range	Description
00066204 00066205 00066206 00066207	Pass position data	0	Command unit	-2147483648 to 2147483647	Set the pass position data at the pass position interrupt output.

Point

- The batch judgement function of the pass position interrupt is supported in the basic system software version "05" or later.
- When "Pass position interrupt condition judgement method" of "System option 5 (parameter No.004C)" is set to "0: Judge each condition from the pass position condition start No.", set the pass position condition in passing order since the pass position conditions are judged one by one in ascending order of the pass position condition No. When "Pass position interrupt condition judgement method" of "System option 5 (parameter No.004C)" is set to "1: Judge all conditions in one batch", the conditions are judged in no particular order.
- The interrupt is output only once for each pass position condition.
- When a passed position is the pass position condition, the interrupt is not output until the position is passed again.
- Ensure one operation cycle or longer between two pass position conditions.
- Only the judgment condition for the pass position condition start No. is valid only for the pass position option. The judgment condition is used for each pass position data as the common setting. (The judgment condition cannot be set individually for each pass position condition.)
- When the current feedback position is selected as the judgment condition for the pass position data, do not set the pass position data within the in-position range. The pass position interrupt may not be output since the pass position judgment ends when the in-position signal (INP) turns ON.
- The no cancel function of the cancel condition of the pass position interrupt is supported in the basic system software version "05" or later.
- When the pass position interrupt is output within the in-position range, set "1: No cancel" to the cancel condition of the pass position option. The pass position interrupt may not be output if "0: In-position signal (INP) is ON" is set to the cancel condition.
- The setting of "1: No cancel" to the cancel condition of the pass position option is invalid only when the in-position signal (INP) is ON after the operation is completed. The pass position interrupt is canceled when the operation is canceled due to an operation alarm, servo alarm, or operation stop command while the operating pass position interrupt signal (PPIOP) is ON, or when the pass position interrupt cancel signal (PPISTP) is turned ON while the pass position interrupt is performed (the operating pass position interrupt signal (PPIOP) is ON).
- When doe to the cancel condition of the pass position option set to "1: No cancel", the operation is started or the servo is OFF while the pass position interrupt is performed, "Pass Position Interrupt Error (operation alarm No.005CH, detail No.0006H)" occurs, and the judgement of the pass position interrupt is canceled.
- When the cancel condition of the pass position option is "1: No cancel", because only the master axis during the pass position interrupt is valid for the tandem drive slave axis, even when the operation is started in the non-synchronous micro adjustment mode, the pass position interrupt does not become incomplete.
- When using the batch judgement function and the no cancel function of the cancel condition at the same time, set the pass position condition start No. to "1: No cancel" of the cancel condition. Even if a pass position option other than the pass position condition start No. is set to "1: No cancel", the pass position interrupt is not output within the in-position range.

8

Point table

To use the pass position interrupt, set "1: Pass position interrupt valid" of the pass position interrupt specification (bit8) to the auxiliary command of the point table.

 • Auxiliary command (☞ Page 92 Auxiliary command)

For details about the point table, refer to the following.

☞ Page 90 Point table

> **Point**
>
> This setting is valid in the point data of the start point No. only. If it is set in the point data after the start point No., "Point Table Setting Error (operation alarm No.0025H, detail No.000CH)" occurs and the operation is stopped.

> **Point**
>
> [Motion API]
> To set/get the point data, use the sscSetPointDataEx function/sscCheckPointDataEx function.

System data (high speed) (system status bit)

Address (hexadecimal)	Bit	Symbol	Signal name
00000821	0	EMIO	Being executed forced stop
	1	—	For manufacturer setting
	2		
	3	PPIAL	Batch judgment of passing position interrupt condition
	4	SEO	System error detected
	5	—	For manufacturer setting
	6	EMID	External forced stop disabled
	7	—	For manufacturer setting

■Details on system status bit

Symbol	Signal name	Function details		
		Function	Operation	
			Conditions for turning ON	Conditions for turning OFF
PPIAL	Batch judgment of passing position interrupt condition	Notify that the pass position interrupt condition judgement method is set to the batch judgement.	The pass position interrupt condition judgement method was set to the batch judgement.	The pass position interrupt condition judgement method was set to a judgement other than the batch judgement.

Axis data (high speed) (command data/status data)

The pass position is judged according to the pass position condition specified in the start No. and the end No. of the pass position condition.

■Command data

The addresses in the table are the addresses for the first axis. For the second axis and after, add "+40h" for each axis. When using only one pass position condition, set the same No. for the start No. and the end No.

Address (hexadecimal)	Name	Setting range	Description	When in tandem drive
00002014	Pass position condition start No.	1 to 128	Set the start No. of the pass position condition for the pass position interrupt.	Master
00002015				
00002016	Pass position condition end No.	1 to 128	Set the end No. for the pass position condition for the pass position interrupt	Master
00002017				

Point

- When the pass position condition used in other axis is imported, "Pass Position Interrupt Error (operation alarm No.005CH, detail No.0005H)" occurs and the operation is stopped. Do not use the same pass position condition No. for multiple axes.
- When the pass position condition start No. is out of range, "Pass Position Interrupt Error (operation alarm No.005CH, detail No.0001H)" occurs and the operation is stopped.
- When the pass position condition end No. is out of range, "Pass Position Interrupt Error (operation alarm No.005CH, detail No.0002H)" occurs and the operation is stopped.
- When the pass position condition start No. is smaller than the pass position condition end No., "Pass Position Interrupt Error (operation alarm No.005CH, detail No.0003H)" occurs and the operation is stopped.

Point

[Motion API]

To set the pass condition start and end Nos., use the sscSetStartingPassNumber function.

■Status data

The addresses in the table are the addresses for the first axis. For the second axis and after, add "+40h" for each axis.

Address (hexadecimal)	Name	Output limits	Description	When in tandem drive
00007014	Executing pass position condition No.	0 to 256	When "Pass position interrupt condition judgement method" of "System option 5 (parameter No.004C)" is set to "0: Judge each condition from the pass position condition start No.", the running pass position condition No. is output. After the pass position condition completion, the last pass position condition No. is output. When "Pass position interrupt condition judgement method" of "System option 5 (parameter No.004C)" is set to "1: Judge all conditions in one batch", 0 is always output. When the pass position interrupt processing is canceled due to the pass position condition setting error, an operation alarm, or other factors, the pass position condition No. where an error occurs is output. When the operation is started with the pass position interrupt invalid, "0" is output.	Master
00007015				

Axis data (high speed) (command bit/status bit)

The axis command bit and the status bit related to the pass position interrupt function are shown below.

■Command bit

The addresses in the table are the addresses for the first axis. For the second axis and after, add "+10h" for each axis.

Address (hexadecimal)	Bit	Symbol	Signal name	When in tandem drive
00001007	0	PPISTP	Pass position interrupt cancel	Master
	1	—	For manufacturer setting	—
	2			
	3			
	4			
	5			
	6			
	7			

• Details on command bit

Symbol	Signal name	Function details	
		Function	Operation
PPISTP	Pass position interrupt cancel	Cancel the pass position interrupt.	Turn ON this signal to cancel the pass position interrupt when the operating pass position interrupt signal (PPIOP) is ON.

Point

[Motion API]

To turn the pass position interrupt cancel signal (PPISTP) ON/OFF, set "SSC_CMDBIT_AX_PPISTP" to the command bit No. of the sscSetCommandBitSignalEx function.

■Status bit

The addresses in the table are the addresses for the first axis. For the second axis and after, add "+10h" for each axis.

Address (hexadecimal)	Bit	Symbol	Signal name	When in tandem drive
00006007	0	PPIOP	Operating pass position interrupt	Master
	1	PPIFIN	Pass position interrupt completed	Master
	2	PPIERR	Pass position interrupt incompleted	Master
	3	—	For manufacturer setting	—
	4			
	5			
	6			
	7	AUTLO	In point table loop	Master

• Details on status bit

Symbol	Signal name	Function details		
		Function	Operation	
			Conditions for turning ON	Conditions for turning OFF
PPIOP	Operating pass position interrupt	Notify that the pass position interrupt is being performed.	The start and end No. of the pass position interrupt are specified and the pass position interrupt is performed.	The pass position interrupt completed signal (PPIFIN) is turned ON or the pass position interrupt incompleted signal (PPIERR) is turned ON.
PPIFIN	Pass position interrupt completed	Notify that the pass position interrupt is completed.	All interrupt outputs are completed in the pass position interrupt.	The start and end No. of the pass position interrupt are specified and the pass position interrupt is performed.
PPIERR	Pass position interrupt incompleted	Notify that the pass position interrupt is canceled.	• The operation is canceled due to an operation alarm, drive unit alarm, or an operation stop command while the operating pass position interrupt signal (PPIOP) is ON. • When the cancel condition of the pass position option is "1: No cancel", the operation is started again or the servo is turned OFF. • Not all pass position interrupt outputs are completed even when the in-position signal (INP) is turned ON after the operation completion while the cancel condition of the pass position option is "0: In-position signal (INP) is ON" and the operating pass position interrupt signal (PPIOP) is ON. • The pass position interrupt cancel signal (PPISTP) is turned ON while the operating pass position interrupt signal (PPIOP) is ON.	The start and end No. of the pass position interrupt are specified and the pass position interrupt is performed.

Point💡

[Motion API]

To confirm if the following pass position interrupt statuses are ON/OFF, set the following to the status bit No. with the sscGetStatusBitSignalEx function/sscWaitStatusBitSignalEx function.
• Operating pass position interrupt signal (PPIOP): SSC_STSBIT_AX_PPIOP
• Pass position interrupt completed signal (PPIFIN): SSC_STSBIT_AX_PPIFIN
• Pass position interrupt incompleted signal (PPIERR): SSC_STSBIT_AX_PPIERR

Interrupt conditions (system parameters)

Set the values that designate ON for the bits that correspond to the factor of pass position interrupt outputting to the system parameter "System interrupt conditions (parameter No.0004)" to validate the interrupt output of the pass position interrupt.

■System interrupt conditions (Parameter No.0004)

Bit	Symbol	Signal name
0	SYSE	During system status code error
1	CALM	During system alarm
2	EMIO	During forced stop
3	SEO	During system error
4	—	For manufacturer setting
5		
6		
7		
8	OASF	Factor of other axes start interrupt is being sent
9	PPI	Factor of pass position interrupt is being sent
10	—	For manufacturer setting
11		
12		
13		
14		
15		

> **Point**
>
> [Motion API]
>
> To set/get the interrupt conditions, use the sscChange2Parameter function/sscCheck2Parameter function.

Pass position interrupt condition judgement method (system parameter)

Set "Pass position interrupt condition judgement method" to "System option 5 (parameter No.004C)".

Parameter No.	Symbol[*1]	Name	Initial value	Units	Setting range	Description
004C	*SYSOP5	System option 5	0000h	—	0000h to 0011h	■■□■ (Pass position interrupt condition judgement method) Specify the pass position interrupt condition judgement method. • 0: Judge each condition from the pass position condition start No. • 1: Judge all conditions in one batch

*1 The settings for the parameters with a * mark at the front of the symbol become valid when the system is started.

Factor of interrupt

Point

[Motion API]

To reset/set/wait of the pass position interrupt events, use the sscResetIntPassPosition function/ sscSetIntPassPosition/sscWaitIntPassPosition function.

■Details on factor of system interrupt

When the pass position data is passed, the factor of pass position interrupt is being sent (interrupt) signal (iPPI) of the details on factor of system interrupt is turned ON.

Address (hexadecimal)	Bit[*1]	Symbol	Signal name
00061080, 00061081	0	iSYSE	During system status code error (interrupt)
	1	iCALM	During system alarm (interrupt)
	2	iEMIO	During forced stop (interrupt)
	3	iSEO	During system error
	4	—	For manufacturer setting
	5		
	6		
	7		
	8	iOASF	Factor of other axes start interrupt is being sent (interrupt)
	9	iPPI	Factor of pass position interrupt is being sent (interrupt)
	10	—	For manufacturer setting
	11		
	12		
	13		
	14		
	15		

*1 OFF: No factor of interrupt exists.
   ON: A factor of interrupt exists.

■Factor of pass position interrupt

When the factor of pass position interrupt is being sent (interrupt) signal (iPPI) is ON, a bit corresponding to the pass position condition No. of the factor of pass position interrupt turns ON.

For details about the factor of the pass position interrupt 1 to 4, refer to the following.

Address (hexadecimal)	Description	Reference
00061400 to 00061403	Factor of pass position interrupt 1 (condition 1 to 32)	Page 519 Factor of pass position interrupt 1
00061404 to 00061407	Factor of pass position interrupt 2 (condition 33 to 64)	Page 520 Factor of pass position interrupt 2
00061408 to 0006140B	Factor of pass position interrupt 3 (condition 65 to 96)	Page 521 Factor of pass position interrupt 3
0006140C to 0006140F	Factor of pass position interrupt 4 (condition 97 to 128)	Page 522 Factor of pass position interrupt 4

■Details on factor of pass position interrupt

When the outputting with factor of pass position interrupt □ signal (iPPI□) is ON, the factor of pass position status bit corresponding to the pass position condition No. turns ON.

For details about the factor of the pass position interrupt 1 to 4, refer to the following.

Address (hexadecimal)	Description	Reference
00061440 to 0006145F	Details on factor of pass position interrupt 1 (condition 1 to 32)	Page 523 Details on factor of pass position interrupt 1
00061460 to 0006147F	Details on factor of pass position interrupt 2 (condition 33 to 64)	Page 524 Details on factor of pass position interrupt 2
00061480 to 0006149F	Details on factor of pass position interrupt 3 (condition 65 to 96)	Page 525 Details on factor of pass position interrupt 3
000614A0 to 000614BF	Details on factor of pass position interrupt 4 (condition 97 to 128)	Page 526 Details on factor of pass position interrupt 4

• Details on factor of pass position interrupt □

The addresses in the table are the addresses for the first axis. For the second axis and after, add "1h" for each axis.

Address (hexadecimal)	Bit	Symbol[1]	Signal name[1]
00061440	0	iPPIF□	Pass position interrupt complete □ (interrupt)
	1	iPPIE□	Pass position interrupt incomplete □ (interrupt)
	2	—	For manufacturer setting
	3		
	4		
	5		
	6		
	7		

[1] □: Pass position condition No. (1 to 128)

Operation example

When the pass position interrupt is complete

The operating pass position interrupt signal (PPIOP) turns ON between the operation start and the completion of all pass position interrupt outputs. When the pass position condition is satisfied, the factor of interrupt of "pass position interrupt complete □" (□ : pass position condition No.) turns ON and the interrupts are output. The operating pass position interrupt signal (PPIOP) turns OFF and the pass position interrupt completed signal (PPIFIN) turns ON when all of pass position interrupts are output.
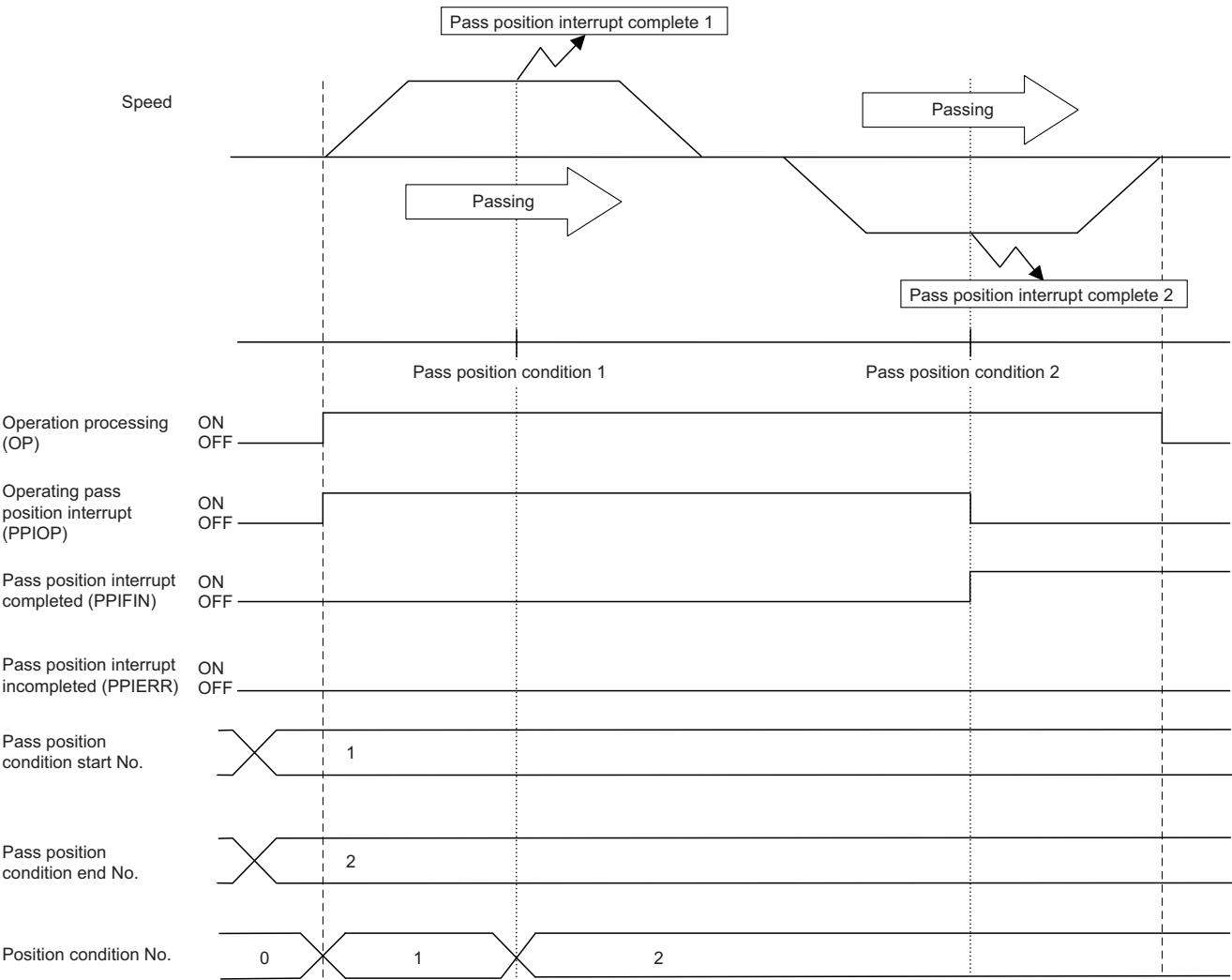
When the pass position interrupt fails

When the operation is canceled due to an operation alarm preceding the satisfaction of the pass position condition, the pass position interrupt incompleted signal (PPIERR) turns ON. The pass position interrupt incompleted signal (PPIERR) turns ON under the following conditions. At this time, the factor of the interrupt of "pass position interrupt error condition □" (□ : pass position condition No.) turns ON to the running and unexecuted pass position interrupt conditions and the interrupt is output.

 • The setting of the pass position condition is incorrect.
 • The operation is canceled by turning ON the stop operation signal (STP) or the rapid stop signal (RSTP) before the pass position condition is satisfied.
 • The operation is canceled by an operation alarm, etc. before the pass position condition is satisfied.
 • The operation is completed and the in-position signal is turned ON before the pass position condition is satisfied.

■**Example of when an operation alarm occurs**
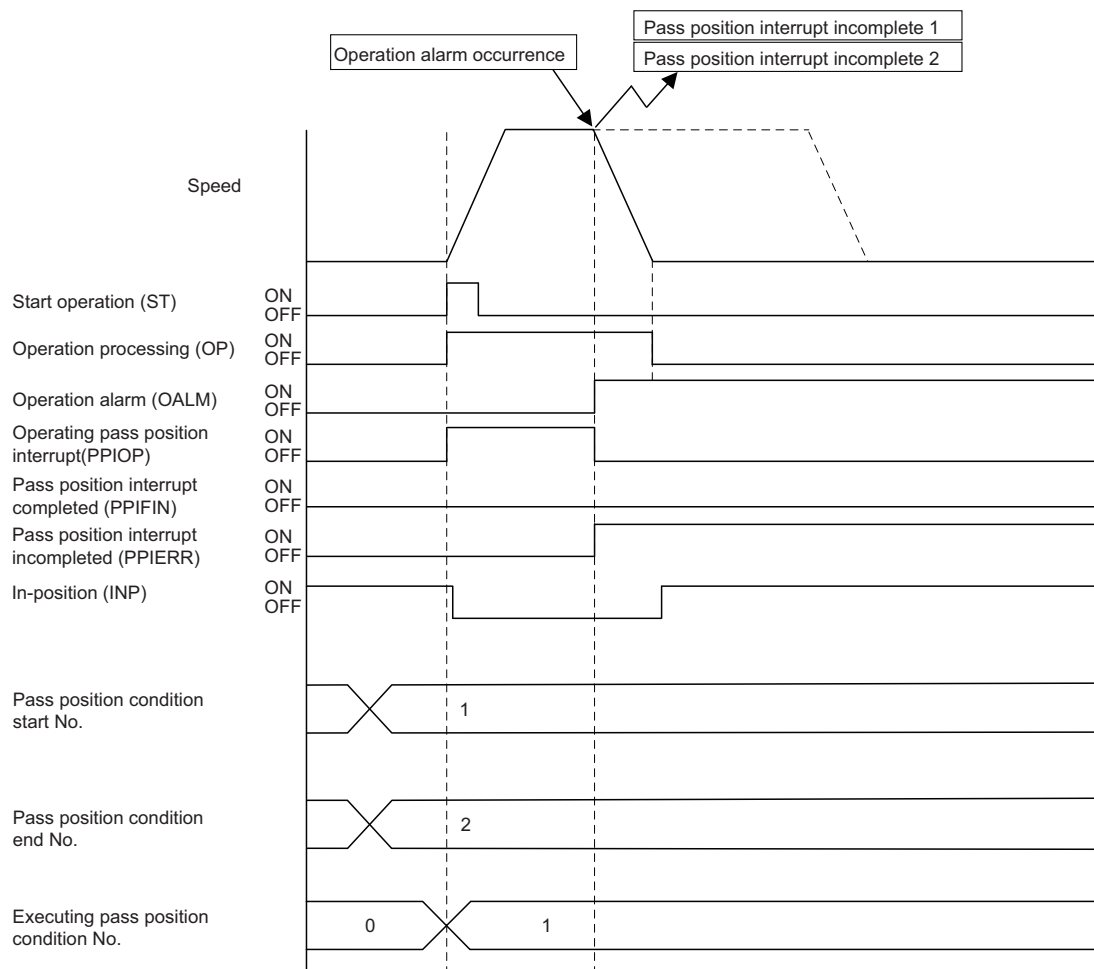
■Example of when operation is completed
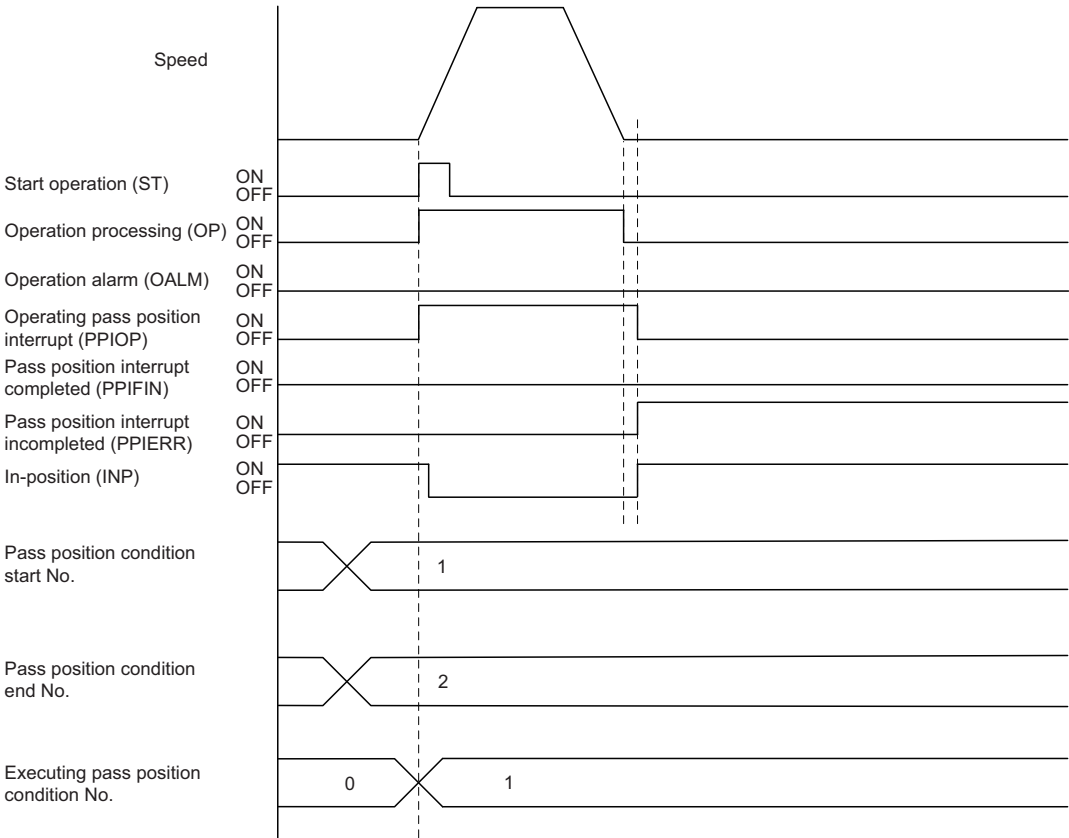
When the pass position interrupt is canceled

When the pass position interrupt cancel signal (PPISTP) is turned ON preceding the satisfaction of the pass position condition, the pass position interrupt incompleted signal (PPIERR) turns ON. At this time, the factor of the interrupt of "pass position interrupt error condition □" (□ : pass position condition No.) turns ON to the running and unexecuted pass position interrupt conditions and the interrupt is output.

■Example of when the pass position interrupt is canceled
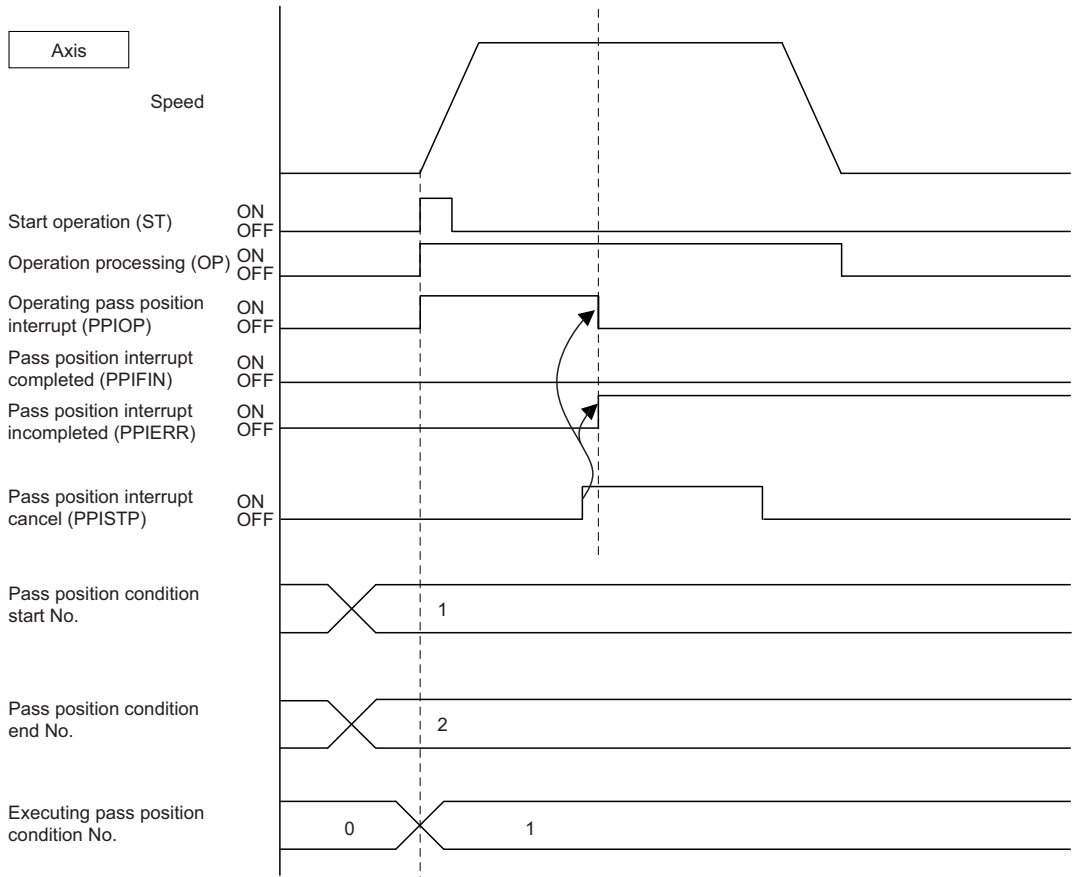
> **Point**
>
> When the operation is started with the pass position specification of the point table and the auxiliary command valid while the pass position interrupt cancel signal (PPISTP) is ON, "Pass Position Interrupt Error (operation alarm No.005CH, detail No.0007H)" occurs and the start operation is canceled. At this time, the pass position interrupt incompleted signal (PPIERR) turns ON.

When "Pass position interrupt condition judgement method" is set to "1: Judge all conditions in one batch"

When "Pass position interrupt condition judgement method" of "System option 5 (parameter No.004C)" is set to "1: Judge all conditions in one batch", the set conditions are judged in no particular order.

■**When the pass position interrupt condition is set to pass in the order of pass position interrupt conditions 2, 1**
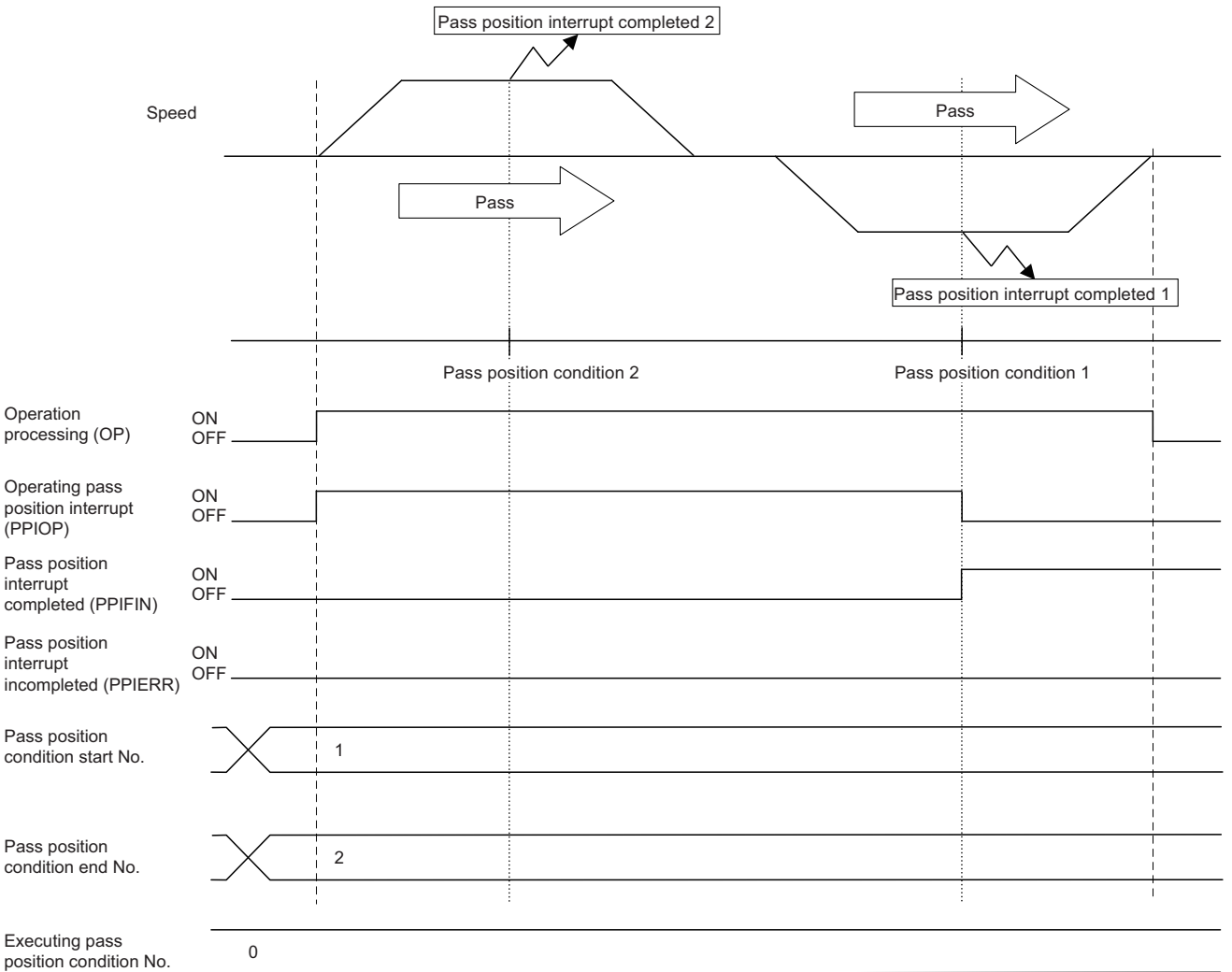
When cancel condition of the pass position interrupt option is set to "1: No cancel"

The operating pass position interrupt signal (PPIOP) turns ON between the operation start and the completion of all pass position interrupt outputs. When the cancel condition of the pass position interrupt option is set to "1: No cancel", the pass position condition is judged until the pass position interrupt cancel signal (PPISTP) turns ON.

■When the pass position interrupt cancel is turned ON without satisfying the pass position condition 2
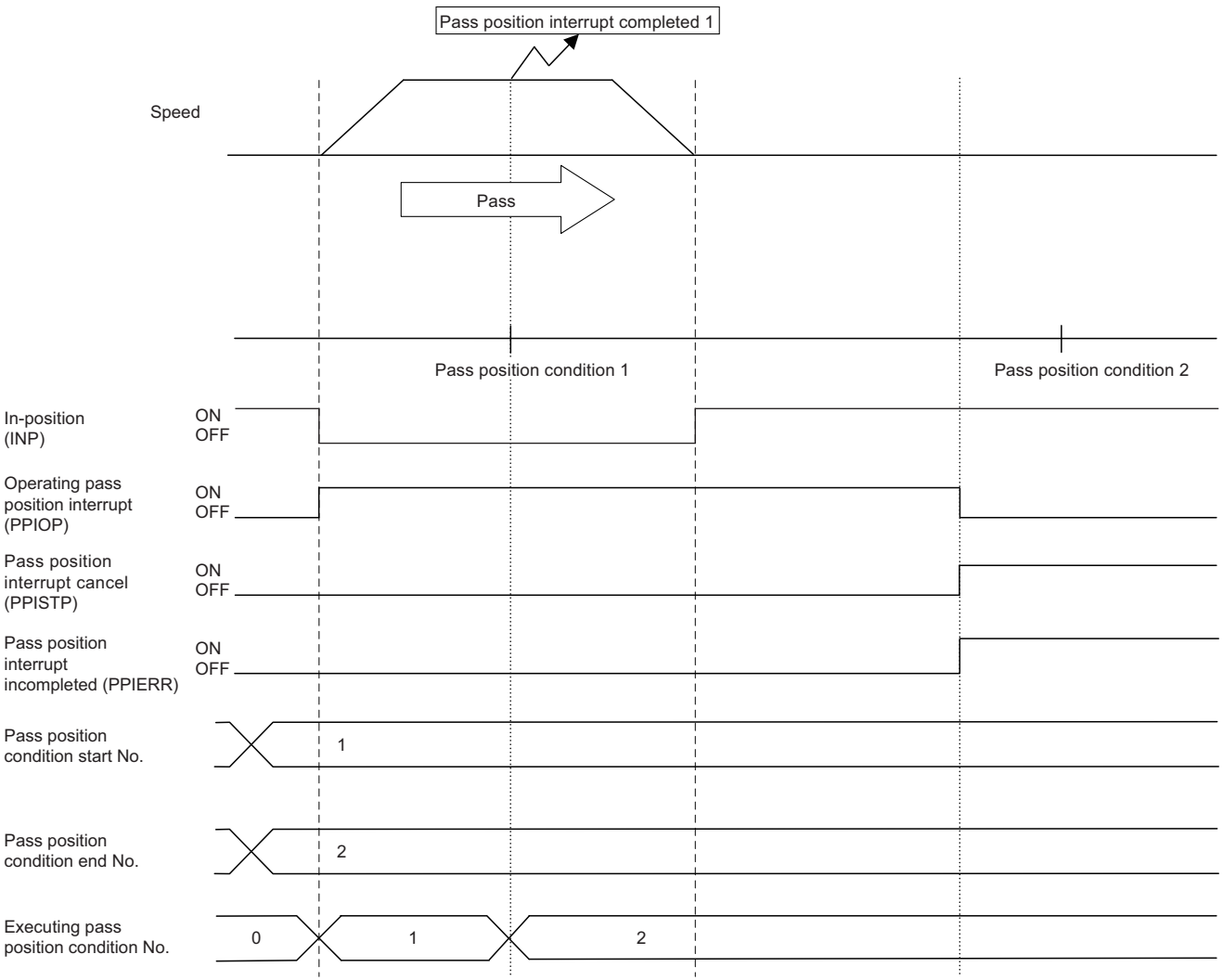
8.25 Continuous Operation to Torque Control

The continuous operation to torque control is a control method that achieves torque control during positioning control without stopping.

By setting the continuous operation to torque specification (bit9) to "1: Continuous operation to torque control valid" in the auxiliary command of the point table, torque control is performed from the position (command position or current feedback position) set to the continuous operation to torque control switching position (PRCPS) without stopping operation. The continuous operation to torque control is completed on the basis of the continuous operation to torque control data, and then returned to position control.

Also, the control mode can be switched by two methods, automatic/manual. In automatic mode, the mode switch until the Motion control board returns to the position control is controlled. In manual mode, the control mode must be switched from the user program. However, it can be switched at any timing.

The continuous operation to torque control uses "Continuous operation to torque control mode (ct)" that is a drive unit function.

The target torque (PRTGTR) of the continuous operation to torque control data is imported every operation cycle while other data become valid at the start of operation for the points set to continuous operation to torque control valid (hereinafter referred to as continuous operation to torque control points).

> **Point**
>
> - The continuous operation to torque control is supported in the basic system software version "05" or later.
> - This function is available for MR-J5(W)-G only. When performing the continuous operation to torque control in a drive unit which does not support the continuous operation to torque control mode (ct), "Press Control Error (operation alarm No.005DH, detail No.0006H)" occurs when the operation is started.
> - The units of the speed limit value sent to a drive unit are decided by "Speed/acceleration/deceleration unit selection (PT01.1)" and "Unit for position data (PT01.2)" of the servo parameters, and a motor to be connected. Depending on the motor to be connected, set as follows.
>   <When connecting a rotary motor>
>   Set "Speed/acceleration/deceleration unit selection (PT01.1)" to "0: r/min", and "Unit for position data (PT01.2)" to "3: pulse". The unit of the speed limit value sent to a drive unit is [0.01r/min].
>   <When connecting a linear motor>
>   Set "Speed/acceleration/deceleration unit selection (PT01.1)" to "1: Command unit/s", and "Unit for position data (PT01.2)" to "3: pulse". The unit of the speed limit value sent to a drive unit is [pulse/s].
>   When other than the above is set, "Slave Object Unit Error (operation alarm No.0082H, detail No.0001H)" occurs when the operation is started. In this case, review the servo parameters "Speed/acceleration/ deceleration unit selection (PT01.1)" and "Unit for position data (PT01.2)" of the drive unit.
> - The continuous operation to torque control data other than the target torque (PRTGTR) becomes valid at the operation of the next continuous operation to torque control point even if it is changed during the operation of a continuous operation to torque control point.
> - When the target torque (PRTGTR) is changed during the continuous operation to torque control, torque increases and decreases according to continuous operation to forward rotation torque time constant (PRCTA)/continuous operation to reverse rotation torque time constant (PRCTD).
> - Even during the continuous operation to torque control, the target torque is limited by "Forward rotation torque limit value (parameter No.0210)" and "Reverse rotation torque limit value (parameter No.0211)". If the value over the torque limit value is input in the target torque (PRTGTR), the during continuous operation to torque control may not occur but "Press Control Error (operation alarm No.005DH, detail No.0003H)" may occur.

Operation example

Two-point operation (deceleration check system is "0: In-position stop") including continuous operation to torque control point.
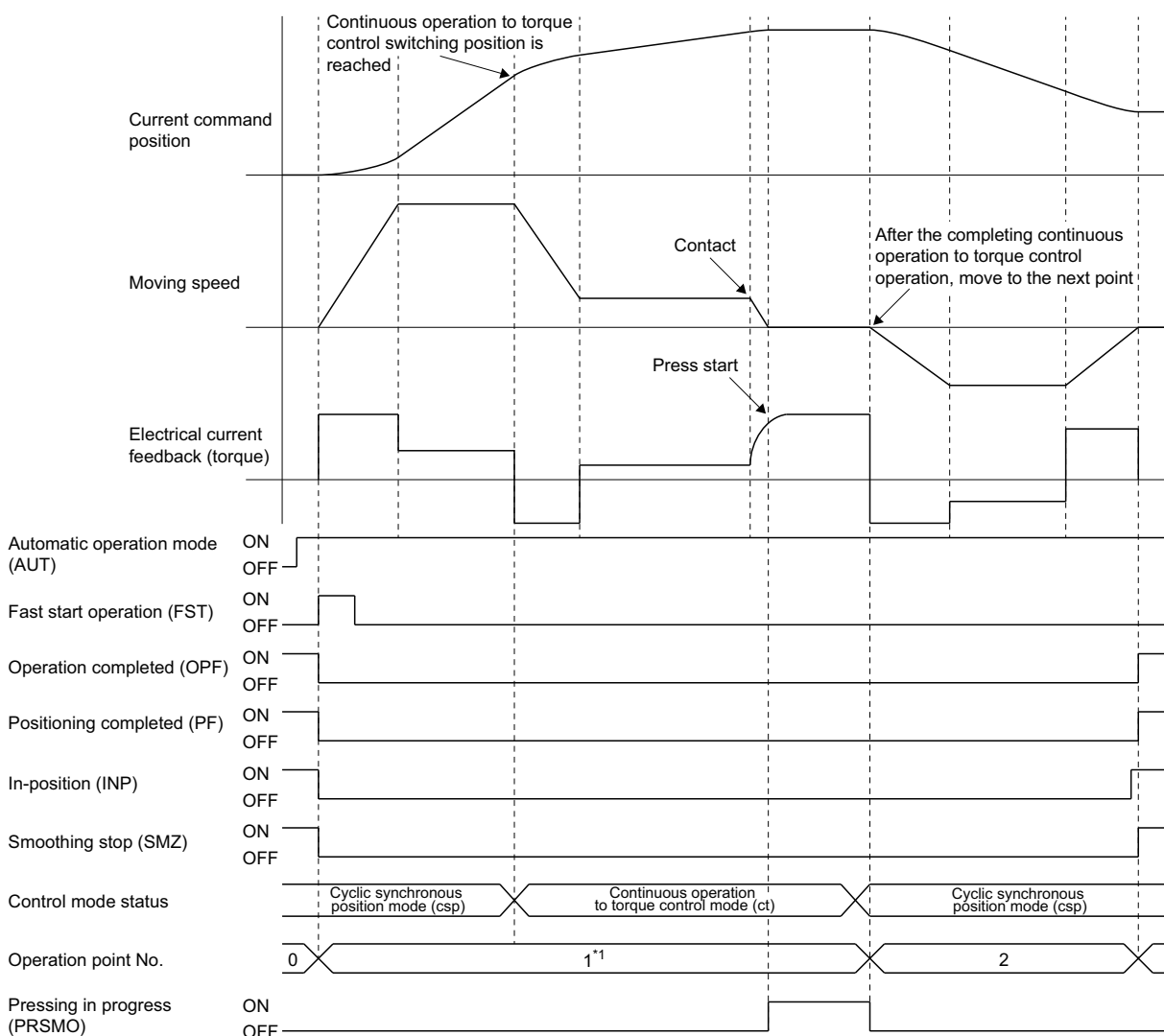
*1 Returning to cyclic synchronous position mode (csp) after the completion of continuous operation to torque control mode (ct) operation is part of the continuous operation to torque control point, and is performed as a one-point operation.

Interface

Set the following data when using the continuous operation to torque control.

Parameter

■Servo parameter (MR-J5(W)-G)

Parameter No.	Symbol[1]	Name	Detail No.	Detail name	Description
PA14	*POL	Travel direction selection	—	—	Select the rotation/travel direction.[2]
PB12	OVA	Overshoot amount compensation	—	—	Set a dynamic friction torque to the rated torque at servo motor rated speed. Alternatively, set a dynamic friction force to the continuous thrust at linear servo motor rated speed.

PC29	*COPB	Function selection C-B	PC29.3	Torque POL reflection selection	When the setting of this parameter is valid, the following torque polarities are changed in the setting of "Travel direction selection (PA14)".
					• Torque command
					  Target torque (Obj. 6071h)
					  Torque demand value (Obj. 6074h)
					• Torque limit value
					  Positive torque limit value (Obj. 60E0h)
					  Negative torque limit value (Obj. 60E1h)
					• Torque feedback
					  Torque actual value (Obj. 6077h)

PE47	TOF	Unbalanced torque offset	—	—	Set this to cancel the unbalanced torque of a vertical axis. Set this the rated torque of the servo motor as 100%.

[1] For the settings for the parameters with a * mark at the front of the symbol, turn ON the power again after the settings, or reset either the controller or the software.

[2] The torque information is as follows.

Setting value		Servo motor rotation direction/linear servo motor travel direction	
Travel direction selection (PA14)	Torque POL reflection selection (PC29.3)	Torque handled by the controller: positive	Torque handled by the controller: negative
0	0: Enabled	CCW or positive direction	CW or negative direction
	1: Disabled		
1	0: Enabled	CW or negative direction	CCW or positive direction
	1: Disabled	CCW or positive direction	CW or negative direction

■Control parameter

Parameter No.	Symbol	Name	Initial value	Unit	Setting range	Description
0205	ITM2	Interrupt condition 2	0000h	—	0000h to FFFFh	When using the pressing in progress signal (PRSMO) in the interrupt function, set interrupt condition 2.
0222	SPLL	Speed limit value (lower)	3000	Speed units	0000h to FFFFh	Set the value for the moving speed limit.
0223	SPLH	Speed limit value (upper)			0000h to 7FFFh	

Point

[Motion API]

To set/get parameters, use the sscChange2Parameter function/sscCheck2Parameter function.

Point table

To use the continuous operation to torque control, set the continuous operation to torque control specification (bit9) to "1: Continuous operation to torque control valid" in the auxiliary command of the point table.

- Position command system (bit0)
- For manufacturer setting (bit1)
- Vibration suppression command filter 1 specification (bit2)
- For manufacturer setting (bit3)
- Deceleration check system (bit4 to 5)
- Speed switching point specification (bit6)
- Dwell specification (bit7)
- Pass position interrupt specification (bit8)
- Continuous operation to torque control specification (bit9)
- For manufacturer setting (bit10)
- Loop specification (bit11 to 12)
- Interpolation method (bit13 to 15)

Bit	Name	Description
0	Position command system	• 0: Absolute position command • 1: Relative position command
4 to 5	Deceleration check system	Regardless of the setting, point movement is complete at the completion of continuous operation to torque control. "2: Continuous operation" is invalid.
6	Speed switching point specification	Speed switching point specification is invalid.
7	Dwell specification	• 0: Dwell Specify the time for after switching to cyclic synchronous position mode (csp). • 1: Predwell Point movement starts when the time specified by predwell has passed.
8	Pass position interrupt specification	• 0: Pass position interrupt invalid • 1: Pass position interrupt valid
9	Continuous operation to torque control specification	• 0: Continuous operation to torque control invalid • 1: Continuous operation to torque control valid

Point

- Position data is the stopping position when switching to continuous operation to torque control could not be made. Set the position data after the continuous operation to torque control switching position (PRCPS) and before the pressing position in continuous operation to torque control.
- When switching to continuous operation to torque control mode (ct) could not be made, "Press Control Error (operation alarm No.005DH, detail No.0002H)" occurs at the completion of position control.
  It is determined that switching to continuous operation to torque control could not be made if the following conditions are satisfied.
  · When position data is before the continuous operation to torque control switching position (PRCPS).
  · When switching is not performed when manual switch is selected.
- When the control mode switching command signal (CTLMC) turns ON during the time specified by predwell, the control mode switching error signal (CTLMCE) turns ON, and control mode cannot be switched.

Point

[Motion API]
To set/get point data, use the sscSetPointDataEx function/sscCheckPointDataEx function.

■Setting image
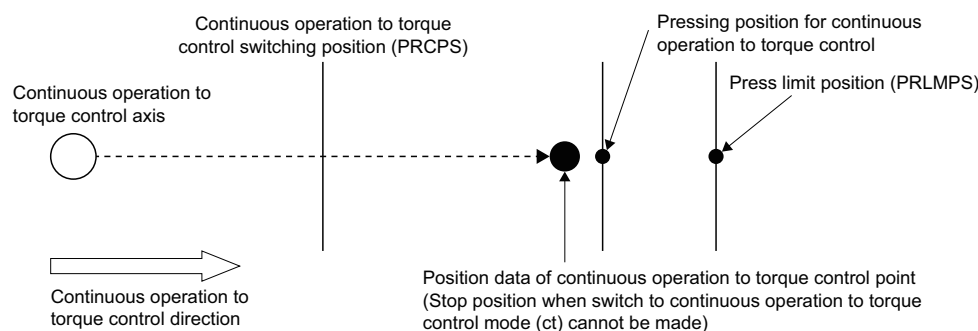
Point
- If the operation is completed when switching to the continuous operation to torque control mode (ct) cannot be made, smoothing stop is performed.
- At any timing after the stop processing by the stop command, an operation alarm does not occur.

Continuous operation to torque control data

Set the conditions on the continuous operation to torque control data for performing continuous operation to torque control.

■Continuous operation to torque control data

Refer to the following.

☞Page 543 Press Control Data

■Continuous operation to torque control data details

The addresses in the table are the addresses for the first axis. For the second axis and after, add "+20h" for each axis.

Address (hexadecimal)	Symbol	Name	Unit	Setting range	Description	At manual switch selection
00066A00 00066A01 00066A02 00066A03	PRCPS	Continuous operation to torque control switching position	Command units	-2147483648 to 2147483647	Set the position for switching to continuous operation to torque control. The position command system depends on the setting of the auxiliary command of the point table.	Invalid
00066A04 00066A05 00066A06 00066A07	PRLMPS	Press limit position	Command units	-2147483648 to 2147483647	Set the limit position of the movement by continuous operation to torque control. It is determined by the feedback position. The position command system depends on the setting of the auxiliary command of the point table.	Valid
00066A08 00066A09 00066A0A 00066A0B	PRCTSP	Continuous operation to torque control speed limit value	Speed Unit	1 to 2147483647	Set the speed limit value during continuous operation to torque control.	Valid
00066A0C 00066A0D	PRTGTR	Target torque	0.1%	-32768 to 32767	Set the target torque during continuous operation to torque control. Set the code according to the direction of torque generation.	Valid
00066A0E 00066A0F	PRTM	Press time	ms	0 to 65535	Set the press time during continuous operation to torque control.	Invalid
00066A10 00066A11	PRTRW	Torque settle width	0.1%	0 to 65535	Set the range (difference from the target torque) at which it is regarded that the target torque (PRTGTR) has been reached during continuous operation to torque control.	Valid
00066A12 00066A13	PRWTM	Torque settle waiting time	ms	0 to 65535	Set the time where it is determined that press is occurring (from when entering the torque settle width until the during continuous operation to torque control signal (PRSMO) is output.)	Valid

Address (hexadecimal)	Symbol	Name	Unit	Setting range	Description	At manual switch selection
00066A14 00066A15	PRCA	Continuous operation to torque control acceleration time constant	ms	0 to 20000	Set the acceleration time constant for during continuous operation to torque control.	Valid
00066A16 00066A17	PRCD	Continuous operation to torque control deceleration time constant	ms	0 to 20000	Set the deceleration time constant for during continuous operation to torque control.	Valid
00066A18 00066A19	PRCOP	Continuous operation to torque control operating conditions	—	0000h to 0012h	■■■□ (Method to switch from cyclic synchronous position mode (csp) to continuous operation to torque control mode (ct)) Set the method to switch the control mode from the cyclic synchronous position mode (csp) to the continuous operation to torque control mode (ct). • 0: Automatic switch (command position) • 1: Automatic switch (current feedback position) • 2: Manual switch ■■□■ (Method to switch from continuous operation to torque control mode (ct) to cyclic synchronous position mode (csp)) Set the method to switch the control mode from the continuous operation to torque control mode (ct) to the cyclic synchronous position mode (csp). • 0: Automatic switch • 1: Manual switch	Valid
00066A1A 00066A1B	PRCTA	Continuous operation to forward rotation torque time constant	ms	0 to 65535	Set the time constant when the continuous operation to torque control mode (ct) is exerted. Valid only when the target torque (PRTGTR) is changed during the continuous operation to torque control mode.	Valid
00066A1C 00066A1D	PRCTD	Continuous operation to reverse rotation torque time constant	ms	0 to 65535	Set the time constant when the continuous operation to torque control mode (ct) is regenerated. Valid only when the target torque (PRTGTR) is changed during the continuous operation to torque control mode.	Valid
00066A1E 00066A1F	—	For manufacturer setting	—	—	—	—

Point

• When the operation cycle is set to 2.0ms or more, the press time (PRTM) or the torque settle waiting time (PRWTM) is reduced to a value that is divisible by the operation cycle.
• When the operation cycle is 2.0ms or more, if the press time (PRTM) or the torque settle waiting time (PRWTM) is set to a value smaller than the operation cycle, each value is regarded as the same as the operation cycle.

Point

[Motion API]
• To set/get continuous operation to torque control data, use the sscSetPressData function/sscGetPressData function.
• To set/get the target torque (PRTGTR) during continuous operation to torque control, use the sscSetPressTargetTorque function/sscGetPressTargetTorque function.

• When the continuous operation to torque control switching position has not been reached at the start of operation
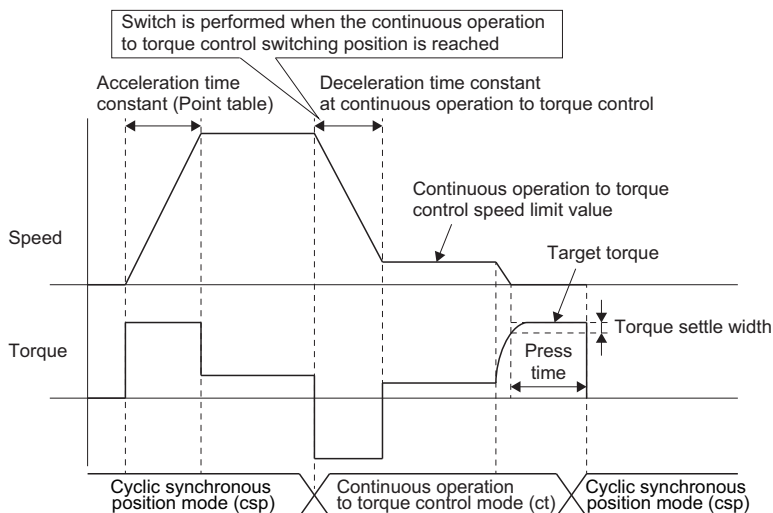
• When the continuous operation to torque control switching position has been passed at the start of operation
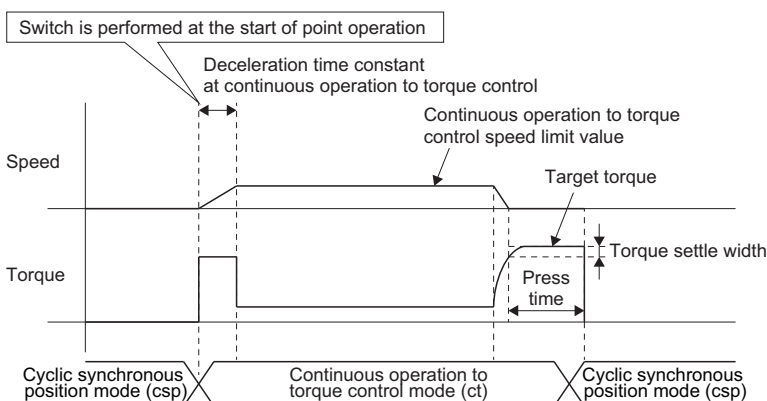
> **Point**
>
> • The value at the start of operation at the continuous operation to torque control point is valid as the continuous operation to control data.
> • The press time is the elapsed time after the pressing in progress signal turns ON. (The elapsed time continues to be measured even if a value falls outside the torque settle width during the process.)
> • When a value outside of the range is set to continuous operation to torque control data and automatic operation is started, "Press control setting error (operation alarm No.005EH, detail No.0001H to 0005H)" occurs, and the operation is not started.
> • When a press limit position (PRLMPS) is set in the opposite direction of the position control travel direction, "Press Control Error (operation alarm No.005DH, detail No.0008H)" occurs, and the operation is not started.
> • When a press limit position (PRLMPS) is set before the position data of the continuous operation to torque control point, "Press Control Error (operation alarm No.005DH, detail No.0005H)" occurs, and the operation is not started. (A press limit position is not reached during position control mode (cps).)
> • The press limit position is determined by the current feedback position. When the press limit position is reached during continuous operation to torque control, "Press Control Error (operation alarm No.005DH, detail No.0003H)" occurs, then slows down and stops at the position where the press limit position was exceeded.
> • When the target torque is reached during acceleration, it is determined that press has started and the press time measurement begins.

Axis data (high speed) (command bit/status bit)

■Command bit

The addresses in the table are the addresses for the first axis. For the second axis and after, add "+10h" for each axis.

Address (hexadecimal)	Bit	Symbol	Signal name	When in tandem drive
0000100C	0	—	For manufacturer setting	—
	1			
	2			
	3			
	4	CTLMC	Control mode switching command	Not supported
	5	—	For manufacturer setting	—
	6			
	7			

- Details on axis command bit

Symbol	Signal name	Function details	
		Function	**Operation**
CTLMC	Control mode switching command	Switch the control mode of the drive unit on the basis of the control mode command.	When all of the following conditions are satisfied, the control mode is switched to the specified control mode. • "Continuous operation to torque control specification (bit9)" within the auxiliary command of the point in operation is set to "1: continuous operation to torque control valid". • The start switch to continuous operation to torque control condition (PRCOP) is set to "Manual switch". • The control mode command is set to "8: Cyclic synchronous position mode (csp)" or "-104: Continuous operation to torque control mode (ct)".

■Status bit

The addresses in the table are the addresses for the first axis. For the second axis and after, add "+10h" for each axis.

| Address (hexadecimal)	Bit	Symbol	Signal name	When in tandem drive
00006008	0	—	For manufacturer setting	—
	1			
	2			
	3			
	4			
	5			
	6			
	7	PRSMO	Pressing in progress	Not supported

Address (hexadecimal)	Bit	Symbol	Signal name	When in tandem drive
0000600C	0	—	For manufacturer setting	—
	1			
	2			
	3			
	4	CTLMCF	Control mode switching completed	Not supported
	5	CTLMCE	Control mode switching error	Not supported
	6	—	For manufacturer setting	—
	7	PRSOVR	Out of torque range during pressing	Not supported

• Details on axis status bit

Symbol	Signal name	Function details		
		Function	**Operation**	
			Conditions for turning ON	**Conditions for turning OFF**
PRSMO	Pressing in progress	Notify that torque within the torque settle width of the target torque has been output during the torque settle waiting time of continuous operation to torque control.	Torque within the torque settle width of the target torque has been output during the torque settle waiting time of continuous operation to torque control.	Control mode was changed to cyclic synchronous position mode (csp).
CTLMCF	Control mode switching completed	Notify that switching of control mode of the drive unit was completed.	The switching of the control mode of the drive unit was completed normally. (Turns ON even when switching to the same control mode as the current control mode)	The control mode switching command signal (CTLMC) was turned OFF.
CTLMCE	Control mode switching error	Notify that switching of control mode of the drive unit could not be performed.	When one of the following conditions below is satisfied and the control mode switching command signal (CTLMC) is turned ON. • Switching command is input during automatic operation during an operation other than continuous operation to torque control points. • A mode other than cyclic synchronous position mode (csp) and continuous operation to torque control mode (ct), or a mode outside of the range is set to the control mode command. • A control mode switching command set to other than manual switch was input during operation.	The control mode switching command signal (CTLMC) was turned OFF.
PRSOVR	Out of torque range during pressing	Notify that the torque out of the torque settle width during pressing is output when the pressing in progress signal (PRSMO) is output.	The torque out of the torque settle width is output during pressing.	The next continuous operation to torque control point is started.

Axis data (high speed) (command data/status data)

■Axis command data

The addresses in the table are the addresses for the first axis. For the second axis and after, add "+40h" for each axis.

Address (hexadecimal)	Name	Setting range	Remarks
00002012 00002013	Control mode command	→	Set the mode to be switched. • 8: Position control mode (Cyclic synchronous position mode (csp)) • -104: Continuous operation to torque control mode (Continuous operation to torque control mode (ct)) • Other than the above: Error value[*1]

*1 When the control mode switching error signal (CTLMCE) is ON, a control mode switch error occurs.

■Axis status data

The addresses in the table are the addresses for the first axis. For the second axis and after, add "+40h" for each axis.

Address (hexadecimal)	Name	Output limits	Remarks
00007012 00007013	Control mode status	→	Display the current control mode. • 0: No mode change/No mode assigned • 1: Profile position mode (pp) • 3: Profile velocity mode (pv) • 4: Profile torque mode (tq) • 6: Homing mode (hm) • 8: Cyclic synchronous position mode (csp) • 9: Cyclic synchronous velocity mode (csv) • 10: Cyclic synchronous torque mode (cst) • -1: Test Operation mode: JOG Operation • -2: Test Operation mode: Positioning Operation • -4: Test Operation mode: DO forced output • -6: Test Operation mode: Machine analyzer • -9: Test Operation mode: Test Exit • -104: Continuous operation to torque control mode (ct) • -111: Cyclic synchronous pressure mode (cspr)

Point

[Motion API]

To switch the control mode of the drive unit, use the sscChangeControlMode function.

Necessary objects

The necessary objects for the continuous operation to torque control are shown below.

Function	Necessary object	
	TPDO	RPDO
Continuous operation to torque control	Torque actual value (Obj. 6077h)	Target torque (Obj. 6071h) Positive torque limit value (Obj. 60E0h) Negative torque limit value (Obj. 60E1h) Velocity limit value (Obj. 2D20h)

Point

• If the necessary objects do not exist, "Slave Object Setting Error (operation alarm No.0080H, detail No.0009H)" occurs when the operation is started.
• When "Target torque (Obj. 6071h)" and "Velocity limit value (Obj. 2D20h)" of the necessary RPDO objects are assigned in the device object I/O, "Slave Object Setting Error (operation alarm No.0080H, detail No.000BH)" occurs.

Control mode switch

For control mode switch, there are the following two methods that can be selected for both switching from "Cyclic synchronous position mode (csp) to continuous operation to torque control mode (ct)" and switching from "Continuous operation to torque control mode (ct) to cyclic synchronous position mode (csp)".
 • Automatic switch
 • Manual switch

Control mode switch setting

The setting contents and setting values required for each switch pattern are shown in the following table.

Switch pattern	Press control operation condition	Setting items	Setting values (□: arbitrary value)
Switching from cyclic synchronous position mode (csp) to continuous operation to torque control mode (ct)	Automatic switch	Continuous operation to torque control switching position (PRCPS)	Position to switch to continuous operation to torque control mode (ct) [command units]
		Method to switch from cyclic synchronous position mode (csp) to continuous operation to torque control mode (ct)	00□0h or 00□1h (automatic switch)
	Manual switch		00□2h (manual switch)
Switching from continuous operation to torque control mode (ct) to cyclic synchronous position mode (csp)	Automatic switch	Method to switch from continuous operation to torque control mode (ct) to cyclic synchronous position mode (csp)	000□h (automatic switch)
	Manual switch		001□h (manual switch)

Procedure for switching from cyclic synchronous position mode (csp) to continuous operation to torque control mode (ct)

■Automatic switch

1. The Motion control board automatically switches the control mode, and thus processing by user program is not required. (The Motion control board determines the continuous operation to torque control switching position, and automatically switches the control mode to continuous operation to torque control mode (ct) once the position is reached.)

■Manual switch

1. Set the control mode command to "-104: Continuous operation to torque control mode (ct)".

2. Turn ON the control mode switching command signal (CTLMC). (Have the switch timing determined by user program.)

3. After confirming the control mode switching completed signal (CTLMCF) is ON, turn OFF the control mode switching command signal (CTLMC).

Procedure for switching from continuous operation to torque control mode (ct) to cyclic synchronous position control mode (cp)

■Automatic switch

1. The Motion control board automatically switches the control mode, and thus processing by user program is not required. (Control mode is automatically returned to cyclic synchronous position control mode (cp) after the press time has passed since the starting of torque generation within the torque settle width of the target torque.)

■Manual switch

1. Set the control mode command to "8: Cyclic synchronous position mode (csp)".

2. Turn ON the control mode switching command signal (CTLMC). (Have the switch timing determined by user program.)

3. After confirming the control mode switching completed signal (CTLMCF) is ON, turn OFF the control mode switching command signal (CTLMC).

Point

 • Operation is completed with the switching to the cyclic synchronous position control mode (csp) completed.
 • When operation is stopped by forced stop, operation alarms etc., the Motion control board automatically switches the control mode to cyclic synchronous position control mode (csp) regardless of the continuous operation to torque control operating conditions (PRCOP).
 • When a control mode of switch disabled is input to the control mode command and the control mode switching command signal (CTLMC) is turned ON, "Control Mode Switch Error (operation alarm No.002EH, detail No.0002H or 0003H)" occurs, followed by a deceleration stop.

Point

[Motion API]
To switch the control mode of the drive unit at manual switch selection, use the sscChangeControlMode function.

Operation timing

Automatic switch (Start switch and end switch)
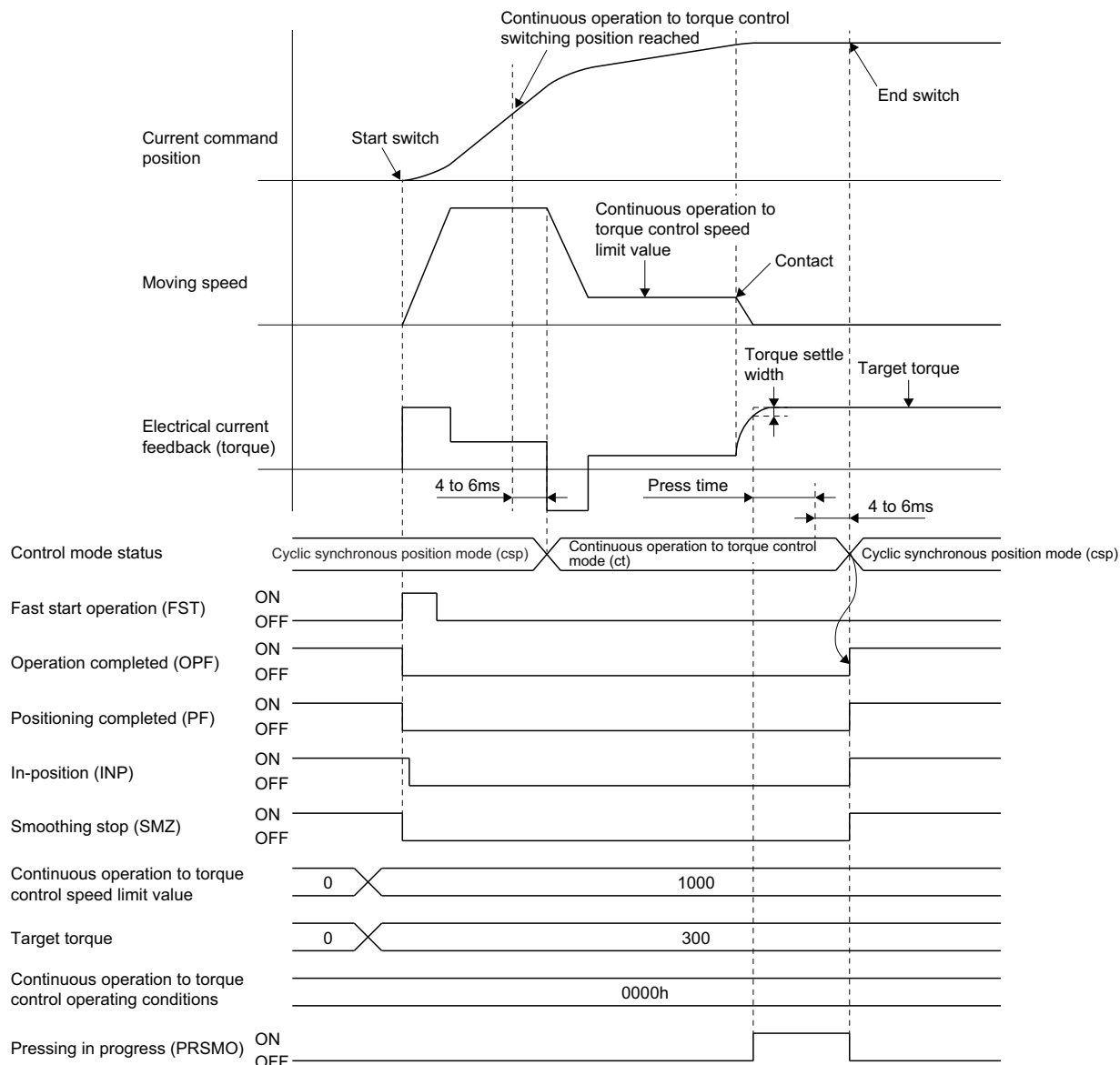
Point
- It takes approximately 4 to 6ms to switch the control mode of the drive unit after reaching the continuous operation to torque control switching position and press time has passed.
- The rough match signal (CPO) turns ON on the basis of the distance remaining to the position data of the point table.
- The positioning completed signal (PF) and the smoothing stop signal (SMZ) turn ON at completion of operation.
- The current command position is matched with the current feedback position at the timing of switch to continuous operation to torque control mode (ct).
- When operation is completed without reaching the continuous operation to torque control switching position, "Press Control Error (operation alarm No.005DH, detail No.0002H)" occurs.

Point

[Motion API]
To startup operation, use the sscAutoStart function.

Manual switch (Start switch and end switch)

Determination timing for pressing in progress

The misjudgment of continuous operation to torque control when the torque fluctuation range is large can be controlled by setting the torque settle waiting time (PRWTM). When torque within the torque settle width is continuously output during the torque settle waiting time, the pressing in progress signal (PRSMO) is turned ON.

Electrical current
feedback (torque)

Target torque

Torque settle width

Contact

Torque settle
waiting time

Pressing in progress ON
(PRSMO) OFF
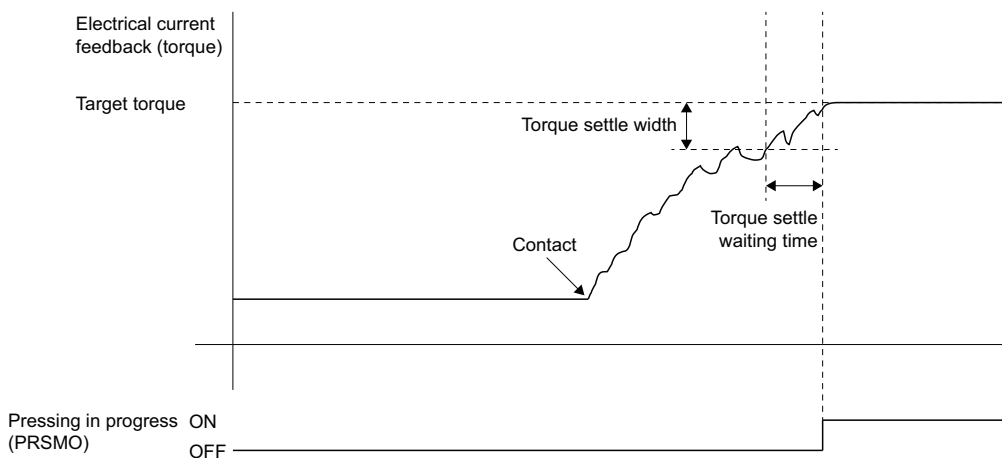
Point

- When a value outside the torque settle width occurs during torque settle waiting time, the torque settle waiting time is measured again from the beginning.
- After the pressing in progress signal (PRSMO) is turned ON, if the torque moves out of the torque settle width, the out of torque range during pressing signal (PRSOVR) is output.

8

Operation during continuous operation to torque control mode

When switching to the continuous operation to torque control mode (ct), the torque is controlled so as to become the torque set as the target torque (PRTGTR), while speed is accelerated/decelerated from the current speed to the speed set at the continuous operation to torque control speed limit value (PRCTSP). During this time, the command speed immediately after the switch is a value converted from the position command.

While a positive value is set for the continuous operation to torque control speed limit value (PRCTSP), the motor rotation direction of the motor conforms to the travel direction specified by the point table.

The relationship between the setting value of the target torque (PRTGTR) and the torque generation direction conforms to the travel direction specified by the point table. (It differs depending on the settings of "Travel direction selection (PA14)" and "Torque POL reflection selection (PC29.3)".)

Torque POL reflection selection (PC29.3)	Travel direction selection (PA14)	Setting value of target torque (PRTGTR)	Output value to drive unit	Torque generation direction of servo motor
0: Enabled	0: CCW rotation with the increase of the position command	Positive value	Positive value	CCW direction
		Negative value	Negative value	CW direction
	1: CW rotation with the increase of the position command	Positive value	Negative value	CW direction
		Negative value	Positive value	CCW direction
1: Disabled	0: CCW rotation with the increase of the position command	Positive value	Positive value	CCW direction
		Negative value	Negative value	CW direction
	1: CW rotation with the increase of the position command	Positive value	Negative value	CCW direction
		Negative value	Positive value	CW direction

For the current torque value, confirm the electrical current feedback of the high speed monitor.

Speed during the continuous operation to torque control mode

Acceleration/deceleration is processed according to trapezoidal acceleration/deceleration.

The continuous operation to torque control speed limit value (PRCTSP) is restricted by "Speed limit value (parameter No.0222, 0223)". When a speed that exceeds the speed limit value is commanded, and a continuous operation to torque control point operation is conducted, speed is restricted to the speed limit value.

For the command speed to the drive unit, confirm "Moving speed" (monitor No.00001304H)".

Torque during the continuous operation to torque control

Acceleration/deceleration is processed according to trapezoidal acceleration/deceleration when the target torque is changed. At this time, the standard values are "Forward rotation torque limit value (parameter No.0210)" and "Reverse rotation torque limit value (parameter No.0211)" that are set at the startup of the continuous operation to torque control. Therefore, for the continuous operation to forward rotation torque time constant (PRCTA) and the continuous operation to reverse rotation torque time constant (PRCTD), set the time from 0 to the time until the torque limit value is reached.

• Image when the forward rotation torque is the standard
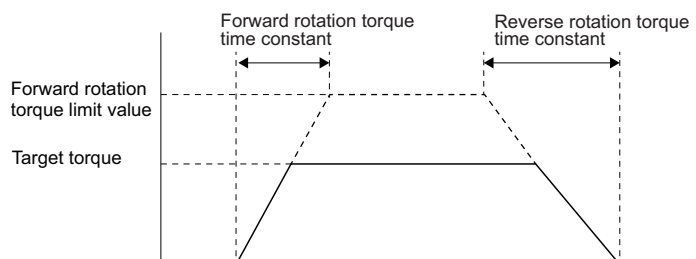
Stop factors during continuous operation to torque control

Stop factor	Operation	
	Stop method	**Alarm/Error**
The press limit position was reached.	Immediate stop	Operation alarm No.005DH, detail No.0003H
The control mode was changed to the cyclic synchronous position mode (csp) during travel in continuous operation to torque control mode (before target torque is reached).	Deceleration stop	Operation alarm No.005DH, detail No.0007H
A control mode of switch disabled was input to the control mode command, and control mode switch was conducted.	Deceleration stop	Operation alarm No.002EH, detail No.0002H or 0003H
The operation mode was changed.	Deceleration stop	Operation alarm No.0023H, detail No.0001H
Servo OFF was performed.	Rapid stop	Operation alarm No.00B3H, detail No.0001H
A forced stop (the external forced stop signal (EMI) or the software forced stop signal (SEMI)) was turned ON.	Immediate stop	Operation alarm No.0012H, detail No.0001H
The stop operation signal (STP) was turned ON.	Deceleration stop	—
The rapid stop signal (RSTP) was turned ON.	Rapid stop	—
The limit switch was turned ON.	Immediate stop	Operation alarm No.00A0H, detail No.0001H or 0002H
The interlock signal (ITL) was turned ON.	Rapid stop	Operation alarm No.005DH, detail No.0004H
The drive unit control is no longer possible. (disconnected)	Immediate stop	Operation alarm No.00B0H, detail No.0002H
A drive unit alarm occurred.	Immediate stop	Operation alarm No.00B1H, detail No.0001H

Point

- For all patterns, the control mode is automatically changed to position control by the Motion control board after the zero speed signal (ZSP) turns ON.
- For the stopping process under each stop factor, a deceleration process is performed in the continuous operation to torque control mode (ct). (For immediate stops, the control mode is switched to the cyclic synchronous position mode (csp) at the current position, and stops immediately.)
- The time constant at a rapid stop follows "Rapid stop time constant (parameter No.0227)".
- The press limit position is determined by the current feedback position. The position after a stop is a position exceeding the press limit position. Therefore, when setting a position, consider the operation that exceeds the press limit position.
- If the software limit is set before the press limit position, "Press Control Error (operation alarm No.005DH, detail No.0009H)" occurs, and the operation does not start.
- If the interlock signal (ITL) turns ON during the cyclic synchronous position mode (csp) of continuous operation to torque control points, "Press Control Error (operation alarm No.005DH, detail No.0004H)" occurs.
- The interference check standby is invalid during the cyclic synchronous position mode (csp) of continuous operation to torque control points.
- The operations listed in the above table are followed when a stop factor occurs during switching from the cyclic synchronous position mode (csp) to the continuous operation to torque control mode (ct).
- An immediate stop occurs when a stop factor occurs during switching from the continuous operation to torque control mode (ct) to the cyclic synchronous position mode (csp).

8

Combinations of continuous operation to torque control and other functions

The following shows the combinations of continuous operation to torque control with each function.

○: Usable, △: Restriction, ×: Unusable, ─: Not applicable

Classification	Function		Compatibility	Remarks
Operational function	JOG operation		─	
	Incremental feed		─	
	Automatic operation		○	Automatic switch/Manual switch can be selected.
	Interpolation operation	Linear interpolation	×	When starting up a continuous operation to torque control point, "Press Control Error (operation alarm No.005DH, detail No.000AH)" occurs.
		Circular interpolation	×	
	Home position return		─	
	Home position reset function (data set)		─	
Application function	Command unit	Electronic gear	○	
	Speed unit	Speed unit	○	Set the continuous operation to torque control speed limit value (PRCTSP) in speed units.
		Speed units multiplication factor	○	
		Speed limit	○	The continuous operation to torque control speed limit value is restricted by "Speed limit value (parameter No.0222, No.0223)"
	Acceleration /deceleration	Linear acceleration/ deceleration	○	
		Smoothing filter	△	Invalid during continuous operation to torque control.
		S-curve acceleration/ deceleration (Sine acceleration/deceleration)	△	
		Jerk ratio acceleration/ deceleration	△	
		Vibration suppression command filter 1	△	
	Servo ON/Servo OFF		○	Control mode is automatically changed to the cyclic synchronous position mode (csp) after an operation alarm occurrence.
	Forced stop		○	
	Stop operation		○	
	Rapid stop operation		○	
	Limit switch (hardware stroke limit)		○	
	Software limit (software stroke limit)		○	
	Interlock		×	
	Rough match output		△	At continuous operation to torque control points, the rough match turns ON when the distance remaining based on the position data of the point table falls within the rough match output range. When switching from the continuous operation to torque control mode (ct) to the cyclic synchronous position mode (csp), the rough match turns ON after the operation is completed even if it does not fall within the rough match output range.
	Torque limit		×	During continuous operation to torque control and torque limit, torque limit stays OFF.
	Command change	Speed change	×	The speed change error signal (SCE) turns ON.
		Change of time constants	×	The acceleration time constant change error signal (TACE), or the deceleration time constant change error signal (TDCE) turns ON.
		Position change	×	The position change error signal (PCE) turns ON.
	Backlash		○	When following up by current feedback position, a position with the backlash taken into account is followed up.
	Position switch		△	Determined by the current feedback position.
	Completion of operation signal		○	Output after switched to the cyclic synchronous position mode (csp).
	Absolute position detection system		○	
	Home position return request		○	

Classification	Function	Compatibility	Remarks
Application function	Other axes start	△	Determined by a current command position matching the current feedback position when current command position is set to the axis judgment coordinate of start condition. The remaining distance is calculated based on the target position of the point data.
	High response Interface	○	
	In-position signal	—	
	I/O device	—	
	Dual port memory exclusive control	—	
	Pass position interrupt	△	Determined by a current command position matching the current feedback position when current command position is set to the axis judgment coordinate of start condition. Therefore, when a current command position is specified, it may not be correctly determined.
	No home position function	○	
	Device station object I/O	○	
	Driver command discard detection	○	
	High speed operation mode	○	
Auxiliary function	Reading/writing parameters	—	
	Alarm/system error	○	
	Monitor function	○	The speed limit value output to the servo amplifier is output for "moving speed" during continuous operation to torque control mode.
	High speed monitor function	○	
	Interrupt	○	Notifies the timing when the out of torque range during pressing signal (PRSOVR) is ON.
	User watchdog function	—	
	Software reboot function	—	
	Parameter backup	—	
	Sampling	—	
	Log	○	
	Operation cycle monitor function	—	
	Drive-unit-less axis function	○	After reaching the continuous operation to torque control speed limit value, it is regarded that the torque settle width has been reached, and the operation is completed after the continuous operation to torque control time has passed. For the electrical current feedback, torque is 0% before reaching the speed limit value, and the target torque is output after reaching the speed limit value.
	Time control	—	
	Link-down detection function	○	
	Event history	○	
Tandem drive		×	When continuous operation to torque control is startup, "Press Control Error (operation alarm No.005DH, detail No.0001H)" occurs.

Restrictions on drive unit functions

- The actual motor speed may not reach the speed limit value depending on the machine load situation during the continuous operation to torque control mode
- When switching from the continuous operation to torque control mode (ct) to the cyclic synchronous position mode (csp), switch the mode after putting the motor in the stop status (zero speed status). Also, if the setting value of the servo parameter "Zero speed (PC07)" is too small, the zero speed may not be correctly determined.
- When switching from the continuous operation to torque control mode (ct) to the cyclic synchronous position mode (csp) before waiting for the motor stop, set the servo parameter "ZSP disabled selection at control switching (PC76.1)" to "1: Disabled (control switching is performed regardless of the range of ZSP)" so that monitoring of the zero speed status is disabled. However, note that vibration or shock may occur during switching the control mode.
- Set the system configuration with an unlimited operation range during the continuous operation to torque control mode because the stroke limit signal of the drive module cannot be used during the continuous operation to torque control mode.
  ☞ Page 169 Software Limit

8.26 Pressure Control

In the pressure control, the pressure value of a load cell is controlled by performing pressure control with a pressure control compatible servo amplifier (MR-J5-_G_-LL).

- The pressure control is performed by setting feed, dwell, and pressure release processes as profiles, and by switching to the pressure control mode during positioning with the automatic operation.
- The pressure control uses the cyclic synchronized pressure mode (cspr) that is a function of a drive unit.
- The pressure control is performed based on the pressure control profile.
- After the pressure control is completed, the operation is returned to the positioning control.

"Pressure control point" is performed in 1-point operation as follows: Starting positioning with automatic operation → Switch to cyclic synchronized pressure mode (cspr) → Feed/dwell/pressure release operations in cyclic synchronized pressure mode (cspr) → Return to cyclic synchronous position mode (csp).

> **Point**
>
> - The pressure control is supported in the basic system software version "05" or later.
> - The pressure control is available for MR-J5-_G_-LL only.
>   When performing the pressure control in a drive unit which does not support the cyclic synchronized pressure mode (cspr), "Pressure Control Initiation Error (operation alarm No.0061H, detail No.000FH)" occurs when the pressure control point is started.
> - Set the servo parameters "Speed/acceleration/deceleration unit selection (PT01.1)" and "Unit for position data (PT01.2)" as follows depending on the motor to be connected.
>   \<When connecting a rotary motor>
>   Set "Speed/acceleration/deceleration unit selection (PT01.1)" to "0: r/min" or "1: Command unit/s", and "Unit for position data (PT01.2)" to "3: pulse".
>   \<When connecting a linear motor>
>   Set "Speed/acceleration/deceleration unit selection (PT01.1)" to "1: Command unit/s", and "Unit for position data (PT01.2)" to "3: pulse".
>   When other than the above is set, "Slave Object Unit Error (operation alarm No.0082H, detail No.0001H)" occurs when the operation is started. In this case, review "Speed/acceleration/deceleration unit selection (PT01.1)" and "Unit for position data (PT01.2)" of the drive unit.
>   The units of the speed limit value sent to a drive unit are decided by the servo parameter "Speed/acceleration/deceleration unit selection (PT01.1)". The unit is [0.01r/min] if "Speed/acceleration/deceleration unit selection (PT01.1)" is set to "0: r/min", and [pulse/s] if set to "1: Command unit/s".
> - The maximum number of axes to perform the pressure control at the same time is 16. If the number of axes is more than 16, "Pressure Control Initiation Error (operation alarm No.0061H, detail No.0015H)" occurs.
> - Set the servo parameter "Forward/reverse-side stop function (PW12.2)" to "1 (Forward-side stop function: Enabled, reverse-side stop function: Disabled)". If the reverse-side stop function is set to "Enabled", "Pressure Control Initiation Error (operation alarm No.0061H, detail No.0017H)" occurs.
> - If the movement amount [command unit] per 1 operation cycle due to a follow up during the pressure control exceeds 8388607 (approx. 8m/s, with command unit nm and operation cycle 1ms), the amount is clamped at the maximum value. Therefore, the follow up delays, and the function to refer to the current command position is affected by a follow up delay. When using a function such as the software limit that refers to the current position to perform the stop processing, lower the speed limit when setting the speed limit value, or to prevent a delay in the stop processing, set the tip position in pressure control.

System configuration

A system configuration that uses a pressure control compatible servo amplifier (MR-J5-_G_-LL) is shown below.
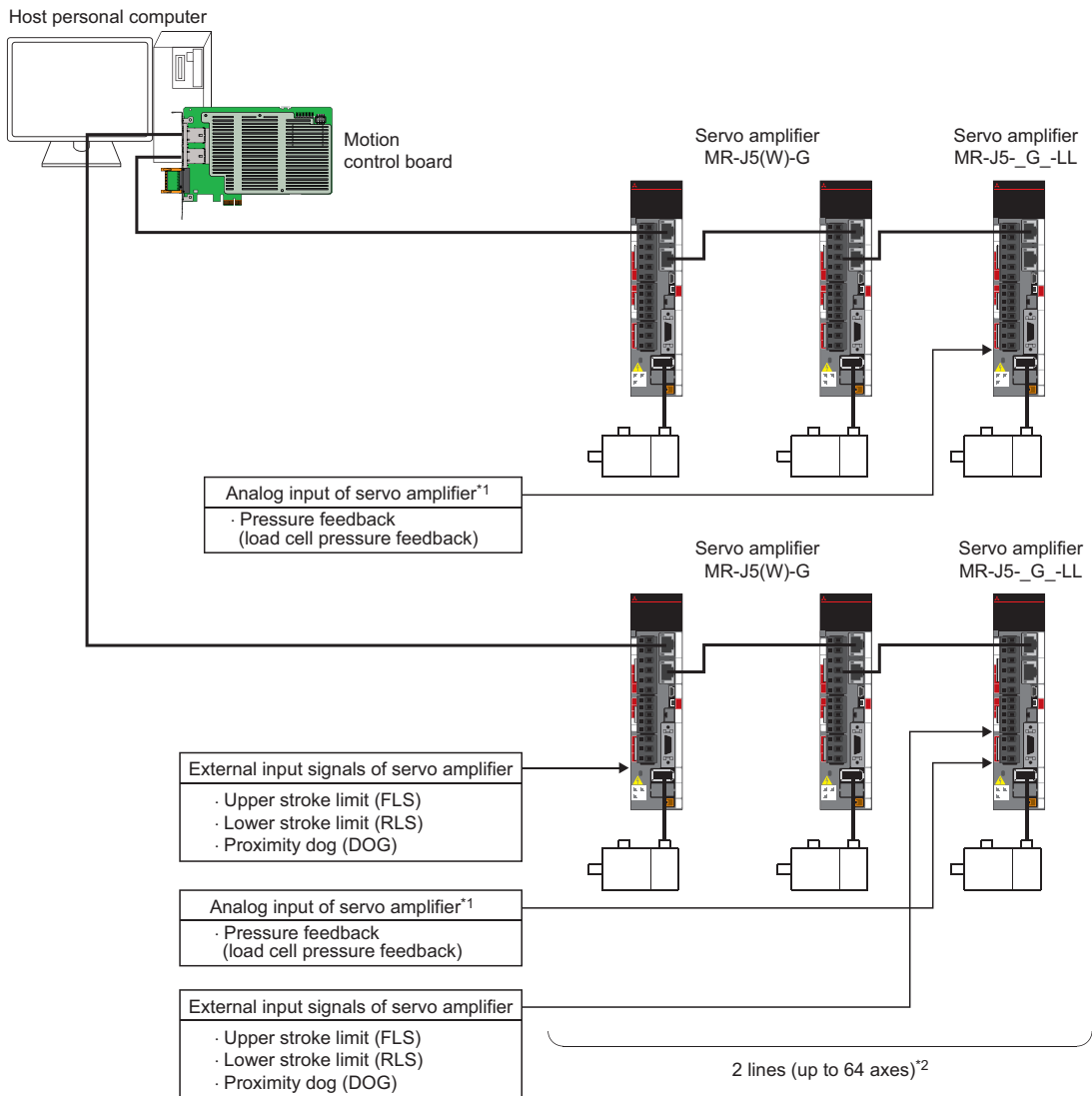
*1　Wire the load cell servo amplifier output to the analog input. For details, refer to the MR-J5-_G_-LL manual.

*2　The maximum number of axes to perform the pressure control function at the same time is 16.

Outline of pressure control

Outline

■Pressure control operation

Feed, dwell, and pressure release are the operations of the pressure control.

Operation	Outline	Processing details
Feed	The process to contact tip (the tip part of a machine that is pressed and pressured) and work and to gradually move the tip to the dwell start position.	(1) Move the tip closer to the work in low speed. (2) Contact the tip and the work. → The load cell pressure (pressure feedback) starts to increase. (3) Specify speed and pressure and gradually move the tip to the dwell start position. (Up to 32 steps) (4) Switch to the dwell operation.
Dwell	The process to specify the time of pressure and dwell, and to pressure the work.	(5) Specify the time of pressure and dwell, and pressure the work variously. (Up to 32 steps) (Example: low pressure → high pressure → middle pressure) (6) Return to the position control when the dwell, is completed.
Pressure release	Release the pressure from the work that was pressured in the dwell operation.	(7) Specify the pressure and lower the pressure for the work. → The load cell pressure (pressure feedback) starts to decrease. (8) The pressure release ends when the load cell pressure (pressure feedback) sufficiently decreased. Return to the position control.

■Data set to pressure control

Set the following data to the pressure control.

Data name	Setting items
Point table	• Set the pressure control profile No. (1 to 32) • Set the pressure control specification (bit8) of the auxiliary command 2 to "1: Pressure control valid". • To "Position" of the point table, set the positioning operation for the start position of feed operation (the position switched to the pressure control).
Pressure control profile	• Set a condition (such as the feedback position for switching) to switch from the position control to the pressure control. • Set the operation of feed/dwell/pressure release processes.
Servo parameter	For details about setting and adjustment of the pressure control system, and servo amplifier parameters, refer to the servo amplifier manual.

■Operation of pressure control point

"Pressure control point" is performed in 1-point operation as follows: Starting positioning with automatic operation → Switch to cyclic synchronized pressure mode (cspr) → Feed/dwell/pressure release operations in cyclic synchronized pressure mode (cspr) → Return to cyclic synchronous position mode (csp). For details about the operation, refer to the following.

• Feed/dwell operation

No.	Operation	Processing details	Control mode of drive unit
1	From automatic operation (positioning) to mode switching (position to pressure)	During positioning with the automatic operation, perform switching to the pressure control mode. Switch the mode by "Mode switching (position to pressure)" of the pressure control profile.	Cyclic synchronous position mode (csp)
2	Feed	Perform the feed operation by "Feed" of the pressure control profile.	Cyclic synchronous pressure mode (cspr)
3	Switching (feed to dwell)	Switch to the dwell operation from "Switching (feed to dwell)" of the pressure control profile.	
4	From dwell to mode switching (pressure to position)	Perform the dwell operation by "Dwell" of the pressure control profile. Switch to the cyclic synchronous position mode (csp) under the following conditions. • The switching condition of the last step in dwelling pressure is satisfied (setting "Dwelling pressure common option 1" is necessary). • The pressure control mode resetting signal(PSMRST) is turned ON.	
5	Point operation complete	Operation is completed upon the completion of switching to the cyclic synchronous position mode (csp).	Cyclic synchronous position mode (csp)

• Pressure release operation

No.	Operation	Processing details	Control mode of drive unit
1	From automatic operation (positioning) to mode switching (position to pressure)	During stopping, perform switching to the pressure control mode. Switch the mode by "Mode switching (position to pressure)" of the pressure control profile.	Cyclic synchronous position mode (csp)
2	From pressure release to mode switching (pressure to position)	Perform the pressure release operation by "Release" of the pressure control profile. Switch to the cyclic synchronous position mode (csp) under the following conditions. • The load cell pressure (pressure feedback) drops below the set pressure. • The pressure control mode resetting signal(PSMRST) is turned ON.	Cyclic synchronous pressure mode (cspr)
3	Point operation complete	Operation is completed upon the completion of switching to the cyclic synchronous position mode (csp).	Cyclic synchronous position mode (csp)

■Operation example

The following is the operation example of feed/dwell operations and pressure release operation. For details about each operation and switching conditions, refer to the following.

☞ Page 304 Operation of pressure control

PR☐ in the following operation example indicates Step ☐ of the pressure command, and V☐ indicates the speed limit value of Step ☐. ☐ indicates the initial value if it is 0.

• Feed/dwell operations

When setting "Mode switching (position to pressure) → Switching option 1" to "0: Feeding/dwelling pressure" in the pressure control profile, feed/dwell operations are started by switching to the cyclic synchronous pressure mode (cspr).
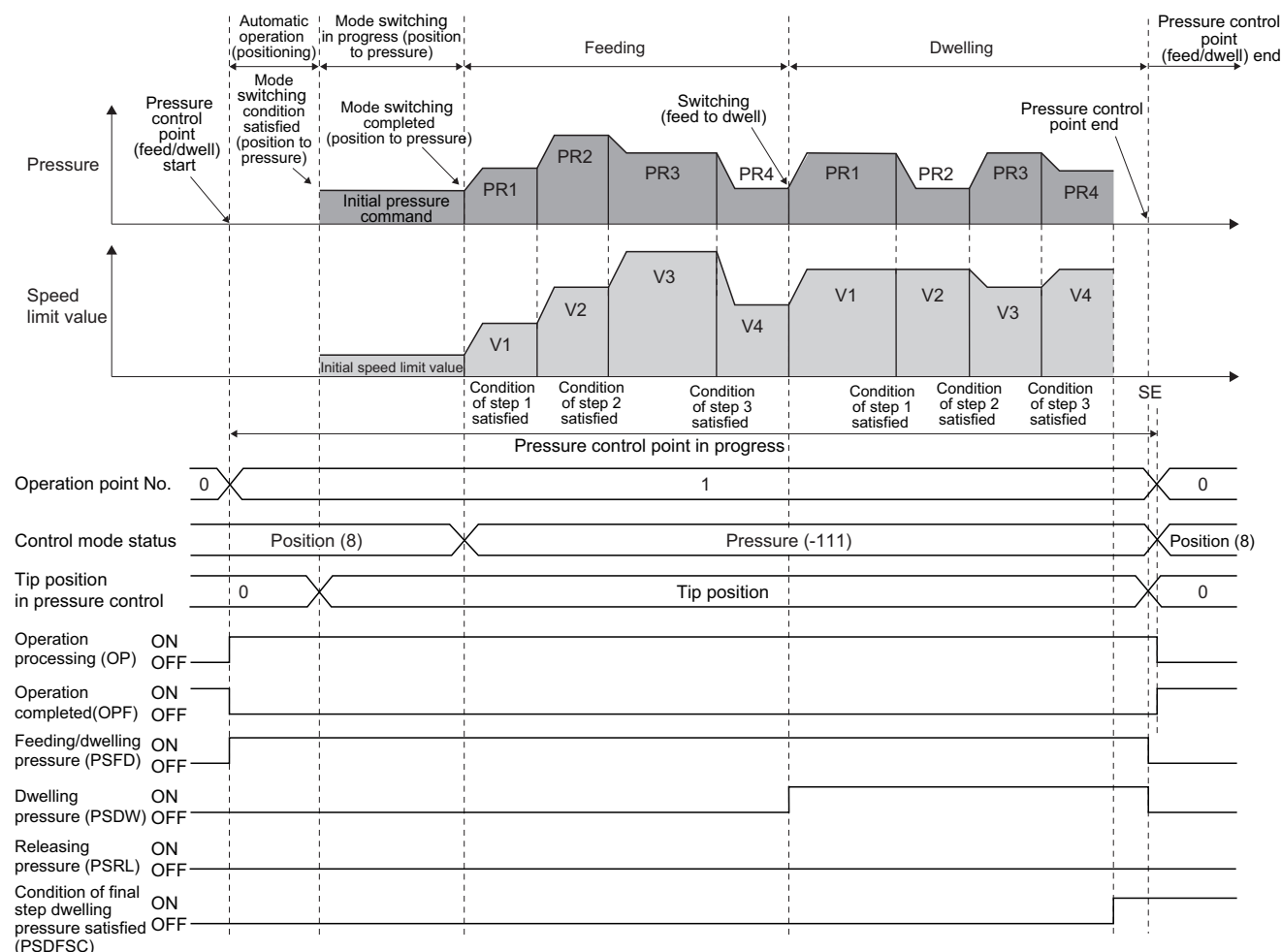
• Pressure release operation

When setting "Mode switching (position to pressure) → Switching option 1" to "1: Releasing pressure" in the pressure control profile, the pressure release operation is started by switching to the cyclic synchronous pressure mode (cspr).

●When performing the pressure control point of the pressure release operation after ending the pressure control point of feed/dwell (when performing two pressure control points continuously)
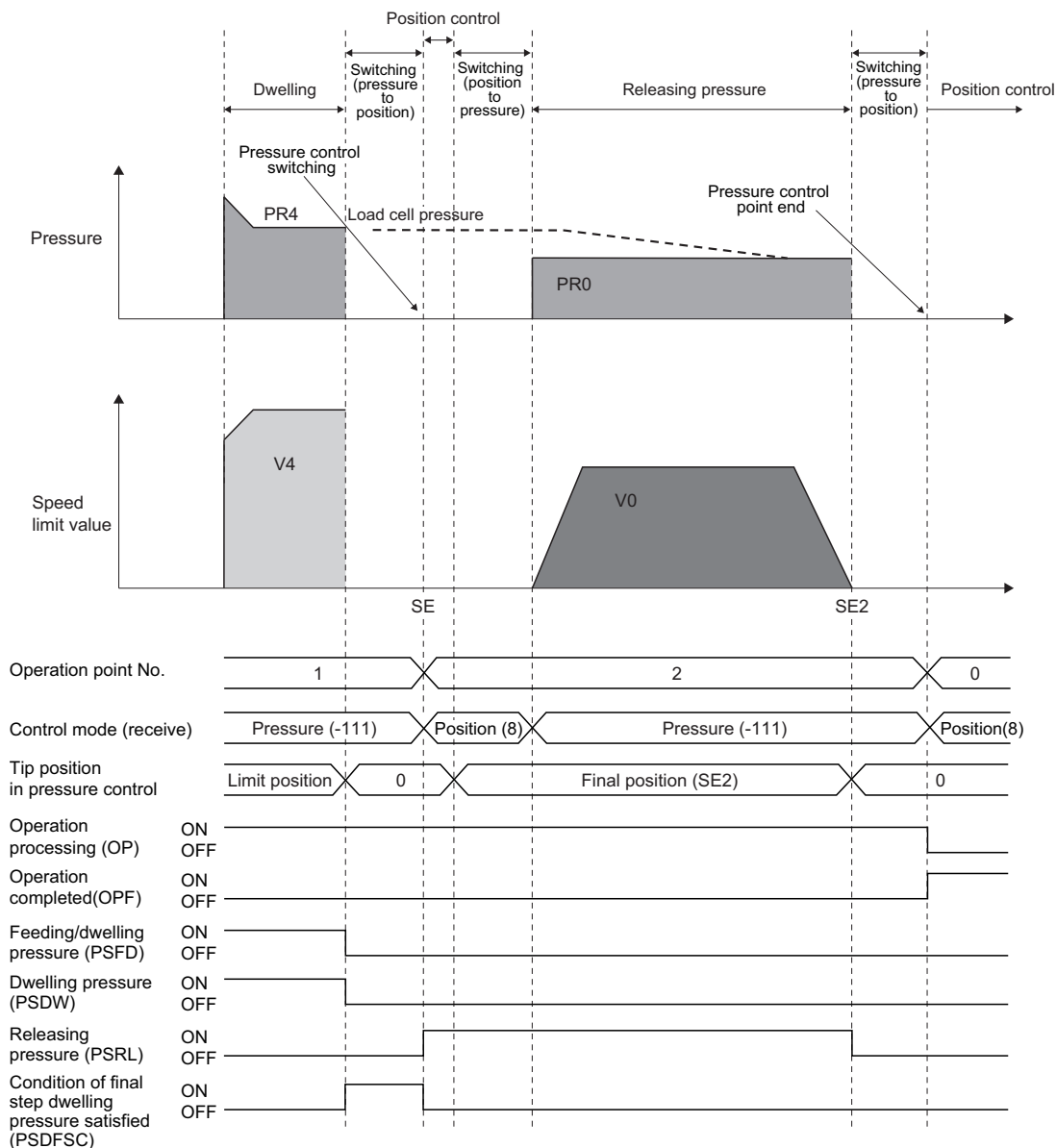
●When restarting the automatic operation and performing the pressure control point of the pressure release operation after once ending the operation of the pressure control point of feed/dwell operation (when operating the pressure control point every one point)
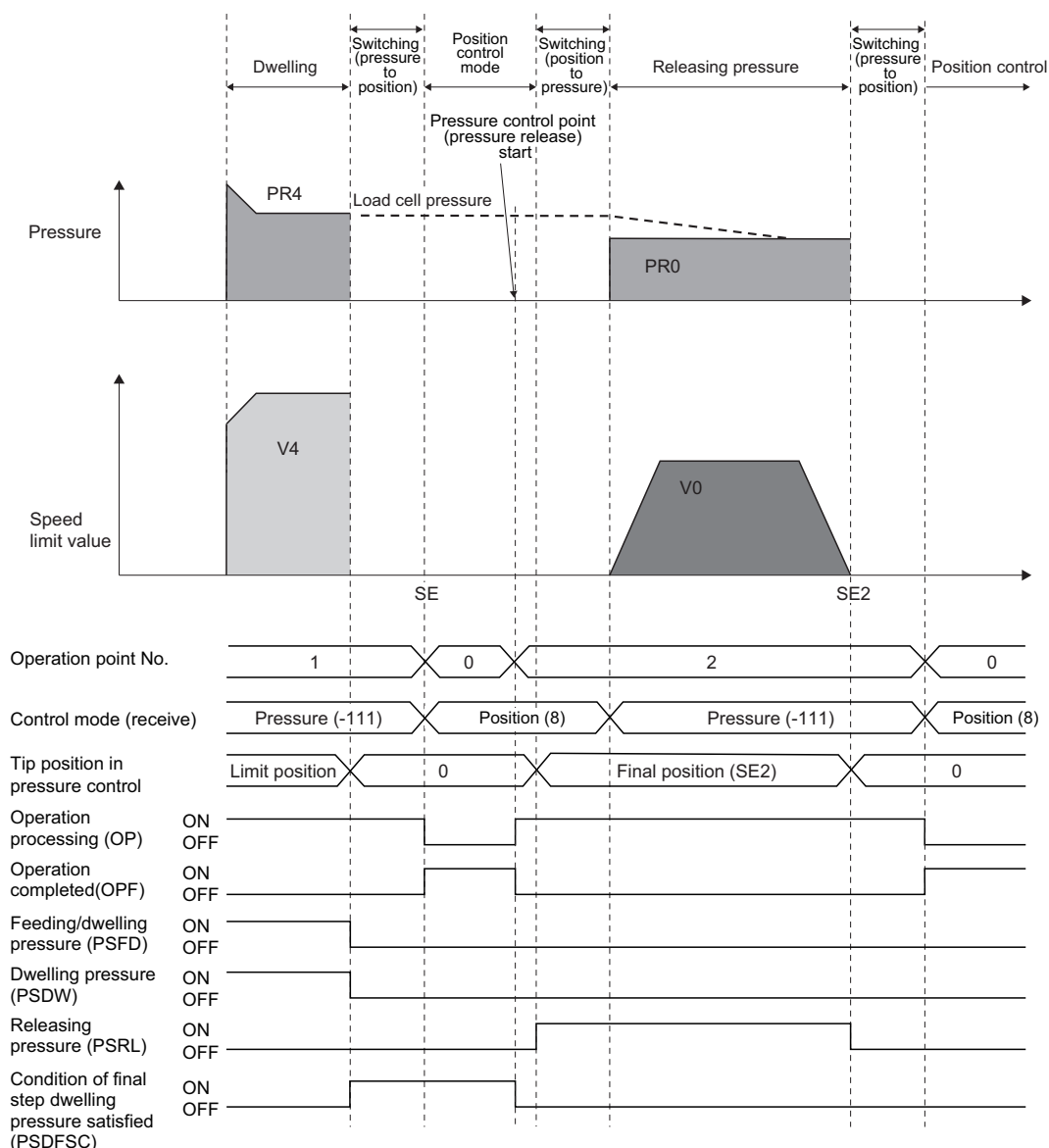
- The pressure release operation cannot be started directly from the dwell operation.
  Perform the pressure control point of the pressure release operation after ending the pressure control point of feed/dwell. Or, after once ending the operation of the pressure control point of feed/dwell operation, restart the automatic operation and perform the pressure control point of the pressure release operation.
- The pressure release operation starts while the axis is stopped. Therefore, after starting the pressure control point, switch to the pressure control mode immediately, and start the pressure release operation.
- When ending the pressure control and backing to the position control, end the operating point at this time, and switch to the next point. (Not moved to the position set as the position data of the point data before switching.)

Switch from position control to feed (pressure control)

By setting the pressure control specification (bit8) of the auxiliary command 2 to "1: Pressure control valid" in the point table to specify the pressure control profile No., the pressure control is performed without stopping the operation from the position where "Switching condition" of "Mode switching (position to pressure)" in the pressure control profile is satisfied. (Switching to the pressure control point is available without stopping the operation during positioning of the position control.)

Based on the pressure control profile, the operation is returned to the position control after the pressure control is completed.

> **Point**
>
> - Set the pressure control operation to "0: Feeding/dwelling pressure" or "1: Releasing pressure" of "Mode switching (position to pressure) → Switching option 1 → Select movement" in the pressure control profile.
> - When the pressure control and the continuous operation to torque control are specified at the same time, "Pressure Control Initiation Error" (operation alarm No.0061H, detail No.0002H)" occurs.
> - When the pressure control valid is specified for the axis used in tandem drive, "Pressure Control Initiation Error" (operation alarm No.0061H, detail No.0012H)" occurs.
> - When the pressure control valid is specified for the axes used in interpolation, "Pressure Control Initiation Error" (operation alarm No.0061H, detail No.0013H)" occurs.
> - Switching to the pressure control is available also by the Pressure control mode forced switching signal (PSMFSW).

Pressure control

The pressure control for feed/dwell is available.

The load sell pressure can be got by the sscGetPrsLoadCellPressure function of the Motion API. (The load cell pressure is used for pressure control F/B by the servo amplifier.)

Changing speed switching point

In the feed operation, when the switching conditions are satisfied at the startup of steps, control is performed with skipping.

- When performing step 1 to 5 in order in the feed operation

  (V1 to V5: speed limit of step 1 to 5)
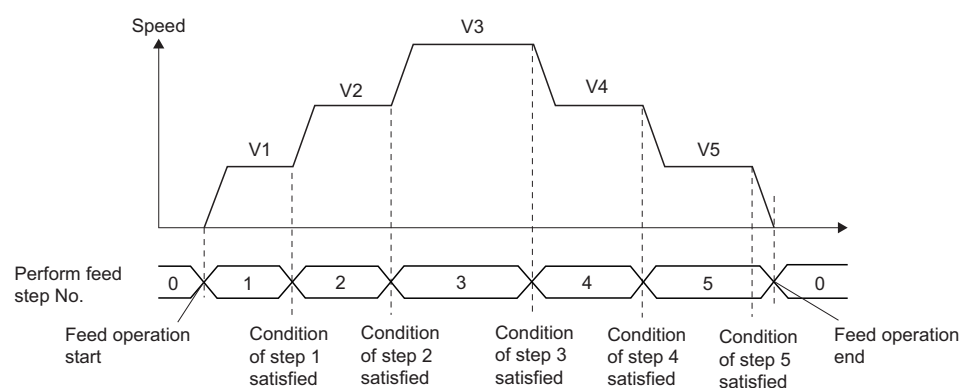
- When switching conditions of step 1 to 2 are satisfied in the feed operation
  (V3 to V5: speed limit of step 3 to 5)
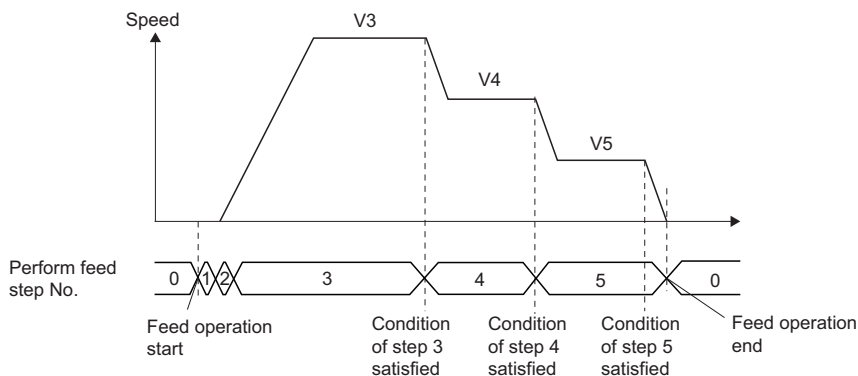
Stop at speed zero setting

When in feed/dwell operations and a switching point is set to speed 0, a deceleration stop is performed from that point. (When the acceleration/deceleration method is set to other than the linear acceleration/deceleration method in the pressure control point, the setting is valid only during the position control.

Ex.

When "V5 = 0", a deceleration stop is performed after the step 5 starts.

(V1 to V6: speed limit of step 1 to 6)
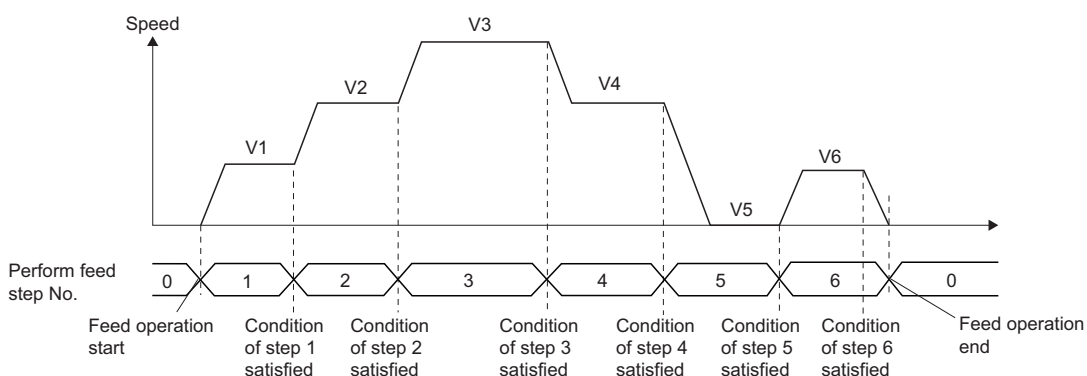
Precautions when backlash compensation is conducted on a pressure control axis

The backlash compensation is not conducted during the pressure control mode. Therefore, when setting the profile, consider that the backlash compensation is not performed.

Setting pressure profile data

The pressure profile data can be set with the motion test tool, or with the Motion API.

■Setting with motion test tool

Write the pressure control profile in the point data of the motion test tool.

For details about operation procedures, refer to the following.

🖘 Help of the motion test tool

🖘 [Project Tree]⇨[Point Data]

Window
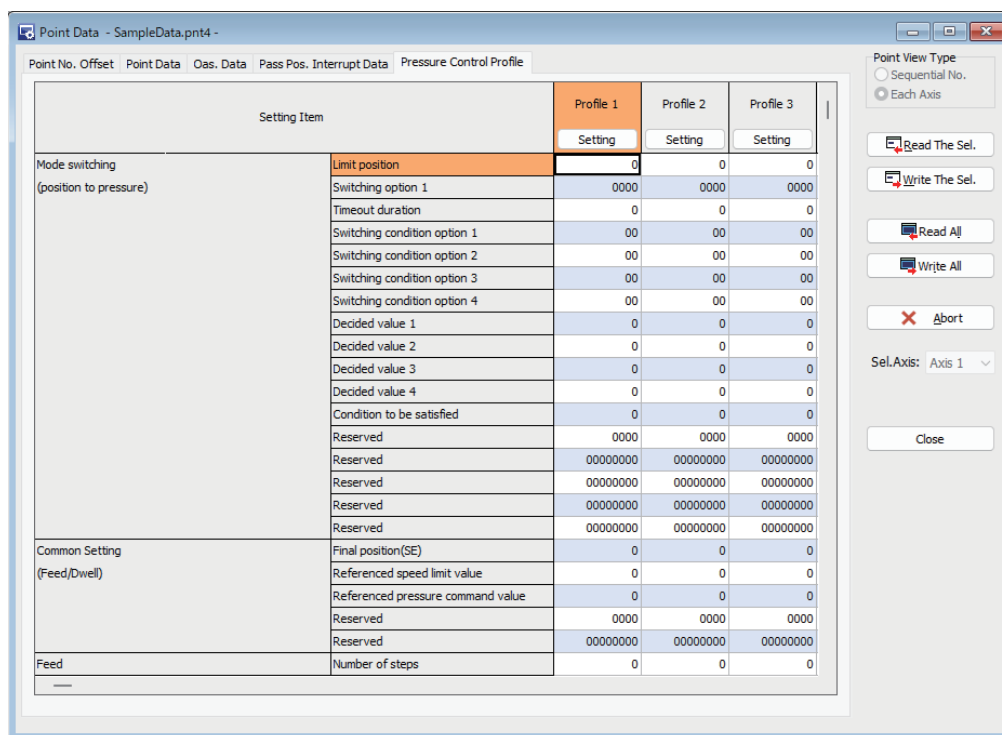
■Write/read with Motion API

Point

[Motion API]

To set/get the pressure profile data, use the following functions.

- Set/get the pressure profile data: sscSetPrsProfile function/sscGetPrsProfile function
- Speed limit value during the pressure control: sscSetPrsProfileSpeedLimit function/ sscGetPrsProfileSpeedLimit function
- Pressure command: sscSetPrsProfilePressureCommand function/sscGetPrsProfilePressureCommand function
- Limit position: sscSetPrsProfileLimitPosition function/sscGetPrsProfileLimitPosition function

Interface

Set the following data when using the pressure control.

Parameters

■Servo parameter (MR-J5-_G_-LL)

For details about setting and adjustment of the pressure control system, and servo amplifier parameters, refer to the servo amplifier manual.

Parameter No.	Symbol *1	Name	Detail No.	Detail name	Description
PC76	*COPE	Function selection C-E	PC76.1	ZSP disabled selection at control switching	Select whether to switch the control mode from or to the position mode within the ZSP range. • 0: Enabled (control switching is performed within the range of ZSP) • 1: Disabled (control switching is performed regardless of the range of ZSP) If set to "1: Disabled", control switching may cause a shock.
PT68	TOP11	Function selection T-11	PT68.0	Quick stop method selection	Select the quick stop method. • 0: Stop with dynamic brake • 1: Servo-off after deceleration to a stop at the deceleration time constant of any of the control modes • 2: Servo-off after deceleration to a stop with "Quick stop deceleration (Obj. 6085h)" • 5: Maintain servo-on after deceleration to a stop at the deceleration time constant of any of the control modes • 6: After deceleration to a stop with "Quick stop deceleration (Obj. 6085h)" After deceleration to a stop with "Quick stop deceleration (Obj. 6085h)", when "Pressure Control Error (operation alarm No.0063H, detail No.000CH)" occurs, perform the stop by the quick stop method of the servo amplifier, and during the servo OFF after the stop, perform the process (follow up) to match the command position and the feedback position. Therefore, set this parameter to 0h to 2h (setting for ready OFF or servo OFF). If set to 5h or 6h (setting to maintain servo ON), "Drive unit alarm [AL. 035_Command frequency error]" may occur. When performing the pressure control with a vertical axis, to prevent dropping when the servo is OFF, take the countermeasure such as installing a break or a stopper.
PW12	*WOP1	Function selection W-1	PW12.1	Selection of pressure increasing direction for positioning address	Select a pressure increasing direction for the positioning address. • 0: Pressure increases as the positioning address decreases • 1: Pressure increases as the positioning address increases For the cyclic synchronous pressure mode (cspr), the servo motor rotation direction and the pressure increasing direction are the combination with "Travel direction selection (PA14).[*2]
			PW12.2	Forward/reverse-side stop function	Enable/disable the forward/reverse-side stop function. • 0… Forward-side stop: Enable, Reverse-side stop: Enabled • 1… Forward-side stop: Enabled, Reverse-side stop: Disabled • 2… Forward-side stop: Disabled, Reverse-side stop: Disabled Set "1" when using the Motion control board. For the mode in which the pressure control axis keeps reversing with an error of the pressure sensor (load cell) during the pressure control, set the software limit with the Motion control board. For details, refer to the following. ☞ Page 169 Software Limit

Parameter No.	Symbol *1	Name	Detail No.	Detail name	Description
PW13	*WOP1	Function selection W-2	PW13.4	Control switching method setting	Set to enabled to reduce the shock when switching "Modes of operation [Obj. 6060h]" from the cyclic synchronous position mode (csp) to the cyclic synchronous pressure mode (cspr). • 0: Disabled • 1: Enabled • 2: Set disabled/enabled with controller ■When setting to "1: Enabled" The operation of the servo amplifier is as follows. To the conditions when the control mode is switched from the cyclic synchronous position mode (csp) to the cyclic synchronous pressure mode (cspr), add the condition that the command speed is less than or equal to the speed limit command. When the mode is not switched to the cyclic synchronous pressure mode (cspr) after the servo parameter "Control mode switching waiting time (PW38)" passes, "Drive unit alarm [AL.19E.6 Control mode switching waiting warning]" occurs. ■When setting to "0: Disabled" For operations of the servo amplified, refer to the section 1.4 "Drive profile" in the following manual. MR-J5-G/MR-J5W-G User's Manual (Communication Function)
PW21	AFBO	Pressure control feedback offset	—	—	Set the pressure control feedback offset voltage. When "100" is set, -100mV is compensated. When "-100" is set, +100mV is compensated. Normally, set "0". When performing the offset adjustment by a user program, change the servo parameter by read/change function of the servo parameter.
PW38	MOPWT	Control mode switching waiting time	—	—	Set the detection time of "Drive unit alarm [AL.19E.6 Control mode switching waiting warning]". For details, refer to the servo parameter "Control switching method setting (PW13.4)" in this table.

*1   For the settings for the parameters with a * mark at the front of the symbol, turn on the power again after the settings, or reset either the controller or the software.

*2   For the cyclic synchronous pressure mode (cspr), the servo motor rotation direction and the pressure increasing direction are as follows.

Setting value of parameter		Positioning address increasing direction		Positioning address decreasing direction	
Selection of pressure increasing direction for positioning address (PW12.1)	Travel direction selection (PA14)	Pressure	Motor rotation direction	Pressure	Motor rotation direction
0: Pressure increases as the positioning address decreases	0	Decrease	CCW	Increase	CW
	1		CW		CCW
1: Pressure increases as the positioning address increases	0	Increase	CCW	Decrease	CW
	1		CW		CCW

Point

The operations when a servo amplifier in which the forward-side stop function is enabled exceeds the tip position in pressure control are as follows.

• If "Driver command discard detection" of "Control option 5 (parameter No.0212)" is set to "0: Detection valid", "Drive Unit Command Discard Detected (operation alarm No.00C0H, detail No.0001H)" occurs, and the operation is stopped.

• If "Driver command discard detection" of "Control option 5 (parameter No.0212)" is set to "1: Detection invalid", a torque in the direction of return to the limit position is generated.

■Control parameter

Parameter No.	Symbol	Name	Initial value	Unit	Setting range	Description
0228	SLPL	Software limit Upper limit (lower)	0	Command units	-2147483648 to 2147483647	Set the + side of the software limit.
0229	SLPH	Software limit Upper limit (upper)				
022A	SLNL	Software limit Lower limit (lower)	0	Command units	-2147483648 to 2147483647	Set the - side of the software limit.
022B	SLNH	Software limit Lower limit (upper)				

Point

[Motion API]

To set/get parameters, use the sscChange2Parameter function/sscCheck2Parameter function.

Point table

Point	Position data [command unit]	Feed speed [speed unit][1]	Acceleration time constant [ms][2]	Deceleration time constant [ms][2]	Dwell/ predwell [ms][2]	Auxiliary command	Other axes start specification	S-curve ratio [%]	Pressure control profile No.
	4bytes	4bytes	2bytes	2bytes	2bytes	2bytes	4bytes	1byte	1byte
0000	2000	2000	20	30	0	0000h	00000000h	0	1
0001	5000	2000	30	50	0	0000h	00000000h	0	2
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮

...	For manufacturer setting	Interpolation axis No.[3]	Arc coordinate [3]	Acceleration/ deceleration data 1	Acceleration/ deceleration data 2	Acceleration/ deceleration data 3	Acceleration/ deceleration data 4	Auxiliary command 2	For manufacturer setting
	2bytes	4bytes	4bytes	2bytes	2bytes	2bytes	2bytes	2bytes	6bytes
...	0	00000000h	0	200	200	20	30	0000h	0
...	0	00000000h	0	500	200	30	50	0000h	0
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮

*1 Not used in the pressure release. Set an arbitrary value within the setting range.
*2 The time specified by the acceleration constant, the deceleration constant and the dwell is rounded off on the basis of the operation cycle. (The value is rounded to the nearest integer.)
<Example> When the dwell is specified to 5ms with the operation cycle of 2.0ms
The time until the running point is completed after the completion of the point movement is 2 operation cycles (4.0ms).
*3 Not used in the automatic operation. The setting is invalid.

■Pressure control profile No.

Set the pressure control profile No. (1 to 32) to be started.

When the pressure control specification (bit8) of the auxiliary command 2 is set to "1: Pressure control valid" and the pressure control profile No. is set, the pressure control is performed according to the corresponding pressure control profile.

■Auxiliary command

The auxiliary command can be set in the following procedure.

Position command system (bit0)
For manufacturer setting (bit1)
Vibration suppression command filter 1 specification (bit2)
For manufacturer setting (bit3)
Deceleration check system (bit4 to 5)
Speed switching point specification (bit6)
Dwell specification (bit7)
Pass position interrupt specification (bit8)
Continuous operation to torque control specification (bit9)
For manufacturer setting (bit10)
Loop specification (bit11 to 12)
Interpolation method (bit13 to 15)[*1]

*1 Not used in the pressure control. The setting is invalid.

Bit	Name	Description
0	Position command system	• 0: Absolute position command • 1: Relative position command
2	Vibration suppression command filter 1 specification	• 0: Vibration suppression command filter 1 disabled • 1: Vibration suppression command filter 1 enabled
4 to 5	Deceleration check system	Regardless of the setting, point movement is complete at the completion of pressure control. The continuous operation is invalid.
6	Speed switching point specification	Speed switching point specification is invalid.
7	Dwell specification	Specify "0: Dwell". When "1: Predwell" is specified, "Pressure Control Initiation Error (operation alarm No.0061H, detail No.001BH)" occurs.
8	Pass position interrupt specification	• 0: Pass position interrupt invalid • 1: Pass position interrupt valid
9	Continuous operation to torque control specification	Select "0: Continuous operation to torque control invalid". When the pressure control and the continuous operation to torque control are specified at the same time, "Pressure Control Initiation Error" (operation alarm No.0061H, detail No.0002H)" occurs.

■Auxiliary command 2

To the pressure control specification (bit8) of the auxiliary command 2, set the point where the pressure control is performed.

Acceleration/deceleration method (bit0 to 2)
For manufacturer setting (bit3 to 7)
Pressure control specification (bit8)
For manufacturer setting (bit9 to 15)
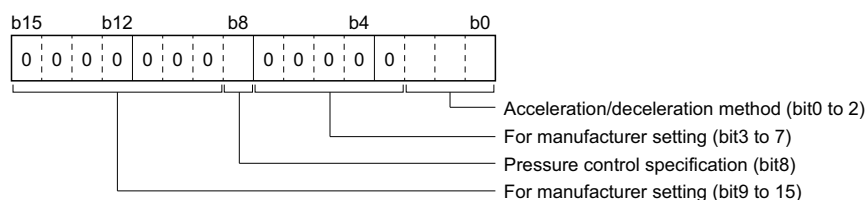
Bit	Name	Description
0 to 2	Acceleration/deceleration method[*1]	• 0: Linear acceleration/deceleration, S-curve acceleration/deceleration • 1: Jerk ratio acceleration/deceleration
8	Pressure control specification	• 0: Pressure control invalid • 1: Pressure control valid When "1: Pressure control valid" is set and the pressure control profile No. is set, the pressure control is performed according to the corresponding pressure control profile.

*1 When the acceleration/deceleration method is set outside of the setting range, "Point Table Setting Error (operation alarm No.0025H, detail No.0012H)" occurs, and the operation is stopped.

- When the acceleration/deceleration method is set to S-curve acceleration/deceleration or jerk ratio acceleration/deceleration at the pressure control point, the setting is valid only during the positioning control before switched to the pressure control.
- The speed limit value and the pressure control value are controlled by the linear acceleration/deceleration method.
- The position data indicates the stop position when not switched to the pressure control. For details about the switching to the pressure control, refer to the following.

☞ Page 307 Switching from position control to pressure control

Point

[Motion API]

To set/get the point data, use the sscSetPointDataEx function/sscCheckPointDataEx function.

Pressure control profile

- There are pressure control profile data ranging from No.1 to 32.
- Specify the pressure control profile No. (1 to 32) in the point table.
- The maximum number of steps in the feed operation is 32, and the maximum number of steps in the dwell operation is 32.

■Outline of pressure control profile (1 profile)

To perform the pressure control, set the following items.

Items	Description		Remarks	Reference
Mode switching (position to pressure)	Limit position		Set the conditions to switch from the position control to the pressure control.	Page285 Mode switching (position to pressure)
	Switching option 1			
	Timeout duration of drive unit control mode switching			
	Switching condition			
Common Setting (Feed / Dwell)	Final position (SE)		Set for feed/dwell operations.	Page286 Common Setting (Feed / Dwell)
	Referenced speed limit value			
	Referenced pressure command value			
Feed	Number of steps		Set for the feed operation.	Page287 Feed
	Feeding common option 1			
	Initial command	Initial speed limit value		
		Initial pressure command value		
	Step No.1 to 32	Limit position		
		Speed limit value (Vn)		
		Pressure command value (PRn)		
		Speed limit time constant		
		Pressure command time constant		
		Switching condition		
Switching (feed to dwell)	Switching option 1		Set the conditions to switch from the feed operation to the dwell operation.	Page290 Switching (feed to dwell)
	Pressure switching settings	Switching pressure		
		Switching time		
	Switching condition			

Items	Description		Remarks	Reference
Dwell	Number of steps		Set for the dwell operation.	Page291 Dwell
	Dwelling pressure common option 1			
	Step No.1 to 32	Limit position		
		Speed limit value (Vn)		
		Pressure command value (PRn)		
		Dwelling pressure option 1		
		Speed limit time constant		
		Pressure command time constant		
		Switching condition		
Release	Final position (SE2)		Set for the pressure release operation.	Page294 Release
	Referenced speed limit value			
	Initial speed limit value (V0)			
	Initial pressure command value (PR0)			
	Speed limit time constant			
	Speed limit stopping time constant			

Point

For the data step No.1 to 32 of Feed and Dwell, import them at the following timing, and check errors.

- Feed step No.1 to 2: startup of the pressure control point
- Feed step No.3 and after: start of the preceding step
- Dwell step No.1: startup of the pressure control point
- Dwell step No.2 and after: start of the preceding step

When setting the value outside the range, "Pressure Control Setting Error (operation alarm No.0062H)" occurs.

■Details of pressure control profile (1 profile)

The address in the table is the address for the profile 1. For the profile 2 and after, add "+F00h" for each profile.

• Mode switching (position to pressure)

○: Setting necessary, △: Setting necessary when used

Address (hexadecimal)	Items	Availability of change during performing pressure control operation	Setting necessary/unnecessary		Unit	Setting range	Description
			Feed/dwell operation	Pressure release operation			

0008CA00
0008CA01
0008CA02
0008CA03
	Limit position	Not available	○	○	Command unit	-2147483648 to 2147483647	Set the limit position to perform the stop judgement during position control before switching to the pressure control. The position command system depends on the setting of the auxiliary command of the point table.
							• Specify under the following conditions.
							  Rotation direction of point operation = forward: limit position ≤ target position of point
							  Rotation direction of point operation = reverse: target position of point ≤ limit position
							• When the software limit is valid
							  Rotation direction of point operation = forward: limit position ≤ software limit (upper limit)
							  Rotation direction of point operation = reverse: software limit (lower limit) ≤ limit position

0008CA04
0008CA05
	Switching option 1	Not available	○	○	—	0000h to 011Fh	■■■□ (Select movement)
							Select the operation after switching to the pressure control.
							• 0: Feeding/dwelling pressure
							• 1: Releasing pressure
							■■□■ (Forced switch to pressure control mode)
							Set whether to switch to the pressure control by turning OFF to ON the axis bit signal (pressure control mode forced switching signal (PSMFSW)) during the position control of the pressure control point.
							• 0: Disable
							• 1: Enable
							■□■■ (Select switching delay)
							When switching from the cyclic synchronous position mode (csp) to the pressure control mode while the axis is moving, select whether to adjust the switch timing to prevent shock from occurring. (Setting is not necessary when switching the control mode during stopping.)
							• 0: Switching delay enabled
							  (The servo amplifier adjusts the switch timing to prevent shock from occurring. The switching time may be longer when there is a big difference between the speed at switching and the speed limit value command.)
							• 1: Switching delay disabled
							  (The servo amplifier immediately switches the control mode. Vibration or shock may occur at switching while the axis is moving.)

0008CA06 0008CA07	Timeout duration	Not available	△	△	ms	0 to 65535	Set the timeout duration of control mode switching • 0: Default value 60 [ms] • 1 to 65535: Timeout duration [ms] Setting "Timeout duration (PW38)" of the servo parameter is also necessary.

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Address (hexadecimal)	Items	Availability of change during performing pressure control operation	Setting necessary/unnecessary		Unit	Setting range	Description
			Feed/dwell operation	Pressure release operation			
0008CA08 ⋮ 0008CA27	Switching condition	Not available	○	○	—	—	Set the conditions to switch operations. For details, refer to the following. ☞ Page 307 Switching from position control to pressure control
0008CA28 ⋮ 0008CA2F	For manufacturer setting	—	—	—	—	—	—

- Common Setting (Feed / Dwell)

○: Setting necessary, ×: Setting not necessary

Address (hexadecimal)	Items	Availability of change during performing pressure control operation	Setting necessary/unnecessary		Unit	Setting range	Description
			Feed/dwell operation	Pressure release operation			
0008CA30 0008CA31 0008CA32 0008CA33	Final position (SE)	Not available	○	×	Command unit	-2147483648 to 2147483647	Set the final target position.
0008CA34 0008CA35 0008CA36 0008CA37	Referenced speed limit value	Not available	○	×	Speed unit	1 to 2147483647	Set the referenced value of the speed limit time constant. The speed limit time constant is the time to reach the referenced speed limit value from 0.
0008CA38 0008CA39	Referenced pressure command value	Not available	○	×	Pressure unit	1 to 32767	Set the referenced value of the pressure command time constant. The pressure command time constant is the time to reach the referenced pressure command value.
0008CA3A ⋮ 0008CA3F	For manufacturer setting	—	—	—	—	—	—

- Feed

○: Setting necessary, △: Setting necessary when used, ✕: Setting not necessary

Address (hexadecimal)	Items		Availability of change during performing pressure control operation	Setting necessary/ unnecessary		Unit	Setting range	Description
				Feed/ dwell operation	Pressure release operation			
0008CA40 0008CA41	Number of steps		Not available	○	✕	—	1 to32	Set the number of steps of in feeding data. Set the set step number.
0008CA42 0008CA43	Feeding common option 1		Not available	△	✕	—	0000h to 001Fh	■■■□ (Select initial speed limit value) Select the initial value of speed limit value for feeding operation. • 0: Command speed while switching The initial value of speed limit value is 0 if pressure control is executed while axes stop. The initial value of speed limit value is the command speed value when switching limited by initial speed limit value if pressure control is started while axes are moving. • 1: Initial speed limit value ■■□■ (Select initial pressure command value) Select the initial value of pressure command for feeding operation. • 0: Disabled (Initial value is 0) • 1: Enabled (Enables the setting of the initial pressure command value)
0008CA44 0008CA45 0008CA46 0008CA47	Initial command	Initial speed limit value	Not available	△	✕	Speed unit	0 to 2147483647	Set the initial value of speed limit value for feeding operation. ■If "Select initial speed limit value" is "0: Command speed while switching" Set the value to limit the initial value of speed limit value. • 0: Doesn't limit the initial value of speed limit value. • Except 0: Limit the initial value of speed limit value by the setting value. ■If "Select initial speed limit value" is "1: Initial speed limit value" The initial value of speed limit value is set.
0008CA48 0008CA49		Initial pressure command value	Not available	△	✕	Pressure unit	0 to 32767	Set the initial value of pressure command for feeding operation. • 0: Assign pressure feedback (Load cell pressure is set to the initial pressure command. If the load cell pressure is below zero, 0 is set instead.) • Except 0: Set the setting value to the initial pressure command.
0008CA4A ⋮ 0008CA4F	For manufacturer setting		—	—	—	—	—	—

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Address (hexadecimal)	Items		Availability of change during performing pressure control operation	Setting necessary/unnecessary		Unit	Setting range	Description
				Feed/ dwell operation	Pressure release operation			
0008CA50 0008CA51 0008CA52 0008CA53	Step No.1	Limit position	Available	○	×	Command unit	-2147483648 to 2147483647	Set the limit position where the axis can reach in feeding operation.[1]
0008CA54 0008CA55 0008CA56 0008CA57		Speed limit value (V1)	Available	○	×	Speed unit	0 to 2147483647	Set the speed limit value at the initial step in feeding operation.
0008CA58 0008CA59		Pressure command value (PR1)	Not available	○	×	Pressure unit	0 to 32767	Set the pressure command value at the initial step in feeding operation.
0008CA5A 0008CA5B		For manufacturer setting	—	—	—	—	—	—
0008CA5C 0008CA5D 0008CA5E 0008CA5F		Speed limit time constant	Not available	○	×	ms	0 to 8388608	Set the accelerating/decelerating time of the speed limit value. Set the time of the duration when the speed limit value reaches the referenced speed limit value from 0.
0008CA60 0008CA61 0008CA62 0008CA63		Pressure command time constant	Not available	○	×	ms	0 to 8388608	Set the accelerating/decelerating time of the pressure command. Set the time of the duration when the pressure command reaches the referenced speed limit value from 0.
0008CA64 ⋮ 0008CA67		For manufacturer setting	—	—	—	—	—	—
0008CA68 ⋮ 0008CA87		Switching condition	Not available	○	×	—	—	Refer to the following. ☞ Page 296 Details of pressure control switching condition
0008CA88 ⋮ 0008CABF	Step No.2		Same as step No.32					
0008CAC0 ⋮ 0008CAF7	Step No.3		Same as step No.32					
⋮	⋮							

Address (hexadecimal)	Items		Availability of change during performing pressure control operation	Setting necessary/ unnecessary		Unit	Setting range	Description
				Feed/ dwell operation	Pressure release operation			
0008D118 0008D119 0008D11A 0008D11B	Step No.32	Limit position	Available	△	×	Command unit	-2147483648 to 2147483647	Set the limit position where the axis can reach in feeding operation.[1]
0008D11C 0008D11D 0008D11E 0008D11F		Speed limit value (V32)[2]	Available	△	×	Speed unit	0 to 2147483647	Set the speed limit value at the initial step in feeding operation.
0008D120 0008D121		Pressure command value (PR32)[3]	Not available	△	×	Pressure unit	0 to 32767	Set the pressure command value at the initial step in feeding operation.
0008D122 0008D123		For manufacturer setting	—	—	—	—	—	—
0008D124 0008D125 0008D126 0008D127		Speed limit time constant	Not available	△	×	ms	0 to 8388608	Set the accelerating/decelerating time of the speed limit value. Set the time of the duration when the speed limit value reaches the referenced speed limit value from 0.
0008D128 0008D129 0008D12A 0008D12B		Pressure command time constant	Not available	△	×	ms	0 to 8388608	Set the accelerating/decelerating time of the pressure command. Set the time of the duration when the pressure command reaches the referenced speed limit value from 0.
0008D12C ⋮ 0008D12F		For manufacturer setting	—	—	—	—	—	—
0008D130 ⋮ 0008D14F		Switching condition	Not available	△	×	—	—	Refer to the following. ☞ Page 296 Details of pressure control switching condition

*1 If "Driver command discard detection" of "Control option 5 (parameter No.0212)" is set to "0: Detection valid", when the limit position is exceeded, "Drive Unit Command Discard Detected (operation alarm No.00C0H, detail No.0001H)" occurs, and the operation is stopped. If "Driver command discard detection" of "Control option 5 (parameter No.0212)" is set to "1: Detection invalid", when the limit position is exceeded, torque in the direction of return to the limit position is generated by the drive unit.

*2 Vn (n=2 to 31) for step No.2 to 31.

*3 PRn (n=2 to 31) for step No.2 to 31.

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- Switching (feed to dwell)

○: Setting necessary, △: Setting necessary when used, ✕: Setting not necessary

Address (hexadecimal)	Items		Availability of change during performing pressure control operation	Setting necessary/unnecessary		Unit	Setting range	Description
				Feed/dwell	Pressure release			
0008D150 0008D151	Switching option 1		Not available	△	✕	—	0000h to 0011h	■■■□ (Forced switch to dwelling pressure) Select whether dwelling pressure operation is switched by the axis bit signal named dwelling pressure forced switching signal (PSDFSW) while in feeding operation. • 0: Disabled • 1: Enabled ■■□■ (Select pressure switching) Select whether the operation is forcibly switched from feeding operation to dwelling pressure operation if the duration of the pressure which equals the switching pressure or more continues more than switching time. • 0: Disabled • 1: Enabled
0008D152 0008D153	Pressure switching settings	Switching pressure	Not available	△	✕	Pressure unit	0 to 32767	Set the value of switching pressure (load cell pressure).
0008D154 0008D155 0008D156 0008D157		Switching time	Not available	△	✕	ms	0 to 327670	Set the time how long the duration of the pressure that equals the switching pressure or more continues until the operation is forcibly switched from feeding operation to dwelling pressure operation.
0008D158 ⋮ 0008D177	Switching condition		Not available	○	✕	—	—	—
0008D178 ⋮ 0008D17F	For manufacturer setting		—	—	—	—	—	—

• Dwell

○: Setting necessary, △: Setting necessary when used, ×: Setting not necessary

Address (hexadecimal)	Items	Availability of change during performing pressure control operation	Setting necessary/unnecessary		Unit	Setting range	Description
			Feed/dwell	Pressure release			
0008D180 0008D181	Number of steps	Not available	○	×	—	1 to 32	Set the number of steps in dwelling pressure data. Set the set step number.
0008D182 0008D183	Dwelling pressure common option 1	Not available	△	×	—	0000h to 0001h	■■■□ (Mode reset) Select whether mode resetting is executed when the switching condition of the last step in dwelling pressure is satisfied. (Return to the position control from the pressure control.) • 0: Mode reset enabled (Return to the position control from the pressure control after mode reset.) • 1: Mode reset disabled When setting "0: Mode reset enabled", if the switching condition of the final dwelling step is satisfied, the mode is automatically switched to the position control. When setting "1: Mode reset disabled", perform the mode reset by the pressure control mode resetting signal (PSMRST). For details about the state transition during dwelling, refer to (7) in the following illustration. ☞ Page 304 State transition
0008D184 ⋮ 0008D18F	For manufacturer setting	—	—	—	—	—	—

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Address (hexadecimal)	Items		Availability of change during performing pressure control operation	Setting necessary/ unnecessary		Unit	Setting range	Description
				Feed/ dwell	Pressure release			
0008D190 0008D191 0008D192 0008D193	Step No.1	Limit position	Available	○	×	Command unit	-2147483648 to 2147483647	Set the limit position where the axis can reach in dwelling pressure operation.[1]
0008D194 0008D195 0008D196 0008D197		Speed limit value (V1)	Not available	○	×	Speed unit	0 to 2147483647	Set the speed limit value in dwelling pressure operation.
0008D198 0008D199		Pressure command value (PR1)	Available/not available	○	×	Pressure unit	0 to 32767	Set the pressure command value in dwelling pressure operation. If "Dwelling pressure time constant" is "0: Time constant is enabled.", this value can be changed during dwelling pressure operation. If "Dwelling pressure time constant" is "1: Time constant is disabled.", this value cannot be changed during dwelling pressure operation.
0008D19A 0008D19B		Dwelling pressure option 1	Not available	△	×	—	0000h to 0001h	■■■□ (Dwelling pressure time constant) Select whether to enable or disable the dwelling pressure time constant in dwelling pressure operation. For details, refer to the following. ☞ Page 328 Pressure command control mode • 0: Time constant is enabled. • 1: Time constant is disabled. (Pressure command between steps are connected by a straight line with the time constant disabled.) The time constant is enabled for the speed limit value.
0008D19C 0008D19D 0008D19E 0008D19F		Speed limit time constant	Not available	○	×	ms	0 to 8388608	Set the accelerating/decelerating time of the speed limit value. Set the time of the duration when the speed limit value reaches the referenced speed limit value from 0.
0008D1A0 0008D1A1 0008D1A2 0008D1A3		Pressure command time constant	Not available	○	×	ms	0 to 8388608	Set the accelerating/decelerating time of the pressure command. Set the time of the duration when the pressure command reaches the referenced speed limit value from 0.
0008D1A4 ⋮ 0008D1A7		For manufacturer setting	—	—	—	—	—	—
0008D1A8 ⋮ 0008D1C7		Switching condition	Not available	○	×	—	—	Refer to the following. ☞ Page 296 Details of pressure control switching condition
0008D1C8 ⋮ 0008D1FF	Step No.2		Same as step No.32					
0008D200 ⋮ 0008D237	Step No.3		Same as step No.32					
⋮	⋮							

Address (hexadecimal)	Items		Availability of change during performing pressure control operation	Setting necessary/unnecessary		Unit	Setting range	Description
				Feed/dwell	Pressure release			
0008D858 0008D859 0008D85A 0008D85B	Step No.32	Limit position	Available	△	×	Command unit	-2147483648 to 2147483647	Set the limit position where the axis can reach in feeding operation.[1]
0008D85C 0008D85D 0008D85E 0008D85F		Speed limit value (V32) [2]	Not available	△	×	Speed unit	0 to 2147483647	Set the speed limit value in dwelling pressure operation.
0008D860 0008D861		Pressure command value (PR32)[3]	Not available/ available	△	×	Pressure unit	0 to 32767	Set the pressure command value in dwelling pressure operation. If "Dwelling pressure time constant" is "0: Time constant is enabled.", this value can be changed during dwelling pressure operation. If "Dwelling pressure time constant" is "1: Time constant is disabled.", this value cannot be changed during dwelling pressure operation.
0008D862 0008D863		Dwelling pressure option 1	Not available	△	×	—	0000h to 0001h	■■■□ (Dwelling pressure time constant) Select whether to enable or disable the dwelling pressure time constant in dwelling pressure operation. For details, refer to the following. ☞ Page 328 Pressure command control mode • 0: Time constant is enabled. • 1: Time constant is disabled. (Pressure command between steps are connected by a straight line with the time consonant disabled.) The time constant is enabled for the speed limit value.
0008D864 0008D865 0008D866 0008D867		Speed limit time constant	Not available	△	×	ms	0 to 8388608	Set the accelerating/decelerating time of the speed limit value. Set the time of the duration when the speed limit value reaches the referenced speed limit value from 0.
0008D868 0008D869 0008D86A 0008D86B		Pressure command time constant	Not available	△	×	ms	0 to 8388608	Set the accelerating/decelerating time of the pressure command. Set the time of the duration when the pressure command reaches the referenced speed limit value from 0.
0008D86C ⋮ 0008D86F		For manufacturer setting	—	—	—	—	—	—
0008D870 ⋮ 0008D88F		Switching condition	Not available	△	×	—	—	Refer to the following. ☞ Page 296 Details of pressure control switching condition

*1 If "Driver command discard detection" of "Control option 5 (parameter No.0212)" is set to "0: Detection valid", when the limit position is exceeded, "Drive Unit Command Discard Detected (operation alarm No.00C0H, detail No.0001H)" occurs, and the operation is stopped. If "Driver command discard detection" of "Control option 5 (parameter No.0212)" is set to "1: Detection invalid", when the limit position is exceeded, torque in the direction of return to the limit position is generated by the drive unit.

*2 Vn (n=2 to 31) for step No.2 to 31.

*3 PRn (n=2 to 31) for step No.2 to 31.

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- Release

○: Setting necessary, ×: Setting not necessary

Address (hexadecimal)	Items	Availability of change during performing pressure control operation	Setting necessary/unnecessary		Unit	Setting range	Description
			Feed/dwell	Pressure release			
0008D8B8 0008D8B9 0008D8BA 0008D8BB	Final position (SE2)	Not available	×	○	Command unit	-2147483648 to 2147483647	Set the final target position in releasing pressure operation.
0008D8BC 0008D8BD 0008D8BE 0008D8BF	Referenced speed limit value	Not available	×	○	Speed unit	1 to 2147483647	Set the referenced time constant of speed in releasing pressure operation. Time constant of speed limit is the time how long it takes to accelerate the speed from 0 to the referenced speed limit value.
0008D8C0 0008D8C1 0008D8C2 0008D8C3	Initial speed limit value (V0)	Not available	×	○	Speed unit	0 to 2147483647	Set the initial speed limit value in releasing pressure operation.
0008D8C4 0008D8C5	Initial pressure command value (PR0)	Available	×	○	Pressure unit	0 to 32767	Set the initial pressure command value in releasing pressure operation.
0008D8C6 0008D8C7	For manufacturer setting	—	—	—	—	—	—
0008D8C8 0008D8C9 0008D8CA 0008D8CB	Speed limit time constant	Not available	×	○	ms	0 to 8388608	Set the accelerating/decelerating time of the speed limit value in releasing pressure operation. Set the time how long it takes to accelerate the speed from 0 to the referenced speed limit value in pressure control.
0008D8CC 0008D8CD 0008D8CE 0008D8CF	Speed limit stopping time constant	Not available	×	○	ms	0 to 8388608	Set the time constant to calculate the decelerating start point to the final position (SE2).
0008D8D0 ⋮ 0008D8D7	For manufacturer setting	—	—	—	—	—	—

Point

- When the operation cycle is set to 2.0ms or more, the setting time (such as switching time, speed limit time constant, pressure command time constant, step running time) is reduced to a value that is divisible by the operation cycle.
- When the operation cycle is 2.0ms or more, if the time smaller than the operation cycle is set, each setting value is regarded as the same as the operation cycle.
- The unit of pressure command value (pressure unit) differs from the general pressure unit system. Within the range from 0 to 32767, the analog input value from the load cell is processed as AD-converted data. The pressure unit of the servo amplifier (press units) and the pressure unit of the Motion control board are convertible.
- When starting the pressure control point, if the corresponding pressure control profile is in use, "Pressure Control Initiation Error (operation alarm No.0061H, detail No.0003H)" occurs.
- Changes in speed, acceleration time constant, deceleration time constant, and position of the axis while the pressure control is running are not supported, thereby causing a change error.
- The torque limit is valid during the pressure control mode.
- In feed/dwell operations, if the difference between the limit position and the feedback position of each step exceeds the number of pulses that are 2^{31} [pulse] - 10 revolutions based on the unit after the electronic gear processing, "Pressure Control Error (operation alarm No.0063H, detail No.0006H)" may occur. Perform the operation within the stroke range not exceeding the number of pulses that are 2^{31} [pulse] - 10 revolutions based on the unit after the electronic gear processing.
  Because the range of the movement is limited, the relationship between a resolution for 1 revolution and the stroke range is as follows. A resolution for 1 revolution can be set by an electronic gear of the drive unit.
  · 4194304 pulses: 502 revolutions
  · 67108864 pulses: 22 revolutions
- In the pressure release operation, if the difference between the final position (SE2) and the feedback position exceeds 2^{31} [pulse] - 1 based on the unit after the electronic gear processing, "Pressure Control Error (operation alarm No.0063H, detail No.0006H)" may occur.
- To extend the stroke limit, set "Electronic gear numerator (PA06)" and "Electronic gear denominator (PA07)"of the servo parameter so that the encoder resolution of the drive unit becomes smaller. If an electronic gear of the servo parameter is changed, review the setting an electronic gear of the Motion control board.

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■Details of pressure control switching condition

The address in the table is the offset address for the switching condition. Add the initial address of the switching condition.

Address (hexadecimal)	Items	Availability of change during control	Unit	Setting range	Description

00000000	Switching condition option 1	Not available	Depending on the selected data	00h to 58h	■□ (Select data1)
					Select the data used for the switching condition.
					The values that can be set for the selected data differ depending on the operation[*1]. When selecting the data that cannot be selected, "Pressure Control Initiation Error (operation alarm No.0061H, detail No.0014H)" occurs when the pressure control point is started. When specifying "Mode switching (position to pressure) → Switching condition → Condition select 1→ Select data 1" to "1: No condition (switching by axis bit signal)", specify "Mode switching (position to pressure) → Switching option 1 → Forced switch to pressure control mode" to "1: Enable". Also, when specifying "Switching (feed to dwell) → Switching condition → Condition select 1 → Select data 1" to "1: No condition (switching by axis bit signal)", specify "Switching (feed to dwell) → Switching option 1 → Forced switch to dwelling pressure" to "1: Enabled". If they are not specified, "Pressure Control Initiation Error (operation alarm No.0061H, detail No.0014H)" occurs.
					• 0: Default selected data
					  For Mode switching (position to pressure), Feed, Switching (feed to dwell)···F/B position [command units]
					  For dwell···Step running time [ms]
					  For Feed/Switching (feed to dwell)···Step running time [ms]
					• 1: No condition (switching by axis bit signal)
					  For Mode switching (position to pressure)···Pressure control mode forced switching signal (PSMFSW)
					  For Switching (feed to dwell)···Dwelling pressure forced switching signal (PSDFSW)
					• 2: Command position [command units][*2]
					• 3: F/B position [command units]
					• 4: Load cell pressure (pressure feedback)
					• 5: Step running time [ms][*3]
					• 6: Moving speed [speed units][*2]
					• 7: F/B moving speed [speed units]
					• 8: No condition (switching immediately)
					□■ (Switching condition 1 judgement)
					Select the judgement of conditions of the selected data.[*4]
					• 0: Selected data 1 turns decided value 1 or more
					• 1: Selected data 1 turns decided value 1 or less
					• 2: Changed value of selected data 1 turns decided value 1 or more[*5][*6]
					• 3: Changed value of selected data 1 turns decided value 1 or less[*5][*6]
					• 4: Selected data 1 gets increased and passes through decided value 1
					• 5: Selected data 1 gets decreased and passes through decided value 1[*5]

00000001	Switching condition option 2	Not available	Depending on the selected data	00h to 58h	Same as the switching condition option 1
00000002	Switching condition option 3	Not available	Depending on the selected data	00h to 58h	Same as the switching condition option 1
00000003	Switching condition option 4	Not available	Depending on the selected data	00h to 58h	Same as the switching condition option 1
00000004 00000005 00000006 00000007	Judgement value 1	Not available	Depending on the selected data	[*7]	Set the judgement value to judge the condition of the selected data. (Used for the switching condition 1.)

Address (hexadecimal)	Items	Availability of change during control	Unit	Setting range	Description
00000008 00000009 0000000A 0000000B	Judgement value 2	Not available	Depending on the selected data	*7	Set the judgement value to judge the condition of the selected data. (Used for the switching condition 2.)
0000000C 0000000D 0000000E 0000000F	Judgement value 3	Not available	Depending on the selected data	*7	Set the judgement value to judge the condition of the selected data. (Used for the switching condition 3.)
00000010 00000011 00000012 00000013	Judgement value 4	Not available	Depending on the selected data	*7	Set the judgement value to judge the condition of the selected data. (Used for the switching condition 4.)
00000014 00000015	Condition to be satisfied	Not available	—	0 to 18	Set when using multiple switching conditions. • 0: Switching condition 1 only • 1: Switching condition 1 AND Switching condition 2 • 2: Switching condition 1 OR Switching condition 2 • 3: Switching condition 1 AND Switching condition 2 AND Switching condition 3 • 4: Switching condition 1 OR Switching condition 2 OR Switching condition 3 • 5: (Switching condition 1 AND Switching condition 2) OR Switching condition 3 • 6: (Switching condition 1 OR Switching condition 2) AND Switching condition 3 • 7: Switching condition 1 AND Switching condition 2 AND Switching condition 3 AND Switching condition 4 • 8: Switching condition 1 OR Switching condition 2 OR Switching condition 3 OR Switching condition 4 • 9: (Switching condition 1 OR Switching condition 2 OR Switching condition 3) AND Switching condition 4 • 10: (Switching condition 1 AND Switching condition 2 AND Switching condition 3) OR Switching condition 4 • 11: ((Switching condition 1 AND Switching condition 2) OR Switching condition 3) AND Switching condition 4 • 12: ((Switching condition 1 OR Switching condition 2) AND Switching condition 3) AND Switching condition 4 • 13: ((Switching condition 1 AND Switching condition 2) OR Switching condition 3) OR Switching condition 4 • 14: ((Switching condition 1 OR Switching condition 2) AND Switching condition 3) OR Switching condition 4 • 15: (Switching condition 1 AND Switching condition 2) OR (Switching condition 3 AND Switching condition 4) • 16: (Switching condition 1 OR Switching condition 2) OR (Switching condition 3 AND Switching condition 4) • 17: (Switching condition 1 AND Switching condition 2) AND (Switching condition 3 OR Switching condition 4) • 18: (Switching condition 1 OR Switching condition 2) AND (Switching condition 3 OR Switching condition 4)
00000016 ⋮ 0000001F	For manufacturer setting	—	—	—	—

*1   The operation is as follows.
    ◎: Selectable (recommended), ○: Selectable, ×: Not selectable, —: Not selectable (no bit signal)

Selected data 1	Operation			
	During position control	During control pressure		
	Mode switching (position to pressure)	Feed → Step No.n (n=1 to 32) → Switching condition	Switching (feed to dwell)	Dwell → Step No.n (n=1 to 32) → Switching condition
0: Default selected data	◎ 0: F/B position	◎ 0: F/B position	◎ 0: F/B position	◎ 0: Step running time [ms]
1: No condition (switching by axis bit signal)	○	—	◎	—
2: Command position	◎	×	×	×
3: F/B position	◎	◎	◎	○
4: Load cell pressure (pressure feedback)	○	○	◎	○
5: Step running time	○	○	○	◎
6: Moving speed	◎	×	×	×
7: F/B moving speed	◎	○	○	○
8: No condition (switching immediately)	○	○	○	○

*2   Only during position control.
*3   To the step running time of "Mode switching (position to pressure)", specify the elapsed time since the switching to the corresponding point. To the step running time of "Switching (feed to dwell)", specify the elapsed time since the starting of the feed step No.1.
*4   Setting is not necessary when "Selected data 1" is "1: No condition" or "8: No condition".
*5   Setting is not available when "Selected data 1" is "5: Step running time".
*6   The amount of change is the changes since the switching to this step No. To "Mode switching (position to pressure)", specify the amount of change since the switching to the corresponding point, and to "Switching (feed to dwell)", specify the amount of change since the starting of the feed step No.1.
*7   The setting range changes according to the selected data.

Selected data 1	Setting range
0: Default selected data	Setting range of actual used data
1: No condition (switching by axis bit signal)	Not necessary
2: Command position *Only during position control	-2147483648 to 2147483647
3: F/B position	
4: Load cell pressure (pressure feedback)	0 to 32767
5: Step running time	0 to 999999
6: Moving speed *Only during position control	-2147483648 to 2147483647
7: F/B moving speed	
8: No condition (switching immediately)	Not necessary

■Memory allocation

Refer to the following.

Axis data (high speed) (command bit/status bit)

■Command bit

The addresses in the table are the addresses for the first axis. For the second axis and after, add "+10h" for each axis.

Address (hexadecimal)	Bit	Symbol	Signal name	When in tandem drive
0000100D	0	PSMFSW	Pressure control mode forced switching	Not supported
	1	PSDFSW	Dwelling pressure forced switching	Not supported
	2	—	For manufacturer setting	—
	3	PSMRST	Pressure control mode resetting	Not supported
	4	—	For manufacturer setting	—
	5			
	6			
	7			

- Details concerning command bit

Symbol	Signal name	Function details	
		Function	Operation
PSMFSW	Pressure control mode forced switching	During the position control of the pressure control point, turn OFF to ON this signal to switch the control mode of the drive unit to the cyclic synchronous pressure mode (cspr).	When all of the following conditions are satisfied, the mode is switched to the cyclic synchronous pressure mode (cspr). • The control mode of the drive unit is the cyclic synchronous position mode (csp). (The pressure control mode in progress signal (PSCMO) is OFF.) • "Mode switching (position to pressure) → Switching condition → Condition select 1 → Select data 1" of the pressure control profile is set to "1: No condition (switching by axis bit signal)", and "Mode switching (position to pressure) → Switching option 1 → Forced switch to pressure control mode" is set to "1: Enable". No processing is performed when the pressure control point is not executed.
PSDFSW	Dwelling pressure forced switching	Switch the feed operation to the dwell operation.	When all of the following conditions are satisfied, the operation is switched to the dwell operation. • The control mode of the drive unit is the cyclic synchronous pressure mode (cspr). (The pressure control mode in progress signal (PSCMO) is ON.) • The feed operation is in progress. (The feeding/dwelling pressure signal (PSFD) is ON and the dwelling pressure signal (PSDW) is OFF.) • "Switching (feed to dwell) → Switching condition → Condition select 1→ Select data 1" of the pressure control profile is set to "1: No condition (switching by axis bit signal)", and "Switching (feed to dwell) → Switching option 1 → Forced switch to dwelling pressure mode" is set to "1: Enabled". No processing is performed when the pressure control point is not executed.
PSMRST	Pressure control mode resetting	End the cyclic synchronous pressure mode (cspr) and switch the mode to the cyclic synchronous position mode (csp).	• When the control mode of the drive unit is the cyclic synchronous pressure mode (cspr) (the pressure control mode in progress signal (PSCMO) is ON) and when feed/dwell/pressure release operation is in progress, the pressure control mode reset is performed. • No processing is performed when the pressure control point is not executed. • When the status of the control pressure is as follows, the pressure control mode resetting error signal (PSMRE) turns ON. 1 : Before mode switching (position to pressure) (feed) 11: Before mode switching (position to pressure) (pressure release) • When the status of the control pressure is as follows, after the switching to the cyclic synchronous pressure mode (cspr) is completed, the mode reset is started. 2 : During mode switching (position to pressure) (feed) (= waiting for the amplifier to be switched) 12: During mode switching (position to pressure) (pressure release) (= waiting for the amplifier to be switched) • When the status of the control pressure is as follows, the mode reset process and the mode switching process (pressure to position) continue, and then the pressure control mode resetting completed signal turns ON. 5: During mode reset 6: During mode switching (pressure to position) 14: During mode reset (pressure release) 15: During mode switching (pressure to position) (pressure release)

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■Status bit

The addresses in the table are the addresses for the first axis. For the second axis and after, add "+10h" for each axis.

Address (hexadecimal)	Bit	Symbol	Signal name	When in tandem drive
0000600D	0	PSCMO	Pressure control mode in progress	Not supported
	1	PSFD	Feeding/dwelling pressure	Not supported
	2	PSDW	Dwelling pressure	Not supported
	3	PSPAS	Pressure attainment switching during feed	Not supported
	4	PSRL	Releasing pressure	Not supported
	5	PSDFSC	Condition of final step dwelling pressure satisfied	Not supported
	6	PSMCF	Pressure control mode switching completed	Not supported
	7	PSMCE	Pressure control mode switching error	Not supported

Address (hexadecimal)	Bit	Symbol	Signal name	When in tandem drive
0000600E	0	PSDCF	Dwelling pressure switching completed	Not supported
	1	PSDCE	Dwelling pressure switching error	Not supported
	2	—	For manufacturer setting	—
	3			
	4			
	5			
	6	PSMRC	Pressure control mode resetting completed	Not supported
	7	PSMRE	Pressure control mode resetting error	Not supported

• Details concerning status bit

Symbol	Signal name	Function details		
		Function	Operation	
			Conditions for turning ON	Conditions for turning OFF
PSCMO	Pressure control mode in progress	Notify that the control mode of the drive unit is the cyclic synchronous pressure mode (cspr).	The drive unit starts the pressure control.	The drive unit ends the pressure control.
PSFD	Feeding/dwelling pressure	Notify that the feed/dwell operation of the pressure control is started.	The feed/dwell operation starts.	• The feed/dwell operation ends. • The mode is switched to the cyclic synchronous position mode (csp).
PSDW	Dwelling pressure	Notify that the dwell operation of the pressure control is started.	The dwell operation starts.	• The dwell operation ends. • The mode is switched to the cyclic synchronous position mode (csp).
PSPAS	Pressure attainment switching during feed	Notify that during the feed operation, the duration of the status that load cell pressure is equal to or more than the switching pressure exceeds the switching time. (Forcibly switched to the dwell operation.)	During the feed operation, the duration of the status that load cell pressure is equal to or more than the switching pressure exceeds the switching time.	The pressure control ends.
PSRL	Releasing pressure	Notify that the pressure release operation of the pressure control is started.	The pressure release operation starts.	• The pressure release operation ends. • The mode is switched to the cyclic synchronous position mode (csp).
PSDFSC	Condition of final step dwelling pressure satisfied	Notify that the switching condition of the final step in the dwell operation is satisfied.	The switching condition of the final step in the dwell operation is satisfied.	The operation of the next pressure control point starts.
PSMCF	Pressure control mode switching completed	Notify that the mode of the drive unit has been switched to the cyclic synchronous pressure mode (cspr) by the pressure control mode forced switching signal (PSMFSW).	The mode of the drive unit has been switched to the cyclic synchronous pressure mode (cspr) normally by the pressure control mode forced switching signal (PSMFSW).	• The pressure control mode forced switching signal (PSMFSW) is turned OFF. • The operation of the next pressure control point starts.

Symbol	Signal name	Function details		
		Function	Operation	
			Conditions for turning ON	Conditions for turning OFF
PSMCE	Pressure control mode switching error	Notify that the mode of the drive unit has failed to be switched to the cyclic synchronous pressure mode (cspr) by the pressure control mode forced switching signal (PSMFSW).	• The mode of the drive unit has failed to be switched to the cyclic synchronous pressure mode (cspr) by the pressure control mode forced switching signal (PSMFSW). • A timeout occurs. • When the pressure control status is in mode reset or mode reset (pressure release), the pressure control mode forced switching signal (PSMFSW) is turned ON. • "Mode switching (position to pressure) → Switching condition → Condition select 1 → Select data" of the pressure control profile is not specified to "1: No condition (switching by axis bit signal)".	• The pressure control mode forced switching signal (PSMFSW) is turned OFF. • The operation of the next pressure control point starts.
PSDCF	Dwelling pressure switching completed	Notify that the switching from the feed operation to the dwell operation is completed by the dwelling pressure forced switching signal (PSDFSW).	The switching from the feed operation to the dwell operation is completed normally by the dwelling pressure forced switching signal (PSDFSW).	• The dwelling pressure forced switching signal (PSDFSW) is turned OFF. • The operation of the next pressure control point starts.
PSDCE	Dwelling pressure switching error	Notify that the switching from the feed operation to the dwell operation has failed by the dwelling pressure forced switching signal (PSDFSW).	• The switching from the feed operation to the dwell operation has failed by the dwelling pressure forced switching signal (PSDFSW). • The switching to the pressure control mode reset occurs. • When the pressure control status is in mode reset or mode reset (pressure release), the dwelling pressure forced switching signal (PSDFSW) is turned ON. • "Switching (feed to dwell) → Switching condition → Condition select 1→ Select data" of the pressure control profile is not specified to "1: No condition (switching by axis bit signal)".	• The dwelling pressure forced switching signal (PSDFSW) is turned OFF. • The operation of the next pressure control point starts.
PSMRC	Pressure control mode resetting completed	Notify that the switching to the pressure control mode reset is completed by the pressure control mode resetting signal (PSMRST).	The switching to the pressure control mode reset is completed by the pressure control mode resetting signal (PSMRST)	• The pressure control mode resetting signal (PSMRST) is turned OFF. • The operation of the next pressure control point starts.
PSMRE	Pressure control mode resetting error	Notify that the switching to the pressure control mode reset has failed by the pressure control mode resetting signal (PSMRST).	The switching to the pressure control mode reset has failed by the pressure control mode resetting signal (PSMRST). When the pressure control state is as follows. • 1: Before mode switching (position to pressure) (feed) • 11: Before mode switching (position to pressure) (pressure release)	• The pressure control mode resetting signal (PSMRST) is turned OFF. • The operation of the next pressure control point starts.

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Axis data (high speed) (command data/status data)

■Command data

Switching to the pressure control mode is automatically performed by the Motion control board. The operation by an user that setting the control mode command and switching to the pressure control mode is not supported.

To switch to the pressure control mode at any timing, set "Mode switching (position to pressure) → Switching condition → Condition select 1 → Select data 1" of the pressure control profile to "1: No condition (switching by axis bit signal)", and use the pressure control mode forced switching signal (PSMFSW).

> **Point**
>
> If the control mode command is set by a user while the pressure control point is executed, the switching to the pressure control mode is not affected and an operation alarm does not occur.

■Status data

The addresses in the table are the addresses for the first axis. For the second axis and after, add "+40h" for each axis.

Address (hexadecimal)	Name	Output limits	Remarks
00007012 00007013	Control mode status	→	Display the current control mode status. 0: No mode change/No mode assigned 1: Profile position mode (pp) 3: Profile velocity mode (pv) 4: Profile torque mode (tq) 6: Homing mode (hm) 8: Cyclic synchronous position mode (csp) 9: Cyclic synchronous velocity mode (csv) 10: Cyclic synchronous torque mode (cst) -1: Test Operation mode: JOG Operation -2: Test Operation mode: Positioning Operation -4: Test Operation mode: DO forced output -6: Test Operation mode: Machine analyzer -9: Test Operation mode: Test Exit -104: Continuous operation to torque control mode (ct) -111: Cyclic synchronous pressure mode (cspr)
00007014 00007033	For manufacturer setting	—	—
00007024 00007025	Profile No. of pressure control in progress	0 to 32	Store the profile No. of pressure control in progress.
00007026 00007027	Step No. of feeding step in progress	0 to 32	Store the step No. of feeding step in progress. The number is cleared and becomes "0" when the pressure control point ends.
00007028 00007029	Step No. of dwelling pressure step in progress	0 to 32	
0000702A 0000702B	Step No. of releasing pressure step in progress	0 to 1	
0000702C 0000702D	Pressure control status	0 to 15	Store the pressure control status in progress. • 0: Pressure control is stopped (pressure control is not in progress) ■Feed/dwell operation: 1 to 6 • 1: Before mode switching (position to pressure) (feed) • 2: During mode switching (position to pressure) (feed) (= waiting for the amplifier to be switched) • 3: During feed • 4: During dwell • 5: During mode reset • 6: During mode switching (pressure to position) ■Pressure release operation: 11 to 15 • 11: Before mode switching (position to pressure) (pressure release) • 12: During mode switching (position to pressure) (pressure release) (= waiting for the amplifier to be switched) • 13: During pressure release • 14: During mode reset (pressure release) • 15: During mode switching (pressure to position) (pressure release)

Address (hexadecimal)	Name	Output limits	Remarks
0000702E 0000702F	Error step No.	0 to 32	When "Pressure Control Initiation Error (operation alarm No.0061H)", "Pressure Control Setting Error (operation alarm No.0062H)", and "Pressure Control Error (operation alarm No.0063H)" occur, store the step No. in which the errors occur. The number is cleared and becomes "0" when the operation of the next pressure control point starts.
00007030 00007031	Error detail No. of switching condition	0000h to FFFFh	Store the detail No. of an error that has occurred in the switching condition. The number is cleared and becomes "0" when the operation of the next pressure control point starts. ■■■☐ (Error factors of switching conditions) • 1: Out of range of selected data • 2: Out of range of switching condition judgement • 3: When selecting the step running time, the judgement select is set to "2: Changed value of selected data turns decided value or more", "3: Changed value of selected data turns decided value or less", or "5: Selected data gets decreased and passes through decided value". ■■☐■ (Switching condition No.) • 1: Switching condition option 1 • 2: Switching condition option 2 • 3: Switching condition option 3 • 4: Switching condition option 4
00007032 00007033	For manufacturer setting	—	—
00007034 00007035 00007036 00007037	Tip position in pressure control	-2147483648 to 2147483647	Store the tip position in pressure control [command unit] that is sent to the drive unit.
00007038 00007039 0000703A 0000703B	Speed limit value	0 to 2147483647	Store the speed limit value [speed unit] that is sent to the drive unit.
0000703C 0000703D	Pressure command value	0 to 32767	Store the pressure command value [pressure unit] that is sent to the drive unit
0000703E 0000703F	Load cell pressure	-32768 to 32767	Store the load cell pressure that is received from the drive unit.

Point

Whether an operation alarm occurred during feed or dwell can be judged by confirming an error step No. and an operation alarm No. (detail No.)

Necessary objects

The necessary objects for the pressure control are as follows.

Function	Necessary objects	
	TPDO	RPDO
Pressure control	[Pressure actual value (Obj. 2E52h)]	[Velocity limit value (Obj. 2D20h)] [Target pressure (Obj. 2E50h)] [Forward-side stop function (Obj. 2E56h)]

Point

If the necessary objects do not exist, "Slave Object Setting Error (operation alarm No.0080H, detail No.000AH)" occurs when the pressure control point is started.

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Operation of pressure control

State transition

The state transition of the pressure control is as follows.

Transition No.	Event	Operation
(1)	At the pressure control point (feed/dwell), "Mode switching (position to pressure) → "Switching condition" of the pressure control profile is satisfied.	The switching from the cyclic synchronous position mode (csp) to the cyclic synchronous pressure mode (cspr) is started. (Sending cyclic synchronous pressure mode (cspr), pressure command, speed limit value, and tip position in pressure control to the drive unit is started.)
(2)	The control mode of the drive unit is switched to the pressure control mode.	The feed operation is started.
(3)	The step that is not a final step but a step of "Feed → Step No.n (n = 1 to 31)" is satisfied.	Switched to the next step.
(4)	• "Switching (feed to dwell) → Switching condition" of the pressure control profile is satisfied. • "Switching (feed to dwell) → Switching option 1 → Select pressure switching" of the pressure control profile is set to "1: Enabled", and the duration of the pressure status that is set to the switching pressure exceeds the switching time. • "Switching (feed to dwell) → Switching option 1 → Forced switch to dwelling pressure" of the pressure control profile is specified to "1: Enabled", and the dwelling pressure forced switching signal (PSDFSW) turns ON.	• Switched from the feed mode to the dwell mode. • The dwell operation is started.
(5)	The step that is not a final step but a step of "Dwell → Step No.n (n = 1 to 31)" is satisfied.	Switched to the next step.
(6)	• A stop factor occurs. • The F/B position passes the final position (SE).	Speed limit value = 0
	The pressure control mode resetting signal (PSMRST) turns ON.	The deceleration process of the speed limit value is started.
(7)	• A stop factor occurs. • The F/B position passes the final position (SE). • "Dwell → Dwelling pressure common option 1 → Mode reset" of the pressure control profile is set to "0: Mode reset enabled", and the switching condition of the final step in the dwell operation is satisfied.	Speed limit value = 0
(8), (13)	The deceleration of the speed limit value is completed (speed limit value command = 0), and the zero speed signal (ZSP) turns ON.	The switching from the cyclic synchronous position mode (csp) to the cyclic synchronous pressure mode (cspr) is started.

Transition No.	Event	Operation
(9), (14)	The control mode of the drive unit is switched to the cyclic synchronous position mode (csp).	The operation of the pressure control point is completed. (Transit to the next point if it exists. The operation is completed when the point is the final point.)
(10)	At the pressure control point (pressure release), "Mode switching (position to pressure) → Switching condition" of the pressure control profile is satisfied.	The switching from the cyclic synchronous position mode (csp) to the cyclic synchronous pressure mode (cspr) is started. (Sending cyclic synchronous pressure mode (cspr), pressure command, speed limit value, and tip position in pressure control to the drive unit is started.)
(11)	The control mode of the drive unit is switched to the pressure control mode.	The pressure release operation is started.
(12)	• A stop factor occurs. • The F/B position passes the final position (SE2). • The load cell pressure drops below the setting pressure ((PR0). • The F/B position passes the position from which the deceleration to the final position (SE2) is started. • The pressure control mode resetting signal (PSMRST) turns ON.	The deceleration process of the speed limit value is started.

Point

The behavior of the final step during feed is as follows.

- Since the final step has no next step, switching is not performed even if the switching condition is satisfied.
- If "Driver command discard detection" of "Control option 5 (parameter No.0212)" is set to "0: Detection valid", when the limit position is exceeded, "Drive Unit Command Discard Detected (operation alarm No.00C0H, detail No.0001H)" occurs, and the operation is stopped. If "Driver command discard detection" of "Control option 5 (parameter No.0212)" is set to "1: Detection invalid", when the limit position is exceeded, torque in the direction of return to the limit position is generated by the drive unit.
- When the conditions of the transition No. (4) in the table above are satisfied, the operation is switched to dwell.

Operation example

The operation example of position control → feed → dwell → pressure release → position control (4 points) is as follows.

Point No.	Operation
1	❶Approaching the work in position control and stopping
2	❷Switched to pressure control during axis stop ❸Feed operation ❹Dwell operation ❺Pressure control ends during axis stop (return to position control)
3	❻Switched to pressure control during axis stop ❼Pressure release operation ❽Pressure control ends after axis stop (return to position control)
4	❾Removing from the work in position control and stopping ❿Operation ends
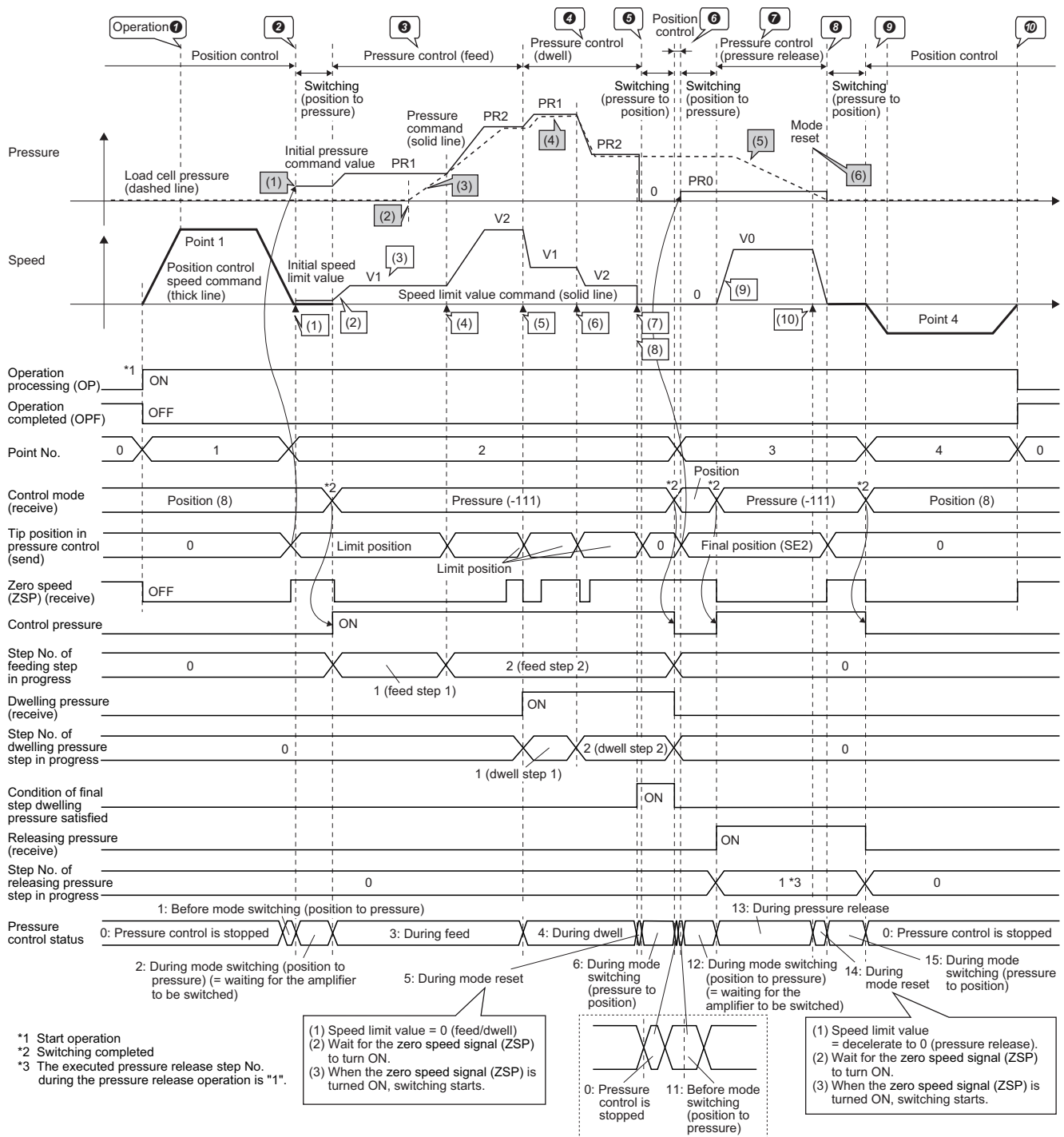
Pressure	Speed
(1) Transmission of pressure command, speed limit value command, and tip position in pressure control is started at the same time that switching is started.	(1) The condition of mode switching (position to pressure) is satisfied.
	(2) After the servo amplifier is switched to the pressure control, the speed limit is accelerated to V1.
(2) Contact with work.	(3) Contact with work at low speed.
(3) The load cell pressure increases.	(4) The feed step 1 condition is satisfied.
(4) The high pressure is applied.	(5) The condition of switching (feed to dwell) is satisfied.
(5) The load cell pressure decreases.	(6) The dwell step 1 condition is satisfied.
(6) Mode reset when the load cell pressure becomes less than or equal to the setting pressure (PR0).	(7) The dwell step 2 condition is satisfied.
	(8) The switching condition of the last step in dwelling pressure is satisfied.
	(9) The command changes after the servo amplifier is switched to the pressure control.
	(10) The pressure release condition is satisfied.

Switching from position control to pressure control

After the pressure control point is started, the Motion control board judges "Mode switching (position to pressure)" of the pressure control profile, and automatically switches to the cyclic synchronous pressure mode (cspr).

Set the switching conditions in "Mode switching (position to pressure) → Switching condition".

• Switching condition → Condition select 1 → Select data 1

The following setting is available in "Mode switching (position to pressure)".

●: Selectable (default), ◎: Selectable (recommended), ○: Selectable, △: Selectable but not normally used

Select data 1	Availability
0: Default selected data	● (Operate as "3: F/B position")
1: No condition (switching by axis bit signal)	○
2: Command position *Only during position control	◎
3: F/B position	◎
4: Load cell pressure (pressure feedback)	△
5: Step running time	△
6: Moving speed *Only during position control	◎
7: F/B moving speed	◎
8: No condition (switching immediately)	△

When "Mode switching (position to pressure) → Switching condition → Condition select 1 → Select data 1" is set to "8: No condition (switching immediately)", switching to the cyclic synchronous pressure mode (cspr) is performed without moving the axis.

• Operation when the pressure control point is started

Mode switching (position to pressure)	Operation
The switching condition is "8: No condition (switching immediately)", or the switching condition is satisfied.	The axis is not moved. Immediately switched to the pressure control mode.
The switching condition is not satisfied.	(1) The axis starts to move toward the position data (target position) in the cyclic synchronous position mode (csp). (2) When the switching condition is satisfied, the mode is switched to the pressure control mode.

Switching from the cyclic synchronous position mode (csp) to the pressure control mode is available while the axis is moving. When switching the mode while the axis is moving, set the switching condition so that the speed is reduced to the speed at which the work is contacted before switching. If switching is performed while the axis is moving at a high speed, the speed may not reach the target speed at the time of contact with work.

> **Point**
> • The rough match signal (CPO) turns ON on the basis of the command remaining distance to the position data in the point table.
> • The smoothing stop signal (SMZ) turns OFF during pressure control.
> • The command current position is adjusted to the feedback position at the timing of switching to the cyclic synchronous pressure mode (cspr).
> • If the operation is completed without reaching the pressure control switching position, "Pressure Control Initiation Error (operation alarm No.0061H, detail No.000CH)" occurs.

■Limit position and switching position

- The position data in the point table is the stop position when switching to the pressure control is not performed. Set the position after the pressure control switching position and before the position where the pressure is applied by the pressure control (position where the work is contacted).
- Set the range of operation by the position control before switching to the pressure control at the limit position.
- If the feedback position reaches the limit position before switching to the cyclic synchronous pressure mode (cspr), "Pressure Control Initiation Error (operation alarm No.0061H, detail No.0011H)" occurs and the operation is stopped.
- If the mode is not switched to the cyclic synchronous pressure mode (cspr), "Pressure Control Initiation Error (operation alarm No.0061H, detail No.000CH)" occurs when the point movement is completed.
  When the following conditions are satisfied, it is judged that the switch to the cyclic synchronous pressure mode (cspr) has not been performed.
  - If the switching condition is not satisfied when "Mode switching (position to pressure) → Switching condition → Condition select 1 → Select data 1" of the pressure control profile is set to other than "1: No condition (switching by axis bit signal)"
  - If the switching is not performed when "Mode switching (position to pressure) → Switching condition → Condition select 1 → Select data 1" of the pressure control profile is set to "1: No condition (switching by axis bit signal)"
- If the limit position is set in the opposite direction of the movement direction in the position control, "Pressure Control Initiation Error (operation alarm No.0061H, detail No.0007H)" occurs, and the operation is not started.
- When movement is performed in the + direction, if the limit position is set to a value larger than the target position, "Pressure Control Initiation Error (operation alarm No.0061H, detail No.0008H)" occurs, and the operation is not started.
- When movement is performed in the - direction, if the limit position is set to a value smaller than the target position, "Pressure Control Initiation Error (operation alarm No.0061H, detail No.0009H)" occurs, and the operation is not started.
- The limit position is judged at the feedback position. If the limit position is reached during the position control, "Pressure Control Initiation Error (operation alarm No.0061H, detail No.0011H)" occurs, and deceleration to a stop is performed at the position beyond the limit position.

\<Setting image\>
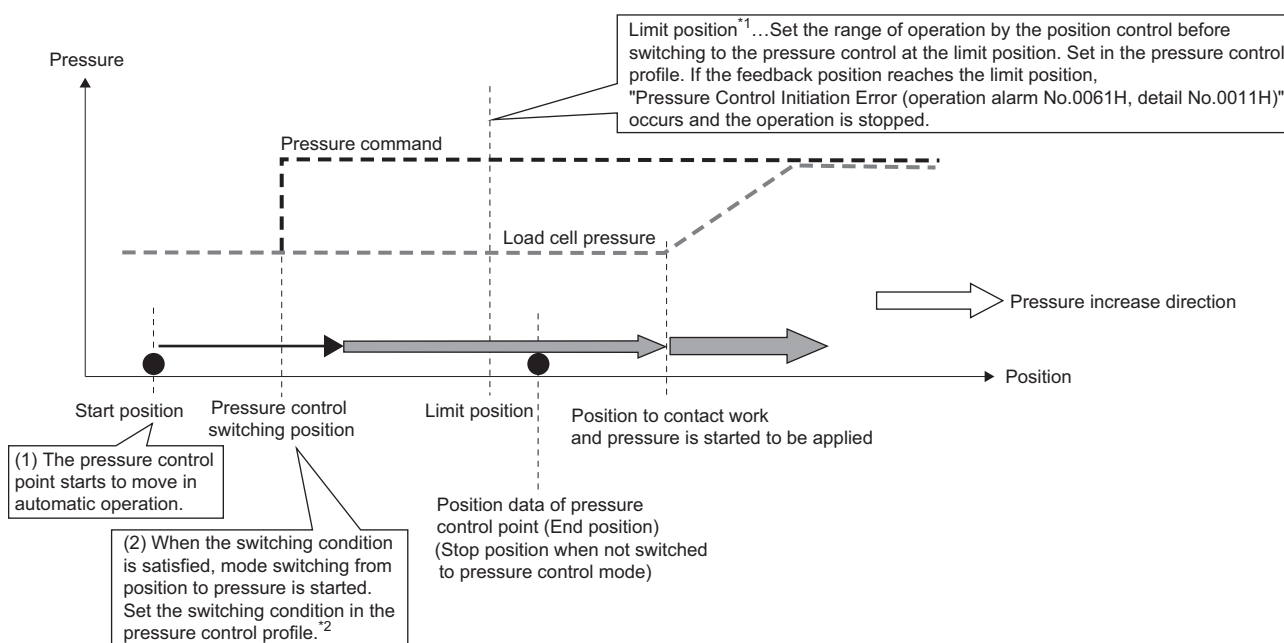
*1 Set with "Mode switching (position to pressure) → Limit position" of the pressure control profile.
*2 Set with "Mode switching (position to pressure) → Switching condition" of the pressure control profile.

> **Point**
>
> - If the automatic operation is started by setting a value outside the range in the pressure control profile data, "Pressure Control Setting Error (operation alarm No.0062H, detail No.1000H to 8FFFH)" occurs, and the operation is not started.
> - The operation alarm does not occur after the stop processing by the stop command.

■Switching control mode while axis is moving

Switching from the cyclic synchronous position mode (csp) to the pressure control mode is available while the axis is moving. When switching the mode while the axis is moving, the servo parameter "ZSP disabled selection at control switching (PC76.1)" must be set.

 • Behavior during control switching

Switching is performed as follows depending on the speed when switching control.

Vchg: Speed at switching (position control), Vbgn: Speed limit value when starting pressure control

Relationship between Vchg and Vbgn	Occurrence of shock at control switching	Switching time
Vchg = Vbgn	Not occur	Short
Vchg > Vbgn		Long
Vchg < Vbgn	Occur	Short

By setting "Feed → Initial command → Select initial speed limit value" of the pressure control profile, the speed limit value (Vbgn) when starting the pressure control can be automatically adjusted and switching is performed without a shock. (Automatically switched as "Vchg = Vbgn".) For details about the setting, refer to the following.

☞ Page317 ●Setting initial speed limit value

●Switching operation example 1: Switching at no speed difference (low speed)

• "Feed" of pressure control profile

Item		Setting value	Description
Feeding common option 1		0000h	■ ■ ■ □ (Select initial speed limit value) • 0: Command speed while switching ■ ■ □ ■ (Select initial pressure command value) • 0: Disabled (initial value = 0)
Initial command	Initial speed limit value	0 (0 to 2147483647)	When "Select initial speed limit value" is "0: Command speed while switching", set the value to limit the initial value of speed limit value. • 0: Doesn't limit the initial value of speed limit value. • Except 0: Limit the initial value of speed limit value by the setting value.
	Initial pressure command value	0	Not used

When "Feeding common option 1 → Select initial speed limit value" is set to "0: Command speed while switching" and switching is performed at low speed (Vchg ≤ V1), switching is performed without a shock.

• Vchg: position control speed at switching
• V1: speed limit value of feed step 1

*1 After switching to the pressure control, set PR1.
*2 Switching is performed at the constant speed. (The speed limit value when starting the pressure control is Vbgn = Vchg.)
   No shock at the time of switching.
*3 After switching to the control mode starts, the position command decelerates and stops from the speed (Vchg) at the time of switching.
*4 After switching to the pressure control, the speed increases (decreases) to V1.
*5 When Vchg ≤ V1, the speed limit command when contacting the work is V1 or less.
*6 Start operation
*7 Switching completed
*8 Switching started

●Switching operation example 2: Switching at no speed difference (high speed)

• "Feed" of pressure control profile

Item		Setting value	Description
Feeding common option 1		0000h	■■■□ (Select initial speed limit value) • 0: Command speed while switching ■■□■ (Select initial pressure command value) • 0: Disabled (initial value = 0)
Initial command	Initial speed limit value	0 (0 to 2147483647)	When "Select initial speed limit value" is "0: Command speed while switching", set the value to limit the initial value of speed limit value. • 0: Doesn't limit the initial value of speed limit value. • Except 0: Limit the initial value of speed limit value by the setting value.
	Initial pressure command value	0	Not used

When performing the switching at high speed (Vchg < V1) by setting "Feeding common option 1 → Select initial speed limit value" to "0: Command speed while switching" and setting "Initial command → Initial speed limit value" to 0, switching is performed without a shock. However, when contacting the work, the speed limit command may be bigger than V1.

- Vchg: position control speed at switching
- V1: speed limit value of feed step 1

When limiting the speed limit value by setting "Feeding common option 1 → Select initial speed limit value" to "0: Command speed while switching" and setting "Initial command → Initial speed limit value" to V1, switching is performed without a shock. However, the switching time is longer.
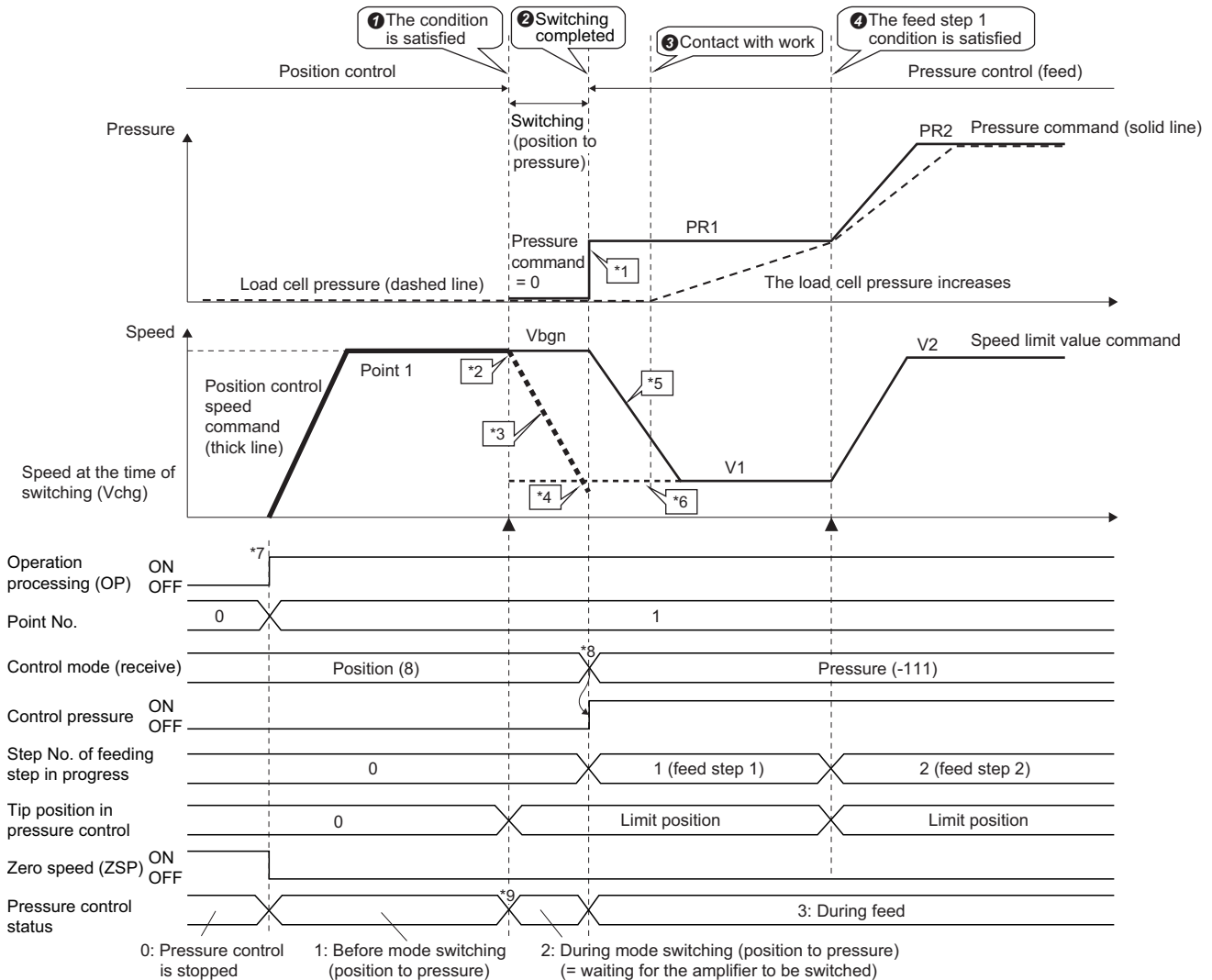
*1 After switching to the pressure control, set PR1.
*2 Switching is performed at the constant speed. (The speed limit value when starting the pressure control is Vbgn = Vchg.)
    No shock at the time of switching.
*3 After switching to the control mode starts, the position command decelerates and stops from the speed (Vchg) at the time of switching.
*4 If the speed limit is clamped at initial speed limit = V1, the switching time is longer.
*5 After switching to the pressure control, the speed increases (decreases) to V1.
*6 When Vchg < V1, the speed limit command when contacting the work is bigger than V1 and a shock may occur.
*7 Start operation
*8 Switching completed
*9 Switching started

●Switching operation example 3: Switching at no speed difference (while decelerating)

• "Feed" of pressure control profile

Item		Setting value	Description
Feeding common option 1		0000h	■■■□ (Select initial speed limit value) • 0: Command speed while switching ■■□■ (Select initial pressure command value) • 0: Disabled (initial value = 0)
Initial command	Initial speed limit value	V1 (0 to 2147483647)	When "Select initial speed limit value" is "0: Command speed while switching", set the value to limit the initial value of speed limit value.
	Initial pressure command value	0	Not used

When performing the switching at low speed (Vchg ≥ V1) by setting "Feeding common option 1 → Select initial speed limit value" to "0: Command speed while switching" and setting "Initial command → Initial speed limit value" to V1, switching is performed without a shock.

• Vchg: position control speed at switching
• V1: speed limit value of feed step 1

*1   After switching to the pressure control, set PR1.
*2   Switching is performed at the constant speed. (The speed limit value when starting the pressure control is Vbgn = Vchg.)
      No shock at the time of switching.
*3   After switching to the control mode starts, the position command decelerates and stops from the speed (Vchg) at the time of switching.
*4   After switching to the pressure control, the speed increases (decreases) to V1.
*5   Start operation
*6   Switching completed
*7   Switching started

●Switching operation example 4: Switching with speed difference (Vchg < V1)

• "Feed" of pressure control profile

Item		Setting value	Description
Feeding common option 1		0001h	■■■□ (Select initial speed limit value) • 1: Initial speed limit value ■■□■ (Select initial pressure command value) • 0: Disabled (initial value = 0)
Initial command	Initial speed limit value	V1 (0 to 2147483647)	Initial speed limit value
	Initial pressure command value	0	Not used

When performing the switching with speed difference (Vchg < V1) by setting "Feeding common option 1 → Select initial speed limit value" to "1: Initial speed limit value" and setting "Initial command → Initial speed limit value" to V1, a shock occurs when switching is performed.

• Vchg: position control speed at switching
• V1: speed limit value of feed step 1

When performing the switching by setting "Feeding common option 1 → Select initial speed limit value" to "0: Command speed while switching", switching is performed without a shock.
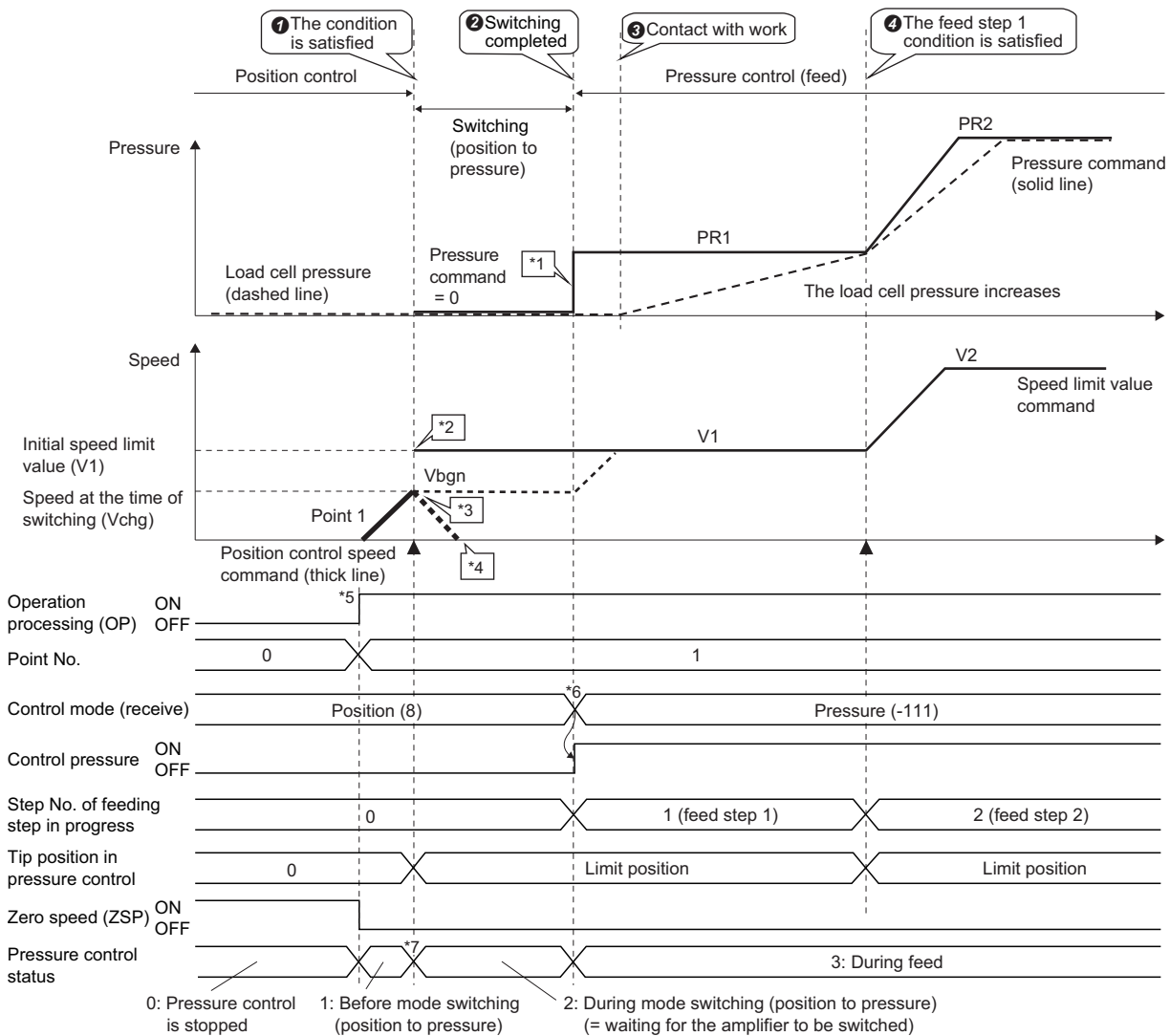
*1 After switching to the pressure control, set PR1.
*2 Perform switching by setting "Feeding common option 1 → Select initial speed limit value" to "1: Initial speed limit value" and setting "Initial speed limit value" to V1. A shock occurs when switching is performed.
*3 Perform switching at the constant speed (speed limit value command = Vchg) by setting "Feeding common option 1 → Select initial speed limit value" to "0: Command speed while switching". A shock does not occur when switching is performed.
*4 After switching to the control mode starts, the position command decelerates and stops from the speed (Vchg) at the time of switching.
*5 Start operation
*6 Switching completed
*7 Switching started

●Switching operation example 5: Switching with speed difference (V1 < Vchg)

• "Feed" of pressure control profile

Item		Setting value	Description
Feeding common option 1		0001h	■■■□ (Select initial speed limit value) • 1: Initial speed limit value ■■□■ (Select initial pressure command value) • 0: Disabled (initial value = 0)
Initial command	Initial speed limit value	V1 (0 to 2147483647)	Initial speed limit value
	Initial pressure command value	0	Not used

When performing the switching by increasing the speed (V1 < Vchg), switching is performed without a shock. However, the switching time is longer.

• Vchg: position control speed at switching
• V1: speed limit value of feed step 1
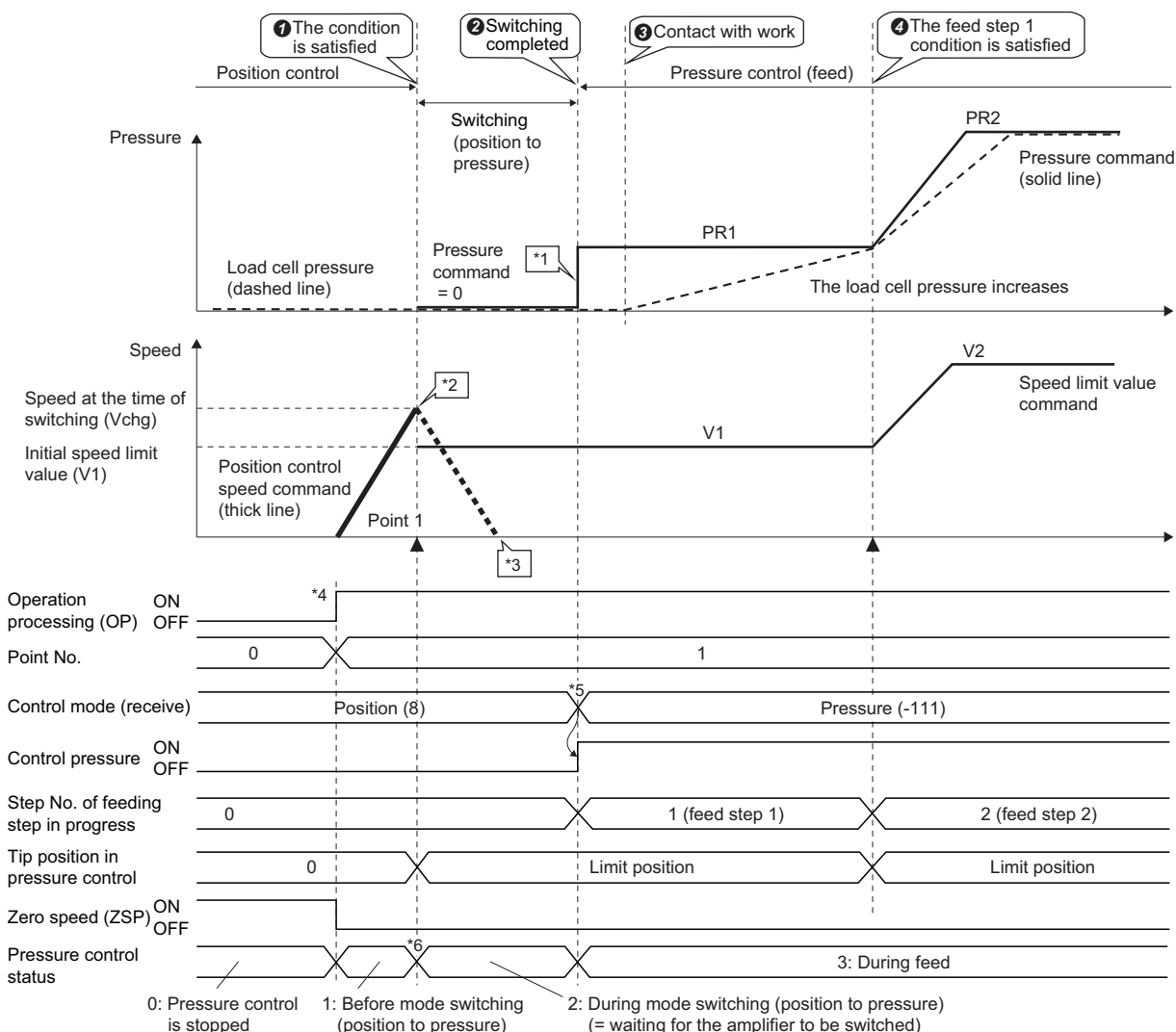
*1 After switching to the pressure control, set PR1.
*2 Perform switching with speed difference (V1 < Vchg) by setting "Feeding common option 1 → Select initial speed limit value" to "1: Initial speed limit value" and setting "Initial speed limit value" to V1.
    A shock does not occur. However, the switching time is longer.
*3 After switching to the control mode starts, the position command decelerates and stops from the speed (Vchg) at the time of switching.
*4 Start operation
*5 Switching completed
*6 Switching started

●Selecting switching delay

Set "Mode switching (position to pressure) → Switching option 1 → Select switching delay" of the pressure control profile.

• Select switching delay

When switching from the cyclic synchronous position mode (csp) to the pressure control mode while the axis is moving, select whether to adjust the switch timing to prevent shock from occurring. (Setting is not necessary when switching the control mode during stopping.)

Setting value	Description
• 0: Switching delay enabled	The servo amplifier adjusts the switch timing to prevent shock from occurring. The switching time may be longer when there is a big difference between the speed at switching and the speed limit value command.
• 1: Switching delay disabled	The servo amplifier immediately switches the control mode. Vibration or shock may occur at switching while the axis is moving.

●Setting initial speed limit value

Set "Feed → Switching option 1 → Feeding common option 1 → Select initial speed limit value" and "Feed → Initial command → Feeding common option 1 → Initial speed limit value" of the pressure control profile.

When performing the switching while axes are moving, set "Select initial speed limit value" to "0: Command speed while switching", and set "Initial speed limit value" to the value that limits the initial value of the speed limit value.

• Select initial speed limit value

Select the initial value of speed limit value for feeding operation.

Setting value
• 0: Command speed while switching The initial value of speed limit value is 0 if pressure control is started while axes stop. The initial value of speed limit value is the command speed value when switching limited by initial speed limit value if pressure control is started while axes are moving.
• 1: Initial speed limit value

• Initial speed limit value

Select the initial value of speed limit value for feeding operation.

Setting value
■When "Select initial speed limit value" is "0: Command speed while switching" Set the value to limit the initial value of speed limit value. • 0: Doesn't limit the initial value of speed limit value. • Except 0: Limit the initial value of speed limit value by the setting value.
■When "Select initial speed limit value" is "1: Initial speed limit value" Set the initial value of speed limit value.

●Setting servo parameter

Set the servo parameter "ZSP disabled selection at control switching (PC76.1)" to "1: Disabled" so that monitoring of the zero speed status is disabled.

●Speed limit value when contacting work

When switching is performed while the axis is moving, set the switching condition so that the speed is decelerated to the speed at which the axis contacts the work before switching. If switching is performed while the axis is moving at high speed, the target speed may not be reached at the time of contact with the work.

■Switching to the pressure control mode immediately without moving the axis during a stop

●Setting

• Point table

Item	Setting value	
Position data	0 (Switched during stopping)	
Feed speed	Arbitrary (low speed)	
Acceleration time constant	Arbitrary	
Deceleration time constant	Arbitrary	
Auxiliary command	0001h	Position command system (bit0) • 1: Relative position command
Pressure control profile No.	Pressure control profile No. to be started (1 to 32)	
Auxiliary command 2	0100h	Pressure control specification (bit8) • 1: Pressure control valid

• "Mode switching (position to pressure)" of pressure control profile

Item		Setting value	
Limit position		0 (Switched during stopping)	
Switching option 1		0000h	■ ■ ■ □ (Select movement) • 0: Feeding/dwelling pressure ■ ■ □ ■ (Forced switch to pressure control mode) • 0: Disable
Switching condition	Condition select 1	08h	■ □ (Select data 1) • 8: No condition (switching immediately)

• "Feed" of pressure control profile

    <Example> When setting initial speed limit value and initial pressure command value

Item		Setting value	
Feeding common option 1		0011h	■ ■ ■ □ (Select initial speed limit value) • 1: Initial speed limit value ■ ■ □ ■ (Select initial pressure command value) • 1: Enabled (Enables the setting of the initial pressure command value)
Initial command	Initial speed limit value	Arbitrary (0 to 2147483647)	
	Initial pressure command value	Arbitrary (0 to 32767)	

• Setting servo parameter

Item	Setting value
ZSP disabled selection at control switching (PC76.1)	0: Enabled (control switching is performed within the range of ZSP)

●Operation
- After the pressure control point is started, switching to pressure control mode is immediately performed without moving the axis.
- After switching to the pressure control mode, feed/dwell operation is performed.

*1 Transmission of pressure command, speed limit value command, and tip position in pressure control is started at the same time that switching is started.
*2 After the pressure control point is started, switching to pressure control mode is immediately started without moving the axis.
*3 Accelerating to V1 after switching to the pressure control.

■Switching to the pressure control mode while the axis is moving when the switching condition is satisfied

●Setting

• Point table

Item	Setting value	
Position data	Set the values as the values in normal automatic operation.	
Feed speed		
Acceleration time constant		
Deceleration time constant		
Auxiliary command		
Pressure control profile No.	Pressure control profile No. to be started (1 to 32)	
Auxiliary command 2	0100h	Pressure control specification (bit8) • 1: Pressure control valid

• "Mode switching (position to pressure)" of pressure control profile

    <Example> Switching to the pressure control mode when the feedback position is 3000000 or more

Item		Setting value	
Limit position		Target position of point (end point)	
Switching option 1		0000h	■■■☐ (Select movement) • 0: Feeding/dwelling pressure ■■☐■ (Forced switch to pressure control mode) • 0: Disable
Switching condition	Condition select 1	03h	■☐ (Select data 1) • 3: F/B position ☐■ (Switching condition 1 judgement) • 0: Selected data 1 turns decided value 1 or more
	Judgement value 1	3000000	Set the switching position.

• "Feed" of pressure control profile

    <Example> When setting initial speed limit value and initial pressure command value

Item		Setting value	
Feeding common option 1		0000h	■■■☐ (Select initial speed limit value) • 0: Command speed while switching ■■☐■ (Select initial pressure command value) • 0: Disabled (initial value = 0)
Initial command	Initial speed limit value	Arbitrary (0 to 2147483647)	When "Select initial speed limit value" is "0: Command speed while switching", set the value to limit the initial value of speed limit value. • 0: Doesn't limit the initial value of speed limit value. • Except 0: Limit the initial value of speed limit value by the setting value.
	Initial pressure command value	0 (Not used.)	

• Setting servo parameter

Item	Setting value
ZSP disabled selection at control switching (PC76.1)	1: Disabled (control switching is performed regardless of the range of ZSP)

If the difference between the speed at mode switching (position to pressure) and the speed limit value (Vbgn) of the feed operation is large, it takes time to switch the control mode, and "Pressure Control Error (operation alarm No.0063H, detail No.000CH)" may occur due to a timeout.

To adjust the timeout duration, set "Mode switching (position to pressure) → Timeout duration" of the pressure control profile. To extend the timeout duration, the timeout duration setting of the servo amplifier side must be changed. For details about the servo parameters, refer to the servo amplifier manual.

When "Pressure Control Error (operation alarm No.0063H, detail No.000CH)" occurs, perform the stop by the quick stop method of the servo amplifier, and during the servo OFF after the stop, perform the process (follow up) to match the command position and the feedback position. Therefore, set the servo parameter "Quick stop method selection (PT68.0)" to 0h to 2h (setting for ready OFF or servo OFF). If set to 5h or 6h (setting to maintain servo ON), "Drive unit alarm [AL. 035_Command frequency error]" may occur.

When performing the pressure control with a vertical axis, To prevent dropping when the servo is OFF, take the countermeasure such as installing a break or a stopper.

8

●Operation
- After the pressure control point is started, the axis moves and switching to the pressure control mode is performed when the switching condition is satisfied.
- After switching to the pressure control mode, feed/dwell operation is performed.

[Position control to pressure control (feed)]

Point 1: High-speed movement to the position for switching to position control mode. Switching to the pressure control while the axis is moving.
Mode switching (position to pressure): "Command position" reaches "Switching position
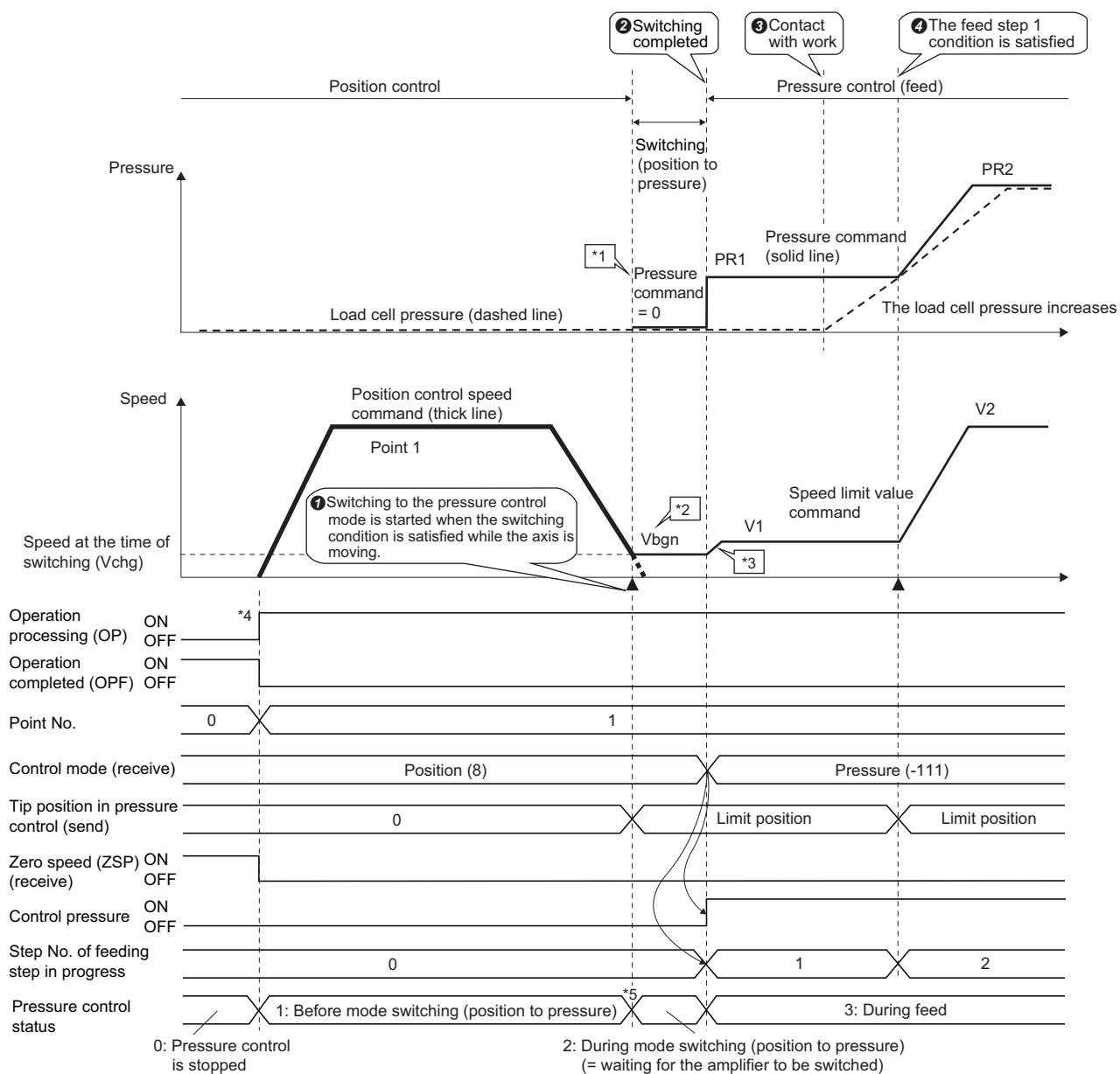
*1 Transmission of pressure command, speed limit value command, and tip position in pressure control is started at the same time that switching is started.
*2 The speed at switching (Vchg) = Vbgn is sent until switching is completed.
*3 After switching to the pressure control, the speed increases (decreases) to V1.
*4 Start operation
*5 Switching started

■Moving at high speed to a specified position and switching to the pressure control mode at a specified speed

●Setting

• Point table 1

Item	Setting value	
Position data	Position shortly before switching to the pressure control	
Feed speed	Arbitrary	
Acceleration time constant	Arbitrary	
Deceleration time constant	Arbitrary	
Auxiliary command	0060h	Deceleration check system (bit4 to 5) • 2: Continue operation Speed switching point specification (bit6) • 1: Before point switching
Pressure control profile No.	0	
Auxiliary command 2	0000h	Pressure control specification (bit8) • 0: Pressure control invalid

• Point table 2

Item	Setting value	
Position data	Position slightly ahead of the position to switch to the pressure control Before the position where the work is contacted	
Feed speed	Low speed (speed at which the axis contacts the work)	
Acceleration time constant	Arbitrary	
Deceleration time constant	Arbitrary	
Auxiliary command	0000h	Deceleration check system (bit4 to 5) • 0: In-position stop
Pressure control profile No.	Pressure control profile No. to be started (1 to 32)	
Auxiliary command 2	0100h	Pressure control specification (bit8) • 1: Pressure control valid

• "Mode switching (position to pressure)" of pressure control profile

<Example> Switching to the pressure control mode when the feedback position is 3000000 or more

Item		Setting value	
Limit position		Target position of point 2 (end point)	
Switching option 1		0000h	■■■□ (Select movement) • 0: Feeding/dwelling pressure ■■□■ (Forced switch to pressure control mode) • 0: Disable
Switching condition	Condition select 1	03h	■□ (Select data 1) • 3: F/B position □■ (Switching condition 1 judgement) • 0: Selected data 1 turns decided value 1 or more
	Judgement value 1	3000000	Set the switching position.

• "Feed" of pressure control profile

<Example> When setting initial speed limit value and initial pressure command value

Item		Setting value	
Feeding common option 1		0010h	■■■□ (Select initial speed limit value) • 0: Command speed while switching ■■□■ (Select initial pressure command value) • 1: Enabled (Enables the setting of the initial pressure command value)
Initial command	Initial speed limit value	Arbitrary (0 to 2147483647)	When "Select initial speed limit value" is "0: Command speed while switching", set the value to limit the initial value of speed limit value. • 0: Doesn't limit the initial value of speed limit value. • Except 0: Limit the initial value of speed limit value by the setting value.
	Initial pressure command value	Arbitrary (0 to 32767)	

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• Setting servo parameter

Item	Setting value
ZSP disabled selection at control switching (PC76.1)	1: Disabled (control switching is performed regardless of the range of ZSP)

●Operation

• Moving at high speed and decelerating to creep speed, and then going to the point 2 after the automatic operation is started.

• Switching to the pressure control mode is performed when the switching condition is satisfied at the point 2.

• After switching to the pressure control mode, feed/dwell operation is performed.

❸ Switching completed
❹ Contact with work
❺ The feed step 1 condition is satisfied

Position control — Pressure control (feed)

Pressure

Switching (position to pressure)

*1 Initial pressure command value

Pressure command (solid line)

PR2

PR1

Load cell pressure (dashed line)

The load cell pressure increases

Speed

Position control speed command (thick line)

Point 1

V2

❶ Decelerating to point 2 command speed and point is switched.

Point 2 command speed = Speed at the time of switching (Vchg)

Speed limit value command

Vbgn *2 V1
*3

Point 2

❷ Switching to the pressure control mode is started when the switching condition is satisfied while the point 2 axis is moving.

Operation processing (OP) ON/OFF *4

Operation completed (OPF) ON/OFF

Point No. | 0 | 1 | 2

Control mode (receive) | Position (8) | Pressure (-111)

Tip position in pressure control (send) | 0 | Limit position | Limit position

Zero speed (ZSP) ON (receive) OFF

Control pressure ON/OFF

Step No. of feeding step in progress | 0 | 1 | 2

Pressure control status | 0: Pressure control is stopped *5 | 3: During feed

1: Before mode switching (position to pressure)
2: During mode switching (position to pressure) (= waiting for the amplifier to be switched)

*1 Transmission of pressure command, speed limit value command, and tip position in pressure control is started at the same time that switching is started.
*2 Speed limit value command (Vbgn) = Speed at switching (Vchg)
    The axis moves while the control mode is being switched.
*3 After switching to the pressure control, the speed increases (decreases) to V1.
*4 Start operation
*5 Switching started

8 APPLICATION FUNCTIONS
8.26 Pressure Control

■Starting the pressure release operation while stopping

●Setting

• Point table

Item	Setting value	
Position data	0 (Switched during stopping)	
Feed speed	Arbitrary (low speed)	
Acceleration time constant	Arbitrary	
Deceleration time constant	Arbitrary	
Auxiliary command	0001h	Position command system (bit0) • 1: Relative position command
Pressure control profile No.	Pressure control profile No. to be started (1 to 32)	
Auxiliary command 2	0100h	Pressure control specification (bit8) • 1: Pressure control valid

• "Mode switching (position to pressure)" of pressure control profile

Item		Setting value	
Limit position		0 (Switched during stopping)	
Switching option 1		0001h	■■■□ (Select movement) • 1: Releasing pressure ■■□■ (Forced switch to pressure control mode) • 0: Disable
Switching condition	Condition select 1	08h	■□ (Select data 1) • 8: No condition (switching immediately)

• Setting servo parameter

Item	Setting value
ZSP disabled selection at control switching (PC76.1)	0: Enabled (control switching is performed within the range of ZSP)

●Operation

• After the pressure control point is started, switching to pressure control mode is immediately performed without moving the axis.

• After switching to the pressure control mode, the pressure release operation is performed.

*1 Transmission of pressure command, speed limit value command, and tip position in pressure control is started at the same time that switching is started.

*2 There is also a condition that the mode reset is performed when the load cell pressure falls below the setting pressure (PR0).
(In the above figure, the decelerating start point has been reached and the mode reset is completed.)

*3 After the pressure control point is started, switching to pressure control mode is immediately started without moving the axis.

*4 After the servo amplifier switches to the pressure control, the command changes.

*5 During the pressure release operation, the Step No. of releasing pressure step in progress is "1".

Feed/dwell operation

- Perform the pressure control according to the pressure control profile specified by the pressure control profile No. in the point table.
  When setting "Mode switching (position to pressure) → Switching option 1 → Select movement" to "0: Feeding/dwelling pressure", the feed/dwell operation is started by switching to the cyclic synchronous pressure mode (cspr).
- Speed limit value, pressure command, speed limit time constant, and pressure command time constant can be set for each step No. in the pressure control profile.
  The speed limit time constant and pressure command time constant set the time required to reach the reference speed limit value and the referenced pressure command value, respectively.
- By setting "Dwell → Step No.n (n=1 to 32) → Dwelling pressure option 1 → Dwelling pressure time constant" to "1: Time constant disabled (Pressure command between steps are connected by a straight line with the time constant disabled.)" in the pressure control profile, the pressure command of the second step and after of the dwell can be connected by a straight line with the time constant invalid. (The time constant is enabled for the speed limit value.)
- When the servo parameter "Pressure increasing direction selection for positioning address (PW12.1)" is set to "0: Increase pressure by decreasing positioning address", set the movement direction of the drive unit so that the forward direction is the "-" direction.
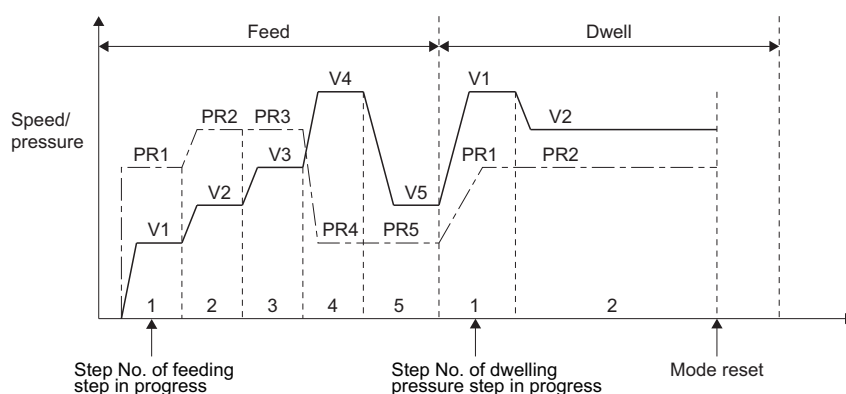
> **Point**
> - If the servo parameter "Function selection W-1 (PW12)" is changed, turn the power of the drive unit on again or reset it. If the operation is performed without reflecting the setting, an unexpected operation may occur such as moving toward the final position regardless of the load cell pressure.
> - The mode is reset by turning on the pressure control mode resetting signal (PSMRST).

■Processing details

●Startup
- Set "Mode switching (position to pressure) → Switching option 1 → Select movement" to "0: Feeding/dwelling pressure".
  When the pressure control point is performed in the automatic operation, and "Mode switching (position to pressure) → Switching condition" of the pressure control profile is satisfied, the mode is switched to the cyclic synchronous pressure mode (cspr), and feed/dwell operation is started.
- When the axis in which the pressure control point is performed does not support the pressure control, "Pressure Control Initiation Error (operation alarm No.0061H, detail No.000FH)" occurs.
- After the startup, the number of steps of the setting data is got and the setting data is checked.
  If the required set value is out of range when the pressure control point is started, "Pressure Control Setting Error (operation alarm No.0062H, detail No.1000H to 8FFFH)" occurs.
- After feed/dwell operation is started, the control is performed by the value set in the pressure control profile.

●Feed/dwell operation
- By setting the number steps of feed/dwell, the change of feed/dwell can be terminated at the number of set steps.
- The pressure command time constant and the speed limit time constant can be set at each step.
- For the step No. in progress, the step No. of feeding step in progress is stored.
- If the required set value is out of range during feed/dwell operation, "Pressure Control Error (operation alarm No.0063H, detail No.0007H to 000AH)" occurs.

●Switching (feed to dwell)

• The Motion control board judges "Switching (feed to dwell)" of the pressure control profile, and automatically switches to the cyclic synchronous pressure mode (cspr).
Set "Switching (feed to dwell) → Switching condition 1 → Forced switch to dwelling pressure" to "1: Enabled". Switching is also available by turning OFF to ON the dwelling pressure forced switching signal (PSDFSW).

• By setting "Switching (feed to dwell) → Switching condition 1 → Forced switch to dwelling pressure" to "1: Enabled" in the pressure control profile, when the duration time of the pressure status set in "Switching pressure" exceeds the "Switching time", the feed operation is forcibly switched to the dwell operation.

●End

• When the final position (SE) is reached, the mode reset is performed (mode switching (pressure to position)).

• Set "Feed → Dwelling pressure common option 1 → Mode reset" to "0: Mode reset enabled" in the pressure control profile, and if the condition is satisfied, mode reset is performed. (Returned to the position control from the pressure control.)

⚠ CAUTION

• Set the servo parameter "Forward/reverse-side stop function (PW12.2)" to "1 (Forward-side stop function: Enabled, reverse-side stop function: Disabled)". If the reverse-side stop function is set to "Enabled", "Pressure Control Initiation Error (operation alarm No.0061H, detail No.0017H)" occurs.

• Set the software limit in the mode where the pressure control axis keeps moving backward due to an abnormality of the load cell detector, etc. or variation of the load cell pressure during pressure control.

■Pressure command control mode

By setting "Dwell → Step No.n (n = 1 to 32) → Dwelling pressure option 1 → Dwelling pressure time constant" of the pressure control profile, the pressure command can be selected from "0: Time constant enabled" or "1: Time constant disabled (Pressure command between steps are connected by a straight line)". (The time constant is enabled for the speed limit value.) When selecting "1: Time constant disabled", select "0: Default selected data" or "5: Step running time" of "Dwell → Step No.n (n = 1 to 32) → Switching condition", and select "0:switching condition 1 only" of "Condition to be satisfied". When "1: Time constant disabled" is selected for "Dwell → Step No.n (n = 1 to 32) → Dwelling pressure option 1 → Dwelling pressure time constant" of the pressure control profile other than the above setting, "Pressure Control Initiation Error (operation alarm No.0061H, detail No.0061H)" occurs.
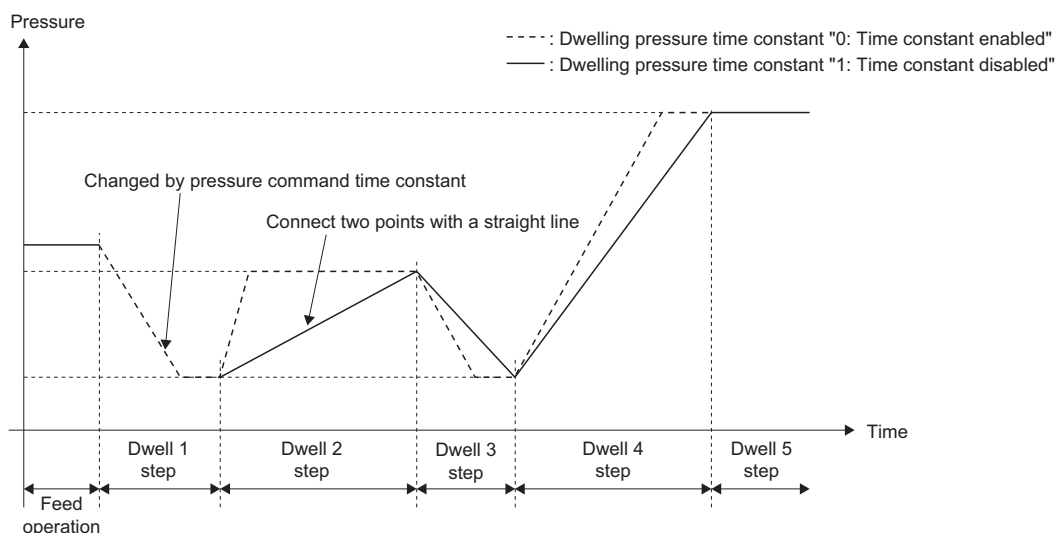
Pressure release operation

- Perform the pressure control according to the pressure control profile specified by the pressure control profile No. in the point table.

  When setting "Mode switching (position to pressure) → Switching option 1 → Select movement" to "1: Releasing pressure", the pressure release operation is started by switching to the cyclic synchronous pressure mode (cspr).

- In the pressure release operation, the pressure command time constant cannot be set.
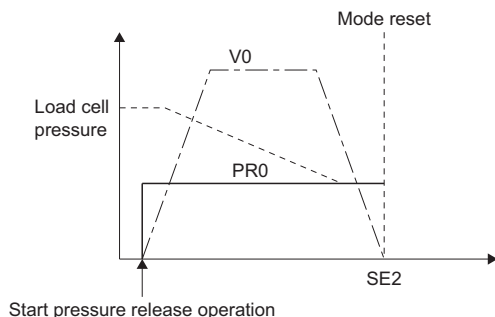
■Processing details

●Startup

- Set "Mode switching (position to pressure) → Switching option 1 → Select movement" to "1: Releasing pressure".

  When the pressure control point is performed in the automatic operation, and "Mode switching (position to pressure) → Switching condition" of the pressure control profile is satisfied, the mode is switched to the cyclic synchronous pressure mode (cspr), and the pressure release operation is started.

- When the axis in which the pressure control point is performed does not support the pressure control, "Pressure Control Initiation Error (operation alarm No.0061H, detail No.000FH)" occurs.

- When the movement amount of the pressure control point for the pressure release operation is not 0, "Pressure Control Initiation Error (operation alarm No.0061H, detail No.0005H)" occurs.

- After the startup, the setting data is checked.

  If the required set value is out of range when the pressure control point for the pressure release operation is started, "Pressure Control Setting Error (operation alarm No.0062H, detail No.1000H to 8FFFH)" occurs.

●Pressure release operation

- The final position (SE2) and the Initial speed limit value (V0) cannot be changed during pressure release.

- The initial pressure command value (PR0) can be changed during pressure release.

- For the step No. of releasing pressure step in progress, "1" is stored.

- If the required set value is out of range during feed/dwell operation, "Pressure Control Error (operation alarm No.0063H, detail No.000BH)" occurs.

●End

- The mode reset is performed when the load cell pressure drops below the initial pressure command value (PR0).

- When the decelerating start point to the final position (SE2) at the speed limit stopping time constant is reached, the decelerating operation starts automatically toward the final position (SE2). If the pressure control mode resetting signal (PSMRST) is turned OFF to ON at this time, the deceleration stop is performed using the speed limit time constant. During the decelerating operation to the final position (SE2), the deceleration time constant is adjusted according to the remaining distance to the final position (SE2). Therefore, the deceleration time constant is not a constant value. In addition, the stop position and the final position (SE2) may not match because the stop is not performed by position control. The mode reset is completed when the zero speed signal (ZSP) is turned ON and the load cell pressure falls below the set pressure value (PR0) during deceleration.

- When the speed limit stopping time constant is short, stopping may be performed beyond the final position (SE2).

Operation at the end of the pressure control

When a factor (such as mode reset and alarm occurrence) that ends the pressure control occurs, the Motion control board automatically switches to the cyclic synchronous position mode (csp).

> **Point**
> - The operation of the pressure control point is completed when switching to the cyclic synchronous position mode (csp) is completed.
> - If operation is stopped in the middle of the operation due to a forced stop or an operation alarm, the Motion control board automatically switches the mode to the cyclic synchronous position mode (csp).

■End of feed/dwell operation

1. When a factor (such as mode reset and alarm occurrence) that ends feed/dwell operation occurs, the status is transited to "Mode reset" status.

○: Transited during mode reset, ―: Disabled (Not transited during mode reset)

Factor that ends feed/dwell operation	Operation status		
	Mode switching (position to pressure) (feed)[*1]	Feeding	Dwelling
"Feed → Step No.n (n = 1 to 32) → Limit position"/Dwell → Step No.n (n = 1 to 32) → Limit position" is out of range.[*2]	○	○	○
The final position (SE) is passed.	―	○	○
The pressure control mode resetting signal (PSMRST) is ON.	―	○	○
(The mode reset is enabled when the condition of the final step is satisfied) and (The condition of the final step is satisfied)	―	―	○
Stop factor[*3]	○	○	○

*1 When the mode switching (position to pressure) is started
*2 When the difference between the limit position and the feedback position exceeds 2^{31} [pulse] in the units after the electronic gear processing.
*3 For details about the stop factors, refer to the following.
  ☞ Page 334 Stop factors during pressure control mode

2. Perform the stop processing during "Mode reset" status. (speed limit value command = 0)

3. Wait for the zero speed signal (ZSP) of the drive unit.

4. When the zero speed signal (ZSP) is turned ON, the switch from the cyclic synchronous pressure mode (cspr) to the cyclic synchronous position mode (csp) is performed.

5. Operation is completed with the switching completion to the cyclic synchronous position control mode (csp). (Transit to the next point if it exists. The operation is completed when the point is the final point.)

> **Point**
> When the final position (SE) is passed during "Mode reset", or a stop factor (servo OFF is stopped) occurs, the speed limit value command is 0 and the pressure command is 0.
> If the final position (SE) is set in the opposite direction of the pressure increasing direction, the status is transited to "Mode reset" status when feed/dwell operation is started.

■End of pressure release operation

1. When a factor that ends the pressure release operation occurs, the status is transited to "Mode reset" status.

○: Transited during mode reset, —: Disabled (Not transited during mode reset)

Factor that ends feed/dwell operation	Operation status	
	Mode switching (position to pressure) (pressure release)[*1]	Releasing pressure
The final position (SE) is out of range.[*2]	○	—
The final position (SE) is passed.	—	○
The pressure control mode resetting signal (PSMRST) is ON.	—	○
Load cell pressure ≤ setting pressure (PR0)	—	○
The position from which the deceleration to the final position (SE) is started is passed.	—	○
Stop factor[*3]	○	○

*1 When the mode switching (position to pressure) is started

*2 When the difference between the final position and the feedback position exceeds 2^{31} [pulse] in the units after the electronic gear processing.

*3 For details about the stop factors, refer to the following.
  ☞ Page 334 Stop factors during pressure control mode

2. Perform the deceleration stop processing during "Mode reset" status. (The speed limit value command is decelerated to 0.)

3. When the speed limit value command becomes 0, wait for the zero speed signal (ZSP) of the drive unit.

4. When the zero speed signal (ZSP) is turned ON, the switch from the cyclic synchronous pressure mode (cspr) to the cyclic synchronous position mode (csp) is performed.

5. Operation is completed with the switching completion to the cyclic synchronous position control mode (csp). (Transit to the next point if it exists. The operation is completed when the point is the final point.)

> **Point**
>
> When the final position (SE) is passed during "Mode reset", or a stop factor occurs, the speed limit value command is 0 and the pressure command is 0.
>
> If the final position (SE2) is set in the pressure increasing direction, the status is transited to "Mode reset" status when the pressure release is started.

Operation of software limit

When the feedback position exceeds the software limit, "Reached Software Limit (operation alarm No.00A2H, detail No.0001H)" occurs, and the mode is reset. (Switched to the cyclic synchronous position mode (csp).)

In some modes, the pressure control axis keeps moving backward during the pressure control due to an error such as an error in the load cell detector. Therefore, set the software limit.

Executed step No.

• The executed step No. can be checked.

• For the step No. of releasing pressure step in progress during the pressure release operation, "1" is stored.

• Reset when the mode switching from the pressure control to position control is performed.

Pressure control setting

This section describes the switching condition of feed/dwell operation, and the setting method of speed limit value/pressure command value.
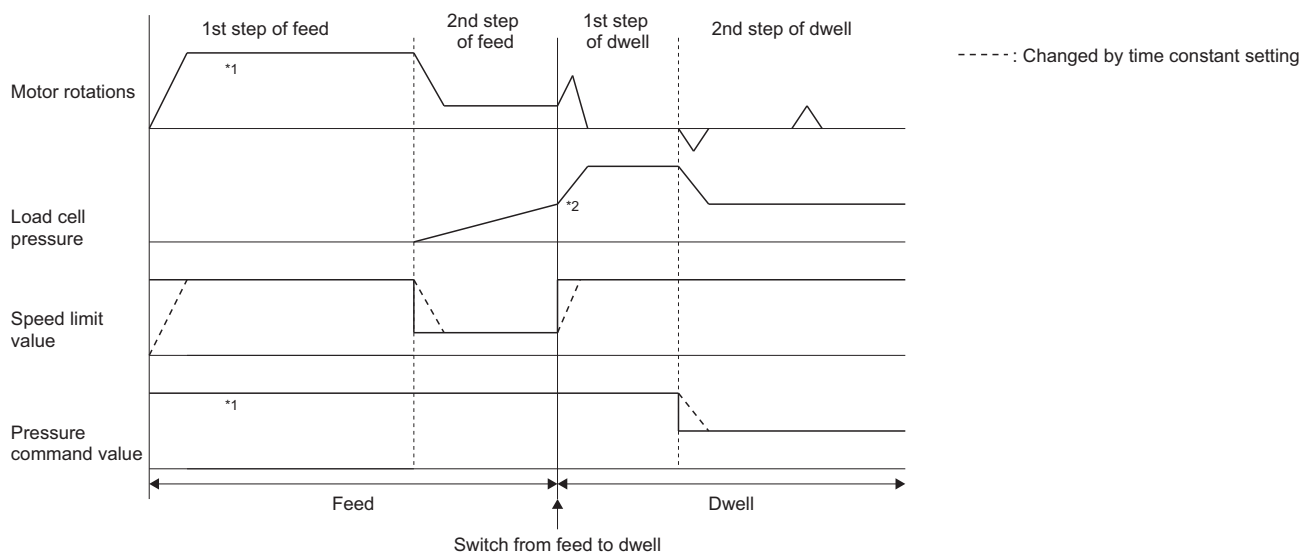
*1   When the number of motor rotations when the feed operation is started does not reach the setting speed, increase the pressure command for the first step of feed.

*2   Shortly before the load cell pressure rises suddenly, switch from feed to dwell.

●Set speed limit value/pressure command value
 • Speed limit value/pressure command value can be set for each step.
 • For milder operation, set the speed limit time constant and the pressure command time constant longer.
 • For the pressure setting, set that set it so that the 1st step of feed is the 1st step of dwell.

●Feed operation
 • During feed, the pressure command is limited by the speed limit value. Therefore, the pressure is not performed as it should be.
 • When the number of motor rotations when the feed operation is started does not reach the setting speed, increase the pressure command for the first step of feed. (The value for the first step of pressure is not necessary to be changed.)
 • Set the second feed step that starts decelerating at low speed so that the motor operation is at low speed by the time the pressure rises even slightly.

●Switch from feed to dwell
 • For the switching from feed to dwell, set the switching condition so that the switching is performed shortly before the position where the load cell pressure rises suddenly.
   To switch the operation at the feedback position, specify "Condition select" of the switching condition to "0: Default selected data ("F/B position [command units]" for the condition when switching from feed to dwell)" or "3: F/B position [command units]".
   By specifying multiple "Condition select", "Judgement value", and "Condition to be satisfied", switching can be performed under the multiple conditions.
 • If the load cell pressure overshoots when switching from feed to dwell, increase the speed limit time constant of the first step of dwell.

●Cautions
 • When the load cell fails and the high pressure is applied, set the software limit to prevent the motor from continuously backing up to reduce the pressure and hitting the tip of the machine.
 • The servo parameter "Pressure control feedback offset (PW21)" should normally be set to "0".
   When performing the offset adjustment by a user program, change the servo parameter by read/change function of the servo parameter. For the details about the servo parameter, refer to the servo amplifier manual.

Point

[Motion API]

To read/change the servo parameter, use the sscSlmpReadSlaveObject function and the sscSlmpWriteSlaveObject function.

Mode reset function when the switching condition of the final step of dwell is satisfied

- Set "Dwell → Dwelling pressure common option 1 → Mode reset" of the pressure control profile to "0: Mode reset enabled", and when the condition is satisfied, reset the mode. (Returned from the pressure control to the position.)
The mode is automatically returned to the position control mode when the switching condition of the final step of dwell is satisfied even when the pressure control mode resetting signal (PSMRST) is not turned ON.
- When setting "Dwell → Dwelling pressure common option 1 → Mode reset" of the pressure control profile to "1: Mode reset disabled", the status becomes the wait status in the final step of dwell. The mode is reset by turning ON the pressure control mode resetting signal (PSMRST).
- Regardless of the setting of "Dwell → Dwelling pressure common option 1 → Mode reset" of the pressure control profile, the mode is reset when the feedback position reaches the final position (SE). (Returned to the pressure control to the position.

8

Stop factors during pressure control mode

Stop factor	Operation		
	Stop method	Alarm/Error	Operation during pressure control mode
Limit position for mode switching (position to pressure) was reached.	Immediate stop	Operation alarm No.0061H, detail No.0011H	When the feedback position reaches the limit position in position control before switching to the pressure control, the operation is stopped immediately. (No deceleration processing is performed.)
The servo is OFF.	Immediate stop	Operation alarm No.00B3H, detail No.0001H	Regardless of the speed limit value, the speed limit command value to be commanded to the drive unit is set to 0, and when the zero speed signal (ZSP) is turned ON, the mode is switched to the cyclic synchronous position mode (csp), and the operation is stopped immediately. (No deceleration processing is performed.)
The pressure control profile setting value is out of range.	Immediate stop	Operation alarm No.0062H, detail No.1000H to 8FFFH	
The drive unit command discard is detected.	Immediate stop	Operation alarm No.00C0H, detail No.0001H	
The stop operation signal (STP) was turned ON.	Immediate stop	—	
The rapid stop signal (RSTP) was turned ON.	Immediate stop		
Operation mode was changed.	Immediate stop	Operation alarm No.0023H, detail No.0001H	
The Interlock signal (ITL) was turned ON.	Immediate stop	Operation alarm No.0061H, detail No.000DH	
The limit switch was OFF.	Immediate stop	Operation alarm No.00A0H, detail No.0001H or No.0002H	The mode is switched to the cyclic synchronous position mode (csp) at the current position, and the operation is stopped immediately. (No deceleration processing is performed.)
The software limit was reached.	Immediate stop	Operation alarm No.00A2H, detail No.0001H	
A forced stop (the external forced stop signal (EMI) or the software forced stop signal (SEMI) was turned ON.	Immediate stop	Operation alarm No.0012H, detail No.0001H	The mode is switched to the cyclic synchronous position mode (csp) when the servo is OFF (the servo ready signal (RDY) is OFF). (The drive unit leaves the control of the Motion control board and stops according to the specifications of the drive unit, such as dynamic brake stop/deceleration stop.)
The drive unit alarm occurred.	Immediate stop	Operation alarm No.00B1H, detail No.0001H	
The drive unit is not controllable. (Disconnected. The control power of the drive unit was turned OFF.)	Immediate stop	Operation alarm No.00B0H, detail No.0002H	The drive unit leaves the control of the Motion control board and stops according to the specifications of the drive unit, such as dynamic brake stop/deceleration stop. (When the drive unit is powered on again, the mode becomes the cyclic synchronous position mode (csp).)

Point

- For all patterns, the Motion control board automatically changes the mode to the position control after the zero speed signal (ZSP) is turned ON.
- The limit position for mode switching (position to pressure) to the pressure control is determined by the feedback position. The position after a stop is a position exceeding the press limit position. Therefore, when setting a position, consider the operation that exceeds the limit position.
- If the interlock signal (ITL) turns ON during the cyclic synchronous position mode of the pressure control point, "Pressure Control Initiation Error (operation alarm No.0061H, detail No.000DH)" occurs.
- When a stop factor occurs during switching from the cyclic synchronous position mode (csp) to the cyclic synchronous pressure mode (cspr), wait for the switch to be completed or the timeout duration to be passed. For a stop method during switching, follow the stop method during the cyclic synchronous position mode (csp).
- An immediate stop occurs when a stop factor occurs during switching from the cyclic synchronous pressure mode (cspr) to the cyclic synchronous position mode (csp).

Combinations of pressure control and other functions

The following shows the combinations of pressure control with each function.

○: Usable, △: Restriction, ×: Unusable, ─: Not applicable

Classification	Function		Compatibility	Remarks
Operational function	JOG operation		─	
	Incremental feed		─	
	Automatic operation		△	The switching method can be selected in "Mode switching (position to pressure)" of the pressure control profile. When the predwell is specified, "Pressure Control Initiation Error (operation alarm No.0061H, detail No.001BH)" occurs.
	Interpolation operation	Linear interpolation	×	When starting up the pressure control point, "Pressure Control Initiation Error (operation alarm No.0061H, detail No.0013H)" occurs.
		Circular interpolation	×	
	Home position return		─	
	Home position reset function (data set)		─	
Application function	Command unit	Electronic gear	○	
	Speed unit	Speed unit	○	Set the speed limit value for the pressure control in speed units.
		Speed units multiplication factor	○	
		Speed limit	○	The speed limit value for the pressure is set in the pressure control profile. The speed limit value for the pressure control is limited by "Speed limit value (Parameter No.0222, 223).
	Acceleration /deceleration	Linear acceleration/ deceleration	○	
		Smoothing filter	△	Invalid during pressure control.
		S-curve acceleration/ deceleration (Sine acceleration/deceleration)	△	
		Jerk ratio acceleration/ deceleration	△	
		Vibration suppression command filter 1	×	When starting up the pressure control point, "Pressure Control Initiation Error (operation alarm No.0061H, detail No.0018H)" occurs.
	Servo ON/Servo OFF		○	Control mode is automatically changed to the cyclic synchronous position mode (csp) after an operation alarm occurrence.
	Forced stop		△	Control mode is automatically changed to the cyclic synchronous position mode (csp) after an operation alarm occurrence. When "Emergency stop option" of "Emergency stop option (parameter No.02A0)" is other than "0: Quick stop", or "Condition axis setting" of "Emergency stop option (parameter No.02A0)" is set to "1 to 3: Valid", "Pressure Control Initiation Error (operation alarm No.0061H, detail No.0019H)" occurs when starting up the pressure control point.
	Stop operation		○	Control mode is automatically changed to the cyclic synchronous position mode (csp) after the operation stops.
	Rapid stop operation		○	
	Limit switch (hardware stroke limit)		○	Control mode is automatically changed to the cyclic synchronous position mode (csp) after an operation alarm occurrence. Since the movement amount of the pressure control point in the pressure release operation is 0, the limit switch is not checked when the operation is started.
	Software limit (software stroke limit)		○	Control mode is automatically changed to the cyclic synchronous position mode (csp) after an operation alarm occurrence.
	Interlock		×	"Pressure Control Initiation Error (operation alarm No.0061H, detail No.000DH)" occurs when it is ON.
	Rough match output		△	At the pressure control point, the rough match turns ON when the distance remaining based on the position data of the point table is within the rough match output range. When switching from the pressure control mode to the cyclic synchronous position mode, the rough match turns ON after the operation is completed even if not within the rough match output range.
	Torque limit		○	During the pressure control mode, torque limit is valid.

Classification	Function		Compatibility	Remarks
Application function	Command change	Speed change	×	The speed change error signal (SCE) turns ON.
		Change of time constants	×	The acceleration time constant change error signal (TACE), or the deceleration time constant change error signal (TDCE) turns ON.
		Position change	×	The position change error signal (PCE) turns ON.
	Backlash		×	
	Position switch		△	Determined by the current feedback position during the pressure control mode.
	Completion of operation signal		○	Output after switched to the cyclic synchronous position mode (csp).
	Absolute position detection system		○	
	Home position return request		○	
	Other axes start		△	When current command position is set to the axis judgment coordinate of start condition during the pressure control mode, a current command position matching the current feedback position is determined. The remaining distance is calculated based on the target position of the point data. When using the specified position pass specification, if a position that exceeds the position data is set in the point table, "Other Axes Start Setting Error (operation alarm No.004DH, detail No.0012H)" occurs. Also, since the amount of movement of the pressure control point is 0 in the pressure release operation, if the other axis is started, "Other Axes Start Setting Error (operation alarm No.004DH, detail No.0012H)" occurs.
	High response I/F		○	
	In-position signal		—	
	I/O device		—	
	Dual port memory exclusive control		—	
	Pass position interrupt		△	When current position is set to the judgment condition of the pass position condition, a current command position matching the current feedback position is determined. Therefore, when a current position is specified, it may not be correctly determined.
	No home position function		○	
	Device station object I/O		○	
	Driver command discard detection		○	■"Driver command discard detection" of "Control option 5 (parameter No.0212)" is set to "0: Detection valid" During feed/dwell operation, when the limit position of each step is exceeded, "Drive Unit Command Discard Detected (operation alarm No.00C0H, detail No.0001H)" occurs and the operation stops. ■"Driver command discard detection" of "Control option 5 (parameter No.0212)" is set to "1: Detection invalid" During feed/dwell operation, no operation alarm occurs even if the limit position of each step is exceeded. Even if the limit position is exceeded, torque in the direction of return to the limit position is generated.
	High speed operation mode		○	
Auxiliary function	Reading/writing parameters		—	
	Alarm/system error		○	
	Monitor function		○	The speed limit value output to the drive unit is output for "moving speed" during the pressure control mode.
	High speed monitor function		○	
	Interrupt		○	
	User watchdog function		—	
	Software reboot function		—	
	Parameter backup		—	
	Sampling		○	Axis data (high speed) (command bits/status bits) and axis data (command data/status data) related to the pressure control can be sampled.
	Operation cycle monitor function		—	
	Drive-unit-less axis function		○	During the pressure control, the speed limit value is ignored. (If the speed limit value is 0, the operation stops.) The load cell pressure returns the same value as the pressure command value for the specified profile.
	File control		—	
	Time control		—	

Classification	Function	Compatibility	Remarks
Auxiliary function	Link-down detection function	—	
	Event history	—	
Tandem drive		×	When starting up the pressure control point, "Pressure Control Initiation Error (operation alarm No.0061H, detail No.0012H)" occurs.

Restrictions on drive unit functions

• When switching from the cyclic synchronous position mode (csp) to the cyclic synchronous pressure mode (cspr) before waiting for the motor stop, set the servo parameter "ZSP disabled selection at control switching (PC76.1)" to "1: Disabled" so that monitoring of the zero speed status is disabled.

• When switching from the cyclic synchronous pressure mode (cspr) to the cyclic synchronous position mode (csp), switch the mode after the motor is put into the stop status (zero speed status). Also, if the setting value of the servo parameter "Zero speed (PC07)" is too small, the zero speed may not be correctly determined.

8

8.27　No Home Position Function

The no home position function is a function that sets the position at the time of power on as the home position.

When this function is valid, the automatic operation and the interpolation operation can be performed even when the home position return is not complete.

Interface

Control parameters

Parameter No.	Symbol *1	Name	Initial value	Units	Setting range	Description	When in tandem drive
0200	*OPC	Control option 1	0000h	—	0000h to 1111h	■□■■ (No home position) Set "1: Valid" when setting the position at the time of power on as the home position. After returning to the home position, the home position becomes the position where the home position return is performed. • 0: Invalid • 1: Valid	Same value

*1　The settings for the parameters with a * mark at the front of the symbol are validated when the system is started.

8.28 Device Station Object I/O

The device station object I/O function is a function that arbitrarily controls (read/write of the data) the object of the device station to which the axis No. is allocated. The object is assigned to the I/O device (RWr, RWw). For details about the I/O device, refer to the following.

☞ Page 229 I/O Device

Setting items

The setting items for assigning the axis object to the I/O device are as follows.

Network parameters

■Start/end offset setting of input word device (RWr)

Set the start/end offset of the input word device (RWr). For details about the setting method, refer to "Cyclic Settings" in the following manual.

📖 Motion Control Board User's Manual (Network)

Setting items		Setting range	Description
RWr setting	Start	0000h to 1FFCh	Set the start offset of the link register to receive.
	End	0003h to 1FFFh	Set the end offset of the link register to receive.

■Start/end offset setting of output word device (RWw)

Set the start/end offset of the output word device (RWw). For details about the setting method, refer to "Cyclic Settings" in the following manual.

📖 Motion Control Board User's Manual (Network)

Setting items		Setting range	Description
RWw setting	Start	0000h to 1FFCh	Set the start offset of the link register to send.
	End	0003h to 1FFFh	Set the end offset of the link register to send.

■PDO Setting

Set the TPDO/RPDO mapping.

Setting items	Description
TPDO setting	Set the PDO mapping of TPDO and RPDO.
RPDO setting	Assign the object within the points of the RWr setting and the RWw setting. Set only the connection module which is compatible with CANopen.

8

Axis management parameters

⚠ CAUTION

When the multiple mapping of the same object is performed for the PDO, the operation is not assured because the read or write may not be performed properly depending on which project is prioritized on the device station.

Do not assign the RPDO object that is necessary for the Motion control board to the PDO setting of the axis control parameter. For details about the RPDO object necessary for the Motion control board, refer to the following.

☞ Page 68 Necessary objects

■TPDO

Parameter No.	Symbol[1]	Name	Initial value	Units	Setting range	Description	When in tandem drive
0480	*NTPL1	TPDO object No. 1 (lower)	0000h	—	0000h to FFFFh	■■□□ (Size) Set the size (bit unit) of the TPDO object which is assigned to the input word device (RWr).[2] • 08h: 8bits (Data Type I8/U8) • 10h: 16bits (Data Type I16/U16) • 20h: 32bits (Data Type I32/U32) <Example> For "Position actual value (Obj. 6064h: 00h)" Since the size is 32 bits, set "20h". □□■■ (Subindex) Set the subindex No. of the TPDO object which is assigned to the input word device (RWr). <Example> For "Position actual value (Obj. 6064h: 00h)" Set the subindex "00h".	Each axis
0481	*NTPH1	TPDO object No. 1 (upper)	0000h	—	0000h to FFFFh	□□□□ (Index) Set the index No. of the TPDO object which is assigned to the input word device (RWr). <Example> For "Position actual value (Obj. 6064h: 00h)" Set the index "6064h".	Each axis
0482	*SUTP1	TPDO object unit 1	0000h	—	0000h to 0001h	■■■□ (Read unit selection) Set the read unit of the TPDO object which is assigned to the input word device (RWr). • 0: Data • 1: Bit	Each axis
0483	*OPTP1	TPDO object bit option 1	0000h	—	0000h to FFFFh	■■□□ (Bit selection) Set the start of the bit which is read in the input word device (RWr). When "0: Data" is set for "Read unit selection" of "TPDO object unit 1 (parameter No.0482)", this parameter is not used. The operation alarm does not occur even if the value outside the range is set. <Example> For reading fifth to eighth bits Set "05h". □□■■ (Number of bits) Set the bit length which is read in the input word device (RWr). The bit length is "set value + 1". When "0: Data" is set for "Read unit selection" of "TPDO object unit 1 (parameter No.0482)", this parameter is not used. The operation alarm does not occur even if the value outside the range is set. <Example> For reading fifth to eighth bits Set "03h".	Each axis
0484	*NTPL2	TPDO object No. 2 (lower)	0000h	—	0000h to FFFFh	The same as "TPDO object No. 1 (lower) (parameter No.0480)".	Each axis
0485	*NTPH2	TPDO object No. 2 (upper)	0000h	—	0000h to FFFFh	The same as "TPDO object No. 1 (upper) (parameter No.0481)".	Each axis
0486	*SUTP2	TPDO object unit 2	0000h	—	0000h to FFFFh	The same as "TPDO object unit 1 (parameter No.0482)".	Each axis
0487	*OPTP2	TPDO object bit option 2	0000h	—	0000h to FFFFh	The same as "TPDO object bit option 1 (parameter No.0483)".	Each axis
0488	*NTPL3	TPDO object No. 3 (lower)	0000h	—	0000h to FFFFh	The same as "TPDO object No. 1 (lower) (parameter No.0480)".	Each axis
0489	*NTPH3	TPDO object No. 3 (upper)	0000h	—	0000h to FFFFh	The same as "TPDO object No. 1 (upper) (parameter No.0481)".	Each axis
048A	*SUTP3	TPDO object unit 3	0000h	—	0000h to FFFFh	The same as "TPDO object unit 1 (parameter No.0482)".	Each axis
048B	*OPTP3	TPDO object bit option 3	0000h	—	0000h to FFFFh	The same as "TPDO object bit option 1 (parameter No.0483)".	Each axis
048C	*NTPL4	TPDO object No. 4 (lower)	0000h	—	0000h to FFFFh	The same as "TPDO object No. 1 (lower) (parameter No.0480)".	Each axis

Parameter No.	Symbol[1]	Name	Initial value	Units	Setting range	Description	When in tandem drive
048D	*NTPH4	TPDO object No. 4 (upper)	0000h	—	0000h to FFFFh	The same as "TPDO object No. 1 (upper) (parameter No.0481)".	Each axis
048E	*SUTP4	TPDO object unit 4	0000h	—	0000h to FFFFh	The same as "TPDO object unit 1 (parameter No.0482)".	Each axis
048F	*OPTP4	TPDO object bit option 4	0000h	—	0000h to FFFFh	The same as "TPDO object bit option 1 (parameter No.0483)".	Each axis
0490	*NTPL5	TPDO object No. 5 (lower)	0000h	—	0000h to FFFFh	The same as "TPDO object No. 1 (lower) (parameter No.0480)".	Each axis
0491	*NTPH5	TPDO object No. 5 (upper)	0000h	—	0000h to FFFFh	The same as "TPDO object No. 1 (upper) (parameter No.0481)".	Each axis
0492	*SUTP5	TPDO object unit 5	0000h	—	0000h to FFFFh	The same as "TPDO object unit 1 (parameter No.0482)".	Each axis
0493	*OPTP5	TPDO object bit option 5	0000h	—	0000h to FFFFh	The same as "TPDO object bit option 1 (parameter No.0483)".	Each axis
0494	*NTPL6	TPDO object No. 6 (lower)	0000h	—	0000h to FFFFh	The same as "TPDO object No. 1 (lower) (parameter No.0480)".	Each axis
0495	*NTPH6	TPDO object No. 6 (upper)	0000h	—	0000h to FFFFh	The same as "TPDO object No. 1 (upper) (parameter No.0481)".	Each axis
0496	*SUTP6	TPDO object unit 6	0000h	—	0000h to FFFFh	The same as "TPDO object unit 1 (parameter No.0482)".	Each axis
0497	*OPTP6	TPDO object bit option 6	0000h	—	0000h to FFFFh	The same as "TPDO object bit option 1 (parameter No.0483)".	Each axis
0498	*NTPL7	TPDO object No. 7 (lower)	0000h	—	0000h to FFFFh	The same as "TPDO object No. 1 (lower) (parameter No.0480)".	Each axis
0499	*NTPH7	TPDO object No. 7 (upper)	0000h	—	0000h to FFFFh	The same as "TPDO object No. 1 (upper) (parameter No.0481)".	Each axis
049A	*SUTP7	TPDO object unit 7	0000h	—	0000h to FFFFh	The same as "TPDO object unit 1 (parameter No.0482)".	Each axis
049B	*OPTP7	TPDO object bit option 7	0000h	—	0000h to FFFFh	The same as "TPDO object bit option 1 (parameter No.0483)".	Each axis
049C	*NTPL8	TPDO object No. 8 (lower)	0000h	—	0000h to FFFFh	The same as "TPDO object No. 1 (lower) (parameter No.0480)".	Each axis
049D	*NTPH8	TPDO object No. 8 (upper)	0000h	—	0000h to FFFFh	The same as "TPDO object No. 1 (upper) (parameter No.0481)".	Each axis
049E	*SUTP8	TPDO object unit 8	0000h	—	0000h to FFFFh	The same as "TPDO object unit 1 (parameter No.0482)".	Each axis
049F	*OPTP8	TPDO object bit option 8	0000h	—	0000h to FFFFh	The same as "TPDO object bit option 1 (parameter No.0483)".	Each axis
04A0	*NTPL9	TPDO object No. 9 (lower)	0000h	—	0000h to FFFFh	The same as "TPDO object No. 1 (lower) (parameter No.0480)".	Each axis
04A1	*NTPH9	TPDO object No. 9 (upper)	0000h	—	0000h to FFFFh	The same as "TPDO object No. 1 (upper) (parameter No.0481)".	Each axis
04A	*SUTP9	TPDO object unit 9	0000h	—	0000h to FFFFh	The same as "TPDO object unit 1 (parameter No.0482)".	Each axis
04A3	*OPTP9	TPDO object bit option 9	0000h	—	0000h to FFFFh	The same as "TPDO object bit option 1 (parameter No.0483)".	Each axis
04A4	*NTPL10	TPDO object No. 10 (lower)	0000h	—	0000h to FFFFh	The same as "TPDO object No. 1 (lower) (parameter No.0480)".	Each axis
04A5	*NTPH10	TPDO object No. 10 (upper)	0000h	—	0000h to FFFFh	The same as "TPDO object No. 1 (upper) (parameter No.0481)".	Each axis
04A6	*SUTP10	TPDO object unit 10	0000h	—	0000h to FFFFh	The same as "TPDO object unit 1 (parameter No.0482)".	Each axis
04A7	*OPTP10	TPDO object bit option 10	0000h	—	0000h to FFFFh	The same as "TPDO object bit option 1 (parameter No.0483)".	Each axis
04A8	*NTPL11	TPDO object No. 11 (lower)	0000h	—	0000h to FFFFh	The same as "TPDO object No. 1 (lower) (parameter No.0480)".	Each axis
04A9	*NTPH11	TPDO object No. 11 (upper)	0000h	—	0000h to FFFFh	The same as "TPDO object No. 1 (upper) (parameter No.0481)".	Each axis

Parameter No.	Symbol[*1]	Name	Initial value	Units	Setting range	Description	When in tandem drive
04AA	*SUTP11	TPDO object unit 11	0000h	—	0000h to FFFFh	The same as "TPDO object unit 1 (parameter No.0482)".	Each axis
04AB	*OPTP11	TPDO object bit option 11	0000h	—	0000h to FFFFh	The same as "TPDO object bit option 1 (parameter No.0483)".	Each axis
04AC	*NTPL12	TPDO object No. 12 (lower)	0000h	—	0000h to FFFFh	The same as "TPDO object No. 1 (lower) (parameter No.0480)".	Each axis
04AD	*NTPH12	TPDO object No. 12 (upper)	0000h	—	0000h to FFFFh	The same as "TPDO object No. 1 (upper) (parameter No.0481)".	Each axis
04AE	*SUTP12	TPDO object unit 12	0000h	—	0000h to FFFFh	The same as "TPDO object unit 1 (parameter No.0482)".	Each axis
04AF	*OPTP12	TPDO object bit option 12	0000h	—	0000h to FFFFh	The same as "TPDO object bit option 1 (parameter No.0483)".	Each axis
04B0	*NTPL13	TPDO object No. 13 (lower)	0000h	—	0000h to FFFFh	The same as "TPDO object No. 1 (lower) (parameter No.0480)".	Each axis
09B1	*NTPH13	TPDO object No. 13 (upper)	0000h	—	0000h to FFFFh	The same as "TPDO object No. 1 (upper) (parameter No.0481)".	Each axis
04B2	*SUTP13	TPDO object unit 13	0000h	—	0000h to FFFFh	The same as "TPDO object unit 1 (parameter No.0482)".	Each axis
04B3	*OPTP13	TPDO object bit option 13	0000h	—	0000h to FFFFh	The same as "TPDO object bit option 1 (parameter No.0483)".	Each axis
04B4	*NTPL14	TPDO object No. 14 (lower)	0000h	—	0000h to FFFFh	The same as "TPDO object No. 1 (lower) (parameter No.0480)".	Each axis
04B5	*NTPH14	TPDO object No. 14 (upper)	0000h	—	0000h to FFFFh	The same as "TPDO object No. 1 (upper) (parameter No.0481)".	Each axis
04B6	*SUTP14	TPDO object unit 14	0000h	—	0000h to FFFFh	The same as "TPDO object unit 1 (parameter No.0482)".	Each axis
04B7	*OPTP14	TPDO object bit option 14	0000h	—	0000h to FFFFh	The same as "TPDO object bit option 1 (parameter No.0483)".	Each axis
04B8	*NTPL15	TPDO object No. 15 (lower)	0000h	—	0000h to FFFFh	The same as "TPDO object No. 1 (lower) (parameter No.0480)".	Each axis
04B9	*NTPH15	TPDO object No. 15 (upper)	0000h	—	0000h to FFFFh	The same as "TPDO object No. 1 (upper) (parameter No.0481)".	Each axis
04BA	*SUTP15	TPDO object unit 15	0000h	—	0000h to FFFFh	The same as "TPDO object unit 1 (parameter No.0482)".	Each axis
04BB	*OPTP15	TPDO object bit option 15	0000h	—	0000h to FFFFh	The same as "TPDO object bit option 1 (parameter No.0483)".	Each axis
04BC	*NTPL16	TPDO object No. 16 (lower)	0000h	—	0000h to FFFFh	The same as "TPDO object No. 1 (lower) (parameter No.0480)".	Each axis
04BD	*NTPH16	TPDO object No. 16 (upper)	0000h	—	0000h to FFFFh	The same as "TPDO object No. 1 (upper) (parameter No.0481)".	Each axis
04BE	*SUTP16	TPDO object unit 16	0000h	—	0000h to FFFFh	The same as "TPDO object unit 1 (parameter No.0482)".	Each axis
04BF	*OPTP16	TPDO object bit option 16	0000h	—	0000h to FFFFh	The same as "TPDO object bit option 1 (parameter No.0483)".	Each axis

*1 The settings for the parameters with a * mark at the front of the symbol are validated when the system is started.

*2 When the 8-bit alignment adjustment object (index: 0000h, subindex: 00h) is set, the parameter setting value is regarded as invalid.

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■RPDO

Parameter No.	Symbol[1]	Name	Initial value	Units	Setting range	Description	When in tandem drive
04C0	*NRPL1	RPDO object No. 1 (lower)	0000h	—	0000h to FFFFh	■■□□ (Size) Set the size (bit unit) of the RPDO object which is assigned to the output word device (RWw).[2] • 08: 8bits (Data Type I8/U8) • 10: 16bits (Data Type I16/U16) • 20: 32bits (Data Type I32/U32) <Example> For "Control DI (Obj. 2D01h: 00h)" Since the size is 16bits, set "10h". □□■■ (Subindex) Set the subindex No. of the RPDO object which is assigned to the output word device (RWw). <Example> For "Control DI (Obj. 2D01h: 00h)" Set the subindex "00h".	Each axis
04C1	*NRPH1	RPDO object No. 1 (upper)	0000h	—	0000h to FFFFh	□□□□ (Index) Set the index No. of the RPDO object which is assigned to the output word device (RWw). <Example> For "Control DI (Obj. 2D01h: 00h)" Set the index "2D01h".	Each axis
04C2	*SURP1	RPDO object unit 1	0000h	—	0000h to FFFFh	■■■□ (Write unit selection) Set the write unit of the RPDO object which is assigned to the output word device (RWw). • 0: Data • 1: Bit	Each axis
04C3	*OPRP1	RPDO object bit option 1	0000h	—	0000h to FFFFh	■■□□ (Bit selection) Set the start of the bit which is written from the output word device (RWw). When "0: Data" is set for "Write unit selection" of "RPDO object unit 1 (parameter No.04C2)", this parameter is not used. The operation alarm does not occur even if the value outside the range is set. <Example> For writing fifth to eighth bits Set "05h". □□■■ (Number of bits) Set the bit length which is written from the output word device (RWw). The bit length is "set value + 1". When "0: Data" is set for "Write unit selection" of "RPDO object unit 1 (parameter No.04C2)", this parameter is not used. The operation alarm does not occur even if the value outside the range is set. <Example> For writing fifth to eighth bits Set "03h".	Each axis
04C4	*NRPL2	RPDO object No. 2 (lower)	0000h	—	0000h to FFFFh	The same as "RPDO object No. 1 (lower) (parameter No.04C0)".	Each axis
04C5	*NRPH2	RPDO object No. 2 (upper)	0000h	—	0000h to FFFFh	The same as "RPDO object No. 1 (upper) (parameter No.04C1)".	Each axis
04C6	*SURP2	RPDO object unit 2	0000h	—	0000h to FFFFh	The same as "RPDO object unit 1 (parameter No.04C2)".	Each axis
04C7	*OPRP2	RPDO object bit option 2	0000h	—	0000h to FFFFh	The same as "RPDO object bit option 1 (parameter No.04C3)".	Each axis
04C8	*NRPL3	RPDO object No. 3 (lower)	0000h	—	0000h to FFFFh	The same as "RPDO object No. 1 (lower) (parameter No.04C0)".	Each axis
04C9	*NRPH3	RPDO object No. 3 (upper)	0000h	—	0000h to FFFFh	The same as "RPDO object No. 1 (upper) (parameter No.04C1)".	Each axis
04CA	*SURP3	RPDO object unit 3	0000h	—	0000h to FFFFh	The same as "RPDO object unit 1 (parameter No.04C2)".	Each axis
04CB	*OPRP3	RPDO object bit option 3	0000h	—	0000h to FFFFh	The same as "RPDO object bit option 1 (parameter No.04C3)".	Each axis
04CC	*NRPL4	RPDO object No. 4 (lower)	0000h	—	0000h to FFFFh	The same as "RPDO object No. 1 (lower) (parameter No.04C0)".	Each axis

Parameter No.	Symbol[*1]	Name	Initial value	Units	Setting range	Description	When in tandem drive
04CD	*NRPH4	RPDO object No. 4 (upper)	0000h	—	0000h to FFFFh	The same as "RPDO object No. 1 (upper) (parameter No.04C1)".	Each axis
04CE	*SURP4	RPDO object unit 4	0000h	—	0000h to FFFFh	The same as "RPDO object unit 1 (parameter No.04C2)".	Each axis
04CF	*OPRP4	RPDO object bit option 4	0000h	—	0000h to FFFFh	The same as "RPDO object bit option 1 (parameter No.04C3)".	Each axis
04D0	*NRPL5	RPDO object No. 5 (lower)	0000h	—	0000h to FFFFh	The same as "RPDO object No. 1 (lower) (parameter No.04C0)".	Each axis
09D1	*NRPH5	RPDO object No. 5 (upper)	0000h	—	0000h to FFFFh	The same as "RPDO object No. 1 (upper) (parameter No.04C1)".	Each axis
04D2	*SURP5	RPDO object unit 5	0000h	—	0000h to FFFFh	The same as "RPDO object unit 1 (parameter No.04C2)".	Each axis
04D3	*OPRP5	RPDO object bit option 5	0000h	—	0000h to FFFFh	The same as "RPDO object bit option 1 (parameter No.04C3)".	Each axis
04D4	*NRPL6	RPDO object No. 6 (lower)	0000h	—	0000h to FFFFh	The same as "RPDO object No. 1 (lower) (parameter No.04C0)".	Each axis
04D5	*NRPH6	RPDO object No. 6 (upper)	0000h	—	0000h to FFFFh	The same as "RPDO object No. 1 (upper) (parameter No.04C1)".	Each axis
04D6	*SURP6	RPDO object unit 6	0000h	—	0000h to FFFFh	The same as "RPDO object unit 1 (parameter No.04C2)".	Each axis
04D7	*OPRP6	RPDO object bit option 6	0000h	—	0000h to FFFFh	The same as "RPDO object bit option 1 (parameter No.04C3)".	Each axis
04D8	*NRPL7	RPDO object No. 7 (lower)	0000h	—	0000h to FFFFh	The same as "RPDO object No. 1 (lower) (parameter No.04C0)".	Each axis
04D9	*NRPH7	RPDO object No. 7 (upper)	0000h	—	0000h to FFFFh	The same as "RPDO object No. 1 (upper) (parameter No.04C1)".	Each axis
04DA	*SURP7	RPDO object unit 7	0000h	—	0000h to FFFFh	The same as "RPDO object unit 1 (parameter No.04C2)".	Each axis
04DB	*OPRP7	RPDO object bit option 7	0000h	—	0000h to FFFFh	The same as "RPDO object bit option 1 (parameter No.04C3)".	Each axis
04DC	*NRPL8	RPDO object No. 8 (lower)	0000h	—	0000h to FFFFh	The same as "RPDO object No. 1 (lower) (parameter No.04C0)".	Each axis
04DD	*NRPH8	RPDO object No. 8 (upper)	0000h	—	0000h to FFFFh	The same as "RPDO object No. 1 (upper) (parameter No.04C1)".	Each axis
04DE	*SURP8	RPDO object unit 8	0000h	—	0000h to FFFFh	The same as "RPDO object unit 1 (parameter No.04C2)".	Each axis
04DF	*OPRP8	RPDO object bit option 8	0000h	—	0000h to FFFFh	The same as "RPDO object bit option 1 (parameter No.04C3)".	Each axis
04E0	*NRPL9	RPDO object No. 9 (lower)	0000h	—	0000h to FFFFh	The same as "RPDO object No. 1 (lower) (parameter No.04C0)".	Each axis
09E1	*NRPH9	RPDO object No. 9 (upper)	0000h	—	0000h to FFFFh	The same as "RPDO object No. 1 (upper) (parameter No.04C1)".	Each axis
04E2	*SURP9	RPDO object unit 9	0000h	—	0000h to FFFFh	The same as "RPDO object unit 1 (parameter No.04C2)".	Each axis
04E3	*OPRP9	RPDO object bit option 9	0000h	—	0000h to FFFFh	The same as "RPDO object bit option 1 (parameter No.04C3)".	Each axis
04E4	*NRPL10	RPDO object No. 10 (lower)	0000h	—	0000h to FFFFh	The same as "RPDO object No. 1 (lower) (parameter No.04C0)".	Each axis
04E5	*NRPH10	RPDO object No. 10 (upper)	0000h	—	0000h to FFFFh	The same as "RPDO object No. 1 (upper) (parameter No.04C1)".	Each axis
04E6	*SURP10	RPDO object unit 10	0000h	—	0000h to FFFFh	The same as "RPDO object unit 1 (parameter No.04C2)".	Each axis
04E7	*OPRP10	RPDO object bit option 10	0000h	—	0000h to FFFFh	The same as "RPDO object bit option 1 (parameter No.04C3)".	Each axis
04E8	*NRPL11	RPDO object No. 11 (lower)	0000h	—	0000h to FFFFh	The same as "RPDO object No. 1 (lower) (parameter No.04C0)".	Each axis
04E9	*NRPH11	RPDO object No. 11 (upper)	0000h	—	0000h to FFFFh	The same as "RPDO object No. 1 (upper) (parameter No.04C1)".	Each axis

Parameter No.	Symbol*1	Name	Initial value	Units	Setting range	Description	When in tandem drive
04EA	*SURP11	RPDO object unit 11	0000h	—	0000h to FFFFh	The same as "RPDO object unit 1 (parameter No.04C2)".	Each axis
04EB	*OPRP11	RPDO object bit option 11	0000h	—	0000h to FFFFh	The same as "RPDO object bit option 1 (parameter No.04C3)".	Each axis
04EC	*NRPL12	RPDO object No. 12 (lower)	0000h	—	0000h to FFFFh	The same as "RPDO object No. 1 (lower) (parameter No.04C0)".	Each axis
04ED	*NRPH12	RPDO object No. 12 (upper)	0000h	—	0000h to FFFFh	The same as "RPDO object No. 1 (upper) (parameter No.04C1)".	Each axis
04EE	*SURP12	RPDO object unit 12	0000h	—	0000h to FFFFh	The same as "RPDO object unit 1 (parameter No.04C2)".	Each axis
04EF	*OPRP12	RPDO object bit option 12	0000h	—	0000h to FFFFh	The same as "RPDO object bit option 1 (parameter No.04C3)".	Each axis
04F0	*NRPL13	RPDO object No. 13 (lower)	0000h	—	0000h to FFFFh	The same as "RPDO object No. 1 (lower) (parameter No.04C0)".	Each axis
09F1	*NRPH13	RPDO object No. 13 (upper)	0000h	—	0000h to FFFFh	The same as "RPDO object No. 1 (upper) (parameter No.04C1)".	Each axis
04F2	*SURP13	RPDO object unit 13	0000h	—	0000h to FFFFh	The same as "RPDO object unit 1 (parameter No.04C2)".	Each axis
04F3	*OPRP13	RPDO object bit option 13	0000h	—	0000h to FFFFh	The same as "RPDO object bit option 1 (parameter No.04C3)".	Each axis
04F4	*NRPL14	RPDO object No. 14 (lower)	0000h	—	0000h to FFFFh	The same as "RPDO object No. 1 (lower) (parameter No.04C0)".	Each axis
04F5	*NRPH14	RPDO object No. 14 (upper)	0000h	—	0000h to FFFFh	The same as "RPDO object No. 1 (upper) (parameter No.04C1)".	Each axis
04F6	*SURP14	RPDO object unit 14	0000h	—	0000h to FFFFh	The same as "RPDO object unit 1 (parameter No.04C2)".	Each axis
04F7	*OPRP14	RPDO object bit option 14	0000h	—	0000h to FFFFh	The same as "RPDO object bit option 1 (parameter No.04C3)".	Each axis
04F8	*NRPL15	RPDO object No. 15 (lower)	0000h	—	0000h to FFFFh	The same as "RPDO object No. 1 (lower) (parameter No.04C0)".	Each axis
04F9	*NRPH15	RPDO object No. 15 (upper)	0000h	—	0000h to FFFFh	The same as "RPDO object No. 1 (upper) (parameter No.04C1)".	Each axis
04FA	*SURP15	RPDO object unit 15	0000h	—	0000h to FFFFh	The same as "RPDO object unit 1 (parameter No.04C2)".	Each axis
04FB	*OPRP15	RPDO object bit option 15	0000h	—	0000h to FFFFh	The same as "RPDO object bit option 1 (parameter No.04C3)".	Each axis
04FC	*NRPL16	RPDO object No. 16 (lower)	0000h	—	0000h to FFFFh	The same as "RPDO object No. 1 (lower) (parameter No.04C0)".	Each axis
04FD	*NRPH16	RPDO object No. 16 (upper)	0000h	—	0000h to FFFFh	The same as "RPDO object No. 1 (upper) (parameter No.04C1)".	Each axis
04FE	*SURP16	RPDO object unit 16	0000h	—	0000h to FFFFh	The same as "RPDO object unit 1 (parameter No.04C2)".	Each axis
04FF	*OPRP16	RPDO object bit option 16	0000h	—	0000h to FFFFh	The same as "RPDO object bit option 1 (parameter No.04C3)".	Each axis

*1   The settings for the parameters with a * mark at the front of the symbol are validated when the system is started.
*2   When the 8-bit alignment adjustment object (index: 0000h, subindex: 00h) is set, the parameter setting value is regarded as invalid.

Control method

The examples when connecting MR-J5(W)-G and performing the control (read/write of the data) by using the device station object I/O function are as follows.

When changing forward/reverse rotation torque limit value for each operation cycle

1. Set the start/end offset of the I/O device (link device). Change [Link Device] from "Cyclic Settings" of "Network Configuration Settings". The setting examples are as follows.

Setting items		Setting value
RWr setting	Start	1000h
	End	1025h
RWw setting	Start	1000h
	End	1010h

2. Register the object to the PDO. Open [PDO Setting] from "Cyclic Settings" of "Network Configuration Settings", and allocate the following objects in an arbitrary order.

TPDO	RPDO
—	Positive torque limit value (Obj. 60E0h)
	Negative torque limit value (Obj. 60E1h)

Point

- Allocate the object with a 16-bit separation. An incorrect data separation due to a boundary violation may occur.
- When writing "Positive torque limit value (Obj. 60E0h)" and "Negative torque limit value (Obj. 60E1h)" at once, allocating the objects with a 32-bit separation enables them to be written faster.

⚠ CAUTION

- When controlling the torque limit value by using the device station object I/O function, before starting the system, be sure to set the initial value which is notified to the drive unit for the output word device to which "Positive torque limit value (Obj. 60E0h)" or "Negative torque limit value (Obj. 60E1h)" is assigned. When the initial value is not set, the operation is done with the torque limit value "0".
- When setting "1: Input from controller (C_FLS/C_RLS/C_DOG)" to "Sensor input method selection (PD41.3)" of the servo parameter and performing the driver homing method, C_FLS/C_RLS/C_DOG is detected in the drive unit by using "Control DI 5 (Obj. 2D05h)". Therefore, do not set "C_FLS (bit9)", "C_RLS (bit10)", and "C_DOG (bit11)" of "Control DI 5 (Obj. 2D05h)" for the axis control parameter in the device station object I/O function.

The setting example (default mapping) is as follows.

- RPDO

No.	Offset (byte)	Index	Subindex	Size (bit)	Data type	PDO entry name
1	0	1D01h	01h	16	UNSIGNED16	Watch dog counter DL
2	2	6060h	00h	8	INTEGER8	Modes of operation
3	3	0000h	00h	8	INTEGER8	*1
4	4	607Ah	00h	32	INTEGER32	Target position
5	8	60FFh	00h	32	INTEGER32	Target velocity
6	12	6040h	00h	16	UNSIGNED16	Controlword
7	14	60E0h	00h	16	UNSIGNED16	Positive torque limit value
8	16	60E1h	00h	16	UNSIGNED16	Negative torque limit value
9	18	6071h	00h	16	INTEGER16	Target torque
10	20	2D20h	00h	32	UNSIGNED32	Velocity limit value
11	24	2D01h	00h	16	UNSIGNED16	Control DI 1
12	26	2D02h	00h	16	UNSIGNED16	Control DI 2
13	28	2D03h	00h	16	UNSIGNED16	Control DI 3
14	30	2D04h	00h	16	UNSIGNED16	Control DI 4
15	32	2D05h	00h	16	UNSIGNED16	Control DI 5
16	34	0000h	00h	16	UNSIGNED16	*1

*1 The automatically added object to adjust the alignment.

3. Write the network parameter to the Motion control board and reboot the software.

4. Change the following control parameters.

Parameter No.	Symbol *1	Name	Setting value	Description
04C0	*NRPL1	RPDO object No. 1 (lower)	0010h	Set the subindex and the size of "Positive torque limit value (Obj. 60E0h)".
04C1	*NRPH1	RPDO object No. 1 (upper)	60E0h	Set the index of "Positive torque limit value (Obj. 60E0h)".
04C2	*SURP1	RPDO object unit 1	0000h	Set "0: Data" to the write unit of "Positive torque limit value (Obj. 60E0h)".
04C4	*NRPL2	RPDO object No. 2 (lower)	0010h	Set the subindex and the size of "Negative torque limit value (Obj. 60E1h)".
04C5	*NRPH2	RPDO object No. 2 (upper)	60E1h	Set the index of "Negative torque limit value (Obj. 60E1h)".
04C6	*SURP2	RPDO object unit 2	0000h	Set "0: Data" to the write unit of "Negative torque limit value (Obj. 60E1h)".

*1 The settings for the parameters with a * mark at the front of the symbol are validated when the system is started.

5. Write the control parameter to the Motion control board and start the system.

6. After confirming the control axis information, write the data. Write the data which is written in "Positive torque limit value (Obj. 60E0h)" and "Negative torque limit value (Obj. 60E1h)" of the output device to the RPDO of MR-J5(W)-G.

Point
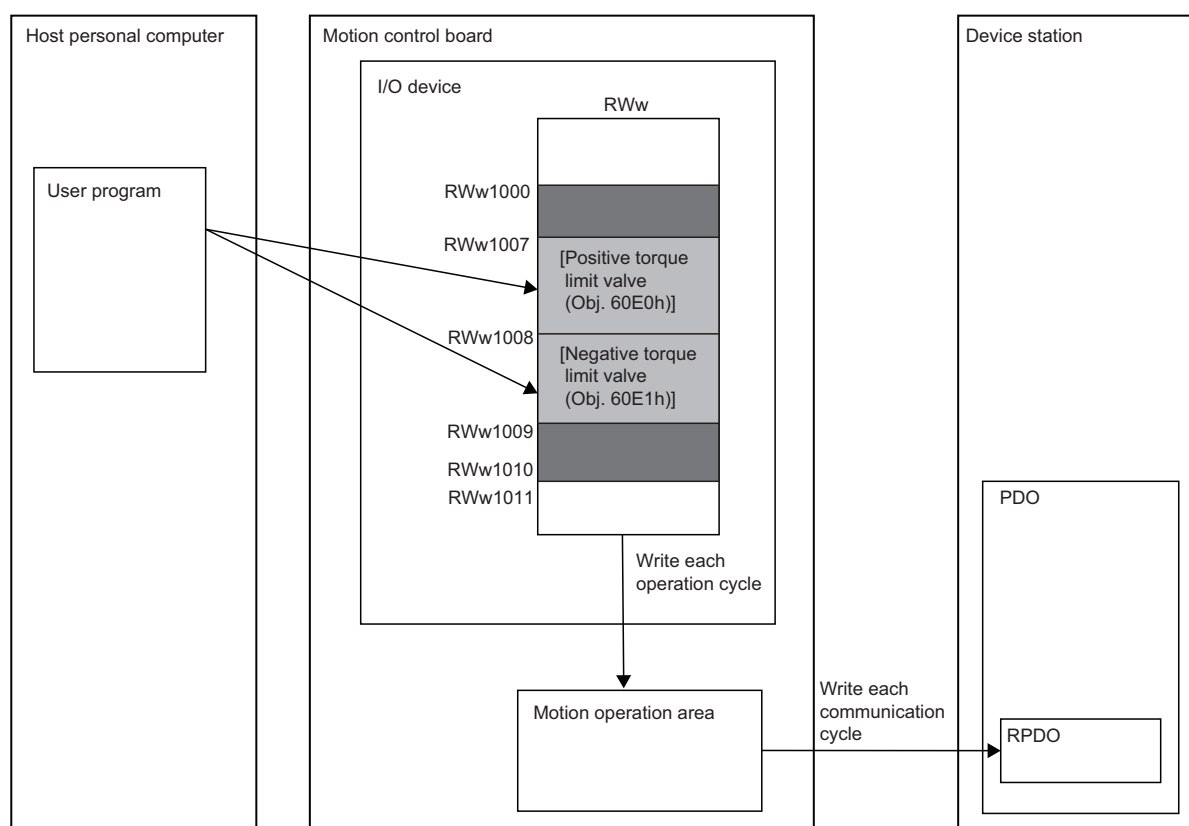
The operation cycle and the communication cycle are the same cycle.

When executing gain switching 2

1. Set the start/end offset of the I/O device (link device). Change [Link Device] from "Cyclic Settings" of "Network Configuration Settings". The setting examples are as follows.

Setting items		Setting value
RWr setting	Start	1000h
	End	1025h
RWw setting	Start	1000h
	End	1010h

2. Register the object to the PDO. Open [PDO Setting] from "Cyclic Settings" of "Network Configuration Settings", and allocate the following objects in an arbitrary order.

TPDO	RPDO
Status DO 5 (Obj. 2D15)	Control DI 5 (Obj. 2D05)

Point

Allocate the object with a 16-bit separation. An incorrect data separation due to a boundary violation may occur.

The setting example (default mapping) is as follows.

- TPDO

No.	Offset (byte)	Index	Subindex	Size (bit)	Data type	PDO entry name
1	0	1D02h	01h	16	UNSIGNED16	Watch dog counter UL
2	2	6061h	00h	8	INTEGER8	Modes of operation display
3	3	0000h	00h	8	INTEGER8	*1
4	4	6064h	00h	32	INTEGER32	Position actual value
5	8	606Ch	00h	32	INTEGER32	Velocity actual value
6	12	60F4h	00h	32	INTEGER32	Following error actual value
7	14	6041h	00h	16	UNSIGNED16	Statusword
8	16	0000h	00h	16	UNSIGNED16	*1
9	18	6077h	00h	16	INTEGER16	Torque actual value
10	20	2D11h	00h	32	UNSIGNED16	Status DO 1
11	24	2D12h	00h	16	UNSIGNED16	Status DO 2
12	26	2D13h	00h	16	UNSIGNED16	Status DO 3
13	28	2D14h	00h	16	UNSIGNED16	Status DO 4
14	30	2D15h	00h	16	UNSIGNED16	Status DO 5
15	34	2D41h	00h	32	UNSIGNED32	Current alarm
16	38	2D21h	00h	32	UNSIGNED32	For manufacturer's use
17	40	2D22h	00h	16	INTEGER16	For manufacturer's use

*1 The automatically added object to adjust the alignment.

8

• RPDO

No.	Offset (byte)	Index	Subindex	Size (bit)	Data type	PDO entry name
1	0	1D01h	01h	16	UNSIGNED16	Watch dog counter DL
2	2	6060h	00h	8	INTEGER8	Modes of operation
3	3	0000h	00h	8	INTEGER8	*2
4	4	607Ah	00h	32	INTEGER32	Target position
5	8	60FFh	00h	32	INTEGER32	Target velocity
6	12	6040h	00h	16	UNSIGNED16	Controlword
7	14	60E0h	00h	16	UNSIGNED16	Positive torque limit value
8	16	60E1h	00h	16	UNSIGNED16	Negative torque limit value
9	18	6071h	00h	16	INTEGER16	Target torque
10	20	2D20h	00h	32	UNSIGNED32	Velocity limit value
11	24	2D01h	00h	16	UNSIGNED16	Control DI 1
12	26	2D02h	00h	16	UNSIGNED16	Control DI 2
13	28	2D03h	00h	16	UNSIGNED16	Control DI 3
14	30	2D04h	00h	16	UNSIGNED16	Control DI 4
15	32	2D05h	00h	16	UNSIGNED16	Control DI 5
16	34	0000h	00h	16	UNSIGNED16	*2

*2 The automatically added object to adjust the alignment.

3. Write the network parameter to the Motion control board and reboot the software.

4. Change the following control parameters.

Parameter No.	Symbol[1]	Name	Setting value	Description
0480	*NTPL1	TPDO object No. 1 (lower)	0010h	Set the subindex and the size of "Status DO 5 (Obj. 2D15)".
0481	*NTPH1	TPDO object No. 1 (upper)	2D15h	Set the index of "Status DO 5 (Obj. 2D15)".
0482	*SUTP1	TPDO object unit 1	0001h	Set "1: Bit" to the read unit of "Status DO 5 (Obj. 2D15)".
0483	*OPTP2	TPDO object bit option 1	0004h	The start of the read bit of "Status DO 5 (Obj. 2D15)" is the fourth bit (Variable gain enabled 2), and set "0" to the number of bits.
04C0	*NRPL1	RPDO object No. 1 (lower)	0010h	Set the subindex and the size of "Control DI 5 (Obj. 2D05)".
04C1	*NRPH1	RPDO object No. 1 (upper)	2D05h	Set the index of "Control DI 5 (Obj. 2D05)".
04C2	*SURP1	RPDO object unit 1	0001h	Set "1: Bit" to the write unit of "Control DI 5 (Obj. 2D05).
04C3	*OPRP1	RPDO object bit option 1	0004h	The start of the written bit of "Control DI 5 (Obj. 2D05)" is the fourth bit (Gain switching 2), and set "0" to the number of bits.

*1 The settings for the parameters with a * mark at the front of the symbol are validated when the system is started.

5. Write the control parameter to the Motion control board and start the system.

6. After confirming the control axis information, read/write the data. Write the data which is written in the fourth bit of "Control DI 5 (Obj. 2D05)" of the output device to the RPDO of MR-J5(W)-G. Also write the data which is sent from the TPDO of MR-J5(W)-G to the fourth bit of "Status DO5 (Obj. 2D15)".
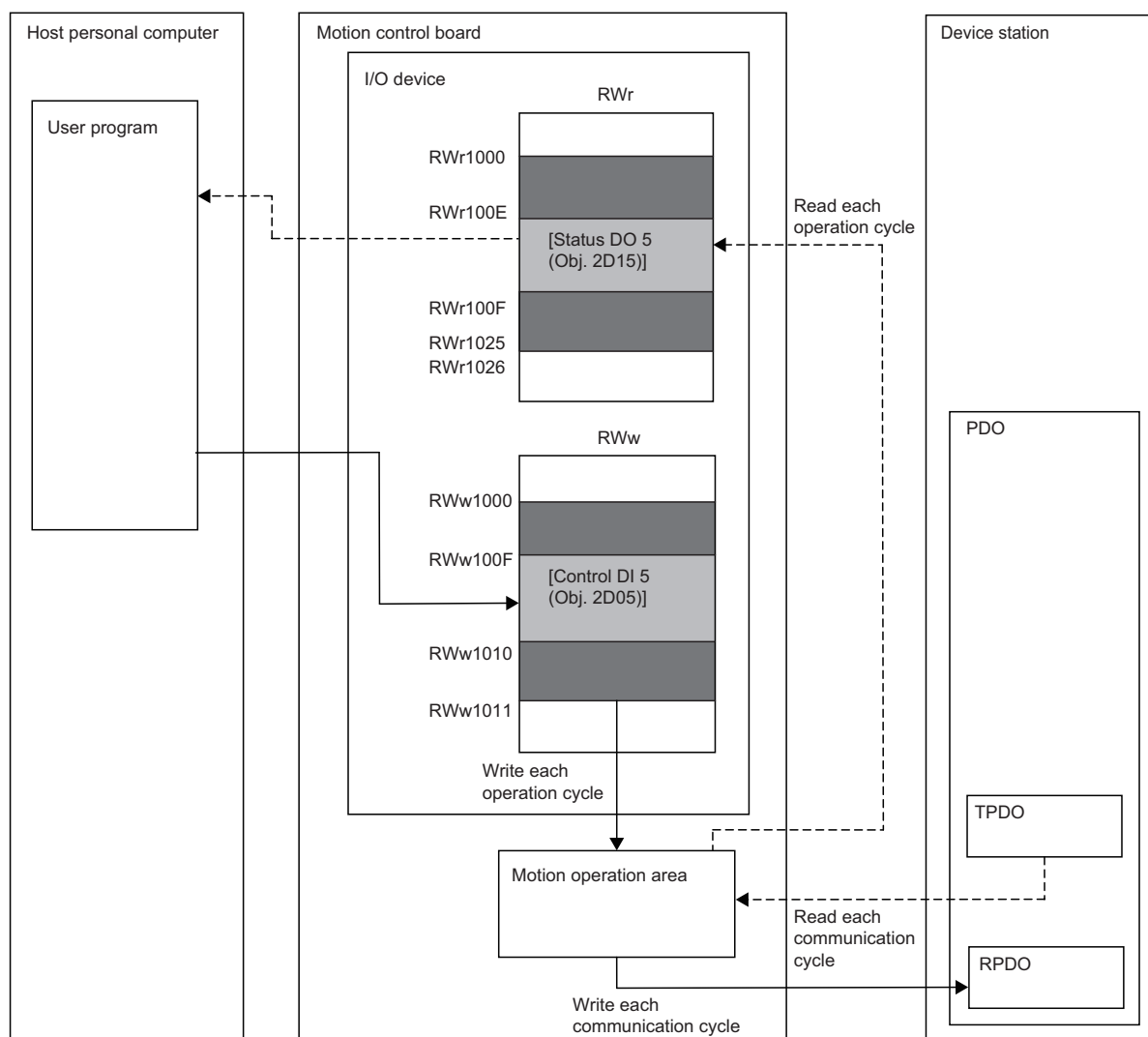
Point

- The operation cycle and the communication cycle are the same cycle.
- To "Control DI 5 (Obj. 2D05)", be sure to set "Bit selection" and "Number of bits" of "RPDO object bit option 1 (parameter No.04C3)". If not, when writing the fourth bit (Gain switching 2) of "Control DI 5 (Obj. 2D05)", the data may be written in other bits in the object, and the limit detection and the proximity dog detection may not operate properly. For details about each object, refer to the following manual.
  📖 MR-J5-G/MR-J5W-G User's Manual (Object Dictionary)

8.29 Driver Command Discard Detection

The driver command discard detection function is a function to detect that the command of the motion system is discarded in the drive unit during the axis operation, and to perform the rapid stop. When the command discard in the drive unit is detected, "Drive Unit Command Discard Detected (operation alarm No.00C0H, detail No.0001H)" occurs, and the command is stopped.

> **Point**
>
> The driver command discard detection is supported in the basic system software version "02" or later.

Interface

Control parameter

Parameter No.	Symbol *1	Name	Initial value	Units	Setting range	Description	When in tandem drive
0212	*OPC5	Control option 5	0000h	—	0000h to 0001h	■■■□ (Driver command discard detection) Set whether to detect or not to detect the driver command discard during the axis operation. • 0: Detection valid • 1: Detection invalid	Master

*1 The settings for the parameters with a * mark at the front of the symbol are validated when the system is started.

> **Point**
>
> • When the basic system software version is "01", the operation of "Driver command discard detection" of "Control option 5 (parameter No.0212)" is the same as the operation of "1: Detection invalid".
> • When the basic system software version is upgraded from "01" to "02", the driver command discard detection becomes "0: Detection valid" automatically.
> • To suppress the separation between the current command position and the current feedback position, setting "0: Detection valid" to "Driver command discard detection" of "Control option 5 (parameter No.0212)" is recommended.

Axis data (high speed) (status bit)

Address (hexadecimal)	Bit	Symbol	Signal name	When in tandem drive
00006004	0	ISTP	Interlock stop	Master
	1	RMRCH	High speed monitor being latched	Each axis
	2	POV	Exceeded stop position	Master
	3	STO	Start up acceptance completed	Master
	4	—	For manufacturer setting	—
	5			
	6	ZREQ	Home position return request	Master
	7	DCDD	Driver command discard detected	Master

■Details concerning status bit

Symbol	Signal name	Function details		
		Function	Operation	
			Conditions for turning ON	Conditions for turning OFF
DCDD	Driver command discard detected	Notify that the command discard in the drive unit is detected.	The driver command discard is detected when "0: Detection valid" is set to the driver command discard detection.*1	Perform the alarm reset.

*1 For the driver command discard detection condition, refer to the following.
☞ Page 355 Necessary object

Case when driver command discard occurs/recovery procedure/ operation example

MR-J5(W)-G

■Case when driver command discard occurs and recovery procedure

The case when the driver command discard occurs in MR-J5(W)-G and the recovery procedure are as follows.

○: Detect, ×: Not detect

Case when driver command discard occurs	Control mode when the case on the left is detected	Detection in Motion control board	Recovery procedure
Limit switch (stroke end) OFF[1][2]	• Cyclic synchronous position mode (csp) • Cyclic synchronous pressure mode (cspr)	○	After turning ON the operation alarm reset signal (ORST), move the current command position to the current feedback position by the automatic operation or the incremental feed.
Forced stop deceleration[3]	• Cyclic synchronous position mode (csp) • Cyclic synchronous pressure mode (cspr)	○	After processing the alarm/error occurred, turn ON the all error reset signal (AERST).
Tip position stopping	Cyclic synchronous pressure mode (cspr)	○	After turning ON the operation alarm reset signal (ORST), move the current command position to the position that does not exceed the limit position of feed/dwell by the automatic operation or the incremental feed.
Servo OFF	• Cyclic synchronous position mode (csp) • Continuous operation to torque control mode (ct) • Cyclic synchronous pressure mode (cspr)	×	—
Control mode switch	Cyclic synchronous position mode (csp)	×	—

*1   When setting "0: Limit switch always enabled" to "Limit switch enabled status selection (PD41.2)" of the servo parameter.

*2   When setting "1: Input from controller (C_FLS/C_RLS/C_DOG)" to "Sensor input method selection (PD41.3)", due to turning ON to OFF the limit switch on the Motion control board side, "Drive Unit Command Discard Detected (operation alarm No.00C0H, detail No.0001H)" occurs.

*3   When setting "2: Forced stop deceleration function enabled (EM2 is used)" to "Forced stop deceleration function selection (PA04.3)".

8

■Operation example

The operation example when "Drive Unit Command Discard Detected (operation alarm No.00C0H, detail No.0001H)" occurs due to turning OFF the limit switch (stroke end) is as follows.

• Condition

Servo parameter	Description
Sensor input method selection (PD41.3)	Set "0: Input from servo amplifier (LSP/LSN/DOG)".
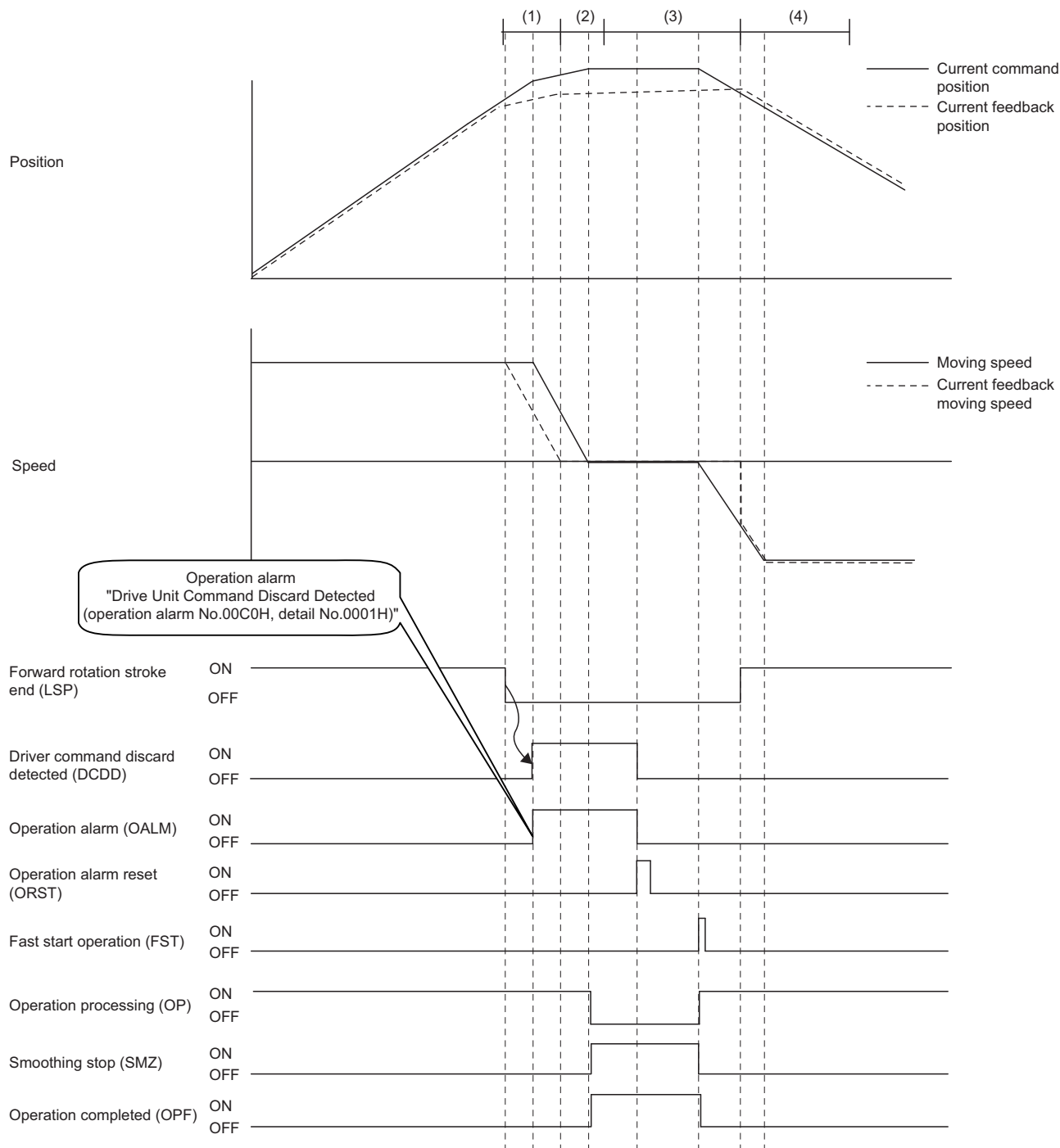
(1) When the forward rotation stroke end (LSP) is turned OFF, "Drive Unit Command Discard Detected (operation alarm No.00C0H, detail No.0001H)" occurs.

(2) The rapid stop occurs when the current feedback position and the current command position are separated.

(3) After the rapid stop, the operation alarm is performed by a user, and the operation is done from the forward rotation stroke end (LSP) in one direction. The current command position and the moving speed are updated, however, the servo motor does not operate (the current feedback position and the feedback moving speed do not change).

(4) When the current command position and the current feedback position match, the servo motor operates from the forward rotation stroke end (LSP) in one direction.

Necessary object

The necessary object for the driver command discard detection function is as follows.

Due to turning ON to OFF the bit12 (Drive follows the command value) of "Statusword (Obj. 6041h)", "Drive Unit Command Discard Detected (operation alarm No.00C0H, detail No.0001H)" occurs.

Function	Necessary object	
	TPDO	RPDO
Driver command discard detection	Statusword (Obj. 6041h)	—

> **Point**
>
> If Statusword (Obj. 6041h) is not set at the PDO mapping, "Necessary Slave Object Unset (error code: 1AA8H)" occurs, and MR-J5(W)-G cannot be connected.

8.30 High Speed Operation Mode

For the Motion control board, the normal operation mode and the high speed operation mode can be selected by "Operation mode setting (parameter No.0011)".

The high speed operation mode is the function for the faster motion operation processing. By setting the high speed operation mode to valid, even with many functions to be used and many numbers of controllable axes within the operation cycle, the cycle time can easily be kept within the operation cycle. In the high speed operation mode, processing is performed per group which is set by "Operation group (parameter No.0410)".

The cycle time per operation group can be confirmed by the operation cycle monitor for the operation group. Up to 3 operation groups can be set regardless of lines. When using the high speed operation mode, some functions are limited. For the limited functions, refer to the following.

☞ Page 359 Combination of each function

In the normal operation mode, all functions can be used without limitation. When using the normal operation mode, setting "Operation group (parameter No.0410)" is unnecessary.

The operation mode setting is imported when starting the system (system command code: 000Ah), and cannot be changed during system running (system status code: 000Ah).

Ex.

When axis 1 to axis 3, axis 10 to axis 12 are set to the operation group 1, axis 4 to axis 6, axis 13 to axis 15 are set to the operation group 2, and axis 7 to axis 9, axis 16 to axis 18 are set to the operation group 3
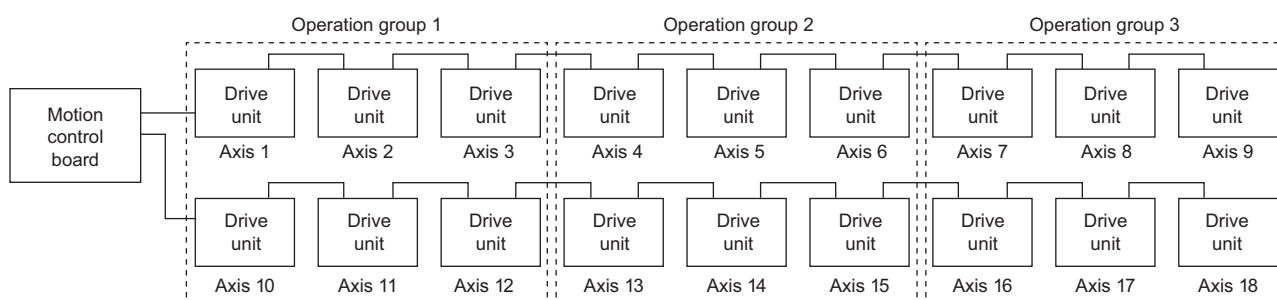
Point

- When setting "1: High speed operation mode" to "Operation mode setting" of "Operation mode setting (parameter No.0011)", the drive unit of a different operation group cannot be specified for the interpolation operation and the tandem drive. When setting "0: Normal operation mode" to "Operation mode setting" of "Operation mode setting (parameter No.0011)", the interpolation operation and the tandem drive are not restricted.
- When the operation cycle over occurs, confirm the cycle time of each operation group, and move several axes in the operation group with the highest load to an operation group with enough cycle time. When changing an operation group of the interpolation operation or the tandem drive, change the operation group of all axes which belong to the same interpolation group or the tandem drive group.
- The high speed operation mode is supported in the basic system software version "03" or later.

Point

[Motion API]

To get the operation cycle current time/operation cycle maximum time/operation cycle over time, use the sscGetOperationCycleMonitorEx function.

Interface

Parameters

■System parameters

Parameter No.	Symbol *1	Name	Initial value	Units	Setting range	Description
0011	*HSCM	Operation mode setting	0000h	—	0000h to 0011h	■■■□ (Operation mode setting) Set the operation mode. • 0: Normal operation mode • 1: High speed operation mode ■■□■ (Maximum number of groups setting) Extend the number of operation groups which can be used in the high speed operation mode. • 0: 2 groups • 1: 3 groups

*1 The settings for the parameters with a * mark at the front of the symbol are validated when the system is started.

■Axis management parameters

Parameter No.	Symbol *1	Name	Initial value	Units	Setting range	Description	When in tandem drive
0410	*HSCG	Operation group	0000h	—	0000h to 0003h	■■■□ (Group No.) Set the group No. of the high speed operation mode. • 0000h: Invalid • 0001h to 0003h: Group No.	Same value

*1 The settings for the parameters with a * mark at the front of the symbol are validated when the system is started.

> **Point**
> • When the value outside the range is set to "Operation mode setting (parameter No.0011)", "Operation Mode Setting Error (system status code error: E506H)" occurs, and the drive unit cannot be controlled (The controlling axis information bit does not turn ON).
> • When the value outside the range is set to "Maximum number of groups setting" of "Operation mode setting (parameter No.0011)", "Parameter Error (operation alarm No.0037H, detail No.0001H)" occurs, and the system is started in the normal operation mode.
> • When "1: High speed operation mode" is set to "Operation mode setting" of "Operation mode setting (parameter No.0011)", and "0: Invalid" is set to "Group No." of "Operation group (parameter No.0410)", "Parameter Error (operation alarm No.0037H, detail No.0001H)" occurs in the axis set to the group No.0.
> • When "1: High speed operation mode" is set to "Operation mode setting" of "Operation mode setting (parameter No.0011)", "0: 2 groups" is set to "Maximum number of groups setting", and "3: Group No.3" is set to "Group No." of "Operation group (parameter No.0410)", "Parameter Error (operation alarm No.0037H, detail No.0001H)" occurs in the axis set to the group No.0.

System data (high speed) (system status bit)

Address (hexadecimal)	Bit	Symbol	Signal name
00000820	0	ITO	Outputting factor of interrupt
	1	—	For manufacturer setting
	2		
	3	HRIF	Highly response I/F enabled
	4	—	For manufacturer setting
	5	MSIO	MSI enabled
	6	HSMO	High speed operation mode enabled
	7	—	For manufacturer setting

• Details concerning system status bit

Symbol	Signal name	Function details			
		Function	**Operation**		
				Conditions for turning ON	**Conditions for turning OFF**
HSMO	High speed operation mode enabled	Notify that the high speed operation mode is enabled.		"1: High speed operation mode" is set to "Operation mode setting" of "Operation mode setting (parameter No.0011)", and the system is started.	"0: Normal operation mode" is set to "Operation mode setting" of "Operation mode setting (parameter No.0011)", and the system is started.

Details on system configuration

Address (hexadecimal)	Name	Remarks
0000650 to 0000657	Axis information 1 for operation group 1	The bit corresponding to the axis set to the operation group 1 turns ON. The bit is from axis 1 (bit0) to axis 64 (bit63).
0000658 to 000065F	For manufacturer setting	—
0000660 to 0000667	Axis information 1 for operation group 2	The bit corresponding to the axis set to the operation group 2 turns ON. The bit is from axis 1 (bit0) to axis 64 (bit63).
0000668 to 000066F	For manufacturer setting	—
0000670 to 0000677	Axis information 1 for operation group 3	The bit corresponding to the axis set to the operation group 3 turns ON. The bit is from axis 1 (bit0) to axis 64 (bit63).
0000678 to 000067F	For manufacturer setting	—

System information

Address (hexadecimal)	Name	Units	Remarks
00000140	Operation cycle monitor for operation group: current cycle time on operation group 1	ns	Store the current cycle time of the operation group 1.
00000141			
00000142			
00000143			
00000144	Operation cycle monitor for operation group: maximum cycle time on operation group 1	ns	Store the maximum cycle time of the operation group 1.
00000145			
00000146			
00000147			
00000148	Operation cycle monitor for operation group: current cycle time on operation group 2	ns	Store the current cycle time of the operation group 2.
00000149			
0000014A			
0000014B			
0000014C	Operation cycle monitor for operation group: maximum cycle time on operation group 2	ns	Store the maximum cycle time of the operation group 2.
0000014D			
0000014E			
0000014F			
00000150	Operation cycle monitor for operation group: current cycle time on operation group 3	ns	Store the current cycle time of the operation group 3.
00000151			
00000152			
00000153			
00000154	Operation cycle monitor for operation group: maximum cycle time on operation group 3	ns	Store the maximum cycle time of the operation group 3.
00000155			
00000156			
00000157			

Combination of each function

○: Available (can be used together), △: Restricted

Functions			High speed operation supported
System function	Operation cycle		○
	Connectable stations		○
	Controllable axes		○
	Axes and stations per line		○
	Control mode		○
	Communication method		○
Operational function	JOG operation		○
	Incremental feed		○
	Automatic operation	Method	○
		Point table size	○
		Number of point tables	○
	Interpolation operation		△ When the operation group is different, "Interpolation Start Up Error (operation alarm No.0040H, detail No.0006H)" occurs.
	Home position return		○
	Home position reset (data set)		○
Application function	Position command units		○
	Electronic gear		○
	Speed units		○
	Acceleration/ deceleration	Command speed limits	○
		Time constant limits	○
		Separate setting of constants for deceleration and acceleration	○
		Setting of constants for separate points	○
		Acceleration/deceleration method	○
	Servo ON/Servo OFF		○
	Stop function		○
	Limit switch		○
	Software limit		○
	Interlock		○
	Rough match output		○
	Torque limit		○
	Command change		○
	Backlash		○
	Position switch		○
	Completion of operation signal		○
	Absolute position detection system		○
	Home position return request		○
	Other axes start	Data	○
		Condition size	○
		Operation details size	○
		General-purpose output control	○
		Output device control	○
	High response Interface		○
	In-position signal		○
	I/O device		○
	Drive unit general I/O		○
	Dual port memory exclusive control		○
	Pass position interrupt		○
	Continuous operation to torque control		○

Functions		High speed operation supported
Application function	Pressure control	○
	No home position function	○
	Device station object I/O	○
	Driver command discard	○
	Remote I/O	○
Auxiliary function	Reading/writing parameters	○
	Alarm and system error	○
	Monitor	○
	High speed monitor	○
	Interrupt	○
	User watchdog function	○
	Software reboot function	○
	Sampling	○
	Operation cycle monitor function	○
	Drive-unit-less axis function	○
	File control	○
	Time control	○
	Link-down detection function	○
	Event history	○
Tandem drive		△ When the high speed operation group is different, "Tandem Drive Axis Setting Error (operation alarm No.0052H, detail No.0004H)" occurs.
Board ID		○
DI	Forced stop	○
	General-purpose input	○
DO	General-purpose output	○
	Exclusive control	○

9 AUXILIARY FUNCTION

9.1 Reading/Writing Parameters

The parameter data in the Motion control board is accessed using the parameter read/write function. The types of parameters include the following.

○: Available , ×: Not available

Parameter	Reading/writing parameters		Reference
	Availability	**Functions for unsupported parameters**	
System parameters	○	—	• Page 362 Interface
Control parameters	○	—	• Page 366 Writing parameters
Axis management parameters	○	—	• Page 368 Reading parameters
Servo parameters (MR-J5(W)-G)	×	• Transient transmission function • Device station parameter automatic setting function	Refer to "Transient Transmission" and "Device station parameter automatic setting" of "Others" in the following manual. 📖Motion Control Board User's Manual (Network)
Network parameters	×	• Network parameter function	Refer to "PARAMETER SETTINGS" in the following manual. 📖Motion Control Board User's Manual (Network)

The parameter read/write function becomes valid after the system preparation completion (system status code: 0001h).[1]

[1] The parameter read/write function is invalid at the timing during control axis initialization1 (system status code: 0008h) and during control axis initialization 2 (system status code: 0009h).

Interface

System data (low speed) (system command bit/system status bit)

The following is the bit data interface to operate the system parameter and confirm the status.

■System command bit

Address (hexadecimal)	Bit	Symbol	Signal name
00000846	0	SPWRT	Parameter write command
	1	—	For manufacturer setting
	2		
	3		
	4		
	5		
	6		
	7		

Address (hexadecimal)	Bit	Symbol	Signal name
00000847	0	SPRD	Parameter read command
	1	—	For manufacturer setting
	2		
	3		
	4		
	5		
	6		
	7		

■System status bit

Address (hexadecimal)	Bit	Symbol	Signal name
000008E6	0	SPWFIN1	Parameter write completed 1
	1	SPWEN1	Parameter No. error 1
	2	SPWED1	Parameter data out of bounds 1
	3	—	For manufacturer setting
	4	SPWFIN2	Parameter write completed 2
	5	SPWEN2	Parameter No. error 2
	6	SPWED2	Parameter data out of bounds 2
	7	—	For manufacturer setting

Address (hexadecimal)	Bit	Symbol	Signal name
000008E7	0	SPRFIN1	Parameter read completed 1
	1	SPREN1	Parameter No. error 1
	2	SPRFIN2	Parameter read completed 2
	3	SPREN2	Parameter No. error 2
	4	—	For manufacturer setting
	5		
	6		
	7		

System data (low speed) (system command data/system status data)

The following is the data to operate the system parameter and confirm the status.

■System command data

Address (hexadecimal)	Name	Units	Setting range	Description
00000888, 00000889	Parameter write No.1	—	0000h to FFFFh	Store the parameter No. to be written.
0000088A, 0000088B	For manufacturer setting	—	—	—
0000088C, 0000088D	Parameter write data 1	—	0000h to FFFFh	Store the parameter data to be written.
0000088E, 0000088F	For manufacturer setting	—	—	—
00000890, 00000891	Parameter write No.2	—	0000h to FFFFh	Store the parameter No. to be written.
00000892, 00000893	For manufacturer setting	—	—	—
00000894, 00000895	Parameter write data 2	—	0000h to FFFFh	Store the parameter data to be written.
00000896, 00000897	For manufacturer setting	—	—	—
00000898, 00000899	Parameter read No.1	—	0000h to FFFFh	Store the parameter No. to be read.
0000089A ⋮ 0000089F	For manufacturer setting	—	—	—
000008A0, 000008A1	Parameter read No.2	—	0000h to FFFFh	Store the parameter No. to be read.
000008A2 ⋮ 000008A7	For manufacturer setting	—	—	—

■System status data

Address (hexadecimal)	Name	Units	Output limits	Description
00000928, 00000929	Parameter write No.1	—	0000h to FFFFh	Output the written parameter No.
0000092A, 0000092B	For manufacturer setting	—	—	—
0000092C, 0000092D	Parameter write data 1	—	0000h to FFFFh	Output the written parameter data.
0000092E, 0000092F	For manufacturer setting	—	—	—
00000930, 00000931	Parameter write No.2	—	0000h to FFFFh	Output the written parameter No.
00000932, 00000933	For manufacturer setting	—	—	—
00000934, 00000935	Parameter write data 2	—	0000h to FFFFh	Output the written parameter data.
00000936, 00000937	For manufacturer setting	—	—	—
00000938, 00000939	Parameter read No.1	—	0000h to FFFFh	Output the read parameter No.
0000093A, 0000093B	For manufacturer setting	—	—	—
0000093C, 0000093D	Parameter read data 1	—	0000h to FFFFh	Output the read parameter data.
0000093E, 0000093F	For manufacturer setting	—	—	—
00000940, 00000941	Parameter read No.2	—	0000h to FFFFh	Output the read parameter No.
00000942, 00000943	For manufacturer setting	—	—	—
00000944, 00000945	Parameter read data 2	—	0000h to FFFFh	Output the read parameter data.
00000946, 00000947	For manufacturer setting	—	—	—

Axis data (low speed) (command bit/status bit)

The following is the bit data interface to operate the control parameter and the axis management parameter, and confirm the status.

■Command bit

The addresses in the table are the addresses for the first axis. For the second axis and after, add "+C0h" for each axis.

Address (hexadecimal)	Bit	Symbol	Signal name	When in tandem drive
0000B001	0	PWRT	Parameter write command	Each axis
	1	—	For manufacturer setting	—
	2			
	3			
	4			
	5			
	6			
	7			

Address (hexadecimal)	Bit	Symbol	Signal name	When in tandem drive
0000B002	0	PRD	Parameter read command	Each axis
	1	—	For manufacturer setting	—
	2			
	3			
	4			
	5			
	6			
	7			

■Status bit

The addresses in the table are the addresses for the first axis. For the second axis and after, add "+C0h" for each axis.

Address (hexadecimal)	Bit	Symbol	Signal name	When in tandem drive
00011001	0	PWFIN1	Parameter write completed 1	Each axis
	1	PWEN1	Parameter No. error 1	Each axis
	2	PWED1	Parameter data out of bounds 1	Each axis
	3	—	For manufacturer setting	—
	4	PWFIN2	Parameter write completed 2	Each axis
	5	PWEN2	Parameter No. error 2	Each axis
	6	PWED2	Parameter data out of bounds 2	Each axis
	7	—	For manufacturer setting	—

Address (hexadecimal)	Bit	Symbol	Signal name	When in tandem drive
00011002	0	PRFIN1	Parameter read completed 1	Each axis
	1	PREN1	Parameter No. error 1	Each axis
	2	PRFIN2	Parameter read completed 2	Each axis
	3	PREN2	Parameter No. error 2	Each axis
	4	—	For manufacturer setting	—
	5			
	6			
	7			

Axis data (low speed) (command data/status data)

The following is the data to operate the control parameter and the axis management parameter, and confirm the status.

■Command data

The addresses in the table are the addresses for the first axis. For the second axis and after, add "+C0h" for each axis.

Address (hexadecimal)	Name	Units	Setting range	Description	When in tandem drive
0000B050, 0000B051	Parameter write No.1	—	0000h to FFFFh	Store the parameter No. to be written.	Each axis
0000B052, 0000B053	For manufacturer setting	—	—	—	—
0000B054, 0000B055	Parameter write data 1	—	0000h to FFFFh	Store the parameter data to be written.	Each axis
0000B056, 0000B057	For manufacturer setting	—	—	—	—
0000B058, 0000B059	Parameter write No.2	—	0000h to FFFFh	Store the parameter No. to be written.	Each axis
0000B05A, 0000B05B	For manufacturer setting	—	—	—	—
0000B05C, 0000B05D	Parameter write data 2	—	0000h to FFFFh	Store the parameter data to be written.	Each axis
0000B05E, 0000B05F	For manufacturer setting	—	—	—	—
0000B060, 0000B051	Parameter read No.1	—	0000h to FFFFh	Store the parameter No. to be read.	Each axis
0000B062 ⋮ 0000B067	For manufacturer setting	—	—	—	—
0000B068, 0000B069	Parameter read No.2	—	0000h to FFFFh	Store the parameter No. to be read.	Each axis
0000B06A ⋮ 0000B06F	For manufacturer setting	—	—	—	—

■Status data

The addresses in the table are the addresses for the first axis. For the second axis and after, add "+C0h" for each axis.

Address (hexadecimal)	Name	Units	Output limits	Description	When in tandem drive
00011050, 00011051	Parameter write No.1	—	0000h to FFFFh	Output the written parameter No.	Each axis
00011052, 00011053	For manufacturer setting	—	—	—	—
00011054, 00011055	Parameter write data 1	—	0000h to FFFFh	Output the written parameter data.	Each axis
00011056, 00011057	For manufacturer setting	—	—	—	—
00011058, 00011059	Parameter write No.2	—	0000h to FFFFh	Output the written parameter No.	Each axis
0001105A, 0001105B	For manufacturer setting	—	—	—	—
0001105C, 0001105D	Parameter write data 2	—	0000h to FFFFh	Output the written parameter data.	Each axis
0001105E, 0001105F	For manufacturer setting	—	—	—	—
00011060, 00011061	Parameter read No.1	—	0000h to FFFFh	Output the read parameter No.	Each axis
00011062, 00011063	For manufacturer setting	—	—	—	—
00011064, 00011065	Parameter read data 1	—	0000h to FFFFh	Output the read parameter data.	Each axis
00011066, 00011067	For manufacturer setting	—	—	—	—
00011068, 00011069	Parameter read No.2	—	0000h to FFFFh	Output the read parameter No.	Each axis
0001106A, 0001106B	For manufacturer setting	—	—	—	—
0001106C, 0001106D	Parameter read data 2	—	0000h to FFFFh	Output the read parameter data.	Each axis
0001106E, 0001106F	For manufacturer setting	—	—	—	—

Writing parameters

Writing parameters are performed by setting the parameter No. and the write data to turn ON the parameter write command, or by using the Motion API.
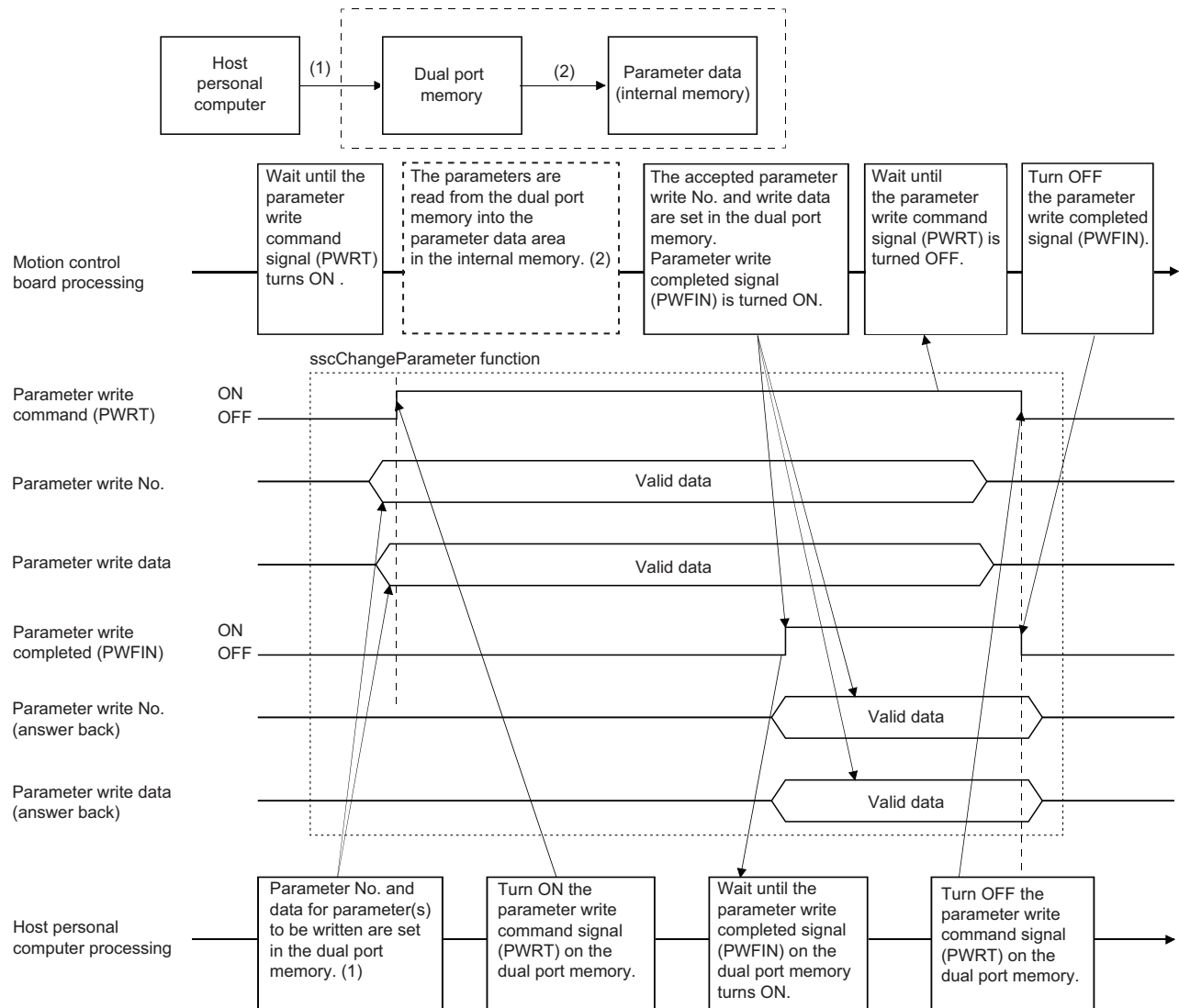
Point

• After writing parameters, some parameters do not become valid until rebooting the software. For the applicable parameters, refer to the following.

☞ Page 564 PARAMETERS

• Since the 32 bit length parameters are separated into upper and lower items, change them simultaneously. Changing of 32 bit length parameters separately can lead to the erroneous operation.

• Two parameters can be written at a time. When writing one parameter, set "0" to the other parameter.

• If an erroneous parameter No. is set, the parameter No. error signal (PWEN□ (□ = 1 to 2)) is turned ON. However, if the parameter No. is "0", it is not considered an parameter No. error.

• If a parameter setting is outside the setting range, a parameter data out of bounds signal (PWED□ (□ = 1 to 2)) is turned ON.

• The parameter limit checks are not performed before system running (System status code: 000Ah). If the parameter set is incorrect, "Parameter Error (system alarm No.0037H, operation alarm No.0037H, detail No.0001H)" occurs at the system startup. Confirm the error parameter No. in "Control parameter error No. (monitor No.00001330H to 0000133EH)" and "System parameter error No. (monitor No.00001410H to 00001416H)", and after rebooting the software, set the correct parameter and start the system again. "Parameter Error (system alarm No.0037H, operation alarm No.0037H, detail No.0001H)" cannot be reset by the alarm reset.

• In the system parameter write, the parameter write command signal (SPWRT), the parameter write completed signal (SPWFIN), the parameter No. error signal (SPWEN□ (□ = 1 to 2)) and the parameter data out of bounds signal (SPWED□ (□ = 1 to 2)) are used.

Point

[Motion API]

To write the parameters, use the sscChangeParameter function/sscChange2Parameter function.

Reading parameters

Reading parameters are performed by setting the parameter No. and the write data to turn ON the parameter write command, or by using the Motion API.
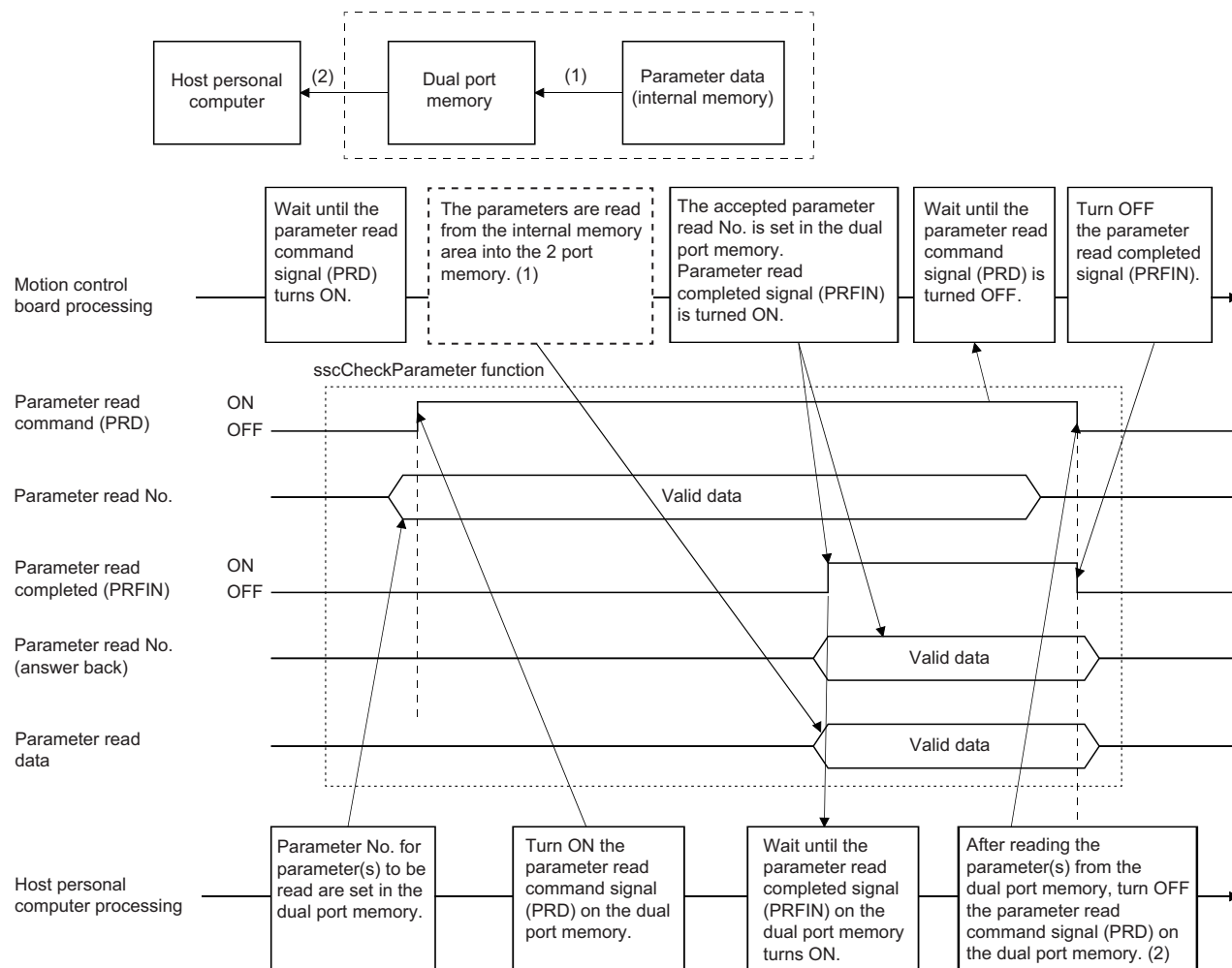
Point

- Two parameters can be read at a time. When reading one parameter, set "0" to the other parameter.
- If an erroneous parameter No. is set, the parameter No. error signal (PREN□ (□ = 1 to 2)) is turned ON. However, if the parameter No. is "0", it is not considered an parameter No. error.
- In the system parameter read, parameter read command signal (SPRD), the parameter read completed signal (SPRFIN) and the parameter No. error signal (SPREN□ (□ = 1 to 2)) are used.

Point

[Motion API]
To read the parameters, use the sscCheckParameter function/sscCheck2Parameter function.

9.2   Alcorm and System Error

When the incorrect setting or incorrect operation is performed, the Motion control board raises an alarm. For the host personal computer, monitor the interrupt or the alarm periodically. For details about monitoring by the interrupt, refer to the following.

☞ Page 384 Interrupt

For the cause of the occurrence and the treatment for each alarm, refer to the following.

☞ Page 600 ALARM No.

The system error can be confirmed by the Network Diagnosis. For the Network Diagnosis, refer to "Confirming the Network Status" in the following manual.

📖 Motion Control Board User's Manual (Network)

System error

The system error is raised when the error occurs in the system of the Motion control board.

The cause of the system error which is raised by the Motion control board is shown in the following table.

Each error content of the motion control error is output to another dual port memory address which is different from the system error.

Error name	Cause of error		Reference
System error	Motion control error	System alarm	Page 373 System alarm
		Drive unit alarm	Page 375 Drive unit alarm
		Operation alarm	Page 377 Operation alarm
		System status code error	Page 379 System status code error
	Network error		Page 379 Network error
	Basic system error		Page 379 Basic system error

The error classification is categorized according to the content of the system error. The state of the LED display is changed depending on the error classification, and the operation is stopped. When another system error occurs while the system error is occurring, the error which is in more major error classification is output.

To reset the system error, turn ON the all error reset signal (AERST).This signal resets each error such as the system alarm of the motion control error, the network error, and the basic system error.

For the motion control error, the dual port memory state of each error (system alarm No., operation alarm No., drive unit alarm No.) is cleared as well.

System error range	Error classification	LED display		Forced stop	Axis stop	All error reset
		RUN LED	ERR LED			
0800H to 0FFFH	Warning	ON	OFF	Not supported	Unsupported	Possible
1000H to 1FFFH 4000H to FFFFH	Minor		ON		Some supported	
2000H to 3BFFH	Moderate		Flashing (200ms interval)[1]	Supported	—[2]	Not possible
3C00H to 3FFFH	Major	OFF	ON or flashing (200ms interval)		—	

[1]   In addition to the moderate and major error, the LED display flashes on and off (500ms interval) when detecting the data link error station.

[2]   In case of MR-J5(W)-G, "Drive unit warning [AL. 09E.8_Master station error detection warning]" occurs, and the axis stops according to the stoppage method of MR-J5(W)-G.

> **Point** 🖉
>
> • For the behavior of the axis and the stoppage, refer to the following.
>
>   ☞ Page 600 ALARM No.
>
> • When the network error and the basic system error which are categorized in the major and moderate error occur, the system status code becomes "System Error Occurs (system status code error: E300H)" which indicates that the system status code is in the network error or the basic system error.

Point

[Motion API]
- To get the system error, use the sscGetSystemErrorCode function.
- To reset all error, use the sscResetAllError function.

System data (high speed) (system status bit)

■System status bit

Address (hexadecimal)	Bit	Symbol	Signal name
00000821	0	EMIO	Being executed forced stop
	1	—	For manufacturer setting
	2		
	3	PPIAL	Batch judgment of passing position interrupt condition
	4	SEO	System error detected
	5	—	For manufacturer setting
	6	EMID	External forced stop disabled
	7	—	For manufacturer setting

- Details concerning system status bit

Symbol	Signal name	Function details		
		Function	Operation	
			Conditions for turning ON	Conditions for turning OFF
SEO	System error detected	Notify that the system error is occurring.	The system error occurred.	The system error is reset.

System data (low speed) (system command bit/system status bit)

■System command bit

Address (hexadecimal)	Bit	Symbol	Signal name
0000084B	0	—	For manufacturer setting
	1		
	2		
	3		
	4	AERST	All error reset
	5	—	For manufacturer setting
	6		
	7		

- Details concerning system command bit

Symbol	Signal name	Function details	
		Function	Operation
AERST	All error reset	Reset the target error.	Reset the following error. • Motion control error • Network error • Basic system error

■System status bit

Address (hexadecimal)	Bit	Symbol	Signal name
000008EB	0	—	For manufacturer setting
	1		
	2		
	3		
	4	AERO	Processing all error reset
	5	AERF	All error reset completed
	6	AERE	All error reset error
	7	—	For manufacturer setting

• Details concerning system status bit

Symbol	Signal name	Function details		
		Function	Operation	
			Conditions for turning ON	Conditions for turning OFF
AERO	Processing all error reset	Notify that the all error reset processing is in the process.	Turn ON the all error reset signal (AERST), and executed the all error reset processing.	The all error reset processing is completed.
AERF	All error reset completed	Notify that the all error reset processing is completed normally.	The all error reset processing is completed normally.	The all error reset signal (AERST) is turned OFF.
AERE	All error reset error	Notify that the all error reset processing is completed abnormally (The error which cannot be reset exists.).	The all error reset processing is completed abnormally.	The all error reset signal (AERST) is turned OFF.

System data (high speed) (system status data)

■System status data

Address (hexadecimal)	Name	Units	Output range	Description
00000830	System error code	—	0000h to FFFFh	Output the system error code.[1]
00000831				

*1 The system error code may not be output correctly depending on the timing of the error reset.

Timing chart at all error reset

- The timing chart for resetting "Operation Alarm (error code: 1C97H)" after resetting "Drive Unit Alarm (error code: 1C98H)" is shown below.
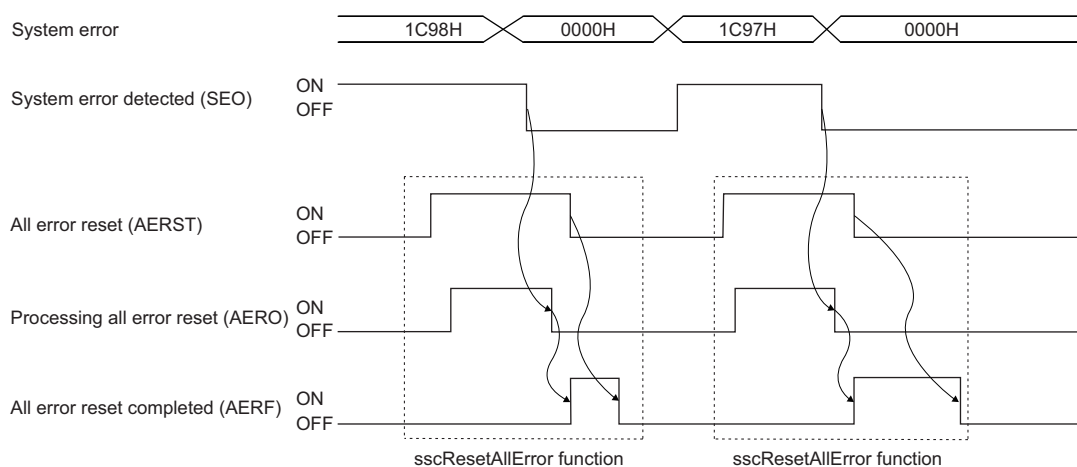
- When the system error occurs just before the all error reset completed, the all error reset completed is turned ON.
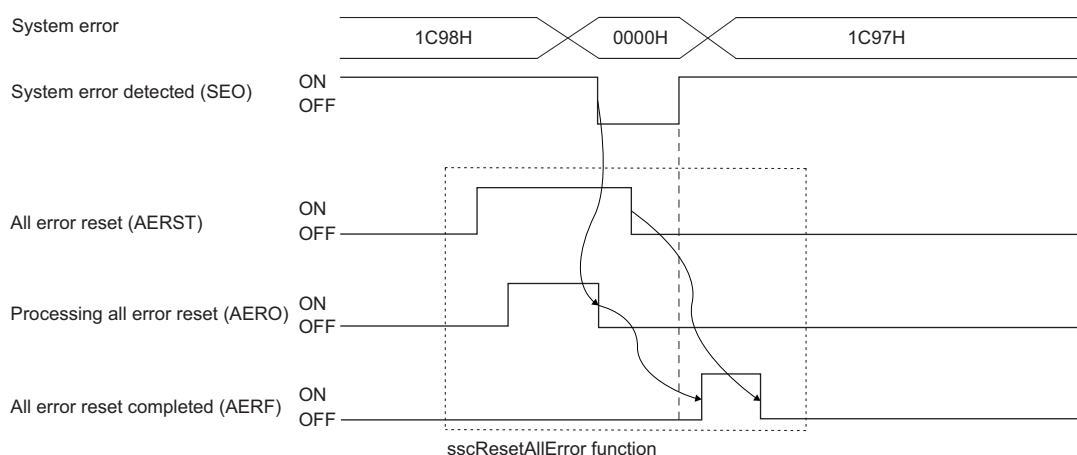
- When the system error occurs not just before the all error reset completion, the all error reset error is turned ON.
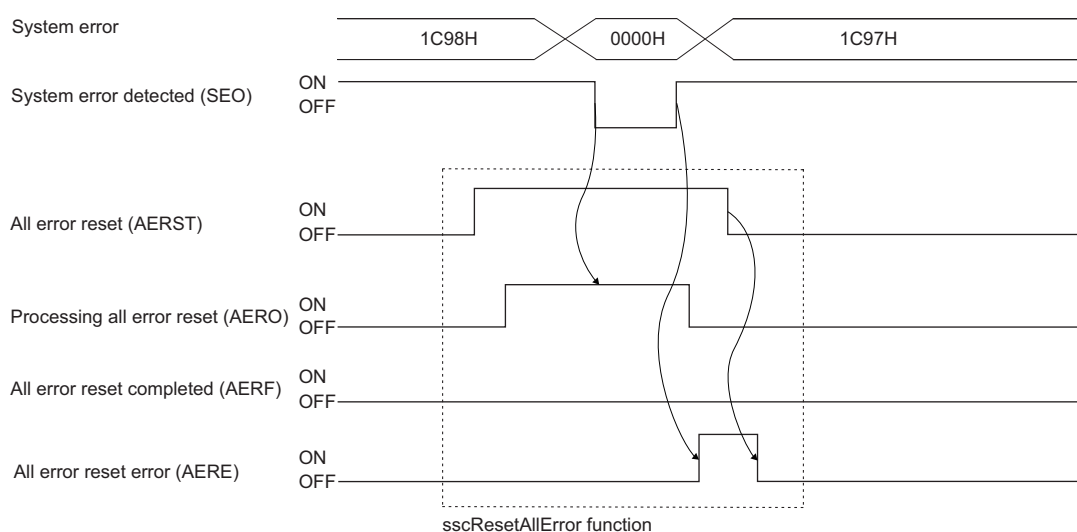
System alarm

The system alarm is an alarm that the Motion control board raises by the incorrect setting of a system parameter or each function. When the system alarm occurs, the current system alarm signal (CALM) turns ON, and the alarm No. and the detail No. are stored in the system alarm No. and the specific system alarm No. In addition, "System Alarm (error code: 0F16H)" is output in the system error. To reset the system alarm, turn ON the system alarm reset signal (CRST).

> **Point**
> - "Parameter error (system alarm No.0037H, detail No.0001H)" cannot be reset with the system alarm reset signal. Reexamine the parameter and start the system again.
> - If another system alarm occurs while the system alarm is occurring, the first system alarm is notified to the system alarm No.

> **Point**
> [Motion API]
> To get/reset the alarm No., use the sscGetAlarm function/sscResetAlarm function, and for the argument of the alarm type, specify the following.
> - System alarm: SSC_ALARM_SYSTEM

System data (low speed) (system command bit/system status bit)

■System command bit

Address (hexadecimal)	Bit	Symbol	Signal name
00000844	0	RBR	Reboot preparation
	1	RBS	Execute rebooting
	2	CRST	System alarm reset
	3	—	For manufacturer setting
	4	SMON	System monitor command
	5	SMONR	System monitor latch command
	6	—	For manufacturer setting
	7		

- Details concerning system command bit

Symbol	Signal name	Function details	
		Function	Operation
CRST	System alarm reset	Reset the system alarm.	Perform the system alarm reset. Reset the system alarm No. and the specific system alarm No. in the dual port memory.

■System status bit

Address (hexadecimal)	Bit	Symbol	Signal name
000008E4	0	RBOK	Reboot preparation completed
	1	RBNG	Reboot preparation error
	2	CALM	Current system alarm
	3	—	For manufacturer setting
	4	SMOUT	Monitor output
	5	SMRCH	Monitor latch
	6	SMER1	Monitor No. error 1
	7	SMER2	Monitor No. error 2

• Details concerning system status bit

Symbol	Signal name	Function details		
		Function	Operation	
			Conditions for turning ON	Conditions for turning OFF
CALM	Current system alarm	Notify that the system alarm is occurring.	The system alarm occurred.	The system alarm is reset. However, "Parameter error (system alarm No.0037H, detail No.0001H)" cannot be reset.

System data (low speed) (system status data)

■System status data

Address (hexadecimal)	Name	Units	Output range	Description
00000904	System alarm No.	—	0000h to FFFFh	Output the system alarm No.
00000905				
00000906	Specific system alarm No.	—	0000h to FFFFh	Output the specific system alarm No.
00000907				

Drive unit alarm

The servo alarm is an alarm that the servo amplifier raises by the incorrect setting of the servo parameter or the incorrect operation of the servo amplifier. When a drive unit alarm occurs, during the drive unit alarm signal (SALM) or during the drive unit warning signal (SWRN) turns ON, and the alarm No. and the detail No. are stored in the drive unit alarm No. and the specific drive unit alarm No. In addition, "Drive Unit Alarm (error code: 1C98H)" or "Drive Unit Warning (error code: 0F17H)" is stored in the system error. To reset the drive unit alarm, turn ON the drive unit alarm reset signal (SRST).

Point

- The reset of the drive unit alarm depends on the specifications of the drive unit. For details, refer to "Alarm function" in the following manual.
  📖MR-J5 User's Manual (Function)
- When a servo alarm occurs by multiple causes, which servo alarm No. is notified depends on the specifications of the servo amplifier.

Point

[Motion API]

To get/reset the alarm No., use the sscGetAlarm function/sscResetAlarm function, and for the argument of the alarm type, specify the following.
- Drive unit alarm: SSC_ALARM_SERVO

⚠ CAUTION

After the completion of the reset for the drive unit alarm, turn OFF the drive unit alarm reset signal (SRST), the all error reset signal (AERST) before using the operational function. Unless the drive unit alarm reset signal (SRST) and the all error reset signal (AERST) are turned OFF, the operation cannot be started.

Necessary objects

The necessary objects in order to store the drive unit alarm No., the specific drive unit alarm No., the drive unit alarm signal, and the drive unit warning signal are shown below.

Function	Necessary objects	
	TPDO	**RPDO**
Drive unit alarm No./detail No.	Current alarm (Obj. 2A41h) (MR-J5(W)-G)	—
Drive unit alarm signal (SALM)/Drive unit warning signal (SWRN)	Statusword (Obj. 6041h)	—
Drive unit alarm reset signal (SRST)	—	Controlword (Obj. 6040h)

Point

- When not setting to "Current alarm (Obj. 2A41h)", the operation is as follows.
  - The drive unit alarm No. remains "0", and the alarm No. is not notified.
  [Basic system software version "03" or later]
  - The drive unit alarm No. which is stored in the event history is "0".
  - If another new drive unit warning occurs while the drive unit warning is occurring, the event information is not stored in the event history (same for the drive unit alarm).
- When not setting to "Statusword (Obj. 6041h)" and "Controlword (Obj. 6040h)", the system error occurs. For details, refer to the following.
  ☞ Page 65 Setting Network Parameter

System data (high speed) (command bit/status bit)

■Command bit

The addresses in the table are the addresses for the first axis. For the second axis and after, add "+10h" for each axis.

Address (hexadecimal)	Bit	Symbol	Signal name	When in tandem drive
00001000	0	SON	Servo on	Special
	1	—	For manufacturer setting	—
	2			
	3			
	4			
	5	SRST	Drive unit alarm reset	Each axis
	6	—	For manufacturer setting	—
	7			

• Details concerning command bit

Symbol	Signal name	Function details	
		Function	Operation
SRST	Drive unit alarm reset	Reset the drive unit alarm.	Issue the alarm reset against the drive unit. Reset the drive unit alarm No. and the specific drive unit alarm No. in the dual port memory.

■Status bit

The addresses in the table are the addresses for the first axis. For the second axis and after, add "+10h" for each axis.

Address (hexadecimal)	Bit	Symbol	Signal name	When in tandem drive
00006000	0	RDY	Servo ready	Each axis
	1	INP	In-position	Each axis
	2	ZSP	Zero speed	Each axis
	3	ZPAS	Passed Z-phase	Each axis
	4	TLC	Torque limit effective	Each axis
	5	SALM	Drive unit alarm	Each axis
	6	SWRN	Drive unit warning	Each axis
	7	ABSE	Absolute position erased	Each axis

• Details concerning status bit

Symbol	Signal name	Function details		
		Function	Operation	
			Conditions for turning ON	Conditions for turning OFF
SALM	Drive unit alarm	Notify that the drive unit alarm is occurring.	The drive unit alarm occurred.	The drive unit alarm is reset.
SWRN	Drive unit warning	Notify that the drive unit warning is occurring.	The drive unit warning occurred.	The cause of the drive unit warning is solved.

Axis data (low speed) (status data)

■Status data

The addresses in the table are the addresses for the first axis. For the second axis and after, add "+40h" for each axis.

Address (hexadecimal)	Name	Units	Output range	Description	When in tandem drive
00007004	Drive unit alarm No.	—	0000h to FFFFh	Output the drive unit alarm No.	Each axis
00007005					
00007006	Specific drive unit alarm No.	—	0000h to FFFFh	Output the specific drive unit alarm No.	Each axis
00007007					

Operation alarm

The operation alarm is an alarm a Motion control board raises in each axis by the incorrect setting of a system parameter or each function. When an operation alarm occurs, during the operation alarm signal (OALM) turns ON, and the alarm No. and the detail No. are stored in the operation alarm No. and the specific operation alarm No. In addition, "Operation Alarm (error code: 1C97H)" is stored in the system error. To reset the operation alarm, turn ON the operation alarm reset signal (ORST).

Point
- "Parameter error (operation alarm No.0037H, detail No.0001H)" and "System Setting Error (operation alarm No.0038H)" cannot be reset with the operation alarm reset signal. Confirm the cause of the alarm and treatment, and start the system again.
- If another operation alarm occurs while the operation alarm is occurring, the first operation alarm is notified to the operation alarm No.

Point
[Motion API]
To get/reset the alarm No., use the sscGetAlarm function/sscResetAlarm function, and for the argument of the alarm type, specify the following.
- Operation alarm: SSC_ALARM_OPERATION

Axis data (high speed) (command bit/status bit)

■Command bit
The addresses in the table are the addresses for the first axis. For the second axis and after, add "+10h" for each axis.

Address (hexadecimal)	Bit	Symbol	Signal name	When in tandem drive
00001001	0	ST	Start operation	Master
	1	DIR	Movement direction	Master
	2	STP	Stop operation	Master
	3	RSTP	Rapid stop	Master
	4	—	For manufacturer setting	—
	5	ORST	Operation alarm reset	Master
	6	—	For manufacturer setting	—
	7			

- Details concerning command bit

Symbol	Signal name	Function details	
		Function	**Operation**
ORST	Operation alarm reset	Reset the operation alarm.	Perform the operation alarm reset. Reset the operation alarm No. and the specific operation alarm No. in the dual port memory.

■Status bit

The addresses in the table are the addresses for the first axis. For the second axis and after, add "+10h" for each axis.

Address (hexadecimal)	Bit	Symbol	Signal name	When in tandem drive
00006001	0	OP	Operation processing	Master
	1	CPO	Rough match	Master
	2	PF	Positioning completed	Master
	3	ZP	Home position return completed	Master
	4	SMZ	Smoothing stop	Master
	5	OALM	Operation alarm	Master
	6	OPF	Operation completed	Master
	7	PSW	Position switch	Each axis

• Details concerning status bit

Symbol	Signal name	Function details		
		Function	Operation	
			Conditions for turning ON	Conditions for turning OFF
OALM	Operation alarm	Notify that the operation alarm is occurring.	The operation alarm occurred.	The operation alarm is reset.

Axis data (high speed) (status data)

■Status data

The addresses in the table are the addresses for the first axis. For the second axis and after, add "+40h" for each axis.

Address (hexadecimal)	Name	Units	Output range	Description	When in tandem drive
00007000	Operation alarm No.	—	0000h to FFFFh	Output the operation alarm No.	Master
00007001					
00007002	Specific operation alarm No.	—	0000h to FFFFh	Output the specific operation alarm No.	Master
00007003					

System status code error

The system status code error occurs in the case when the positioning control cannot be continued, such as when a hardware error of the Motion control board occurs. When the system status code error occurs, the axis is forced stopped. For details about the forced stop, refer to the following.

☞Page 157 Forced Stop

The error code of the system status code error is stored in the system status code. In addition, "System Status Code Error (error code: 3216H)" is stored in the system error.

> *Point*
>
> • The system status code error cannot be reset. Reboot the software and start the system again. If the software reboot cannot be performed, turn on the power supply of the host personal computer again.
> • If another system status code error occurs while the system error is occurring, the system error code corresponding to the error which is in more major error classification is output.

> *Point*
>
> [Motion API]
> To get the system status code error, use the sscGetSystemStatusCodeEx function.

System data (low speed) (system status data)

■System status data

Address (hexadecimal)	Name	Units	Output limits	Description
00000900	System status code	—	0000h to FFFFh	Output the system status code.
00000901				

Precautions

In the basic system software version "02", even if the following system errors occur, the system status code error does not occur.

- Network Parameter File Not Found (error code: 3210H)
- Out of Parameter Range (Network) (error code: 3211H)

Network error

The error which is detected by the network boot software is output. The network error is notified to the system error.
For the system error reset, turn ON the all error reset signal (AERST).

> *Point*
>
> [Motion API]
> To get the network error, use the same function when getting the system error. Use the sscGetSystemErrorCode function.

Basic system error

The error which is detected by the add-on other than the EmbeddedMotion is output. The basic system error is notified to the system error.
For the system error reset, turn ON the all error reset signal (AERST).

> *Point*
>
> [Motion API]
> To get the basic system error, use the same function when getting the system error. Use the sscGetSystemErrorCode function.

9.3   Monitor Function

The monitor function is for referencing the drive unit information such as the current command position, the speed feedback etc. and the operation information and the system information. The monitorable data is categorized as follows.

Monitor classifications	Monitor No. (hexadecimal)	Monitor size
Drive unit information	00000100 to 000001FF	Double word
	00001100 to 000011FF	
Operation information	00000300 to 000003FF	Double word
	00001300 to 000013FF	
System information	00000400 to 000004FF	Double word
	00001400 to 000014FF	

When monitoring the system information, the monitor area in the system command/status table is used. Also, when monitoring the drive unit information and the operational information, the monitor area of the command/status table for each axis is used.

2 items of system information and 4 items per axis of the drive unit information can be monitored. While the monitor command signal (MON) is ON, the monitor data is continuously updated.

Point
The update cycle is the operation cycle to several ms, and the updated cycle differs depending on the control status.
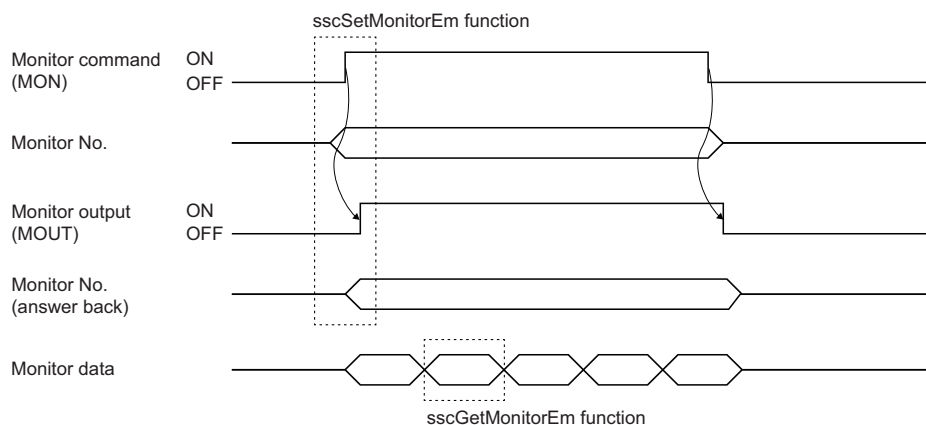
When changing the monitor No., turn OFF the monitor command signal (MON). Changing of the monitor No. is performed on the raising edge of the monitor command signal (MON) (if the monitor No. is changed while the monitor command is ON, it is ignored).

The monitor No. and the monitor data are 4bytes per item.

Ex.
When specifying the current position to the monitor No.1

Current command position data
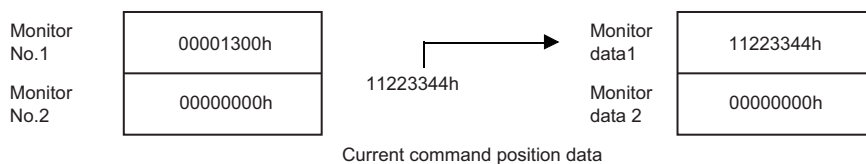
- If an erroneous monitor No. is commanded, the monitor No. error signal (MER□ (□ = 1 to 4)) is turned ON. The data for a correct monitor No. can be monitored at this time (The monitor output is turned ON.). However, if the monitor No. is set to "0", the monitor No. error is not set and the monitor data is continually set to "0".
- The drive unit information cannot be referenced if the drive unit is not connected.
- When using the monitor function (when monitoring the system information), the system monitor command signal (SMON), the monitor output signal (SMOUT), the monitor No. error signal (SMER□ (□ = 1 to 2)) are used.

Monitor latch function

The monitor data is not updated while the monitor latch command signal (MONR) is ON. While the monitor command is ON, use the Motion API to operate the monitor latch command signal (MONR).

Monitor data is not updated during this period.
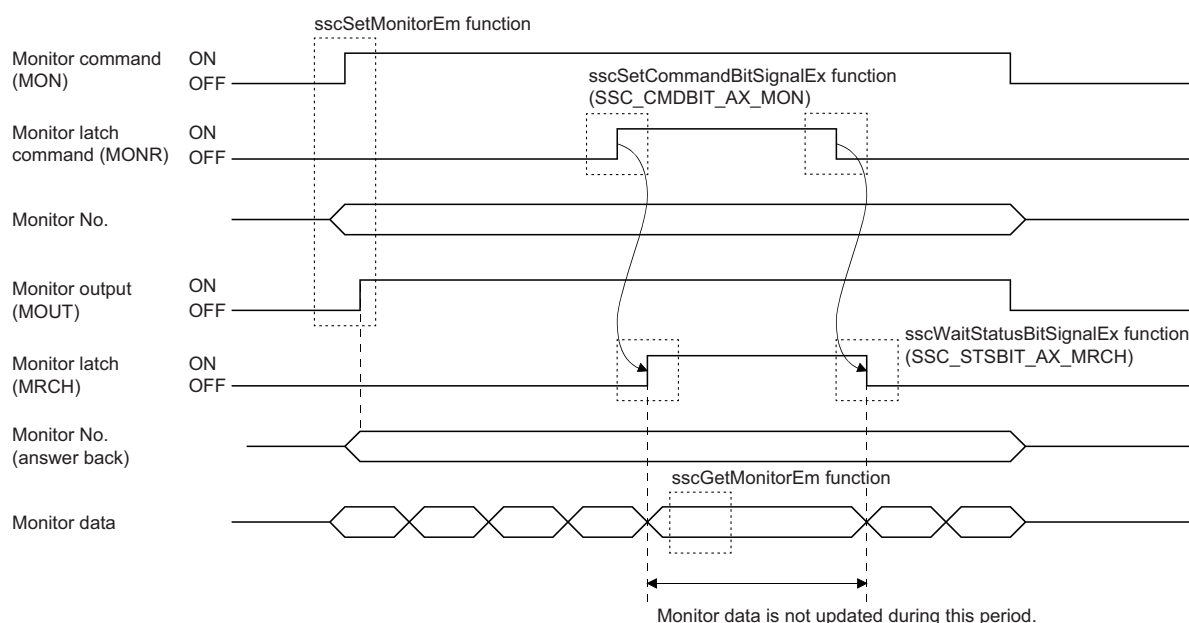
When using the monitor function (when monitoring the system information), the following signals are used.
- System monitor latch command signal (SMONR)
- Monitor latch signal (SMRCH)
- Monitor output signal (SMOUT)

[Motion API]
- To turn ON/OFF the monitor latch command signal (MONR), set "SSC_CMDBIT_AX_MON" to the command bit No. of the sscSetCommandBitSignalEx function.
  When using the monitor function (when monitoring the system information), set "SSC_CMDBIT_SYS_SMON".
- To confirm if the monitor latch signal (MRCH or SMRCH) is ON/OFF, set "SSC_STSBIT_AX_MRCH" to the status bit No. with the sscGetStatusBitSignalEx function/sscWaitStatusBitSignalEx function.
  When using the monitor function (when monitoring the system information), set "SSC_STSBIT_SYS_SMRCH".

9.4 High Speed Monitor Function

The high speed monitor function is for monitoring the current command position and the current feedback position etc. It becomes valid after the system is started up, and the monitor data is updated every operation cycle.

The data that can be referenced with the high speed monitor function are the following items.

Data item	Units	Data size	Address*1	Remarks
Current command position	Command units	4bytes	017000h + 20h × (n - 1)	Same as monitor No.00001300H
Current feedback position	Command units	4bytes	017004h + 20h × (n - 1)	Same as monitor No.00001302H
Moving speed	Speed units	4bytes	017008h + 20h × (n - 1)	Same as monitor No.00001304H
Feedback moving speed	Speed units	4bytes	01700Ch + 20h × (n - 1)	Same as monitor No.00001316H
Electrical current feedback	0.1%	2bytes	017010h + 20h × (n - 1)	Same as monitor No.00000327H
External signal status*2	—	2bytes	017012h + 20h × (n - 1)	Same as monitor No.00000320H
Position droop	pulse	4bytes	017014h + 20h × (n - 1)	—

*1 n is the axis No.

*2 The sensor status specified at "Sensor input options (parameter No.0219)" is displayed for the external signal status.

Point

[Motion API]

To get the high speed monitor data, use the following functions.

- Current command position: sscGetCurrentCmdPositionFast function
- Current feedback position: sscGetCurrentFbPositionFast function
- Moving speed: sscGetCmdSpeedFast function
- Feedback moving speed: sscGetFbSpeedFast function
- Electrical current feedback: sscGetCurrentFbFast function
- External signal status: sscGetIoStatusFast function

Necessary objects

The necessary objects for the high speed monitor function are shown below.

Function	Necessary objects	
	TPDO	RPDO
Current feedback position, Feedback moving speed	Position actual value (Obj. 6064h)	—
Electrical current feedback	Torque actual value (Obj. 6077h)	—
External signal status	Digital inputs (Obj. 60FDh)	—
Position droop	Following error actual value (Obj. 60F4h)	—

Point

- When setting "Sensor input system" of "Sensor input options (parameter No.0219)" to "1: Driver input" without setting "Digital inputs (Obj. 60FDh)", "Slave Object Setting Error (operation alarm No.0080H, detail No.0003H)" occurs.
- When setting "Drive-unit-less axis function" of "Control option 1 (parameter No.0200)" to "1: Valid", "Slave Object Setting Error (operation alarm No.0080H, detail No.0003H)" does not occur.

High speed monitor latch function

The monitor data is not updated while the high speed monitor latch command signal (RMONR) is ON.

Monitor data is not updated during this period.
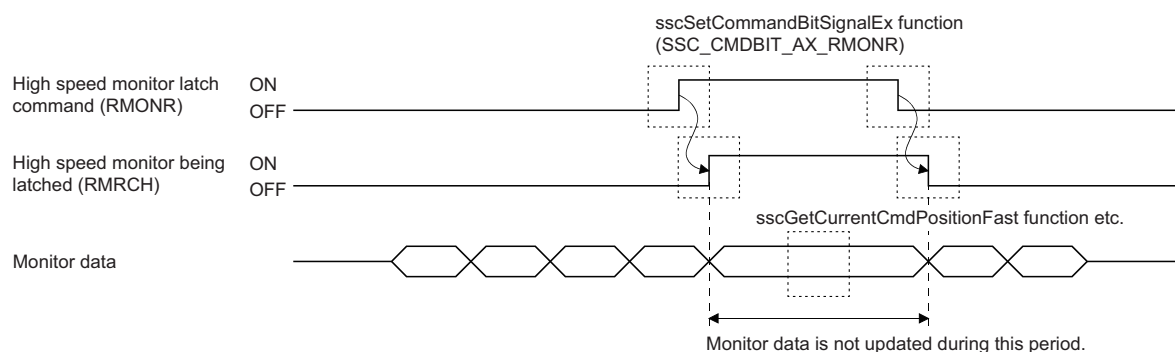
Point

[Motion API]
- To turn ON/OFF the high speed monitor latch command signal (RMONR), set "SSC_CMDBIT_AX_RMONR" to the command bit No. of the sscSetCommandBitSignalEx function. When using the monitor function (when monitoring the system information), set "SSC_CMDBIT_SYS_SMON".
- To confirm if the high speed monitor being latched signal (RMRCH) is ON/OFF, set "SSC_STSBIT_AX_RMRCH" to the status bit No. with the sscGetStatusBitSignalEx function/ sscWaitStatusBitSignalEx function.

9.5 Interrupt

Interrupt sequence

If the interrupt output start signal (ITS) is ON and the interrupt conditions are met[*1], the Motion control board outputs the interrupt trigger on the dual port memory and generates an interrupt. For the host personal computer, refer to the factor of the interrupt after generating the interrupt.

After the cancellation of the interrupt, turn ON the interrupt processing fast stop signal (ITFE). The Motion control board turns OFF the outputting factor of interrupt signal (ITO) and clears the factor of the interrupt to 0 after confirming the interrupt processing fast stop signal (ITFE) is ON. The next interrupt output is put on hold until this operation is performed.
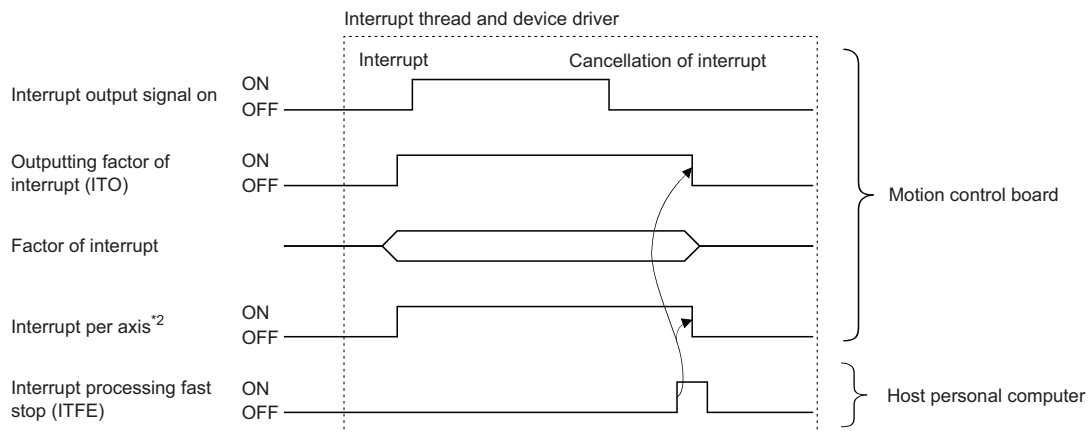
*1   The interrupt conditions can be set in following parameters.
      System interrupt conditions (parameter No.0004)
      Interrupt condition 1 (parameter No.0204)
      Interrupt condition 2 (parameter No.0205)
*2   Only the axis signal with an interrupt generated turns ON.

> **Point**
> - If multiple interrupt conditions are met during one operation cycle, all corresponding factors for interrupts are turned ON.
> - If the message signal interrupt (MSI) is valid while the interrupt output start signal (ITS) is ON, the MSI enabled signal (MSIO) is turned ON. When the MSI enabled signal (MSIO) is OFF, the interrupt signal is not issued.

> **Point**
> [Motion API]
> Confirmation of the factor of the interrupt is processed by the interrupt thread and the device driver that are created when calling the sscIntStart function. Thus processing by the user program is unnecessary.

If another interrupt condition is met while the outputting factor of interrupt signal (ITO) is ON, the factor of the interrupt is put on hold until the interrupt processing fast stop signal (ITFE) turns OFF from ON.
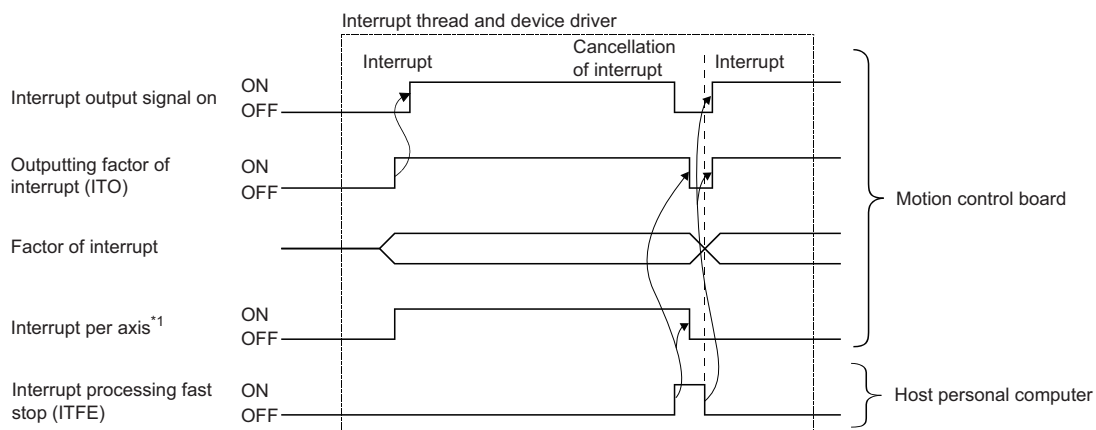
*1   Only the signal for the axis where the interrupt occurs is turned ON.

Interface

System data (high speed) (system command bit)

Address (hexadecimal)	Bit	Symbol	Signal name
00000800	0	ITE	Interrupt processing stop
	1	ITS	Interrupt output start
	2	—	For manufacturer setting
	3		
	4		
	5		
	6		
	7		

System data (high speed) (system status bit)

Address (hexadecimal)	Bit	Symbol	Signal name
00000820	0	ITO	Outputting factor of interrupt
	1	—	For manufacturer setting
	2		
	3	HRIF	Highly response I/F enabled
	4	—	For manufacturer setting
	5	MSIO	MSI enabled
	6	HSMO	High speed operation mode enabled
	7	—	For manufacturer setting

Interrupt conditions

Interrupt conditions (system parameters)

When interrupts the system are to be validated, set the values that designate ON for the bits that correspond to the conditions shown below to the system parameter "System interrupt conditions (parameter No.0004)".

■System interrupt conditions (Parameter No.0004)

Bit	Symbol	Signal name
0	SYSE	During system status code error
1	CALM	During system alarm
2	EMIO	During forced stop
3	SEO	During system error
4	—	For manufacturer setting
5		
6		
7		
8	OASF	Factor of other axes start interrupt is being sent
9	PPI	Factor of pass position interrupt is being sent
10	—	For manufacturer setting
11		
12		
13		
14		
15		

Point

[Motion API]

To set the interrupt conditions, use the sscChangeParameter function/sscChange2Parameter function.

Interrupt conditions (control parameters)

When interrupts each axis are to be validated, set the values that designate ON for the bits that correspond to the conditions shown below to "Interrupt condition 1 (parameter No.0204)" and "Interrupt condition 2 (parameter No.0205)" of the control parameter.

The interrupts occur on the rise of the signal corresponding to the interrupt condition.

The multiple interrupt conditions can be selected.

■Interrupt condition 1 (Parameter No.0204)

Bit	Symbol	Signal name
0	RDY	Servo ready
1	INP	In-position
2	ZSP	Zero speed
3	ZPAS	Passed Z-phase
4	TLC	Torque limit effective
5	SALM	Drive unit alarm
6	SWRN	Drive unit warning
7	ABSE	Absolute position erased
8	OP	Operation processing
9	CPO	Rough match
10	PF	Positioning completed
11	ZP	Home position return completed
12	SMZ	Smoothing stop
13	OALM	Operation alarm
14	OPF	Operation completed
15	PSW	Position switch

■Interrupt condition 2 (Parameter No.0205)

Bit	Symbol	Signal name
0	—	For manufacturer setting
1		
2		
3		
4		
5		
6		
7	PRSMO	Pressing in progress
8	—	For manufacturer setting
9	SINP	Drive unit in-position
10	—	For manufacturer setting
11		
12		
13		
14		
15		

Necessary object

Function	Necessary objects	
	TPDO	**RPDO**
Zero speed signal (ZSP)	Status DO 2 (Obj. 2D12h)	—
Passed Z-phase signal (ZPAS)	Status DO 2 (Obj. 2D12h)	—
Torque limit effective signal (TLC)	Status DO 1 (Obj. 2D11h)	—
Drive unit alarm signal (SALM)/Drive unit warning signal (SWRN)	Statusword (Obj. 6041h)	—
Absolute position erased signal (ABSE)	Status DO 1 (Obj. 2D11h)	—
Drive unit in-position signal (SINP)	Status DO 1 (Obj. 2D11h)	—

Factor of interrupt

> **Point**
>
> [Motion API]
> - Confirmation of the factor of the interrupt is processed by the interrupt thread that is created when calling the sscIntStart function. Thus processing by the user program is unnecessary.
> - To wait the factor of the interrupt, use the following functions.
>   Factor of system/axis interrupt: sscWaitIntEvent function
>   Factor of other axes start interrupt: sscWaitIntOasEvent function
>   Factor of pass position interrupt: sscWaitIntPassPosition function

Information of outputting with factor of interrupt

When an interrupt occurs, the bit corresponding to the axis No., the station No., or the system which is the factor of the interrupt turns ON.

Address (hexadecimal)	Content
00061000	Outputting factor of system interrupt (only bit0)
00061001	
00061002	For manufacturer setting
⋮	
0006103F	
00061040	Outputting factor of axis interrupt 1 (axis 1 to 32)
00061041	
00061042	
00061043	
00061044	Outputting factor of axis interrupt 2 (axis 33 to 64)
00061045	
00061046	
00061047	
00061048	For manufacturer setting
⋮	
0006107F	

System interrupt factors

Address (hexadecimal)	Content	Reference
00061080	Details on factor of System interrupt	Page 509 Details on factor of system interrupt
00061081		
00061082	For manufacturer setting	—
⋮		
000610FF		

Factor of axis interrupt

For details about each address of the factor of the axis interrupt, refer to the following.

☞Page 510 Factor of axis interrupt

Address (hexadecimal)	Content	Reference
00061100 to 00061103	details on factor of axis interrupt (axis 1)	Page 512 Details on factor of axis interrupt
00061104 to 00061107	details on factor of axis interrupt (axis 2)	
00061108 to 0006110B	details on factor of axis interrupt (axis 3)	
0006110C to 0006110F	details on factor of axis interrupt (axis 4)	
00061110 to 00061113	details on factor of axis interrupt (axis 5)	
⋮	⋮	
000611F8 to 000611FB	details on factor of axis interrupt (axis 63)	
000611FC to 000611FF	details on factor of axis interrupt (axis 64)	
00061200	For manufacturer setting	—
⋮		
000612FF		

Factor of other axes start interrupt

Address (hexadecimal)	Content	Reference
00061300	Factor of other axes start interrupt 1 (data 1 to 32)	Page 514 Factor of other axes start interrupt 1
00061301		
00061302		
00061303		
00061304	Factor of other axes start interrupt 2 (data 33 to 64)	Page 515 Factor of other axes start interrupt 2
00061305		
00061306		
00061307		
00061308	For manufacturer setting	—
⋮		
0006133F		
00061340	Details on factor of other axes start interrupt 1 (data 1 to 32)	Page 516 Details on factor of other axes start interrupt 1
⋮		
0006135F		
00061360	Details on factor of other axes start interrupt 2 (data 33 to 64)	Page 517 Details on factor of other axes start interrupt 2
⋮		
0006137F		
00061380	For manufacturer setting	—
⋮		
000613FF		

Factor of pass position interrupt

Address (hexadecimal)	Content	Reference
00061400 00061401 00061402 00061403	Factor of pass position interrupt 1 (condition 1 to 32)	Page 519 Factor of pass position interrupt 1
00061404 00061405 00061406 00061407	Factor of pass position interrupt 2 (condition 33 to 64)	Page 520 Factor of pass position interrupt 2
00061408 00061409 0006140A 0006140B	Factor of pass position interrupt 3 (condition65 to 96)	Page 521 Factor of pass position interrupt 3
0006140C 0006140D 0006140E 0006140F	Factor of pass position interrupt 4 (condition 97 to 128)	Page 522 Factor of pass position interrupt 4
00061410 ⋮ 0006143F	For manufacturer setting	—
00061440 ⋮ 0006145F	Details on factor of pass position interrupt 1 (condition 1 to 32)	Page 523 Details on factor of pass position interrupt 1
00061460 ⋮ 0006147F	Details on factor of pass position interrupt 2 (condition 33 to 64)	Page 524 Details on factor of pass position interrupt 2
00061480 ⋮ 0006149F	Details on factor of pass position interrupt 3 (condition 65 to 96)	Page 525 Details on factor of pass position interrupt 3
000614A0 ⋮ 000614BF	Details on factor of pass position interrupt 4 (condition 97 to 128)	Page 526 Details on factor of pass position interrupt 4
000614C0 ⋮ 000615FF	For manufacturer setting	—

Interrupt processing example

*1 Perform the necessary processing for the different factor of interrupts, such as for the completion of the operation and the generation of an operation alarm.
<Example> When an operation alarm occurs, send a stop request to other axes that are in the operation.

Point

[Motion API]

Since the interrupt processing is performed by the device driver, thus processing by the user program is unnecessary.

Interrupt signal re-output

The interrupt signal re-output function outputs the interrupt signal again when the interrupt processing fast stop signal (ITFE) is not turned ON from turning ON the outputting factor of interrupt signal (ITO) to the lapse of the specified time. This function is used to get the interrupt signal again when the user program is failed to get the interrupt signal due to its short output interval.

The factor of the interrupt is not cleared until the interrupt processing fast stop signal (ITFE) is turned ON.

The interrupt signal output count is for counting the cumulative total number of the generated interrupt signals. The final interrupt signal output free-running counter outputs the free-running counter value when the interrupt signal is output at the end.

The interrupt signal re-output cumulative count is for only counting the number of the interrupt signal re-output after turning ON the outputting factor of interrupt signal (ITO). The interrupt signal output count and the interrupt signal re-output cumulative count are cleared when turning ON the interrupt output start signal (ITS).

The following is the operation when setting 2 to "Interrupt signal re-output count (parameter No.0013)" (output 2 times after turning ON the outputting factor of interrupt signal (ITO)).
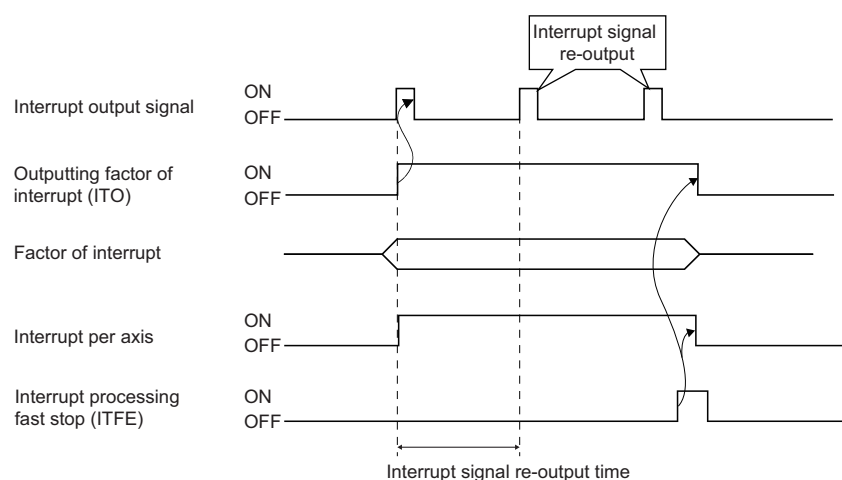
Interface

■System information for Motion API

Address (hexadecimal)	Name	Units	Setting range	Description
00000A80	Final interrupt signal output free-running counter	—	0 to 4294967295	—
00000A81				
00000A82				
00000A83				
00000A84	Interrupt signal output count	—	0 to 4294967295	It is 4-byte ring counter without code.
00000A85				
00000A86				
00000A87				
00000A88	Interrupt end processing specified time exceeded count	—	0 to 65535	☞ Page 393 Interrupt end processing specified time exceeded count
00000A89				
00000A8A				
00000A8B				
00000A8C	Interrupt signal re-output cumulative count	—	0 to 65535	Stop the update when reaching the maximum value.
00000A8D				
00000A8E				
00000A8F				

■System parameters

Parameter No.	Symbol *1	Name	Initial value	Units	Setting range	Function
0012	*IRET	Interrupt signal re-output time	0	ms	0 to 65535	Set the time from turning ON the outputting factor of interrupt signal (ITO) until re-outputting the interrupt signal. • 0: Interrupt signal re-output is invalid • 1 to 65535: 1 to 65535ms
0013	*IRN	Interrupt signal re-output count	0	—	0 to 32767	Set the number of times to re-output the interrupt signal. When setting 0, the interrupt signal is output 4 times.

*1 The settings for the parameters with a * mark at the front of the symbol are validated when the system is started.

> **Point**
>
> For the interrupt signal re-output time, the re-outputting timing is calculated by setting value ÷ operation cycle. The value is rounded up if there is a decimal point.
> <Example> When the interrupt signal re-output time is specified to 101ms with the operation cycle of 2.0ms
> The time until the running point is completed after the completion of the point movement is 51 operation cycles (approx. 102.0ms).

> **Point**
>
> [Motion API]
> If the interrupt callback function is set to use, the interrupt signal output is performed multiple times against the same factor of the interrupt due to the interrupt signal re-output. When both validating the interrupt signal re-output and using the interrupt callback function, take into consideration that the interrupt callback function is called multiple times and create the user program.

Interrupt end processing specified time exceeded count

The interrupt end processing specified time exceeded count function is for monitoring the number of times that the interrupt processing fast stop signal (ITFE) is not turned ON from turning ON the outputting factor of interrupt signal (ITO) to 100ms. This function becomes valid after the system startup.

The interrupt end processing specified time exceeded count is counted up after 100ms since the outputting factor of interrupt signal (ITO) is turned ON, and the counting up is not performed until the outputting factor of interrupt signal (ITO) is turned ON again. When the interrupt end processing specified time exceeded count is counted up, it means that the Motion API is failed to return the response of the interrupt processing complete. Use the interrupt signal re-output function to output the interrupt signal again.

Interface

■System information for Motion API

Address (hexadecimal)	Name	Units	Setting range	Description
00000A88	Interrupt end processing specified time exceeded count	—	0 to 65535	Stop the update when reaching the maximum value.
00000A89				
00000A8A				
00000A8B				

9.6 User Watchdog Function

The user watchdog function is to check the user program error. When an error occurs at the user program, the Motion control board and the connected axis are forced stopped. For the movement of the device station other than the axis, refer to "Cyclic Transmission" in the following manual.

📖Motion Control Board User's Manual (Network)

> **Point**
>
> The user watchdog function is supported in the basic system software version "02" or later.

Interface

System data (low speed) (system command data/system status data)

■System command data

Address (hexadecimal)	Name	Units	Setting range	Description
0000080C	Watchdog check counter	—	0 to 65535	Set the value of the previous value + 1.
0000080D				
0000080E	Number of milliseconds for watchdog timer timeout	ms	0 to 65535	Set the time until determining the host personal computer error. When the setting value is "0", the user watchdog function is invalid. When setting "0" to the number of milliseconds for watchdog timer timeout after setting other than "0", the user watchdog function is invalidated. When setting other than "0" again, the user watchdog is validated again, and it is restarted from the value of resetting.
0000080F				

■System status data

Address (hexadecimal)	Name	Units	Output limits	Description
0000082C	Remaining time (watchdog timer)	ms	0 to 65535	Store the remaining time until determining the host personal computer error.
0000082D				

> **Point**
>
> - The Motion Control Board checks that the value of the watchdog check counter is different from the previous value.
> - When the watchdog check counter exceeds the maximum value in the range, count from "0" again.
> - By setting "0" to the number of milliseconds for watchdog timer timeout while the user watchdog error detected is occurring, the error can be canceled.
> - When setting 2.0ms or more to the communication cycle, the number of milliseconds for watchdog timer timeout is rounded to be divisible by the communication cycle.
>   <Example> When the number of milliseconds for watchdog timer timeout is 5.0ms with the communication cycle of 2.0ms
>   Check with the number of milliseconds for watchdog timer timeout of 4.0ms.
> - When writing the smaller value than the communication cycle with the communication cycle of 2.0ms to the number of milliseconds for watchdog timer timeout, the value of the number of milliseconds for watchdog timer timeout is considered to be the same as the communication cycle.

> **Point**
>
> [Motion API]
> - To enable/disable the user watchdog function, use the sscWdEnable function/sscWdDisable function.
> - To update the watchdog check counter, use the sscChangeWdCounter function.
> - For a detailed procedure for the watchdog, refer to the sample program (WatchDog) contained on the EM Motion SDK.

System data (low speed) (system status bit)

For details about the forced stop factor 2 (User watchdog error detected) signal (EMC2), refer to the following.
☞ Page 159 System data (low speed) (system status bit)

Operation example

The operation example of the user program error check by the user watchdog function is shown below.
- Normal conditions
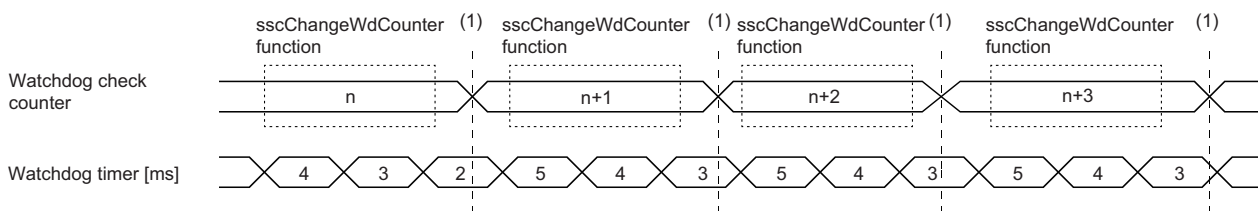
- When the host personal computer overruns
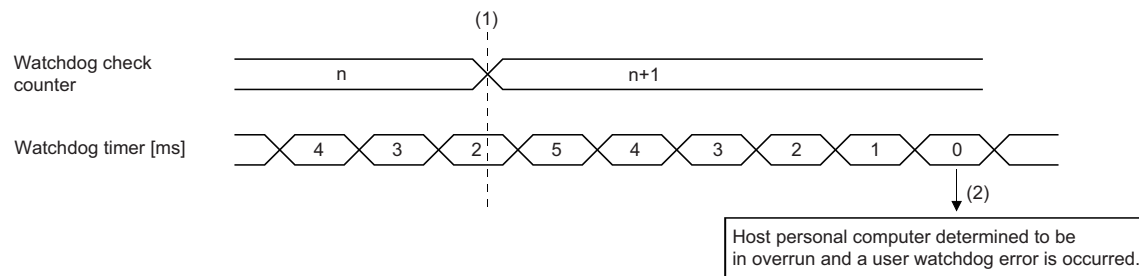
(1) Update the value of the user watchdog check counter on the dual port memory by the host personal computer periodically.

(2) When the value of the user watchdog check counter is not updated in the specified time (when the value of the watchdog timer is "0"), the user watchdog error detected is occurred by determining the host personal computer error, and the Motion control board performs a forced stop processing.

> **Point**
>
> - After the user watchdog error detected, the stoppage processing is performed within 1 operation cycle. The stoppage processing is performed by the Quick stop (axis only) and the notification of the master station error. For the movement of the device station by the Quick stop and the master station error, refer to the manual of the device station.
> - For MR-J5(W)-G, "Drive unit warning [AL. 09E.8_Master station error detection warning]" occurs due to the master station error. The occurrence of the drive unit warning may suspend the function which operates by the Quick stop. Confirm the operation of each function of MR-J5(W)-G, and use the user watchdog function.

Necessary objects

The necessary objects for forced stopping the axis by the user watchdog function is shown below.

Function	Necessary objects	
	TPDO	**RPDO**
User watchdog function	—	Controlword (Obj. 6040h)

Point

When not setting "Controlword (Obj. 6040h)" to the PDO mapping, "Necessary Slave Object Unset (error code:1AA8H)" occurs, and MR-J5(W)-G cannot be connected.

9.7 Software Reboot Function

Through using the software reboot function, the host personal computer can restart the Motion control board using the software.

This function is used when re-importing the parameter or returning back the Motion control board to its state when the power supply is turned on without stopping the entire system due to such as powering on the system again.

Perform the software reboot according to the following procedure.

sscReboot function

- Start
- Set reboot ID *1
- Turn ON reboot preparation signal (RBR)
- Is the reboot preparation OK? (RBOK = ON?) — No
- Yes
- Turn ON execute rebooting signal (RBS)
- Finish
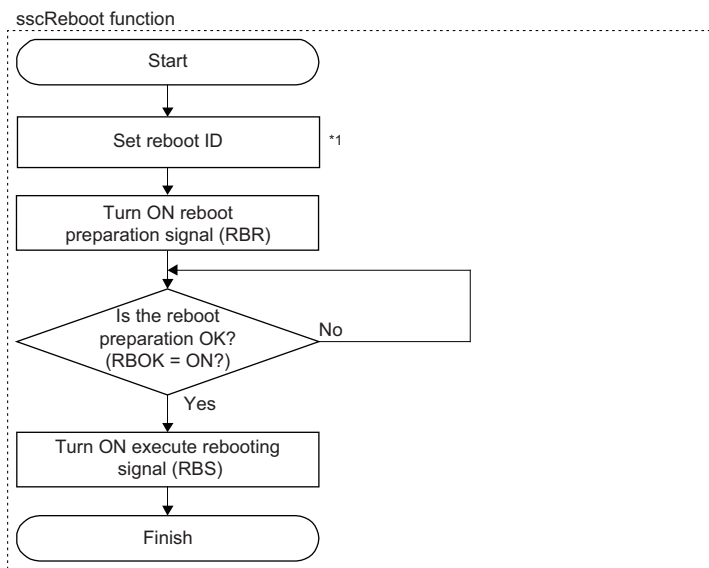
*1 Set the reboot ID to "1EA5h: System reset".

Point

- Since rebooting the software while the motion test tool is connected to the Ethernet causes the disconnection of the Ethernet connection, connect the motion test tool again after starting up the Motion control board.
- When turning ON the reboot preparation, it becomes a forced stop status. For details, refer to the following.
  ☞ Page 157 Forced Stop
- Accessing the Motion control board via the bus during a software reboot may cause the host personal computer to freeze.
- Depending on the environment of the host personal computer, a blue screen may occur due to the Windows Hardware Error Architecture (WHEA). When the blue screen occurs, change the slot to attach the Motion control board.
- It takes about 20 seconds from performing the software reboot to turning the system status code to "0001h: System preparation completion".

Point

[Motion API]
To perform the software reboot, use the sscReboot function.

Interface

System data (low speed) (system command data)

■System command data

Address (hexadecimal)	Name	Units	Setting range	Description
00000866	Reboot ID	—	1EA5h	Store the reboot ID.
00000867				• 1EA5h: System reset

System data (low speed) (system command bit/system status bit)

■System command bit

Address (hexadecimal)	Bit	Symbol	Signal name
00000844	0	RBR	Reboot preparation
	1	RBS	Execute rebooting
	2	CRST	System alarm reset
	3	—	For manufacturer setting
	4	SMON	System monitor command
	5	SMONR	System monitor latch command
	6	—	For manufacturer setting
	7		

• Details concerning system command bit

Symbol	Signal name	Function details	
		Function	Operation
RBR	Reboot preparation	Prepare for the reboot and change the status to the forced stop status.	When turning ON the reboot preparation signal (RBR), check the reboot ID value and turn ON the reboot preparation completed signal (RBOK). When turning ON the reboot preparation signal (RBR) with the incorrect reboot ID setting, turn ON the reboot preparation error signal (RBNG). When the reboot preparation error signal (RBNG) is turned ON, turn OFF the reboot preparation signal (RBR) and the execute rebooting signal (RBS), and start over again.
RBS	Execute rebooting	Execute the reboot.	When turning ON the execute rebooting signal (RBS), execute the reboot according to the reboot ID value. When turning ON the execute rebooting signal (RBS) without turning ON the reboot preparation signal (RBR), turn ON the reboot preparation error signal (RBNG). When the reboot preparation error signal (RBNG) is turned ON, turn OFF the reboot preparation signal (RBR) and the execute rebooting signal (RBS), and start over again.

■System status bit

Address (hexadecimal)	Bit	Symbol	Signal name
000008E4	0	RBOK	Reboot preparation completed
	1	RBNG	Reboot preparation error
	2	CALM	Current system alarm
	3	—	For manufacturer setting
	4	SMOUT	Monitor output
	5	SMRCH	Monitor latch
	6	SMER1	Monitor No. error 1
	7	SMER2	Monitor No. error 2

• Details concerning system status bit

Symbol	Signal name	Function details		
		Function	Operation	
			Conditions for turning ON	Conditions for turning OFF
RBOK	Reboot preparation completed	Notify that the reboot preparation is completed.	Turn ON the reboot preparation signal (RBR), and the reboot ID check is completed normally.	• The reboot preparation signal (RBR) is turned OFF. • The reboot is completed.
RBNG	Reboot preparation error	Notify that the incorrect reboot ID is confirmed.	The incorrect reboot ID is detected.	The reboot preparation signal (RBR) and the execute rebooting signal (RBS) are turned OFF.

9.8 Sampling

The sampling function is a function that monitors the Motion control board status and samples this data. After sending the sampling start signal (SMPS), when met the trigger condition of the axis, the following data is sampled every sampling cycle. The data is sampled in the sampling data buffer area in the Motion control board up to 65536 points.

> **Point**
> • The sampling function can be used in the graph function of the motion test tool.
> • The sampling function performs sampling in the operation cycle.

The sampled data can be read to the sampling data read area by specifying the sampling read page No. The sampled data is stored in the Motion control board internal memory and initialized by power off of the Motion control board or the software reboot.

Sampling specification list

Item		Specification
Number of sampling points		Up to 65536 points (with a bus or Ethernet connection) (Ring buffer of 65536 points) ■Sampling time in each operation cycle (reference) The following shows the sampling time when the number of sampling points is 65536 and the multiplication is 1 times. • 62.50μs: 4.096s • 125.00μs: 8.192s • 250.00μs: 16.384s • 500.00μs: 32.768s • 1000.00μs: 65.536s • 2000.00μs: 131.072s
Sampling cycle		Operation cycle × (1 to 256) • 1.0ms: up to approx. 16777s
Number of sampling items	Bits	Up to 32 items
	Data	Up to 32 items (32 items set to either 2 or 4bytes each)[1]
Sampling item content	Bits	Set through the operation information monitor ■Axis data (high speed)[2] • Command bits (address: 00001000H to 0000100FH) • Status bits (address 00006000H to 0000600FH) ■Axis data (low speed)[2] • Command bits (address: 0000B000H to 0000B01FH) • Status bits (address 00011000H to 0001101FH)
	Data	• Drive unit information (monitor) • Operation information (monitor) • System information (monitor)
Sampling trigger	Number of trigger conditions	8 conditions
	Trigger conditions[3]	• Rise of bit • Trailing edge of bit • Bit ON • Bit OFF • When data is "passing through trigger value in increase direction" • When data is "passing through trigger value in decrease direction" • When data is "same as trigger value or higher" • When data is "same as trigger value or lower" • No trigger
	Trigger mode	• Trigger condition "or" • Trigger condition "and" • No trigger
	Pre-trigger	0 to 90% (in units of 10%) (Set the ratio of the number of sampling points before satisfying the trigger conditions against the specified number of sampling points.)
Sampling data	Number of points per page	128 points
	Maximum page No.	512 (=65536/128)

*1 There can be a combination of up to 3 bit or data points of the drive unit information per axis. The electrical current feedback monitor and the effective load ratio monitor have no restriction on the number of points allowed.

*2 The addresses in the table are the addresses for the first axis. For the second axis and after, add the following value for each axis.
Axis data (high speed) (command bit): +10h
Axis data (high speed) (status bit): +10h
Axis data (low speed) (command bit): +C0h
Axis data (low speed) (status bit): +C0h

*3 For details about bits/data, refer to "Sampling item content".

Interface

System data (low speed) (system command bit/system status bit)

■System command bit

Address (hexadecimal)	Bit	Symbol	Signal name
00000840	0	SMPS	Sampling start
	1	—	For manufacturer setting
	2		
	3		
	4		
	5		
	6		
	7		

Address (hexadecimal)	Bit	Symbol	Signal name
00000848	0	SMPSW	Sampling setting write command
	1	—	For manufacturer setting
	2		
	3		
	4	SMPSR	Sampling setting read command
	5	—	For manufacturer setting
	6		
	7		

• Details concerning system command bits

Symbol	Signal name	Function details	
		Function	Operation
SMPS	Sampling start	Start sampling.	When turning ON the sampling start signal (SMPS), starts the storage of sampling data.
SMPSW	Sampling setting write command	Write sampling setting.	Write the sampling setting which is set to the sampling setting write No. When the sampling setting write No. is incorrect and the sampling setting to be written is outside the setting range, the sampling setting write is not performed. (The sampling setting write command is valid only while the system is running.)
SMPSR	Sampling setting read command	Read sampling setting.	Read the sampling setting which is set to the sampling setting read No. When the sampling setting read No. is incorrect, the sampling setting read is not performed. (The sampling setting read command is valid only while the system is running.)

■System status bit

Address (hexadecimal)	Bit	Symbol	Signal name
000008E0	0	SMPW	Waiting for sampling trigger
	1	SMPO	Sampling is being performed
	2	SMPF	Sampling completed
	3	SMPE	Sampling error
	4	—	For manufacturer setting
	5		
	6		
	7		

Address (hexadecimal)	Bit	Symbol	Signal name
000008E8	0	SWFIN	Sampling setting write completed
	1	SWEN	Sampling setting No. error
	2	SWED	Sampling setting data out of bounds
	3	—	For manufacturer setting
	4	SRFIN	Sampling setting read completed
	5	SREN	Sampling setting No. error
	6	—	For manufacturer setting
	7		

- Details concerning system command bits

Symbol	Signal name	Function details		
		Function	Operation	
			Conditions for turning ON	Conditions for turning OFF
SMPW	Waiting for sampling trigger	Notify that the sampling trigger is being waited.	When the sampling start signal (SMPS) is ON, and being wait for the sampling trigger.	• The sampling start signal (SMPS) is turned OFF. • The trigger for the start sampling trigger axis is met.
SMPO	Sampling is being performed	Notify that sampling is now being performed.	When the sampling start signal (SMPS) is ON, and being performed sampling.	• The sampling start signal (SMPS) is turned OFF. • Sampling is completed.
SMPF	Sampling completed	Notify that sampling was completed normally.	Sampling is completed normally.	The sampling start signal (SMPS) is turned OFF.
SMPE	Sampling error	Notify that sampling was not completed normally.	• The sampling setting error occurs. • The sampling item error occurs. • The next page No. of the completed read sampled page No. is same as the sampling read page No. (The data was not sampled in time.) • The sampling start signal (SMPS) is turned ON when the read sampled data completion page No. is -1. • The page No. 0 is designated from the page No. other than 0 when the sampling is being performed.	The start sampling signal (SMPS) is turned OFF.
SWFIN	Sampling setting write completed	Notify that writing of the sampling setting was completed.	The sampling setting write No. and the setting value in the range are set correctly and the sampling setting write command signal (SMPSW) is turned ON.	The sampling setting write command signal (SMPSW) is turned OFF.
SWEN	Sampling setting No. error	Notify that the sampling setting No. is incorrect.	The sampling setting No. is set incorrectly and the sampling setting write command signal (SMPSW) is turned ON.	The sampling setting write command signal (SMPSW) is turned OFF.

Symbol	Signal name	Function details		
		Function	**Operation**	
			Conditions for turning ON	**Conditions for turning OFF**
SWED	Sampling setting data out of bounds	Notify that the sampling setting value is outside the setting range.	The sampling setting value which is outside the setting range is set and the sampling setting write command signal (SMPSW) is turned ON.	The sampling setting write command signal (SMPSW) is turned OFF.
SRFIN	Sampling setting read completed	Notify that reading of the sampling setting was completed.	The sampling setting read No. is set correctly and the sampling setting read command signal (SMPSR) is turned ON.	The sampling setting read command signal (SMPSR) is turned OFF.
SREN	Sampling setting No. error	Notify that the sampling setting No. is incorrect.	The sampling setting read No. is set incorrectly and the sampling setting read command signal (SMPSR) is turned ON.	The sampling setting read command signal (SMPSR) is turned OFF.

Sampling setting write (command/status)

■Sampling setting write (command)

Address (hexadecimal)	Name	Units	Setting range	Description
00069360	Sampling setting write No.	—	0000h to 00AFh	Set the sampling setting No. to be written. (For 0000h, the sampling setting No. error does not occur.)
00069361				
00069362	For manufacturer setting	—	—	—
⋮				
00069367				
00069368	Sampling setting write data	—	0000000000000000h to FFFFFFFFFFFFFFFFh	Set the data of the sampling setting No. to be written.
00069369				
0006936A				
0006936B				
0006936C				
0006936D				
0006936E				
0006936F				

■Sampling setting write (status)

Address (hexadecimal)	Name	Units	Output limits	Description
00069370	Sampling setting write No.	—	0000h to 00AFh	Display the sampling setting No. which was written.
00069371				
00069372	For manufacturer setting	—	—	—
⋮				
00069377				
00069378	Sampling setting write data	—	0000000000000000h to FFFFFFFFFFFFFFFFh	Display the data of the sampling setting No. which was written.
00069379				
0006937A				
0006937B				
0006937C				
0006937D				
0006937E				
0006937F				

Sampling setting read (command/status)

■Sampling setting read (command)

Address (hexadecimal)	Name	Units	Setting range	Description
00069380	Sampling setting read No.	—	0000h to 00AFh	Set the sampling setting No. to be read. (For 0000h, the sampling setting No. error does not occur.)
00069381				

■Sampling setting read (status)

Address (hexadecimal)	Name	Units	Output limits	Description
00069390	Sampling setting read No.	—	0000h to 00AFh	Display the sampling setting No. which was read.
00069391				
00069392	For manufacturer setting	—	—	—
⋮				
00069397				
00069398	Sampling setting read data	—	0000000000000000h to FFFFFFFFFFFFFFFFh	Display the data of the sampling setting No. which was read.
00069399				
0006939A				
0006939B				
0006939C				
0006939D				
0006939E				
0006939F				

Sampling error information

Address (hexadecimal)	Name	Setting range	Description
000693A0	Sampling axis error information 1 (axis 1 to axis 32)	00000000h to FFFFFFFFh	Turn ON the bit of the sampling axis which became the sampling error. • Axis No.1 (bit0) to 32 (bit31)
000693A1			
000693A2			
000693A3			
000693A4	Sampling axis error information 1 (axis 33 to axis 64)	00000000h to FFFFFFFFh	Turns ON the bit of the sampling axis which became the sampling error. • Axis No.33 (bit0) to 64 (bit31)
000693A5			
000693A6			
000693A7			
000693A8	For manufacturer setting	—	—
⋮			
000693B7			
000693B8	Sampling data error information	00000000h to FFFFFFFFh	Turns ON the bit of the sampling data which became the sampling error. • Sampling data 1 (bit0) to 32 (bit31)
000693B9			
000693BA			
000693BB			
000693BC	For manufacturer setting	—	—
000693BD			
000693BE			
000693BF			
000693C0	Sampling bit error information	00000000h to FFFFFFFFh	Turns ON the bit of the sampling bit information which became the sampling error. • Sampling data information 1 (bit0) to 32 (bit31)
000693C1			
000693C2			
000693C3			

Sampled data read (command/status)

■Sampled data read (command)

Address (hexadecimal)	Name	Units	Setting range	Description
000693D0	Sampling read page No.	—	0 to 512	Set the page No. which is read in the sampling data read area. 12 points of sampled data are read per page. (When start sampling, set "0".)
000693D1				

■Sampled data read (status)

Address (hexadecimal)	Name	Units	Output limits	Description
000693D8	Read sampled data page No.	—	-2 to 512	Store the page No. which is transferred to the sampling data read area. • -2: Sampling read error • -1: Sampling reading • 0: When sampling read No. is 0 • 1 to 512: Page No. whose sampled data is read
000693D9				
000693DA	Valid read sampled points	—	0 to 128	Store the number of sampled data in the page where sampling read is completed. The host personal computer needs to read the sampling data read area and to refer to the data of this valid read sampled points. All sampled data after the valid sampled points is "0". • 0 to 128 points: Data points sampled in a page
000693DB				
000693DC	Completed read sampled page No.	—	0 to 512	Store the page No. where sampling is completed by the Motion control board. • 0: Sampling trigger waiting or the page No.1 (only the first time) is being sampled • 1 to 512: Completed read sampled page No.
000693DD				

Sampling setting write/read

The conditions for sampling and the contents of sampling can be set by the sampling setting write. Also, the current sampling setting can be read by the sampling setting read. The sampling setting write/read is valid during system running (system status code: 000Ah).

When writing the sampling setting
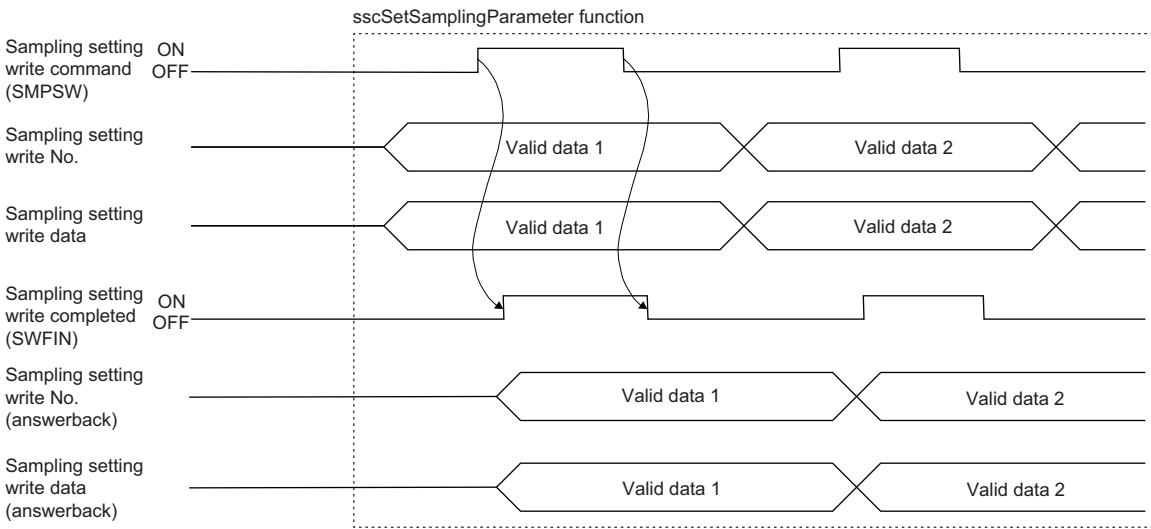
Point

- The sampling setting write data is written in 4bytes.
- Write all necessary settings for the sampling and perform the sampling.

When reading the sampling setting
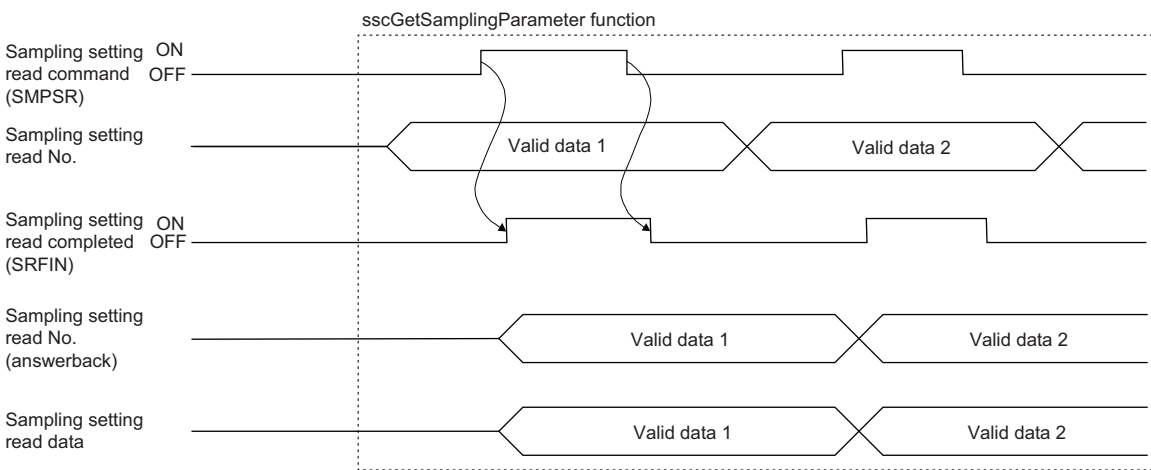
Point

The sampling setting read data is read in 4bytes.

Details for sampling function settings

The settings related to the sampling function are shown below. Each setting is imported when the sampling is started (SMPS: ON). The sampling setting cannot be changed while the sampling trigger being waited (SMPW: ON) and the sampling is being performed (SMPO: ON).

Sampling setting

Sampling setting No.	Name	Initial value	Setting range	Description
0001	Sampling option	00000000h	00000000h to 000029FFh	■■■■■□□ (Sampling cycle) Set the sampling cycle. • 0 to 255: Operation cycle × (setting + 1) <Example> If the sampling cycle is set to 3 with the operation cycle set to 1.0ms • Perform sampling every 4.0ms. ■■■■■□■■ (Pre-trigger) Set the timing that the trigger condition is met. • 0 to 9: Setting × 10% ■■■■□■■■ (Trigger mode) Set the trigger mode. • 0: Trigger turns ON when the sampling is started. • 1: Trigger turns ON when one of each trigger condition is met. • 2: Trigger turns ON when all of the trigger conditions are met.
0002	Sampling points	65536	0 to 65536	Set the points to be sampled.
0003 ⋮ 000F	For manufacturer setting	00000000h ⋮ 00000000h	—	—
0010	Sampling trigger 1 setting	00000000h	00000000h to 10041F01h	■■■■■■□ (Trigger 1 sampling items) Select the sampling items referred by trigger 1. • 0: Sampling data • 1: Sampling bit information The following settings differ up to the trigger 1 sampling items. [When "0: Sampling data" is selected] ■■■□□■■ (Trigger 1 sampling data No.) Set the sampling data No. referred by the trigger 1 in hexadecimal. <Example> 00h to 1Fh • Sampling data 1 to 32 ■■■□■■■ (Trigger 1 condition) Set the trigger 1 condition. • 0: Trigger 1 setting invalid • 1: Fulfilled when passing through trigger value 1 in increase direction • 2: Fulfilled when passing through trigger value 1 in decrease direction • 3: Fulfilled with trigger value 1 or later • 4: Fulfilled with trigger value 1 or lower □■■■■■■ (Trigger 1 code) Set the code of sampling data referred by trigger 1. • 0: Without code • 1: With code [When "1: Sampling bit information" is selected] ■■■□□■■ (Trigger 1 sampling bit information No.) Set the sampling bit information No. referred by trigger 1 in hexadecimal. <Example> 00h to 1Fh • Sampling bit information 1 to 32 ■■■□■■■ (Trigger 1 condition) Set the trigger 1 condition. • 0: Trigger 1 setting invalid • 1: Fulfilled by rise of bit • 2: Fulfilled by trailing edge of bit • 3: Fulfilled while bit is ON • 4: Fulfilled while bit is OFF
0011	Sampling trigger 2 setting	00000000h	00000000h to 10041F01h	Same as the sampling trigger 1 setting.

Sampling setting No.	Name	Initial value	Setting range	Description
0012	Sampling trigger 3 setting	00000000h	00000000h to 10041F01h	Same as the sampling trigger 1 setting.
0013	Sampling trigger 4 setting	00000000h	00000000h to 10041F01h	Same as the sampling trigger 1 setting.
0014	Sampling trigger 5 setting	00000000h	00000000h to 10041F01h	Same as the sampling trigger 1 setting.
0015	Sampling trigger 6 setting	00000000h	00000000h to 10041F01h	Same as the sampling trigger 1 setting.
0016	Sampling trigger 7 setting	00000000h	00000000h to 10041F01h	Same as the sampling trigger 1 setting.
0017	Sampling trigger 8 setting	00000000h	00000000h to 10041F01h	Same as the sampling trigger 1 setting.
0018 ⋮ 001F	For manufacturer setting	00000000h	—	—
0020	Sampling trigger value 1	00000000h	00000000h to FFFFFFFFh	Set the threshold for the trigger 1. • Set the threshold in double word regardless of the size of the data set in the sampling trigger 1 setting. • When the contents of trigger 1 are sampling bit information, this setting is not used.
0021	Sampling trigger value 2	00000000h	00000000h to FFFFFFFFh	Set the threshold for the trigger 2. The setting contents are same as the sampling trigger value 1.
0022	Sampling trigger value 3	00000000h	00000000h to FFFFFFFFh	Set the threshold for the trigger 3. The setting contents are same as the sampling trigger value 1.
0023	Sampling trigger value 4	00000000h	00000000h to FFFFFFFFh	Set the threshold for the trigger 4. The setting contents are same as the sampling trigger value 1.
0024	Sampling trigger value 5	00000000h	00000000h to FFFFFFFFh	Set the threshold for the trigger 5. The setting contents are same as the sampling trigger value 1.
0025	Sampling trigger value 6	00000000h	00000000h to FFFFFFFFh	Set the threshold for the trigger 6. The setting contents are same as the sampling trigger value 1.
0026	Sampling trigger value 7	00000000h	00000000h to FFFFFFFFh	Set the threshold for the trigger 7. The setting contents are same as the sampling trigger value 1.
0027	Sampling trigger value 8	00000000h	00000000h to FFFFFFFFh	Set the threshold for the trigger 8. The setting contents are same as the sampling trigger value 1.
0028 ⋮ 002F	For manufacturer setting	00000000h	—	—
0030	Sampling data 1 setting	00000000h	00000000h to 003F14FFh	■■■□□□□ (Monitor No.) Set the monitor No. to be sampled. (Set with the last 4 digits of the monitor No.) • 0000h : Not selected • 0100h to 01FFh: drive unit information (1) • 1100h to 11FFh: drive unit information (1) (double word) • 0300h to 03FFh: operation information • 1300h to 13FFh: operation information (double word) • 0400h to 04FFh: system information • 1400h to 14FFh: system information (double word) Axis No. is not necessary to be set in the system information. ■■□□■■■■ (Axis No.) Set the axis No. of sampling data 1. • 00h to 3Fh: Axis No.1 to 64 <Example> 00h • Axis No.1
0031	Sampling data 2 setting	00000000h	00000000h to 003F14FFh	Same as the sampling data 1 setting.
0032	Sampling data 3 setting	00000000h	00000000h to 003F14FFh	Same as the sampling data 1 setting.
0033	Sampling data 4 setting	00000000h	00000000h to 003F14FFh	Same as the sampling data 1 setting.
0034	Sampling data 5 setting	00000000h	00000000h to 003F14FFh	Same as the sampling data 1 setting.

Sampling setting No.	Name	Initial value	Setting range	Description
0035	Sampling data 6 setting	00000000h	00000000h to 003F14FFh	Same as the sampling data 1 setting.
0036	Sampling data 7 setting	00000000h	00000000h to 003F14FFh	Same as the sampling data 1 setting.
0037	Sampling data 8 setting	00000000h	00000000h to 003F14FFh	Same as the sampling data 1 setting.
0038	Sampling data 9 setting	00000000h	00000000h to 003F14FFh	Same as the sampling data 1 setting.
0039	Sampling data 10 setting	00000000h	00000000h to 003F14FFh	Same as the sampling data 1 setting.
003A	Sampling data 11 setting	00000000h	00000000h to 003F14FFh	Same as the sampling data 1 setting.
003B	Sampling data 12 setting	00000000h	00000000h to 003F14FFh	Same as the sampling data 1 setting.
003C	Sampling data 13 setting	00000000h	00000000h to 003F14FFh	Same as the sampling data 1 setting.
003D	Sampling data 14 setting	00000000h	00000000h to 003F14FFh	Same as the sampling data 1 setting.
003E	Sampling data 15 setting	00000000h	00000000h to 003F14FFh	Same as the sampling data 1 setting.
003F	Sampling data 16 setting	00000000h	00000000h to 003F14FFh	Same as the sampling data 1 setting.
0040	Sampling data 17 setting	00000000h	00000000h to 003F14FFh	Same as the sampling data 1 setting.
0041	Sampling data 18 setting	00000000h	00000000h to 003F14FFh	Same as the sampling data 1 setting.
0042	Sampling data 19 setting	00000000h	00000000h to 003F14FFh	Same as the sampling data 1 setting.
0043	Sampling data 20 setting	00000000h	00000000h to 003F14FFh	Same as the sampling data 1 setting.
0044	Sampling data 21 setting	00000000h	00000000h to 003F14FFh	Same as the sampling data 1 setting.
0045	Sampling data 22 setting	00000000h	00000000h to 003F14FFh	Same as the sampling data 1 setting.
0046	Sampling data 23 setting	00000000h	00000000h to 003F14FFh	Same as the sampling data 1 setting.
0047	Sampling data 24 setting	00000000h	00000000h to 003F14FFh	Same as the sampling data 1 setting.
0048	Sampling data 25 setting	00000000h	00000000h to 003F14FFh	Same as the sampling data 1 setting.
0049	Sampling data 26 setting	00000000h	00000000h to 003F14FFh	Same as the sampling data 1 setting.
004A	Sampling data 27 setting	00000000h	00000000h to 003F14FFh	Same as the sampling data 1 setting.
004B	Sampling data 28 setting	00000000h	00000000h to 003F14FFh	Same as the sampling data 1 setting.
004C	Sampling data 29 setting	00000000h	00000000h to 003F14FFh	Same as the sampling data 1 setting.
004D	Sampling data 30 setting	00000000h	00000000h to 003F14FFh	Same as the sampling data 1 setting.
004E	Sampling data 31 setting	00000000h	00000000h to 003F14FFh	Same as the sampling data 1 setting.
004F	Sampling data 32 setting	00000000h	00000000h to 003F14FFh	Same as the sampling data 1 setting.
0050 ⋮ 006F	For manufacturer setting	00000000h	—	—

Sampling setting No.	Name	Initial value	Setting range	Description
0070	Sampling bit information 1 setting[*1]	00000000h	00000000h to 0F3F03FFh	■■■□□□□ (Monitor No.) Set the monitor No. including the bit information to be sampled. • 0000h : Not selected • 0300h to 03FFh: operation information ■■□□■■■■ (Axis No.) Set the axis No. of sampling bit 1. • 00h to 3Fh: Axis No.1 to 64 <Example> 00h • Axis No.1 ■□■■■■■ (Bit No.) Set the bit No. of the sampling bit information 1. • 0h to Fh: Bit No.0 to F
0071	Sampling bit information 2 setting	00000000h	00000000h to 0F3F03FFh	Same as the sampling bit information 1 setting.
0072	Sampling bit information 3 setting	00000000h	00000000h to 0F3F03FFh	Same as the sampling bit information 1 setting.
0073	Sampling bit information 4 setting	00000000h	00000000h to 0F3F03FFh	Same as the sampling bit information 1 setting.
0074	Sampling bit information 5 setting	00000000h	00000000h to 0F3F03FFh	Same as the sampling bit information 1 setting.
0075	Sampling bit information 6 setting	00000000h	00000000h to 0F3F03FFh	Same as the sampling bit information 1 setting.
0076	Sampling bit information 7 setting	00000000h	00000000h to 0F3F03FFh	Same as the sampling bit information 1 setting.
0077	Sampling bit information 8 setting	00000000h	00000000h to 0F3F03FFh	Same as the sampling bit information 1 setting.
0078	Sampling bit information 9 setting	00000000h	00000000h to 0F3F03FFh	Same as the sampling bit information 1 setting.
0079	Sampling bit information 10 setting	00000000h	00000000h to 0F3F03FFh	Same as the sampling bit information 1 setting.
007A	Sampling bit information 11 setting	00000000h	00000000h to 0F3F03FFh	Same as the sampling bit information 1 setting.
007B	Sampling bit information 12 setting	00000000h	00000000h to 0F3F03FFh	Same as the sampling bit information 1 setting.
007C	Sampling bit information 13 setting	00000000h	00000000h to 0F3F03FFh	Same as the sampling bit information 1 setting.
007D	Sampling bit information 14 setting	00000000h	00000000h to 0F3F03FFh	Same as the sampling bit information 1 setting.
007E	Sampling bit information 15 setting	00000000h	00000000h to 0F3F03FFh	Same as the sampling bit information 1 setting.
007F	Sampling bit information 16 setting	00000000h	00000000h to 0F3F03FFh	Same as the sampling bit information 1 setting.
0080	Sampling bit information 17 setting	00000000h	00000000h to 0F3F03FFh	Same as the sampling bit information 1 setting.
0081	Sampling bit information 18 setting	00000000h	00000000h to 0F3F03FFh	Same as the sampling bit information 1 setting.
0082	Sampling bit information 19 setting	00000000h	00000000h to 0F3F03FFh	Same as the sampling bit information 1 setting.
0083	Sampling bit information 20 setting	00000000h	00000000h to 0F3F03FFh	Same as the sampling bit information 1 setting.
0084	Sampling bit information 21 setting	00000000h	00000000h to 0F3F03FFh	Same as the sampling bit information 1 setting.
0085	Sampling bit information 22 setting	00000000h	00000000h to 0F3F03FFh	Same as the sampling bit information 1 setting.
0086	Sampling bit information 23 setting	00000000h	00000000h to 0F3F03FFh	Same as the sampling bit information 1 setting.
0087	Sampling bit information 24 setting	00000000h	00000000h to 0F3F03FFh	Same as the sampling bit information 1 setting.
0088	Sampling bit information 25 setting	00000000h	00000000h to 0F3F03FFh	Same as the sampling bit information 1 setting.

Sampling setting No.	Name	Initial value	Setting range	Description
0089	Sampling bit information 26 setting	00000000h	00000000h to 0F3F03FFh	Same as the sampling bit information 1 setting.
008A	Sampling bit information 27 setting	00000000h	00000000h to 0F3F03FFh	Same as the sampling bit information 1 setting.
008B	Sampling bit information 28 setting	00000000h	00000000h to 0F3F03FFh	Same as the sampling bit information 1 setting.
008C	Sampling bit information 29 setting	00000000h	00000000h to 0F3F03FFh	Same as the sampling bit information 1 setting.
008D	Sampling bit information 30 setting	00000000h	00000000h to 0F3F03FFh	Same as the sampling bit information 1 setting.
008E	Sampling bit information 31 setting	00000000h	00000000h to 0F3F03FFh	Same as the sampling bit information 1 setting.
008F	Sampling bit information 32 setting	00000000h	00000000h to 0F3F03FFh	Same as the sampling bit information 1 setting.
0090 ⋮ 012F	For manufacturer setting	00000000h	—	—

*1 For the bits which are able to be sampled and their settings (monitor No. and bit No.), refer to the following.

Number of sampled points

By setting "Sampling points (sampling setting No.0002)", points to be sampled can be changed. Number of data which is sampled before the trigger conditions are met (set with "pre-trigger" of "Sampling option (sampling setting No.0001)") is specified by the percentage to the number of sampled points.

When sampling of the points set in "Sampling points (sampling setting No.0002)" is completed, sampling itself is completed automatically.

Sampling items

The sampling items are the sampling data and the sampling bit information. By setting the axis No. and the monitor No. to be sampled in the sampling data, the arbitrary monitor data can be sampled. Up to 32 items of monitor data can be specified. The bit information in the following table can be sampled as the sampling bit information.

Sampling bit information		Address (hexadecimal)[1]
Axis data (high speed)	Command bit	00001000 to 0000100F
	Status bit	00006000 to 0000600F
Axis data (low speed)	Command bit	0000B000 to 0000B01F
	Status bit	00011000 to 0001101F

[1] The addresses in the table are the addresses for the first axis. For the second axis and after, add the following value for each axis.
Axis data (high speed) (command bit): +10h
Axis data (high speed) (status bit): +10h
Axis data (low speed) (command bit): +C0h
Axis data (low speed) (status bit): +C0h

Up to 32 items of bit information can be specified.

Examples of the sampling items are shown below.

Point

Depending on the timing when the value is set to the output device, there are cases that 1 cycle lag occurs between the sampled output device value and the value to be sent to the device station.

For operation information

The current command position (monitor No.00001300H), the current feedback position (monitor No.00001302H), the moving speed (monitor No.00001304H) etc. can be set as the sampling items. For details, refer to the following.

For axis bit information

The operation processing signal (OP), the completion of operation completed signal (OPF), the drive unit alarm signal (SALM) etc. can be set as the sampling items. For details, refer to the following.

Sampling trigger

As a trigger for start of the sampling, up to 8 conditions can be set. The case when one of the trigger conditions is met or when all of the trigger conditions are met can be set as a trigger. The data or the bit information trigger refers to are selected from set sampling items. There are 4 types of trigger conditions for each of the contents the trigger refers to.

When the trigger content is data

■Fulfilled when passing through trigger value in increase direction

When the data increases from lower than the trigger value to the trigger value or higher, the trigger condition is met.

<Example 1>   <Example 2>
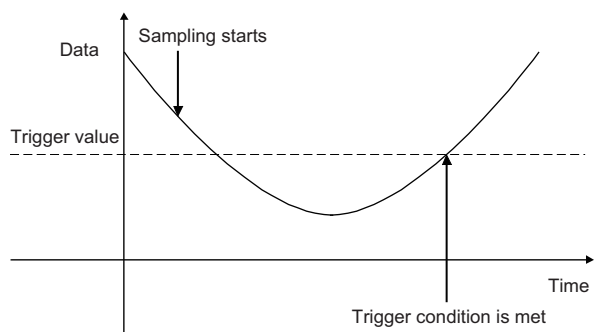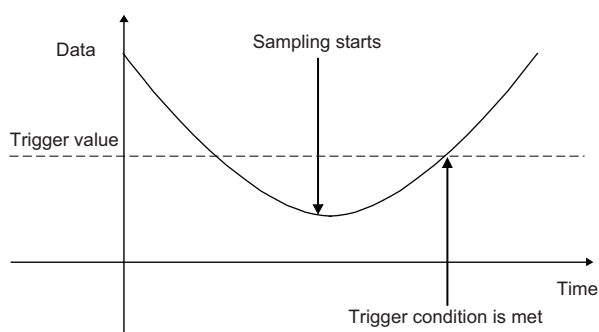
■Fulfilled when passing through trigger value in decrease direction

When the data decreases from higher than the trigger value to the trigger value or lower, the trigger condition is met.

<Example 1>   <Example 2>
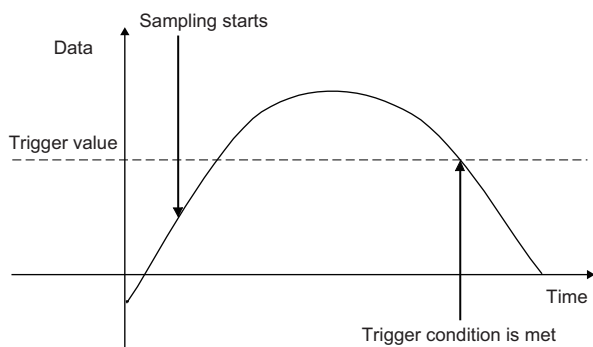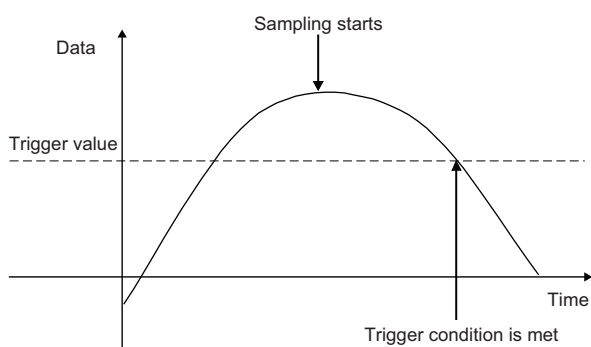
■Fulfilled when the data is same as trigger value or higher

When the data is same as the trigger value or higher, the trigger condition is met.

<Example 1>   <Example 2>
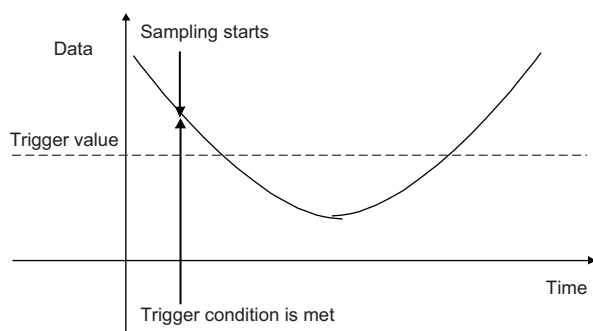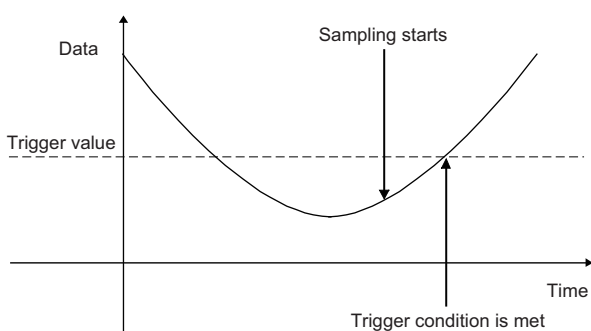
■Fulfilled when the data is same as trigger value or lower

When the data is same as the trigger value or lower, the trigger condition is met.

<Example 1>

<Example 2>
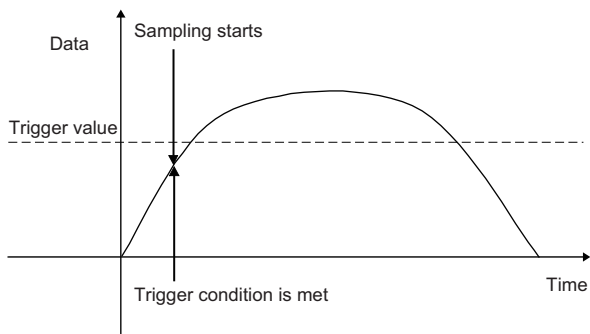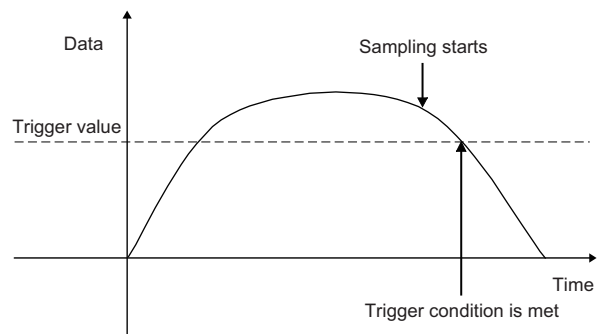
When the trigger content is bit information

■Fulfilled by rise of bit

When the bit turns ON from OFF, the trigger condition is met.

<Example 1>

<Example 2>
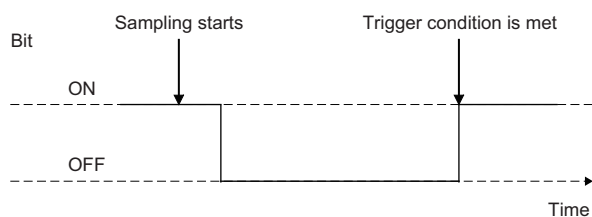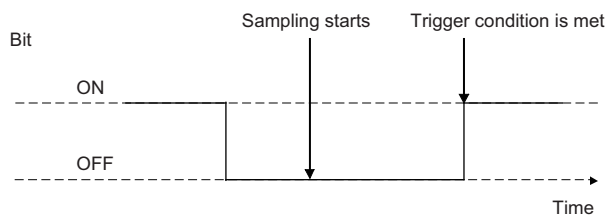
■Fulfilled by trailing edge of bit

When the bit turns OFF from ON, the trigger condition is met.

<Example 1>

<Example 2>
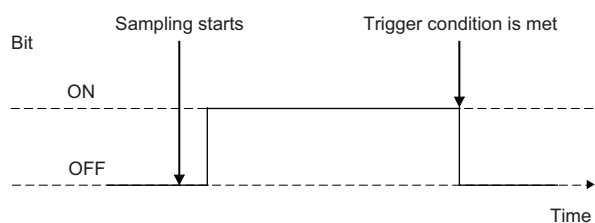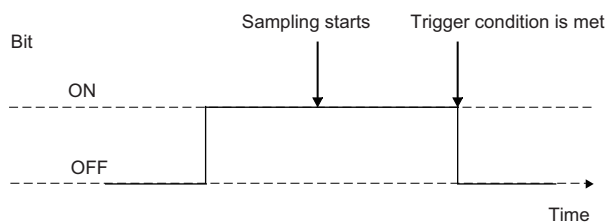
■Fulfilled while bit is on

While the bit is ON, the trigger condition is met.

<Example 1>

<Example 2>
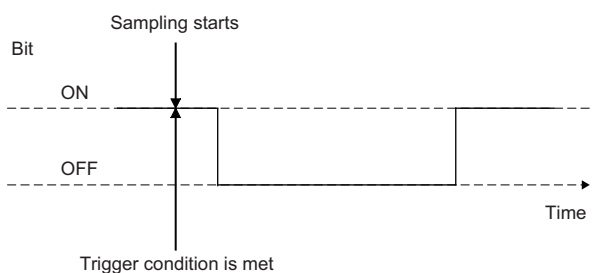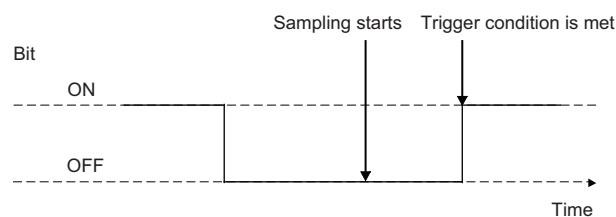
■Fulfilled while bit is OFF

While the bit is OFF, the trigger condition is met.

<Example 1>

<Example 2>
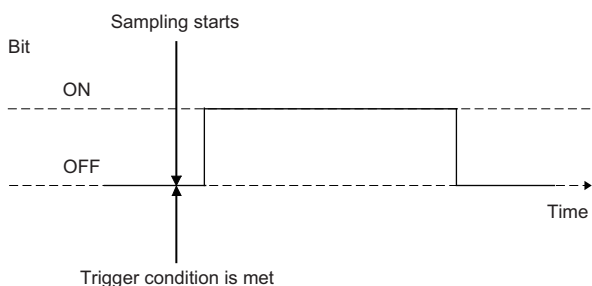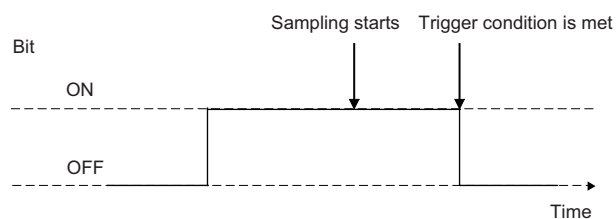
Sampling data read

The sampled data of 65536 points is stored in the sampling data buffer area of the Motion control board internal memory. The sampled data is transferred to the sampling data read area divided in units of a page (128 points/page). For the sampling data read during the sampling, refer to the following.

Sampling data read area

Offset	
+0000h	Epoch time(s)
+0008h	Epoch time(ns)
+000Ch	UTC offset(min)
+000Eh	Summer-time offset(min)
+0010h	Sampling data 1
+0018h	Sampling data 2
+0020h	Sampling data 3
+0028h	Sampling data 4
+0030h	Sampling data 5
+0038h	Sampling data 6
+0040h	Sampling data 7
+0048h	Sampling data 8
+0050h	Sampling data 9
+0058h	Sampling data 10
+0060h	Sampling data 11
+0068h	Sampling data 12
+0070h	Sampling data 13
+0078h	Sampling data 14
+0080h	Sampling data 15
+0088h	Sampling data 16
+0090h	Sampling data 17
+0098h	Sampling data 18
+00A0h	Sampling data 19
+00A8h	Sampling data 20
+00B0h	Sampling data 21
+00B8h	Sampling data 22
+00C0h	Sampling data 23
+00C8h	Sampling data 24
+00D0h	Sampling data 25
+00D8h	Sampling data 26
+00E0h	Sampling data 27
+00E8h	Sampling data 28
+00F0h	Sampling data 29
+00F8h	Sampling data 30
+0100h	Sampling data 31
+0108h	Sampling data 32
+0110h	Sampling bit information 1 to 32
+0114h	For manufacturer setting
+0118h	

Sampling read data details

Page No.	Page details
1	1st point to 128th point
2	129th point to 256th point
⋮	⋮
512	65409th point to 65536th point

Transferred on a per page basis

Sampling data read area

00069400h	1st point + (n - 1) × 128
00069518h	2nd point + (n - 1) × 128
00069630h	3rd point + (n - 1) × 128
⋮	⋮
00071DD0h	127th point + (n - 1) × 128
00071EE8h	128th point + (n - 1) × 128

n: page No.

A timing chart of reading of sampled data

To read the sampled data, set the page No. to be transferred to the sample read page No. When detecting the change of the sampling read page No., the Motion control board transfers the sampled data corresponding to the page No. to the sampling data read area and stores the points of data which are sampled in the page in the valid read sampled points.
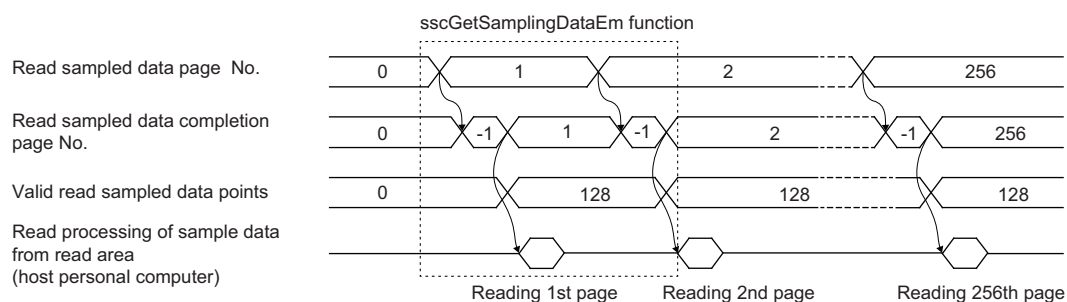
> **Point**
>
> - The read sampled data completion page No. is -1 (during sampling data transferring) while the data is being transferred to the sampling data read area.
> - When the sample read is executed in the following cases, read sampled data completion page No. is -2 (sampling read error) and sampled data is not read.
>   - When the sample read page No. is incorrect
>   - When the next page No. of the completed read sampled page No. is specified during sampling
> - When the page No. is changed from other than 0 to 0 during sampling, sampling is finished. (The sampling error signal (SMPE) turns ON.)
>   The read sampled data completion page No. becomes 0 and the sampling data read area is cleared to 0.
> - The change of sample read No. is invalid while the data is being transferred to the sampling data read area (transferring the page No. before changed is continued).
>   After completion of the sample read, the sampled data of changed page No. is started to be transferred.
> - When 0 is set to the sampling read page No., the sampling data read area is cleared to 0.
> - The Motion control board does not start transferring sampled data until the sampling read page No. is changed. When the same page No. is needed to be set, such as to update the contents of the sampling data read area, set the sampling read page No. to 0. After confirming the page No. is 0, specify the page No. to be transferred.

Timing chart for sampling function

A timing chart for the sampling function is shown below.

Starting sampling

To start the sampling, write the sampling setting previously and turn ON the sampling start signal (SMPS). When the sampling start signal (SMPS) is accepted, the waiting for sampling trigger signal (SMPW) turns ON. Then, after trigger conditions are met, the sampling is being performed signal (SMPO) turns ON.
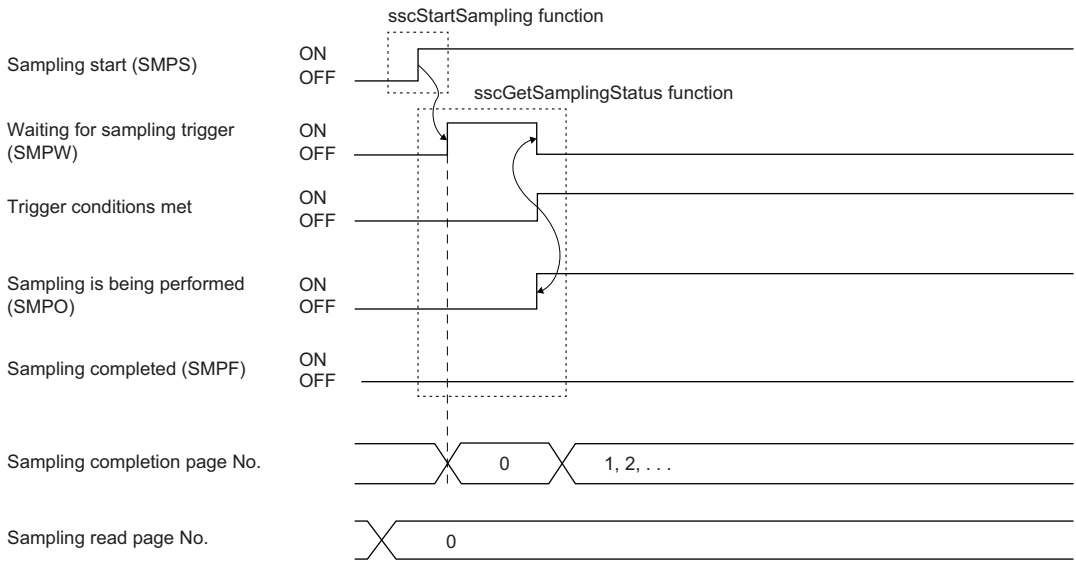
Point

- Turn ON the sampling start signal (SMPS) after setting 0 to the sampling read page No.
- In the following cases, the sampling error signal (SMPE: ON) occurs.
  - When the setting for the sampling option is outside of the setting range
  - When the setting for the sampling data is outside of the setting range
  - When the setting value for the sampling bit information is outside of the setting range
  - When four or more monitor Nos. for the drive unit information are designated for the same axis
  - When 0 is not set to the sampling read page No.
- When a monitor No. related to the drive unit information is designated for an axis for which communication with the drive unit has not been performed, such as it is not the control axis or a drive-unit-less axis, the data to be sampled is always 0 (for bit, OFF). (The sampling error signal (SMPE) and the sampling error information do not turn ON.)

Sampling completion

When the sampling of specified sampling points is completed, the sampling completed signal (SMPF) turns ON.

Sampling start (SMPS)	ON OFF	
		sscGetSamplingStatus function
Sampling is being performed (SMPO)	ON OFF	
Sampling completed (SMPF)	ON OFF	
Sampling completion page No.		510 511 512
Sampling read page No.		0
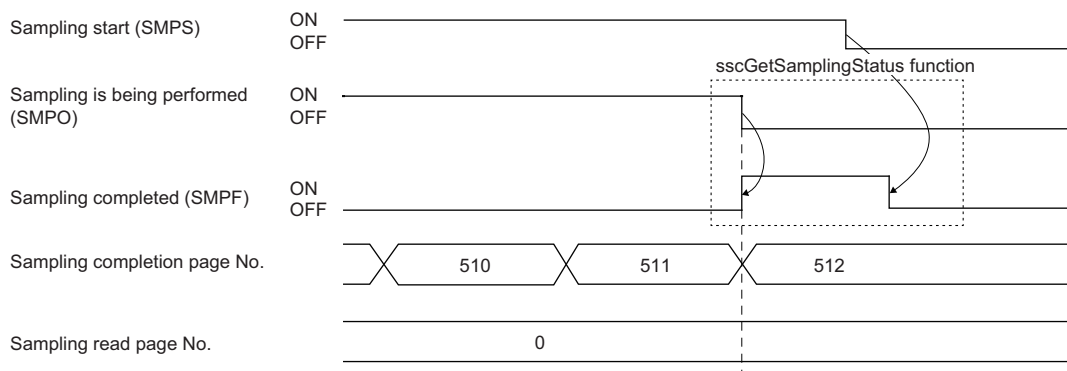
Point

In the timing chart above, since 65536 is the multiplication of 128, the valid sampled data (valid sampled read points) in the last page (page 512) are 1 to 128 points.

Sampling stopped prior to full completion

When the sampling start signal (SMPS) is turned OFF while the sampling is being performed signal (SMPO) is ON, the sampling is being performed signal (SMPO) turns OFF and the sampling finishes.

		sscStopSampling function
Sampling start (SMPS)	ON OFF	
		sscGetSamplingStatus function
Sampling is being performed (SMPO)	ON OFF	
Sampling completed (SMPF)	ON OFF	
Sampling completion page No.		3 4 5
Sampling read page No.		0
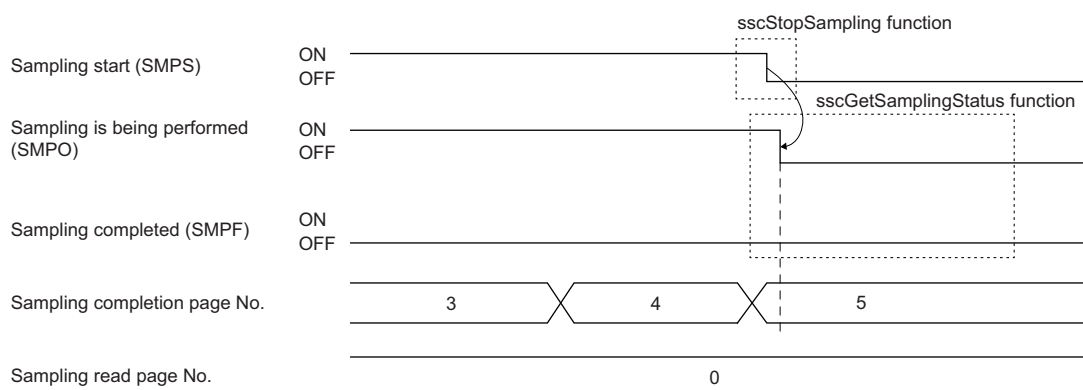
Point

- The sampling completed signal (SMPF) is not turned ON.
- In the timing chart above, the sampling stopped in the 5 page. For the valid sampled data in the page, confirm the valid sampled read points at the sampling read.
- The sampling data other than the valid read sampled points is read as "0" value.

When reading sampled data

After confirming the sampling is being performed signal (SMPO) is turned OFF, read the sampled data and the valid read sampled points from the page 1 to the page of the completed read sampled page No. The sampled data points in the page where the sampling read is completed is stored in the valid read sampled points.
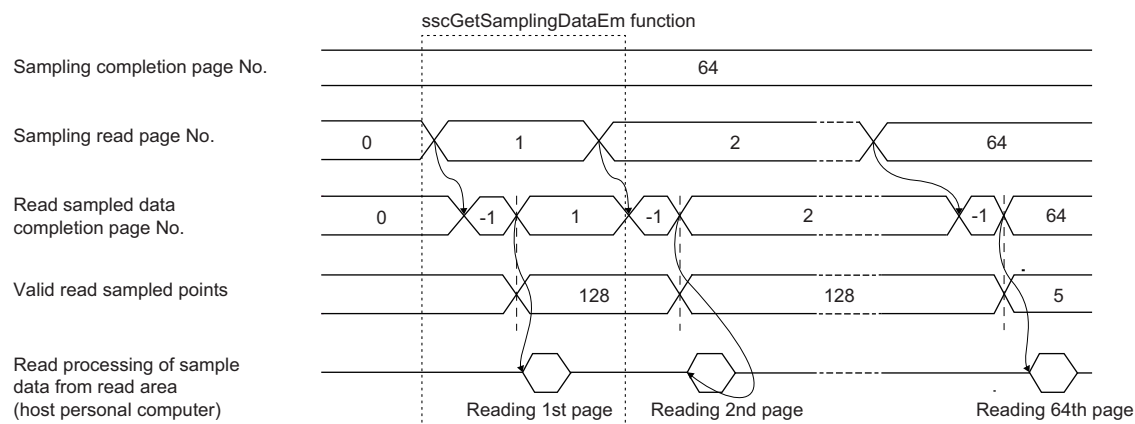
> **Point**
>
> • In the timing chart above, the data is stored in the page 1 to 64, and the sampled data in the page 64 is valid from 1 to 5 points.
> • The sampling data other than the valid read sampled points is read as "0" value.
> • In the following cases, the sampling read error (The read sampled data completion page No. is -2) occurs.
>   - When the setting for the sampling read page No. is outside of the setting range
>   - When the next page No. of the completed read sampled page No. is specified during the sampling

9.9 Operation Cycle Monitor Function

The operation cycle monitor function is a function that monitors the operation cycle current time, the operation cycle maximum time, and the operation cycle over time. The operation cycle monitor function becomes valid after the system starts.

Interface

The interfaces related to the operation cycle monitor function are shown below.

System information

Address (hexadecimal)	Name	Units	Description
000000C0	Operation cycle monitor: current cycle time	ns	Store the current cycle time.
000000C1			
000000C2			
000000C3			
000000C4	Operation cycle monitor: maximum cycle time	ns	Store the maximum cycle time.
000000C5			
000000C6			
000000C7			
000000C8	Operation cycle monitor: set cycle time	ns	Store the current set operation cycle.
000000C9			
000000CA			
000000CB			
000000CC	Operation cycle monitor: cycle over	—	Turn ON when the time of operation processing exceeds the operation cycle. • 0: OFF • 1: ON (cycle over occurred)
000000CD			
000000CE			
000000CF			

> **Point**
>
> When "Cycle Over (error code: 1C80H)" occurs, the motion operation cycle gets longer. Review the following contents.
> • Extend the operation cycle in the setting.
>   <Example> When the operation cycle is 1.0ms, change it to 2.0ms.
> • Reexamine the operation pattern so that each axis does not start the operation simultaneously.
> • Confirm the registered contents of the objects, and delete the entry of the unnecessary objects.

> **Point**
>
> [Motion API]
> • To get the operation cycle current time/operation cycle maximum time/operation cycle over time, use the sscGetOperationCycleMonitorEx function.
> • To get the setting cycle of the operation cycle monitor, use the sscGetControlCycle function.

9.10 Drive-unit-less Axis Function

The drive-unit-less axis function is a function that enables to operate the Motion control board without connecting a drive unit.
This function enables to debug the host personal computer at the start-up of the device and to simulate the positioning operation.
The specification when simulating without depending on the settings is equivalent to MR-J5(W)-G.

Point

This function is available to use without adding MR-J5(W)-G at the network configuration window of the network parameter. For details about the network configuration window, refer to "Network Configuration Settings" in the following manual.
📖 Motion Control Board User's Manual (Network)

Interface

To use the drive-unit-less axis function, set "Control axis" of "Control option 1 (parameter No.0200)" to "1: Controlled", and "Drive-unit-less" to "1: Valid".

Control parameters

Parameter No.	Symbol *1	Name	Initial value	Units	Setting range	Function	When in tandem drive
0200	*OPC	Control option 1	0000h	—	0000h to 1111h	■■■□ (Control axis) Set to "1: Controlled" for performing the drive unit control. • 0: Not controlled • 1: Controlled ■■□■ (Drive-unit-less axis function) Set "1: Valid" when not communicating with drive unit. When "1" is set with "Control axis", the Motion control board can be operated (simulated) without a drive unit. • 0: Invalid • 1: Valid	Same value

*1 The settings for the parameters with a * mark at the front of the symbol are validated when the system is started.

Control details

The operation details related to the drive-unit-less axis function are shown below.

Item	Operation
Drive unit	The specification of a supposedly connected drive unit is equivalent to MR-J5(W)-G.[*1] • Number of detector pulses per revolution [pulse]: 67108864 • Motor maximum revolution speed [r/min]: 6700 The specification of the servo motor and the encoder is equivalent to HK-KT13W. The specification of the operation mode is shown below. • Cyclic synchronous position mode (csp): supported • Cyclic synchronous velocity mode (csv): not supported • Cyclic synchronous torque mode (cst): not supported • Homing mode (hm): supported • Continuous operation to torque control mode (ct): supported • Cyclic synchronous pressure mode (cspr): supported The PDO mapping is the default mapping. Since there is a restriction on the feedback specification, refer to the description of each function in this table.
Home position return	The driver homing method is only compatible with the data set method (Set "37 (Homing on current position)" to "Homing method (Obj. 6098h)".
In-position signal (INP)	This signal turns ON when the current command position and the current feedback position are the same.
Drive unit alarm	No drive unit alarm occurs.
Drive unit information	Drive Unit Information (1) can use the following monitors. • Motor maximum revolution speed (monitor No.00001114H) • Number of encoder pulses per revolution (monitor No.00001116H) • Maximum output pulse rate (monitor No.00001122H)
High speed monitor	In the current feedback position, the current command position of 1 previous operation cycle is displayed. In the electrical current feedback, always 0 is displayed.
Torque limit	The torque limit effective signal (TLC) does not turn ON and the operation of the drive-unit-less axis is not affected.
Forced stop	Even when the forced stop (Quick stop) occurs, the positioning operation is continued. However, if a forced stop (other than Quick stop) occurs, stop the positioning operation according to "Emergency stop option (parameter No.02A0)".
External signal	To simulate an operation using a limit switch signal or dog signal (such as the home position return), set "4: Axis command bit input" to "Sensor input system" of "Sensor input options (parameter No.0219)" and control the sensor signal command (LSPC, LSNC, DOGC) with the host personal computer.
Absolute position detection system	The absolute position detection system cannot be used. It operates as the incremental system.[*2]
Continuous operation to torque control	After the continuous operation to torque control speed limit value is reached, the torque settle width is considered to have been reached, and the operation is completed after the press time passes.
Pressure control	The servo parameter "Selection of pressure increasing direction for positioning address (PW12.1)" operates as "0: Pressure increases as the positioning address decreases". The operations during the pressure control are as follows. <During mode switching (position to pressure)> • The position control is switched to the pressure control in 1 operation cycle. • "Mode switching (position to pressure) → Switching option 1 → Select switching delay" in the pressure control profile operates as "1: Switching delay disabled". <During feed/dwell> • The operation is performed with the speed limit value. • For the load cell pressure, the pressure command value before 1 operation cycle is displayed. The load cell pressure decreases by performing the pressure release. After performing feed/dwell, perform the pressure release. <During mode resetting> • The switching to the during mode switching (pressure to position) is performed in 1 operation cycle. <During mode switching (pressure to position)> • The pressure control is switched to the position control in 1 operation cycle. <During pressure release> • The load cell pressure is subtracted by 1 [Pressure units] every operation cycle. • The feedback position is added by 5 [Pressure units] every operation cycle. <During mode resetting (pressure release)> • The switching to the during mode switching (pressure to position) (pressure release) is performed in 1 operation cycle. • The load cell pressure is subtracted by 5 [Pressure units] every operation cycle. • The feedback position is added by 10 [Pressure units] every operation cycle. <During mode switching (pressure to position) (pressure release)> • The pressure control is switched to the position control in 1 operation cycle.
Device station object I/O	The device station object I/O function cannot be used against the drive-unit-less axis.
Driver command discard detection[*3]	The driver command discard detection function cannot be used against the drive-unit-less axis. (The operation is the same as when "Driver command discard detection" of "Control option 5 (parameter No.0212)" is set to "1: Detection invalid".)
User watchdog function[*3]	Even when the user watchdog error occurs, the positioning operation is continued.

*1   The servo amplifier operates as a servo amplifier compatible with a rotary servo motor. (It does not operate as a servo amplifier compatible with the fully closed, linear, and direct drive.)

*2   The home position return is required each time when turning on the power supply.

*3   This function is supported in the basic system software version "02" or later.

Point🔎

The operation of the current feedback position and the timing of the in-position signal (INP) are different from the case where the MR-J5(W)-G is connected. Confirm the final operation with a real machine.

9.11　File Control

The control data (such as a network parameter) which is created by the motion test tool is controlled on the file. By using the motion test tool and the Motion API, write or read the file on the Motion control board.

Item	User drive
Usage	• Network parameter • Device station parameter • General data
Drive identifier	/rom
Memory capacity[*1]	64Mbytes
File system	Equivalent to FAT16 (VFAT)[*2]
Format necessity before the first usage	Not necessary[*3]

*1　Total capacity including the file management area. The available capacity is smaller.
*2　Power off is protected. (The file system is not damaged even if the power is off during writing.)
*3　Formatting is completed prior to shipping.

File list

The following shows the list of files to be used in the Motion control board.

■rom

File name	Usage
NWParam.bin	Network parameter
NetworkParameterProject.LZM	Network parameter (project)
NWParamCommon.bin	Network parameter (CRC)
$MELPRJ$/CC_IE_TSN/SLAVExxxyyyzzz.NSP	Device station parameter

Interface

System information

Address (hexadecimal)	Name	Units	Description
0000007C	User drive information: capacity	Kbyte	Store the maximum capacity of the user drive.
0000007D			
0000007E			
0000007F			
00000080	User drive information: free space	Kbyte	Store the free space of the user drive.
00000081			
00000082			
00000083			
00000084	User drive information: mounted status	—	Store the mounted status of the user drive. • 0: Access disabled • 1: Access enabled
00000085			
00000086			
00000087			

Operation that can be executed

The file can be operated by the motion test tool and the Motion API.

Writing, reading, and deleting a file can be performed to the drive in the Motion control board.

> **Point**
>
> - Use a flash ROM as a user drive. The flash ROM can be rewritten up to 100,000 times. For the number of rewrite of the flash ROM so far can be confirmed with "Number of write accesses to flash ROM (monitor No.0000140CH)".
> - For the file security, refer to "Security" in the following manual.
>   📖 Motion Control Board User's Manual (Network)

> **Point**
>
> [Motion API]
> - To write the file, use the sscWriteFile function.
> - To read the file, use the sscReadFile function.
> - To delete the file, use the sscDeleteFile function.
> - To get the file list, use the sscGetFileListEx function.

Precautions

Processing of reading/writing files

- Reading/Writing time is changed depending on the file size and the system load state. Therefore, the system startup time may be longer.
- Writing time of the user drive may be longer if the free space of the drive decreases.
- The timeout error may occur during reading/writing files due to the communication failure with the motion test tool. In such a case, try the operation after a while.

Power OFF at the file operation (including software reboot)

- While the file operation excluding the data reading, if turning OFF the power (including the software reboot), the file contents are not guaranteed. To prevent the data damage, reboot the software, turn OFF the power of/reboot the host personal computer after the file operation is completed.
- Confirm the consistency of the file system at the Motion control board initialization. It may take time to confirm when there are many files in the drive.

Access to the different files from multiple request sources at the same time

- The access to the different files from multiple request sources at the same time is not available.

9.12 Time Control

The Motion control board performs the control by creating the operation cycle based on the time of the host personal computer. Also, the Motion control board performs the time synchronization with the device station.

The current time which is controlled by the Motion control board can be confirmed on the dual port memory.

Point

For the time settings of the host personal computer and the time synchronization with the device station, refer to "Time synchronization" in the following manual.

📖Motion Control Board User's Manual (Network)

Interface

System information

Address (hexadecimal)	Name	Units	Description
00000120	Epoch times (second)	s	Output the local time by the number of elapsed seconds since "00:00:00, January 1st 1970". Output the counted time by the Motion control board based on the time set by the host personal computer. For the epoch times (second), output the part of second [s] units of lapsed seconds. For the epoch times (ns), output the part that is smaller than second units of lapsed seconds (the units smaller than 1 second) with nanoseconds [ns] units.
00000121			
00000122			
00000123			
00000124			
00000125			
00000126			
00000127			
00000128	Epoch times (ns)	ns	
00000129			
0000012A			
0000012B			
0000012C	UTC offset	min	Output the UTC offset of the host personal computer. <Example> • (UTC + 09:00) Osaka, Sapporo, Tokyo: 540 • (UTC - 12:00) International date line west: -720
0000012D			
0000012E	Summertime offset	min	This is not supported by the Motion control board. Output "8000h" which means unsupported.
0000012F			

Point

The time which is output by the sampling function is the same as this specification.

9.13 Link-down Detection Function

The link-down detection function detects that the PCI Express bus connection between the Motion control board and the host personal computer is turned from during link-up to link-down, and rapidly stops the axis which is connected with the Motion control board. For the operation of the device station other than the axis, refer to "Connectable device to CC-Link IE TSN" in the following manual.

📖Motion Control Board User's Manual (Network)

> **Point**
> - The link-down detection function is supported in the basic system software version "03" or later.
> - After detecting link-down, the output/forced stop of "PCIe Bus Connection Error (system status code error: E310H)" is performed within 1 operation cycle.

Operation when detecting link-down

When the PCI Express bus connection is turned from during the PCI Express link-up to the PCI Express link-down, "PCIe Bus Connection Error (system status code error: E310H)" occurs and the Motion control board is in the state of the forced stop. When the connection condition of the PCI Express is turned to the PCIe bus disconnection, confirm the error with the motion test tool which is connected with Ethernet. Also, the connection condition of the PCI Express can be confirmed at the PCIe LED on the Motion control board. For details about the LED display, refer to the following.

☞ Page 25 NAME OF EACH SECTION

> **Point**
> [Motion API]
> To confirm the connection condition of the PCI Express bus, use the sscCheckPCIeBusConnection function.

Precautions

When the basic system software version is "02" or earlier, this function is invalid. Even when the PCI Express bus connection is turned from during link-up to link-down, the Motion control board does not become the state of the forced stop, and the operation does not stop.

9.14 Event History

The event history function is the function that saves the error information as the event history in the Motion control board. Even when turning OFF the Motion control board and rebooting the software, the history can be confirmed as it is saved as the event history. In addition, by using this function, the cause of the error which occurs in the equipment/device can be investigated.

Point

- The event history is supported in the basic system software version "03" or later.
- The event history is always valid.
- The event history can be cleared by the motion test tool. When clearing the event history, the event information which describes the completion of the clear is saved as the event history.
- The event history is always collected regardless of the operation status of the Motion control board. However, when the Motion control board is under the major error, the event history may not be collected.
- When saving the event history is failed, "Event History Error (error code: 1C85H)" occurs, and the update against the event history is stopped.
- Register the error code of the network as the system code.

Point

[Motion API]
- To get the event history, use the sscReadEventHistoryData function.
- To clear the event history, use the sscClearEventHistoryData function.

Precautions

- The event history performs the update periodically (5 seconds after saving the previous event history). When turning OFF the power of the Motion control board or rebooting the software before saving the event information as the event history, the event information which is not saved is erased.
- When events occur frequently, the event history storage area in the Motion control board might be full of event information which has not been collected. If a new event occurs in this state, the Motion control board discards the event information and saves the event information which indicates that the event information has been erased as the event history. In this case, the message "*HST.LOSS*" (The event information has been erased.) is displayed on the motion test tool.
- For the event which is recorded to the event history, the order of event occurrence may not match with the order of registration (the order of display). When displaying the event history by the motion test tool, the history can be confirmed in order of event occurrence by sorting the data in the occurrence date.
- The time when starting up the host personal computer/rebooting the software is the standard for the Motion control board. Therefore, the time and date of the event that occurred before completing to get the time may be different from the actual time and date.
- The Motion control board gets the time only once at starting up the host personal computer/rebooting the software, and does not adjust the time after that. Therefore, the time and date of the event may be different from the actual time and date.
- The occurrence date is not stored for the event history of the event which occurred about 10 seconds after the system preparation completion.
- When the events are occurring at multiple axes in 1 operation cycle, the occurrence date of the event is the same. However, the order of event occurrence is maintained. Also, when using the high speed operation mode, only the order of event which occurred in the same operation cycle is maintained.
- Read the event history while the axis is stopped. When reading the event history while the axis is in the operation, "Cycle Over (error code: 320CH)" may occur.
- When the drive unit warning and the drive unit alarm are occurring consequently at the drive unit, the drive unit alarm No. may be displayed on the event detail information of "Drive Unit Warning (error code: 0F17H)".

10 TANDEM DRIVE

The tandem drive is the function that 1 physically connected axis is driven by 2 motors. The Motion control board provides the same position command to the 2 axes set up for the tandem drive.

The tandem drive can be set up for a maximum of 8 sets (16 axes).

Point

> When using the tandem drive in the operation cycle 62.50µs, use the high speed operation mode.

10.1 Drive Modes

For the tandem drive, there are 2 drive modes; synchronous mode and non-synchronous micro adjustment mode. The types of the operation that can be performed for each mode are as follows.

○: Operation available, ×: Operation not available

Operation mode	Drive Modes	
	Synchronous mode	Non-synchronous micro adjustment mode
JOG operation	○	○
Incremental feed	○	○
Automatic operation	○	×
Interpolation operation	○	×
Home position return	○[1]	×
Home position reset	○	×

[1] For the Home position return operation, it is recommended to use "37 (Homing on current position)" of "Homing method (Obj. 6098h)". For details, refer to the following.
　☞ Page 442 Home position return during the tandem drive

Point

> When performing the start operation with the non-compatible mode during the non-synchronous micro adjustment mode, "While in Tandem Drive Nonsynchronous Mode (operation alarm No.0051H, detail No.0001H)" occurs.

Interface

System data (low speed) (system command bit/system status bit)

■System command bit

Address (hexadecimal)	Bit	Symbol	Signal name
00000842	0	ASYN1	Non-synchronous command (group 1)
	1	ASYN2	Non-synchronous command (group 2)
	2	ASYN3	Non-synchronous command (group 3)
	3	ASYN4	Non-synchronous command (group 4)
	4	ASYN5	Non-synchronous command (group 5)
	5	ASYN6	Non-synchronous command (group 6)
	6	ASYN7	Non-synchronous command (group 7)
	7	ASYN8	Non-synchronous command (group 8)

• Details concerning system command bit

Symbol[1]	Signal name	Function details	
		Function	Operation
ASYN□	Non-synchronous command (group □)	Change to the non-synchronous micro adjustment mode.	Turn ON the non-synchronous command (group □) signal (ASYN□) and change the drive mode of the group □ to the non-synchronous micro adjustment mode.

[1] □: Group No. (1 to 8)

■System status bit

Address (hexadecimal)	Bit	Symbol	Signal name
000008E2	0	ASYO1	In non-synchronous mode (group 1)
	1	ASYO2	In non-synchronous mode (group 2)
	2	ASYO3	In non-synchronous mode (group 3)
	3	ASYO4	In non-synchronous mode (group 4)
	4	ASYO5	In non-synchronous mode (group 5)
	5	ASYO6	In non-synchronous mode (group 6)
	6	ASYO7	In non-synchronous mode (group 7)
	7	ASYO8	In non-synchronous mode (group 8)

• Details concerning system status bit

Symbol[1]	Signal name	Function details		
		Function	Operation	
			Conditions for turning ON	Conditions for turning OFF
ASYO□	In non-synchronous mode (group □)	Notify that the drive mode of the group □ is the non-synchronous micro adjustment mode.	Turn ON the non-synchronous command (group □) signal (ASYN□).	Turn OFF the non-synchronous command (group □) signal (ASYN□).

[1] □: Group No. (1 to 8)

Control parameters

Parameter No.	Symbol	Name	Initial value	Units	Setting range	Description	When in tandem drive
0265	TOP	Tandem drive options	0000h	—	0000h to 0010h	■ ■ □ ■ (Synchronous alignment valid/invalid) Set the validity/invalidity of the synchronization for the turning servo ON. • 0: The synchronous alignment is valid • 1: The synchronous alignment is invalid	Master

Synchronous mode

Through providing the same position command to the master and slave axes, they move together. The position loop, the speed loop, and the current loop use a feedback signal of each axis for control.

Non-synchronous micro adjustment mode

The non-synchronous micro adjustment mode temporarily cancels synchronizing in order to adjust the position balance between the master axis and the slave axis. This enables submitting different position commands to each of the axes. This can only be done when using the incremental feed or the JOG operation.

When the home position return has been completed, even if the tandem drive mode is switched to the non-synchronous micro adjustment mode, the system is not switched to the non-home position return complete (the home position return request signal (ZREQ) is not ON). After the mode is switched to the synchronous mode, the automatic operation and the interpolation operation can be performed without the re-performing home position return.

Point

- If "Synchronous alignment valid/invalid" of "Tandem drive options (parameter No.0265)" is set to "0: Synchronous alignment is valid", the synchronization is not completed when the mode is switched to the non-synchronous micro adjustment mode. When the mode is switched to the synchronous mode again, turn the servo OFF and then ON, then perform the synchronization. When the automatic operation or the interpolation operation is performed with the synchronization incomplete, "Tandem Drive Synchronous Alignment Error (operation alarm No.0058H, detail No.0002H)" occurs.
- When "Synchronous alignment valid/invalid" of "Tandem drive options (parameter No.0265)" is set to "1: Synchronous alignment is invalid", the operation in the synchronization mode is performed based on the master axis holding deviation between the master axis and the slave axis at switching the mode to the synchronization mode.

Changing of drive mode

The changing of modes is performed using ON/OFF of the non-synchronous command signal (ASYN□: □ is the group No.).

The changing of mode can be performed on a group basis.

The changing of drive mode can only be performed when all of the following conditions are met.
- The smoothing stop signal (SMZ) is ON for both the master axis and the slave axis.
- The in-position signal (INP) is ON for both the master axis and the slave axis.
- No operation alarm has occurred for both the master axis and the slave axis.
- Neither the master axis nor the slave axis is operating.
- They are not being synchronized.

If even one of the conditions is not met, "Tandem Drive Mode Change Error (operation alarm No.0050H, detail No.0001H)" occurs.

Example when drive mode can be changed
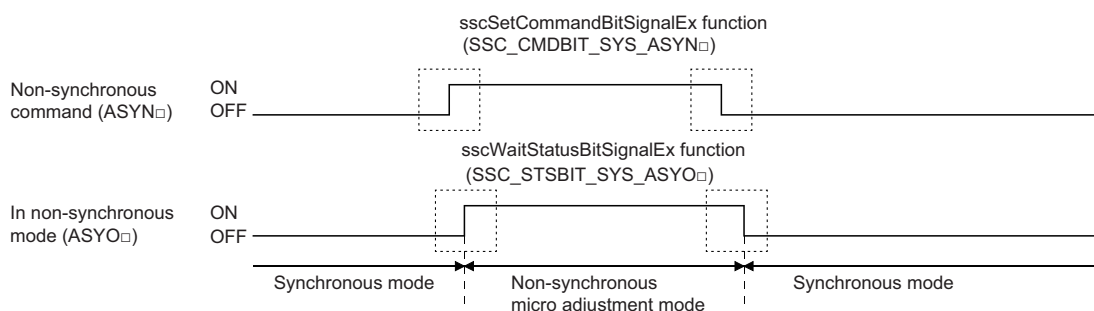
Example when drive mode cannot be changed (master axis is not during in-position)
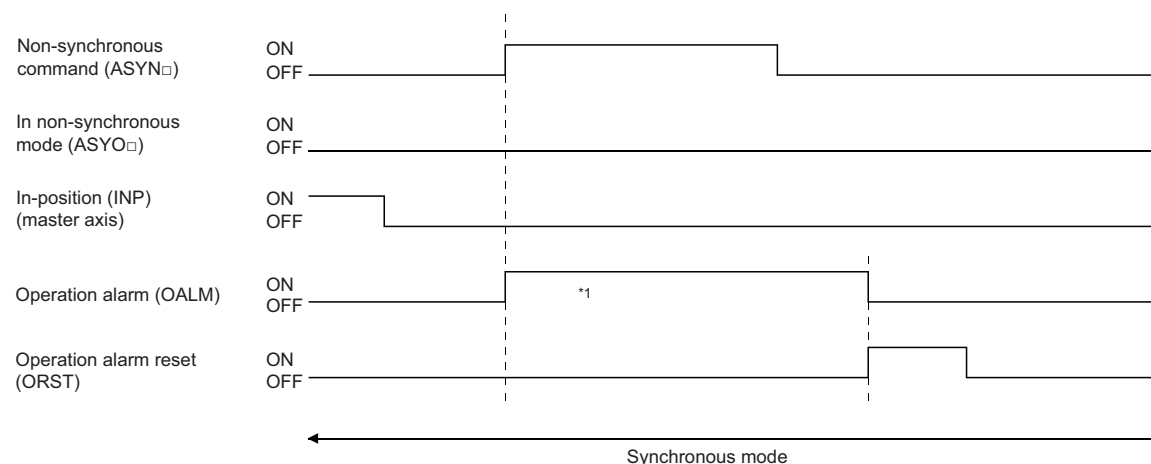
*1   When "Tandem Drive Mode Change Error (operation alarm No.0050H, detail No.0001H)" has been set, after returning the non-synchronous command signal (ASYN□) to its normal status, turn ON the operation alarm reset signal (ORST) to cancel the operation alarm.

When changing from the non-synchronous micro adjustment mode to the synchronous mode, of the axis data for the slave axis, only the data that is valid for the master axis ( ) is saved from the non-synchronous micro adjustment mode. The zero-initialization and the like is not performed.

10.2 Parameter Settings

Interface

Control parameters

Parameter No.	Symbol *1	Name	Initial value	Units	Setting range	Description	When in tandem drive
0264	*TGRP	Tandem drive group	0000h	—	0000h to 0008h	■ ■ ■ □ (Group No.) Set the tandem drive group. • 0: Invalid • 1 to 8: Group No.	Same value

*1 The settings for the parameters with a * mark at the front of the symbol are validated when the system is started.

Servo parameters (MR-J5W-G)

Set the servo parameters to the same values for the axes for which the tandem drive is performed. However, the travel direction selection (servo parameter No.PA14) can be different values depending on the mechanical specifications. For details about the servo parameters, refer to the following manual.

📖MR-J5-G/MR-J5W-G User's Manual (Parameters)

⚠️CAUTION

When connecting the axis which performs the tandem drive, set "1: Enabled only for homing mode" to "Limit switch enabled status selection" of the servo parameter. When setting "0: Limit switch always enabled" and the rapid stop due to the limit switch OFF occurs with the master axis and slave axis, the equipment may be under a load since there is a position difference.

Designation of tandem drive axes

Setting the group No. in "Tandem drive group (parameter No.0264)" defines the tandem drive axis.

The 2 axes that are set to the same group No. can be driven in parallel. The maximum number of groups that can be driven in parallel is 8 (groups 1 to 8). Of the 2 axes that are designated with the same tandem drive group No., the axis with the smaller axis No. is the master axis and the axis with the larger axis No. is the slave axis.

Operation cycle [µs]	Valid group No.
62.50	1 to 2
125.00	1 to 4
250.00	1 to 8
500.00	
1000.00	
2000.00	

Point💡

- For the following conditions, upon system startup, "Tandem Drive Axis Setting Error (operation alarm No.0052H, detail No.0002H)" occurs, and the tandem drive control cannot be performed.
  - If the complement axis is not set up.
  - If 3 or more axes are set up with the same group No.
  - If the group No. exceeds the valid group No.
- When "Operation mode setting" of "Operation mode setting (parameter No.0011)" is set to "1: High speed operation mode" and the axis of the different operation group is set to the tandem drive group, "Tandem Drive Axis Setting Error (operation alarm No.0052H, detail No.0004H)" occurs at the system startup and the tandem drive control cannot be performed. Review the parameter and start the system again.
- When changing "Operation group (parameter No.0410)" of the tandem drive group axis, change the 2 axes of the tandem drive group to be the same operation group.

Setting classifications of control parameters

The setting classifications of the control parameters when using the tandem drive can be selected from the following 3 selections: master, same value, each axis.

Setting classifications	Description
Master	Validate the master axis only. Share the value of the master axis in the master axis/slave axis. In this case, ignore the setting value of the slave axis.
Same value	Set the same value in the master axis/slave axis.
Each axis	Setting the master axis/slave axis individually is available.

10.3 Axis Data Classifications

The axis data for the tandem drive axes have 3 data type settings: "master", "each axis", and "special".

Setting	Description
Master	Data only valid for the master axis
Axes separate	Individual data for the master axis/slave axis
Special	Data which is valid when both the master axis/slave axis are set

Point

- For the axis data classifications for the tandem drive axes, refer to the following.
  ☞ Page 472 Axis Data (High Speed)
  ☞ Page 488 Axis Data (Low Speed)
  In the above table, the data only valid for the master axis is designated as "master", the individual data for the master axis/slave axis is designated as "Each axis", and the data which is valid when both the master axis/slave axis are set is designated as "special".
- It is possible to review the monitor data for each axis individually.
- For details about "special", refer to the following.
  ☞ Page 444 Servo ON and Servo OFF During Tandem Drive Axis Operation

Data only valid for the master axis

The data only valid for the master axis is command/status data. The following shows the contents of the command/status data.

Command data/status data	Data	
Command data	Axis data (high speed)	Command data
		Command bit
	Axis data (low speed)	Command data
		Command bit
Status data	Axis data (high speed)	Status data
		Status bit
	Axis data (low speed)	Status data
		Status bit

■Command data

When the drive mode is the synchronous mode, only the command data from the master axis is valid. For this case, the command data for the slave axis is ignored. If the drive mode is the non-synchronous micro adjustment mode, each axis becomes valid.

■Status data

When the drive mode is the synchronous mode, only the status data from the master axis is valid. For this case, the status data for the slave axis is optional. If the drive mode is the non-synchronous micro adjustment mode, each axis becomes valid.

Individual data for master axis/slave axis

The data that is valid for each axis independent of the drive mode.

Data which is valid when both master axis and slave axis are set

When the drive mode is the synchronous mode, by setting the command data of the both axes of master/slave, the data is valid.

If the drive mode is the non-synchronous micro adjustment mode, each axis becomes valid.

10.4 Tandem Drive Axis Operation

JOG operation during the tandem drive

Synchronous mode

When the JOG operation is performed while in the synchronous mode, the master axis data and the signals are used. An example is shown below.
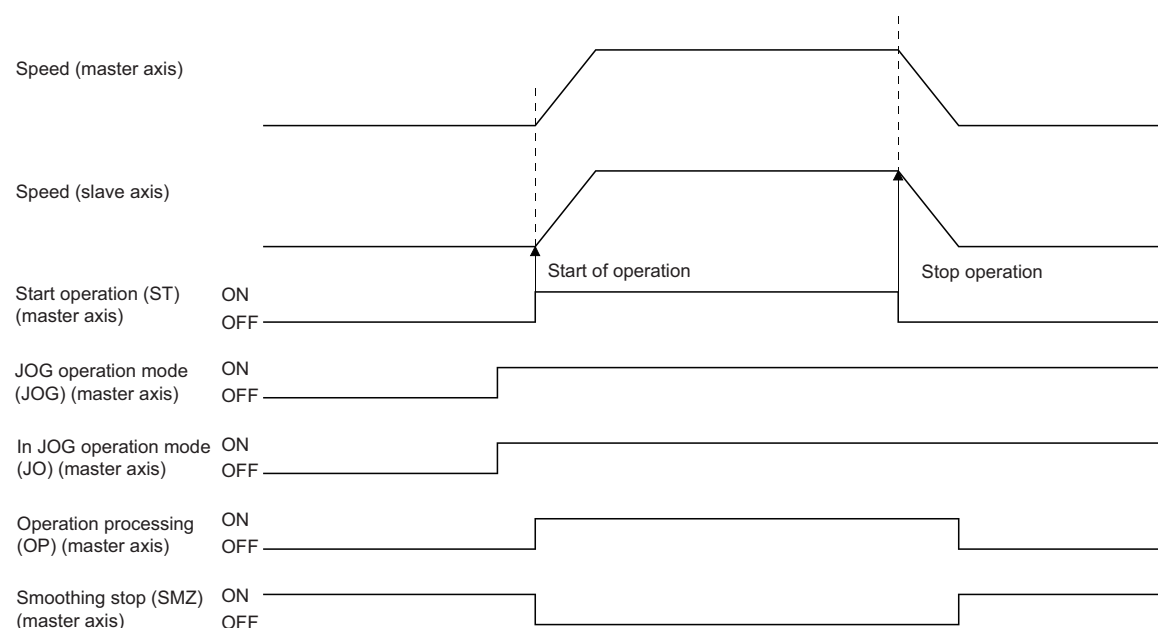
The important data classifications related to the JOG operation during the synchronous mode are shown in the following table.

For other related data, refer to the following.

Type		Items for which only item associated with master is valid	Items defined for each axis
Axis data (high speed)	Command bit	JOG operation mode signal (JOG) Movement direction signal (DIR) Start operation signal (ST)	None
	Command data	Manual feed speed Manual acceleration time constant Manual deceleration time constant	
	Status bit	In JOG operation mode signal (JO) Operation processing signal (OP) Smoothing stop signal (SMZ)	In-position signal (INP) Position switch signal (PSW)

The in-position signal (INP) is output for each axis separately; therefore, when the axes have come to a stop and the in-position signals (INP) are being used, confirm the in-position signal (INP) for both the master axis and the slave axis.

Non-synchronous micro adjustment mode

The operation is the same as for the normal axis operation. For details, refer to the following.

Incremental feed while using the tandem drive

Synchronous mode

When the incremental feed operation is performed while in the synchronous mode, the master axis data and the signals are used. An example is shown below.
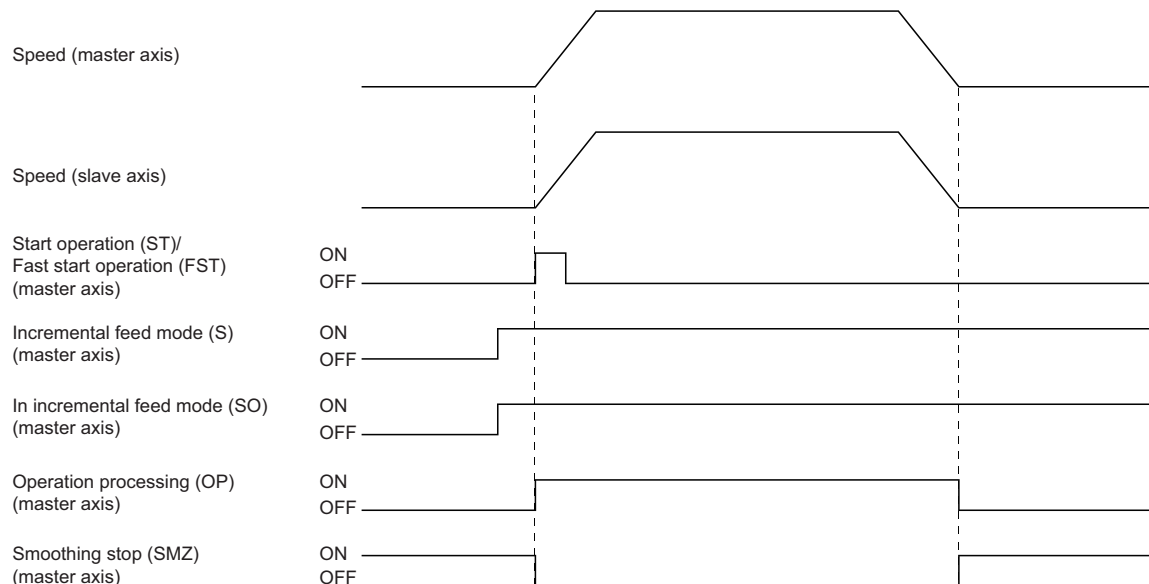
The important data classifications related to the incremental feed operation during the synchronous mode are shown in the following table. For other related data, refer to the following.

Type		Items for which only item associated with master is valid	Items defined for each axis
Axis data (high speed)	Command bit	Incremental feed mode signal (S) Movement direction signal (DIR) Start operation signal (ST) Fast start operation signal (FST)	None
	Command data	Manual feed speed Manual acceleration time constant Manual deceleration time constant Incremental feed movement amount	
	Status bit	In incremental feed mode signal (SO) Operation processing signal (OP) Smoothing stop signal (SMZ)	In-position signal (INP) Position switch signal (PSW)

The in-position signal (INP) is output for each axis separately; therefore, when the axes have come to a stop and the in-position signals (INP) are being used, confirm the in-position signal (INP) for both the master axis and the slave axis.

Non-synchronous micro adjustment mode

The operation is the same as for the normal axis operation. For details, refer to the following.

Automatic operation during tandem drive

Synchronous mode

When the automatic operation is entered while in the synchronous mode, the master axis data and the signals are used. Also, the master axis table is used for the point table. An example is shown below.
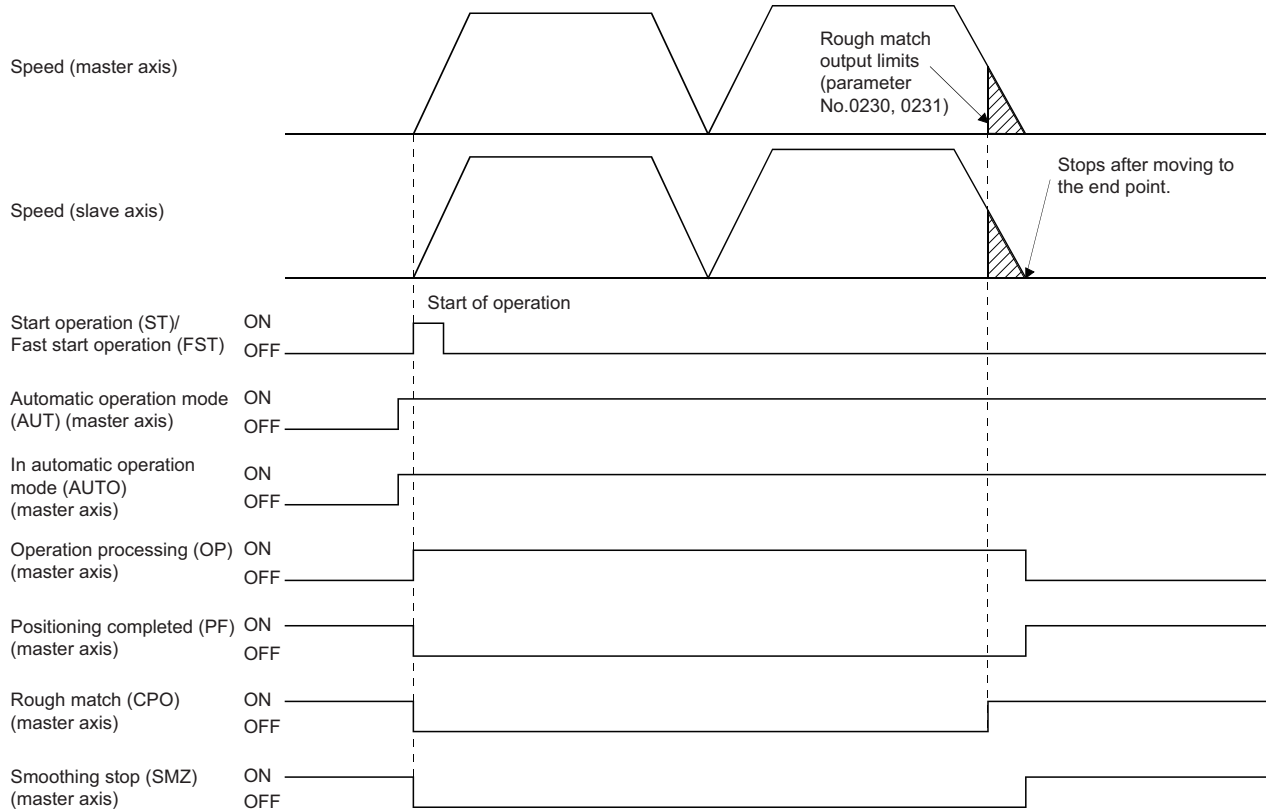
The important data classifications related to the automatic operation during the synchronous mode are shown in the following table. For other related data, refer to the following.

☞ Page 472 Axis Data (High Speed)
☞ Page 488 Axis Data (Low Speed)

Type		Items for which only item associated with master is valid	Items defined for each axis
Axis data (high speed)	Command bit	Automatic operation mode signal (AUT) Start operation signal (ST) Fast start operation signal (FST)	None
	Command data	Start point No. End point No.	
	Status bit	In automatic operation mode signal (AUTO) Operation processing signal (OP) Smoothing stop signal (SMZ) Positioning completed signal (PF) Rough match signal (CPO)	In-position signal (INP) Position switch signal (PSW)

The in-position signal (INP) is output for each axis separately; therefore, when the axes have come to a stop and in-position signals (INP) are being used, check the in-position signal (INP) for both the master axis and the slave axis.

Non-synchronous micro adjustment mode

The automatic operation cannot be entered while in the non-synchronous micro adjustment mode. "While in Tandem Drive Nonsynchronous Mode (operation alarm No.0051H, detail No.0001H)" occurs upon the start of the operation.

Interpolation operation during the tandem drive

When performing the interpolation operation, it is necessary to group the axes for which the interpolation is to be set up. The groups are set up using "Interpolation group (parameter No.0260)" and the master axis is the only one set up when in the tandem drive axis operation. For other types of operation, the normal axis operation is followed. For details, refer to the following.

☞ Page 104 Interpolation Operation

> **Point**
>
> When performing the interpolation operation, limit the total number of axes for 1 tandem drive group to be within 4 axes, including the slave axes. If the total number of axes exceeds 4, "Interpolation Start Up Error (operation alarm No.0040H, detail No.0002H)" occurs upon the start of the operation.

The following is a set up example of "Interpolation group (parameter No.0260)" and "Tandem drive group (parameter No.0264)".

Ex.
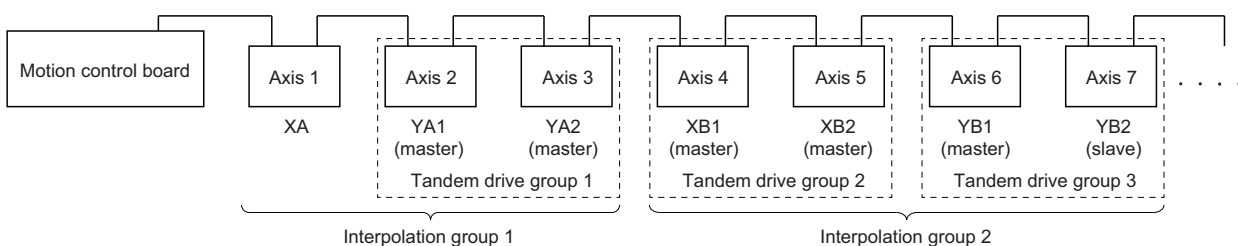
Axis No.	Axis name	Interpolation group (parameter No.0260)	Tandem drive group (parameter No.0264)
1	XA	1	0
2	YA1	1	1
3	YA2	0[*1]	1
4	XB1	2	2
5	XB2	0[*1]	2
6	YB1	2	3
7	YB2	0[*1]	3

*1 The group No. of the slave axis is set to the same number of the master axis independent of its setting.

Synchronous mode

When the interpolation operation is entered while in the synchronous mode, the master axis data and the signals are used. Also, the master axis is used for the point table.

The important data classifications related to interpolation operation during the synchronous mode are shown in the following table. For other related data, refer to the following.

☞ Page 472 Axis Data (High Speed)

☞ Page 488 Axis Data (Low Speed)

Type		Items for which only item associated with master is valid	Items defined for each axis
Axis data (high speed)	Command bit	Interpolation operation mode signal (LIP) Start operation signal (ST) Fast start operation signal (FST)	None
	Command data	Start point No. End point No.	
	Status bit	In interpolation operation mode signal (LIPO) Operation processing signal (OP) Smoothing stop signal (SMZ) Positioning completed signal (PF) Rough match signal (CPO)	In-position signal (INP) Position switch signal (PSW)

The in-position signal (INP) is output for each axis separately; therefore, when the axes have come to a stop and in-position signals (INP) are being used, confirm the in-position signal (INP) for both the master axis and the slave axis.

The following shows an example where the start operation is performed for the interpolation group 1 from the configuration example on the previous.
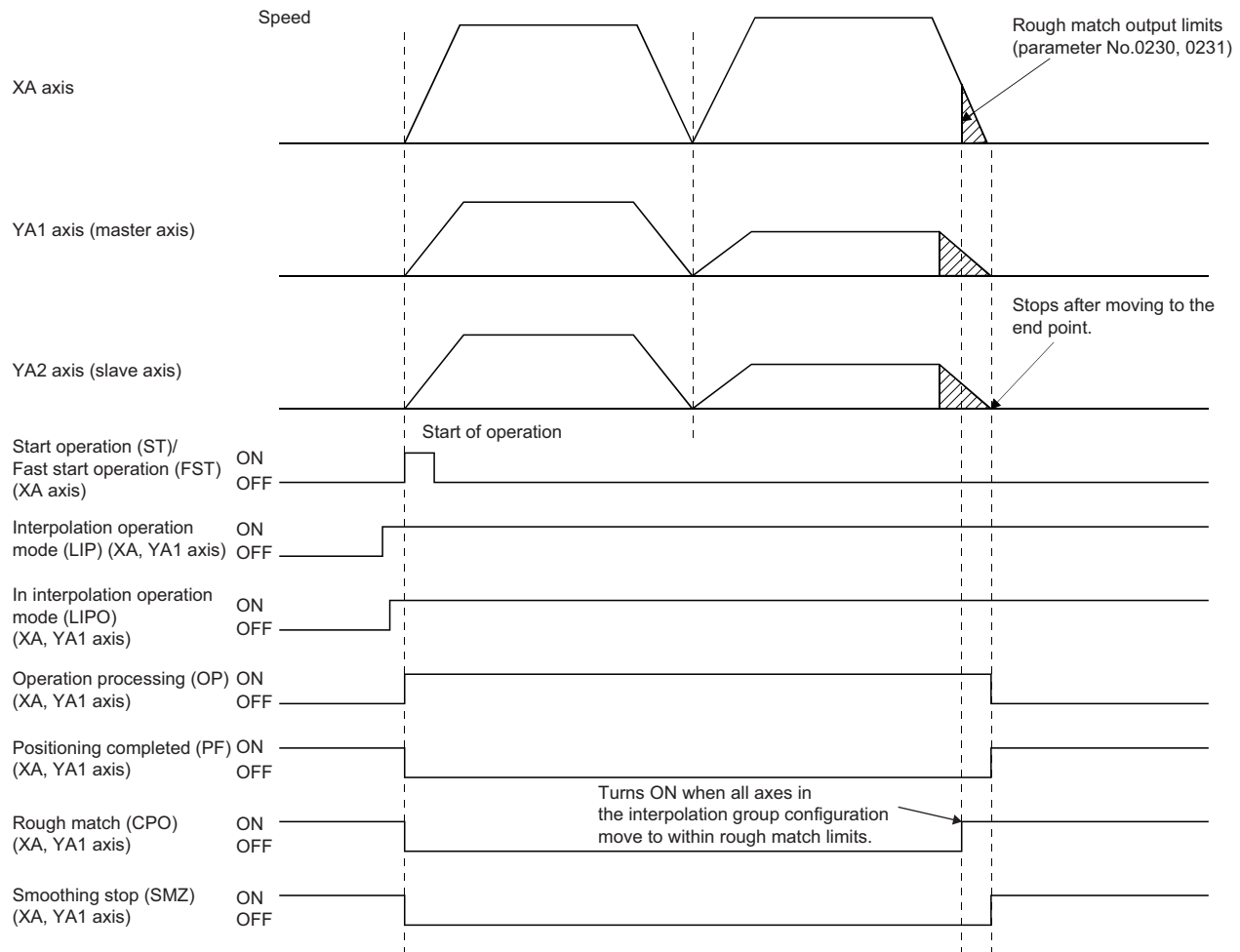
Point

For the interpolation operation, the XA axis and YA1 axis (master axis) are used for the interpolation operation. The YA2 axis (slave axis) moves synchronously with the master axis.

Non-synchronous micro adjustment mode

The interpolation operation cannot be entered while in the non-synchronous micro adjustment mode. "While in Tandem Drive Nonsynchronous Mode (operation alarm No.0051H, detail No.0001H)" occurs upon the start of the operation.

Home position return during the tandem drive

The method for returning to home position while using the tandem drive axes includes the driver method. This home position return methods are performed while in the synchronous mode.

> **Point**
>
> - For the driver homing method, returning to the home position is performed independently in each axis even in the synchronization mode. Therefore, the method for returning to the home position at the drive unit is recommended to use "-3 (the data set method return to home position)" of "Homing method (Obj. 6098h)") which sets the current command position as the home position. For the method for returning to the home position, set it by MR Configurator2 beforehand.
> - Returning to the home position is performed in each axis. Therefore, when setting the method other than the recommended returning to the home position to the method for returning to the home position at the drive unit, the structures of the equipment is under a load during the home position return, and the error such as overload may occur.
> - For the adjustment of the home position coordinates, use the JOG operation or the incremental feed.
> - If a non-compatible method is used to perform the home position return, "Tandem Drive Axis Setting Error (operation alarm No.0052H, detail No.0001H)" occurs when the home position return is started.
> - When in the non-synchronous micro adjustment mode, "While in Tandem Drive Nonsynchronous Mode (operation alarm No.0051H, detail No.0001H)" occurs when the home position return is started.
> - If the balance between the tandem drive axes is not good just after turning ON the power, it can cause stress to the equipment, therefore use the non-synchronous micro adjustment mode to adjust the balance and perform the home position return.
> - When the home position return is completed, "Home position coordinates (master axis parameter No.0246, 0247)" are set to the current command position for both the master axis and the slave axis.
> - When either the master axis or the slave axis is set to the drive-unit-less axis, "Tandem Drive Axis Setting Error (operation alarm No.0052H, detail No.0003H)" occurs, and the home position return does not perform.

When setting "-3 (data set method return to home position)" to "Homing method (Obj. 6098h)"

Ex.
When using the JOG operation for moving to the home position
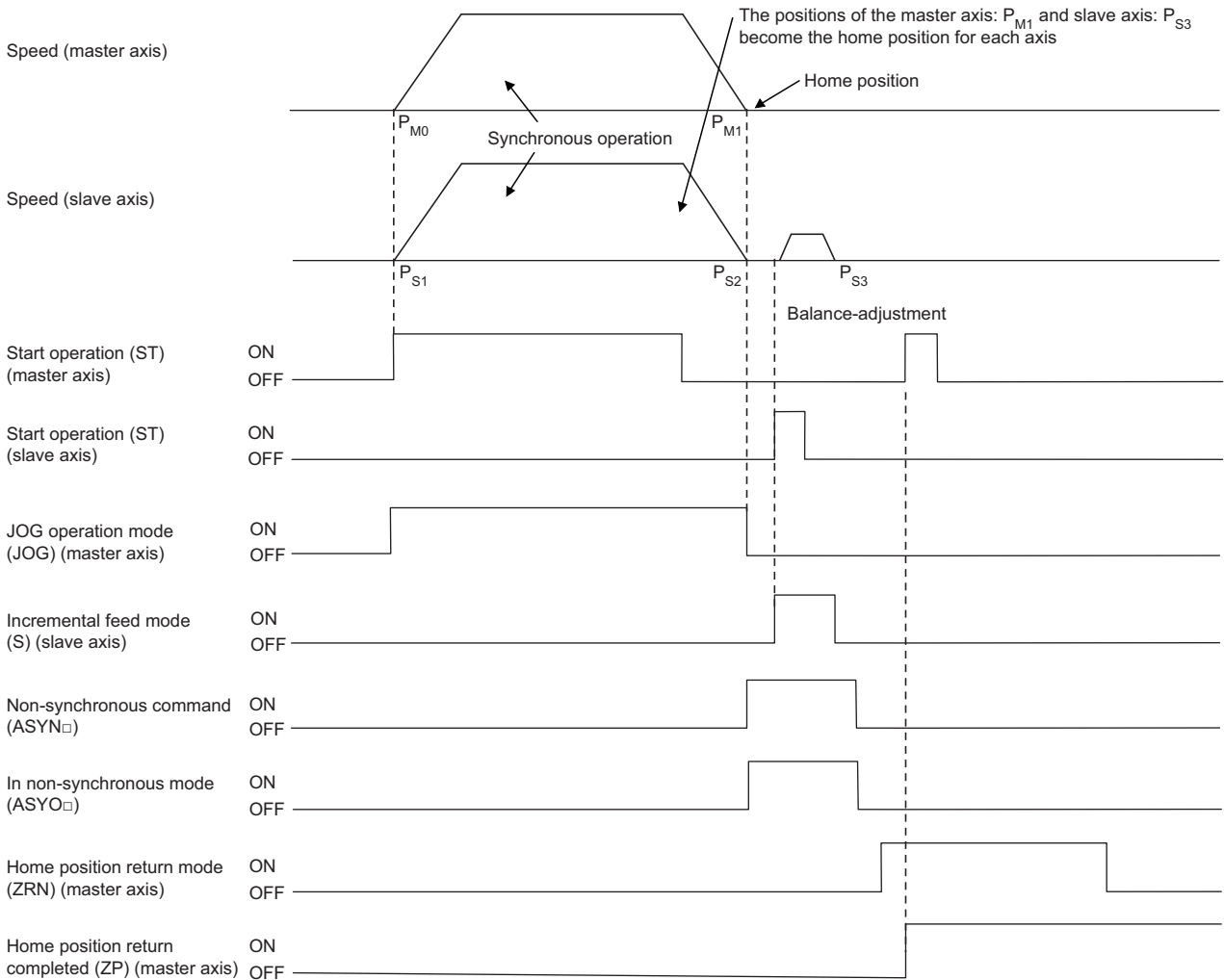
10.5 Servo ON and Servo OFF During Tandem Drive Axis Operation

Operation for each drive mode

Interface

■System data (low speed) (system status bit)

Address (hexadecimal)	Bit	Symbol	Signal name
000008E3	0	SYEO1	Synchronizing (group 1)
	1	SYEO2	Synchronizing (group 2)
	2	SYEO3	Synchronizing (group 3)
	3	SYEO4	Synchronizing (group 4)
	4	SYEO5	Synchronizing (group 5)
	5	SYEO6	Synchronizing (group 6)
	6	SYEO7	Synchronizing (group 7)
	7	SYEO8	Synchronizing (group 8)

• Details concerning system status bit

Symbol[1]	Signal name	Function details		
		Function	Operation	
			Conditions for turning ON	Conditions for turning OFF
SYEO□	Synchronizing (group □)	Notify that the group □ is performing the synchronization.	The servo on signal (SON) is turned ON when there is a misalignment between the master axis and the slave axis.	The synchronization is completed.

[1] □: Group No. (1 to 8)

Synchronous mode

When the master axis servo on signal (SON) and the slave axis servo on signal (SON) are turned ON, the both axes are turned ON. Also, when the servo on signal (SON) for either the master axis or the slave axis is turned OFF, both axes are turned servo OFF.
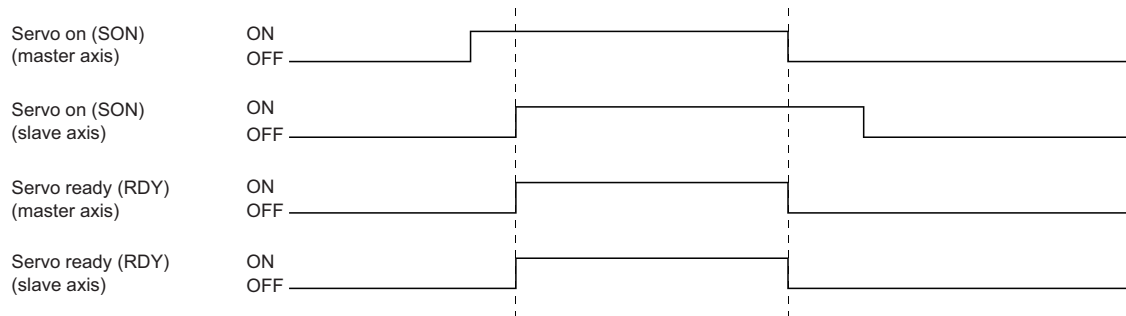
When an axis has moved while the servo OFF, the current command position is updated in accordance with the movement amount (current feedback position) both for the master axis and for the slave axis. When there is a misalignment between the master axis and the slave axis at the servo ON, the synchronous alignment is performed by aligning the command for the slave axis with the one for the master axis. During the synchronous alignment, the synchronizing signal (SYEO□: □ = group No.) turns ON. After confirming the synchronizing signal is OFF, perform the start operation.

However under the following conditions, "Tandem Drive Synchronous Alignment Error (operation alarm No.0058H, detail No.0001H)" occurs and the synchronization is canceled. Perform the home position return after resetting the operation alarm. When the automatic operation or the interpolation operation is performed with the synchronization incomplete, "Tandem Drive Synchronous Alignment Error (operation alarm No.0058H, detail No.0002H)" occurs.

- If the misalignment between the master axis command position and the slave axis command position exceeds "Tandem drive synchronous alignment valid width (parameter No.0266)", "Tandem Drive Synchronous Alignment Valid Width Error (operation alarm No.0054H, detail No.0001H)" occurs.
- If a stop command (STP, RSTP) is input while synchronizing, "Tandem Drive Synchronous Alignment Error (operation alarm No.0058H, detail No.0001H)" occurs.

- The Synchronization is validated after the home position return complete (after the home position is established). When the home position return request signal (ZREQ) is ON, the synchronization is not performed.
- Set the speed at the synchronization using "Tandem drive synchronous alignment speed (parameter No.0267)" and "Speed units multiplication factor (parameter No.020E, 020F)".
- When the start operation is performed during the synchronization, "Tandem Drive While Performing Synchronization (operation alarm No.0055H, detail No.0001H)" occurs.
- When the drive mode is toggled during the synchronization, "Tandem Drive Mode Change Error (operation alarm No.0050H, detail No.0001H)" occurs.
- If "Tandem Drive Synchronous Alignment Valid Width Error (operation alarm No.0054H, detail No.0001H)" or "Tandem Drive Synchronous Alignment Error (operation alarm No.0058H, detail No.0001H)" occurs within the absolute position detection system, the absolute value is lost. ("Absolute position data" of "Home position return option 2 (parameter No.0241)" becomes "0: Invalid" and the absolute position erased signal (ABSE) turns ON.)
- Implement a stop command on the master axis. Because the system is in the synchronous mode, inputting a stop command to the slave axis is invalid.
- If "Synchronous alignment valid/invalid" of "Tandem drive options (parameter No.0265)" is set to "1: Synchronous alignment is invalid", the synchronization for turning servo ON is not performed. The Motion control board operates with the deviation between the master axis and the slave axis held. The setting of this parameter becomes valid at the rise of servo ready signal (RDY).
  While the synchronization is invalid, the following operations may make a deviation between the master axis and the slave axis. As necessary, perform synchronization (micro-adjustment) with the host personal computer. In addition, confirm the deviation between the master axis and the slave axis is within an allowance.
  - At turning ON the servo after turning OFF the servo
  - At canceling a drive unit alarm after a drive unit alarm occurs
  - At resetting a forced stop after a forced stop occurs

While in non-synchronous micro adjustment mode

The servos can be turned ON and OFF separately. The operation is the same as for the normal axis operation. For details, refer to the following.

10.6 Tandem Drive Axis Limit Switch

If the limit switches on either the master axis or the slave axis is detected, an alarm occurs and both axes are stopped using the rapid stop time constant.

☞ Page 168 Limit Switch (Stroke End)

10.7 Tandem Drive Axis Software Limit

The software limits become valid after completing the home position return (the home position return request signal (ZREQ) is OFF). The software limits are confirmed for both the master axis and the slave axis. In this case, the software limit boundaries for the master axis become valid.

The following shows an example where the software limit is reached during the JOG operation when "Synchronous alignment valid/invalid" of "Tandem drive options (parameter No.0265)" is set to "1: Synchronous alignment is invalid", and there is a misalignment between the master axis and the slave axis at servo-on.
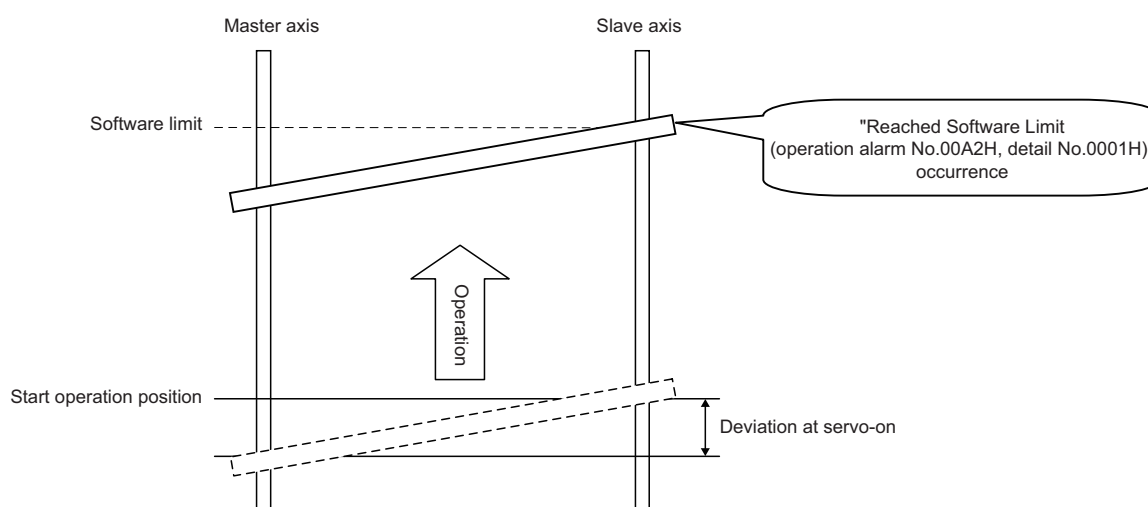
For other types of software limit occurrences, the normal axis operation is followed. For details, refer to the following.
☞ Page 169 Software Limit

10.8 Tandem Drive Axis Drive Unit Alarms

If a drive unit alarm/drive unit warning occurs on the master axis or the slave axis, dynamic braking and stoppage is implemented for the axis for which the drive unit alarm/drive unit warning did not occur as well. When the cause for an alarm on an axis is canceled such as through a drive unit alarm reset, the dynamic brake is canceled.

Drive unit warning is for the alarms which have "DB" or "SD" in the motor stop method. For details, refer to the following.
📖 MR-J5 User's Manual (Troubleshooting)

This operation does not exist in drive modes (synchronous mode/non-synchronous micro adjustment mode).

> **Point**
>
> The relationship between servo ON/OFF and dynamic brake ON/OFF is shown below.
> • Dynamic brake OFF
>   While the servo ON command is ON: The servo control is operating (Positioning can be controlled.)
>   While the servo ON command is OFF: The servo is coasting (Is easily turned using an external force.)
> • Dynamic brake ON
>   While the servo ON command is ON/OFF: Dynamic brake status (If an external force is placed to try and rotate axis, the dynamic brake resists the force.)

10.9 Deviation Monitoring Function

A function where if the deviation between the master axis and the slave axis exceeds "Tandem drive excessive deviation width (parameter No.0268)" during the synchronous mode while in the tandem drive axis mode, "Tandem Drive Excessive Deviation (operation alarm No.0053H, detail No.0001H)" occurs and both axes are stopped using a dynamic brake. When the setting for the excessive deviation width is set to "0", it becomes invalid.

Interface

Control parameters

Parameter No.	Symbol *1	Name	Initial value	Units	Setting range	Description	When in tandem drive
0268	*TEO	Tandem drive excessive deviation width	10000	Command unit	0 to 32767	Set the detection level for the excessive deviation alarm for deviation between the master axis and the slave axis. • 0: The check with the excessive deviation width is invalid.	Master

*1 The settings for the parameters with a * mark at the front of the symbol are validated when the system is started.

Necessary objects

Operation mode	Necessary objects	
	TPDO	RPDO
Deviation monitoring function	Following error actual value (Obj. 60F4h)	—

> **Point**
>
> If "Following error actual value (Obj. 60F4h)" is not set at the PDO mapping, "Slave Object Setting Error (operation alarm No.0080H, detail No.0008H)" occurs. When "Drive-unit-less axis function" of "Control option 1 (parameter No.0200)" is set to "1: Valid", the operation alarm does not occur.

10.10 Tandem Drive No Home Position

When using no home position function at the tandem drive axis, set "No home position" of "Control option 1 (parameter No.0200)" to "0: Invalid" for both the master axis and the slave axis. If "No home position" of "Control option 1 (parameter No.0200)" to "0: Invalid" for one side of the master axis or the slave axis, the no home position function operates as invalid.

⚠ CAUTION

In the structure where the master axis and the slave axis are connected, before using the no home position function, adjust the axes in order to get rid of the misalignment of the axis. Operation with a misalignment of the axis may cause the failure of the machine.

10.11 Tandem Drive Driver Command Discard Detection

When validating the driver command discard detection, the master axis and the slave axis are stopped abruptly in case of detecting the driver command discard detection at the master axis or the slave axis. For valid/invalid of the driver command discard detection, the parameter value of the master axis is prioritized.

The following shows an example where the driver command discard detection is detected at the slave axis.
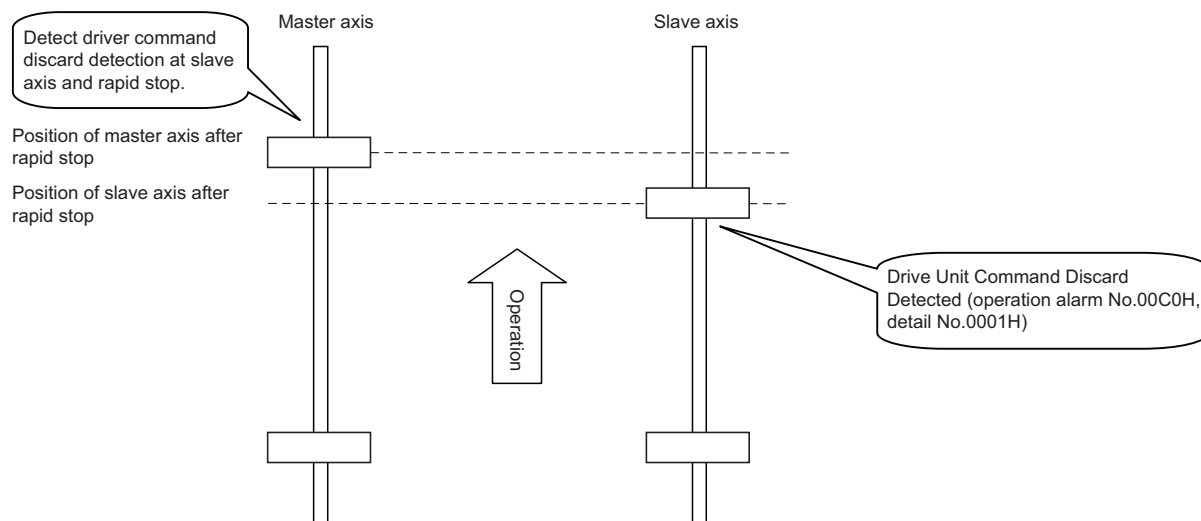
⚠ CAUTION

When connecting the axis which performs the tandem drive, set "1: Enabled only for homing mode" to "Limit switch enabled status selection" of the servo parameter. When setting "0: Limit switch always enabled" and the rapid stop due to the limit switch OFF occurs with the master axis and slave axis, the equipment may be under a load since there is a position difference.

Point

This function is supported in the basic system software version "02" or later.

Interface

Control parameters

Parameter No.	Symbol[*1]	Name	Initial value	Units	Setting range	Description	When in tandem drive
0212	*OPC5	Control option 5	0000h	—	0000h to 0001h	■■■☐ (Driver command discard detection) Set whether to detect or not to detect the drive unit command discard during the axis operation. • 0: Detection valid • 1: Detection invalid	Master

*1 The settings for the parameters with a * mark at the front of the symbol are validated when the system is started.

11 TABLE MAP

11.1 Table Map List

> **Point**
> • Do not write to manufacturer setting areas.
> • The start No. in the point table for each axis can be designated by using point No. offset.

• Dual port memory

Address (hexadecimal)	Table area content		Reference
00000000 ⋮	System information (1024bytes)		Page 452 System Information
00000400 ⋮	System configuration (1024bytes)		Page 455 System Configuration
00000800 ⋮	System data (high speed)	System command (32bytes)	Page 456 System command
00000820 ⋮		System status (32bytes)	Page 458 System status
00000840 ⋮	System data (low speed)	System command (160bytes)	Page 460 System command
000008E0 ⋮		System status (160bytes)	Page 465 System status
00000980	System information for Motion API (384bytes)		Page 471 System Information for Motion API
00000B00 ⋮	For manufacturer setting (1280bytes)		—
00001000 ⋮	Axis data (high speed)	Axis data command (20480bytes)	Page 472 Axis data command
00006000 ⋮		Axis data status (20480bytes)	Page 479 Axis data status
0000B000 ⋮	Axis data (low speed)	Axis data command (24576bytes)	Page 488 Axis data command
00011000 ⋮		Axis data status (24576bytes)	Page 494 Axis data status
00017000 ⋮	High speed monitor (4096bytes)		Page 500 High Speed Monitor
00018000 ⋮	Interpolation group No. being executed (128bytes)		Page 502 Interpolation Group No. Being Executed
00018080 ⋮	For manufacturer setting (3712bytes)		—
00018F00 ⋮	Point No. offset (256bytes)		Page 504 Point No. Offset
00019000 ⋮	Point table (196608bytes)		Page 506 Point Table
00049000 ⋮	For manufacturer setting (98304bytes)		—
00061000 ⋮	Outputting information with factor of interrupt (128bytes)		Page 508 Outputting with factor of interrupt
00061080 ⋮	Details on factor of system interrupt (128bytes)		Page 509 System interrupt factors
00061100 ⋮	Details on factor of axis interrupt (512bytes)		Page 510 Factor of axis interrupt
00061300 ⋮	Details on factor of other axes start interrupt (256bytes)		Page 513 Factor of other axes start interrupt
00061400 ⋮	Details on factor of pass position interrupt (512bytes)		Page 518 Factor of pass position interrupt

Address (hexadecimal)	Table area content		Reference
00061600 ⋮	For manufacturer setting (2560bytes)		—
00062000 ⋮	Other axes start (512bytes)		Page 528 Other Axes Start
00062200 ⋮	Other axes start data (16384bytes)		Page 532 Other Axes Start Data
00066200 ⋮	Conditions on pass position interrupt (2048bytes)		Page 537 Pass Position Interrupt Condition
00066A00 ⋮	Press control data (4096bytes)		Page 543 Press Control Data
00067A00 ⋮	For manufacturer setting (6496bytes)		—
00069360 ⋮	Sampling setting write	Command (16bytes)	Page 545 Sampling setting write (command)
00069370 ⋮		Status (16bytes)	Page 545 Sampling setting write (status)
00069380 ⋮	Sampling setting read	Command (16bytes)	Page 546 Sampling setting read (command)
00069390 ⋮		Status (16bytes)	Page 545 Sampling setting write (status)
000693A0 ⋮	Sampling error information (48bytes)		Page 547 Sampling Error Information
000693D0 ⋮	Sampling data read	Command (8bytes)	Page 548 Sampling data read (command)
000693D8 ⋮		Status (8bytes)	Page 548 Sampling data read (status)
000693E0 ⋮	For manufacturer setting (32bytes)		—
00069400 ⋮	Read Sampling data (143360bytes)		Page 549 Read Sampling Data
0008C400 ⋮	For manufacturer setting (1024bytes)		—
0008C800 ⋮	Exclusion control (16bytes)		Page 555 Exclusion Control
0008C810 ⋮	For manufacturer setting (240bytes)		—
0008C900 ⋮	Pressure control (246016bytes)		Page 556 Pressure Control
000C8A00 ⋮	For manufacturer setting (976384bytes)		—
001B7000 ⋮	User optional area (262144bytes)		—
001F7000 ⋮	Remote input (RX) (2048bytes)		Page 559 Input bit device (remote input (RX))
001F7800 ⋮	Remote output (RY) (2048bytes)		Page 561 Output bit device (remote output (RY))
001F8000 ⋮	Remote register (RWw) (16384bytes)		Page 562 Output word device (remote register (RWw))
001FC000 ⋮ 001FFFFF	Remote register (RWr) (16384bytes)		Page 563 Input word device (remote register (RWr))

11.2 System Information

Address (hexadecimal)	Content
00000000	Boot software version
00000001	
00000002	For manufacturer setting
00000003	
00000004	Network software version
00000005	
00000006	Base system software version
00000007	
00000008	For manufacturer setting
⋮	
00000017	
00000018	Addon version
00000019	
0000001A	
0000001B	
0000001C	
0000001D	
0000001E	
0000001F	
00000020	
00000021	
00000022	
00000023	
00000024	
00000025	
00000026	
00000027	
00000028	For manufacturer setting
⋮	
0000007B	
0000007C	User drive information: capacity
0000007D	
0000007E	
0000007F	
00000080	User drive information: free space
00000081	
00000082	
00000083	
00000084	User drive information: mounted status
00000085	
00000086	
00000087	
00000088	For manufacturer setting
⋮	
000000BF	
000000C0	Operation cycle monitor: current cycle time
000000C1	
000000C2	
000000C3	

Address (hexadecimal)	Content
000000C4	Operation cycle monitor: maximum cycle time
000000C5	
000000C6	
000000C7	
000000C8	Operation cycle monitor: set cycle time
000000C9	
000000CA	
000000CB	
000000CC	Operation cycle monitor: cycle over
000000CD	
000000CE	
000000CF	
000000D0	For manufacturer setting
⋮	
0000011F	
00000120	Epoch times (second)
00000121	
00000122	
00000123	
00000124	
00000125	
00000126	
00000127	
00000128	Epoch times (ns)
00000129	
0000012A	
0000012B	
0000012C	UTC offset
0000012D	
0000012E	Summertime offset
0000012F	
00000130	For manufacturer setting
⋮	
0000013F	
00000140	Operation cycle monitor for operation group: current cycle time on operation group 1
00000141	
00000142	
00000143	
00000144	Operation cycle monitor for operation group: maximum cycle time on operation group 1
00000145	
00000146	
00000147	
00000148	Operation cycle monitor for operation group: current cycle time on operation group 2
00000149	
0000014A	
0000014B	
0000014C	Operation cycle monitor for operation group: maximum cycle time on operation group 2
0000014D	
0000014E	
0000014F	

Address (hexadecimal)	Content
00000150	Operation cycle monitor for operation group: current cycle time on operation group 3
00000151	
00000152	
00000153	
00000154	Operation cycle monitor for operation group: maximum cycle time on operation group 3
00000155	
00000156	
00000157	
00000158	For manufacturer setting
⋮	
000003FB	
000003FC	Free-running counter
000003FD	
000003FE	
000003FF	

11.3 System Configuration

Address (hexadecimal)	Content
00000400	For manufacturer setting
00000401	
⋮	
00000407	
00000408	Controlling axis information 1
00000409	
0000040A	
0000040B	
0000040C	Controlling axis information 2
0000040D	
0000040E	
0000041F	
00000410	For manufacturer setting
⋮	
0000064F	
00000650	Axis information 1 for operation group 1
00000651	
00000652	
00000653	
00000654	
00000655	
00000656	
00000657	
00000658	For manufacturer setting
⋮	
0000065F	
00000660	Axis information 1 for operation group 2
00000661	
00000662	
00000663	
00000664	
00000665	
00000666	
00000667	
00000668	For manufacturer setting
⋮	
0000066F	
00000670	Axis information 1 for operation group 3
00000671	
00000672	
00000673	
00000674	
00000675	
00000676	
00000677	
00000678	For manufacturer setting
⋮	
000007FF	

11.4 System Data (High Speed)

System command

Address (hexadecimal)	Content
00000800	System command bit
00000801	
00000802	
00000803	
00000804	
00000805	
00000806	
00000807	
00000808	For manufacturer setting
⋮	
0000080B	
0000080C	Watchdog check counter
0000080D	
0000080E	Number of milliseconds for watchdog timer timeout
0000080F	
00000810	For manufacturer setting
⋮	
0000081F	

System command bit

For each bit, "0" stands for invalid and "1" stands for valid.

Address (hexadecimal)	Bit	Symbol	Signal name
00000800	0	ITE	Interrupt processing stop
	1	ITS	Interrupt output start
	2	—	For manufacturer setting
	3		
	4		
	5		
	6		
	7		

Address (hexadecimal)	Bit	Symbol	Signal name
00000801	0	SEMI	Software forced stop
	1	—	For manufacturer setting
	2		
	3		
	4		
	5		
	6		
	7		

Address (hexadecimal)	Bit	Symbol	Signal name
00000802	0	ITFE	Interrupt processing fast stop
	1	—	For manufacturer setting
	2		
	3		
	4		
	5		
	6		
	7		

Address (hexadecimal)	Bit	Symbol	Signal name
00000803 ⋮ 00000807	0	—	For manufacturer setting
	1		
	2		
	3		
	4		
	5		
	6		
	7		

System status

Address (hexadecimal)	Content
00000820	System status bit
00000821	
00000822	
00000823	
00000824	
00000825	
00000826	
00000827	
00000828	General input status
00000829	
0000082A	General output status
0000082B	
0000082C	Remaining time (watchdog timer)
0000082D	
0000082E	For manufacturer setting
0000082F	
00000830	System error code
00000831	
00000832	For manufacturer setting
⋮	
0000083F	

System status bit

For each bit, "0" stands for invalid and "1" stands for valid.

Address (hexadecimal)	Bit	Symbol	Signal name
00000820	0	ITO	Outputting factor of interrupt
	1	—	For manufacturer setting
	2		
	3	HRIF	Highly response I/F enabled
	4	—	For manufacturer setting
	5	MSIO	MSI enabled
	6	HSMO	High speed operation mode enabled
	7	—	For manufacturer setting

Address (hexadecimal)	Bit	Symbol	Signal name
00000821	0	EMIO	Being executed forced stop
	1	—	For manufacturer setting
	2		
	3	PPIAL	Batch judgment of passing position interrupt condition
	4	SEO	System error detected
	5	—	For manufacturer setting
	6	EMID	External forced stop disabled
	7	—	For manufacturer setting

Address (hexadecimal)	Bit	Symbol	Signal name
00000822 ⋮ 00000827	0	—	For manufacturer setting
	1		
	2		
	3		
	4		
	5		
	6		
	7		

11.5 System Data (Low Speed)

System command

Address (hexadecimal)	Content
00000840	System command bit
00000841	
00000842	
00000843	
00000844	
00000845	
00000846	
00000847	
00000848	
00000849	
0000084A	
0000084B	
0000084C	
0000084D	
0000084E	
0000084F	
00000850	
00000851	
00000852	
00000853	
00000854	
00000855	
00000856	
00000857	
00000858	
00000859	
0000085A	
0000085B	
0000085C	
0000085D	
0000085E	
0000085F	
00000860	System command code
00000861	
00000862	For manufacturer setting
⋮	
00000865	
00000866	Reboot ID
00000867	
00000868	For manufacturer setting
⋮	
0000086F	
00000870	Monitor No.1
00000871	
00000872	
00000873	

Address (hexadecimal)	Content
00000874	Monitor No.2
00000875	
00000876	
00000877	
00000878	For manufacturer setting
⋮	
00000887	
00000888	Parameter write No.1
00000889	
0000088A	For manufacturer setting
0000088B	
0000088C	Parameter write data 1
0000088D	
0000088E	For manufacturer setting
0000088F	
00000890	Parameter write No.2
00000891	
00000892	For manufacturer setting
00000893	
00000894	Parameter write data 2
00000895	
00000896	For manufacturer setting
00000897	
00000898	Parameter read No.1
00000899	
0000089A	For manufacturer setting
⋮	
0000089F	
000008A0	Parameter read No.2
000008A1	
000008A2	For manufacturer setting
⋮	
000008DF	

System command bit

For each bit, "0" stands for invalid and "1" stands for valid.

Address (hexadecimal)	Bit	Symbol	Signal name
00000840	0	SMPS	Sampling start
	1	—	For manufacturer setting
	2		
	3		
	4		
	5		
	6		
	7		

Address (hexadecimal)	Bit	Symbol	Signal name
00000841	0	—	For manufacturer setting
	1		
	2		
	3		
	4		
	5		
	6		
	7		

Address (hexadecimal)	Bit	Symbol	Signal name
00000842	0	ASYN1	Non-synchronous command (group 1)
	1	ASYN2	Non-synchronous command (group 2)
	2	ASYN3	Non-synchronous command (group 3)
	3	ASYN4	Non-synchronous command (group 4)
	4	ASYN5	Non-synchronous command (group 5)
	5	ASYN6	Non-synchronous command (group 6)
	6	ASYN7	Non-synchronous command (group 7)
	7	ASYN8	Non-synchronous command (group 8)

Address (hexadecimal)	Bit	Symbol	Signal name
00000843	0	—	For manufacturer setting
	1		
	2		
	3		
	4		
	5		
	6		
	7		

Address (hexadecimal)	Bit	Symbol	Signal name
00000844	0	RBR	Reboot preparation
	1	RBS	Execute rebooting
	2	CRST	System alarm reset
	3	—	For manufacturer setting
	4	SMON	System monitor command
	5	SMONR	System monitor latch command
	6	—	For manufacturer setting
	7		

Address (hexadecimal)	Bit	Symbol	Signal name
00000845	0	—	For manufacturer setting
	1		
	2		
	3		
	4		
	5		
	6		
	7		

Address (hexadecimal)	Bit	Symbol	Signal name
00000846	0	SPWRT	Parameter write command
	1	—	For manufacturer setting
	2		
	3		
	4		
	5		
	6		
	7		

Address (hexadecimal)	Bit	Symbol	Signal name
00000847	0	SPRD	Parameter read command
	1	—	For manufacturer setting
	2		
	3		
	4		
	5		
	6		
	7		

Address (hexadecimal)	Bit	Symbol	Signal name
00000848	0	SMPSW	Sampling setting write command
	1	—	For manufacturer setting
	2		
	3		
	4	SMPSR	Sampling setting read command
	5	—	For manufacturer setting
	6		
	7		

Address (hexadecimal)	Bit	Symbol	Signal name
00000849	0	—	For manufacturer setting
	1		
	2		
	3		
	4		
	5		
	6		
	7		

Address (hexadecimal)	Bit	Symbol	Signal name
0000084A	0	—	For manufacturer setting
	1		
	2		
	3		
	4		
	5		
	6		
	7		

Address (hexadecimal)	Bit	Symbol	Signal name
0000084B	0	—	For manufacturer setting
	1		
	2		
	3		
	4	AERST	All error reset
	5	—	For manufacturer setting
	6		
	7		

Address (hexadecimal)	Bit	Symbol	Signal name
0000084C ⋮ 0000085F	0	—	For manufacturer setting
	1		
	2		
	3		
	4		
	5		
	6		
	7		

System status

Address (hexadecimal)	Content
000008E0	System status bit
000008E1	
000008E2	
000008E3	
000008E4	
000008E5	
000008E6	
000008E7	
000008E8	
000008E9	
000008EA	
000008EB	
000008EC	
000008ED	
000008EE	
000008EF	
000008F0	
000008F1	
000008F2	
000008F3	
000008F4	
000008F5	
000008F6	
000008F7	
000008F8	
000008F9	
000008FA	
000008FB	
000008FC	
000008FD	
000008FE	
000008FF	
00000900	System status code
00000901	
00000902	For manufacturer setting
00000903	
00000904	System alarm No.
00000905	
00000906	Specific system alarm No.
00000907	
00000908	For manufacturer setting
⋮	
0000090F	
00000910	Monitor No.1
00000911	
00000912	
00000913	

Address (hexadecimal)	Content
00000914	Monitor No.2
00000915	
00000916	
00000917	
00000918	Monitor data 1
00000919	
0000091A	
0000091B	
0000091C	For manufacturer setting
0000091D	
0000091E	
0000091F	
00000920	Monitor data 2
00000921	
00000922	
00000923	
00000924	For manufacturer setting
00000925	
00000926	
00000927	
00000928	Parameter write No.1
00000929	
0000092A	For manufacturer setting
0000092B	
0000092C	Parameter write data 1
0000092D	
0000092E	For manufacturer setting
0000092F	
00000930	Parameter write No.2
00000931	
00000932	For manufacturer setting
00000933	
00000934	Parameter write data 2
00000935	
00000936	For manufacturer setting
00000937	
00000938	Parameter read No.1
00000939	
0000093A	For manufacturer setting
0000093B	
0000093C	Parameter read data 1
0000093D	
0000093E	For manufacturer setting
0000093F	
00000940	Parameter read No.2
00000941	
00000942	For manufacturer setting
00000943	
00000944	Parameter read data 2
00000945	

Address (hexadecimal)	Content
00000946	For manufacturer setting
⋮	
0000097F	

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System status bit

For each bit, "0" stands for invalid and "1" stands for valid.

Address (hexadecimal)	Bit	Symbol	Signal name
000008E0	0	SMPW	Waiting for sampling trigger
	1	SMPO	Sampling is being performed
	2	SMPF	Sampling completed
	3	SMPE	Sampling error
	4	—	For manufacturer setting
	5		
	6		
	7		

Address (hexadecimal)	Bit	Symbol	Signal name
000008E1	0	—	For manufacturer setting
	1		
	2		
	3		
	4		
	5		
	6	IPCH	Changeable interpolation group
	7	—	For manufacturer setting

Address (hexadecimal)	Bit	Symbol	Signal name
000008E2	0	ASYO1	In non-synchronous mode (group 1)
	1	ASYO2	In non-synchronous mode (group 2)
	2	ASYO3	In non-synchronous mode (group 3)
	3	ASYO4	In non-synchronous mode (group 4)
	4	ASYO5	In non-synchronous mode (group 5)
	5	ASYO6	In non-synchronous mode (group 6)
	6	ASYO7	In non-synchronous mode (group 7)
	7	ASYO8	In non-synchronous mode (group 8)

Address (hexadecimal)	Bit	Symbol	Signal name
000008E3	0	SYEO1	Synchronizing (group 1)
	1	SYEO2	Synchronizing (group 2)
	2	SYEO3	Synchronizing (group 3)
	3	SYEO4	Synchronizing (group 4)
	4	SYEO5	Synchronizing (group 5)
	5	SYEO6	Synchronizing (group 6)
	6	SYEO7	Synchronizing (group 7)
	7	SYEO8	Synchronizing (group 8)

Address (hexadecimal)	Bit	Symbol	Signal name
000008E4	0	RBOK	Reboot preparation completed
	1	RBNG	Reboot preparation error
	2	CALM	Current system alarm
	3	—	For manufacturer setting
	4	SMOUT	Monitor output
	5	SMRCH	Monitor latch
	6	SMER1	Monitor No. error 1
	7	SMER2	Monitor No. error 2

Address (hexadecimal)	Bit	Symbol	Signal name
000008E5	0	—	For manufacturer setting
	1		
	2		
	3		
	4		
	5		
	6		
	7		

Address (hexadecimal)	Bit	Symbol	Signal name
000008E6	0	SPWFIN1	Parameter write completed 1
	1	SPWEN1	Parameter No. error 1
	2	SPWED1	Parameter data out of bounds 1
	3	—	For manufacturer setting
	4	SPWFIN2	Parameter write completed 2
	5	SPWEN2	Parameter No. error 2
	6	SPWED2	Parameter data out of bounds 2
	7	—	For manufacturer setting

Address (hexadecimal)	Bit	Symbol	Signal name
000008E7	0	SPRFIN1	Parameter read completed 1
	1	SPREN1	Parameter No. error 1
	2	SPRFIN2	Parameter read completed 2
	3	SPREN2	Parameter No. error 2
	4	—	For manufacturer setting
	5		
	6		
	7		

Address (hexadecimal)	Bit	Symbol	Signal name
000008E8	0	SWFIN	Sampling setting write completed
	1	SWEN	Sampling setting No. error
	2	SWED	Sampling setting data out of bounds
	3	—	For manufacturer setting
	4	SRFIN	Sampling setting read completed
	5	SREN	Sampling setting No. error
	6	—	For manufacturer setting
	7		

Address (hexadecimal)	Bit	Symbol	Signal name
000008E9	0	—	For manufacturer setting
	1		
	2		
	3		
	4		
	5		
	6		
	7		

Address (hexadecimal)	Bit	Symbol	Signal name
000008EA	0	—	For manufacturer setting
	1		
	2		
	3		
	4		
	5		
	6		
	7		

Address (hexadecimal)	Bit	Symbol	Signal name
000008EB	0	—	For manufacturer setting
	1		
	2		
	3		
	4	AERO	Processing all error reset
	5	AERF	All error reset completed
	6	AERE	All error reset error
	7	—	For manufacturer setting

Address (hexadecimal)	Bit	Symbol	Signal name
000008EC	0	EMC0	Forced stop factor 0 (Being executed external forced stop)
	1	EMC1	Forced stop factor 1 (Being executed software forced stop)
	2	EMC2	Forced stop factor 2 (User watchdog error detected)
	3	—	For manufacturer setting
	4		
	5	EMC5	Forced stop factor 5 (Preparing reboot)
	6	EMC6	Forced stop factor 6 (System status code error detected)
	7	—	For manufacturer setting

Address (hexadecimal)	Bit	Symbol	Signal name
000008ED ⋮ 000008FF	0	—	For manufacturer setting
	1		
	2		
	3		
	4		
	5		
	6		
	7		

11.6 System Information for Motion API

Address (hexadecimal)	Content
00000980	For manufacturer setting
⋮	
00000A7F	
00000A80	Final interrupt signal output free-running counter
00000A81	
00000A82	
00000A83	
00000A84	Interrupt signal output count
00000A85	
00000A86	
00000A87	
00000A88	Interrupt end processing specified time exceeded count
00000A89	
00000A8A	
00000A8B	
00000A8C	Interrupt signal re-output cumulative count
00000A8D	
00000A8E	
00000A8F	
00000A90	For manufacturer setting
⋮	
00000AFF	

11.7 Axis Data (High Speed)

Axis data command

For details about the command bit and the command data, refer to the following.

☞ Page 475 Command bit

☞ Page 478 Command data

Address (hexadecimal)	Content
00001000 to 0000100F	Command bit (Axis 1)
00001010 to 0000101F	Command bit (Axis 2)
00001020 to 0000102F	Command bit (Axis 3)
00001030 to 0000103F	Command bit (Axis 4)
00001040 to 0000104F	Command bit (Axis 5)
00001050 to 0000105F	Command bit (Axis 6)
00001060 to 0000106F	Command bit (Axis 7)
00001070 to 0000107F	Command bit (Axis 8)
00001080 to 0000108F	Command bit (Axis 9)
00001090 to 0000109F	Command bit (Axis 10)
000010A0 to 000010AF	Command bit (Axis 11)
000010B0 to 000010BF	Command bit (Axis 12)
000010C0 to 000010CF	Command bit (Axis 13)
000010D0 to 000010DF	Command bit (Axis 14)
000010E0 to 000010EF	Command bit (Axis 15)
000010F0 to 000010FF	Command bit (Axis 16)
00001100 to 0000110F	Command bit (Axis 17)
00001110 to 0000111F	Command bit (Axis 18)
00001120 to 0000112F	Command bit (Axis 19)
00001130 to 0000113F	Command bit (Axis 20)
00001140 to 0000114F	Command bit (Axis 21)
00001150 to 0000115F	Command bit (Axis 22)
00001160 to 0000116F	Command bit (Axis 23)
00001170 to 0000117F	Command bit (Axis 24)
00001180 to 0000118F	Command bit (Axis 25)
00001190 to 0000119F	Command bit (Axis 26)
000011A0 to 000011AF	Command bit (Axis 27)
000011B0 to 000011BF	Command bit (Axis 28)
000011C0 to 000011CF	Command bit (Axis 29)
000011D0 to 000011DF	Command bit (Axis 30)
000011E0 to 000011EF	Command bit (Axis 31)
000011F0 to 000011FF	Command bit (Axis 32)
00001200 to 0000120F	Command bit (Axis 33)
00001210 to 0000121F	Command bit (Axis 34)
00001220 to 0000122F	Command bit (Axis 35)
00001230 to 0000123F	Command bit (Axis 36)
00001240 to 0000124F	Command bit (Axis 37)
00001250 to 0000125F	Command bit (Axis 38)
00001260 to 0000126F	Command bit (Axis 39)
00001270 to 0000127F	Command bit (Axis 40)
00001280 to 0000128F	Command bit (Axis 41)
00001290 to 0000129F	Command bit (Axis 42)
000012A0 to 000012AF	Command bit (Axis 43)
000012B0 to 000012BF	Command bit (Axis 44)

Address (hexadecimal)	Content
000012C0 to 000012CF	Command bit (Axis 45)
000012D0 to 000012DF	Command bit (Axis 46)
000012E0 to 000012EF	Command bit (Axis 47)
000012F0 to 000012FF	Command bit (Axis 48)
00001300 to 0000130F	Command bit (Axis 49)
00001310 to 0000131F	Command bit (Axis 50)
00001320 to 0000132F	Command bit (Axis 51)
00001330 to 0000133F	Command bit (Axis 52)
00001340 to 0000134F	Command bit (Axis 53)
00001350 to 0000135F	Command bit (Axis 54)
00001360 to 0000136F	Command bit (Axis 55)
00001370 to 0000137F	Command bit (Axis 56)
00001380 to 0000138F	Command bit (Axis 57)
00001390 to 0000139F	Command bit (Axis 58)
000013A0 to 000013AF	Command bit (Axis 59)
000013B0 to 000013BF	Command bit (Axis 60)
000013C0 to 000013CF	Command bit (Axis 61)
000013D0 to 000013DF	Command bit (Axis 62)
000013E0 to 000013EF	Command bit (Axis 63)
000013F0 to 000013FF	Command bit (Axis 64)
00001400	For manufacturer setting
⋮	
00001FFF	
00002000 to 0000203F	Command data (Axis 1)
00002040 to 0000207F	Command data (Axis 2)
00002080 to 000020BF	Command data (Axis 3)
000020C0 to 000020FF	Command data (Axis 4)
00002100 to 0000213F	Command data (Axis 5)
00002140 to 0000217F	Command data (Axis 6)
00002180 to 000021BF	Command data (Axis 7)
000021C0 to 000021FF	Command data (Axis 8)
00002200 to 0000223F	Command data (Axis 9)
00002240 to 0000227F	Command data (Axis 10)
00002280 to 000022BF	Command data (Axis 11)
000022C0 to 000022FF	Command data (Axis 12)
00002300 to 0000233F	Command data (Axis 13)
00002340 to 0000237F	Command data (Axis 14)
00002380 to 000023BF	Command data (Axis 15)
000023C0 to 000023FF	Command data (Axis 16)
00002400 to 0000243F	Command data (Axis 17)
00002440 to 0000247F	Command data (Axis 18)
00002480 to 000024BF	Command data (Axis 19)
000024C0 to 000024FF	Command data (Axis 20)
00002500 to 0000253F	Command data (Axis 21)
00002540 to 0000257F	Command data (Axis 22)
00002580 to 000025BF	Command data (Axis 23)
000025C0 to 000025FF	Command data (Axis 24)
00002600 to 0000263F	Command data (Axis 25)
00002640 to 0000267F	Command data (Axis 26)
00002680 to 000026BF	Command data (Axis 27)
000026C0 to 000026FF	Command data (Axis 28)
00002700 to 0000273F	Command data (Axis 29)

Address (hexadecimal)	Content
00002740 to 0000277F	Command data (Axis 30)
00002780 to 000027BF	Command data (Axis 31)
000027C0 to 000027FF	Command data (Axis 32)
00002800 to 0000283F	Command data (Axis 33)
00002840 to 0000287F	Command data (Axis 34)
00002880 to 000028BF	Command data (Axis 35)
000028C0 to 000028FF	Command data (Axis 36)
00002900 to 0000293F	Command data (Axis 37)
00002940 to 0000297F	Command data (Axis 38)
00002980 to 000029BF	Command data (Axis 39)
000029C0 to 000029FF	Command data (Axis 40)
00002A00 to 00002A3F	Command data (Axis 41)
00002A40 to 00002A7F	Command data (Axis 42)
00002A80 to 00002ABF	Command data (Axis 43)
00002AC0 to 00002AFF	Command data (Axis 44)
00002B00 to 00002B3F	Command data (Axis 45)
00002B40 to 00002B7F	Command data (Axis 46)
00002B80 to 00002BBF	Command data (Axis 47)
00002BC0 to 00002BFF	Command data (Axis 48)
00002C00 to 00002C3F	Command data (Axis 49)
00002C40 to 00002C7F	Command data (Axis 50)
00002C80 to 00002CBF	Command data (Axis 51)
00002CC0 to 00002CFF	Command data (Axis 52)
00002D00 to 00002D3F	Command data (Axis 53)
00002D40 to 00002D7F	Command data (Axis 54)
00002D80 to 00002DBF	Command data (Axis 55)
00002DC0 to 00002DFF	Command data (Axis 56)
00002E00 to 00002E3F	Command data (Axis 57)
00002E40 to 00002E7F	Command data (Axis 58)
00002E80 to 00002EBF	Command data (Axis 59)
00002EC0 to 00002EFF	Command data (Axis 60)
00002F00 to 00002F3F	Command data (Axis 61)
00002F40 to 00002F7F	Command data (Axis 62)
00002F80 to 00002FBF	Command data (Axis 63)
00002FC0 to 00002FFF	Command data (Axis 64)
00003000	For manufacturer setting
⋮	
00005FFF	

Command bit

The addresses in the table are the addresses for the first axis. For the second axis and after, add "+10h" for each axis.

<Example> When determining the address of the axis 64 from the servo ON (00001000h) of the axis 1
00001000h + (64 - 1) × 10h = 000013F0h (the servo ON of the axis 64)

For each bit, "0" stands for invalid and "1" stands for valid.

The when in tandem drive column in the table is for axis data classification for when using the tandem drive synchronous mode.

- Master: Data only valid for the master axis (☞ Page 436 Data only valid for the master axis)
- Each axis: Individual data for the master axis/slave axis (☞ Page 436 Individual data for master axis/slave axis)
- Special: Data which is valid when both the master axis/slave axis are set (☞ Page 436 Data which is valid when both master axis and slave axis are set)

Address (hexadecimal)	Bit	Symbol	Signal name	When in tandem drive
00001000	0	SON	Servo on	Special
	1	—	For manufacturer setting	—
	2			
	3			
	4			
	5	SRST	Drive unit alarm reset	Each axis
	6	—	For manufacturer setting	—
	7			

Address (hexadecimal)	Bit	Symbol	Signal name	When in tandem drive
00001001	0	ST	Start operation	Master
	1	DIR	Movement direction	Master
	2	STP	Stop operation	Master
	3	RSTP	Rapid stop	Master
	4	—	For manufacturer setting	—
	5	ORST	Operation alarm reset	Master
	6	—	For manufacturer setting	—
	7			

Address (hexadecimal)	Bit	Symbol	Signal name	When in tandem drive
00001002	0	AUT	Automatic operation mode	Master
	1	ZRN	Home position return mode	Master
	2	JOG	JOG operation mode	Master
	3	S	Incremental feed mode	Master
	4	—	For manufacturer setting	—
	5	LIP	Interpolation operation mode	Master
	6	DST	Home position reset mode	Master
	7	—	For manufacturer setting	—

Address (hexadecimal)	Bit	Symbol	Signal name	When in tandem drive
00001003	0	—	For manufacturer setting	—
	1			
	2			
	3			
	4			
	5			
	6			
	7			

Address (hexadecimal)	Bit	Symbol	Signal name	When in tandem drive
00001004	0	ITL	Interlock	Master
	1	RMONR	High speed monitor latch command	Each axis
	2	—	For manufacturer setting	—
	3			
	4	LSPC	+ side limit switch input	Each axis
	5	LSNC	- side limit switch input	Each axis
	6	DOGC	Proximity dog input	Each axis
	7	—	For manufacturer setting	—

Address (hexadecimal)	Bit	Symbol	Signal name	When in tandem drive
00001005	0	SCHG	Change speed	Master
	1	TACHG	Change acceleration time constant	Master
	2	TDCHG	Change deceleration time constant	Master
	3	PCHG	Change position	Master
	4	—	For manufacturer setting	—
	5			
	6			
	7			

Address (hexadecimal)	Bit	Symbol	Signal name	When in tandem drive
00001006	0	FST	Fast start operation	Master
	1	—	For manufacturer setting	—
	2			
	3			
	4			
	5			
	6			
	7			

Address (hexadecimal)	Bit	Symbol	Signal name	When in tandem drive
00001007	0	PPISTP	Pass position interrupt cancel	Master
	1	—	For manufacturer setting	—
	2			
	3			
	4			
	5			
	6			
	7			

Address (hexadecimal)	Bit	Symbol	Signal name	When in tandem drive
00001008 ⋮ 0000100B	0	—	For manufacturer setting	—
	1			
	2			
	3			
	4			
	5			
	6			
	7			

Address (hexadecimal)	Bit	Symbol	Signal name	When in tandem drive
0000100C	0	—	For manufacturer setting	—
	1			
	2			
	3			
	4	CTLMC	Control mode switching command	Not supported
	5	—	For manufacturer setting	—
	6			
	7			

Address (hexadecimal)	Bit	Symbol	Signal name	When in tandem drive
0000100D	0	PSMFSW	Pressure control mode forced switching	Not supported
	1	PSDFSW	Dwelling pressure forced switching	Not supported
	2	—	For manufacturer setting	—
	3	PSMRST	Pressure control mode resetting	Not supported
	4	—	For manufacturer setting	—
	5			
	6			
	7			

Address (hexadecimal)	Bit	Symbol	Signal name	When in tandem drive
0000100E ⋮ 0000100F	0	—	For manufacturer setting	—
	1			
	2			
	3			
	4			
	5			
	6			
	7			

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Command data

The addresses in the table are the addresses for the first axis. For the second axis and after, add "+40h" for each axis.

<Example> When determining the address of the axis 64 from the manual feed deceleration time constant (00002006h) of the axis 1
00002006h + (64 - 1) × 40h = 00002FC6h (the manual feed deceleration time constant of the axis 64)

The when in tandem drive column in the table is for axis data classification for when using the tandem drive synchronous mode.

• Master: Data only valid for the master axis (☞ Page 436 Data only valid for the master axis)

Address (hexadecimal)	Signal name	When in tandem drive
00002000	Manual feed speed	Master
00002001		
00002002		
00002003		
00002004	Manual feed acceleration time constant	Master
00002005		
00002006	Manual feed deceleration time constant	Master
00002007		
00002008	Incremental feed movement amount	Master
00002009		
0000200A		
0000200B		
0000200C	Start point No.	Master
0000200D		
0000200E	End point No.	Master
0000200F		
00002010	Latest command point No.	Master
00002011		
00002012	Control mode command	Master
00002013		
00002014	Pass position condition start No.	Master
00002015		
00002016	Pass position condition end No.	Master
00002017		
00002018 ⋮ 0000203F	For manufacturer setting	—

Axis data status

For details about the status bit and the status data, refer to the following.

☞Page 482 Status bit

☞Page 486 Status data

Address (hexadecimal)	Content
00006000 to 0000600F	Status bit (Axis 1)
00006010 to 0000601F	Status bit (Axis 2)
00006020 to 0000602F	Status bit (Axis 3)
00006030 to 0000603F	Status bit (Axis 4)
00006040 to 0000604F	Status bit (Axis 5)
00006050 to 0000605F	Status bit (Axis 6)
00006060 to 0000606F	Status bit (Axis 7)
00006070 to 0000607F	Status bit (Axis 8)
00006080 to 0000608F	Status bit (Axis 9)
00006090 to 0000609F	Status bit (Axis 10)
000060A0 to 000060AF	Status bit (Axis 11)
000060B0 to 000060BF	Status bit (Axis 12)
000060C0 to 000060CF	Status bit (Axis 13)
000060D0 to 000060DF	Status bit (Axis 14)
000060E0 to 000060EF	Status bit (Axis 15)
000060F0 to 000060FF	Status bit (Axis 16)
00006100 to 0000610F	Status bit (Axis 17)
00006110 to 0000611F	Status bit (Axis 18)
00006120 to 0000612F	Status bit (Axis 19)
00006130 to 0000613F	Status bit (Axis 20)
00006140 to 0000614F	Status bit (Axis 21)
00006150 to 0000615F	Status bit (Axis 22)
00006160 to 0000616F	Status bit (Axis 23)
00006170 to 0000617F	Status bit (Axis 24)
00006180 to 0000618F	Status bit (Axis 25)
00006190 to 0000619F	Status bit (Axis 26)
000061A0 to 000061AF	Status bit (Axis 27)
000061B0 to 000061BF	Status bit (Axis 28)
000061C0 to 000061CF	Status bit (Axis 29)
000061D0 to 000061DF	Status bit (Axis 30)
000061E0 to 000061EF	Status bit (Axis 31)
000061F0 to 000061FF	Status bit (Axis 32)
00006200 to 0000620F	Status bit (Axis 33)
00006210 to 0000621F	Status bit (Axis 34)
00006220 to 0000622F	Status bit (Axis 35)
00006230 to 0000623F	Status bit (Axis 36)
00006240 to 0000624F	Status bit (Axis 37)
00006250 to 0000625F	Status bit (Axis 38)
00006260 to 0000626F	Status bit (Axis 39)
00006270 to 0000627F	Status bit (Axis 40)
00006280 to 0000628F	Status bit (Axis 41)
00006290 to 0000629F	Status bit (Axis 42)
000062A0 to 000062AF	Status bit (Axis 43)
000062B0 to 000062BF	Status bit (Axis 44)
000062C0 to 000062CF	Status bit (Axis 45)
000062D0 to 000062DF	Status bit (Axis 46)
000062E0 to 000062EF	Status bit (Axis 47)

Address (hexadecimal)	Content
000062F0 to 000062FF	Status bit (Axis 48)
00006300 to 0000630F	Status bit (Axis 49)
00006310 to 0000631F	Status bit (Axis 50)
00006320 to 0000632F	Status bit (Axis 51)
00006330 to 0000633F	Status bit (Axis 52)
00006340 to 0000634F	Status bit (Axis 53)
00006350 to 0000635F	Status bit (Axis 54)
00006360 to 0000636F	Status bit (Axis 55)
00006370 to 0000637F	Status bit (Axis 56)
00006380 to 0000638F	Status bit (Axis 57)
00006390 to 0000639F	Status bit (Axis 58)
000063A0 to 000063AF	Status bit (Axis 59)
000063B0 to 000063BF	Status bit (Axis 60)
000063C0 to 000063CF	Status bit (Axis 61)
000063D0 to 000063DF	Status bit (Axis 62)
000063E0 to 000063EF	Status bit (Axis 63)
000063F0 to 000063FF	Status bit (Axis 64)
00006400 ⋮ 00006FFF	For manufacturer setting
00007000 to 0000703F	Status data (Axis 1)
00007040 to 0000707F	Status data (Axis 2)
00007080 to 000070BF	Status data (Axis 3)
000070C0 to 000070FF	Status data (Axis 4)
00007100 to 0000713F	Status data (Axis 5)
00007140 to 0000717F	Status data (Axis 6)
00007180 to 000071BF	Status data (Axis 7)
000071C0 to 000071FF	Status data (Axis 8)
00007200 to 0000723F	Status data (Axis 9)
00007240 to 0000727F	Status data (Axis 10)
00007280 to 000072BF	Status data (Axis 11)
000072C0 to 000072FF	Status data (Axis 12)
00007300 to 0000733F	Status data (Axis 13)
00007340 to 0000737F	Status data (Axis 14)
00007380 to 000073BF	Status data (Axis 15)
000073C0 to 000073FF	Status data (Axis 16)
00007400 to 0000743F	Status data (Axis 17)
00007440 to 0000747F	Status data (Axis 18)
00007480 to 000074BF	Status data (Axis 19)
000074C0 to 000074FF	Status data (Axis 20)
00007500 to 0000753F	Status data (Axis 21)
00007540 to 0000757F	Status data (Axis 22)
00007580 to 000075BF	Status data (Axis 23)
000075C0 to 000075FF	Status data (Axis 24)
00007600 to 0000763F	Status data (Axis 25)
00007640 to 0000767F	Status data (Axis 26)
00007680 to 000076BF	Status data (Axis 27)
000076C0 to 000076FF	Status data (Axis 28)
00007700 to 0000773F	Status data (Axis 29)
00007740 to 0000777F	Status data (Axis 30)
00007780 to 000077BF	Status data (Axis 31)
000077C0 to 000077FF	Status data (Axis 32)

Address (hexadecimal)	Content
00007800 to 0000783F	Status data (Axis 33)
00007840 to 0000787F	Status data (Axis 34)
00007880 to 000078BF	Status data (Axis 35)
000078C0 to 000078FF	Status data (Axis 36)
00007900 to 0000793F	Status data (Axis 37)
00007940 to 0000797F	Status data (Axis 38)
00007980 to 000079BF	Status data (Axis 39)
000079C0 to 000079FF	Status data (Axis 40)
00007A00 to 00007A3F	Status data (Axis 41)
00007A40 to 00007A7F	Status data (Axis 42)
00007A80 to 00007ABF	Status data (Axis 43)
00007AC0 to 00007AFF	Status data (Axis 44)
00007B00 to 00007B3F	Status data (Axis 45)
00007B40 to 00007B7F	Status data (Axis 46)
00007B80 to 00007BBF	Status data (Axis 47)
00007BC0 to 00007BFF	Status data (Axis 48)
00007C00 to 00007C3F	Status data (Axis 49)
00007C40 to 00007C7F	Status data (Axis 50)
00007C80 to 00007CBF	Status data (Axis 51)
00007CC0 to 00007CFF	Status data (Axis 52)
00007D00 to 00007D3F	Status data (Axis 53)
00007D40 to 00007D7F	Status data (Axis 54)
00007D80 to 00007DBF	Status data (Axis 55)
00007DC0 to 00007DFF	Status data (Axis 56)
00007E00 to 00007E3F	Status data (Axis 57)
00007E40 to 00007E7F	Status data (Axis 58)
00007E80 to 00007EBF	Status data (Axis 59)
00007EC0 to 00007EFF	Status data (Axis 60)
00007F00 to 00007F3F	Status data (Axis 61)
00007F40 to 00007F7F	Status data (Axis 62)
00007F80 to 00007FBF	Status data (Axis 63)
00007FC0 to 00007FFF	Status data (Axis 64)
00008000	For manufacturer setting
⋮	
0000AFFF	

Status bit

The addresses in the table are the addresses for the first axis. For the second axis and after, add "+10h" for each axis.

<Example> When determining the address of the axis 64 from the servo ready ON (00006000h) of the axis 1
00006000h + (64 - 1) × 10h = 000063F0h (the servo ready ON of the axis 64)

For each bit, "0" stands for invalid and "1" stands for valid.

The when in tandem drive column in the table is for axis data classification for when using the tandem drive synchronous mode.

- Master: Data only valid for the master axis (☞ Page 436 Data only valid for the master axis)
- Each axis: Individual data for the master axis/slave axis (☞ Page 436 Individual data for master axis/slave axis)

Address (hexadecimal)	Bit	Symbol	Signal name	When in tandem drive
00006000	0	RDY	Servo ready	Each axis
	1	INP	In-position	Each axis
	2	ZSP	Zero speed	Each axis
	3	ZPAS	Passed Z-phase	Each axis
	4	TLC	Torque limit effective	Each axis
	5	SALM	Drive unit alarm	Each axis
	6	SWRN	Drive unit warning	Each axis
	7	ABSE	Absolute position erased	Each axis

Address (hexadecimal)	Bit	Symbol	Signal name	When in tandem drive
00006001	0	OP	Operation processing	Master
	1	CPO	Rough match	Master
	2	PF	Positioning completed	Master
	3	ZP	Home position return completed	Master
	4	SMZ	Smoothing stop	Master
	5	OALM	Operation alarm	Master
	6	OPF	Operation completed	Master
	7	PSW	Position switch	Each axis

Address (hexadecimal)	Bit	Symbol	Signal name	When in tandem drive
00006002	0	AUTO	In automatic operation mode	Master
	1	ZRNO	In home position return mode	Master
	2	JO	In JOG operation mode	Master
	3	SO	In incremental feed mode	Master
	4	—	For manufacturer setting	—
	5	LIPO	In interpolation operation mode	Master
	6	DSTO	In home position reset mode	Master
	7	—	For manufacturer setting	—

Address (hexadecimal)	Bit	Symbol	Signal name	When in tandem drive
00006003	0	—	For manufacturer setting	—
	1			
	2			
	3			
	4			
	5			
	6			
	7			

Address (hexadecimal)	Bit	Symbol	Signal name	When in tandem drive
00006004	0	ISTP	Interlock stop	Master
	1	RMRCH	High speed monitor being latched	Each axis
	2	POV	Exceeded stop position	Master
	3	STO	Start up acceptance completed	Master
	4	—	For manufacturer setting	—
	5			
	6	ZREQ	Home position return request	Master
	7	DCDD	Driver command discard detected	Master

Address (hexadecimal)	Bit	Symbol	Signal name	When in tandem drive
00006005	0	SCF	Preparation for changing speed completed	Master
	1	TACF	Preparation for changing acceleration time constant completed	Master
	2	TDCF	Preparation for changing deceleration time constant completed	Master
	3	PCF	Preparation for changing position completed	Master
	4	SCE	Speed change error	Master
	5	TACE	Acceleration time constant change error	Master
	6	TDCE	Deceleration time constant change error	Master
	7	PCE	Position change error	Master

Address (hexadecimal)	Bit	Symbol	Signal name	When in tandem drive
00006006	0	—	For manufacturer setting	—
	1			
	2			
	3			
	4			
	5			
	6			
	7			

Address (hexadecimal)	Bit	Symbol	Signal name	When in tandem drive
00006007	0	PPIOP	Operating pass position interrupt	Master
	1	PPIFIN	Pass position interrupt completed	Master
	2	PPIERR	Pass position interrupt incompleted	Master
	3	—	For manufacturer setting	—
	4			
	5			
	6			
	7	AUTLO	In point table loop	Master

Address (hexadecimal)	Bit	Symbol	Signal name	When in tandem drive
00006008	0	—	For manufacturer setting	—
	1			
	2			
	3			
	4			
	5			
	6			
	7	PRSMO	Pressing in progress	Not supported

Address (hexadecimal)	Bit	Symbol	Signal name	When in tandem drive
00006009	0	—	For manufacturer setting	—
	1	SINP	Drive unit in-position	Each axis
	2	—	For manufacturer setting	—
	3			
	4			
	5			
	6			
	7			

Address (hexadecimal)	Bit	Symbol	Signal name	When in tandem drive
0000600A, 0000600B	0	—	For manufacturer setting	—
	1			
	2			
	3			
	4			
	5			
	6			
	7			

Address (hexadecimal)	Bit	Symbol	Signal name	When in tandem drive
0000600C	0	—	For manufacturer setting	—
	1			
	2			
	3			
	4	CTLMCF	Control mode switching completed	Not supported
	5	CTLMCE	Control mode switching error	Not supported
	6	—	For manufacturer setting	—
	7	PRSOVR	Out of torque range during pressing	Not supported

Address (hexadecimal)	Bit	Symbol	Signal name	When in tandem drive
0000600D	0	PSCMO	Pressure control mode in progress	Not supported
	1	PSFD	Feeding/dwelling pressure	Not supported
	2	PSDW	Dwelling pressure	Not supported
	3	PSPAS	Pressure attainment switching during feed	Not supported
	4	PSRL	Releasing pressure	Not supported
	5	PSDFSC	Condition of final step dwelling pressure satisfied	Not supported
	6	PSMCF	Pressure control mode switching completed	Not supported
	7	PSMCE	Pressure control mode switching error	Not supported

Address (hexadecimal)	Bit	Symbol	Signal name	When in tandem drive
0000600E	0	PSDCF	Dwelling pressure switching completed	Not supported
	1	PSDCE	Dwelling pressure switching error	Not supported
	2	—	For manufacturer setting	—
	3			
	4			
	5			
	6	PSMRC	Pressure control mode resetting completed	Not supported
	7	PSMRE	Pressure control mode resetting error	Not supported

Address (hexadecimal)	Bit	Symbol	Signal name	When in tandem drive
0000600F	0	—	For manufacturer setting	—
	1			
	2			
	3			
	4			
	5			
	6			
	7			

Status data

The addresses in the table are the addresses for the first axis. For the second axis and after, add "+40h" for each axis.

<Example> When determining the address of the axis 64 from the he drive unit alarm No. (00007004h) of the axis 1
00007004h + (64 - 1) × 40h = 00007FC4h (the drive unit alarm No. of the axis 64)

The when in tandem drive column in the table is for axis data classification for when using the tandem drive synchronous mode.

- Master: Data only valid for the master axis (☞ Page 436 Data only valid for the master axis)
- Each axis: Individual data for the master axis/slave axis (☞ Page 436 Individual data for master axis/slave axis)

Address (hexadecimal)	Signal name	When in tandem drive
00007000	Operation alarm No.	Master
00007001		
00007002	Specific operation alarm No.	Master
00007003		
00007004	Drive unit alarm No.	Each axis
00007005		
00007006	Specific drive unit alarm No.	Each axis
00007007		
00007008	Selected home position return method	Master
00007009		
0000700A	For manufacturer setting	—
0000700B		
0000700C	Operation point No.	Master
0000700D		
0000700E	For manufacturer setting	—
0000700F		
00007010		
00007011		
00007012	Control mode status	Master
00007013		
00007014	Executing pass position condition No.	Master
00007015		
00007016	For manufacturer setting	—
⋮		
00007023		
00007024	Profile No. of pressure control in progress	Not supported
00007025		
00007026	Step No. of feeding step in progress	Not supported
00007027		
00007028	Step No. of dwelling pressure step in progress	Not supported
00007029		
0000702A	Step No. of releasing pressure step in progress	Not supported
0000702B		
0000702C	Pressure control status	Not supported
0000702D		
0000702E	Error step No.	Not supported
0000702F		
00007030	Error detail No. of switching condition	Not supported
00007031		
00007032	For manufacturer setting	—
00007033		

Address (hexadecimal)	Signal name	When in tandem drive
00007034	Tip position in pressure control	Not supported
00007035		
00007036		
00007037		
00007038	Speed limit value	Not supported
00007039		
0000703A		
0000703B		
0000703C	Pressure command value	Not supported
0000703D		
0000703E	Load cell pressure	Not supported
0000703F		

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11.8 Axis Data (Low Speed)

Axis data command

For details about the command bit and the command data, refer to the following.

Address (hexadecimal)	Content	
0000B000 to 0000B01F	Axis 1	Command bit
0000B020 to 0000B0BF		Command data
0000B0C0 to 0000B0DF	Axis 2	Command bit
0000B0E0 to 0000B17F		Command data
0000B180 to 0000B19F	Axis 3	Command bit
0000B1A0 to 0000B23F		Command data
0000B240 to 0000B25F	Axis 4	Command bit
0000B260 to 0000B2FF		Command data
0000B300 to 0000B31F	Axis 5	Command bit
0000B320 to 0000B3BF		Command data
0000B3C0 to 0000B3DF	Axis 6	Command bit
0000B3E0 to 0000B47F		Command data
0000B480 to 0000B49F	Axis 7	Command bit
0000B4A0 to 0000B53F		Command data
0000B540 to 0000B55F	Axis 8	Command bit
0000B560 to 0000B5FF		Command data
0000B600 to 0000B61F	Axis 9	Command bit
0000B620 to 0000B6BF		Command data
0000B6C0 to 0000B6DF	Axis 10	Command bit
0000B6E0 to 0000B77F		Command data
0000B780 to 0000B79F	Axis 11	Command bit
0000B7A0 to 0000B83F		Command data
0000B840 to 0000B85F	Axis 12	Command bit
0000B860 to 0000B8FF		Command data
0000B900 to 0000B91F	Axis 13	Command bit
0000B920 to 0000B9BF		Command data
0000B9C0 to 0000B9DF	Axis 14	Command bit
0000B9E0 to 0000BA7F		Command data
0000BA80 to 0000BA9F	Axis 15	Command bit
0000BAA0 to 0000BB3F		Command data
0000BB40 to 0000BB5F	Axis 16	Command bit
0000BB60 to 0000BBFF		Command data
0000BC00 to 0000BC1F	Axis 17	Command bit
0000BC20 to 0000BCBF		Command data
0000BCC0 to 0000BCDF	Axis 18	Command bit
0000BCE0 to 0000BD7F		Command data
0000BD80 to 0000BD9F	Axis 19	Command bit
0000BDA0 to 0000BE3F		Command data
0000BE40 to 0000BE5F	Axis 20	Command bit
0000BE60 to 0000BEFF		Command data
0000BF00 to 0000BF1F	Axis 21	Command bit
0000BF20 to 0000BFBF		Command data
0000BFC0 to 0000BFDF	Axis 22	Command bit
0000BFE0 to 0000C07F		Command data

Address (hexadecimal)	Content	
0000C080 to 0000C09F	Axis 23	Command bit
0000C0A0 to 0000C13F		Command data
0000C140 to 0000C15F	Axis 24	Command bit
0000C160 to 0000C1FF		Command data
0000C200 to 0000C21F	Axis 25	Command bit
0000C220 to 0000C2BF		Command data
0000C2C0 to 0000C2DF	Axis 26	Command bit
0000C2E0 to 0000C37F		Command data
0000C380 to 0000C39F	Axis 27	Command bit
0000C3A0 to 0000C43F		Command data
0000C440 to 0000C45F	Axis 28	Command bit
0000C460 to 0000C4FF		Command data
0000C500 to 0000C51F	Axis 29	Command bit
0000C520 to 0000C5BF		Command data
0000C5C0 to 0000C5DF	Axis 30	Command bit
0000C5E0 to 0000C67F		Command data
0000C680 to 0000C69F	Axis 31	Command bit
0000C6A0 to 0000C73F		Command data
0000C740 to 0000C75F	Axis 32	Command bit
0000C760 to 0000C7FF		Command data
0000C800 to 0000C81F	Axis 33	Command bit
0000C820 to 0000C8BF		Command data
0000C8C0 to 0000C8DF	Axis 34	Command bit
0000C8E0 to 0000C97F		Command data
0000C980 to 0000C99F	Axis 35	Command bit
0000C9A0 to 0000CA3F		Command data
0000CA40 to 0000CA5F	Axis 36	Command bit
0000CA60 to 0000CAFF		Command data
0000CB00 to 0000CB1F	Axis 37	Command bit
0000CB20 to 0000CBBF		Command data
0000CBC0 to 0000CBDF	Axis 38	Command bit
0000CBE0 to 0000CC7F		Command data
0000CC80 to 0000CC9F	Axis 39	Command bit
0000CCA0 to 0000CD3F		Command data
0000CD40 to 0000CD5F	Axis 40	Command bit
0000CD60 to 0000CDFF		Command data
0000CE00 to 0000CE1F	Axis 41	Command bit
0000CE20 to 0000CEBF		Command data
0000CEC0 to 0000CEDF	Axis 42	Command bit
0000CEE0 to 0000CF7F		Command data
0000CF80 to 0000CF9F	Axis 43	Command bit
0000CFA0 to 0000D03F		Command data
0000D040 to 0000D05F	Axis 44	Command bit
0000D060 to 0000D0FF		Command data
0000D100 to 0000D11F	Axis 45	Command bit
0000D120 to 0000D1BF		Command data
0000D1C0 to 0000D1DF	Axis 46	Command bit
0000D1E0 to 0000D27F		Command data
0000D280 to 0000D29F	Axis 47	Command bit
0000D2A0 to 0000D33F		Command data
0000D340 to 0000D35F	Axis 48	Command bit
0000D360 to 0000D3FF		Command data

Address (hexadecimal)	Content	
0000D400 to 0000D41F	Axis 49	Command bit
0000D420 to 0000D4BF		Command data
0000D4C0 to 0000D4DF	Axis 50	Command bit
0000D4E0 to 0000D57F		Command data
0000D580 to 0000D59F	Axis 51	Command bit
0000D5A0 to 0000D63F		Command data
0000D640 to 0000D65F	Axis 52	Command bit
0000D660 to 0000D6FF		Command data
0000D700 to 0000D71F	Axis 53	Command bit
0000D720 to 0000D7BF		Command data
0000D7C0 to 0000D7DF	Axis 54	Command bit
0000D7E0 to 0000D87F		Command data
0000D880 to 0000D89F	Axis 55	Command bit
0000D8A0 to 0000D93F		Command data
0000D940 to 0000D95F	Axis 56	Command bit
0000D960 to 0000D9FF		Command data
0000DA00 to 0000DA1F	Axis 57	Command bit
0000DA20 to 0000DABF		Command data
0000DAC0 to 0000DADF	Axis 58	Command bit
0000DAE0 to 0000DB7F		Command data
0000DB80 to 0000DB9F	Axis 59	Command bit
0000DBA0 to 0000DC3F		Command data
0000DC40 to 0000DC5F	Axis 60	Command bit
0000DC60 to 0000DCFF		Command data
0000DD00 to 0000DD1F	Axis 61	Command bit
0000DD20 to 0000DDBF		Command data
0000DDC0 to 0000DDDF	Axis 62	Command bit
0000DDE0 to 0000DE7F		Command data
0000DE80 to 0000DE9F	Axis 63	Command bit
0000DEA0 to 0000DF3F		Command data
0000DF40 to 0000DF5F	Axis 64	Command bit
0000DF60 to 0000DFFF		Command data
0000E000	For manufacturer setting	
⋮		
00010FFF		

Command bit

The addresses in the table are the addresses for the first axis. For the second axis and after, add "+C0h" for each axis.

<Example> When determining the address of the axis 64 from the monitor command (0000B000h) of the axis 1
0000B000h + (64 - 1) × C0h = 0000DF40h (the monitor command of the axis 64)

For each bit, "0" stands for invalid and "1" stands for valid.

The when in tandem drive column in the table is for axis data classification for when using the tandem drive synchronous mode.

• Master: Data only valid for the master axis (☞ Page 436 Data only valid for the master axis)

Address (hexadecimal)	Bit	Symbol	Signal name	When in tandem drive
0000B000	0	MON	Monitor command	Each axis
	1	MONR	Monitor latch command	Each axis
	2	—	For manufacturer setting	—
	3			
	4			
	5			
	6			
	7			

Address (hexadecimal)	Bit	Symbol	Signal name	When in tandem drive
0000B001	0	PWRT	Parameter write command	Each axis
	1	—	For manufacturer setting	—
	2			
	3			
	4			
	5			
	6			
	7			

Address (hexadecimal)	Bit	Symbol	Signal name	When in tandem drive
0000B002	0	PRD	Parameter read command	Each axis
	1	—	For manufacturer setting	—
	2			
	3			
	4			
	5			
	6			
	7			

Address (hexadecimal)	Bit	Symbol	Signal name	When in tandem drive
0000B003 ⋮ 0000B01F	0	—	For manufacturer setting	—
	1			
	2			
	3			
	4			
	5			
	6			
	7			

Command data

The addresses in the table are the addresses for the first axis. For the second axis and after, add "+C0h" for each axis.

<Example> When determining the address of the axis 64 from the monitor No.2 (0000B024h) of the axis 1
0000B024h + (64 - 1) × C0h = 0000DF64h (the monitor No.2 of the axis 64)

The when in tandem drive column in the table is for axis data classification for when using the tandem drive synchronous mode.

• Each axis: Individual data for the master axis/slave axis (☞ Page 436 Individual data for master axis/slave axis)

Address (hexadecimal)	Signal name	When in tandem drive
0000B020	Monitor No.1	Each axis
0000B021		
0000B022		
0000B023		
0000B024	Monitor No.2	Each axis
0000B025		
0000B026		
0000B027		
0000B028	Monitor No.3	Each axis
0000B029		
0000B02A		
0000B02B		
0000B02C	Monitor No.4	Each axis
0000B02D		
0000B02E		
0000B02F		
0000B030 ⋮ 0000B04F	For manufacturer setting	—
0000B050	Parameter write No.1	Each axis
0000B051		
0000B052	For manufacturer setting	—
0000B053		
0000B054	Parameter write data 1	Each axis
0000B055		
0000B056	For manufacturer setting	—
0000B057		
0000B058	Parameter write No.2	Each axis
0000B059		
0000B05A	For manufacturer setting	—
0000B05B		
0000B05C	Parameter write data 2	Each axis
0000B05D		
0000B05E	For manufacturer setting	—
0000B05F		
0000B060	Parameter read No.1	Each axis
0000B061		
0000B062 ⋮ 0000B067	For manufacturer setting	—
0000B068	Parameter read No.2	Each axis
0000B069		

Address (hexadecimal)	Signal name	When in tandem drive
0000B06A	For manufacturer setting	—
⋮		
0000B0BF		

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Axis data status

For details about the status bit and the status data, refer to the following.

☞Page 497 Status bit

☞Page 498 Status data

Address (hexadecimal)	Content	
00011000 to 0001101F	Axis 1	Status bit
00011020 to 000110BF		Status data
000110C0 to 000110DF	Axis 2	Status bit
000110E0 to 0001117F		Status data
00011180 to 0001119F	Axis 3	Status bit
000111A0 to 0001123F		Status data
00011240 to 0001125F	Axis 4	Status bit
00011260 to 000112FF		Status data
00011300 to 0001131F	Axis 5	Status bit
00011320 to 000113BF		Status data
000113C0 to 000113DF	Axis 6	Status bit
000113E0 to 0001147F		Status data
00011480 to 0001149F	Axis 7	Status bit
000114A0 to 0001153F		Status data
00011540 to 0001155F	Axis 8	Status bit
00011560 to 000115FF		Status data
00011600 to 0001161F	Axis 9	Status bit
00011620 to 000116BF		Status data
000116C0 to 000116DF	Axis 10	Status bit
000116E0 to 0001177F		Status data
00011780 to 0001179F	Axis 11	Status bit
000117A0 to 0001183F		Status data
00011840 to 0001185F	Axis 12	Status bit
00011860 to 000118FF		Status data
00011900 to 0001191F	Axis 13	Status bit
00011920 to 000119BF		Status data
000119C0 to 000119DF	Axis 14	Status bit
000119E0 to 00011A7F		Status data
00011A80 to 00011A9F	Axis 15	Status bit
00011AA0 to 00011B3F		Status data
00011B40 to 00011B5F	Axis 16	Status bit
0000BB60 to 00011BFF		Status data
00011C00 to 00011C1F	Axis 17	Status bit
00011C20 to 00011CBF		Status data
00011CC0 to 00011CDF	Axis 18	Status bit
00011CE0 to 00011D7F		Status data
00011D80 to 00011D9F	Axis 19	Status bit
00011DA0 to 00011E3F		Status data
00011E40 to 00011E5F	Axis 20	Status bit
00011E60 to 00011EFF		Status data
00011F00 to 00011F1F	Axis 21	Status bit
00011F20 to 00011FBF		Status data
00011FC0 to 00011FDF	Axis 22	Status bit
00011FE0 to 0001207F		Status data
00012080 to 0001209F	Axis 23	Status bit
000120A0 to 0001213F		Status data

Address (hexadecimal)	Content	
00012140 to 0001215F	Axis 24	Status bit
00012160 to 000121FF		Status data
00012200 to 0001221F	Axis 25	Status bit
00012220 to 000122BF		Status data
000122C0 to 000122DF	Axis 26	Status bit
000122E0 to 0001237F		Status data
00012380 to 0001239F	Axis 27	Status bit
000123A0 to 0001243F		Status data
00012440 to 0001245F	Axis 28	Status bit
00012460 to 000124FF		Status data
00012500 to 0001251F	Axis 29	Status bit
00012520 to 000125BF		Status data
000125C0 to 000125DF	Axis 30	Status bit
000125E0 to 0001267F		Status data
00012680 to 0001269F	Axis 31	Status bit
000126A0 to 0001273F		Status data
00012740 to 0001275F	Axis 32	Status bit
00012760 to 000127FF		Status data
00012800 to 0001281F	Axis 33	Status bit
00012820 to 000128BF		Status data
000128C0 to 000128DF	Axis 34	Status bit
000128E0 to 0001297F		Status data
00012980 to 0001299F	Axis 35	Status bit
000129A0 to 00012A3F		Status data
00012A40 to 00012A5F	Axis 36	Status bit
00012A60 to 00012AFF		Status data
00012B00 to 00012B1F	Axis 37	Status bit
00012B20 to 00012BBF		Status data
00012BC0 to 00012BDF	Axis 38	Status bit
00012BE0 to 00012C7F		Status data
00012C80 to 00012C9F	Axis 39	Status bit
00012CA0 to 00012D3F		Status data
00012D40 to 00012D5F	Axis 40	Status bit
00012D60 to 00012DFF		Status data
00012E00 to 00012E1F	Axis 41	Status bit
00012E20 to 00012EBF		Status data
00012EC0 to 00012EDF	Axis 42	Status bit
00012EE0 to 00012F7F		Status data
00012F80 to 00012F9F	Axis 43	Status bit
00012FA0 to 0001303F		Status data
00013040 to 0001305F	Axis 44	Status bit
00013060 to 000130FF		Status data
00013100 to 0001311F	Axis 45	Status bit
00013120 to 000131BF		Status data
000131C0 to 000131DF	Axis 46	Status bit
000131E0 to 0001327F		Status data
00013280 to 0001329F	Axis 47	Status bit
000132A0 to 0001333F		Status data
00013340 to 0001335F	Axis 48	Status bit
00013360 to 000133FF		Status data
00013400 to 0001341F	Axis 49	Status bit
00013420 to 000134BF		Status data

Address (hexadecimal)	Content	
000134C0 to 000134DF	Axis 50	Status bit
000134E0 to 0001357F		Status data
00013580 to 0001359F	Axis 51	Status bit
000135A0 to 0001363F		Status data
00013640 to 0001365F	Axis 52	Status bit
00013660 to 000136FF		Status data
00013700 to 0001371F	Axis 53	Status bit
00013720 to 000137BF		Status data
000137C0 to 000137DF	Axis 54	Status bit
000137E0 to 0001387F		Status data
00013880 to 0001389F	Axis 55	Status bit
000138A0 to 0001393F		Status data
00013940 to 0001395F	Axis 56	Status bit
00013960 to 000139FF		Status data
00013A00 to 00013A1F	Axis 57	Status bit
00013A20 to 00013ABF		Status data
00013AC0 to 00013ADF	Axis 58	Status bit
00013AE0 to 00013B7F		Status data
00013B80 to 00013B9F	Axis 59	Status bit
00013BA0 to 00013C3F		Status data
00013C40 to 00013C5F	Axis 60	Status bit
00013C60 to 00013CFF		Status data
00013D00 to 00013D1F	Axis 61	Status bit
00013D20 to 00013DBF		Status data
00013DC0 to 00013DDF	Axis 62	Status bit
00013DE0 to 00013E7F		Status data
00013E80 to 00013E9F	Axis 63	Status bit
00013EA0 to 00013F3F		Status data
00013F40 to 00013F5F	Axis 64	Status bit
00013F60 to 00013FFF		Status data
00014000	For manufacturer setting	
⋮		
00016FFF		

Status bit

The addresses in the table are the addresses for the first axis. For the second axis and after, add "+C0h" for each axis.

<Example> When determining the address of the axis 64 from the monitor output (00011000h) of the axis 1
00011000h + (64 - 1) × C0h = 00013F40h (the monitor output of the axis 64)

For each bit, "0" stands for invalid and "1" stands for valid.

The when in tandem drive column in the table is for axis data classification for when using the tandem drive synchronous mode.

• Each axis: Individual data for the master axis/slave axis (☞ Page 436 Individual data for master axis/slave axis)

Address (hexadecimal)	Bit	Symbol	Signal name	When in tandem drive
00011000	0	MOUT	Monitor output	Each axis
	1	MRCH	Monitor latch	Each axis
	2	MER1	Monitor No. error 1	Each axis
	3	MER2	Monitor No. error 2	Each axis
	4	MER3	Monitor No. error 3	Each axis
	5	MER4	Monitor No. error 4	Each axis
	6	—	For manufacturer setting	—
	7			

Address (hexadecimal)	Bit	Symbol	Signal name	When in tandem drive
00011001	0	PWFIN1	Parameter write completed 1	Each axis
	1	PWEN1	Parameter No. error 1	Each axis
	2	PWED1	Parameter data out of bounds 1	Each axis
	3	—	For manufacturer setting	—
	4	PWFIN2	Parameter write completed 2	Each axis
	5	PWEN2	Parameter No. error 2	Each axis
	6	PWED2	Parameter data out of bounds 2	Each axis
	7	—	For manufacturer setting	—

Address (hexadecimal)	Bit	Symbol	Signal name	When in tandem drive
00011002	0	PRFIN1	Parameter read completed 1	Each axis
	1	PREN1	Parameter No. error 1	Each axis
	2	PRFIN2	Parameter read completed 2	Each axis
	3	PREN2	Parameter No. error 2	Each axis
	4	—	For manufacturer setting	—
	5			
	6			
	7			

Address (hexadecimal)	Bit	Symbol	Signal name	When in tandem drive
00011003 ⋮ 0001101F	0	—	For manufacturer setting	—
	1			
	2			
	3			
	4			
	5			
	6			
	7			

Status data

The addresses in the table are the addresses for the first axis. For the second axis and after, add "+C0h" for each axis.

<Example> When determining the address of the axis 64 from the Monitor No.2 (00011024h) of the axis 1
00011024h + (64 - 1) × C0h = 00013F64h (the Monitor No.2 of axis the 64)

The when in tandem drive column in the table is for axis data classification for when using the tandem drive synchronous mode synchronous mode.

• Each axis: Individual data for the master axis/slave axis (☞ Page 436 Individual data for master axis/slave axis)

Address (hexadecimal)	Name	When in tandem drive
00011020	Monitor No.1	Each axis
00011021		
00011022		
00011023		
00011024	Monitor No.2	Each axis
00011025		
00011026		
00011027		
00011028	Monitor No.3	Each axis
00011029		
0001102A		
0001102B		
0001102C	Monitor No.4	Each axis
0001102D		
0001102E		
0001102F		
00011030	Monitor data 1	Each axis
00011031		
00011032		
00011033		
00011034	For manufacturer setting	—
⋮		
00011037		
00011038	Monitor data 2	Each axis
00011039		
0001103A		
0001103B		
0001103C	For manufacturer setting	—
⋮		
0001103F		
00011040	Monitor data 3	Each axis
00011041		
00011042		
00011043		
00011044	For manufacturer setting	—
⋮		
00011047		
00011048	Monitor data 4	Each axis
00011049		
0001104A		
0001104B		

Address (hexadecimal)	Name	When in tandem drive
0001104C ⋮ 0001104F	For manufacturer setting	—
00011050 00011051	Parameter write No.1	Each axis
00011052 00011053	For manufacturer setting	—
00011054 00011055	Parameter write data 1	Each axis
00011056 00011057	For manufacturer setting	—
00011058 00011059	Parameter write No.2	Each axis
0001105A 0001105B	For manufacturer setting	—
0001105C 0001105D	Parameter write data 2	Each axis
0001105E 0001105F	For manufacturer setting	—
00011060 00011061	Parameter read No.1	Each axis
00011062 00011063	For manufacturer setting	—
00011064 00011065	Parameter read data 1	Each axis
00011066 00011067	For manufacturer setting	—
00011068 00011069	Parameter read No.2	Each axis
0001106A 0001106B	For manufacturer setting	—
0001106C 0001106D	Parameter read data 2	—
0001106E ⋮ 000110BF	For manufacturer setting	—

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11.9 High Speed Monitor

Address (hexadecimal)	Content
00017000 to 0001701F	High speed monitor data (Axis 1)
00017020 to 0001703F	High speed monitor data (Axis 2)
00017040 to 0001705F	High speed monitor data (Axis 3)
00017060 to 0001707F	High speed monitor data (Axis 4)
00017080 to 0001709F	High speed monitor data (Axis 5)
000170A0 to 000170BF	High speed monitor data (Axis 6)
000170C0 to 000170DF	High speed monitor data (Axis 7)
000170E0 to 000170FF	High speed monitor data (Axis 8)
00017100 to 0001711F	High speed monitor data (Axis 9)
00017120 to 0001713F	High speed monitor data (Axis 10)
00017140 to 0001715F	High speed monitor data (Axis 11)
00017160 to 0001717F	High speed monitor data (Axis 12)
00017180 to 0001719F	High speed monitor data (Axis 13)
000171A0 to 000171BF	High speed monitor data (Axis 14)
000171C0 to 000171DF	High speed monitor data (Axis 15)
000171E0 to 000171FF	High speed monitor data (Axis 16)
00017200 to 0001721F	High speed monitor data (Axis 17)
00017220 to 0001723F	High speed monitor data (Axis 18)
00017240 to 0001725F	High speed monitor data (Axis 19)
00017260 to 0001727F	High speed monitor data (Axis 20)
00017280 to 0001729F	High speed monitor data (Axis 21)
000172A0 to 000172BF	High speed monitor data (Axis 22)
000172C0 to 000172DF	High speed monitor data (Axis 23)
000172E0 to 000172FF	High speed monitor data (Axis 24)
00017300 to 0001731F	High speed monitor data (Axis 25)
00017320 to 0001733F	High speed monitor data (Axis 26)
00017340 to 0001735F	High speed monitor data (Axis 27)
00017360 to 0001737F	High speed monitor data (Axis 28)
00017380 to 0001739F	High speed monitor data (Axis 29)
000173A0 to 000173BF	High speed monitor data (Axis 30)
000173C0 to 000173DF	High speed monitor data (Axis 31)
000173E0 to 000173FF	High speed monitor data (Axis 32)
00017400 to 0001741F	High speed monitor data (Axis 33)
00017420 to 0001743F	High speed monitor data (Axis 34)
00017440 to 0001745F	High speed monitor data (Axis 35)
00017460 to 0001747F	High speed monitor data (Axis 36)
00017480 to 0001749F	High speed monitor data (Axis 37)
000174A0 to 000174BF	High speed monitor data (Axis 38)
000174C0 to 000174DF	High speed monitor data (Axis 39)
000174E0 to 000174FF	High speed monitor data (Axis 40)
00017500 to 0001751F	High speed monitor data (Axis 41)
00017520 to 0001753F	High speed monitor data (Axis 42)
00017540 to 0001755F	High speed monitor data (Axis 43)
00017560 to 0001757F	High speed monitor data (Axis 44)
00017580 to 0001759F	High speed monitor data (Axis 45)
000175A0 to 000175BF	High speed monitor data (Axis 46)
000175C0 to 000175DF	High speed monitor data (Axis 47)
000175E0 to 000175FF	High speed monitor data (Axis 48)
00017600 to 0001761F	High speed monitor data (Axis 49)

Address (hexadecimal)	Content
00017620 to 0001763F	High speed monitor data (Axis 50)
00017640 to 0001765F	High speed monitor data (Axis 51)
00017660 to 0001767F	High speed monitor data (Axis 52)
00017680 to 0001769F	High speed monitor data (Axis 53)
000176A0 to 000176BF	High speed monitor data (Axis 54)
000176C0 to 000176DF	High speed monitor data (Axis 55)
000176E0 to 000176FF	High speed monitor data (Axis 56)
00017700 to 0001771F	High speed monitor data (Axis 57)
00017720 to 0001773F	High speed monitor data (Axis 58)
00017740 to 0001775F	High speed monitor data (Axis 59)
00017760 to 0001777F	High speed monitor data (Axis 60)
00017780 to 0001779F	High speed monitor data (Axis 61)
000177A0 to 000177BF	High speed monitor data (Axis 62)
000177C0 to 000177DF	High speed monitor data (Axis 63)
000177E0 to 000177FF	High speed monitor data (Axis 64)
00017800	For manufacturer setting
⋮	
00017FFF	

High Speed Monitor details

The addresses in the table are the addresses for the first axis. For the second axis and after, add "+20h" for each axis.

Address (hexadecimal)	Name
00017000	Command pos.
00017001	
00017002	
00017003	
00017004	Feedback pos.
00017005	
00017006	
00017007	
00017008	Speed
00017009	
0001700A	
0001700B	
0001700C	Feedback speed
0001700D	
0001700E	
0001700F	
00017010	Elec. current fdbk.
00017011	
00017012	External signal status
00017013	
00017014	Position droop
00017015	
00017016	
00017017	
00017018	For manufacturer setting
⋮	
0001701F	

11.10 Interpolation Group No. Being Executed

Address (hexadecimal)	Content
00018000	Interpolation group No. being executed (Axis 1)
00018001	Interpolation group No. being executed (Axis 2)
00018002	Interpolation group No. being executed (Axis 3)
00018003	Interpolation group No. being executed (Axis 4)
00018004	Interpolation group No. being executed (Axis 5)
00018005	Interpolation group No. being executed (Axis 6)
00018006	Interpolation group No. being executed (Axis 7)
00018007	Interpolation group No. being executed (Axis 8)
00018008	Interpolation group No. being executed (Axis 9)
00018009	Interpolation group No. being executed (Axis 10)
0001800A	Interpolation group No. being executed (Axis 11)
0001800B	Interpolation group No. being executed (Axis 12)
0001800C	Interpolation group No. being executed (Axis 13)
0001800D	Interpolation group No. being executed (Axis 14)
0001800E	Interpolation group No. being executed (Axis 15)
0001800F	Interpolation group No. being executed (Axis 16)
00018010	Interpolation group No. being executed (Axis 17)
00018011	Interpolation group No. being executed (Axis 18)
00018012	Interpolation group No. being executed (Axis 19)
00018013	Interpolation group No. being executed (Axis 20)
00018014	Interpolation group No. being executed (Axis 21)
00018015	Interpolation group No. being executed (Axis 22)
00018016	Interpolation group No. being executed (Axis 23)
00018017	Interpolation group No. being executed (Axis 24)
00018018	Interpolation group No. being executed (Axis 25)
00018019	Interpolation group No. being executed (Axis 26)
0001801A	Interpolation group No. being executed (Axis 27)
0001801B	Interpolation group No. being executed (Axis 28)
0001801C	Interpolation group No. being executed (Axis 29)
0001801D	Interpolation group No. being executed (Axis 30)
0001801E	Interpolation group No. being executed (Axis 31)
0001801F	Interpolation group No. being executed (Axis 32)
00018020	Interpolation group No. being executed (Axis 33)
00018021	Interpolation group No. being executed (Axis 34)
00018022	Interpolation group No. being executed (Axis 35)
00018023	Interpolation group No. being executed (Axis 36)
00018024	Interpolation group No. being executed (Axis 37)
00018025	Interpolation group No. being executed (Axis 38)
00018026	Interpolation group No. being executed (Axis 39)
00018027	Interpolation group No. being executed (Axis 40)
00018028	Interpolation group No. being executed (Axis 41)
00018029	Interpolation group No. being executed (Axis 42)
0001802A	Interpolation group No. being executed (Axis 43)
0001802B	Interpolation group No. being executed (Axis 44)
0001802C	Interpolation group No. being executed (Axis 45)
0001802D	Interpolation group No. being executed (Axis 46)
0001802E	Interpolation group No. being executed (Axis 47)
0001802F	Interpolation group No. being executed (Axis 48)
00018030	Interpolation group No. being executed (Axis 49)

Address (hexadecimal)	Content
00018031	Interpolation group No. being executed (Axis 50)
00018032	Interpolation group No. being executed (Axis 51)
00018033	Interpolation group No. being executed (Axis 52)
00018034	Interpolation group No. being executed (Axis 53)
00018035	Interpolation group No. being executed (Axis 54)
00018036	Interpolation group No. being executed (Axis 55)
00018037	Interpolation group No. being executed (Axis 56)
00018038	Interpolation group No. being executed (Axis 57)
00018039	Interpolation group No. being executed (Axis 58)
0001803A	Interpolation group No. being executed (Axis 59)
0001803B	Interpolation group No. being executed (Axis 60)
0001803C	Interpolation group No. being executed (Axis 61)
0001803D	Interpolation group No. being executed (Axis 62)
0001803E	Interpolation group No. being executed (Axis 63)
0001803F	Interpolation group No. being executed (Axis 64)
00018040	For manufacturer setting
⋮	
0001807F	

Interpolation group No. being executed

Stores the interpolation group No. being executed in axes that are executing the interpolation operation.

When the interpolation operation is completed, the interpolation group No. being executed is cleared and changes to "0".

Interpolation group No. being executed details

The addresses in the table are the addresses for the first axis. For the second axis and after, add "+1h" for each axis.

Address (hexadecimal)	Content
00018000	Interpolation group No. being executed

11.11 Point No. Offset

The start No. in the point table for each axis can be designated using the point No. offset.

The amount of offset from the start point in the point table is set by the point No. for the point No. offset.

When setting up the point table, use the following equation to derive the 2-point memory address.

The address of the dual port memory = 020000h + 30h × point No. offset

<Example> When the point No. offset of the axis 2 is "0020h"
020000h + 30h × 0020h = 020600h
Set the point table for the axis 2 from "020600h".

Address (hexadecimal)	Content	Initial value
00018F00, 00018F01	Point No. offset (Axis 1)	0000h
00018F02, 00018F03	Point No. offset (Axis 2)	0020h
00018F04, 00018F05	Point No. offset (Axis 3)	0040h
00018F06, 00018F07	Point No. offset (Axis 4)	0060h
00018F08, 00018F09	Point No. offset (Axis 5)	0080h
00018F0A, 00018F0B	Point No. offset (Axis 6)	00A0h
00018F0C, 00018F0D	Point No. offset (Axis 7)	00C0h
00018F0E, 00018F0F	Point No. offset (Axis 8)	00E0h
00018F10, 00018F11	Point No. offset (Axis 9)	0100h
00018F12, 00018F13	Point No. offset (Axis 10)	0120h
00018F14, 00018F15	Point No. offset (Axis 11)	0140h
00018F16, 00018F17	Point No. offset (Axis 12)	0160h
00018F18, 00018F19	Point No. offset (Axis 13)	0180h
00018F1A, 00018F1B	Point No. offset (Axis 14)	01A0h
00018F1C, 00018F1D	Point No. offset (Axis 15)	01C0h
00018F1E, 00018F1F	Point No. offset (Axis 16)	01E0h
00018F20, 00018F21	Point No. offset (Axis 17)	0200h
00018F22, 00018F23	Point No. offset (Axis 18)	0220h
00018F24, 00018F25	Point No. offset (Axis 19)	0240h
00018F26, 00018F27	Point No. offset (Axis 20)	0260h
00018F28, 00018F29	Point No. offset (Axis 21)	0280h
00018F2A, 00018F2B	Point No. offset (Axis 22)	02A0h
00018F2C, 00018F2D	Point No. offset (Axis 23)	02C0h
00018F2E, 00018F2F	Point No. offset (Axis 24)	02E0h
00018F30, 00018F31	Point No. offset (Axis 25)	0300h
00018F32, 00018F33	Point No. offset (Axis 26)	0320h
00018F34, 00018F35	Point No. offset (Axis 27)	0340h
00018F36, 00018F37	Point No. offset (Axis 28)	0360h
00018F38, 00018F39	Point No. offset (Axis 29)	0380h
00018F3A, 00018F3B	Point No. offset (Axis 30)	03A0h
00018F3C, 00018F3D	Point No. offset (Axis 31)	03C0h
00018F3E, 00018F3F	Point No. offset (Axis 32)	03E0h
00018F40, 00018F41	Point No. offset (Axis 33)	0400h
00018F42, 00018F43	Point No. offset (Axis 34)	0420h
00018F44, 00018F45	Point No. offset (Axis 35)	0440h
00018F46, 00018F47	Point No. offset (Axis 36)	0460h
00018F48, 00018F49	Point No. offset (Axis 37)	0480h
00018F4A, 00018F4B	Point No. offset (Axis 38)	04A0h
00018F4C, 00018F4D	Point No. offset (Axis 39)	04C0h
00018F4E, 00018F4F	Point No. offset (Axis 40)	04E0h
00018F50, 00018F51	Point No. offset (Axis 41)	0500h
00018F52, 00018F53	Point No. offset (Axis 42)	0520h

Address (hexadecimal)	Content	Initial value
00018F54, 00018F55	Point No. offset (Axis 43)	0540h
00018F56, 00018F57	Point No. offset (Axis 44)	0560h
00018F58, 00018F59	Point No. offset (Axis 45)	0580h
00018F5A, 00018F5B	Point No. offset (Axis 46)	05A0h
00018F5C, 00018F5D	Point No. offset (Axis 47)	05C0h
00018F5E, 00018F5F	Point No. offset (Axis 48)	05E0h
00018F60, 00018F61	Point No. offset (Axis 49)	0600h
00018F62, 00018F63	Point No. offset (Axis 50)	0620h
00018F64, 00018F65	Point No. offset (Axis 51)	0640h
00018F66, 00018F67	Point No. offset (Axis 52)	0660h
00018F68, 00018F69	Point No. offset (Axis 53)	0680h
00018F6A, 00018F6B	Point No. offset (Axis 54)	06A0h
00018F6C, 00018F6D	Point No. offset (Axis 55)	06C0h
00018F6E, 00018F6F	Point No. offset (Axis 56)	06E0h
00018F70, 00018F71	Point No. offset (Axis 57)	0700h
00018F72, 00018F73	Point No. offset (Axis 58)	0720h
00018F74, 00018F75	Point No. offset (Axis 59)	0740h
00018F76, 00018F77	Point No. offset (Axis 60)	0760h
00018F78, 00018F79	Point No. offset (Axis 61)	0780h
00018F7A, 00018F7B	Point No. offset (Axis 62)	07A0h
00018F7C, 00018F7D	Point No. offset (Axis 63)	07C0h
00018F7E, 00018F7F	Point No. offset (Axis 64)	07E0h
00018F80	For manufacturer setting	—
⋮		
00018FFF		

Point No. Offset details

The addresses in the table are the addresses for the first axis. For the second axis and after, add "+2h" for each axis.

Address (hexadecimal)	Content
00018F00	Point No. offset
00018F01	

11.12 Point Table

Address (hexadecimal)	Content
00019000 to 0001902F	Point data (point 0)
00019030 to 0001905F	Point data (point 1)
00019060 to 0001908F	Point data (point 2)
00019090 to 000190BF	Point data (point 3)
000190C0 to 000190EF	Point data (point 4)
000191F0 to 0001911F	Point data (point 5)
00019120 to 0001914F	Point data (point 6)
00019150 to 0001917F	Point data (point 7)
00019180 to 000191AF	Point data (point 8)
000191B0 to 000191DF	Point data (point 9)
000191E0 to 0001920F	Point data (point 10)
00019210 to 0001923F	Point data (point 11)
00019240 to 0001926F	Point data (point 12)
00019270 to 0001929F	Point data (point 13)
000192A0 to 000192CF	Point data (point 14)
000192D0 to 000192FF	Point data (point 15)
00019300 to 0001932F	Point data (point 16)
⋮	⋮
00030FD0 to 00030FFF	Point data (point 2047)
00031000	For manufacturer setting
⋮	
00048FFF	

Point Table details

The addresses in the table are the addresses for the first axis. For the second axis and after, add "+30h" for each axis.

Address (hexadecimal)	Content
00019000	Position data [command unit]
00019001	
00019002	
00019003	
00019004	Speed data [speed unit]
00019005	
00019006	
00019007	
00019008	Acc. [ms]
00019009	
0001900A	Dec. [ms]
0001900B	
0001900C	Dwell/Predwell [ms]
0001900D	
0001900E	Auxiliary command
0001900F	
00019010	Other axes start designation
00019011	
00019012	
00019013	
00019014	S-curve ratio [%]
00019015	Profile No. of pressure control

Address (hexadecimal)	Content
00019016	For manufacturer setting
00019017	
00019018	Interpolation axis No.
00019019	
0001901A	
0001901B	
0001901C	Circular arc coordinate
0001901D	
0001901E	
0001901F	
00019020	Acc/Dec data 1
00019021	
00019022	Acc/Dec data 2
00019023	
00019024	Acc/Dec data 3
00019025	
00019026	Acc/Dec data 4
00019027	
00019028	Auxiliary command 2
00019029	
0001902A	For manufacturer setting
⋮	
0001902F	

11.13 Factor of Interrupt

Outputting with factor of interrupt

When an interrupt occurs, turns ON the bit corresponding to the axis No. or system which is the factor of the interrupt.

Address (hexadecimal)	Content	Remarks
00061000	Outputting factor of system interrupt	System (bit0)
00061001		
00061002	For manufacturer setting	—
⋮		
0006103F		
00061040	Outputting factor of axis interrupt 1 (axis 1 to 32)	Axis 1 (bit0) to axis 32 (bit31)
00061041		
00061042		
00061043		
00061044	Outputting factor of axis interrupt 2 (axis 33 to 64)	Axis 33 (bit0) to axis 64 (bit31)
00061045		
00061046		
00061047		
00061048	For manufacturer setting	—
⋮		
0006107F		

System interrupt factors

Address (hexadecimal)	Content
00061080	Details on factor of system interrupt
00061081	
00061082	For manufacturer setting
⋮	
000610FF	

Details on factor of system interrupt

For each bit, "0" stands for invalid and "1" stands for valid.

Address (hexadecimal)	Bit	Symbol	Signal name
00061080, 00061081	0	iSYSE	During system status code error (interrupt)
	1	iCALM	During system alarm (interrupt)
	2	iEMIO	During forced stop (interrupt)
	3	iSEO	During system error (interrupt)
	4	—	For manufacturer setting
	5		
	6		
	7		
	8	iOASF	Factor of other axes start interrupt is being sent (interrupt)
	9	iPPI	Factor of pass position interrupt is being sent (interrupt)
	10	—	For manufacturer setting
	11		
	12		
	13		
	14		
	15		

Factor of axis interrupt

For details about the factor of axis interrupt, refer to the following.

Address (hexadecimal)	Content
00061100 to 00061103	Details on factor of axis interrupt (Axis 1)
00061104 to 00061107	Details on factor of axis interrupt (Axis 2)
00061108 to 0006110B	Details on factor of axis interrupt (Axis 3)
0006110C to 0006110F	Details on factor of axis interrupt (Axis 4)
00061110 to 00061113	Details on factor of axis interrupt (Axis 5)
00061114 to 00061117	Details on factor of axis interrupt (Axis 6)
00061118 to 0006111B	Details on factor of axis interrupt (Axis 7)
0006111C to 0006111F	Details on factor of axis interrupt (Axis 8)
00061120 to 00061123	Details on factor of axis interrupt (Axis 9)
00061124 to 00061127	Details on factor of axis interrupt (Axis 10)
00061128 to 0006112B	Details on factor of axis interrupt (Axis 11)
0006112C to 0006112F	Details on factor of axis interrupt (Axis 12)
00061130 to 00061133	Details on factor of axis interrupt (Axis 13)
00061134 to 00061137	Details on factor of axis interrupt (Axis 14)
00061138 to 0006113B	Details on factor of axis interrupt (Axis 15)
0006113C to 0006113F	Details on factor of axis interrupt (Axis 16)
00061140 to 00061143	Details on factor of axis interrupt (Axis 17)
00061144 to 00061147	Details on factor of axis interrupt (Axis 18)
00061148 to 0006114B	Details on factor of axis interrupt (Axis 19)
0006114C to 0006114F	Details on factor of axis interrupt (Axis 20)
00061150 to 00061153	Details on factor of axis interrupt (Axis 21)
00061154 to 00061157	Details on factor of axis interrupt (Axis 22)
00061158 to 0006115B	Details on factor of axis interrupt (Axis 23)
0006115C to 0006115F	Details on factor of axis interrupt (Axis 24)
00061160 to 00061163	Details on factor of axis interrupt (Axis 25)
00061164 to 00061167	Details on factor of axis interrupt (Axis 26)
00061168 to 0006116B	Details on factor of axis interrupt (Axis 27)
0006116C to 0006116F	Details on factor of axis interrupt (Axis 28)
00061170 to 00061173	Details on factor of axis interrupt (Axis 29)
00061174 to 00061177	Details on factor of axis interrupt (Axis 30)
00061178 to 0006117B	Details on factor of axis interrupt (Axis 31)
0006117C to 0006117F	Details on factor of axis interrupt (Axis 32)
00061180 to 00061183	Details on factor of axis interrupt (Axis 33)
00061184 to 00061187	Details on factor of axis interrupt (Axis 34)
00061188 to 0006118B	Details on factor of axis interrupt (Axis 35)
0006118C to 0006118F	Details on factor of axis interrupt (Axis 36)
00061190 to 00061193	Details on factor of axis interrupt (Axis 37)
00061194 to 00061197	Details on factor of axis interrupt (Axis 38)
00061198 to 0006119B	Details on factor of axis interrupt (Axis 39)
0006119C to 0006119F	Details on factor of axis interrupt (Axis 40)
000611A0 to 000611A3	Details on factor of axis interrupt (Axis 41)
000611A4 to 000611A7	Details on factor of axis interrupt (Axis 42)
000611A8 to 000611AB	Details on factor of axis interrupt (Axis 43)
000611AC to 000611AF	Details on factor of axis interrupt (Axis 44)
000611B0 to 000611B3	Details on factor of axis interrupt (Axis 45)
000611B4 to 000611B7	Details on factor of axis interrupt (Axis 46)
000611B8 to 000611BB	Details on factor of axis interrupt (Axis 47)
000611BC to 000611BF	Details on factor of axis interrupt (Axis 48)

Address (hexadecimal)	Content
000611C0 to 000611C3	Details on factor of axis interrupt (Axis 49)
000611C4 to 000611C7	Details on factor of axis interrupt (Axis 50)
000611C8 to 000611CB	Details on factor of axis interrupt (Axis 51)
000611CC to 000611CF	Details on factor of axis interrupt (Axis 52)
000611D0 to 000611D3	Details on factor of axis interrupt (Axis 53)
000611D4 to 000611D7	Details on factor of axis interrupt (Axis 54)
000611D8 to 000611DB	Details on factor of axis interrupt (Axis 55)
000611DC to 000611DF	Details on factor of axis interrupt (Axis 56)
000611E0 to 000611E3	Details on factor of axis interrupt (Axis 57)
000611E4 to 000611E7	Details on factor of axis interrupt (Axis 58)
000611E8 to 000611EB	Details on factor of axis interrupt (Axis 59)
000611EC to 000611EF	Details on factor of axis interrupt (Axis 60)
000611F0 to 000611F3	Details on factor of axis interrupt (Axis 61)
000611F4 to 000611F7	Details on factor of axis interrupt (Axis 62)
000611F8 to 000611FB	Details on factor of axis interrupt (Axis 63)
000611FC to 000611FF	Details on factor of axis interrupt (Axis 64)
00061200	For manufacturer setting
⋮	
000612FF	

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Details on factor of axis interrupt

The addresses in the table are the addresses for the first axis. For the second axis and after, add "+4h" for each axis.

For each bit, "0" stands for invalid and "1" stands for valid.

Address (hexadecimal)	Bit	Symbol	Signal name
00061100 to 00061103	0	iRDY	Servo ready (interrupt)
	1	iINP	In-position (interrupt)
	2	iZSP	Zero speed (interrupt)
	3	iZPAS	Passed Z-phase (interrupt)
	4	iTLC	Torque limit effective (interrupt)
	5	iSALM	Drive unit alarm (interrupt)
	6	iSWRN	Drive unit warning (interrupt)
	7	iABSE	Absolute position erased (interrupt)
	8	iOP	During operation (interrupt)
	9	iCPO	Rough match (interrupt)
	10	iPF	Positioning complete (interrupt)
	11	iZP	Home position return complete (interrupt)
	12	iSMZ	During smoothing of stopping (interrupt)
	13	iOALM	Operation alarm (interrupt)
	14	iOPF	Completion of operation (interrupt)
	15	iPSW	Position switch (interrupt)
	16	—	For manufacturer setting
	17		
	18		
	19		
	20		
	21		
	22		
	23		
	24		
	25	iSINP	Drive unit in-position (interrupt)
	26	—	For manufacturer setting
	27		
	28		
	29		
	30		
	31		

Factor of other axes start interrupt

Address (hexadecimal)	Content	Reference
00061300 00061301 00061302 00061303	Factor of other axes start interrupt 1 (data 1 to 32)	Page 514 Factor of other axes start interrupt 1
00061304 00061305 00061306 00061307	Factor of other axes start interrupt 2 (data 33 to 64)	Page 515 Factor of other axes start interrupt 2
00061308 ⋮ 0006133F	For manufacturer setting	—
00061340 ⋮ 0006135F	Details on factor of other axes start interrupt 1 (data 1 to 32)	Page 516 Details on factor of other axes start interrupt 1
00061360 ⋮ 0006137F	Details on factor of other axes start interrupt 2 (data 33 to 64)	Page 517 Details on factor of other axes start interrupt 2
00061380 ⋮ 000613FF	For manufacturer setting	—

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Factor of other axes start interrupt

■Factor of other axes start interrupt 1

When the outputting with factor of other axes start interrupt is being sent (iOASF) is ON, the applicable bit corresponding to other axes start data No. turns ON.

Address (hexadecimal)	Bit	Symbol	Signal name
00061300 to 00061303	0	iOAS1	Factor of other axes start interrupt 1
	1	iOAS2	Factor of other axes start interrupt 2
	2	iOAS3	Factor of other axes start interrupt 3
	3	iOAS4	Factor of other axes start interrupt 4
	4	iOAS5	Factor of other axes start interrupt 5
	5	iOAS6	Factor of other axes start interrupt 6
	6	iOAS7	Factor of other axes start interrupt 7
	7	iOAS8	Factor of other axes start interrupt 8
	8	iOAS9	Factor of other axes start interrupt 9
	9	iOAS10	Factor of other axes start interrupt 10
	10	iOAS11	Factor of other axes start interrupt 11
	11	iOAS12	Factor of other axes start interrupt 12
	12	iOAS13	Factor of other axes start interrupt 13
	13	iOAS14	Factor of other axes start interrupt 14
	14	iOAS15	Factor of other axes start interrupt 15
	15	iOAS16	Factor of other axes start interrupt 16
	16	iOAS17	Factor of other axes start interrupt 17
	17	iOAS18	Factor of other axes start interrupt 18
	18	iOAS19	Factor of other axes start interrupt 19
	19	iOAS20	Factor of other axes start interrupt 20
	20	iOAS21	Factor of other axes start interrupt 21
	21	iOAS22	Factor of other axes start interrupt 22
	22	iOAS23	Factor of other axes start interrupt 23
	23	iOAS24	Factor of other axes start interrupt 24
	24	iOAS25	Factor of other axes start interrupt 25
	25	iOAS26	Factor of other axes start interrupt 26
	26	iOAS27	Factor of other axes start interrupt 27
	27	iOAS28	Factor of other axes start interrupt 28
	28	iOAS29	Factor of other axes start interrupt 29
	29	iOAS30	Factor of other axes start interrupt 30
	30	iOAS31	Factor of other axes start interrupt 31
	31	iOAS32	Factor of other axes start interrupt 32

■Factor of other axes start interrupt 2

When the outputting with factor of other axes start interrupt is being sent (iOASF) is ON, the applicable bit corresponding to other axes start data No. turns ON.

Address (hexadecimal)	Bit	Symbol	Signal name
00061304 to 00061307	0	iOAS33	Factor of other axes start interrupt 33
	1	iOAS34	Factor of other axes start interrupt 34
	2	iOAS35	Factor of other axes start interrupt 35
	3	iOAS36	Factor of other axes start interrupt 36
	4	iOAS37	Factor of other axes start interrupt 37
	5	iOAS38	Factor of other axes start interrupt 38
	6	iOAS39	Factor of other axes start interrupt 39
	7	iOAS40	Factor of other axes start interrupt 40
	8	iOAS41	Factor of other axes start interrupt 41
	9	iOAS42	Factor of other axes start interrupt 42
	10	iOAS43	Factor of other axes start interrupt 43
	11	iOAS44	Factor of other axes start interrupt 44
	12	iOAS45	Factor of other axes start interrupt 45
	13	iOAS46	Factor of other axes start interrupt 46
	14	iOAS47	Factor of other axes start interrupt 47
	15	iOAS48	Factor of other axes start interrupt 48
	16	iOAS49	Factor of other axes start interrupt 49
	17	iOAS50	Factor of other axes start interrupt 50
	18	iOAS51	Factor of other axes start interrupt 51
	19	iOAS52	Factor of other axes start interrupt 52
	20	iOAS53	Factor of other axes start interrupt 53
	21	iOAS54	Factor of other axes start interrupt 54
	22	iOAS55	Factor of other axes start interrupt 55
	23	iOAS56	Factor of other axes start interrupt 56
	24	iOAS57	Factor of other axes start interrupt 57
	25	iOAS58	Factor of other axes start interrupt 58
	26	iOAS59	Factor of other axes start interrupt 59
	27	iOAS60	Factor of other axes start interrupt 60
	28	iOAS61	Factor of other axes start interrupt 61
	29	iOAS62	Factor of other axes start interrupt 62
	30	iOAS63	Factor of other axes start interrupt 63
	31	iOAS64	Factor of other axes start interrupt 64

Details on factor of other axes start interrupt

■Details on factor of other axes start interrupt 1

Address (hexadecimal)	Signal name
00061340	Details on factor of other axes start interrupt 1
00061341	Details on factor of other axes start interrupt 2
00061342	Details on factor of other axes start interrupt 3
00061343	Details on factor of other axes start interrupt 4
00061344	Details on factor of other axes start interrupt 5
00061345	Details on factor of other axes start interrupt 6
00061346	Details on factor of other axes start interrupt 7
00061347	Details on factor of other axes start interrupt 8
00061348	Details on factor of other axes start interrupt 9
00061349	Details on factor of other axes start interrupt 10
0006134A	Details on factor of other axes start interrupt 11
0006134B	Details on factor of other axes start interrupt 12
0006134C	Details on factor of other axes start interrupt 13
0006134D	Details on factor of other axes start interrupt 14
0006134E	Details on factor of other axes start interrupt 15
0006134F	Details on factor of other axes start interrupt 16
00061350	Details on factor of other axes start interrupt 17
00061351	Details on factor of other axes start interrupt 18
00061352	Details on factor of other axes start interrupt 19
00061353	Details on factor of other axes start interrupt 20
00061354	Details on factor of other axes start interrupt 21
00061355	Details on factor of other axes start interrupt 22
00061356	Details on factor of other axes start interrupt 23
00061357	Details on factor of other axes start interrupt 24
00061358	Details on factor of other axes start interrupt 25
00061359	Details on factor of other axes start interrupt 26
0006135A	Details on factor of other axes start interrupt 27
0006135B	Details on factor of other axes start interrupt 28
0006135C	Details on factor of other axes start interrupt 29
0006135D	Details on factor of other axes start interrupt 30
0006135E	Details on factor of other axes start interrupt 31
0006135F	Details on factor of other axes start interrupt 32

• Details on factor of other axes start interrupt □

When the factor of other axes start interrupt (iOAS□) is ON, the interrupt factor of other axes start status bit corresponding to other axes start data No. turns ON.

The addresses in the table for the details on factor of other axes start interrupt 1. For the details on factor of other axes start interrupt 2 and after, add "+1h" for each details on factor of other axes start interrupt.

Address (hexadecimal)	Bit	Symbol[1]	Signal name[1]
00061340	0	iOSOP□	Other axes start notice □ (interrupt)
	1	iOSFIN□	Other axes start complete □ (interrupt)
	2	iOSERR□	Other axes start incomplete □ (interrupt)
	3	—	For manufacturer setting
	4		
	5		
	6		
	7		

[1] □: Other axes start No. (1 to 32)

■Details on factor of other axes start interrupt 2

Address (hexadecimal)	Signal name
00061360	Details on factor of other axes start interrupt 33
00061361	Details on factor of other axes start interrupt 34
00061362	Details on factor of other axes start interrupt 35
00061363	Details on factor of other axes start interrupt 36
00061364	Details on factor of other axes start interrupt 37
00061365	Details on factor of other axes start interrupt 38
00061366	Details on factor of other axes start interrupt 39
00061367	Details on factor of other axes start interrupt 40
00061368	Details on factor of other axes start interrupt 41
00061369	Details on factor of other axes start interrupt 42
0006136A	Details on factor of other axes start interrupt 43
0006136B	Details on factor of other axes start interrupt 44
0006136C	Details on factor of other axes start interrupt 45
0006136D	Details on factor of other axes start interrupt 46
0006136E	Details on factor of other axes start interrupt 47
0006136F	Details on factor of other axes start interrupt 48
00061370	Details on factor of other axes start interrupt 49
00061371	Details on factor of other axes start interrupt 50
00061372	Details on factor of other axes start interrupt 51
00061373	Details on factor of other axes start interrupt 52
00061374	Details on factor of other axes start interrupt 53
00061375	Details on factor of other axes start interrupt 54
00061376	Details on factor of other axes start interrupt 55
00061377	Details on factor of other axes start interrupt 56
00061378	Details on factor of other axes start interrupt 57
00061379	Details on factor of other axes start interrupt 58
0006137A	Details on factor of other axes start interrupt 59
0006137B	Details on factor of other axes start interrupt 60
0006137C	Details on factor of other axes start interrupt 61
0006137D	Details on factor of other axes start interrupt 62
0006137E	Details on factor of other axes start interrupt 63
0006137F	Details on factor of other axes start interrupt 64

• Details on factor of other axes start interrupt □

When the factor of other axes start interrupt (iOAS□) is ON, the interrupt factor of other axes start status bit corresponding to other axes start data No. turns ON.

The addresses in the table are the addresses for the details on factor of other axes start interrupt 33. For the details on factor of other axes start interrupt 34 and after, add "+1h" for each details on factor of other axes start interrupt.

Address (hexadecimal)	Bit	Symbol[*1]	Signal name[*1]
00061360	0	iOSOP□	Other axes start notice □ (interrupt)
	1	iOSFIN□	Other axes start complete □ (interrupt)
	2	iOSERR□	Other axes start incomplete □ (interrupt)
	3	—	For manufacturer setting
	4		
	5		
	6		
	7		

*1 □: Other axes start No. (33 to 64)

Factor of pass position interrupt

Address (hexadecimal)	Content	Reference
00061400	Factor of pass position interrupt 1 (condition 1 to condition 32)	Page 519 Factor of pass position interrupt 1
00061401		
00061402		
00061403		
00061404	Factor of pass position interrupt 2 (condition 33 to condition 64)	Page 520 Factor of pass position interrupt 2
00061405		
00061406		
00061407		
00061408	Factor of pass position interrupt 3 (condition 65 to condition 96)	Page 521 Factor of pass position interrupt 3
00061409		
0006140A		
0006140B		
0006140C	Factor of pass position interrupt 4 (condition 97 to condition 128)	Page 522 Factor of pass position interrupt 4
0006140D		
0006140E		
0006140F		
00061410 ⋮ 0006143F	For manufacturer setting	—
00061440 ⋮ 0006145F	Details on factor of pass position interrupt 1 (condition 1 to condition 32)	Page 523 Details on factor of pass position interrupt 1
00061460 ⋮ 0006147F	Details on factor of pass position interrupt 2 (condition 33 to condition 64)	Page 524 Details on factor of pass position interrupt 2
00061480 ⋮ 0006149F	Details on factor of pass position interrupt 3 (condition 65 to condition 96)	Page 525 Details on factor of pass position interrupt 3
000614A0 ⋮ 000614BF	Details on factor of pass position interrupt 4 (condition 97 to condition 128)	Page 526 Details on factor of pass position interrupt 4
000614C0 ⋮ 000615FF	For manufacturer setting	—

Factor of pass position interrupt

When the outputting with factor of pass position interrupt is being sent (iPPI) is ON, the bit corresponding to the pass position condition No. of the factor of the pass position interrupt turns ON.

■Factor of pass position interrupt 1

Address (hexadecimal)	Bit	Symbol	Signal name
00061400 to 00061403	0	iPPI1	Factor of pass position interrupt 1
	1	iPPI2	Factor of pass position interrupt 2
	2	iPPI3	Factor of pass position interrupt 3
	3	iPPI4	Factor of pass position interrupt 4
	4	iPPI5	Factor of pass position interrupt 5
	5	iPPI6	Factor of pass position interrupt 6
	6	iPPI7	Factor of pass position interrupt 7
	7	iPPI8	Factor of pass position interrupt 8
	8	iPPI9	Factor of pass position interrupt 9
	9	iPPI10	Factor of pass position interrupt 10
	10	iPPI11	Factor of pass position interrupt 11
	11	iPPI12	Factor of pass position interrupt 12
	12	iPPI13	Factor of pass position interrupt 13
	13	iPPI14	Factor of pass position interrupt 14
	14	iPPI15	Factor of pass position interrupt 15
	15	iPPI16	Factor of pass position interrupt 16
	16	iPPI17	Factor of pass position interrupt 17
	17	iPPI18	Factor of pass position interrupt 18
	18	iPPI19	Factor of pass position interrupt 19
	19	iPPI20	Factor of pass position interrupt 20
	20	iPPI21	Factor of pass position interrupt 21
	21	iPPI22	Factor of pass position interrupt 22
	22	iPPI23	Factor of pass position interrupt 23
	23	iPPI24	Factor of pass position interrupt 24
	24	iPPI25	Factor of pass position interrupt 25
	25	iPPI26	Factor of pass position interrupt 26
	26	iPPI27	Factor of pass position interrupt 27
	27	iPPI28	Factor of pass position interrupt 28
	28	iPPI29	Factor of pass position interrupt 29
	29	iPPI30	Factor of pass position interrupt 30
	30	iPPI31	Factor of pass position interrupt 31
	31	iPPI32	Factor of pass position interrupt 32

■Factor of pass position interrupt 2

Address (hexadecimal)	Bit	Symbol	Signal name
00061404 to 00061407	0	iPPI33	Factor of pass position interrupt 33
	1	iPPI34	Factor of pass position interrupt 34
	2	iPPI35	Factor of pass position interrupt 35
	3	iPPI36	Factor of pass position interrupt 36
	4	iPPI37	Factor of pass position interrupt 37
	5	iPPI38	Factor of pass position interrupt 38
	6	iPPI39	Factor of pass position interrupt 39
	7	iPPI40	Factor of pass position interrupt 40
	8	iPPI41	Factor of pass position interrupt 41
	9	iPPI42	Factor of pass position interrupt 42
	10	iPPI43	Factor of pass position interrupt 43
	11	iPPI44	Factor of pass position interrupt 44
	12	iPPI45	Factor of pass position interrupt 45
	13	iPPI46	Factor of pass position interrupt 46
	14	iPPI47	Factor of pass position interrupt 47
	15	iPPI48	Factor of pass position interrupt 48
	16	iPPI49	Factor of pass position interrupt 49
	17	iPPI50	Factor of pass position interrupt 50
	18	iPPI51	Factor of pass position interrupt 51
	19	iPPI52	Factor of pass position interrupt 52
	20	iPPI53	Factor of pass position interrupt 53
	21	iPPI54	Factor of pass position interrupt 54
	22	iPPI55	Factor of pass position interrupt 55
	23	iPPI56	Factor of pass position interrupt 56
	24	iPPI57	Factor of pass position interrupt 57
	25	iPPI58	Factor of pass position interrupt 58
	26	iPPI59	Factor of pass position interrupt 59
	27	iPPI60	Factor of pass position interrupt 60
	28	iPPI61	Factor of pass position interrupt 61
	29	iPPI62	Factor of pass position interrupt 62
	30	iPPI63	Factor of pass position interrupt 63
	31	iPPI64	Factor of pass position interrupt 64

■Factor of pass position interrupt 3

Address (hexadecimal)	Bit	Symbol	Signal name
00061408 to 0006140B	0	iPPI65	Factor of pass position interrupt 65
	1	iPPI66	Factor of pass position interrupt 66
	2	iPPI67	Factor of pass position interrupt 67
	3	iPPI68	Factor of pass position interrupt 68
	4	iPPI69	Factor of pass position interrupt 69
	5	iPPI70	Factor of pass position interrupt 70
	6	iPPI71	Factor of pass position interrupt 71
	7	iPPI72	Factor of pass position interrupt 72
	8	iPPI73	Factor of pass position interrupt 73
	9	iPPI74	Factor of pass position interrupt 74
	10	iPPI75	Factor of pass position interrupt 75
	11	iPPI76	Factor of pass position interrupt 76
	12	iPPI77	Factor of pass position interrupt 77
	13	iPPI78	Factor of pass position interrupt 78
	14	iPPI79	Factor of pass position interrupt 79
	15	iPPI80	Factor of pass position interrupt 80
	16	iPPI81	Factor of pass position interrupt 81
	17	iPPI82	Factor of pass position interrupt 82
	18	iPPI83	Factor of pass position interrupt 83
	19	iPPI84	Factor of pass position interrupt 84
	20	iPPI85	Factor of pass position interrupt 85
	21	iPPI86	Factor of pass position interrupt 86
	22	iPPI87	Factor of pass position interrupt 87
	23	iPPI88	Factor of pass position interrupt 88
	24	iPPI89	Factor of pass position interrupt 89
	25	iPPI90	Factor of pass position interrupt 90
	26	iPPI91	Factor of pass position interrupt 91
	27	iPPI92	Factor of pass position interrupt 92
	28	iPPI93	Factor of pass position interrupt 93
	29	iPPI94	Factor of pass position interrupt 94
	30	iPPI95	Factor of pass position interrupt 95
	31	iPPI96	Factor of pass position interrupt 96

■Factor of pass position interrupt 4

Address (hexadecimal)	Bit	Symbol	Signal name
0006140C to 0006140F	0	iPPI97	Factor of pass position interrupt 97
	1	iPPI98	Factor of pass position interrupt 98
	2	iPPI99	Factor of pass position interrupt 99
	3	iPPI100	Factor of pass position interrupt 100
	4	iPPI101	Factor of pass position interrupt 101
	5	iPPI102	Factor of pass position interrupt 102
	6	iPPI103	Factor of pass position interrupt 103
	7	iPPI104	Factor of pass position interrupt 104
	8	iPPI105	Factor of pass position interrupt 105
	9	iPPI106	Factor of pass position interrupt 106
	10	iPPI107	Factor of pass position interrupt 107
	11	iPPI108	Factor of pass position interrupt 108
	12	iPPI109	Factor of pass position interrupt 109
	13	iPPI110	Factor of pass position interrupt 110
	14	iPPI111	Factor of pass position interrupt 111
	15	iPPI112	Factor of pass position interrupt 112
	16	iPPI113	Factor of pass position interrupt 113
	17	iPPI114	Factor of pass position interrupt 114
	18	iPPI115	Factor of pass position interrupt 115
	19	iPPI116	Factor of pass position interrupt 116
	20	iPPI117	Factor of pass position interrupt 117
	21	iPPI118	Factor of pass position interrupt 118
	22	iPPI119	Factor of pass position interrupt 119
	23	iPPI120	Factor of pass position interrupt 120
	24	iPPI121	Factor of pass position interrupt 121
	25	iPPI122	Factor of pass position interrupt 122
	26	iPPI123	Factor of pass position interrupt 123
	27	iPPI124	Factor of pass position interrupt 124
	28	iPPI125	Factor of pass position interrupt 125
	29	iPPI126	Factor of pass position interrupt 126
	30	iPPI127	Factor of pass position interrupt 127
	31	iPPI128	Factor of pass position interrupt 128

Details on factor of pass position interrupt

■Details on factor of pass position interrupt 1

Address (hexadecimal)	Name
00061440	Details on factor of pass position interrupt 1
00061441	Details on factor of pass position interrupt 2
00061442	Details on factor of pass position interrupt 3
00061443	Details on factor of pass position interrupt 4
00061444	Details on factor of pass position interrupt 5
00061445	Details on factor of pass position interrupt 6
00061446	Details on factor of pass position interrupt 7
00061447	Details on factor of pass position interrupt 8
00061448	Details on factor of pass position interrupt 9
00061449	Details on factor of pass position interrupt 10
0006144A	Details on factor of pass position interrupt 11
0006144B	Details on factor of pass position interrupt 12
0006144C	Details on factor of pass position interrupt 13
0006144D	Details on factor of pass position interrupt 14
0006144E	Details on factor of pass position interrupt 15
0006144F	Details on factor of pass position interrupt 16
00061450	Details on factor of pass position interrupt 17
00061451	Details on factor of pass position interrupt 18
00061452	Details on factor of pass position interrupt 19
00061453	Details on factor of pass position interrupt 20
00061454	Details on factor of pass position interrupt 21
00061455	Details on factor of pass position interrupt 22
00061456	Details on factor of pass position interrupt 23
00061457	Details on factor of pass position interrupt 24
00061458	Details on factor of pass position interrupt 25
00061459	Details on factor of pass position interrupt 26
0006145A	Details on factor of pass position interrupt 27
0006145B	Details on factor of pass position interrupt 28
0006145C	Details on factor of pass position interrupt 29
0006145D	Details on factor of pass position interrupt 30
0006145E	Details on factor of pass position interrupt 31
0006145F	Details on factor of pass position interrupt 32

- Details on factor of pass position interrupt □

  When the outputting with factor of pass position interrupt (iPPI□) is ON, the pass position status bit corresponding to the pass position condition No. turns ON.

  The addresses in the table are the addresses for the details on factor of pass position interrupt 1. For the details on factor of pass position interrupt 2 and above, add "+1h" for each details on factor of pass position interrupt.

Address (hexadecimal)	Bit	Symbol[1]	Signal name[1]
00061440	0	iPPIF□	Pass position interrupt complete □ (interrupt)
	1	iPPIE□	Pass position interrupt incomplete □ (interrupt)
	2	—	For manufacturer setting
	3		
	4		
	5		
	6		
	7		

[1] □: Details on factor of pass position interrupt No. (1 to 32)

■Details on factor of pass position interrupt 2

Address (hexadecimal)	Name
00061460	Details on factor of pass position interrupt 33
00061461	Details on factor of pass position interrupt 34
00061462	Details on factor of pass position interrupt 35
00061463	Details on factor of pass position interrupt 36
00061464	Details on factor of pass position interrupt 37
00061465	Details on factor of pass position interrupt 38
00061466	Details on factor of pass position interrupt 39
00061467	Details on factor of pass position interrupt 40
00061468	Details on factor of pass position interrupt 41
00061469	Details on factor of pass position interrupt 42
0006146A	Details on factor of pass position interrupt 43
0006146B	Details on factor of pass position interrupt 44
0006146C	Details on factor of pass position interrupt 45
0006146D	Details on factor of pass position interrupt 46
0006146E	Details on factor of pass position interrupt 47
0006146F	Details on factor of pass position interrupt 48
00061470	Details on factor of pass position interrupt 49
00061471	Details on factor of pass position interrupt 50
00061472	Details on factor of pass position interrupt 51
00061473	Details on factor of pass position interrupt 52
00061474	Details on factor of pass position interrupt 53
00061475	Details on factor of pass position interrupt 54
00061476	Details on factor of pass position interrupt 55
00061477	Details on factor of pass position interrupt 56
00061478	Details on factor of pass position interrupt 57
00061479	Details on factor of pass position interrupt 58
0006147A	Details on factor of pass position interrupt 59
0006147B	Details on factor of pass position interrupt 60
0006147C	Details on factor of pass position interrupt 61
0006147D	Details on factor of pass position interrupt 62
0006147E	Details on factor of pass position interrupt 63
0006147F	Details on factor of pass position interrupt 64

- Details on factor of pass position interrupt □

When the outputting with factor of pass position interrupt (iPPI□) is ON, the pass position status bit corresponding to the pass position condition No. turns ON.

The addresses in the table are the addresses for the details on factor of pass position interrupt 33. For the details on factor of pass position interrupt 34 and above, add "+1h" for each details on factor of pass position interrupt.

Address (hexadecimal)	Bit	Symbol[*1]	Signal name[*1]
00061460	0	iPPIF□	Pass position interrupt complete □ (interrupt)
	1	iPPIE□	Pass position interrupt incomplete □ (interrupt)
	2	—	For manufacturer setting
	3		
	4		
	5		
	6		
	7		

*1 □: Details on factor of pass position interrupt No. (33 to 64)

■**Details on factor of pass position interrupt 3**

Address (hexadecimal)	Name
00061480	Details on factor of pass position interrupt 65
00061481	Details on factor of pass position interrupt 66
00061482	Details on factor of pass position interrupt 67
00061483	Details on factor of pass position interrupt 68
00061484	Details on factor of pass position interrupt 69
00061485	Details on factor of pass position interrupt 70
00061486	Details on factor of pass position interrupt 71
00061487	Details on factor of pass position interrupt 72
00061488	Details on factor of pass position interrupt 73
00061489	Details on factor of pass position interrupt 74
0006148A	Details on factor of pass position interrupt 75
0006148B	Details on factor of pass position interrupt 76
0006148C	Details on factor of pass position interrupt 77
0006148D	Details on factor of pass position interrupt 78
0006148E	Details on factor of pass position interrupt 79
0006148F	Details on factor of pass position interrupt 80
00061490	Details on factor of pass position interrupt 81
00061491	Details on factor of pass position interrupt 82
00061492	Details on factor of pass position interrupt 83
00061493	Details on factor of pass position interrupt 84
00061494	Details on factor of pass position interrupt 85
00061495	Details on factor of pass position interrupt 86
00061496	Details on factor of pass position interrupt 87
00061497	Details on factor of pass position interrupt 88
00061498	Details on factor of pass position interrupt 89
00061499	Details on factor of pass position interrupt 90
0006149A	Details on factor of pass position interrupt 91
0006149B	Details on factor of pass position interrupt 92
0006149C	Details on factor of pass position interrupt 93
0006149D	Details on factor of pass position interrupt 94
0006149E	Details on factor of pass position interrupt 95
0006149F	Details on factor of pass position interrupt 96

• Details on factor of pass position interrupt □

When the outputting with factor of pass position interrupt (iPPI□) is ON, the pass position status bit corresponding to the pass position condition No. turns ON.

The addresses in the table are the addresses for the details on factor of pass position interrupt 65. For the details on factor of pass position interrupt 66 and above, add "+1h" for each details on factor of pass position interrupt.

Address (hexadecimal)	Bit	Symbol[*1]	Signal name[*1]
00061480	0	iPPIF□	Pass position interrupt complete □ (interrupt)
	1	iPPIE□	Pass position interrupt incomplete □ (interrupt)
	2	—	For manufacturer setting
	3		
	4		
	5		
	6		
	7		

*1 □: Details on factor of pass position interrupt No. (65 to 96)

■Details on factor of pass position interrupt 4

Address (hexadecimal)	Name
000614A0	Details on factor of pass position interrupt 97
000614A1	Details on factor of pass position interrupt 98
000614A2	Details on factor of pass position interrupt 99
000614A3	Details on factor of pass position interrupt 100
000614A4	Details on factor of pass position interrupt 101
000614A5	Details on factor of pass position interrupt 102
000614A6	Details on factor of pass position interrupt 103
000614A7	Details on factor of pass position interrupt 104
000614A8	Details on factor of pass position interrupt 105
000614A9	Details on factor of pass position interrupt 106
000614AA	Details on factor of pass position interrupt 107
000614AB	Details on factor of pass position interrupt 108
000614AC	Details on factor of pass position interrupt 109
000614AD	Details on factor of pass position interrupt 110
000614AE	Details on factor of pass position interrupt 111
000614AF	Details on factor of pass position interrupt 112
000614B0	Details on factor of pass position interrupt 113
000614B1	Details on factor of pass position interrupt 114
000614B2	Details on factor of pass position interrupt 115
000614B3	Details on factor of pass position interrupt 116
000614B4	Details on factor of pass position interrupt 117
000614B5	Details on factor of pass position interrupt 118
000614B6	Details on factor of pass position interrupt 119
000614B7	Details on factor of pass position interrupt 120
000614B8	Details on factor of pass position interrupt 121
000614B9	Details on factor of pass position interrupt 122
000614BA	Details on factor of pass position interrupt 123
000614BB	Details on factor of pass position interrupt 124
000614BC	Details on factor of pass position interrupt 125
000614BD	Details on factor of pass position interrupt 126
000614BE	Details on factor of pass position interrupt 127
000614BF	Details on factor of pass position interrupt 128
000614C0	For manufacturer setting
⋮	
000615FF	

- Details on factor of pass position interrupt □

When the outputting with factor of pass position interrupt (iPPI□) is ON, the pass position status bit corresponding to the pass position condition No. turns ON.

The addresses in the table are the addresses for the details on factor of pass position interrupt 97. For the details on factor of pass position interrupt 98 and above, add "+1h" for each details on factor of pass position interrupt.

Address (hexadecimal)	Bit	Symbol[1]	Signal name[1]
000614A0	0	iPPIF□	Pass position interrupt complete □ (interrupt)
	1	iPPIE□	Pass position interrupt incomplete □ (interrupt)
	2	—	For manufacturer setting
	3		
	4		
	5		
	6		
	7		

[1] □: Details on factor of pass position interrupt No. (97 to 128)

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11.14 Other Axes Start

For details about the other axes start command and the other axes start status, refer to the following.

Address (hexadecimal)	Content	
00062000, 00062001	Other axes start command/status table (table1)	Other axes start command
00062002, 00062003		Other axes start status
00062004, 00062005	Other axes start command/status table (table2)	Other axes start command
00062006, 00062007		Other axes start status
00062008, 00062009	Other axes start command/status table (table3)	Other axes start command
0006200A, 0006200B		Other axes start status
0006200C, 0006200D	Other axes start command/status table (table4)	Other axes start command
0006200E, 0006200F		Other axes start status
00062010, 00062011	Other axes start command/status table (table5)	Other axes start command
00062012, 00062013		Other axes start status
00062014, 00062015	Other axes start command/status table (table6)	Other axes start command
00062016, 00062017		Other axes start status
00062018, 00062019	Other axes start command/status table (table7)	Other axes start command
0006201A, 0006201B		Other axes start status
0006201C, 0006201D	Other axes start command/status table (table8)	Other axes start command
0006201E, 0006201F		Other axes start status
00062020, 00062021	Other axes start command/status table (table9)	Other axes start command
00062022, 00062023		Other axes start status
00062024, 00062025	Other axes start command/status table (table10)	Other axes start command
00062026, 00062027		Other axes start status
00062028, 00062029	Other axes start command/status table (table11)	Other axes start command
0006202A, 0006202B		Other axes start status
0006202C, 0006202D	Other axes start command/status table (table12)	Other axes start command
0006202E, 0006202F		Other axes start status
00062030, 00062031	Other axes start command/status table (table13)	Other axes start command
00062032, 00062033		Other axes start status
00062034, 00062035	Other axes start command/status table (table14)	Other axes start command
00062036, 00062037		Other axes start status
00062038, 00062039	Other axes start command/status table (table15)	Other axes start command
0006203A, 0006203B		Other axes start status
0006203C, 0006203D	Other axes start command/status table (table16)	Other axes start command
0006203E, 0006203F		Other axes start status
00062040, 00062041	Other axes start command/status table (table17)	Other axes start command
00062042, 00062043		Other axes start status
00062044, 00062045	Other axes start command/status table (table18)	Other axes start command
00062046, 00062047		Other axes start status
00062048, 00062049	Other axes start command/status table (table19)	Other axes start command
0006204A, 0006204B		Other axes start status
0006204C, 0006204D	Other axes start command/status table (table20)	Other axes start command
0006204E, 0006204F		Other axes start status
00062050, 00062051	Other axes start command/status table (table21)	Other axes start command
00062052, 00062053		Other axes start status
00062054, 00062055	Other axes start command/status table (table22)	Other axes start command
00062056, 00062057		Other axes start status
00062058, 00062059	Other axes start command/status table (table23)	Other axes start command
0006205A, 0006205B		Other axes start status

Address (hexadecimal)	Content	
0006205C, 0006205D	Other axes start command/status table (table24)	Other axes start command
0006205E, 0006205F		Other axes start status
00062060, 00062061	Other axes start command/status table (table25)	Other axes start command
00062062, 00062063		Other axes start status
00062064, 00062065	Other axes start command/status table (table26)	Other axes start command
00062066, 00062067		Other axes start status
00062068, 00062069	Other axes start command/status table (table27)	Other axes start command
0006206A, 0006206B		Other axes start status
0006206C, 0006206D	Other axes start command/status table (table28)	Other axes start command
0006206E, 0006206F		Other axes start status
00062070, 00062071	Other axes start command/status table (table29)	Other axes start command
00062072, 00062073		Other axes start status
00062074, 00062075	Other axes start command/status table (table30)	Other axes start command
00062076, 00062077		Other axes start status
00062078, 00062079	Other axes start command/status table (table31)	Other axes start command
0006207A, 0006207B		Other axes start status
0006207C, 0006207D	Other axes start command/status table (table32)	Other axes start command
0006207E, 0006207F		Other axes start status
00062080, 00062081	Other axes start command/status table (table33)	Other axes start command
00062082, 00062083		Other axes start status
00062084, 00062085	Other axes start command/status table (table34)	Other axes start command
00062086, 00062087		Other axes start status
00062088, 00062089	Other axes start command/status table (table35)	Other axes start command
0006208A, 0006208B		Other axes start status
0006208C, 0006208D	Other axes start command/status table (table36)	Other axes start command
0006208E, 0006208F		Other axes start status
00062090, 00062091	Other axes start command/status table (table37)	Other axes start command
00062092, 00062093		Other axes start status
00062094, 00062095	Other axes start command/status table (table38)	Other axes start command
00062096, 00062097		Other axes start status
00062098, 00062099	Other axes start command/status table (table39)	Other axes start command
0006209A, 0006209B		Other axes start status
0006209C, 0006209D	Other axes start command/status table (table40)	Other axes start command
0006209E, 0006209F		Other axes start status
000620A0, 000620A1	Other axes start command/status table (table41)	Other axes start command
000620A2, 000620A3		Other axes start status
000620A4, 000620A5	Other axes start command/status table (table42)	Other axes start command
000620A6, 000620A7		Other axes start status
000620A8, 000620A9	Other axes start command/status table (table43)	Other axes start command
000620AA, 000620AB		Other axes start status
000620AC, 000620AD	Other axes start command/status table (table44)	Other axes start command
000620AE, 000620AF		Other axes start status
000620B0, 000620B1	Other axes start command/status table (table45)	Other axes start command
000620B2, 000620B3		Other axes start status
000620B4, 000620B5	Other axes start command/status table (table46)	Other axes start command
000620B6, 000620B7		Other axes start status
000620B8, 000620B9	Other axes start command/status table (table47)	Other axes start command
000620BA, 000620BB		Other axes start status
000620BC, 000620BD	Other axes start command/status table (table48)	Other axes start command
000620BE, 000620BF		Other axes start status
000620C0, 000620C1	Other axes start command/status table (table49)	Other axes start command
000620C2, 000620C3		Other axes start status

Address (hexadecimal)	Content	
000620C4, 000620C5	Other axes start command/status table (table50)	Other axes start command
000620C6, 000620C7		Other axes start status
000620C8, 000620C9	Other axes start command/status table (table51)	Other axes start command
000620CA, 000620CB		Other axes start status
000620CC, 000620CD	Other axes start command/status table (table52)	Other axes start command
000620CE, 000620CF		Other axes start status
000620D0, 000620D1	Other axes start command/status table (table53)	Other axes start command
000620D2, 000620D3		Other axes start status
000620D4, 000620D5	Other axes start command/status table (table54)	Other axes start command
000620D6, 000620D7		Other axes start status
000620D8, 000620D9	Other axes start command/status table (table55)	Other axes start command
000620DA, 000620DB		Other axes start status
000620DC, 000620DD	Other axes start command/status table (table56)	Other axes start command
000620DE, 000620DF		Other axes start status
000620E0, 000620E1	Other axes start command/status table (table57)	Other axes start command
000620E2, 000620E3		Other axes start status
000620E4, 000620E5	Other axes start command/status table (table58)	Other axes start command
000620E6, 000620E7		Other axes start status
000620E8, 000620E9	Other axes start command/status table (table59)	Other axes start command
000620EA, 000620EB		Other axes start status
000620EC, 000620ED	Other axes start command/status table (table60)	Other axes start command
000620EE, 000620EF		Other axes start status
000620F0, 000620F1	Other axes start command/status table (table61)	Other axes start command
000620F2, 000620F3		Other axes start status
000620F4, 000620F5	Other axes start command/status table (table62)	Other axes start command
000620F6, 000620F7		Other axes start status
000620F8, 000620F9	Other axes start command/status table (table63)	Other axes start command
000620FA, 000620FB		Other axes start status
000620FC, 000620FD	Other axes start command/status table (table64)	Other axes start command
000620FE, 000620FF		Other axes start status
00062100	For manufacturer setting	
⋮		
000621FF		

Other axes start command

The addresses in the table are the addresses for the other axes start command/status table 1. For the other axes data 2 and after, add "+4h" for each other axes start command/status table.

Address (hexadecimal)	Bit	Symbol[1]	Signal name
00062000	0	OSSTP□	Other axes start cancel
	1	—	For manufacturer setting
	2		
	3		
	4		
	5		
	6		
	7		
	8		
	9		
	10		
	11		
	12		
	13		
	14		
	15		

[1] □: Other axes start No. (1 to 64)

Other axes start status

The addresses in the table are the addresses for the other axes start command/status table 1. For the other axes data 2 and after, add "+4h" for each other axes start command/status table.

Address (hexadecimal)	Bit	Symbol[1]	Signal name
00062002	0	OSOP□	Other axes start notice
	1	OSFIN□	Other axes start complete
	2	OSERR□	Other axes start incomplete
	3	—	For manufacturer setting
	4		
	5		
	6		
	7		
	8		
	9		
	10		
	11		
	12	OSDTO□	Other axes start output signal timer control
	13	OSDCE□	Other axes start output signal control error
	14	OSDDL□	Other axes start output signal control delay
	15	—	For manufacturer setting

[1] □: Other axes start No. (1 to 64)

11.15 Other Axes Start Data

For details about the start condition and the operation content, refer to the following.

Address (hexadecimal)	Content	
00062200 to 00062227	Other axes start data (data1)	Start condition
00062228 to 0006227F		Operation content
00062280 to 000622A7	Other axes start data (data2)	Start condition
000622A8 to 000622FF		Operation content
00062300 to 00062327	Other axes start data (data3)	Start condition
00062328 to 0006237F		Operation content
00062380 to 000623A7	Other axes start data (data4)	Start condition
000623A8 to 000623FF		Operation content
00062400 to 00062427	Other axes start data (data5)	Start condition
00062428 to 0006247F		Operation content
00062480 to 000624A7	Other axes start data (data6)	Start condition
000624A8 to 000624FF		Operation content
00062500 to 00062527	Other axes start data (data7)	Start condition
00062528 to 0006257F		Operation content
00062580 to 000625A7	Other axes start data (data8)	Start condition
000625A8 to 000625FF		Operation content
00062600 to 00062627	Other axes start data (data9)	Start condition
00062628 to 0006267F		Operation content
00062680 to 0900662A7	Other axes start data (data10)	Start condition
000626A8 to 000626FF		Operation content
00062700 to 00062727	Other axes start data (data11)	Start condition
00062728 to 0006277F		Operation content
00062780 to 000627A7	Other axes start data (data12)	Start condition
000627A8 to 000627FF		Operation content
00062800 to 00062827	Other axes start data (data13)	Start condition
00062828 to 0006287F		Operation content
00062880 to 000628A7	Other axes start data (data14)	Start condition
000628A8 to 000628FF		Operation content
00062900 to 00062927	Other axes start data (data15)	Start condition
00062928 to 0006297F		Operation content
00062980 to 000629A7	Other axes start data (data16)	Start condition
000629A8 to 000629FF		Operation content
00062A00 to 00062A27	Other axes start data (data17)	Start condition
00062A28 to 00062A7F		Operation content
00062A80 to 00062AA7	Other axes start data (data18)	Start condition
00062AA8 to 00062AFF		Operation content
00062B00 to 00062B27	Other axes start data (data19)	Start condition
00062B28 to 00062B7F		Operation content
00062B80 to 00062BA7	Other axes start data (data20)	Start condition
00062BA8 to 00062BFF		Operation content
00062C00 to 00062C27	Other axes start data (data21)	Start condition
00062C28 to 00062C7F		Operation content
00062C80 to 00062CA7	Other axes start data (data22)	Start condition
00062CA8 to 00062CFF		Operation content
00062D00 to 00062D27	Other axes start data (data23)	Start condition
00062D28 to 00062D7F		Operation content

Address (hexadecimal)	Content	
00062D80 to 00062DA7	Other axes start data (data24)	Start condition
00062DA8 to 00062DFF		Operation content
00062E00 to 00062E27	Other axes start data (data25)	Start condition
00062E28 to 00062E7F		Operation content
00062E80 to 00062EA7	Other axes start data (data26)	Start condition
00062EA8 to 00062EFF		Operation content
00062F00 to 00062F27	Other axes start data (data27)	Start condition
00062F28 to 00062F7F		Operation content
00062F80 to 00062FA7	Other axes start data (data28)	Start condition
00062FA8 to 00062FFF		Operation content
00063000 to 00063027	Other axes start data (data29)	Start condition
00063028 to 0006307F		Operation content
00063080 to 000630A7	Other axes start data (data3)	Start condition
000630A8 to 000630FF		Operation content
00063100 to 00063127	Other axes start data (data31)	Start condition
00063128 to 0006317F		Operation content
00063180 to 000631A7	Other axes start data (data32)	Start condition
000631A8 to 000631FF		Operation content
00063200 to 00063227	Other axes start data (data33)	Start condition
00063228 to 0006327F		Operation content
00063280 to 000632A7	Other axes start data (data34)	Start condition
000632A8 to 000632FF		Operation content
00063300 to 00063327	Other axes start data (data35)	Start condition
00063328 to 0006337F		Operation content
00063380 to 000633A7	Other axes start data (data36)	Start condition
000633A8 to 000633FF		Operation content
00063400 to 00063427	Other axes start data (data37)	Start condition
00063428 to 0006347F		Operation content
00063480 to 000634A7	Other axes start data (data38)	Start condition
000634A8 to 000634FF		Operation content
00063500 to 00063527	Other axes start data (data39)	Start condition
00063528 to 0006357F		Operation content
00063580 to 000635A7	Other axes start data (data40)	Start condition
000635A8 to 000635FF		Operation content
00063600 to 00063627	Other axes start data (data41)	Start condition
00063628 to 0006367F		Operation content
00063680 to 000636A7	Other axes start data (data42)	Start condition
000636A8 to 000636FF		Operation content
00063700 to 00063727	Other axes start data (data43)	Start condition
00063728 to 0006377F		Operation content
00063780 to 000637A7	Other axes start data (data44)	Start condition
000637A8 to 000637FF		Operation content
00063800 to 00063827	Other axes start data (data45)	Start condition
00063828 to 0006387F		Operation content
00063880 to 000638A7	Other axes start data (data46)	Start condition
000638A8 to 000638FF		Operation content
00063900 to 00063927	Other axes start data (data47)	Start condition
00063928 to 0006397F		Operation content
00063980 to 000639A7	Other axes start data (data48)	Start condition
000639A8 to 000639FF		Operation content
00063A00 to 00063A27	Other axes start data (data49)	Start condition
00063A28 to 00063A7F		Operation content

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Address (hexadecimal)	Content	
00063A80 to 00063AA7	Other axes start data (data50)	Other axes start command
00063AA8 to 00063AFF		Other axes start status
00063B00 to 00063B27	Other axes start data (data51)	Other axes start command
00063B28 to 00063B7F		Other axes start status
00063B80 to 00063BA7	Other axes start data (data52)	Other axes start command
00063BA8 to 00063BFF		Other axes start status
00063C00 to 00063C27	Other axes start data (data53)	Other axes start command
00063C28 to 00063C7F		Other axes start status
00063C80 to 00063CA7	Other axes start data (data54)	Other axes start command
00063CA8 to 00063CFF		Other axes start status
00063D00 to 00063D27	Other axes start data (data55)	Other axes start command
00063D28 to 00063D7F		Other axes start status
00063D80 to 00063DA7	Other axes start data (data56)	Other axes start command
00063DA8 to 00063DFF		Other axes start status
00063E00 to 00063E27	Other axes start data (data57)	Other axes start command
00063E28 to 00063E7F		Other axes start status
00063E80 to 00063EA7	Other axes start data (data58)	Other axes start command
00063EA8 to 00063EFF		Other axes start status
00063F00 to 00063F27	Other axes sta59rt data (data59)	Other axes start command
00063F28 to 00063F7F		Other axes start status
00063F80 to 00063FA7	Other axes start data (data60)	Other axes start command
00063FA8 to 00063FFF		Other axes start status
00064000 to 00064027	Other axes start data (data61)	Other axes start command
00064028 to 0006407F		Other axes start status
00064080 to 000640A7	Other axes start data (data62)	Other axes start command
000640A8 to 000640FF		Other axes start status
00064100 to 00064127	Other axes start data (data63)	Other axes start command
00064128 to 0006417F		Other axes start status
00064180 to 000641A7	Other axes start data (data64)	Other axes start command
000641A8 to 000641FF		Other axes start status
00064200	For manufacturer setting	
⋮		
000661FF		

Start condition

The addresses in the table are the addresses for the other axes start data 1. For the other axes start data 2 and after, add "+80h" for each other axes start data.

Address (hexadecimal)	Name
00062200	Axis option
00062201	
00062202	
00062203	
00062204	Observed axis option
00062205	
00062206	
00062207	
00062208	Axis remaining distance data/Axis pass position data
00062209	
0006220A	
0006220B	
0006220C	Observed axis specified position data
0006220D	
0006220E	
0006220F	
00062210	For manufacturer setting
⋮	
00062227	

Operation content

The addresses in the table are the addresses for the other axes start data 1. For the other axes start data 2 and after, add "+80h" for each other axes start data.

Address (hexadecimal)	Name
00062228	Start axis designation 1[*1]
00062229	
0006222A	
0006222B	
0006222C	Start axis designation 2[*1]
0006222D	
0006222E	
0006222F	
00062230	Start axis start point No.
00062231	
00062232	Start axis end point No.
00062233	
00062234	For manufacturer setting
⋮	
00062263	
00062264	Output signal specification
00062265	
00062266	Output signal No.
00062267	
00062268	Output signal enable selection
00062269	

Address (hexadecimal)	Name
0006226A	Output signal command
0006226B	
0006226C	For manufacturer setting
⋮	
0006226F	
00062270	Output signal timer control
00062271	
00062272	Output signal timer
00062273	
00062274	For manufacturer setting
⋮	
0006227F	

*1 Set so that the total number of axes for the start axis designation1 and the start axis designation 2 does not exceed the maximum number of synchronous startup axes.

11.16 Pass Position Interrupt Condition

For details about the pass position option and the pass position data, refer to the following.

☞ Page 542 Pass position option

☞ Page 542 Pass position data

Address (hexadecimal)	Content	
00066200 to 00066203	Pass position condition (condition1)	Pass position option
00066204 to 00066207		Pass position data
00066208 to 0006620C	Pass position condition (condition2)	Pass position option
0006620D to 0006620F		Pass position data
00066210 to 00066213	Pass position condition (condition3)	Pass position option
00066214 to 00066217		Pass position data
00066218 to 0006621C	Pass position condition (condition4)	Pass position option
0006621D to 0006621F		Pass position data
00066220 to 00066223	Pass position condition (condition5)	Pass position option
00066224 to 00066227		Pass position data
00066228 to 0006622C	Pass position condition (condition6)	Pass position option
0006622D to 0006622F		Pass position data
00066230 to 00066233	Pass position condition (condition7)	Pass position option
00066234 to 00066237		Pass position data
00066238 to 0006623C	Pass position condition (condition8)	Pass position option
0006623D to 0006623F		Pass position data
00066240 to 00066243	Pass position condition (condition9)	Pass position option
00066244 to 00066247		Pass position data
00066248 to 0006624C	Pass position condition (condition10)	Pass position option
0006624D to 0006624F		Pass position data
00066250 to 00066253	Pass position condition (condition11)	Pass position option
00066254 to 00066257		Pass position data
00066258 to 0006625C	Pass position condition (condition12)	Pass position option
0006625D to 0006625F		Pass position data
00066260 to 00066263	Pass position condition (condition13)	Pass position option
00066264 to 00066267		Pass position data
00066268 to 0006626C	Pass position condition (condition14)	Pass position option
0006626D to 0006626F		Pass position data
00066270 to 00066273	Pass position condition (condition15)	Pass position option
00066274 to 00066277		Pass position data
00066278 to 0006627C	Pass position condition (condition16)	Pass position option
0006627D to 0006627F		Pass position data
00066280 to 00066283	Pass position condition (condition17)	Pass position option
00066284 to 00066287		Pass position data
00066288 to 0006628C	Pass position condition (condition18)	Pass position option
0006628D to 0006628F		Pass position data
00066290 to 00066293	Pass position condition (condition19)	Pass position option
00066294 to 00066297		Pass position data
00066298 to 0006629C	Pass position condition (condition20)	Pass position option
0006629D to 0006629F		Pass position data
000662A0 to 000662A3	Pass position condition (condition21)	Pass position option
000662A4 to 000662A7		Pass position data
000662A8 to 000662AC	Pass position condition (condition22)	Pass position option
000662AD to 000662AF		Pass position data
000662B0 to 000662B3	Pass position condition (condition23)	Pass position option
000662B4 to 000662B7		Pass position data

Address (hexadecimal)	Content	
000662B8 to 000662BC	Pass position condition (condition24)	Pass position option
000662BD to 000662BF		Pass position data
000662C0 to 000662C3	Pass position condition (condition25)	Pass position option
000662C4 to 000662C7		Pass position data
000662C8 to 000662CC	Pass position condition (condition26)	Pass position option
000662CD to 000662CF		Pass position data
000662D0 to 000662D3	Pass position condition (condition27)	Pass position option
000662D4 to 000662D7		Pass position data
000662D8 to 000662DC	Pass position condition (condition28)	Pass position option
000662DD to 000662DF		Pass position data
000662E0 to 000662E3	Pass position condition (condition29)	Pass position option
000662E4 to 000662E7		Pass position data
000662E8 to 000662EC	Pass position condition (condition30)	Pass position option
000662ED to 000662EF		Pass position data
000662F0 to 000662F3	Pass position condition (condition31)	Pass position option
000662F4 to 000662F7		Pass position data
000662F8 to 000662FC	Pass position condition (condition32)	Pass position option
000662FD to 000662FF		Pass position data
00066300 to 00066303	Pass position condition (condition33)	Pass position option
00066304 to 00066307		Pass position data
00066308 to 0006630C	Pass position condition (condition34)	Pass position option
0006630D to 0006630F		Pass position data
00066310 to 00066313	Pass position condition (condition35)	Pass position option
00066314 to 00066317		Pass position data
00066318 to 0006631C	Pass position condition (condition36)	Pass position option
0006631D to 0006631F		Pass position data
00066320 to 00066323	Pass position condition (condition37)	Pass position option
00066324 to 00066327		Pass position data
00066328 to 0006632C	Pass position condition (condition38)	Pass position option
0006632D to 0006632F		Pass position data
00066330 to 00066333	Pass position condition (condition39)	Pass position option
00066334 to 00066337		Pass position data
00066338 to 0006633C	Pass position condition (condition40)	Pass position option
0006633D to 0006633F		Pass position data
00066340 to 00066343	Pass position condition (condition41)	Pass position option
00066344 to 00066347		Pass position data
00066348 to 0006634C	Pass position condition (condition42)	Pass position option
0006634D to 0006634F		Pass position data
00066350 to 00066353	Pass position condition (condition43)	Pass position option
00066354 to 00066357		Pass position data
00066358 to 0006635C	Pass position condition (condition44)	Pass position option
0006635D to 0006635F		Pass position data
00066360 to 00066363	Pass position condition (condition45)	Pass position option
00066364 to 00066367		Pass position data
00066368 to 0006636C	Pass position condition (condition46)	Pass position option
0006636D to 0006636F		Pass position data
00066370 to 00066373	Pass position condition (condition47)	Pass position option
00066374 to 00066377		Pass position data
00066378 to 0006637C	Pass position condition (condition48)	Pass position option
0006637D to 0006637F		Pass position data
00066380 to 00066383	Pass position condition (condition49)	Pass position option
00066384 to 00066387		Pass position data

Address (hexadecimal)	Content	
00066388 to 0006638C	Pass position condition (condition40)	Pass position option
0006638D to 0006638F		Pass position data
00066390 to 00066393	Pass position c5ndition (condition51)	Pass position option
00066394 to 00066397		Pass position data
00066398 to 0006639C	Pass position condition (condition52)	Pass position option
0006639D to 0006639F		Pass position data
000663A0 to 000663A3	Pass position condition (condition53)	Pass position option
000663A4 to 000663A7		Pass position data
000663A8 to 000663AC	Pass position condition (condition54)	Pass position option
000663AD to 000663AF		Pass position data
000663B0 to 000663B3	Pass position condition (condition55)	Pass position option
000663B4 to 000663B7		Pass position data
000663B8 to 000663BC	Pass position condition (condition56)	Pass position option
000663BD to 000663BF		Pass position data
000663C0 to 000663C3	Pass position condition (condition57)	Pass position option
000663C4 to 000663C7		Pass position data
000663C8 to 000663CC	Pass position condition (condition58)	Pass position option
000663CD to 000663CF		Pass position data
000663D0 to 000663D3	Pass position condition (condition59)	Pass position option
000663D4 to 000663D7		Pass position data
000663D8 to 000663DC	Pass position condition (condition60)	Pass position option
000663DD to 000663DF		Pass position data
000663E0 to 000663E3	Pass position condition (condition61)	Pass position option
000663E4 to 000663E7		Pass position data
000663E8 to 000663EC	Pass position condition (condition62)	Pass position option
000663ED to 000663EF		Pass position data
000663F0 to 000663F3	Pass position condition (condition63)	Pass position option
000663F4 to 000663F7		Pass position data
000663F8 to 000663FC	Pass position condition (condition64)	Pass position option
000663FD to 000663FF		Pass position data
00066400 to 00066403	Pass position condition (condition65)	Pass position option
00066404 to 00066407		Pass position data
00066408 to 0006640C	Pass position condition (condition66)	Pass position option
0006640D to 0006640F		Pass position data
00066410 to 00066413	Pass position condition (condition67)	Pass position option
00066414 to 00066417		Pass position data
00066418 to 0006641C	Pass position condition (condition68)	Pass position option
0006641D to 0006641F		Pass position data
00066420 to 00066423	Pass position condition (condition69)	Pass position option
00066424 to 00066427		Pass position data
00066428 to 0006642C	Pass position condition (condition70)	Pass position option
0006642D to 0006642F		Pass position data
00066430 to 00066433	Pass position condition (condition71)	Pass position option
00066434 to 00066437		Pass position data
00066438 to 0006643C	Pass position condition (condition72)	Pass position option
0006643D to 0006643F		Pass position data
00066440 to 00066443	Pass position condition (condition73)	Pass position option
00066444 to 00066447		Pass position data
00066448 to 0006644C	Pass position condition (condition74)	Pass position option
0006644D to 0006644F		Pass position data
00066450 to 00066453	Pass position condition (condition75)	Pass position option
00066454 to 00066457		Pass position data

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Address (hexadecimal)	Content	
00066458 to 0006645C	Pass position condition (condition76)	Pass position option
0006645D to 0006645F		Pass position data
00066460 to 00066463	Pass position condition (condition77)	Pass position option
00066464 to 00066467		Pass position data
00066468 to 0006646C	Pass position condition (condition78)	Pass position option
0006646D to 0006646F		Pass position data
00066470 to 00066473	Pass position condition (condition79)	Pass position option
00066474 to 00066477		Pass position data
00066478 to 0006647C	Pass position condition (condition80)	Pass position option
0006647D to 0006647F		Pass position data
00066480 to 00066483	Pass position condition (condition81)	Pass position option
00066484 to 00066487		Pass position data
00066488 to 0006648C	Pass position condition (condition82)	Pass position option
0006648D to 0006648F		Pass position data
00066490 to 00066493	Pass position condition (condition83)	Pass position option
00066494 to 00066497		Pass position data
00066498 to 0006649C	Pass position condition (condition84)	Pass position option
0006649D to 0006649F		Pass position data
000664A0 to 000664A3	Pass position condition (condition85)	Pass position option
000664A4 to 000664A7		Pass position data
000664A8 to 000664AC	Pass position condition (condition86)	Pass position option
000664AD to 000664AF		Pass position data
000664B0 to 000664B3	Pass position condition (condition87)	Pass position option
000664B4 to 000664B7		Pass position data
000664B8 to 000664BC	Pass position condition (condition88)	Pass position option
000664BD to 000664BF		Pass position data
000664C0 to 000664C3	Pass position condition (condition89)	Pass position option
000664C4 to 000664C7		Pass position data
000664C8 to 000664CC	Pass position condition (condition90)	Pass position option
000664CD to 000664CF		Pass position data
000664D0 to 000664D3	Pass position condition (condition91)	Pass position option
000664D4 to 000664D7		Pass position data
000664D8 to 000664DC	Pass position condition (condition92)	Pass position option
000664DD to 000664DF		Pass position data
000664E0 to 000664E3	Pass position condition (condition93)	Pass position option
000664E4 to 000664E7		Pass position data
000664E8 to 000664EC	Pass position condition (condition94)	Pass position option
000664ED to 000664EF		Pass position data
000664F0 to 000664F3	Pass position condition (condition95)	Pass position option
000664F4 to 000664F7		Pass position data
000664F8 to 000664FC	Pass position condition (condition96)	Pass position option
000664FD to 000664FF		Pass position data
00066500 to 00066503	Pass position condition (condition97)	Pass position option
00066504 to 00066507		Pass position data
00066508 to 0006650C	Pass position condition (condition98)	Pass position option
0006650D to 0006650F		Pass position data
00066510 to 00066513	Pass position condition (condition99)	Pass position option
00066514 to 00066517		Pass position data
00066518 to 0006651C	Pass position condition (condition100)	Pass position option
0006651D to 0006651F		Pass position data
00066520 to 00066523	Pass position condition (condition101)	Pass position option
00066524 to 00066527		Pass position data

Address (hexadecimal)	Content	
00066528 to 0006652C	Pass position condition (condition102)	Pass position option
0006652D to 0006652F		Pass position data
00066530 to 00066533	Pass position condition (condition103)	Pass position option
00066534 to 00066537		Pass position data
00066538 to 0006653C	Pass position condition (condition104)	Pass position option
0006653D to 0006653F		Pass position data
00066540 to 00066543	Pass position condition (condition105)	Pass position option
00066544 to 00066547		Pass position data
00066548 to 0006654C	Pass position condition (condition106)	Pass position option
0006654D to 0006654F		Pass position data
00066550 to 00066553	Pass position condition (condition107)	Pass position option
00066554 to 00066557		Pass position data
00066558 to 0006655C	Pass position condition (condition108)	Pass position option
0006655D to 0006655F		Pass position data
00066560 to 00066563	Pass position condition (condition109)	Pass position option
00066564 to 00066567		Pass position data
00066568 to 0006656C	Pass position condition (condition110)	Pass position option
0006656D to 0006656F		Pass position data
00066570 to 00066573	Pass position condition (condition111)	Pass position option
00066574 to 00066577		Pass position data
00066578 to 0006657C	Pass position condition (condition112)	Pass position option
0006657D to 0006657F		Pass position data
00066580 to 00066583	Pass position condition (condition113)	Pass position option
00066584 to 00066587		Pass position data
00066588 to 0006658C	Pass position condition (condition114)	Pass position option
0006658D to 0006658F		Pass position data
00066590 to 00066593	Pass position condition (condition115)	Pass position option
00066594 to 00066597		Pass position data
00066598 to 0006659C	Pass position condition (condition116)	Pass position option
0006659D to 0006659F		Pass position data
000665A0 to 000665A3	Pass position condition (condition117)	Pass position option
000665A4 to 000665A7		Pass position data
000665A8 to 000665AC	Pass position condition (condition118)	Pass position option
000665AD to 000665AF		Pass position data
000665B0 to 000665B3	Pass position condition (condition119)	Pass position option
000665B4 to 000665B7		Pass position data
000665B8 to 000665BC	Pass position condition (condition120)	Pass position option
000665BD to 000665BF		Pass position data
000665C0 to 000665C3	Pass position condition (condition121)	Pass position option
000665C4 to 000665C7		Pass position data
000665C8 to 000665CC	Pass position condition (condition122)	Pass position option
000665CD to 000665CF		Pass position data
000665D0 to 000665D3	Pass position condition (condition123)	Pass position option
000665D4 to 000665D7		Pass position data
000665D8 to 000665DC	Pass position condition (condition124)	Pass position option
000665DD to 000665DF		Pass position data
000665E0 to 000665E3	Pass position condition (condition125)	Pass position option
000665E4 to 000665E7		Pass position data
000665E8 to 000665EC	Pass position condition (condition126)	Pass position option
000665ED to 000665EF		Pass position data
000665F0 to 000665F3	Pass position condition (condition127)	Pass position option
000665F4 to 000665F7		Pass position data

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Address (hexadecimal)	Content	
000665F8 to 000665FC	Pass position condition (condition128)	Pass position option
000665FD to 000665FF		Pass position data
00066600	For manufacturer setting	
⋮		
000669FF		

Pass position option

The addresses in the table are the addresses for the pass position condition 1. For the pass position condition 2 and after, add "+8h" for each pass position condition.

Address (hexadecimal)	Name[1]
00066200	Pass position option☐
00066201	
00066202	
00066203	

[1] ☐: Pass position condition No. (1 to 128)

Pass position data

The addresses in the table are the addresses for the pass position condition 1. For the pass position condition 2 and after, add "+8h" for each pass position condition.

Address (hexadecimal)	Name[1]
00066204	Pass position data☐
00066205	
00066206	
00066207	

[1] ☐: Pass position condition No. (1 to 128)

11.17 Press Control Data

Address (hexadecimal)	Content
00066A00 to 00066A1F	Press control data (Axis 1)
00066A20 to 00066A3F	Press control data (Axis 2)
00066A40 to 00066A5F	Press control data (Axis 3)
00066A60 to 00066A7F	Press control data (Axis 4)
00066A80 to 00066A9F	Press control data (Axis 5)
00066AA0 to 00066ABF	Press control data (Axis 6)
00066AC0 to 00066ADF	Press control data (Axis 7)
00066AE0 to 00066AFF	Press control data (Axis 8)
00066B00 to 00066B1F	Press control data (Axis 9)
00066B20 to 00066B3F	Press control data (Axis 10)
00066B40 to 00066B5F	Press control data (Axis 11)
00066B60 to 00066B7F	Press control data (Axis 12)
00066B80 to 00066B9F	Press control data (Axis 13)
00066BA0 to 00066BBF	Press control data (Axis 14)
00066BC0 to 00066BDF	Press control data (Axis 15)
00066BE0 to 00066BFF	Press control data (Axis 16)
00066C00 to 00066C1F	Press control data (Axis 17)
00066C20 to 00066C3F	Press control data (Axis 18)
00066C40 to 00066C5F	Press control data (Axis 19)
00066C60 to 00066C7F	Press control data (Axis 20)
00066C80 to 00066C9F	Press control data (Axis 21)
00066CA0 to 00066CBF	Press control data (Axis 22)
00066CC0 to 00066CDF	Press control data (Axis 23)
00066CE0 to 00066CFF	Press control data (Axis 24)
00066D00 to 00066D1F	Press control data (Axis 25)
00066D20 to 00066D3F	Press control data (Axis 26)
00066D40 to 00066D5F	Press control data (Axis 27)
00066D60 to 00066D7F	Press control data (Axis 28)
00066D80 to 00066D9F	Press control data (Axis 29)
00066DA0 to 00066DBF	Press control data (Axis 30)
00066DC0 to 00066DDF	Press control data (Axis 31)
00066DE0 to 00066DFF	Press control data (Axis 32)
00066E00 to 00066E1F	Press control data (Axis 33)
00066E20 to 00066E3F	Press control data (Axis 34)
00066E40 to 00066E5F	Press control data (Axis 35)
00066E60 to 00066E7F	Press control data (Axis 36)
00066E80 to 00066E9F	Press control data (Axis 37)
00066EA0 to 00066EBF	Press control data (Axis 38)
00066EC0 to 00066EDF	Press control data (Axis 39)
00066EE0 to 00066EFF	Press control data (Axis 40)
00066F00 to 00066F1F	Press control data (Axis 41)
00066F20 to 00066F3F	Press control data (Axis 42)
00066F40 to 00066F5F	Press control data (Axis 43)
00066F60 to 00066F7F	Press control data (Axis 44)
00066F80 to 00066F9F	Press control data (Axis 45)
00066FA0 to 00066FBF	Press control data (Axis 46)
00066FC0 to 00066FDF	Press control data (Axis 47)
00066FE0 to 00066FFF	Press control data (Axis 48)
00067000 to 0006701F	Press control data (Axis 49)

Address (hexadecimal)	Content
00067020 to 0006703F	Press control data (Axis 50)
00067040 to 0006705F	Press control data (Axis 51)
00067060 to 0006707F	Press control data (Axis 52)
00067080 to 0006709F	Press control data (Axis 53)
000670A0 to 000670BF	Press control data (Axis 54)
000670C0 to 000670DF	Press control data (Axis 55)
000670E0 to 000670FF	Press control data (Axis 56)
00067100 to 0006711F	Press control data (Axis 57)
00067120 to 0006713F	Press control data (Axis 58)
00067140 to 0006715F	Press control data (Axis 59)
00067160 to 0006717F	Press control data (Axis 60)
00067180 to 0006719F	Press control data (Axis 61)
000671A0 to 000671BF	Press control data (Axis 62)
000671C0 to 000671DF	Press control data (Axis 63)
000671E0 to 000671FF	Press control data (Axis 64)
00067200	For manufacturer setting
⋮	
000679FF	

Press control data details

Refer to the following.

11.18 Sampling Setting Write

Sampling setting write (command)

Address (hexadecimal)	Content
00069360	Sampling setting write No.
00069361	
00069362	For manufacturer setting
⋮	
00069367	
00069368	Sampling setting write data
00069369	
0006936A	
0006936B	
0006936C	
0006936D	
0006936E	
0006936F	

Sampling setting write (status)

Address (hexadecimal)	Content
00069370	Sampling setting write No.
00069371	
00069372	For manufacturer setting
⋮	
00069377	
00069378	Sampling setting write data
00069379	
0006937A	
0006937B	
0006937C	
0006937D	
0006937E	
0006937F	

11.19 Sampling Setting Read

Sampling setting read (command)

Address (hexadecimal)	Content
00069380	Sampling setting read No.
00069381	
00069382	For manufacturer setting
⋮	
0006938F	

Sampling setting read (status)

Address (hexadecimal)	Content
00069390	Sampling setting read No.
00069391	
00069392	For manufacturer setting
⋮	
00069397	
00069398	Sampling setting read data
00069399	
0006939A	
0006939B	
0006939C	
0006939D	
0006939E	
0006939F	

11.20 Sampling Error Information

Address (hexadecimal)	Content
000693A0	Sampling axis error information 1 (axis 1 to axis 32)
000693A1	
000693A2	
000693A3	
000693A4	Sampling axis error information 2 (axis 33 to axis 64)
000693A5	
000693A6	
000693A7	
000693A8	For manufacturer setting
⋮	
000693B7	
000693B8	Sampling data error information
000693B9	
000693BA	
000693BB	
000693BC	For manufacturer setting
⋮	
000693BF	
000693C0	Sampling bit error information
000693C1	
000693C2	
000693C3	
000693C4	For manufacturer setting
⋮	
000693CF	

11.21 Sampling Data Read

Sampling data read (command)

Address (hexadecimal)	Content
000693D0	Sampling read page No.
000693D1	
000693D2	For manufacturer setting
⋮	
000693D7	

Sampling data read (status)

Address (hexadecimal)	Content
000693D8	Read sampled data page No.
000693D9	
000693DA	Valid read sampled points
000693DB	
000693DC	Completed read sampled page No.
0006939D	
0006939E	For manufacturer setting
0006939F	

11.22 Read Sampling Data

For details about the sampled read data, refer to the following.

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Address (hexadecimal)	Content
00069400 to 00069517	Sampled read data (data 1)
00069518 to 0006962F	Sampled read data (data 2)
00069630 to 00069747	Sampled read data (data 3)
00069748 to 0006985F	Sampled read data (data 4)
00069860 to 00069977	Sampled read data (data 5)
00069978 to 00069A8F	Sampled read data (data 6)
00069A90 to 00069BA7	Sampled read data (data 7)
00069BA8 to 00069CBF	Sampled read data (data 8)
00069CC0 to 00069DD7	Sampled read data (data 9)
00069DD8 to 00069EEF	Sampled read data (data 10)
00069EF0 to 00069007	Sampled read data (data 11)
0006A008 to 0006911F	Sampled read data (data 12)
0006A120 to 00069237	Sampled read data (data 13)
0006A238 to 0006A34F	Sampled read data (data 14)
0006A350 to 0006A467	Sampled read data (data 15)
0006A468 to 0006A57F	Sampled read data (data 16)
0006A580 to 0006A697	Sampled read data (data 17)
0006A698 to 0006A7AF	Sampled read data (data 18)
0006A7B0 to 0006A8C7	Sampled read data (data 19)
0006A8C8 to 0006A9DF	Sampled read data (data 20)
0006A9E0 to 0006AAF7	Sampled read data (data 21)
0006AAF8 to 0006AC0F	Sampled read data (data 22)
0006AC10 to 0006AD27	Sampled read data (data 23)
0006AD28 to 0006AE3F	Sampled read data (data 24)
0006AE40 to 0006AF57	Sampled read data (data 25)
0006AF58 to 0006B06F	Sampled read data (data 26)
0006B070 to 0006B187	Sampled read data (data 27)
0006B188 to 0006B29F	Sampled read data (data 28)
0006B2A0 to 0006B3B7	Sampled read data (data 29)
0006B3B8 to 0006B4CF	Sampled read data (data 30)
0006B4D0 to 0006B5E7	Sampled read data (data 31)
0006B5E8 to 0006B6FF	Sampled read data (data 32)
0006B700 to 0006B817	Sampled read data (data 33)
0006B818 to 0006B92F	Sampled read data (data 34)
0006B930 to 0006BA47	Sampled read data (data 35)
0006BA48 to 0006BB5F	Sampled read data (data 36)
0006BB60 to 0006BC77	Sampled read data (data 37)
0006BC78 to 0006BD8F	Sampled read data (data 38)
0006BD90 to 0006BEA7	Sampled read data (data 39)
0006BEA8 to 0006BFBF	Sampled read data (data 40)
0006FC0 to 0006C0D7	Sampled read data (data 41)
0006C0D8 to 0006C1EF	Sampled read data (data 42)
0006C1F0 to 0006C307	Sampled read data (data 43)
0006C308 to 0006C41F	Sampled read data (data 44)
0006C420 to 0006C537	Sampled read data (data 45)
0006C538 to 0006C64F	Sampled read data (data 46)
0006C650 to 0006C767	Sampled read data (data 47)

Address (hexadecimal)	Content
0006C768 to 0006C87F	Sampled read data (data 48)
0006C880 to 0006C997	Sampled read data (data 49)
0006C998 to 0006CAAF	Sampled read data (data 50)
0006CAB0 to 0006CBC7	Sampled read data (data 51)
0006CBC8 to 0006CCDF	Sampled read data (data 52)
0006CCE0 to 0006CDF7	Sampled read data (data 53)
0006CDF8 to 0006CF0F	Sampled read data (data 54)
0006CF10 to 0006D027	Sampled read data (data 55)
0006D028 to 0006D13F	Sampled read data (data 56)
0006D140 to 0006D257	Sampled read data (data 57)
0006D258 to 0006D36F	Sampled read data (data 58)
0006D370 to 0006D487	Sampled read data (data 59)
0006D488 to 0006D59F	Sampled read data (data 60)
0006D5A0 to 0006D6B7	Sampled read data (data 61)
0006D6B8 to 0006D7CF	Sampled read data (data 62)
0006D7D0 to 0006D8E7	Sampled read data (data 63)
0006D8E8 to 0006D9FF	Sampled read data (data 64)
0006DA00 to 0006DB17	Sampled read data (data 65)
0006DB18 to 0006DC2F	Sampled read data (data 66)
0006DC30 to 0006DD47	Sampled read data (data 67)
0006DD48 to 0006DE5F	Sampled read data (data 68)
0006DE60 to 0006DF77	Sampled read data (data 69)
0006DF78 to 0006E08F	Sampled read data (data 70)
0006E090 to 0006E1A7	Sampled read data (data 71)
0006E1A8 to 0006E2BF	Sampled read data (data 72)
0006E2C0 to 0006E3D7	Sampled read data (data 73)
0006E3D8 to 0006E4EF	Sampled read data (data 74)
0006E4F0 to 0006E607	Sampled read data (data 75)
0006E608 to 0006E71F	Sampled read data (data 76)
0006E720 to 0006E837	Sampled read data (data 77)
0006E838 to 0006E94F	Sampled read data (data 78)
0006E950 to 0006EA67	Sampled read data (data 79)
0006EA68 to 0006EB7F	Sampled read data (data 80)
0006EB80 to 0006EC97	Sampled read data (data 81)
0006EC98 to 0006EDAF	Sampled read data (data 82)
0006EDB0 to 0006EEC7	Sampled read data (data 83)
0006EEC8 to 0006EEDF	Sampled read data (data 84)
0006EFE0 to 0006F0F7	Sampled read data (data 85)
0006F0F8 to 0006F20F	Sampled read data (data 86)
0006F210 to 0006F327	Sampled read data (data 87)
0006F328 to 0006F43F	Sampled read data (data 88)
0006F440 to 0006F557	Sampled read data (data 89)
0006F558 to 0006F66F	Sampled read data (data 90)
0006F670 to 0006F787	Sampled read data (data 91)
0006F788 to 0006F89F	Sampled read data (data 92)
0006F8A0 to 0006F9B7	Sampled read data (data 93)
0006F9B8 to 0006FACF	Sampled read data (data 94)
0006FAD0 to 0006FBE7	Sampled read data (data 95)
0006FBE8 to 0006FCFF	Sampled read data (data 96)
0006FD00 to 0006FE17	Sampled read data (data 97)
0006FE18 to 0006FF2F	Sampled read data (data 98)
0006FF30 to 00070047	Sampled read data (data 99)

Address (hexadecimal)	Content
00070048 to 0007015F	Sampled read data (data 100)
00070160 to 00070277	Sampled read data (data 101)
00070278 to 0007038F	Sampled read data (data 102)
00070390 to 000704A7	Sampled read data (data 103)
000704A8 to 000705BF	Sampled read data (data 104)
000705C0 to 000706D7	Sampled read data (data 105)
000706D8 to 000707EF	Sampled read data (data 106)
000707F0 to 00070907	Sampled read data (data 107)
00070908 to 00070A1F	Sampled read data (data 108)
00070A20 to 00070B37	Sampled read data (data 109)
00070B38 to 00070C4F	Sampled read data (data 110)
00070C50 to 00070D67	Sampled read data (data 111)
00070D68 to 00070E7F	Sampled read data (data 112)
00070E80 to 00070F97	Sampled read data (data 113)
00070F98 to 000710AF	Sampled read data (data 114)
000710B0 to 000711C7	Sampled read data (data 115)
000711C8 to 000712DF	Sampled read data (data 116)
000712E0 to 000713F7	Sampled read data (data 117)
000713F8 to 0007150F	Sampled read data (data 118)
00071510 to 00071627	Sampled read data (data 119)
00071628 to 0007173F	Sampled read data (data 120)
00071740 to 00071857	Sampled read data (data 121)
00071858 to 0007196F	Sampled read data (data 122)
00071970 to 00071A87	Sampled read data (data 123)
00071A88 to 00071B9F	Sampled read data (data 124)
00071BA0 to 00071CB7	Sampled read data (data 125)
00071CB8 to 00071DCF	Sampled read data (data 126)
00071DD0 to 00071EE7	Sampled read data (data 127)
00071EE8 to 00071FFF	Sampled read data (data 128)
00072000	For manufacturer setting
⋮	
0008C3FF	

Sampled read data

The addresses in the table are the addresses for the sampled read data 1. For the sampled read data 2 and after, add "+118h" for each sampled read data.

<Example> When determining the address of the sampled read data 128 from the sampling data 1 of the sampled read data 1 (00069410h)
000069410h + (128 - 1) × 118h = 00071EF8h (the sampling data 1 of the sampled read data 128)

Address (hexadecimal)	Name
00069400	Epoch times (second)
00069401	
00069402	
00069403	
00069404	
00069405	
00069406	
00069407	
00069408	Epoch times (ns)
00069409	
0006940A	
0006940B	
0006940C	UTC offset (minute)
0006940D	
0006940E	Summertime offset (minute)
0006940F	
00069410	Sampling data 1
⋮	
00069417	
00069418	Sampling data 2
⋮	
0006941F	
00069420	Sampling data 3
⋮	
00069427	
00069428	Sampling data 4
⋮	
0006942F	
00069430	Sampling data 5
⋮	
00069437	
00069438	Sampling data 6
⋮	
0006943F	
00069440	Sampling data 7
⋮	
00069447	
00069448	Sampling data 8
⋮	
0006944F	
00069450	Sampling data 9
⋮	
00069457	
00069458	Sampling data 10
⋮	
0006945F	

Address (hexadecimal)	Name
00069460	Sampling data 11
⋮	
00069467	
00069468	Sampling data 12
⋮	
0006946F	
00069470	Sampling data 13
⋮	
00069477	
00069478	Sampling data 14
⋮	
0006947F	
00069480	Sampling data 15
⋮	
00069487	
00069488	Sampling data 16
⋮	
0006948F	
00069490	Sampling data 17
⋮	
00069497	
00069498	Sampling data 18
⋮	
0006949F	
000694A0	Sampling data 19
⋮	
000694A7	
000694A8	Sampling data 20
⋮	
000694AF	
000694B0	Sampling data 21
⋮	
000694B7	
000694B8	Sampling data 22
⋮	
000694BF	
000694C0	Sampling data 23
⋮	
000694C7	
000694C8	Sampling data 24
⋮	
000694CF	
000694D0	Sampling data 25
⋮	
000694D7	
000694D8	Sampling data 26
⋮	
000694DF	
000694E0	Sampling data 27
⋮	
000694E7	

Address (hexadecimal)	Name
000694E8	Sampling data 28
⋮	
000694EF	
000694F0	Sampling data 29
⋮	
000694F7	
000694F8	Sampling data 30
⋮	
000694FF	
00069500	Sampling data 31
⋮	
00069507	
00069508	Sampling data 32
⋮	
0006950F	
00069510	Sampling bit information 1 to 32
00069511	
00069512	
00069513	
00069514	For manufacturer setting
00069515	
00069516	
00069517	

11.23 Exclusion Control

Address (hexadecimal)	Content
0008C800	Request for output signal occupation by host
0008C801	
0008C802	Requesting output signal occupation by motion control board
0008C803	
0008C804	Selection for output signal occupation
0008C805	
0008C806	For manufacturer setting
0008C807	
0008C808	Request for general output signal occupation by user
0008C809	
0008C80A	Requesting general output signal occupation by system
0008C80B	
0008C80C	Selection for output signal occupation
0008C80D	
0008C80E	For manufacturer setting
0008C80F	

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11.24 Pressure Control

Address (hexadecimal)	Content
0008C900 to 0008C9FF	Pressure control information
0008CA00 to 0008D8FF	Pressure control profile (Profile 1)
0008D900 to 0008E7FF	Pressure control profile (Profile 2)
0008E800 to 0008F6FF	Pressure control profile (Profile 3)
0008F700 to 000905FF	Pressure control profile (Profile 4)
00090600 to 000914FF	Pressure control profile (Profile 5)
00091500 to 000923FF	Pressure control profile (Profile 6)
00092400 to 000932FF	Pressure control profile (Profile 7)
00093300 to 000941FF	Pressure control profile (Profile 8)
00094200 to 000950FF	Pressure control profile (Profile 9)
00095100 to 00095FFF	Pressure control profile (Profile 10)
00096000 to 00096EFF	Pressure control profile (Profile 11)
00096F00 to 00097DFF	Pressure control profile (Profile 12)
00097E00 to 00098CFF	Pressure control profile (Profile 13)
00098D00 to 00099BFF	Pressure control profile (Profile 14)
00099C00 to 0009AAFF	Pressure control profile (Profile 15)
0009AB00 to 0009B9FF	Pressure control profile (Profile 16)
0009BA00 to 0009C8FF	Pressure control profile (Profile 17)
0009C900 to 0009D7FF	Pressure control profile (Profile 18)
0009D800 to 0009E6FF	Pressure control profile (Profile 19)
0009E700 to 0009F5FF	Pressure control profile (Profile 20)
0009F600 to 000A04FF	Pressure control profile (Profile 21)
000A0500 to 000A13FF	Pressure control profile (Profile 22)
000A1400 to 000A22FF	Pressure control profile (Profile 23)
000A2300 to 000A31FF	Pressure control profile (Profile 24)
000A3200 to 000A40FF	Pressure control profile (Profile 25)
000A4100 to 000A4FFF	Pressure control profile (Profile 26)
000A5000 to 000A5EFF	Pressure control profile (Profile 27)
000A5F00 to 000A6DFF	Pressure control profile (Profile 28)
000A6E00 to 000A7CFF	Pressure control profile (Profile 29)
000A7D00 to 000A8BFF	Pressure control profile (Profile 30)
000A8C00 to 000A9AFF	Pressure control profile (Profile 31)
000A9B00 to 000AA9FF	Pressure control profile (Profile 32)
000AAA00	For manufacturer setting
⋮	
000C89FF	

Pressure control information

Address (hexadecimal)	Content
0008C900	Pressure control profile in use information
0008C901	
0008C902	
0008C903	
0008C904	
0008C905	
0008C906	
0008C907	
0008C908	Axis No. in use (Profile 1)
0008C909	Axis No. in use (Profile 2)
0008C90A	Axis No. in use (Profile 3)
0008C90B	Axis No. in use (Profile 4)
0008C90C	Axis No. in use (Profile 5)
0008C90D	Axis No. in use (Profile 6)
0008C90E	Axis No. in use (Profile 7)
0008C90F	Axis No. in use (Profile 8)
0008C910	Axis No. in use (Profile 9)
0008C911	Axis No. in use (Profile 10)
0008C912	Axis No. in use (Profile 11)
0008C913	Axis No. in use (Profile 12)
0008C914	Axis No. in use (Profile 13)
0008C915	Axis No. in use (Profile 14)
0008C916	Axis No. in use (Profile 15)
0008C917	Axis No. in use (Profile 16)
0008C918	Axis No. in use (Profile 17)
0008C919	Axis No. in use (Profile 18)
0008C91A	Axis No. in use (Profile 19)
0008C91B	Axis No. in use (Profile 20)
0008C91C	Axis No. in use (Profile 21)
0008C91D	Axis No. in use (Profile 22)
0008C91E	Axis No. in use (Profile 23)
0008C91F	Axis No. in use (Profile 24)
0008C920	Axis No. in use (Profile 25)
0008C921	Axis No. in use (Profile 26)
0008C922	Axis No. in use (Profile 27)
0008C923	Axis No. in use (Profile 28)
0008C924	Axis No. in use (Profile 29)
0008C925	Axis No. in use (Profile 30)
0008C926	Axis No. in use (Profile 31)
0008C927	Axis No. in use (Profile 32)
0008C928	For manufacturer setting
⋮	
0008C9FF	

Pressure control profile

Refer to the following.

Pressure control switching condition

Refer to the following.

11.25 I/O Device

Input bit device (remote input (RX))

Address (hexadecimal)	Input bit device No.	Symbol	Description
001F7000, 001F7001	Input bit device 0 to input bit device F	RX0 to RXF	Notifies the status of the bit device input signal. • RX0 (bit0) to RXF (bit15)
001F7002, 001F7003	Input bit device 10 to input bit device 1F	RX10 to RX1F	Notifies the status of the bit device input signal. • RX10 (bit0) to RX1F (bit15)
001F7004, 001F7005	Input bit device 20 to input bit device 2F	RX20 to RX2F	Notifies the status of the bit device input signal. • RX20 (bit0) to RX2F (bit15)
001F7006, 001F7007	Input bit device 30to input bit device 3F	RX30 to RX3F	Notifies the status of the bit device input signal. • RX30 (bit0) to RX3F (bit15)
001F7008, 001F7009	Input bit device 40to input bit device 4F	RX40 to RX4F	Notifies the status of the bit device input signal. • RX40 (bit0) to RX4F (bit15)
001F700A, 001F700B	Input bit device 50 to input bit device 5F	RX50 to RX5F	Notifies the status of the bit device input signal. • RX50 (bit0) to RX5F (bit15)
001F700C, 001F700D	Input bit device 60 to input bit device 6F	RX60 to RX6F	Notifies the status of the bit device input signal. • RX60 (bit0) to RX6F (bit15)
001F700E, 001F700F	Input bit device 70 to input bit device 7F	RX70 to RX7F	Notifies the status of the bit device input signal. • RX70 (bit0) to RX7F (bit15)
001F7010, 001F7011	Input bit device 80 to input bit device 8F	RX80 to RX8F	Notifies the status of the bit device input signal. • RX80 (bit0) to RX8F (bit15)
001F7012, 001F7013	Input bit device 90 to input bit device 9F	RX90 to RX9F	Notifies the status of the bit device input signal. • RX90 (bit0) to RX9F (bit15)
001F7014, 001F7015	Input bit device A0 to input bit device AF	RXA0 to RXAF	Notifies the status of the bit device input signal. • RXA0 (bit0) to RXAF (bit15)
001F7016, 001F7017	Input bit device B0 to input bit device BF	RXB0 to RXBF	Notifies the status of the bit device input signal. • RXB0 (bit0) to RXBF (bit15)
001F7018, 001F7019	Input bit device C0 to input bit device CF	RXC0 to RXCF	Notifies the status of the bit device input signal. • RXC0 (bit0) to RXCF (bit15)
001F701A, 001F701B	Input bit device D0 to input bit device DF	RXD0 to RXDF	Notifies the status of the bit device input signal. • RXD0 (bit0) to RXDF (bit15)
001F701C, 001F701D	Input bit device E0 to input bit device EF	RXE0 to RXEF	Notifies the status of the bit device input signal. • RXE0 (bit0) to RXEF (bit15)
001F701E, 001F701F	Input bit device F0 to input bit device FF	RXF0 to RXFF	Notifies the status of the bit device input signal. • RXF0 (bit0) to RXFF (bit15)
001F7020, 001F7021	Input bit device 100 to input bit device 10F	RX100 to RX10F	Notifies the status of the bit device input signal. • RX100 (bit0) to RX10F (bit15)
001F7022, 001F7023	Input bit device 110 to input bit device 11F	RX110 to RX11F	Notifies the status of the bit device input signal. • RX110 (bit0) to RX11F (bit15)
⋮	⋮	⋮	⋮
001F71FE, 001F71FF	Input bit device FF0 to input bit device FFF	RXFF0 to RXFFF	Notifies the status of the bit device input signal. • RXFF0 (bit0) to RXFFF (bit15)
001F7200, 001F7201	Input bit device 1000 to input bit device 100F	RX1000 to RX100F	Notifies the status of the bit device input signal. • RX1000 (bit0) to RX100F (bit15)
⋮	⋮	⋮	⋮
001F73FE, 001F73FF	Input bit device 1FF0 to input bit device 1FFF	RX1FF0 to RX1FFF	Notifies the status of the bit device input signal. • RX1FF0 (bit0) to RX1FFF (bit15)
001F7400, 001F7401	Input bit device 2000 to input bit device 200F	RX2000 to RX200F	Notifies the status of the bit device input signal. • RX2000 (bit0) to RX200F (bit15)
⋮	⋮	⋮	⋮
001F75FE, 001F75FF	Input bit device 2FF0 to input bit device 2FFF	RX2FF0 to RX2FFF	Notifies the status of the bit device input signal. • RX2FF0 (bit0) to RX2FFF (bit15)
001F7600, 001F7601	Input bit device 3000 to input bit device 300F	RX3000 to RX300F	Notifies the status of the bit device input signal. • RX3000 (bit0) to RX300F (bit15)
⋮	⋮	⋮	⋮

Address (hexadecimal)	Input bit device No.	Symbol	Description
001F77FE, 001F77FF	Input bit device 3FF0 to input bit device 3FFF	RX3FF0 to RX3FFF	Notifies the status of the bit device input signal. • RX3FF0 (bit0) to RX3FFF (bit15)

Output bit device (remote output (RY))

Address (hexadecimal)	Output bit device No.	Symbol	Description
001F7800, 001F7801	Output bit device 0 to output bit device F	RY0 to RYF	Turns ON/OFF the bit device output signal. • RY0 (bit0) to RYF (bit15)
001F7802, 001F7803	Output bit device 10 to output bit device 1F	RY10 to RY1F	Turns ON/OFF the bit device output signal. • RY10 (bit0) to RY1F (bit15)
001F7804, 001F7805	Output bit device 20 to output bit device 2F	RY20 to RY2F	Turns ON/OFF the bit device output signal. • RY20 (bit0) to RY2F (bit15)
001F7806, 001F7807	Output bit device 30 to output bit device 3F	RY30 to RY3F	Turns ON/OFF the bit device output signal. • RY30 (bit0) to RY3F (bit15)
001F7808, 001F7809	Output bit device 40 to output bit device 4F	RY40 to RY4F	Turns ON/OFF the bit device output signal. • RY40 (bit0) to RY4F (bit15)
001F780A, 001F780B	Output bit device 50 to output bit device 5F	RY50 to RY5F	Turns ON/OFF the bit device output signal. • RY50 (bit0) to RY5F (bit15)
001F780C, 001F780D	Output bit device 60 to output bit device 6F	RY60 to RY6F	Turns ON/OFF the bit device output signal. • RY60 (bit0) to RY6F (bit15)
001F780E, 001F780F	Output bit device 70 to output bit device 7F	RY70 to RY7F	Turns ON/OFF the bit device output signal. • RY70 (bit0) to RY7F (bit15)
001F7810, 001F7811	Output bit device 80 to output bit device 8F	RY80 to RY8F	Turns ON/OFF the bit device output signal. • RY80 (bit0) to RY8F (bit15)
001F7812, 001F7813	Output bit device 90 to output bit device 9F	RY90 to RY9F	Turns ON/OFF the bit device output signal. • RY90 (bit0) to RY9F (bit15)
001F7814, 001F7815	Output bit device A0 to output bit device AF	RYA0 to RYAF	Turns ON/OFF the bit device output signal. • RYA0 (bit0) to RYAF (bit15)
001F7816, 001F7817	Output bit device B0 to output bit device BF	RYB0 to RYBF	Turns ON/OFF the bit device output signal. • RYB0 (bit0) to RYBF (bit15)
001F7818, 001F7819	Output bit device C0 to output bit device CF	RYC0 to RYCF	Turns ON/OFF the bit device output signal. • RYC0 (bit0) to RYCF (bit15)
001F781A, 001F781B	Output bit device D0 to output bit device DF	RYD0 to RYDF	Turns ON/OFF the bit device output signal. • RYD0 (bit0) to RYDF (bit15)
001F781C, 001F781D	Output bit device E0 to output bit device EF	RYE0 to RYEF	Turns ON/OFF the bit device output signal. • RYE0 (bit0) to RYEF (bit15)
001F781E, 001F781F	Output bit device F0 to output bit device FF	RYF0 to RYFF	Turns ON/OFF the bit device output signal. • RYF0 (bit0) to RYFF (bit15)
001F7820, 001F7821	Output bit device 100 to output bit device 10F	RY100 to RY10F	Turns ON/OFF the bit device output signal. • RY100 (bit0) to RY10F (bit15)
001F7822, 001F7823	Output bit device 110 to output bit device 11F	RY110 to RY11F	Turns ON/OFF the bit device output signal. • RY110 (bit0) to RY11F (bit15)
⋮	⋮	⋮	⋮
001F79FE, 001F79FF	Output bit device FF0 to output bit device FFF	RYFF0 to RYFFF	Turns ON/OFF the bit device output signal. • RYFF0 (bit0) to RYFFF (bit15)
001F7A00, 001F7A01	Output bit device 1000 to output bit device 100F	RY1000 to RY100F	Turns ON/OFF the bit device output signal. • RY1000 (bit0) to RY100F (bit15)
⋮	⋮	⋮	⋮
001F7BFE, 001F7BFF	Output bit device 1FF0 to output bit device 1FFF	RY1FF0 to RY1FFF	Turns ON/OFF the bit device output signal. • RY1FF0 (bit0) to RY1FFF (bit15)
001F7C00, 001F7C01	Output bit device 2000 to output bit device 200F	RY2000 to RY200F	Turns ON/OFF the bit device output signal. • RY2000 (bit0) to RY200F (bit15)
⋮	⋮	⋮	⋮
001F7DFE, 001F7DFF	Output bit device 2FF0 to output bit device 2FFF	RY2FF0 to RY2FFF	Turns ON/OFF the bit device output signal. • RY2FF0 (bit0) to RY2FFF (bit15)
001F7E00, 001F7E01	Output bit device 3000 to output bit device 300F	RY3000 to RY300F	Turns ON/OFF the bit device output signal. • RY3000 (bit0) to RY300F (bit15)
⋮	⋮	⋮	⋮
001F7FFE, 001F7FFF	Output bit device 3FF0 to output bit device 3FFF	RY3FF0 to RY3FFF	Turns ON/OFF the bit device output signal. • RY3FF0 (bit0) to RY3FFF (bit15)

Output word device (remote register (RWw))

Address (hexadecimal)	Output bit device No.	Description
001F8000, 001F7801	Output word device 0	Turns ON/OFF the word device output signal.
001F8002, 001F7803	Output word device 1	
001F8004, 001F8005	Output word device 2	
001F8006, 001F8007	Output word device 3	
001F8008, 001F8009	Output word device 4	
001F800A, 001F800B	Output word device 5	
001F800C, 001F800D	Output word device 6	
001F800E, 001F800F	Output word device 7	
001F8010, 001F8011	Output word device 8	
001F8012, 001F8013	Output word device 9	
001F8014, 001F8015	Output word device A	
001F8016, 001F8017	Output word device B	
001F8018, 001F8019	Output word device C	
001F801A, 001F801B	Output word device D	
001F801C, 001F801D	Output word device E	
001F801E, 001F801F	Output word device F	
001F8020, 001F8021	Output word device 10	
001F8022, 001F8023	Output word device 11	
001F8024, 001F8025	Output word device 12	
001F8026, 001F8027	Output word device 13	
001F8028, 001F8029	Output word device 14	
001F802A, 001F802B	Output word device 15	
001F802C, 001F802D	Output word device 16	
001F802E, 001F802F	Output word device 17	
001F8030, 001F8031	Output word device 18	
001F8032, 001F8033	Output word device 19	
001F8034, 001F8035	Output word device 1A	
001F8036, 001F8037	Output word device 1B	
001F8038, 001F8039	Output word device 1C	
001F803A, 001F803B	Output word device 1D	
001F803C, 001F803D	Output word device 1E	
001F803E, 001F803F	Output word device 1F	
001F8040, 001F8041	Output word device 20	
⋮	⋮	
001F81FE, 001F81FF	Output word device FF	
001F8200, 001F8201	Output word device 100	
⋮	⋮	
001F9FFE, 001F9FFF	Output word device FFF	
001FA000, 001FA001	Output word device 1000	
⋮	⋮	
001FBFFE, 001FBFFF	Output word device 1FFF	

Input word device (remote register (RWr))

Address (hexadecimal)	Input word device No.	Description
001FC000, 001FC001	Input word device 0	Notifies the status of the word device input signal.
001FC002, 001FC003	Input word device 1	
001FC004, 001FC005	Input word device 2	
001FC006, 001FC007	Input word device 3	
001FC008, 001FC009	Input word device 4	
001FC00A, 001FC00B	Input word device 5	
001FC00C, 001FC00D	Input word device 6	
001FC00E, 001FC00F	Input word device 7	
001FC010, 001FC011	Input word device 8	
001FC012, 001FC013	Input word device 9	
001FC014, 001FC015	Input word device A	
001FC016, 001FC017	Input word device B	
001FC018, 001FC019	Input word device C	
001FC01A, 001FC01B	Input word device D	
001FC01C, 001FC01D	Input word device E	
001FC01E, 001FC01F	Input word device F	
001FC020, 001FC021	Input word device 10	
001FC022, 001FC023	Input word device 11	
001FC024, 001FC025	Input word device 12	
001FC026, 001FC027	Input word device 13	
001FC028, 001FC029	Input word device 14	
001FC02A, 001FC02B	Input word device 15	
001FC02C, 001FC02D	Input word device 16	
001FC02E, 001FC02F	Input word device 17	
001FC030, 001FC031	Input word device 18	
001FC032, 001FC033	Input word device 19	
001FC034, 001FC035	Input word device 1A	
001FC036, 001FC037	Input word device 1B	
001FC038, 001FC039	Input word device 1C	
001FC03A, 001FC03B	Input word device 1D	
001FC03C, 001FC03D	Input word device 1E	
001FC03E, 001FC03F	Input word device 1F	
001FC040, 001FC041	Input word device 20	
⋮	⋮	
001FC1FE, 001FC1FF	Input word device FF	
001FC200, 001FC201	Input word device 100	
⋮	⋮	
001FDFFE, 001FDFFF	Input word device FFF	
001FE000, 001FE001	Input word device 1000	
⋮	⋮	
001FFFFE, 001FFFFF	Input word device 1FFF	

12 PARAMETERS

Concerning the parameters whose name shows that they are set by a manufacturer, do not set them with other than the initial values. If erroneous values are set, unexpected movement can occur.

The parameters are classified as below.

Classification	Parameter No.[1]	Description	Reference
System parameters	0001 to 00FF	—	Page 565 System Parameters
Servo parameters	—	Set the parameters by MR Configurator2, and write them by the device station parameter automatic setting.	Page 567 Servo Parameters
Control parameters	0200 to 02FF	Set the parameters for each axis.	Page 568 Control Parameters
Axis management parameters	0400 to 04FF	Set the parameters for the axis control such as to tie with the network parameter.	Page 575 Axis Management Parameters

[1] Parameter No. are given in hexadecimal.

12.1 System Parameters

Point

The settings for the parameters with a * mark at the front of the symbol are validated when the system is started.

Parameter No.	Symbol	Name	Initial value	Units	Setting range	Description
0001	—	For manufacturer setting	0000h	—	—	—
0002			0000h			
0003	*SYSOP3	System option 3	0000h	—	0000h, 0010h	■■□■ (Forced stop option selection) Set valid/invalid of the forced stop option. • 0: Invalid • 1: Valid
0004	SITM	System interrupt conditions	0000h	—	0000h to FFFFh	Set the interrupt conditions for the system by specifying the bit. • Bit0: System status code error detected • Bit1: System alarm detected • Bit2: Being executed forced stop • Bit3: System error detected • Bit8: Factor of other axes start interrupt being output • Bit9: Factor of pass position interrupt being output
0005	—	For manufacturer setting	0000h	—	—	—
0006	*DOOP	General output (DO) option	0000h	—	0000h to 0001h	■■■□ (DO common selection) Set sink/source of the DO common. • 0: Sink • 1: Source
0007 ⋮ 000D	—	For manufacturer setting	0000h ⋮ 0000h	—	—	—
000E	*EMID	External forced stop disabled	0000h	—	0000h, 5AE1h	Disable the forced stop by the EMI signal. • 0000h: Forced stop enabled • 5AE1h: Forced stop disabled
000F	—	For manufacturer setting	0000h	—	—	—
0010			0000h			
0011	*HSCM	Operation mode setting	0000h	—	0000h to 0011h	■■■□ (Operation mode setting) Set the operation mode. • 0: Normal operation mode • 1: High speed operation mode ■■□■ (Maximum number of groups setting) Expand the maximum number of groups that can be used in the high speed operation mode. • 0: 2 groups • 1: 3 groups
0012	*IRET	Interrupt signal re-output time	0	ms	0 to 65535	Set the time from turning ON the outputting factor of interrupt signal (ITO) until re-outputting the interrupt signal. • 0: Interrupt signal re-output is invalid • 1 to 65535: 1 to 65535ms
0013	*IRN	Interrupt signal re-output count	0	—	0 to 32767	Set the number of times to re-output the interrupt signal. When setting 0, the interrupt signal is output 4 times.
0014	*EMIDI	Input signal settings for emergency stop	0000h	—	0000h to 00F2h	■■■□ (Input signal setting) Set the input signal for emergency stop. • 0: General-purpose input specification • 1: Input bit device specification • 2: Input word device specification ■■□■ (Bit selection) When specifying the input word device, set the bit No. to use. <Example> When using fifth bit Set 0052h.

Parameter No.	Symbol	Name	Initial value	Units	Setting range	Description
0015	*EMIS	Specification of sensor signal (EMI) connection	0000h	—	0000h to 3FFFh	■For "0: General-purpose input specification" (DI□□□□) Set the general-purpose input (DI) No. to which EMI is connected. • 0000h to 0003h: DI0 to DI3 ■For "1: Input bit device specification" (RX□□□□) Set the input bit device (RX) No. to which EMI is connected. • 0000h to 3FFFh: RX0000 to RX3FFF ■For "2: Input word device specification" (RWr□□□□) Set the input word device (RWr) No. to which EMI is connected. • 0000h to 1FFFh: RWr0000 to RWr1FFF
0016 ⋮ 004B	—	For manufacturer setting	0000h ⋮ 0000h	—	—	—
004C	*SYSOP5	System option 5	0001h	—	0000h to 0011h	■■■□ (Interpolation axis setting method) Specify the interpolation axis setting method. • 0: Use control parameter • 1: Use point table ■■□■ (Pass position interrupt condition judgement method) Specify the pass position interrupt condition judgement method. • 0: Judge each condition from the pass position condition start No. • 1: Judge all conditions in one batch
004D ⋮ 00FF	—	For manufacturer setting	0000h ⋮ 0000h	—	—	—

12.2 Servo Parameters

The parameters described in this section are for using the servo amplifier MR-J5(W)-G. For details, refer to the servo amplifier manual for your servo amplifier.

For MR-J5(W)-G: ⊞MR-J5-G/MR-J5W-G User's Manual (Parameters)

12.3 Control Parameters

Point

- The settings for the parameters with a * mark at the front of the symbol are validated when the system is started.
- When in tandem drive column in the table is for the control parameter setting classification of the axis for which the tandem drive is performed.

  Master: Only valid for the master axis value (☞ Page 436 Data only valid for the master axis)

  Each axis: Setting the master axis/slave axis individually is available (☞ Page 436 Individual data for master axis/slave axis)

  Same value: Set the same value in the master axis/slave axis

Parameter No.	Symbol	Name	Initial value	Units	Setting range	Description	When in tandem drive
0200	*OPC	Control option 1	0000h	—	0000h to 1111h	■■■□ (Control axis) Set "1: Controlled" when controlling the drive unit. • 0: Not controlled • 1: Controlled ■■□■ (Drive-unit-less) Set "1: Valid" when not communicating with the drive unit. When setting "1: Valid" with the control axis, the operation without the drive unit (simulation) is available. • 0: Invalid • 1: Valid ■□■■ (No home position) Set "1: Valid" when setting the position at the time of power on as the home position. After returning to the home position, the home position becomes the position where the home position return is performed. • 0: Invalid • 1: Valid □■■■ (Speed unit) Set the speed command unit. • 0: Position command unit/min • 1: Position command unit/sec	Same value

Parameter No.	Symbol	Name	Initial value	Units	Setting range	Description	When in tandem drive
0201	OPC2	Control option 2	0000h	—	0000h to 1121h	■■■□ (Position switch judgment conditions) Set the position switch judgment conditions. • 0: Current command position • 1: Current feedback position ■■□■ (Continuous operation position over-bound processing) Set the processing for when the stop position exceeds the command position during the operation. Operate through "2: Stop firmly at command position "when using the circular interpolation. • 0: Alarm • 1: Return to command position • 2: Stop firmly at command position ■□■■ (Change of position over-bound processing) Set the processing for when the stop position exceeds the command position during the position change. • 0: Alarm • 1: Return to command position □■■■ (Driver command discard detection) Set whether to detect or not to detect the driver command discard during the axis operation. • 0: Detection valid • 1: Detection invalid	Master
0202	*OPC3	Control option 3	0001h	—	0000h to 0001h	■■■□ (Interlock signal polarity) Set the polarity of the Interlock signal. • 0: B-contact • 1: A-contact	Master
0203	—	For manufacturer setting	0000h	—	—	—	—
0204	ITM1	Interrupt condition 1	0000h	—	0000h to FFFFh	Set the interrupt condition 1 by specifying the bit. • Bit0: Servo ready • Bit1: In-position • Bit2: Zero speed • Bit3: Passed Z-phase • Bit4: Torque limit effective • Bit5: Drive unit alarm • Bit6: Drive unit warning • Bit7: Absolute position erased • Bit8: Operation processing • Bit9: Rough match • Bit10: Positioning completed • Bit11: Home position return completed • Bit12: Smoothing stop • Bit13: Operation alarm • Bit14: Operation completed • Bit15: Position switch	Each axis
0205	ITM2	Interrupt condition 2	0000h	—	0000h to FFFFh	Set the interrupt condition 2 by specifying the bit. • Bit0 to 8: For manufacturer setting • Bit19: Drive unit in-position • Bit10 to 15: For manufacturer setting	Each axis

Parameter No.	Symbol	Name	Initial value	Units	Setting range	Description	When in tandem drive
0206	*OPC4	Control option 4	0000h	—	0000h to 1001h	■■■□ (Predwell setting range) Set the setting range of the predwell. • 0: 0 to 3000ms • 1: 0 to 65535ms □■■■ (Re-acceleration setting for position change during deceleration) Set the re-acceleration setting for the position change during the deceleration to enabled/disabled. • 0: Invalid • 1: Valid	Master
0207	*BKCD	Backlash compensation direction	0000h	—	0000h to 0001h	■■■□ (Backlash compensation direction) Set the direction for the backlash compensation. • 0: + direction • 1: - direction	Same value
0208	*BKCL	Backlash compensation amount (lower)	0000h	pos units	0000h to FFFFh	Settings for performing the compensation of the machine backlash. • 0 to 16777215	Same value
0209	*BKCH	Backlash compensation amount (upper)	0000h		0000h to 00FFh		
020A	*CMXL	Electronic gear numerator (lower)	0001h	—	1 to 5242879	Set the numerator of the electronic gear.	Master
020B	*CMXH	Electronic gear numerator (upper)	0000h				
020C	*CDVL	Electronic gear denominator (lower)	0001h	—	1 to 589823	Set the denominator of the electronic gear.	Master
020D	*CDVH	Electronic gear denominator (upper)	0000h				
020E	SUML	Speed units multiplication factor (lower)	2000h	—	1 to 32768	Set the multiplication factor for the speed command.	Master
020F	SUMH	Speed units multiplication factor (upper)	0000h				
0210	TLP	Forward rotation torque limit value	10000	0.1%	0 to 32767	Set the forward rotation torque limit value that is sent to the drive unit in the operation cycle.	Master
0211	TLN	Reverse rotation torque limit value	10000	0.1%	0 to 32767	Set the reverse rotation torque limit value that is sent to the drive unit in the operation cycle.	Master
0212	*OPC5	Control option 5	0000h	—	0000h to 0001h	■■■□ (Driver command discard detection) Set whether to detect or not to detect the driver command discard. • 0: Detection valid • 1: Detection invalid	Master
0213 ⋮ 0218	—	For manufacturer setting	0000h ⋮ 0000h	—	—	—	—
0219	*SOP	Sensor input options	0000h	—	0000h to 0304h	■■■□ (Sensor input system) Set the input system of the sensor (LSP, LSN, DOG). • 0: Not use • 1: Driver input • 3: Not connected (It does not detect LSP, LSN, DOG) • 4: Axis command bit input ■□■■ (Limit switch signal selection) Set valid/invalid of the limit switch. • 0: LSP/LSN are valid • 1: LSP is valid, LSN is invalid • 2: LSP is invalid, LSN is valid • 3: LSP/LSN are invalid	Each axis

Parameter No.	Symbol	Name	Initial value	Units	Setting range	Description	When in tandem drive
021A ⋮ 021F	—	For manufacturer setting	0000h ⋮ 0000h	—	—	—	—
0220	OPS	Speed options	0000h	—	0000h to 0001h	■■■□ (Acceleration/deceleration method) Set the type of acceleration/deceleration. • 0: Linear acceleration/deceleration • 1: Smoothing filter	Master
0221	SRATE	S-curve ratio	0	%	0 to 100	Set the S-curve ratio of the S-curve acceleration/deceleration (sine acceleration/deceleration). • 0 to 29: S-curve acceleration/ deceleration invalid • 30 to 100: S-curve acceleration/ deceleration The S-curve acceleration/deceleration is performed for the acceleration/deceleration method selected in "Speed options (parameter No.0220)". The S-curve ratio set by this parameter is used in the JOG operation, the incremental feed operation, and the home position return. For the automatic operation and the interpolation operation, set the S-curve ratio in the point table.	Master
0222	SPLL	Speed limit value (lower)	3000	Speed units	0 to 2147483647	Set the value for the moving speed limit.	Master
0223	SPLH	Speed limit value (upper)					
0224 0225	—	For manufacturer setting	0	—	—	—	—
0226	STC	Smoothing time constant	0	ms	0 to 100	Set the time constant of the smoothing filter.	Master
0227	STE	Rapid stop time constant	20	ms	0 to 20000	Set the deceleration time constant for when the operation rapid stop or the limit switch is input.	Master
0228	SLPL	Software limit Upper limit (lower)	0	Command units	-2147483648 to 2147483647	Set the + side of the software limit.	Master
0229	SLPH	Software limit Upper limit (upper)					
022A	SLPL	Software limit Lower limit (lower)	0	Command units	-2147483648 to 2147483647	Set the - side of the software limit.	Master
022B	SLPH	Software limit Lower limit (upper)					
022C	PSPL	Position switch Upper limit (lower)	0	Command units	-2147483648 to 2147483647	Set the + end position for turning ON the position switch.	Master
022D	PSPH	Position switch Upper limit (upper)					
022E	PSNL	Position switch Lower limit (lower)	0	Command units	-2147483648 to 2147483647	Set the - end position for turning ON the position switch.	Master
022F	PSNH	Position switch Lower limit (upper)					
0230	CRPL	Rough match output limits (lower)	0	Command units	0 to 2147483647	Set the remaining distance limits for outputting a command for rough matching.	Master
0231	CRPH	Rough match output limits (upper)					
0232	INPCL	In-position width (lower)	25600	Command units	0 to 16777215	Set the in-position width which is judged by the Motion control board.	Each axis
0233	INPCH	In-position width (upper)					
0234 ⋮ 023F	—	For manufacturer setting	0000h ⋮ 0	—	—	—	—

Parameter No.	Symbol	Name	Initial value	Units	Setting range	Description	When in tandem drive
0240	*OPZ1	Home position return option 1	000Fh	—	000Fh	■ ■ ■ □ (Home position return method) Set the method for the home position return. • F: Driver method	Master
0241	*OPZ2	Home position return option 2	0000h	—	0000h to 0001h	■ ■ ■ □ (Absolute position data) Set the validity/invalidity of restoring the absolute position. • 0: Invalid (The position at the system startup is defined to be 0. The home position return must be executed prior to performing the automatic operation or the interpolation operation.) • 1: Valid (The absolute position is restored at the system startup based on the home position multiple revolution data and the home position within 1 revolution position.)	Master
0242 ⋮ 0245	—	For manufacturer setting	00C8h ⋮ 100	—	—	—	—
0246	ZPSL	Home position coordinates (lower)	0	Command units	-2147483648 to 2147483647	Set the home position coordinates (the position after completing the home position return).	Master
0247	ZPSH	Home position coordinates (upper)					
0248 ⋮ 025B	—	For manufacturer setting	0 ⋮ 0000h	—	—	—	—
025C	FREQ	Vibration suppression command filter 1 frequency	0	0.1Hz	0 to 20000	Set the vibration suppression command filter 1 frequency in increments of 0.1Hz. The setting range for each operation cycle is shown below. When a frequency outside the range is set, the vibration suppression command filter 1 becomes invalid. • 62.50μs: 160 to 20000 • 125.00μs: 80 to 20000 • 250.00μs: 40 to 20000 • 500.00μs: 20 to 10000 • 1000.00μs: 10 to 5000 • 2000.00μs: 5 to 2500	Master
025D	ATT	Vibration suppression command filter 1 attenuation	0	—	0 to 32	Set the attenuation of the vibration component. • 0: Maximum filter attenuation	Master
025E	EDRP	Vibration suppression command filter 1 operation ending droop	0	pulse	0 to 10000	Set the operation ending droop for when the operation finishes. When the amount of droop by the vibration suppression command filter 1 is equal to or less than the set value, all remaining pulses are output and the operation ends. • 0: 5 [pulse]	Master
025F	—	For manufacturer setting	0000h	—	—	—	—
0260	*LGRP	Interpolation group	0000h	—	0000h to 0010h	■ ■ □ □ (Group No.) Set the group for the interpolation operation. • 00h: Invalid • 01h to 10h: Group No.1 to 16 <Example> 0Ah Group No.10	Master

Parameter No.	Symbol	Name	Initial value	Units	Setting range	Description	When in tandem drive
0261	LOP	Interpolation options	0000h	—	0000h to 0102h	■■■□ (Excessive speed processing) Set the operation when the speed is excessive. • 0: Speed clamp • 1: Alarm stop • 2: No processing ■□■■ (Trajectory processing during continuous operation) When using the continuous operation for the interpolation operation, select the trajectory processing to use when the point data is switched. • 0: Position adjustment • 1: Proximity pass	Master
0262	LSLL	Interpolation speed limit value (lower)	3000	Speed units	0 to 2147483647	Set the limit for the interpolation speed.	Master
0263	LSLH	Interpolation speed limit value (upper)					
0264	*TGRP	Tandem drive group	0000h	—	0000h to 0008h	■■■□ (Group No.) Set the tandem drive group. • 0: Invalid • 1 to 8: Group No.	Same value
0265	TOP	Tandem drive options	0000h	—	0000h to 0010h	■■□■ (Synchronous alignment valid/ invalid) Set the validity/invalidity of the synchronization for turning the servo ON. • 0: The synchronous alignment is valid. • 1: The synchronous alignment is invalid.	Master
0266	*TEV	Tandem drive synchronous alignment valid width	10000	Command units	0 to 32767	Set the valid width for performing the compensation of the deviation between the master axis and the slave axis when the servo is turned ON. • 0: The check with the synchronous alignment valid width is invalid.	Master
0267	*TES	Tandem drive synchronous alignment speed	10000	Speed units	1 to 32767	Set the speed for performing the compensation of the deviation between the master axis and the slave axis when the servo is turned ON.	Master
0268	*TEO	Tandem drive excessive deviation width	10000	Command units	0 to 32767	Set the detection level for the excessive deviation alarm for the deviation between the master axis and the slave axis. • 0: The check with the excessive deviation width is invalid.	Master
0269	*TMAG	Tandem drive unit multiplication factor	1	—	1 to 32767	Set the multiplication factor for the synchronous alignment valid width and the excessive deviation width for the tandem drive axes.	Master
026A	*TED	Late starting of tandem drive excessive deviation detection	50	ms	0 to 500	Set the delay time from the completion of the synchronization for turning the servo ON until the detection of the excessive deviation is started.	Master
026B ⋮ 029F	—	For manufacturer setting	10000 ⋮ 0000h	—	—	—	—

Parameter No.	Symbol	Name	Initial value	Units	Setting range	Description	When in tandem drive
02A0	*EMIOP	Emergency stop option	0000h	—	0000h to 0304h	■■■□ (Forced stop option) Set the operation of forced stop. • 0: Quick stop • 1: Rapid stop • 2: Stop after operation completed • 3: Stop after operation completed if any one of the condition axes is operating toward the judgement direction of condition axes settings. Rapid stop if other than the above. • 4: Forced stop invalid ■□■■ (Condition axis setting) Set valid/invalid of a condition axis and the judgement direction when the axis is valid. • 0: Invalid • 1 to 3: Valid (1: + direction, 2: - direction, 3: Both directions)	Master
02A1 ⋮ 02CB	—	For manufacturer setting	10000 ⋮ 0000h	—	—	—	—
02CC	CIERL	Allowable error range for circular interpolation (lower)	0	Command units	0 to 1000000	Set the allowable range for the calculated arc trajectory and the end point coordinate. (For the central point-specified 2-axis circular interpolation control, the trajectory of the arc calculated from the start and central point coordinates may not coincide with the end point coordinate.) When the error between the calculated arc trajectory and the end coordinate is within the set range, both the circular interpolation to the set end point coordinate and the error compensation are executed simultaneously by means of the spiral interpolation. For the allowable error range for the circular interpolation, the primary axis settings are valid.	Master
02CD	CIERH	Allowable error range for circular interpolation (upper)					
02CE ⋮ 02FF	—	For manufacturer setting	0000h ⋮ 0000h	—	—	—	—

12.4 Axis Management Parameters

> **Point**
>
> The settings for the parameters with a * mark at the front of the symbol are validated when the system is started.

Parameter No.	Symbol	Name	Initial value	Units	Setting range	Description	When in tandem drive
0400	*AXALCOP	Axis No. option	0000h	—	0000h	Set the designation method of the station address which is assigned to the axis No. • 0000h: IP address (IPv4), multidrop No.	Each axis
0401	—	For manufacturer setting	0000h	—	—	—	—
0402			0000h				
0403	*IPV41	IPv4 first & second octet	0000h	—	0000h to FFFFh	Set the station address of the device station which is assigned to the axis No. of the Motion control board. Set the first and second octet of the IP address (IPv4). (The range of the IP address is "1.0.0.1 to 223.255.255.254".) <Example> IP address "192.168.3.1" Set C0A8h (C0h=192, A8h=168).	Each axis
0404	*IPV42	IPv4 third & fourth octet	0000h	—	0000h to FFFFh	Set the station address of the device station which is assigned to the axis No. of the Motion control board. Set the third and fourth octet of the IP address (IPv4). (The range of the IP address is "1.0.0.1 to 223.255.255.254".) <Example> IP address "192.168.3.1" Set 0301h (03h=3, 01h=1).	Each axis
0405 ⋮ 040E	—	For manufacturer setting	0000h ⋮ 0	—	—	—	—
040F	*MDNUM	Multidrop station No.	0	—	0 to 7	Set the station address of the device station which is assigned to the axis No. of the Motion control board. Set the multi-drop No. in order to distinguish axes when one station includes multiple axes, such as the multi-axis drive unit. ■For a single axis device <Example> MR-J5-G Set "0". ■For a multi-axis device <Example> MR-J5W3-G Set the following axis No. Axis A: 0 Axis B: 1 Axis C: 2	Each axis
0410	*HSCG	Operation group	0000h	—	0000h to 0003h	■■■□ (Group No.) Set the group No. of the high speed operation mode. • 0000h: Invalid • 0001h to 0003h: Group No.	Same value
0411 ⋮ 047F	—	For manufacturer setting	0000h ⋮ 0000h	—	—	—	—

Parameter No.	Symbol	Name	Initial value	Units	Setting range	Description	When in tandem drive
0480	*NTPL1	TPDO object No. 1 (lower)	0000h	—	0000h to FFFFh	■■□□ (Size) Set the size (bit unit) of the TPDO object which is assigned to the input word device (RWr).[*1] • 08h: 8bits (Data Type I8/U8) • 10h: 16bits (Data Type I16/U16) • 20h: 32bits (Data Type I32/U32) <Example> For "Position actual value (Obj. 6064h: 00h)" Since the size is 32 bits, set "20h". □□■■ (Subindex) Set the subindex No. of the TPDO object which is assigned to the input word device (RWr). <Example> For "Position actual value (Obj. 6064h: 00h)" Set the subindex "00h".	Each axis
0481	*NTPH1	TPDO object No. 1 (upper)	0000h	—	0000h to FFFFh	□□□□ (Index) Set the index No. of the TPDO object which is assigned to the input word device (RWr). <Example> For "Position actual value (Obj. 6064h: 00h)" Set the index "6064h".	Each axis
0482	*SUTP1	TPDO object unit 1	0000h	—	0000h to 0001h	■■■□ (Read unit selection) Set the read unit of the TPDO object which is assigned to the input word device (RWr). • 0: Data • 1: Bit	Each axis
0483	*OPTP1	TPDO object bit option 1	0000h	—	0000h to FFFFh	■■□□ (Bit selection) Set the start of the bit which is read in the input word device (RWr). When "0: Data" is set for "Read unit selection" of "TPDO object unit 1 (parameter No.0482)", this parameter is not used. The operation alarm does not occur even if the value outside the range is set. <Example> For reading fifth to eighth bits Set "05h". □□■■ (Number of bits) Set the bit length which is read in the input word device (RWr). The bit length is "set value + 1". When "0: Data" is set for "Read unit selection" of "TPDO object unit 1 (parameter No.0482)", this parameter is not used. The operation alarm does not occur even if the value outside the range is set. <Example> For reading fifth to eighth bits Set "03h".	Each axis
0484	*NTPL2	TPDO object No. 2 (lower)	0000h	—	0000h to FFFFh	Same as "TPDO object No. 1 (lower) (parameter No.0480)".	Each axis
0485	*NTPH2	TPDO object No. 2 (upper)	0000h	—	0000h to FFFFh	Same as "TPDO object No. 1 (upper) (parameter No.0481)".	Each axis
0486	*SUTP2	TPDO object unit 2	0000h	—	0000h to 0001h	Same as "TPDO object unit 1 (parameter No.0482)".	Each axis
0487	*OPTP2	TPDO object bit option 2	0000h	—	0000h to FFFFh	Same as "TPDO object bit option 1 (parameter No.0483)".	Each axis
0488	*NTPL3	TPDO object No. 3 (lower)	0000h	—	0000h to FFFFh	Same as "TPDO object No. 1 (lower) (parameter No.0480)".	Each axis
0489	*NTPH3	TPDO object No. 3 (upper)	0000h	—	0000h to FFFFh	Same as "TPDO object No. 1 (upper) (parameter No.0481)".	Each axis
048A	*SUTP3	TPDO object unit 3	0000h	—	0000h to 0001h	Same as "TPDO object unit 1 (parameter No.0482)".	Each axis
048B	*OPTP3	TPDO object bit option 3	0000h	—	0000h to FFFFh	Same as "TPDO object bit option 1 (parameter No.0483)".	Each axis
048C	*NTPL4	TPDO object No. 4 (lower)	0000h	—	0000h to FFFFh	Same as "TPDO object No. 1 (lower) (parameter No.0480)".	Each axis

Parameter No.	Symbol	Name	Initial value	Units	Setting range	Description	When in tandem drive
048D	*NTPH4	TPDO object No. 4 (upper)	0000h	—	0000h to FFFFh	Same as "TPDO object No. 1 (upper) (parameter No.0481)".	Each axis
048E	*SUTP4	TPDO object unit 4	0000h	—	0000h to 0001h	Same as "TPDO object unit 1 (parameter No.0482)".	Each axis
048F	*OPTP4	TPDO object bit option 4	0000h	—	0000h to FFFFh	Same as "TPDO object bit option 1 (parameter No.0483)".	Each axis
0490	*NTPL5	TPDO object No. 5 (lower)	0000h	—	0000h to FFFFh	Same as "TPDO object No. 1 (lower) (parameter No.0480)".	Each axis
0491	*NTPH5	TPDO object No. 5 (upper)	0000h	—	0000h to FFFFh	Same as "TPDO object No. 1 (upper) (parameter No.0481)".	Each axis
0492	*SUTP5	TPDO object unit 5	0000h	—	0000h to 0001h	Same as "TPDO object unit 1 (parameter No.0482)".	Each axis
0493	*OPTP5	TPDO object bit option 5	0000h	—	0000h to FFFFh	Same as "TPDO object bit option 1 (parameter No.0483)".	Each axis
0494	*NTPL6	TPDO object No. 6 (lower)	0000h	—	0000h to FFFFh	Same as "TPDO object No. 1 (lower) (parameter No.0480)".	Each axis
0495	*NTPH6	TPDO object No. 6 (upper)	0000h	—	0000h to FFFFh	Same as "TPDO object No. 1 (upper) (parameter No.0481)".	Each axis
0496	*SUTP6	TPDO object unit 6	0000h	—	0000h to 0001h	Same as "TPDO object unit 1 (parameter No.0482)".	Each axis
0497	*OPTP6	TPDO object bit option 6	0000h	—	0000h to FFFFh	Same as "TPDO object bit option 1 (parameter No.0483)".	Each axis
0498	*NTPL7	TPDO object No. 7 (lower)	0000h	—	0000h to FFFFh	Same as "TPDO object No. 1 (lower) (parameter No.0480)".	Each axis
0499	*NTPH7	TPDO object No. 7 (upper)	0000h	—	0000h to FFFFh	Same as "TPDO object No. 1 (upper) (parameter No.0481)".	Each axis
049A	*SUTP7	TPDO object unit 7	0000h	—	0000h to 0001h	Same as "TPDO object unit 1 (parameter No.0482)".	Each axis
049B	*OPTP7	TPDO object bit option 7	0000h	—	0000h to FFFFh	Same as "TPDO object bit option 1 (parameter No.0483)".	Each axis
049C	*NTPL8	TPDO object No. 8 (lower)	0000h	—	0000h to FFFFh	Same as "TPDO object No. 1 (lower) (parameter No.0480)".	Each axis
049D	*NTPH8	TPDO object No. 8 (upper)	0000h	—	0000h to FFFFh	Same as "TPDO object No. 1 (upper) (parameter No.0481)".	Each axis
049E	*SUTP8	TPDO object unit 8	0000h	—	0000h to 0001h	Same as "TPDO object unit 1 (parameter No.0482)".	Each axis
049F	*OPTP8	TPDO object bit option 8	0000h	—	0000h to FFFFh	Same as "TPDO object bit option 1 (parameter No.0483)".	Each axis
04A0	*NTPL9	TPDO object No. 9 (lower)	0000h	—	0000h to FFFFh	Same as "TPDO object No. 1 (lower) (parameter No.0480)".	Each axis
04A1	*NTPH9	TPDO object No. 9 (upper)	0000h	—	0000h to FFFFh	Same as "TPDO object No. 1 (upper) (parameter No.0481)".	Each axis
04A2	*SUTP9	TPDO object unit 9	0000h	—	0000h to 0001h	Same as "TPDO object unit 1 (parameter No.0482)".	Each axis
04A3	*OPTP9	TPDO object bit option 9	0000h	—	0000h to FFFFh	Same as "TPDO object bit option 1 (parameter No.0483)".	Each axis
04A4	*NTPL10	TPDO object No. 10 (lower)	0000h	—	0000h to FFFFh	Same as "TPDO object No. 1 (lower) (parameter No.0480)".	Each axis
04A5	*NTPH10	TPDO object No. 10 (upper)	0000h	—	0000h to FFFFh	Same as "TPDO object No. 1 (upper) (parameter No.0481)".	Each axis
04A6	*SUTP10	TPDO object unit 10	0000h	—	0000h to 0001h	Same as "TPDO object unit 1 (parameter No.0482)".	Each axis
04A7	*OPTP10	TPDO object bit option 10	0000h	—	0000h to FFFFh	Same as "TPDO object bit option 1 (parameter No.0483)".	Each axis
04A8	*NTPL11	TPDO object No. 11 (lower)	0000h	—	0000h to FFFFh	Same as "TPDO object No. 1 (lower) (parameter No.0480)".	Each axis
04A9	*NTPH11	TPDO object No. 11 (upper)	0000h	—	0000h to FFFFh	Same as "TPDO object No. 1 (upper) (parameter No.0481)".	Each axis

Parameter No.	Symbol	Name	Initial value	Units	Setting range	Description	When in tandem drive
04AA	*SUTP11	TPDO object unit 11	0000h	—	0000h to 0001h	Same as "TPDO object unit 1 (parameter No.0482)".	Each axis
04AB	*OPTP11	TPDO object bit option 11	0000h	—	0000h to FFFFh	Same as "TPDO object bit option 1 (parameter No.0483)".	Each axis
04AC	*NTPL12	TPDO object No. 12 (lower)	0000h	—	0000h to FFFFh	Same as "TPDO object No. 1 (lower) (parameter No.0480)".	Each axis
04AD	*NTPH12	TPDO object No. 12 (upper)	0000h	—	0000h to FFFFh	Same as "TPDO object No. 1 (upper) (parameter No.0481)".	Each axis
04AE	*SUTP12	TPDO object unit 12	0000h	—	0000h to 0001h	Same as "TPDO object unit 1 (parameter No.0482)".	Each axis
04AF	*OPTP12	TPDO object bit option 12	0000h	—	0000h to FFFFh	Same as "TPDO object bit option 1 (parameter No.0483)".	Each axis
04B0	*NTPL13	TPDO object No. 13 (lower)	0000h	—	0000h to FFFFh	Same as "TPDO object No. 1 (lower) (parameter No.0480)".	Each axis
09B1	*NTPH13	TPDO object No. 13 (upper)	0000h	—	0000h to FFFFh	Same as "TPDO object No. 1 (upper) (parameter No.0481)".	Each axis
04B2	*SUTP13	TPDO object unit 13	0000h	—	0000h to 0001h	Same as "TPDO object unit 1 (parameter No.0482)".	Each axis
04B3	*OPTP13	TPDO object bit option 13	0000h	—	0000h to FFFFh	Same as "TPDO object bit option 1 (parameter No.0483)".	Each axis
04B4	*NTPL14	TPDO object No. 14 (lower)	0000h	—	0000h to FFFFh	Same as "TPDO object No. 1 (lower) (parameter No.0480)".	Each axis
04B5	*NTPH14	TPDO object No. 14 (upper)	0000h	—	0000h to FFFFh	Same as "TPDO object No. 1 (upper) (parameter No.0481)".	Each axis
04B6	*SUTP14	TPDO object unit 14	0000h	—	0000h to 0001h	Same as "TPDO object unit 1 (parameter No.0482)".	Each axis
04B7	*OPTP14	TPDO object bit option 14	0000h	—	0000h to FFFFh	Same as "TPDO object bit option 1 (parameter No.0483)".	Each axis
04B8	*NTPL15	TPDO object No. 15 (lower)	0000h	—	0000h to FFFFh	Same as "TPDO object No. 1 (lower) (parameter No.0480)".	Each axis
04B9	*NTPH15	TPDO object No. 15 (upper)	0000h	—	0000h to FFFFh	Same as "TPDO object No. 1 (upper) (parameter No.0481)".	Each axis
04BA	*SUTP15	TPDO object unit 15	0000h	—	0000h to 0001h	Same as "TPDO object unit 1 (parameter No.0482)".	Each axis
04BB	*OPTP15	TPDO object bit option 15	0000h	—	0000h to FFFFh	Same as "TPDO object bit option 1 (parameter No.0483)".	Each axis
04BC	*NTPL16	TPDO object No. 16 (lower)	0000h	—	0000h to FFFFh	Same as "TPDO object No. 1 (lower) (parameter No.0480)".	Each axis
04BD	*NTPH16	TPDO object No. 16 (upper)	0000h	—	0000h to FFFFh	Same as "TPDO object No. 1 (upper) (parameter No.0481)".	Each axis
04BE	*SUTP16	TPDO object unit 16	0000h	—	0000h to 0001h	Same as "TPDO object unit 1 (parameter No.0482)".	Each axis
04BF	*OPTP16	TPDO object bit option 16	0000h	—	0000h to FFFFh	Same as "TPDO object bit option 1 (parameter No.0483)".	Each axis
04C0	*NRPL1	RPDO object No. 1 (lower)	0000h	—	0000h to FFFFh	■ ■ □ □ (Size) Set the size (bit unit) of the RPDO object which is assigned to the output word device (RWw).[1] • 08h: 8bits (Data Type I8/U8) • 10h: 16bits (Data Type I16/U16) • 20h: 32bits (Data Type I32/U32) <Example> For "Control DI (Obj. 2D01h: 00h)" Since the size is 16bits, set "10h". □ □ ■ ■ (Subindex) Set the subindex No. of the RPDO object which is assigned to the output word device (RWw). <Example> For "Control DI (Obj. 2D01h: 00h)" Set the subindex "00h".	Each axis

Parameter No.	Symbol	Name	Initial value	Units	Setting range	Description	When in tandem drive
04C1	*NRPH1	RPDO object No. 1 (upper)	0000h	—	0000h to FFFFh	☐☐☐☐ (Index) Set the index No. of the RPDO object which is assigned to the output word device (RWw). <Example> For "Control DI (Obj. 2D01h: 00h)" Set the index "2D01h".	Each axis
04C2	*SURP1	RPDO object unit 1	0000h	—	0000h to 0001h	■■■☐ (Write unit selection) Set the write unit of the RPDO object which is assigned to the output word device (RWw). • 0: Data • 1: Bit	Each axis
04C3	*OPRP1	RPDO object bit option 1	0000h	—	0000h to FFFFh	■■☐☐ (Bit selection) Set the start of the bit which is written from the output word device (RWw). When "0: Data" is set for "Write unit selection" of "RPDO object unit 1 (parameter No.04C2)", this parameter is not used. The operation alarm does not occur even if the value outside the range is set. <Example> For writing fifth to eighth bits Set "05h". ☐☐■■ (Number of bits) Set the bit length which is written from the output word device (RWw). The bit length is "set value + 1". When "0: Data" is set for "Write unit selection" of "RPDO object unit 1 (parameter No.04C2)", this parameter is not used. The operation alarm does not occur even if the value outside the range is set. <Example> For writing fifth to eighth bits Set "03h".	Each axis
04C4	*NRPL2	RPDO object No. 2 (lower)	0000h	—	0000h to FFFFh	Same as "RPDO object No. 1 (lower) (parameter No.04C0)".	Each axis
04C5	*NRPH2	RPDO object No. 2 (upper)	0000h	—	0000h to FFFFh	Same as "RPDO object No. 1 (upper) (parameter No.04C1)".	Each axis
04C6	*SURP2	RPDO object unit 2	0000h	—	0000h to 0001h	Same as "RPDO object unit 1 (parameter No.04C2)".	Each axis
04C7	*OPRP2	RPDO object bit option 2	0000h	—	0000h to FFFFh	Same as "RPDO object bit option 1 (parameter No.04C3)".	Each axis
04C8	*NRPL3	RPDO object No. 3 (lower)	0000h	—	0000h to FFFFh	Same as "RPDO object No. 1 (lower) (parameter No.04C0)".	Each axis
04C9	*NRPH3	RPDO object No. 3 (upper)	0000h	—	0000h to FFFFh	Same as "RPDO object No. 1 (upper) (parameter No.04C1)".	Each axis
04CA	*SURP3	RPDO object unit 3	0000h	—	0000h to 0001h	Same as "RPDO object unit 1 (parameter No.04C2)".	Each axis
04CB	*OPRP3	RPDO object bit option 3	0000h	—	0000h to FFFFh	Same as "RPDO object bit option 1 (parameter No.04C3)".	Each axis
04CC	*NRPL4	RPDO object No. 4 (lower)	0000h	—	0000h to FFFFh	Same as "RPDO object No. 1 (lower) (parameter No.04C0)".	Each axis
04CD	*NRPH4	RPDO object No. 4 (upper)	0000h	—	0000h to FFFFh	Same as "RPDO object No. 1 (upper) (parameter No.04C1)".	Each axis
04CE	*SURP4	RPDO object unit 4	0000h	—	0000h to 0001h	Same as "RPDO object unit 1 (parameter No.04C2)".	Each axis
04CF	*OPRP4	RPDO object bit option 4	0000h	—	0000h to FFFFh	Same as "RPDO object bit option 1 (parameter No.04C3)".	Each axis
04D0	*NRPL5	RPDO object No. 5 (lower)	0000h	—	0000h to FFFFh	Same as "RPDO object No. 1 (lower) (parameter No.04C0)".	Each axis
04D1	*NRPH5	RPDO object No. 5 (upper)	0000h	—	0000h to FFFFh	Same as "RPDO object No. 1 (upper) (parameter No.04C1)".	Each axis
04D2	*SURP5	RPDO object unit 5	0000h	—	0000h to 0001h	Same as "RPDO object unit 1 (parameter No.04C2)".	Each axis
04D3	*OPRP5	RPDO object bit option 5	0000h	—	0000h to FFFFh	Same as "RPDO object bit option 1 (parameter No.04C3)".	Each axis

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Parameter No.	Symbol	Name	Initial value	Units	Setting range	Description	When in tandem drive
04D4	*NRPL6	RPDO object No. 6 (lower)	0000h	—	0000h to FFFFh	Same as "RPDO object No. 1 (lower) (parameter No.04C0)".	Each axis
04D5	*NRPH6	RPDO object No. 6 (upper)	0000h	—	0000h to FFFFh	Same as "RPDO object No. 1 (upper) (parameter No.04C1)".	Each axis
04D6	*SURP6	RPDO object unit 6	0000h	—	0000h to 0001h	Same as "RPDO object unit 1 (parameter No.04C2)".	Each axis
04D7	*OPRP6	RPDO object bit option 6	0000h	—	0000h to FFFFh	Same as "RPDO object bit option 1 (parameter No.04C3)".	Each axis
04D8	*NRPL7	RPDO object No. 7 (lower)	0000h	—	0000h to FFFFh	Same as "RPDO object No. 1 (lower) (parameter No.04C0)".	Each axis
04D9	*NRPH7	RPDO object No. 7 (upper)	0000h	—	0000h to FFFFh	Same as "RPDO object No. 1 (upper) (parameter No.04C1)".	Each axis
04DA	*SURP7	RPDO object unit 7	0000h	—	0000h to 0001h	Same as "RPDO object unit 1 (parameter No.04C2)".	Each axis
04DB	*OPRP7	RPDO object bit option 7	0000h	—	0000h to FFFFh	Same as "RPDO object bit option 1 (parameter No.04C3)".	Each axis
04DC	*NRPL8	RPDO object No. 8 (lower)	0000h	—	0000h to FFFFh	Same as "RPDO object No. 1 (lower) (parameter No.04C0)".	Each axis
04DD	*NRPH8	RPDO object No. 8 (upper)	0000h	—	0000h to FFFFh	Same as "RPDO object No. 1 (upper) (parameter No.04C1)".	Each axis
04DE	*SURP8	RPDO object unit 8	0000h	—	0000h to 0001h	Same as "RPDO object unit 1 (parameter No.04C2)".	Each axis
04DF	*OPRP8	RPDO object bit option 8	0000h	—	0000h to FFFFh	Same as "RPDO object bit option 1 (parameter No.04C3)".	Each axis
04E0	*NRPL9	RPDO object No. 9 (lower)	0000h	—	0000h to FFFFh	Same as "RPDO object No. 1 (lower) (parameter No.04C0)".	Each axis
04E1	*NRPH9	RPDO object No. 9 (upper)	0000h	—	0000h to FFFFh	Same as "RPDO object No. 1 (upper) (parameter No.04C1)".	Each axis
04E2	*SURP9	RPDO object unit 9	0000h	—	0000h to 0001h	Same as "RPDO object unit 1 (parameter No.04C2)".	Each axis
04E3	*OPRP9	RPDO object bit option 9	0000h	—	0000h to FFFFh	Same as "RPDO object bit option 1 (parameter No.04C3)".	Each axis
04E4	*NRPL10	RPDO object No. 10 (lower)	0000h	—	0000h to FFFFh	Same as "RPDO object No. 1 (lower) (parameter No.04C0)".	Each axis
04E5	*NRPH10	RPDO object No. 10 (upper)	0000h	—	0000h to FFFFh	Same as "RPDO object No. 1 (upper) (parameter No.04C1)".	Each axis
04E6	*SURP10	RPDO object unit 10	0000h	—	0000h to 0001h	Same as "RPDO object unit 1 (parameter No.04C2)".	Each axis
04E7	*OPRP10	RPDO object bit option 10	0000h	—	0000h to FFFFh	Same as "RPDO object bit option 1 (parameter No.04C3)".	Each axis
04E8	*NRPL11	RPDO object No. 11 (lower)	0000h	—	0000h to FFFFh	Same as "RPDO object No. 1 (lower) (parameter No.04C0)".	Each axis
04E9	*NRPH11	RPDO object No. 11 (upper)	0000h	—	0000h to FFFFh	Same as "RPDO object No. 1 (upper) (parameter No.04C1)".	Each axis
04EA	*SURP11	RPDO object unit 11	0000h	—	0000h to 0001h	Same as "RPDO object unit 1 (parameter No.04C2)".	Each axis
04EB	*OPRP11	RPDO object bit option 11	0000h	—	0000h to FFFFh	Same as "RPDO object bit option 1 (parameter No.04C3)".	Each axis
04EC	*NRPL12	RPDO object No. 12 (lower)	0000h	—	0000h to FFFFh	Same as "RPDO object No. 1 (lower) (parameter No.04C0)".	Each axis
04ED	*NRPH12	RPDO object No. 12 (upper)	0000h	—	0000h to FFFFh	Same as "RPDO object No. 1 (upper) (parameter No.04C1)".	Each axis
04EE	*SURP12	RPDO object unit 12	0000h	—	0000h to 0001h	Same as "RPDO object unit 1 (parameter No.04C2)".	Each axis
04EF	*OPRP12	RPDO object bit option 12	0000h	—	0000h to FFFFh	Same as "RPDO object bit option 1 (parameter No.04C3)".	Each axis
04F0	*NRPL13	RPDO object No. 13 (lower)	0000h	—	0000h to FFFFh	Same as "RPDO object No. 1 (lower) (parameter No.04C0)".	Each axis

Parameter No.	Symbol	Name	Initial value	Units	Setting range	Description	When in tandem drive
04F1	*NRPH13	RPDO object No. 13 (upper)	0000h	—	0000h to FFFFh	Same as "RPDO object No. 1 (upper) (parameter No.04C1)".	Each axis
04F2	*SURP13	RPDO object unit 13	0000h	—	0000h to 0001h	Same as "RPDO object unit 1 (parameter No.04C2)".	Each axis
04F3	*OPRP13	RPDO object bit option 13	0000h	—	0000h to FFFFh	Same as "RPDO object bit option 1 (parameter No.04C3)".	Each axis
04F4	*NRPL14	RPDO object No. 14 (lower)	0000h	—	0000h to FFFFh	Same as "RPDO object No. 1 (lower) (parameter No.04C0)".	Each axis
04F5	*NRPH14	RPDO object No. 14 (upper)	0000h	—	0000h to FFFFh	Same as "RPDO object No. 1 (upper) (parameter No.04C1)".	Each axis
04F6	*SURP14	RPDO object unit 14	0000h	—	0000h to 0001h	Same as "RPDO object unit 1 (parameter No.04C2)".	Each axis
04F7	*OPRP14	RPDO object bit option 14	0000h	—	0000h to FFFFh	Same as "RPDO object bit option 1 (parameter No.04C3)".	Each axis
04F8	*NRPL15	RPDO object No. 15 (lower)	0000h	—	0000h to FFFFh	Same as "RPDO object No. 1 (lower) (parameter No.04C0)".	Each axis
04F9	*NRPH15	RPDO object No. 15 (upper)	0000h	—	0000h to FFFFh	Same as "RPDO object No. 1 (upper) (parameter No.04C1)".	Each axis
04FA	*SURP15	RPDO object unit 15	0000h	—	0000h to 0001h	Same as "RPDO object unit 1 (parameter No.04C2)".	Each axis
04FB	*OPRP15	RPDO object bit option 15	0000h	—	0000h to FFFFh	Same as "RPDO object bit option 1 (parameter No.04C3)".	Each axis
04FC	*NRPL16	RPDO object No. 16 (lower)	0000h	—	0000h to FFFFh	Same as "RPDO object No. 1 (lower) (parameter No.04C0)".	Each axis
04FD	*NRPH16	RPDO object No. 16 (upper)	0000h	—	0000h to FFFFh	Same as "RPDO object No. 1 (upper) (parameter No.04C1)".	Each axis
04FE	*SURP16	RPDO object unit 16	0000h	—	0000h to 0001h	Same as "RPDO object unit 1 (parameter No.04C2)".	Each axis
04FF	*OPRP16	RPDO object bit option 16	0000h	—	0000h to FFFFh	Same as "RPDO object bit option 1 (parameter No.04C3)".	Each axis

*1   When the 8-bit alignment adjustment object (index: 0000h, subindex: 00h) is set, the parameter setting value is regarded as invalid.

13 MONITOR No.

13.1 Drive Unit Information (1)

Monitor No. (hexadecimal)	Content	Units	Remarks
00000100 ⋮ 00000114	For manufacturer setting	—	—
00000115	Motor maximum torque	*1	Display the value of "Max torque (Obj. 6072h)".
00000116 ⋮ 0000012F	For manufacturer setting	—	—
00000130	Station No.	—	Display the station No. of the drive unit.
00000131	Multidrop No.	—	Display the multidrop No. of the drive unit.
00000132 ⋮ 000001FF	For manufacturer setting	—	—

*1 Refer to the following manual.
📖MR-J5-G/MR-J5W-G User's Manual (Object Dictionary)

13.2 Drive Unit Information (1) (Double Word)

Monitor No. (hexadecimal)	Content	Units	Remarks
00001100 ⋮ 00001113	For manufacturer setting	—	—
00001114	Motor maximum revolution speed	*1	Display the value of "Max motor speed (Obj. 6080h)".
00001115	For manufacturer setting	—	—
00001116	Number of encoder pulses per revolution	*1	Display the value of "Encoder increments (Obj. 608Fh: 01h)".
00001117 ⋮ 00001121	For manufacturer setting	—	—
00001122	Maximum output pulse rate	kpps	Display the maximum pulse rate that can be output by the Motion control board.
00001123 ⋮ 00001131	For manufacturer setting	—	—
00001132	IPv4 address	—	Display the IP address (IPv4) of the drive unit.
00001133 ⋮ 000011FF	For manufacturer setting	—	—

*1 Refer to the following manual.
📖MR-J5-G/MR-J5W-G User's Manual (Object Dictionary)

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13.3 Operation Information

Monitor No. (hexadecimal)	Content	Units	Remarks
00000300 ⋮ 00000309	For manufacturer setting	—	—
0000030A	Operation point No.	—	Display the value of the operation point No. +1. Display "0" during stopping.
0000030B	Remaining dwell time	ms	—
0000030C ⋮ 0000031F	For manufacturer setting	—	—
00000320	External signal status	—	• Bit0: LSP • Bit1: LSN • Bit2: DOG (Display 0: I/O input signal OFF, 1: I/O input signal ON.)
00000321 ⋮ 00000326	For manufacturer setting	—	—
00000327	Electrical current feedback	0.1%	Display the value of "Torque actual value (Obj. 6077h)".
00000328 ⋮ 0000037F	For manufacturer setting	—	—
00000380	High speed axis data command bit 1	—	Used for sampling the high speed axis data command bit. For details, refer to the following. ☞ Page 586 High speed axis data command bit
00000381	High speed axis data command bit 2		
00000382	High speed axis data command bit 3		
00000383	High speed axis data command bit 4		
00000384	High speed axis data command bit 5		
00000385	High speed axis data command bit 6		
00000386	High speed axis data command bit 7		
00000387	High speed axis data command bit 8		
00000388 ⋮ 0000038F	For manufacturer setting	—	—
00000390	Low speed axis data command bit 1	—	Used for sampling the low speed axis data command bit. For details, refer to the following. ☞ Page 592 Low speed axis data command bit
00000391	Low speed axis data command bit 2		
00000392	Low speed axis data command bit 3		
00000393	Low speed axis data command bit 4		
00000394	Low speed axis data command bit 5		
00000395	Low speed axis data command bit 6		
00000396	Low speed axis data command bit 7		
00000397	Low speed axis data command bit 8		
00000398	Low speed axis data command bit 9		
00000399	Low speed axis data command bit 10		
0000039A	Low speed axis data command bit 11		
0000039B	Low speed axis data command bit 12		
0000039C	Low speed axis data command bit 13		
0000039D	Low speed axis data command bit 14		
0000039E	Low speed axis data command bit 15		
0000039F	Low speed axis data command bit 16		

Monitor No. (hexadecimal)	Content	Units	Remarks
000003A0	High speed axis data status bit 1	—	Used for sampling the high speed axis data status bit. For details, refer to the following. ☞ Page 589 High speed axis data status bit
000003A1	High speed axis data status bit 2		
000003A2	High speed axis data status bit 3		
000003A3	High speed axis data status bit 4		
000003A4	High speed axis data status bit 5		
000003A5	High speed axis data status bit 6		
000003A6	High speed axis data status bit 7		
000003A7	High speed axis data status bit 8		
000003A8 ⋮ 000003AF	For manufacturer setting	—	—
000003B0	Low speed axis data status bit 1	—	Used for sampling the low speed axis data status bit. For details, refer to the following. ☞ Page 594 Low speed axis data status bit
000003B1	Low speed axis data status bit 2		
000003B2	Low speed axis data status bit 3		
000003B3	Low speed axis data status bit 4		
000003B4	Low speed axis data status bit 5		
000003B5	Low speed axis data status bit 6		
000003B6	Low speed axis data status bit 7		
000003B7	Low speed axis data status bit 8		
000003B8	Low speed axis data status bit 9		
000003B9	Low speed axis data status bit 10		
000003BA	Low speed axis data status bit 11		
000003BB	Low speed axis data status bit 12		
000003BC	Low speed axis data status bit 13		
000003BD	Low speed axis data status bit 14		
000003BE	Low speed axis data status bit 15		
000003BF	Low speed axis data status bit 16		
000003C0 ⋮ 000003FF	For manufacturer setting	—	—

High speed axis data command bit

Monitor No. (hexadecimal)	Content	Bit	Symbol	Signal name
00000380	High speed axis data command bit 1	0	SON	Servo on
		1	—	For manufacturer setting
		2		
		3		
		4		
		5	SRST	Drive unit alarm reset
		6	—	For manufacturer setting
		7		
		8	ST	Start operation
		9	DIR	Movement direction
		10	STP	Stop operation
		11	RSTP	Rapid stop
		12	—	For manufacturer setting
		13	ORST	Operation alarm reset
		14	—	For manufacturer setting
		15		

Monitor No. (hexadecimal)	Content	Bit	Symbol	Signal name
00000381	High speed axis data command bit 2	0	AUT	Automatic operation mode
		1	ZRN	Home position return mode
		2	JOG	JOG operation mode
		3	S	Incremental feed mode
		4	—	For manufacturer setting
		5	LIP	Interpolation operation mode
		6	DST	Home position reset mode
		7	—	For manufacturer setting
		8		
		9		
		10		
		11		
		12		
		13		
		14		
		15		

Monitor No. (hexadecimal)	Content	Bit	Symbol	Signal name
00000382	High speed axis data command bit 3	0	ITL	Interlock
		1	RMONR	High speed monitor latch command
		2	—	For manufacturer setting
		3		
		4	LSPC	+ side limit switch input
		5	LSNC	- side limit switch input
		6	DOGC	Proximity dog input
		7	—	For manufacturer setting
		8	SCHG	Change speed
		9	TACHG	Change acceleration time constant
		10	TDCHG	Change deceleration time constant
		11	PCHG	Change position
		12	—	For manufacturer setting
		13		
		14		
		15		

Monitor No. (hexadecimal)	Content	Bit	Symbol	Signal name
00000383	High speed axis data command bit 4	0	FST	Fast start operation
		1	—	For manufacturer setting
		2		
		3		
		4		
		5		
		6		
		7		
		8	PPISTP	Pass position interrupt cancel
		9	—	For manufacturer setting
		10		
		11		
		12		
		13		
		14		
		15		

Monitor No. (hexadecimal)	Content	Bit	Symbol	Signal name
00000384, 00000385	High speed axis data command bit 5, High speed axis data command bit 6	0	—	For manufacturer setting
		1		
		2		
		3		
		4		
		5		
		6		
		7		
		8		
		9		
		10		
		11		
		12		
		13		
		14		
		15		

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Monitor No. (hexadecimal)	Content	Bit	Symbol	Signal name
00000386	High speed axis data command bit 7	0	—	For manufacturer setting
		1		
		2		
		3		
		4		
		5		
		6		
		7		
		8	PSMFSW	Pressure control mode forced switching
		9	PSDFSW	Dwelling pressure forced switching
		10	—	For manufacturer setting
		11	PSMRST	Pressure control mode resetting
		12	—	For manufacturer setting
		13		
		14		
		15		

Monitor No. (hexadecimal)	Content	Bit	Symbol	Signal name
00000387	High speed axis data command bit 8	0	—	For manufacturer setting
		1		
		2		
		3		
		4		
		5		
		6		
		7		
		8		
		9		
		10		
		11		
		12		
		13		
		14		
		15		

High speed axis data status bit

Monitor No. (hexadecimal)	Content	Bit	Symbol	Signal name
000003A0	High speed axis data status bit 1	0	RDY	Servo ready
		1	INP	In-position
		2	ZSP	Zero speed
		3	ZPAS	Passed Z-phase
		4	TLC	Torque limit effective
		5	SALM	Drive unit alarm
		6	SWRN	Drive unit warning
		7	ABSE	Absolute position erased
		8	OP	Operation processing
		9	CPO	Rough match
		10	PF	Positioning completed
		11	ZP	Home position return completed
		12	SMZ	Smoothing stop
		13	OALM	Operation alarm
		14	OPF	Operation completed
		15	PSW	Position switch

Monitor No. (hexadecimal)	Content	Bit	Symbol	Signal name
000003A1	High speed axis data status bit 2	0	AUTO	In automatic operation mode
		1	ZRNO	In home position return mode
		2	JO	In JOG operation mode
		3	SO	In incremental feed mode
		4	—	For manufacturer setting
		5	LIPO	In interpolation operation mode
		6	DSTO	In home position reset mode
		7	—	For manufacturer setting
		8		
		9		
		10		
		11		
		12		
		13		
		14		
		15		

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Monitor No. (hexadecimal)	Content	Bit	Symbol	Signal name
000003A2	High speed axis data status bit 3	0	ISTP	Interlock stop
		1	RMRCH	High speed monitor being latched
		2	POV	Exceeded stop position
		3	STO	Start up acceptance completed
		4	—	For manufacturer setting
		5		
		6	ZREQ	Home position return request
		7	DCDD	Driver command discard detected
		8	SCF	Preparation for changing speed completed
		9	TACF	Preparation for changing acceleration time constant completed
		10	TDCF	Preparation for changing deceleration time constant completed
		11	PCF	Preparation for changing position completed
		12	SCE	Speed change error
		13	TACE	Acceleration time constant change error
		14	TDCE	Deceleration time constant change error
		15	PCE	Position change error

Monitor No. (hexadecimal)	Content	Bit	Symbol	Signal name
000003A3	High speed axis data status bit 4	0	—	For manufacturer setting
		1		
		2		
		3		
		4		
		5		
		6		
		7		
		8	PPIOP	Operating pass position interrupt
		9	PPIFIN	Pass position interrupt completed
		10	PPIERR	Pass position interrupt incompleted
		11	—	For manufacturer setting
		12		
		13		
		14		
		15	AUTLO	In point table loop

Monitor No. (hexadecimal)	Content	Bit	Symbol	Signal name
000003A4	High speed axis data status bit 5	0	—	For manufacturer setting
		1		
		2		
		3		
		4		
		5		
		6		
		7	PRSMO	Pressing in progress
		8	—	For manufacturer setting
		9	SINP	Drive unit in-position
		10	—	For manufacturer setting
		11		
		12		
		13		
		14		
		15		

Monitor No. (hexadecimal)	Content	Bit	Symbol	Signal name
000003A5	High speed axis data status bit 6	0	—	For manufacturer setting
		1		
		2		
		3		
		4		
		5		
		6		
		7		
		8		
		9		
		10		
		11		
		12		
		13		
		14		
		15		

Monitor No. (hexadecimal)	Content	Bit	Symbol	Signal name
000003A6	High speed axis data status bit 7	0	—	For manufacturer setting
		1		
		2		
		3		
		4		
		5		
		6		
		7		
		8	PSCMO	Pressure control mode in progress
		9	PSFD	Feeding/dwelling pressure
		10	PSDW	Dwelling pressure
		11	PSPAS	Pressure attainment switching during feed
		12	PSRL	Releasing pressure
		13	PSDFSC	Condition of final step dwelling pressure satisfied
		14	PSMCF	Pressure control mode switching completed
		15	PSMCE	Pressure control mode switching error

Monitor No. (hexadecimal)	Content	Bit	Symbol	Signal name
000003A7	High speed axis data status bit 8	0	PSDCF	Dwelling pressure switching completed
		1	PSDCE	Dwelling pressure switching error
		2	—	For manufacturer setting
		3		
		4		
		5		
		6	PSMRC	Pressure control mode resetting completed
		7	PSMRE	Pressure control mode resetting error
		8	—	For manufacturer setting
		9		
		10		
		11		
		12		
		13		
		14		
		15		

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Low speed axis data command bit

Monitor No. (hexadecimal)	Content	Bit	Symbol	Signal name
00000390	Low speed axis data command bit 1	0	MON	Monitor command
		1	MONR	Monitor latch command
		2	—	For manufacturer setting
		3		
		4		
		5		
		6		
		7		
		8	PWRT	Parameter write command
		9	—	For manufacturer setting
		10		
		11		
		12		
		13		
		14		
		15		

Monitor No. (hexadecimal)	Content	Bit	Symbol	Signal name
00000391	Low speed axis data command bit 2	0	PRD	Parameter read command
		1	—	For manufacturer setting
		2		
		3		
		4		
		5		
		6		
		7		
		8		
		9		
		10		
		11		
		12		
		13		
		14		
		15		

Monitor No. (hexadecimal)	Content	Bit	Symbol	Signal name
00000392 ⋮ 0000039F	Low speed axis data command bit 3 ⋮ Low speed axis data command bit 16	0	—	For manufacturer setting
		1		
		2		
		3		
		4		
		5		
		6		
		7		
		8		
		9		
		10		
		11		
		12		
		13		
		14		
		15		

Low speed axis data status bit

Monitor No. (hexadecimal)	Content	Bit	Symbol	Signal name
000003B0	Low speed axis data status bit 1	0	MOUT	Monitor output
		1	MRCH	Monitor latch
		2	MER1	Monitor No. error 1
		3	MER2	Monitor No. error 2
		4	MER3	Monitor No. error 3
		5	MER4	Monitor No. error 4
		6	—	For manufacturer setting
		7		
		8	PWFIN1	Parameter write completed 1
		9	PWEN1	Parameter No. error 1
		10	PWED1	Parameter data out of bounds 1
		11	—	For manufacturer setting
		12	PWFIN2	Parameter write completed 2
		13	PWEN2	Parameter No. error 2
		14	PWED2	Parameter data out of bounds 2
		15	—	For manufacturer setting

Monitor No. (hexadecimal)	Content	Bit	Symbol	Signal name
000003B1	Low speed axis data status bit 2	0	PRFIN1	Parameter read completed 1
		1	PREN1	Parameter No. error 1
		2	PRFIN2	Parameter read completed 2
		3	PREN2	Parameter No. error 2
		4	—	For manufacturer setting
		5		
		6		
		7		
		8		
		9		
		10		
		11		
		12		
		13		
		14		
		15		

Monitor No. (hexadecimal)	Content	Bit	Symbol	Signal name
000003B2 ⋮ 000003BF	Low speed axis data status bit 3 ⋮ Low speed axis data status bit 16	0	—	For manufacturer setting
		1		
		2		
		3		
		4		
		5		
		6		
		7		
		8		
		9		
		10		
		11		
		12		
		13		
		14		
		15		

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13.4 Operation Information (Double Word)

Monitor No. (hexadecimal)	Content	Units	Remarks
00001300	Current command position	Command units	The current command position before the electronic gear processing
00001301	For manufacturer setting	—	—
00001302	Current feedback position	Command units	The feedback position before the electronic gear processing
00001303	For manufacturer setting	—	—
00001304	Moving speed	Speed units	The set velocity to output to the servo amplifier
00001305	For manufacturer setting	—	—
00001306	Remaining distance to move	Command units	The distance from the current position to the end position during the automatic operation
00001307 ⋮ 0000130F	For manufacturer setting	—	—
00001310	Current command position	pulse	The current command position after the electronic gear processing
00001311	For manufacturer setting	—	—
00001312	Current feedback position	pulse	The feedback position after the electronic gear processing
00001313	For manufacturer setting	—	—
00001314	FDT	pulse	Movement amount per operation cycle
00001315	For manufacturer setting	—	—
00001316	Feedback moving speed	Speed units	The feedback speed converted from the difference of the feedback position (after the electronic gear processing)
00001317 ⋮ 0000132F	For manufacturer setting	—	—
00001330	Control parameter error number No.0200 to 021F	—	The bit that corresponds to the parameter No. is turned ON. The bits are No.0200 (bit0) to 021F (bit31).
00001331	For manufacturer setting	—	—
00001332	Control parameter error number No.0220 to 023F	—	The bit that corresponds to the parameter No. is turned ON. The bits are No.0220 (bit0) to 023F (bit31).
00001333	For manufacturer setting	—	—
00001334	Control parameter error number No.0240 to 025F	—	The bit that corresponds to the parameter No. is turned ON. The bits are No.0240 (bit0) to 025F (bit31).
00001335	For manufacturer setting	—	—
00001336	Control parameter error number No.0260 to 027F	—	The bit that corresponds to the parameter No. is turned ON. The bits are No.0260 (bit0) to 027F (bit31).
00001337	For manufacturer setting	—	—
00001338	Control parameter error number No.0280 to 029F	—	The bit that corresponds to the parameter No. is turned ON. The bits are No.0280 (bit0) to 029F (bit31).
00001339	For manufacturer setting	—	—
0000133A	Control parameter error number No.02A0 to 02BF	—	The bit that corresponds to the parameter No. is turned ON. The bits are No.02A0 (bit0) to 02BF (bit31).
0000133B	For manufacturer setting	—	—
0000133C	Control parameter error number No.02C0 to 02DF	—	The bit that corresponds to the parameter No. is turned ON. The bits are No.02C0 (bit0) to 02DF (bit31).
0000133D	For manufacturer setting	—	—
0000133E	Control parameter error number No.02E0 to 02FF	—	The bit that corresponds to the parameter No. is turned ON. The bits are No.02E0 (bit0) to 02FF (bit31).
0000133F ⋮ 000013CF	For manufacturer setting	—	—
000013D0	Axis management parameter error number No.0400 to 041F	—	The bit that corresponds to the parameter No. is turned ON. The bits are No.0400 (bit0) to 041F (bit31).

Monitor No. (hexadecimal)	Content	Units	Remarks
000013D1	For manufacturer setting	—	—
000013D2	Axis management parameter error number No.0420 to 043F	—	The bit that corresponds to the parameter No. is turned ON. The bits are No.0420 (bit0) to 043F (bit31).
000013D3	For manufacturer setting	—	—
000013D4	Axis management parameter error number No.0440 to 045F	—	The bit that corresponds to the parameter No. is turned ON. The bits are No.0440 (bit0) to 045F (bit31).
000013D5	For manufacturer setting	—	—
000013D6	Axis management parameter error number No.0460 to 047F	—	The bit that corresponds to the parameter No. is turned ON. The bits are No.0460 (bit0) to 047F (bit31).
000013D7	For manufacturer setting	—	—
000013D8	Axis management parameter error number No.0480 to 049F	—	The bit that corresponds to the parameter No. is turned ON. The bits are No.0480 (bit0) to 049F (bit31).
000013D9	For manufacturer setting	—	—
000013DA	Axis management parameter error number No.04A0 to 04BF	—	The bit that corresponds to the parameter No. is turned ON. The bits are No.04A0 (bit0) to 04BF (bit31).
000013DB	For manufacturer setting	—	—
000013DC	Axis management parameter error number No.04C0 to 04DF	—	The bit that corresponds to the parameter No. is turned ON. The bits are No.04C0 (bit0) to 04DF (bit31).
000013DD	For manufacturer setting	—	—
000013DE	Axis management parameter error number No.04E0 to 04FF	—	The bit that corresponds to the parameter No. is turned ON. The bits are No.04E0 (bit0) to 04FF (bit31).
000013DF ⋮ 000013FF	For manufacturer setting	—	—

13.5 System Information

Monitor No. (hexadecimal)	Content	Units	Remarks
00000400	For manufacturer setting	—	—
00000401	Cause of forced stop	—	The bit for the corresponding forced stop factor is turned ON. • Bit0: Being executed external forced stop • Bit1: Being executed software forced stop • Bit2: User watchdog error detected[1] • Bit5: Preparing reboot • Bit6: System status code error detected
00000402 ⋮ 000004FF	For manufacturer setting	—	—

*1 This function is supported in the basic system software version "02" or later.

13.6 System Information (Double Word)

Monitor No. (hexadecimal)	Content	Units	Remarks
00001400 ⋮ 0000140B	For manufacturer setting	—	—
0000140C	Number of write accesses to flash ROM	Times	Display the index value of the number of write accesses to the flash ROM.
0000140D 0000140E 0000140F	For manufacturer setting	—	—
00001410	System parameter error number No.0001 to 001F	—	The bit that corresponds to the parameter No. is turned ON. The bits are No.0001 (bit0) to 001F (bit31).
00001411	For manufacturer setting	—	—
00001412	System parameter error number No.0020 to 003F	—	The bit that corresponds to the parameter No. is turned ON. The bits are No.0020 (bit0) to 003F (bit31).
00001413	For manufacturer setting	—	—
00001414	System parameter error number No.0040 to 005F	—	The bit that corresponds to the parameter No. is turned ON. The bits are No.0040 (bit0) to 005F (bit31).
00001415	For manufacturer setting	—	—
00001416	System parameter error number No.0060 to 007F	—	The bit that corresponds to the parameter No. is turned ON. The bits are No.0060 (bit0) to 007F (bit31).
00001417 ⋮ 00001487	For manufacturer setting	—	—
00001488	Electronic gear setting error axis information 1	—	When "Electronic Gear Setting Error (system status code error: E500H)" occurs, the applicable bit is turned ON. Axis 1 (bit0) to axis 32 (bit31)
00001489	For manufacturer setting	—	—
0000148A	Electronic gear setting error axis information 2	—	When "Electronic Gear Setting Error (system status code error: E500H)" occurs, the applicable bit is turned ON. Axis 33 (bit0) to axis 64 (bit31)
0000148B ⋮ 000014FF	For manufacturer setting	—	—

14 ALARM No.

The Motion control board can raise the following alarms: system error, motion control error (system alarm, operation alarm, system status code error), and drive unit error. The error code, alarm No., detail No. are represented in hexadecimal numbers.

14.1 System Error

Warning

Error code	Content	Cause of occurrence	Procedure
0F08H	Cycle Over Warning	Operation cycle processing or other fixed scan processing is not completed within the set cycle.	Refer to the following. ☞ Page 421 Operation Cycle Monitor Function
0F11H	Manufacturer Setting Switch Detected as ON	Manufacturer setting switch 4 is ON.	After turning the power OFF, turn OFF the manufacturer setting switch 4, and then restart the system.
0F16H	System Alarm	A system alarm occurred.	Check the causes and corrective actions of the system alarm No. ☞ Page 604 System alarm
0F17H	Drive Unit Warning	A drive unit warning occurred.	Check the causes and corrective actions of the drive unit warning No. ☞ Page 619 Drive unit warning

Minor

Error code	Content	Cause of occurrence	Procedure
1080H	Writing to Flash ROM Count Error	The number of writes to the flash ROM has exceeded 100,000.	Replace the Motion control board.
1AA8H	Necessary Slave Object Unset	Necessary slave object for operational function execution is not set to axis.	Set necessary object in operational function. For the necessary object, refer to the followings. ☞ Page 65 Setting Network Parameter
1AE3H	csp Unsupported Drive Unit	The drive unit does not support csp.	Connect a drive unit that supports csp.
1C41H	Watchdog Counter Error	• A watchdog counter error of drive unit was detected. • Ethernet communication was performed from a ethernet device (PC, etc.) with antivirus or security software via CC-Link IE TSN Class B devices.	• Review the communication period interval setting. • Check surrounding environment errors such as noise etc., and remove the cause. • Check device stations for error. • Check 7-segment LED of MR-J5(W)-G. If "Drive unit warning [AL.09E.3 Number of cyclic points warning]" occurs, review the PDO mapping setting. • Exclude software with ethernet communication from monitoring target of antivirus or security software. However, we are not responsible for problems on the Motion control board and system troubles that arise due to the above.
1C42H	Unsupported Drive Unit Connection	An unsupported drive unit was connected.	Connect a supported drive unit.
1C43H	SLMP Communication Error	An error occurred in SLMP communication.	• Check the slave object setting. • Check the specifications of the drive unit.
1C45H	SLMP Communication Error (Timeout)	Response timeout was detected in SLMP communication.	Check the transient transmission time. It is derived by the following formula. (Transient Transmission Time = Communication Period Interval Setting - Cyclic Transmission Time - System Reserved Time)
1C48H	PDO Mapping Setting Error	Abnormal response for PDO mapping setting was received from a device station.	Review the PDO mapping setting.
1C49H	Configuration mismatch on return	A model name mismatch was detected during return of device stations.	Connect a device station with the same name as the disconnected one, then reboot the Motion control board.
1C80H	Cycle Over	Operation processing is not completed within the set cycle.	Refer to the followings. ☞ Page 421 Operation Cycle Monitor Function
1C85H	Event History Error	An error has been detected in the event history function.	Consult your local Mitsubishi representative.
1C97H	Operation Alarm	An operation alarm occurred.	Check the causes and corrective actions of the operation alarm No. ☞ Page 604 Operation alarm
1C98H	Drive Unit Alarm	A drive unit alarm occurred.	Check the causes and corrective actions of the drive unit alarm No. ☞ Page 619 Drive unit alarm
1C9AH	Manufacturer Setting Switch Detected as ON	Manufacturer setting switch 3 is ON.	After turning the power OFF, turn OFF the manufacturer setting switch 3, and then restart the system.
1D20H	Synchronous Watchdog Counter Error	The connection with the device station in CC-Link IE TSN is failed.	• Check the transient transmission time. • If the amount of 'Transient Transmission additional Time (calculated)' (SW007A) is not 0, add "Communication Period Interval Setting" and "Transient Transmission Time" to the amount (µs). • Check if the switching hub and the Ethernet cables are connected properly.
1D21H	Synchronous Watchdog Counter Initialization Error	The initialization with the device station in CC-Link IE TSN is failed.	• Install the version that includes CC-Link IE TSN network synchronization setting function, in case any station that enables the function exists. • Take measures to reduce noise.

Moderate

Error code	Content	Cause of occurrence	Procedure
3110H	Network Synchronized Communication Setting Error[*1]	Network synchronization setting is enabled to the station in which network synchronization is not supported.	Set the applicable local station to "Do not" in "NetworkSync" under "Cyclic Settings" of the master station.
3130H	Ethernet Device Setting Error[*1]	Devices with time synchronization priority of 1 to 15 have been connected.	Remove devices with time synchronization priority of 1 to 15, or change the priority to between 16 and 255.
3135H	Network Composition Error[*1]	When the time synchronization setting is set to IEEE1588, the total number of stations exceeds the number of stations that can be connected.	• Reduce the total number of stations to 31 stations (master station: 1, device station: 30) or less. • Reduce the number of stations of CC-Link IE TSN Class B devices to 8 or less for each port of the master station.
3203H	WDT Error Detected[*1]	Operation has been stopped over 1 second because of the error.	Review the value of "Communication Period Interval Setting" in "Communication Period Setting" under "Basic Settings" of the master station.
3205H	Add-on Library Load Error[*1]	• The add-on file is broken. • There is an inconsistency in the versions.	Consult your local Mitsubishi representative.
3207H	Drive Error[*1]	• Failed to mount the drive. • Check disk ended with error. • A verification error of plane management target memory occurred.	Consult your local Mitsubishi representative.
3208H	Insufficient Total System Memory (RAM)[*1]	The total size of all add-ons exceeds the total size of system memory (RAM).	Consult your local Mitsubishi representative.
3209H	Insufficient Add-on System Memory (RAM)[*1]	The size of RAM to be used exceeds the total size of system memory (RAM).	Consult your local Mitsubishi representative.
320AH	Insufficient Total System Memory (Backup RAM)[*1]	The total size of backup RAM to be used by add-ons exceeds the total size of system memory (RAM).	Consult your local Mitsubishi representative.
320BH	Insufficient Add-on System Memory (Backup RAM)[*1]	The size of backup RAM to be used exceeds the total size of system memory (RAM).	Consult your local Mitsubishi representative.
320CH	Cycle Over[*1]	Operation processing or other fixed scan processing is not completed within the set cycle.	Refer to the followings. ☞ Page 421 Operation Cycle Monitor Function
320DH	Base System Error[*1]	Failed in initial process.	Consult your local Mitsubishi representative.
320EH	Network Driver Error[*1]	Failed in communication between motion area and network area.	Consult your local Mitsubishi representative.
320FH	Servo Driver Error[*1]	Failed to initialize the servo driver.	Consult your local Mitsubishi representative.
3210H	Network Parameter File Not Found[*1]	Network parameter file does not exist.	Write the network parameter again.
3211H	Out of Parameter Range (Network)[*1]	• Parameter is out of the range. • No object was set for TPDO or RPDO in "Cyclic Settings". • Failed to write the parameter. ■When the base system software version is "03" or earlier • "Multicast" was set in "Communication Mode". • A device station was set as the standard station in "Network Configuration Settings". • A value other than 0 was set for the number of points of LB or LW in "Cyclic Settings".	• Please correct the parameters shown in the cause. • Write the network parameter again. If the problem is not solved after rewriting the parameter, consult your local Mitsubishi representative.
3216H	System Status Code Error[*1]	An error occurred in system status code.	Check the causes and corrective actions of the system status code. ☞ Page 618 System status code error
3228H	Combination Error In Communication Cycle With General Station	The value less than 125µs is set in "Communication Period Interval Setting" while there are device stations set as general station in "Network configuration setting".	• Set the device station as motion control station instead of general station in "Network configuration setting". • Set "Communication Period Interval Setting" to 125µs or more.
322AH	Combination Error In Communication Period Interval Setting	"Multicast" is set in "Communication Mode" while the value less than 125µs is set in "Communication Period Interval Setting".	• Set "Communication Period Interval Setting" to 125us or more. • Set "Communication Mode" to "Unicast".
322BH	Motion Control Station Setting Error[*1]	A local station was set as the motion control station in "Network Configuration Settings".	Please correct the parameters shown in the cause.

*1 The system error cannot be reset.

Major

Error code	Content	Cause of occurrence	Procedure
3C00H	Hardware Error[*1]	An error was detected in the hardware.	• Take measures to reduce noise. • If the problem is not solved after taking the above measure, consult your local Mitsubishi representative.
3C01H	Hardware Error[*1]	An error was detected in the hardware.	• Take measures to reduce noise. • If the problem is not solved after taking the above measure, consult your local Mitsubishi representative.
3C02H	Hardware Error[*1]	An error was detected in the hardware.	• Take measures to reduce noise. • If the problem is not solved after taking the above measure, consult your local Mitsubishi representative.
3C0FH	Hardware Error[*1]	An error was detected in the hardware.	• Take measures to reduce noise. • If the problem is not solved after taking the above measure, consult your local Mitsubishi representative.
3C10H	Hardware Error[*1]	An error was detected in the hardware.	• Take measures to reduce noise. • If the problem is not solved after taking the above measure, consult your local Mitsubishi representative.
3C11H	Hardware Error[*1]	An error was detected in the hardware.	• Take measures to reduce noise. • If the problem is not solved after taking the above measure, consult your local Mitsubishi representative.
3C13H	Hardware Error[*1]	An error was detected in the hardware.	• Take measures to reduce noise. • If the problem is not solved after taking the above measure, consult your local Mitsubishi representative.
3C14H	Hardware Error[*1]	An error was detected in the hardware.	• Take measures to reduce noise. • If the problem is not solved after taking the above measure, consult your local Mitsubishi representative.
3C2FH	Hardware Error[*1]	An error was detected in the hardware.	• Take measures to reduce noise. • If the problem is not solved after taking the above measure, consult your local Mitsubishi representative.
3C40H	Hardware Error[*1]	An error was detected in the hardware.	• Take measures to reduce noise. • If the problem is not solved after taking the above measure, consult your local Mitsubishi representative.

*1   The system error cannot be reset.

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14.2 Motion Control Error

System alarm

Alarm No.	Content	Detail No.	Cause of occurrence	Procedure
0037H	Parameter Error[*1]	0001H	System parameter setting is erroneous.	Set the setting to a correct value within the parameter limits.
0039H	CPU Temperature Rising	0001H	Temperature in the Motion control board has been rising.	Review the environment in which Motion control board is implemented. It should be applied to the specifications in the manual.

*1 The system alarm cannot be reset.

Operation alarm

Alarm No.	Content	Detail No.	Cause of occurrence	Procedure
0010H	Stop Command On	0001H	The stop operation signal (STP) is on.	Turn off the stop operation signal (STP).
		0002H	The rapid stop signal (RSTP) is on.	Turn off the rapid stop signal (RSTP).
0012H	During Forced Stop	0001H	A forced stop is present.	Cancel the forced stop.
0013H	Interlock Is On	0001H	An Interlock is present.	Cancel the interlock.
0016H	Group Error	0001H	An alarm occurred on an axis that is part of a group. (Not the axis).	Remove the cause for the alarm from the axis where the alarm occurred.
0020H	Operation Mode Error	0001H	Operation modes overlap.	Set up the operation modes correctly.
		0002H	Operation modes are not set up.	Set up the operation modes correctly.
0021H	Command Speed Zero	0001H	The command speed is zero or less.	Set the command speed to 1 or more.[*1]
		0002H	The speed limit is zero.	Set the speed limit to 1 or more.
		0003H	The command speed is zero or less.	Make the command speed higher.[*2]
0022H	Point Number Error	0001H	The start point number or end point number is a negative value.	Set up the point numbers correctly.
		0002H	The start point number is greater than the end point number.	Set up the point numbers correctly.
		0003H	The start point number or end point number exceeds the point table area of the buffer memory.	Set up the point numbers and point number offset correctly.
0023H	Mode Change During Operation	0001H	Operation mode was changed during operation.	Do not attempt to change operation modes during operation.
0024H	Position Exceeded During Positioning	0001H	Stopping of end point or changing position for continuous operation, when the deceleration stop point exceeds the command position.	Perform command position taking into account the minimum distance needed to stop.

Alarm No.	Content	Detail No.	Cause of occurrence	Procedure
0025H	Point Table Setting Error	0001H	The position command system setting is erroneous.	Set up the position command system correctly.
		0002H	The deceleration check system setting is erroneous.	Set up the deceleration check system correctly.
		0006H	The S-curve ratio setting is erroneous.	Set up the S-curve ratio correctly.
		0007H	The speed switching point specification setting is erroneous.	Set up the help command correctly.
		0008H	The point data setting of the next point is erroneous.[3]	Reexamine the setting value of the next point in the point table.
		0009H	The other axes start specification setting is erroneous.	Set up the other axes start specification correctly.
		000AH	The predwell setting is erroneous.	Set up the predwell correctly.
		000CH	The setting of pass position interrupt specification is erroneous.	Set only the start point for the pass position interrupt specification.
		0011H	The interpolation method setting is erroneous.	Set the interpolation method correctly.
		0012H	The setting for acceleration/deceleration method is outside of the setting range.	Set the acceleration/deceleration method correctly.
		0013H	A value for acceleration/deceleration data 1 to 4 is outside of the setting range.	Set acceleration/deceleration data 1 to 4 correctly.
		0014H	The total of the values of acceleration/deceleration data 1 and 2, or acceleration/deceleration data 3 and 4 exceed 1000.	Set acceleration/deceleration data 1 and 2, or acceleration/deceleration data 3 and 4 correctly.
		0015H	The acceleration/deceleration method was set to jerk ratio acceleration/deceleration during interpolation operation.	Reexamine the acceleration/deceleration method.
0026H	Incremental Feed Movement Amount Error	0001H	The setting for incremental feed movement amount is a negative value.	Set the incremental feed movement amount using natural numbers including 0. Movement direction is designated by the movement direction signal (DIR).
002EH	Control Mode Switch Error	0002H	The control mode which is out of range is set.	Review the value of the control mode command.
		0003H[4]	Without the control mode changing, a time out occurred.	• If the control mode change was conducted on an axis that does not support control mode change, check that control mode change is possible before performing a control mode change. • An error occurred in communication processing between the motion control board and the drive unit. Consult your local Mitsubishi representative.
0037H	Parameter Error[4]	0001H	Control parameter setting is erroneous.	Set the setting to correct value within the parameter limits.
0038H	System Setting Error[4]	0002H	The axis No. assignment (parameter No.0403 to 040E) is set to 0.	Set the axis No. assignment (parameter No.0403 to 040E) to match with the setting of the "Axis No. assignment option (parameter No.0400)".
		0003H	The setting value of axis No. assignment (parameter No.0403 to 040E) is invalid. (Out of parameter range)	Set the axis No. assignment (parameter No.0403 to 040E) within the valid range to match with the setting of the "Axis No. assignment option (parameter No.0400)".
		0004H	The setting value of axis No. assignment (parameter No.0403 to 040E) is the same as other axes.	Reexamine the axis No. assignment setting (parameter No.0403 to 040E) to match with the setting of the "Axis No. assignment option (parameter No.0400)".
		0005H	• The setting value of axis No. assignment (parameter No.0403 to 040E) is invalid. (Nonexistent in the network configuration) • The setting axis of axis No. assignment (parameter No.0403 to 040E) is a non-motion control station or a station not compatible with CANopen.	Reexamine the axis No. assignment setting (parameter No.0403 to 040E) to match with the setting of the "Axis No. assignment option (parameter No.0400)", or reexamine the network parameter setting.

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Alarm No.	Content	Detail No.	Cause of occurrence	Procedure
0040H	Interpolation Start Up Error	0001H	Axes that have been set to something besides interpolation operation mode signal (LIP) are included in the same group.	Designate all of the axes in the group as interpolation operation mode signal (LIP).
		0002H	There are 5 or more axes in the group formation during linear interpolation; alternatively, a group formation consists of either 1 axis or 3 or more axes during circular interpolation.	Reexamine the group formation.
		0003H	Start operation was performed for interpolation operation with the invalid interpolation group number.	Reexamine the "Interpolation group (parameter No.0260)". For the valid group No., refer to the following. ☞ Page 107 Linear Interpolation ☞ Page 116 Circular Interpolation
		0004H	The number of points defined for axes in the group is different.	Set the same number of points for all axes.
		0006H	Operation group set in the parameter is unmatched.	Set the same operation group in the parameter.

Alarm No.	Content	Detail No.	Cause of occurrence	Procedure
0041H	Interpolation Point Data Error	0001H	During linear control, the movement amount in the group exceeds the maximum value "999999999".	Set it to the correct data.
		0002H	With "Excessive speed processing" of "Interpolation options (parameter No.0261)" set to "1: alarm stop", the group formation axis exceeds the speed limit.	Reexamine feed speed and speed limit values.
		0003H	The axis No. for interpolation axis No. is outside the valid range.	Reexamine the interpolation axis No. setting value.
		0004H	The number of linear interpolation or circular interpolation groups operating simultaneously exceeds the valid number of interpolation operation groups.	Reexamine the operation pattern so that the number of linear interpolation or circular interpolation groups operating simultaneously does not exceed the valid number of interpolation groups.
		0005H	The axis No. for the auxiliary axis specified by the point table overlaps with the primary axis or another auxiliary axis.	Reexamine the auxiliary axis No. so that it is not the same as another axis No.
		0006H	The axis No. for the auxiliary axis specified by the point table is not set in the left-justified format.	Set the axis No. for the auxiliary axis specified by the point table in the left-justified format.
		0010H	When executing central point-specified circular interpolation, the difference between the radius of the start/central points and the radius of the end/central points exceeds the "Allowable error range for circular interpolation (parameter No.02CC, 02CD)".	Reexamine the central point (arc coordinate), the end point (position data), and the allowable error range value.
		0011H	During auxiliary point-specified circular interpolation, the start point = auxiliary point.	Reexamine the auxiliary point (arc coordinate).
		0012H	During auxiliary point-specified circular interpolation, the end point = auxiliary point.	Reexamine the auxiliary point (arc coordinate).
		0013H	During auxiliary point-specified circular interpolation, the start point, end point, and auxiliary point form a straight line.	Reexamine the auxiliary point (arc coordinate).
		0014H	During auxiliary point-specified circular interpolation, the auxiliary point coordinate is outside the range of -2147483648 to 2147483647.	Reexamine the auxiliary point (arc coordinate).
		0015H	During auxiliary point-specified circular interpolation, the start point = end point.	Reexamine the end point (position data).
		0016H	During either auxiliary point- or central point-specified circular interpolation, the end point position is outside the range of -2147483648 to 2147483647.	Reexamine the end point (position data).
		0017H	During central point-specified circular interpolation, the start point = central point.	Reexamine the central point (arc coordinate).
		0018H	During central point-specified circular interpolation, the end point = central point.	Reexamine the central point (arc coordinate).
		0019H	During central point-specified circular interpolation, the central point position is outside the range of -2147483648 to 2147483647.	Reexamine the central point (arc coordinate).
		001AH	The arc radius exceeds 536870912.	Reexamine the auxiliary point (arc coordinate), the central point (arc coordinate), and the end point (position data).
0042H	Can't Start Interpolation Auxiliary Axis Error	0001H	The auxiliary axis is in operation.	Perform start operation for interpolation operation after making sure all axes in the group are stopped.
		0002H	The auxiliary axis has an alarm set.	Remove the cause for the alarm on the auxiliary axis.

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Alarm No.	Content	Detail No.	Cause of occurrence	Procedure
004DH	Other Axes Start Setting Error	0010H	The axis judgment condition of the other axes start condition is outside limits.	Set correct data.
		0011H	The axis remaining distance data of other axes start condition is a negative value.	Set correct data.
		0012H	The position specified in the axis pass position data of other axes start condition cannot be passed.	Set correct data.
		0013H	The axis judgment coordinates of other axes start condition is outside limits.	Set correct data.
		0014H	The observed axis No. of other axes start condition is outside limits.	Set correct data.
		0015H	The observe judgment condition of other axes start condition is outside limits.	Set correct data.
		0016H	The observed axis judgment coordinates of other axes start condition is outside limits.	Set correct data.
		0017H	The specified position pass judgment condition of observed axis of other axes start condition is outside limits.	Set correct data.
		0018H	The observed axis specification of other axes start condition is outside limits.	Set correct data.
		0019H	A non-existent axis is set in the observed axis No. of other axes start condition.	Set the axis specified by the observed axis No. to "1: Controlled" for "Control axis" of "Control option 1 (parameter No.0200)". Or, establish the communication with the observed axis.
		0020H	A self-axis or non-existent axis was set in the start axis designation of the other axes operation content.	Set the axis specified as the start axis No. to "1: Controlled" for "Control axis" of "Control option 1 (parameter No.0200)". Or, establish the communication with the start axis.
		0021H	The start axis starting point No. and start axis end point No. settings of other axes operation content are outside limits.	Set correct data.
		0022H	The output device signal control of other axes operation content is outside limits.	Set correct data.
		0023H	The output signal No. of other axes operation content is outside the limits.	Set correct data.
		0024H	The selection for output signal validation of other axes operation content is out of range.	Set correct data.
		0025H	The output signal command of other axes operation content is out of range.	Set correct data.
		0026H	The output signal timer control of other axes operation content is out of range.	Set correct data.
		0027H	The timer control is enabled to the output signal which setting of selection for output signal validation of other axes operation content is not enabled.	Set correct data.
		0028H	0ms is set to output signal timer when any of output signal timer control of other axes operation content is enabled.	Set correct data.
0050H	Tandem Drive Mode Change Error	0001H	Drive mode change was attempted while tandem drive axis mode toggling was prohibited.	Change the drive mode when the change conditions are satisfied. For details, refer to the following. ☞ Page 433 Changing of drive mode
0051H	While in Tandem Drive Nonsynchronous Mode	0001H	Home position return, home position reset, automatic operation, or interpolation operation was attempted while in non-synchronous micro adjustment mode of tandem drive axes.	Perform home position return, home position reset, automatic operation as well as interpolation operation while in synchronous mode.

Alarm No.	Content	Detail No.	Cause of occurrence	Procedure
0052H	Tandem Drive Axis Setting Error	0001H	A home position return method other than driver homing method was attempted for home position return while in tandem drive axis mode.	Set "000Fh: Driver homing method" to "Home position return option 1 (parameter No.0240)".
		0002H	A second axis is not set for the tandem drive axis group. Or 3 or more axes are set up with the same tandem drive group number.	Set up the tandem drive axis group number in pairs.
		0003H	The slave axis is set as a drive-unit-less axis for the driver homing method of the tandem drive axis.	Set both the master and slave axes to a disabled drive-unit-less axis for the driver homing method of the tandem drive axis.
		0004H	Operation group set in the parameter is unmatched.	Set the same operation group in the parameter.
0053H	Tandem Drive Excessive Deviation	0001H	The deviation between the master axis and slave axis for tandem drive axes exceeds the tandem drive excessive deviation width of the parameter.	Make adjustments so that the deviation between the master axis and slave axis is reduced. And reexamine excessive deviation width and delay of start detection for excessive deviation, defined in the parameters.
0054H	Tandem Drive Synchronous Alignment Valid Width Error	0001H	When deviation exceeds the synchronous alignment valid width during calculation error correction performed for servo on, while in tandem drive synchronous mode.	Reexamine the parameter synchronous alignment valid width. As the home position return is incomplete (home position return request (ZREQ) is ON), execute home position return again.
0055H	Tandem Drive While Performing Synchronization	0001H	When start of operation is executed during calculation error correction performed for turning on of the servo, while in tandem drive synchronous mode.	Do not perform start up while the synchronizing signal (SYEO□) is ON.
0056H	Tandem Drive Slave Axis Error	0001H	There is a drive unit alarm for the tandem drive slave axis.	Cancel the drive unit alarm. For details, refer to the drive unit manual for your drive unit.
		0002H	A communication error or a power outage on the drive unit occurred.	Confirm that the connection to the drive unit is intact. For details concerning communication errors, refer to the following. ☞ Page 600 System Error
		0003H	The tandem drive slave axis entered servo ready off mode.	Confirm that the connection to the drive unit is intact. For details concerning communication errors, refer to the following. ☞ Page 600 System Error
0058H	Tandem Drive Synchronous Alignment Error	0001H	When a stop command is input during calculation error correction performed for turning on the servo, while in tandem drive synchronous mode.	Perform home position return afar resetting the operation alarm.
		0002H	In tandem drive synchronous mode, the start operation is performed without completion of synchronization.	To correct the error between the master axis and the slave axis, turn the servo off and then on to perform synchronization again.
005BH	Using Other Axes Start Data	0001H	Other axes start data is being used (the other axes start notice signal (OSOP□) is on). Or other axes in different operation group is importing other axes start data by the same number of other axes start data.	Check the other axes start data is not being used (the other axes start notice signal (OSOP□) is off). Or set the other axes start data so that it does not overlap with other axes.

Alarm No.	Content	Detail No.	Cause of occurrence	Procedure
005CH	Pass Position Interrupt Error	0001H	The setting to the start number of the pass interrupt condition is out of range.	Check the start number setting of the pass interrupt condition.
		0002H	The setting to the end number of the pass interrupt condition is out of range.	Check the end number setting of the pass interrupt condition.
		0003H	The start number of the pass interrupt condition exceeds the end number.	Check the start number setting and the end number setting of the pass interrupt condition.
		0004H	The setting of the pass interrupt condition is out of range.	Check the pass interrupt condition setting.
		0005H	The specified pass interrupt condition is used for other axes.	Do not overlap the passing interrupt condition numbers for each axis.
		0006H	The operation is started during the pass position output interrupt or a servo was off.	Do not start the operation or turn off the servo until the pass position output interrupt is completed.
		0007H	During the pass position output interrupt cancel signal (PPISTP) is on, the operation is started with setting valid to the pass position specification for auxiliary command of point table.	Start the operation after turning off the pass position output interrupt cancel signal (PPISTP).
005DH	Press Control Error	0001H	Press control is enabled for the axis used in tandem drive.	Disable press control to the axes used in tandem drive.
		0002H	Operation completed without switching to press control mode in the press control point operation.	• If auto switching is enabled, review the setting of position of switching to press control mode. • If manual switching is enabled, Switch to the press control mode before finishing the operation during position control mode.
		0003H	The pressing limit position has been reached.	Review the position at which the pressing will start and the pressing limit position.
		0004H	Interlock signal (ITL) was turned on during the press control point operation.	Do not turn on the interlock signal (ITL) during the press control point operation.
		0005H	The Combination of direction and the pressing limit position is invalid.	• Reexamine the setting value in the point table. • Move the axis to the opposite direction, and start the operation before the pressing limit position.
		0006H	Press control is enabled for the drive unit which doesn't support press control mode.	• Reexamine the setting value in the point table. • Replace to the drive unit of the version which supports press control mode.
		0007H	The control mode switching command signal (CTLMC) was turned on while moving (before reaching target torque) in press control mode.	Turn on the control mode switching command signal (CTLMC) after press control is completed. (switching to position control mode)
		0008H	Pressing limit position is set before the position data in the point table.	Set pressing limit position after the position data in the point table.
		0009H	Software limit is set to the position before the pressing limit position.	Set pressing limit position before software limit.
		000AH	Press control is enabled to the axes used in linear or circular interpolation.	Disable press control to the axes that are used in linear or circular interpolation.
		000BH	Press control is enabled to the point with the movement amount is 0.	Set a right amount in the point to initiate press control.
005EH	Press Control Setting Error	0001H	The speed limit value for press control is out of range.	Review the value of the speed limit value for press control.
		0003H	The acceleration time constant for press control is out of range.	Review the value of the acceleration time constant for press control.
		0004H	The deceleration time constant for press control is out of range.	Review the value of the deceleration time constant for press control.
		0005H	The press control operation condition is out of range.	Review the value of the press control operation condition.

Alarm No.	Content	Detail No.	Cause of occurrence	Procedure
005FH	Point Table Loop Error	0001H	The loop start point is specified but the latest command point No. is 0.	After updating the point table, set the latest command point No.
		0002H	The loop start point is specified but the number of points used is 1.	When specifying the point table loop, set more than one point.
		0003H	A value smaller than the start point No. or a value larger than the end point No. was input to the latest command point No.	Input a number within the range of start point No. and end point No. to the latest command point No.
		0004H	The next point for a point that specifies continuous operation has not been updated.	• Increase the number of points to be used in loop method so that update is complete at the time of operation start for the next point. • Increase the updating speed so that update is complete at the time of operation start for the next point. • After updating the point table, set the latest command point No.
		0005H	Loop end point was specified while not in point table loop.	Specify loop end point while using point table loop method.
		0006H	"1: Before point switching" is set in the speed switching point specification but the next point has not been updated before operation start for the point before point switching.	• Increase the number of points to be used in loop method so that update is complete at the time of operation start for the point before point switching. • Increase the updating speed so that update is complete at the time of operation start for the point before point switching. • After updating the point table, set the latest command point No.

Alarm No.	Content	Detail No.	Cause of occurrence	Procedure
0061H	Pressure Control Initiation Error	0001H	No. of pressure control profile is out of range.	Input the correct No. of pressure control profile.
		0002H	Press control and pressure control are enabled at once.	Disable press control to the axes used in pressure control mode.
		0003H	The profile specified by the pressure control profile No. is being used.	Review pressure control profile.
		0005H	Movement amount of the pressure control point of the pressure release operation is not 0.	Start the releasing pressure when axes are stopped.
		0007H	The limit position is set in the direction opposite to the movement direction in the position control.	Review the movement direction of limit position.
		0008H	Limit position is more than target position while moving to + direction.	Review the limit position and the target position.
		0009H	Limit position is less than target position while moving to - direction.	Review the limit position and the target position.
		000CH	Target position was reached before switching to pressure control while moving in pressure control point operation.	Review the target position.
		000DH	Interlock signal (ITL) was turned on during the pressure control point operation.	Do not turn on the interlock signal (ITL) during the pressure control point operation.
		000FH	Drive unit is not applicable for pressure control. (Not applicable for Cyclic synchronized pressure mode (cspr).)	• Reexamine the setting value in the point table. • Install a drive unit which supports pressure control mode.
		0011H	Limit position for switching conditions from position control to pressure control was reached.	Review the limit position for switching conditions from position control to pressure control.
		0012H	Pressure control is enabled to the axis used in tandem drive.	Disable pressure control to the axis used in tandem drive.
		0013H	Pressure control is enabled to the axes used in interpolation.	Disabled pressure control to the axes used in linear or circular interpolation.
		0014H	Data which is not applicable for switching condition option is selected.	Review the option data in switching condition option.
		0015H	Pressure control was initiated with more than 16 axes at once.	Set 16 or less than 16 axes at once used in pressure control.
		0016H	Settings in switching condition are wrong while "1: time constant disabled" is selected in time constant for dwelling pressure.	Set "5: step operation time" in option data 1 of switching condition option and "0: switching condition 1 only" in condition to be satisfied while "1: time constant disabled" is selected in time constant for dwelling pressure.
		0017H	"Disabled" in forward-edge stopping or "Enabled" in back-edge stopping is set in "forward-edge/back-edge stopping function" of the servo parameter "pressure control function option 1 (PW12)".	Set "1(forward-edge stopping: enabled, back-edge stopping: disabled)" in "forward-edge/back-edge stopping function" of the servo parameter "pressure control function option 1 (PW12)".
		0018H	Vibration suppression command filter 1 and pressure control are enabled at once.	Disable vibration suppression command filter 1.
		0019H	The pressure control is enabled for the axes set to forced stop option.	Disable forced stop option.
		001BH	Predwell and pressure control are enabled at once.	Disable predwell.

Alarm No.	Content	Detail No.	Cause of occurrence	Procedure
0062H	Pressure Control Setting Error	1201H	Switching option 1 in switching conditions from position control to pressure control is out of range.	Set correct data.
		1202H	Forced switching to pressure control of switching option 1 in switching conditions from position control to pressure control is out of range.	Set correct data.
		1203H	Selection of switching delay of switching option 1 in switching conditions from position control to pressure control is out of range.	Set correct data.
		1401H	Switching condition option of switching condition in switching conditions from position control to pressure control is out of range.	Set correct data.
		1402H	Decided value 1 of switching condition in switching conditions from position control to pressure control is out of range.	Set correct data.
		1403H	Decided value 2 of switching condition in switching conditions from position control to pressure control is out of range.	Set correct data.
		1404H	Decided value 3 of switching condition in switching conditions from position control to pressure control is out of range.	Set correct data.
		1405H	Decided value 4 of switching condition in switching conditions from position control to pressure control is out of range.	Set correct data.
		1406H	Condition to be satisfied of switching condition in switching conditions from position control to pressure control is out of range.	Set correct data.
		2200H	Referenced speed limit value in feeding/ dwelling pressure common setting is out of range.	Set correct data.
		2300H	Referenced pressure command value in feeding/dwelling pressure common setting is out of range.	Set correct data.
		3100H	Number of steps in feeding data is out of range.	Set correct data.
		3201H	Selection of initial speed limit value of feeding common option 1 in feeding data is out of range.	Set correct data.
		3202H	Selection of initial pressure command value of feeding common option 1 in feeding data is out of range.	Set correct data.
		3310H	Initial speed limit value in feeding data is out of range.	Set correct data.
		3320H	Initial pressure command value in feeding data is out of range.	Set correct data.
		3420H	Speed limit value in feeding data is out of range.	Set correct data.
		3430H	Pressure command value in feeding data is out of range.	Set correct data.
		3440H	Speed limit time constant in feeding data is out of range.	Set correct data.
		3450H	Pressure command time constant in feeding data is out of range.	Set correct data.
		3461H	Switching condition option of switching condition in feeding data is out of range.	Set correct data.
		3462H	Decided value 1 of switching condition in feeding data is out of range.	Set correct data.
		3463H	Decided value 2 of switching condition in feeding data is out of range.	Set correct data.

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Alarm No.	Content	Detail No.	Cause of occurrence	Procedure
0062H	Pressure Control Setting Error	3464H	Decided value 3 of switching condition in feeding data is out of range.	Set correct data.
		3465H	Decided value 4 of switching condition in feeding data is out of range.	Set correct data.
		3466H	Condition to be satisfied of switching condition in feeding data is out of range.	Set correct data.
		4101H	Forced switching to dwelling pressure of switching option 1 in switching conditions from feeding to dwelling pressure is out of range.	Set correct data.
		4102H	Selection of switching pressure of switching option 1 in switching conditions from feeding to dwelling pressure is out of range.	Set correct data.
		4210H	Switching pressure in switching conditions from feeding to dwelling pressure is out of range.	Set correct data.
		4220H	Switching time in switching conditions from feeding to dwelling pressure is out of range.	Set correct data.
		4301H	Switching condition option of switching condition in switching conditions from feeding to dwelling pressure is out of range.	Set correct data.
		4302H	Decided value 1 of switching condition in switching conditions from feeding to dwelling pressure is out of range.	Set correct data.
		4303H	Decided value 2 of switching condition in switching conditions from feeding to dwelling pressure is out of range.	Set correct data.
		4304H	Decided value 3 of switching condition in switching conditions from feeding to dwelling pressure is out of range.	Set correct data.
		4305H	Decided value 4 of switching condition in switching conditions from feeding to dwelling pressure is out of range.	Set correct data.
		4306H	Condition to be satisfied of switching condition in switching conditions from feeding to dwelling pressure is out of range.	Set correct data.
		5100H	Number of steps in dwelling pressure data is out of range.	Set correct data.
		5200H	Mode resetting of dwelling pressure common option 1 in dwelling pressure data is out of range.	Set correct data.
		5320H	Speed limit value in dwelling pressure data is out of range.	Set correct data.
		5330H	Pressure command value in dwelling pressure data is out of range.	Set correct data.
		5340H	Selection of time constant for dwelling pressure mode of dwelling pressure option 1 in dwelling pressure data is out of range.	Set correct data.
		5350H	Speed limit time constant in dwelling pressure data is out of range.	Set correct data.
		5360H	Pressure command time constant in dwelling pressure data is out of range.	Set correct data.
		5371H	Switching condition option of switching condition in dwelling pressure data is out of range.	Set correct data.
		5372H	Decided value 1 of switching condition in dwelling pressure data is out of range.	Set correct data.
		5373H	Decided value 2 of switching condition in dwelling pressure data is out of range.	Set correct data.
		5374H	Decided value 3 of switching condition in dwelling pressure data is out of range.	Set correct data.

Alarm No.	Content	Detail No.	Cause of occurrence	Procedure
0062H	Pressure Control Setting Error	5375H	Decided value 4 of switching condition in dwelling pressure data is out of range.	Set correct data.
		5376H	Condition to be satisfied of switching condition in dwelling pressure data is out of range.	Set correct data.
		7200H	Referenced speed limit value in releasing pressure data is out of range.	Set correct data.
		7300H	Initial speed limit value in releasing pressure data is out of range.	Set correct data.
		7400H	Initial pressure command value in releasing pressure data is out of range.	Set correct data.
		7500H	Speed limit time constant in releasing pressure data is out of range.	Set correct data.
		7600H	Speed limit stopping time constant in releasing pressure data is out of range.	Set correct data.
0063H	Pressure Control Error	0003H	The distance required for deceleration at the speed limit stopping time constant [pulse] exceeded the maximum amount (2147483647).	Set correct data.
		0006H	The following differences [pulse] exceeded 32 bit stroke. • Limit position of previous step and current step during feeding or dwelling pressure. • Command current position and limit position/final position (SE2) when switching conditions from position control to pressure control are satisfied.	Set correct data.
		0008H	Speed limit value got out of range while feeding.	Set correct data.
		000AH	Pressure command value got out of range while dwelling pressure.	Set correct data.
		000BH	Initial pressure command value got out of range while releasing pressure.	Set correct data.
		000CH	Timeout occurred while switching model pressure control mode.	• Reexamine timeout duration in pressure control profile. • Review timeout setting in drive unit.

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Alarm No.	Content	Detail No.	Cause of occurrence	Procedure
0080H	Slave Object Setting Error	0002H	The operation of the driver homing method started without the necessary settings of slave objects for this method.	Reexamine the slave object setting.
		0003H	"Sensor input options (parameter No.0219)" is set to "1: Driver input" without setting "Digital inputs (Obj. 60FDh)".	Reexamine the slave object setting.
		0004H	An object with 4bytes and not aligned to 4-byte boundary on the TPDO map was set for the axis management parameter.	Reexamine the slave object setting.
		0005H	An object with 4bytes and not aligned to 4-byte boundary on the RPDO map was set for the axis management parameter.	Reexamine the slave object setting.
		0006H	The "Forward rotation torque limit value (parameter No.0210)" was changed from the initial value without setting "Positive torque limit value (Obj. 60E0h)".	Reexamine the slave object setting.
		0007H	The "Reverse rotation torque limit value (parameter No.0211)" was changed from the initial value without setting "Negative torque limit value (Obj. 60E1h)".	Reexamine the slave object setting.
		0008H[*4]	Tandem drive was performed without setting "Following error actual value (Obj. 60F4h)".	• Reexamine the slave object setting. • Reexamine the parameter setting of the tandem drive axis.
		0009H	Press control was initiated when the objects which are required to press control are not installed.	Reexamine the slave object setting.
		000AH	Pressure control was initiated when the objects which are required to pressure control are not installed.	Reexamine the slave object setting.
		000BH	Press control was initiated when the RPDO objects which are required for press control are assigned to device station object input/output.	Reexamine the slave object setting.
0081H	Slave Object Mismatch	0001H	The size, index, and subindex set with the TPDO object No. do not match the object assigned with the TPDO setting.	Reexamine the TPDO Object No. setting of the axis management parameter.
		0002H	The size, index, and subindex set with the RPDO object No. do not match the object assigned with the RPDO setting.	Reexamine the RPDO Object No. setting of the axis management parameter.
0082H	Slave Object Unit Error	0001H	The unit used in slave object doesn't match with the unit used in motion control board.	Reexamine parameter settings about unit at MR-J5(W)-G.
0090H	Home Position Return Not Complete	0001H	Automatic operation, interpolation operation, or home position reset were performed without executing return to home position.	Execute home position return. Or set "1: Valid" for "No home position" of "Control option 1 (parameter No.0200)".
0096H	Home Position Setting Error	0001H	Home position reset were performed before the motor settling.	Adjust the drive unit so that stopping to origin position settles quickly.
009EH	Driver Homing Method Start Not Possible	0001H	The operation of driver homing method started with a drive unit incompatible with the home position return mode.	Perform the driver homing method with a drive unit compatible with the home position return mode.
		0002H	The operation of driver homing method started in a control mode other than position control mode.	Perform the driver homing method after switching the control mode to position control mode.
009FH	Driver Homing Method Operation Error	0001H	The home position return was completed without reaching the target position.	Check the status of the motor, and perform a home position return again.
		0002H	The control mode became a non-home position return mode during home position return.	• Check there is no alarm in the drive unit. • If the problem is not resolved, consult your local Mitsubishi representative.
		0003H	Reading the home position information from the drive unit failed.	Do not use transient transmit during a home position return.

Alarm No.	Content	Detail No.	Cause of occurrence	Procedure
00A0H	Limit Switch	0001H	The upper limit switch (LSP) turned off while moving in the + direction.	Using JOG operation etc. move in the opposite direction to return to within the limit switch boundaries.
		0002H	The lower limit switch (LSN) turned off while moving in the - direction.	Using JOG operation etc. move in the opposite direction to return to within the limit switch boundaries.
00A1H	Out of Software Limit Boundaries	0001H	Position outside of software limit boundaries is being designated.	Set the movement command to within the software limit boundaries.
00A2H	Reached Software Limit	0001H	The software limit has been reached.	Using JOG operation etc. move in the opposite direction to return to within the software limit boundaries.
00A4H	Software Limit Parameter Error	0001H	The parameter settings for the software limits has the upper limit < lower limit.	Set the parameter settings for the software limits such that the upper limit > lower limit.
00A5H	Position Switch Parameter Error	0001H	The parameter settings for the position switch has the upper limit < lower limit.	Set the parameter settings for the position switch such that the upper limit > lower limit.
00B0H	Servo Is Not Controllable	0001H	Axis is not a control axis.	Set "1: Control" for "Control axis" of "Control option 1 (parameter No.0200)".
		0002H	A communication error or a power outage on the drive unit occurred.	Confirm that the connection to the drive unit is intact. Refer to the section of "System error" for further details concerning communication errors.
		0003H	• A drive unit alarm was set and servo ready off mode was entered. • The main circuit of MR-J5(W)-G is off. • A forced stop is present.	• Cancel the drive unit alarm. For details, refer to the drive unit manual for your drive unit. • Turn on the main circuit of MR-J5(W)-G. • Cancel the forced stop.
		0004H	Servo on signal (SON) was turned on during a forced stop.	Turn on the servo after canceling the forced stop.
		0005H	The initialization of the control axis failed.	Reexamine the settings of axis control parameter. If the problem is not resolved, consult your local Mitsubishi representative.
00B1H	Drive Unit Alarm	0001H	The drive unit is in an alarm state.	Cancel the drive unit alarm. For details, refer to the drive unit manual for your drive unit.
00B2H	Servo Is Off	0001H	Servo is in off status.	Turn on the servo.
00B3H	Servo Off Command	0001H	Servo on signal (SON) was turned off during operation.	Turn on the servo.
00C0H	Drive Unit Command Discard Detected	0001H	The command discard ("Statusword (Obj. 6041h)" bit12 OFF) of the drive unit was detected during operation.	Refer to the drive unit manual for your drive unit about the cause of this alarm. Review the conditions of the operation which doesn't generates the command discard.

*1 Depending on parameter settings, a setting of 1 or more may be treated as 0 by internal calculations.

*2 This occurs when the command speed is treated as 0 by the internal operation of the jerk ratio acceleration/deceleration.

*3 Only when "1: Before point switching" is set in the speed switching point specification.

*4 The operation alarm cannot be reset.

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System status code error

The error code of the system status code can be confirmed by "System status code (address: 00000900H, 00000901H)".

When the system status code is "E□□□h", it is applied to the system error.

Error code	Content	Cause of occurrence	Procedure
E010H	Dual Port Memory Error 1[*1]	A dual port memory error was detected.	An error with the dual port memory occurred. Consult your local Mitsubishi representative.
E011H	Dual Port Memory Error 2[*1]	A dual port memory error was detected.	An error with the dual port memory occurred. Consult your local Mitsubishi representative.
E012H	Dual Port Memory Error 3[*1]	A dual port memory error was detected.	An error with the dual port memory occurred. Consult your local Mitsubishi representative.
E013H	Dual Port Memory Error 4[*1]	A dual port memory error was detected.	An error with the dual port memory occurred. Consult your local Mitsubishi representative.
E020H	General I/O Error 1[*1]	An error with the internal part of the motion control board (general I/O) was detected.	An error with the general I/O occurred. Consult your local Mitsubishi representative.
E021H	General I/O Error 2[*1]	An error with the internal part of the motion control board (general I/O) was detected.	An error with the general I/O occurred. Consult your local Mitsubishi representative.
E040H	Internal Part Error 1[*1]	An internal part error was detected.	An error with the internal parts occurred. Consult your local Mitsubishi representative.
E041H	Internal Part Error 2[*1]	An internal part error was detected.	An error with the internal parts occurred. Consult your local Mitsubishi representative.
E042H	Internal Part Error 3[*1]	An internal part error was detected.	An error with the internal parts occurred. Consult your local Mitsubishi representative.
E043H	Internal Part Error 4[*1]	An internal part error was detected.	An error with the internal parts occurred. Consult your local Mitsubishi representative.
E044H	Internal Part Error 5[*1]	An internal part error was detected.	An error with the internal parts occurred. Consult your local Mitsubishi representative.
E045H	Internal Part Error 6[*1]	An internal part error was detected.	An error with the internal parts occurred. Consult your local Mitsubishi representative.
E050H	CPU Temperature measurement Error[*1]	An internal part error was detected.	An error with the internal parts occurred. Consult your local Mitsubishi representative.
E300H	System Error Occurs[*1]	A major/moderate system error was detected.	Check the cause of occurrence and procedure of system error code.
E310H	PCIe Bus Connection Error[*1]	The connection to host PC via PCI Express has been disconnected.	Review the PCI Express condition of the connection between host PC and Motion control board.
E500H	Electronic Gear Setting Error[*1]	A value out of the setting range was input.	Check the following details. • The settings of the electronic gear numerator (CMX) and the electronic gear denominator (CDV) are within the setting range. • The settings of the electronic gears (CMX/CDV) are within the setting range.
E503H	Exclusive Control Error[*1]	The invalid value is set to the exclusive control data area.	Reexamine the setting process for the exclusive control data.
E504H	CPU Temperature Limit[*1]	Temperature in the Motion control board has risen excessively.	Turn off host PC. Review the environment in which Motion control board is implemented. It should be applied to the specifications in the manual.
E505H	General output exclusion control error[*1]	Invalid value is set on the data area of general output exclusion control.	Review the setting process to the data area of general output exclusion control.
E506H	Operation Mode Setting Error[*1]	Invalid value is set on operation mode setting.	Review operation mode setting.
E520H	Communication Cycle Setting Error[*1]	An error with the communication cycle interval was detected.	Reexamine the communication period interval setting of the network parameter.[*2] • Check if an unsupported communication cycle interval is set.
E521H	System Startup Error[*1]	An error was detected during the preparation of system startup.	An error occurred during the preparation of system startup. Consult your local Mitsubishi representative.
EF01H	System Command Code Error[*1]	An erroneous system command code was set.	Do not set any system command code other than those listed in the following. ☞ Page 79 System Startup Processing

*1   The system status code error cannot be reset.
*2   The communication cycle interval is the same as the operation cycle.

14.3 Drive Unit Error

Drive unit alarm

For the error which is not listed in the table below, refer to the drive unit manual.

For MR-J5(W)-G: 📖MR-J5 User's Manual (Troubleshooting)

Alarm No.	Content	Detail No.	Cause of occurrence	Procedure
0000H	Drive Unit Alarm	0000H	Drive unit alarm has occurred without setting "Current alarm (Obj. 2A41h)".	Reexamine the slave object setting.

Drive unit warning

For the error which is not listed in the table below, refer to the drive unit manual.

For MR-J5(W)-G: 📖MR-J5 User's Manual (Troubleshooting)

Alarm No.	Content	Detail No.	Cause of occurrence	Procedure
0000H	Drive Unit Warning	0000H	Drive unit warning has occurred without setting "Current alarm (Obj. 2A41h)".	Reexamine the slave object setting.

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15 LIST OF EVENT CODES

System

Event code	Overview	Cause
07EBH	System Start	The system was startup.
07FBH	Event History File Creation	The event history file was created.

Operation

Event code	Overview	Cause
27FFEH	Software Reboot Execution	The software reboot was executed.
27FFFH	Event History Clear	The event history was cleared.

MEMO

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16 EMC AND LOW VOLTAGE DIRECTIVES

In each country, laws and regulations concerning electromagnetic compatibility (EMC) and electrical safety are enacted.

For the products sold in the European countries, compliance with the EU's EMC Directive has been a legal obligation as EMC regulation since 1996, as well as the EU's Low Voltage Directive as electrical safety regulation since 1997.

Manufacturers who recognize their products are compliant with the EMC and Low Voltage Directives are required to perform a Declaration of Conformity and attach "CE marking" on their products in European countries.

In some other countries and regions, manufacturers are required to make their products compliant with applicable laws or regulations and attach a certification mark on the products as well (such as UK Conformity Assessed (UKCA) marking in the UK, and Korea Certification (KC) marking in South Korea).

Each country works to make their regulatory requirements consistent across countries based on international standards.

When the requirements are consistent, measures to comply with the EMC and electrical safety regulations become common across countries.

The UK and South Korea have enacted EMC regulations whose requirements are consistent with those of the EMC Directive. The UK has also enacted electrical safety regulations whose requirements are consistent with those of the Low Voltage Directive.

Manufacturers who recognize their products are compliant with the EMC and Low Voltage Directives are required to attach a "CE marking" on their products.

The sales representative in EU member states is:

Company: Mitsubishi Electric Europe B.V.

Address: Mitsubishi-Electric-Platz1, 40882 Ratingen, Germany

16.1 Measures to Comply with the EMC Directive

The EMC Directive specifies that "products placed on the market must be so constructed that they do not cause excessive electromagnetic interference (emissions) and are not unduly affected by electromagnetic interference (immunity)". This section summarizes the precautions on compliance with the EMC Directive of the machinery constructed with the Motion control board.

These precautions are based on the requirements and the standards of the regulation, however, it does not guarantee that the entire machinery constructed according to the descriptions is not complied with abovementioned directives. The method and judgment for complying with the EMC Directive must be determined by the person who constructs the entire machinery.

EMC Directive related standards

■Emission requirements
Standard: IEC61131-2:2017

Test item	Test description	Value specified in standard[1]

IEC61000-6-4, CISPR16-2-3 Radiated emission	The electromagnetic wave emitted by the product to the external space is measured.	• 30 to 230MHz
		  QP: 40dBμV/m (measured at 10m distance)
		• 230 to 1000MHz
		  QP: 47dBμV/m (measured at 10m distance)
		• 1000M to 3000MHz
		  QP: 76dBμV/m (measured at 3m distance),
		  Mean: 56dBμV/m (measured at 3m distance)
		• 3000M to 6000MHz
		  QP: 80dBμV/m (measured at 3m distance),
		  Mean: 60dBμV/m (measured at 3m distance)

IEC61000-6-4, CISPR16-2-1, CISPR32 Conducted emission	The noise level which the product emits to the power line and the telecommunication port is measured.	AC power line
		• 150k to 500kHz
		  QP: 79dBμV, Mean: 66dBμV
		• 500k to 30MHz
		  QP: 73dBμV, Mean: 60dBμV
		Telecommunication port
		• 150k to 500kHz
		  QP: 97 to 87dBμV, Mean: 84 to 74dBμV
		• 500k to 30MHz
		  QP: 87dBμV, Mean: 74dBμV

*1 QP: Quasi-Peak value, Mean: Average value

■Immunity requirements
Standard: IEC61131-2:2017

Test item	Test description	Value specified in standard
IEC61000-4-2 Electrostatic discharge immunity	An electrostatic discharge is applied to the enclosure of the equipment.	• 8kV: Air discharge • 4kV: Contact discharge • 4kV: Indirect discharge
IEC61000-4-3 Radiated, radio-frequency, electromagnetic field immunity	An electric field is radiated to the product.	80% AM modulation @1kHz • 80 to 1000MHz: 10V/m • 1.4 to 6.0GHz: 3V/m
IEC61000-4-4 Fast transient/burst immunity	Burst noise is applied to power lines and signal lines.	• AC/DC power and I/O power lines: 2kV • DC I/O, analog, and communication lines: 1kV
IEC61000-4-5 Surge immunity	Lightning surge is applied to power lines and signal lines.	• AC power, AC I/O power, and AC I/O (unshielded) lines: 2kV CM, 1kV DM • DC power and DC I/O power lines: 0.5kV CM, 0.5kV DM • DC I/O, AC I/O (shielded), analog, and communication lines: 1kV CM
IEC61000-4-6 Conducted RF immunity	High-frequency noise is applied to power lines and signal lines.	0.15 to 80MHz, 80% AM modulation@1kHz, 10Vrms
IEC61000-4-8 Power-frequency magnetic field immunity	The product is immersed in the magnetic field of an induction coil.	50/60Hz, 30A/m
IEC61000-4-11 Voltage dips and interruption immunity	Power voltage is momentarily interrupted.	• 0%, 0.5 cycle, starting at zerocrossing • 0%, 250/300 cycles (50/60Hz) • 40%, 10/12 cycles (50/60Hz) • 70%, 25/30 cycles (50/60Hz)

Installation

■Power cable and ground cable

Provide a ground point to the control panel near the host personal computer. Ground the FG terminal of the host personal computer to the ground point with the thickest and shortest ground cable possible (2mm^2, 30cm (11.82inch) or shorter).

■Cable

If a shielded cable is not used or not grounded properly, the noise immunity does not meet the requirement.

■Grounding a shielded cable

Ground the shield of a shielded cable as close to the cable terminal as possible so that the grounded cable is not affected by electromagnetic induction from ungrounded cables.

Ground the exposed shield to a large area on the control panel. A clamp fitting can be used as shown below. In this case, mask off the inner wall surface of the control panel, which comes in contact with the clamp fitting.

Paint mask
Clamp fitting
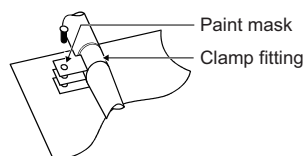
Point

Do not use the tip of a PVC wire soldered onto a shield of the shielded cable for grounding. Doing so may raise the high-frequency impedance, resulting in loss of the shielding effect.

Shielded cable

PVC wire
Solderless terminal
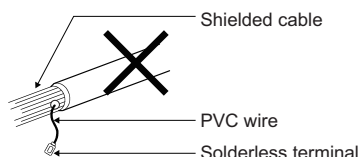
■Precautions for static electricity

ESD Susceptibility Symbol is labeled on the Motion control board.

Before handling the Motion control board, touch a grounded metal, etc. to discharge static electricity from a human body. Failure to do so may cause failure or malfunction of the Motion control board.

Do not touch the Motion control board, CC-Link IE TSN cable and I/O signal cable while power is ON. Touching them could cause electric shock or operation failure.

ESD Susceptibility Symbol

P1

P2
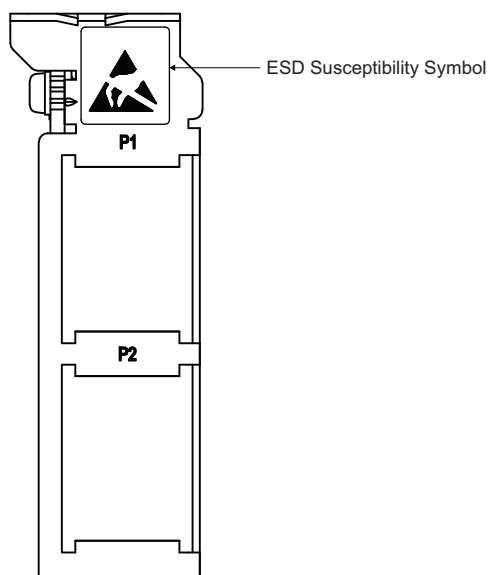
Parts of measure against noise

■Ferrite core

A ferrite core is effective for reducing radiated noise in the 30MHz to 100MHz frequency band. Installing a ferrite core to the cable is not essential, however, it is recommended to install a ferrite core if a shield cable extended out of the control panel does not provide sufficient shielding effects.

Install a ferrite core to the cable in the position just before the cable is extended out of the control panel. If the installation position is not appropriate, the ferrite core does not produce any effect.
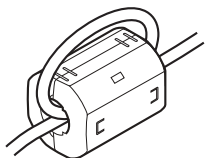
■Recommended ferrite core

Manufacturer	Model name
TDK Corporation	ZCAT3035-1330

■Noise filter (power supply line filter)

A noise filter is effective for reducing conducted noise. Installing a noise filter on the power supply of the servo amplifier is effective for reducing the noise. (The noise filter has the effect of reducing conducted noise of 10MHz or less.)

■Recommended noise filter

Manufacturer	Model name
Mitsubishi Electric Corporation	FR-BLF
Soshin Electric Corporation	HF3010A-UN

■Cable clamp

Use a cable clamp for the shield cable, and grounding the exposed shield to the control panel is possible.

Ground the shield as close to the cable terminal as possible.

■Recommended cable clamp

Manufacturer	Model name
Mitsubishi Electric Corporation	• AERSBAN-DSET • AERSBAN-ESET • AD75CK

⚠ CAUTION

Do not ground the cable clamp to the top of control panel. Doing so may lead to damage by damage of screws, etc. during installation or removing the cable clamp.

16.2 Measures to Comply with the Low Voltage Directive

MR-EM441G does not use the power supply from 50 to 1000VAC or 75 to 1500VDC, so that the product is not targeted for the Low Voltage Directive compliance.

APPENDICES

Appendix 1 Confirming Serial No. and Operating System Software Version

Confirming the serial No. of the Motion control board and software version are shown below.

Confirming serial No.

Confirming on the rating plate

The rating plate is on the Motion control board. The Motion control board serial No. is printed on the SERIAL line, and the year and month of manufacture is printed on the DATE line.

Serial No.
SERIAL xxxxxxxxxxxxxxxx

Year and month of manufacturer
DATE 20xx-xx

Rating plate
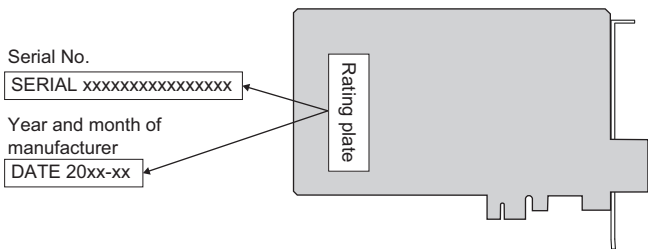
> **Point**
>
> When the Motion control board is mounted to the host personal computer, the serial No. cannot be confirmed. Take note of the serial No. before mounting.
> When confirming the No. after mounting, refer to "Confirming in software" below.

Confirming in software

The Motion control board serial No. can be confirmed by the motion test tool or the Motion API.

	[+00]	[+01]	[+02]	[+03]	[+04]	[+05]	[+06]	[+07]	[+08]	[+09]	[+0A]	[+0B]	[+0C]	[+0D]	[+0E]	[+0F]
Serial No.	0 (00h)	1 (01h)	0 (00h)	1 (01h)	0 (00h)	0 (00h)	0 (00h)	0 (00h)	0 (00h)	0 (00h)	0 (00h)	0 (00h)	0 (00h)	0 (00h)	0 (00h)	0 (00h)

In ( ): ASCII code
In [ ]: Byte unit offset

> **Point**
>
> [Motion API]
>
> To confirm the serial No., use the sscGetBoardSerialNumber function.

A

Confirming software version

The software version of the Motion control board can be confirmed by the motion test tool or the Motion API.

Point

[Motion API]
To confirm the software version, use the sscGetBoardVersionEx function.

Confirming base system software version

Address (H)

	000007	000006
Basic System Software Version	0	1

Confirming add-on version

Address (H)

	000018	000019	00001A	00001B	00001C	00001D	00001E	00001F	000020	000021	000022	000023	000024	000025	000026	000027
Add-on Version	1 (31h)	. (2Eh)	1 (31h)	. (2Eh)	0 (30h)	0 (30h)	0 (30h)	1 (31h)	. (2Eh)	0 (30h)	0 (00h)	\0 (00h)	\0 (00h)	\0 (00h)	\0 (00h)	\0 (00h)

Confirming boot software version

Address (H)

	000001	000000
Boot Software Version	0	1

Confirming network boot software version

Address (H)

	000005	000004
Network Boot Software Version	0	1

Appendix 2 Restrictions by the Software Version

There are restrictions in the function that can be used by the version of the software (base system software version).

—: There is no restriction by the software version.

Function/Item	Software version	
	MR-EM441G	**EM Motion SDK**
Backlash	02 or later	—
Driver command discard detection		
User watchdog function		
Circular interpolation		
Acceleration/deceleration method (smoothing filter, jerk ratio acceleration/deceleration, vibration suppression command filter 1)		
Interlock		
Rough match output		
Position switch		
CC-Link IE TSN network synchronous communication	03 or later	
Operation cycle expansion (62.50µs/1000.00µs/2000.00µs)		
High speed operation mode		
I/O control of remote I/O		
Link-down detection function		1.010L or later
Event history		
Other axes start, General-purpose output control	05 or later	1.015R or later
Other axes start, Output device control		
General-purpose output exclusive control		
Dual port memory exclusive control		
Pass position interrupt function, Batch judgment of passing position, Cancel condition of the pass position interrupt		
Continuous operation to torque control		
Pressure control		
Connecting standard station		
Connecting local station		
Forced stop option		
Source output of general-purpose output		

A

Appendix 3 List of Add-on Libraries

The following shows the versions of each add-on corresponding to the software version (base system software version) of the Motion control board.

×: Not supported

Software version	Add-on library name				
	baseSystem	EmbeddedMotion	ServoDriver_CANopen	NetworkDriver_CCIETSN	MotionEventHist
01	1.1	1.1	1.1	1.1	×
02	1.2	1.2	1.2	1.2	×
03	1.3	1.3	1.3	1.3	1.3
05	1.5	1.5	1.5	1.5	1.5

Point

All add-ons are required.

Details of the add-on libraries

The following shows the details of the add-on libraries.

—: No dependent add-on

Add-on library name	Name	Description	Dependent add-on (required)	Dependent add-on (with functional restrictions)
baseSystem	Basic system software	Basic software	—	—
EmbeddedMotion	Embedded motion control	Basic add-on for motion control	[baseSystem] [ServoDriver_CANopen] [NetworkDriver_CCIETSN] [MotionEventHist]	—
ServoDriver_CANopen	Servo driver (CANopen)	CANopen servo driver	[baseSystem] [EmbeddedMotion] [NetworkDriver_CCIETSN] [MotionEventHist]	—
NetworkDriver_CCIETSN	Network driver (CC-Link IE TSN)	Network driver of CC-Link IE TSN	[baseSystem] [EmbeddedMotion] [ServoDriver_CANopen] [MotionEventHist]	—
MotionEventHist	Event history	Add-on for event history	[baseSystem] [EmbeddedMotion] [ServoDriver_CANopen] [NetworkDriver_CCIETSN]	—

Appendix 4   List of Boot Software

The following shows the versions of each boot corresponding to the software version (basic system software version) of the Motion control board.

Software version	Boot name	
	Network boot software	**Boot software**
01	1	1
02	2	2
03	3	3
05	5	5

A

Appendix 5 Exterior Dimensions

Motion control board

■MR-EM441G

[Unit: mm (inch)]
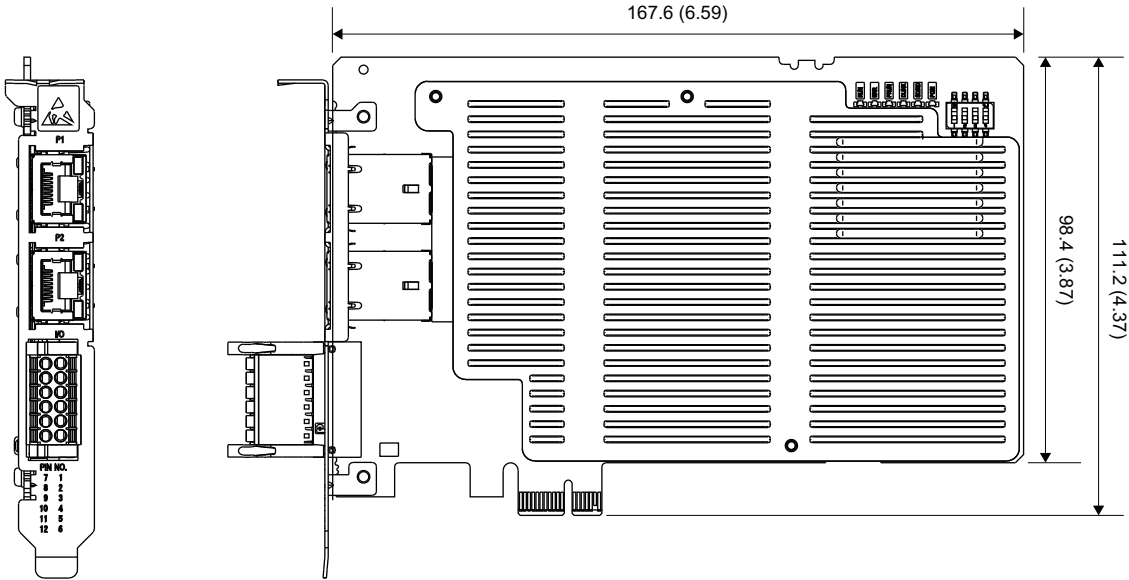
Appendix 6 Open Source Software

The software of the Motion control board includes the following open source software.
 • Distributed software as a free software in which copyright of a third party exists.

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> **Point**
>
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REVISIONS

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

Revision date	*Manual number	Description
August 2023	IB(NA)-0300599ENG-A	First edition
June 2024	IB(NA)-0300599ENG-B	■Added functions General-purpose output exclusive control, Dual port memory exclusive control, Continuous operation to torque control, Pressure control ■Added or modified parts SAFETY PRECAUTIONS, TERMS, GENERIC TERMS AND ABBREVIATIONS, Section 1.1, 3.2, 3.3, 3.5, 3.6, Chapter 4, Section 4.1, 4.2, 4.3, 5.2, 6.4, 7.1, 7.4, 7.6, 7.7, 7.8, 8.3, 8.5, 8.9, 8.12, 8.19, 8.22, 8.23, 8.24, 8.25, 8.26, 8.28, 8.29, 8.30, 9.2, 9.5, 9.10, 11.1, 11.4, 11.7, 11.9, 11.10, 11.11, 11.12, 11.14, 11.15, 11.17, 11.23, 11.24, 12.1, 12.3, 13.3, 14.1, 14.2, Appendix 2, 3, 4, 6, INDEX, INFORMATION AND SERVICES, TRADEMARKS

Japanese manual number: IB-0300592-B

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WARRANTY

Warranty

1. Warranty period and coverage

We will repair any failure or defect hereinafter referred to as "failure" in our FA equipment hereinafter referred to as the "Product" arisen during warranty period at no charge due to causes for which we are responsible through the distributor from which you purchased the Product or our service provider. However, we will charge the actual cost of dispatching our engineer for an on-site repair work on request by customer in Japan or overseas countries. We are not responsible for any on-site readjustment and/or trial run that may be required after a defective unit is repaired or replaced.

[Term]

For terms of warranty, please contact your original place of purchase.

[Limitations]

(1) You are requested to conduct an initial failure diagnosis by yourself, as a general rule.
  It can also be carried out by us or our service company upon your request and the actual cost will be charged. However, it will not be charged if we are responsible for the cause of the failure.

(2) This limited warranty applies only when the condition, method, environment, etc. of use are in compliance with the terms and conditions and instructions that are set forth in the instruction manual and user manual for the Product and the caution label affixed to the Product.

(3) Even during the term of warranty, the repair cost will be charged on you in the following cases;
  1. a failure caused by your improper storing or handling, carelessness or negligence, etc., and a failure caused by your hardware or software problem
  2. a failure caused by any alteration, etc. to the Product made on your side without our approval
  3. a failure which may be regarded as avoidable, if your equipment in which the Product is incorporated is equipped with a safety device required by applicable laws and has any function or structure considered to be indispensable according to a common sense in the industry
  4. a failure which may be regarded as avoidable if consumable parts designated in the instruction manual, etc. are duly maintained and replaced
  5. any replacement of consumable parts (battery, fan, smoothing capacitor, etc.)
  6. a failure caused by external factors such as inevitable accidents, including without limitation fire and abnormal fluctuation of voltage, and acts of God, including without limitation earthquake, lightning and natural disasters
  7. a failure generated by an unforeseeable cause with a scientific technology that was not available at the time of the shipment of the Product from our company
  8. any other failures which we are not responsible for or which you acknowledge we are not responsible for

2. Term of warranty after the stop of production

(1) We may accept the repair at charge for another seven (7) years after the production of the product is discontinued. The announcement of the stop of production for each model can be seen in our Sales and Service, etc.

(2) Please note that the Product (including its spare parts) cannot be ordered after its stop of production.

3. Service in overseas countries

Our regional FA Center in overseas countries will accept the repair work of the Product. However, the terms and conditions of the repair work may differ depending on each FA Center. Please ask your local FA center for details.

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. Change of Product specifications

Specifications listed in our catalogs, manuals or technical documents may be changed without notice.

6. Application and use of the Product

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

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

(3) Mitsubishi shall have no responsibility or liability for any problems involving programmable controller trouble and system trouble caused by DoS attacks, unauthorized access, computer viruses, and other cyberattacks.

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