MITSUBISHI ELECTRIC

POSITION BOARD
SSCNETⅢ/H Interface

# POSITION BOARD

Details

MR-MC210

MR-MC211

MR-MC240

MR-MC241

User's Manual

# ● SAFETY PRECAUTIONS ●

(Please read these instructions before using this equipment.)

Before using this product, please read this manual and the relevant manuals introduced in this manual carefully and pay full attention to safety to handle the product correctly.
These precautions apply only to this product.
In this manual, the safety instructions are ranked as "DANGER" and "CAUTION".

| | |
|---|---|
| ⚠DANGER | 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 medium or slight personal injury or physical damage. |

Depending on circumstances, procedures indicated by ⚠ CAUTION may also be linked to serious results.
In any case, it is important to follow the directions for usage.

Please save this manual to make it accessible when required and always forward it to the end user.

## For Safe Operations

## 1. Prevention of electric shocks

### ⚠DANGER

- Never open the front case or terminal covers of the servo amplifier while the power is ON or the unit is running, as this may lead to electric shocks.
- Never run the unit with the front case or terminal cover of the servo amplifier removed. The high voltage terminal and charged sections will be exposed and may lead to electric shocks.
- Never open the front case or terminal cover of the servo amplifier at times other than wiring work or periodic inspections even if the power is OFF. The insides of the position board and servo amplifier are charged and may lead to electric shocks.
- Completely turn off the externally supplied power used in the system before mounting or removing the position board, performing wiring work, or inspections. Failing to do so may lead to electric shocks.
- When performing wiring work or inspections, turn the power OFF, wait at least ten minutes, and then check the voltage with a tester, etc. Failing to do so may lead to electric shocks.
- Be sure to ground the controller incorporating the position board, servo amplifier and servo motor. (Ground resistance : 100 Ω or less) Do not ground commonly with other devices.
- The wiring work and inspections must be done by a qualified technician.
- Wire the units after installing the position board, servo amplifier and servo motor. Failing to do so may lead to electric shocks or damage.
- Never operate the switches with wet hands, as this may lead to electric shocks.
- Do not damage, apply excessive stress, place heavy things on or sandwich the cables, as this may lead to electric shocks.
- Do not touch the position board, servo amplifier or servo motor terminal blocks while the power is ON, as this may lead to electric shocks.
- Do not touch the built-in power supply, built-in grounding or signal wires of the position board and servo amplifier, as this may lead to electric shocks.

## 2. For fire prevention

### ⚠CAUTION

- Install the position board, servo amplifier, servo motor and regenerative resistor on incombustible. Installing them directly or close to combustibles will lead to fire.
- If a fault occurs in the position board or servo amplifier, shut the power OFF at the servo amplifier's power source. If a large current continues to flow, fire may occur.
- When using a regenerative resistor, shut the power OFF with an error signal. The regenerative resistor may abnormally overheat due to a fault in the regenerative transistor, etc., and may lead to fire.
- Always take heat measures such as flame proofing for the inside of the control panel where the servo amplifier or regenerative resistor is installed and for the wires used. Failing to do so may lead to fire.
- Do not damage, apply excessive stress, place heavy things on or sandwich the cables, as this may lead to fire.

## 3. For injury prevention

**⚠CAUTION**

- Do not apply a voltage other than that specified in this manual and the instruction manual of the product you are using on any terminal.
  Doing so may lead to destruction or damage.
- Do not mistake the terminal connections, as this may lead to destruction or damage.
- Do not mistake the polarity ( + / - ), as this may lead to destruction or damage.
- Do not touch the heat radiating fins of position board or servo amplifier, regenerative resistor and servo motor, etc., while the power is ON and for a short time after the power is turned OFF. In this timing, these parts become very hot and may lead to burns.
- Always turn the power OFF before touching the servo motor shaft or coupled machines, as these parts may lead to injuries.
- Do not go near the machine during test operations or during operations such as teaching.
  Doing so may lead to injuries.

## 4. Various precautions

Strictly observe the following precautions.

Mistaken handling of the unit may lead to faults, injuries or electric shocks.

### (1) System structure

**⚠CAUTION**

- Always install a leakage breaker on the controller incorporating the position board and servo amplifier power source.
- If installation of an electromagnetic contactor for power shut off during an error, etc., is specified in the instruction manual for the servo amplifier, etc., always install the electromagnetic contactor.
- Install the emergency stop circuit externally so that the operation can be stopped immediately and the power shut off.
- Use the position board, servo amplifier, servo motor and regenerative resistor with the correct combinations listed in the instruction manual. Other combinations may lead to fire or faults.
- If safety standards (ex., robot safety rules, etc.,) apply to the system using the position board, servo amplifier and servo motor, make sure that the safety standards are satisfied.
- Construct a safety circuit externally of the position board or servo amplifier if the abnormal operation of the position board or servo amplifier differ from the safety directive operation in the system.
- In systems where coasting of the servo motor will be a problem during the forced stop, emergency stop, servo OFF or power supply OFF, use dynamic brakes.
- Make sure that the system considers the coasting amount even when using dynamic brakes.
- In systems where perpendicular shaft dropping may be a problem during the forced stop, emergency stop, servo OFF or power supply OFF, use both dynamic brakes and electromagnetic brakes.

## ⚠CAUTION

- The dynamic brakes must be used only on errors that cause the forced stop, emergency stop, or servo OFF. These brakes must not be used for normal braking.
- The brakes (electromagnetic brakes) assembled into the servo motor are for holding applications, and must not be used for normal braking.
- The system must have a mechanical allowance so that the machine itself can stop even if the stroke limits switch is passed through at the max. speed.
- Use wires and cables that have a wire diameter, heat resistance and bending resistance compatible with the system.
- Use wires and cables within the length of the range described in the instruction manual.
- The ratings and characteristics of the parts (other than position board, servo amplifier and servo motor) used in a system must be compatible with the position board, servo amplifier and servo motor.
- Install a cover on the shaft so that the rotary parts of the servo motor are not touched during operation.
- There may be some cases where holding by the electromagnetic brakes is not possible due to the life or mechanical structure (when the ball screw and servomotor are connected with a timing belt, etc.). Install a stopping device to ensure safety on the machine side.

(2) Parameter settings and programming

## ⚠CAUTION

- Set the parameter values to those that are compatible with the position board, servo amplifier, servo motor and regenerative resistor model and the system application. The protective functions may not function if the settings are incorrect.
- The regenerative resistor model and capacity parameters must be set to values that conform to the operation mode and servo amplifier. The protective functions may not function if the settings are incorrect.
- Set the mechanical brake output and dynamic brake output validity parameters to values that are compatible with the system application. The protective functions may not function if the settings are incorrect.
- Set the stroke limit input validity parameter to a value that is compatible with the system application. The protective functions may not function if the setting is incorrect.
- Set the servo motor encoder type (increment, absolute position type, etc.) parameter to a value that is compatible with the system application. The protective functions may not function if the setting is incorrect.
- Set the servo motor capacity and type (standard, low-inertia, flat, etc.) parameter to values that are compatible with the system application. The protective functions may not function if the settings are incorrect.
- Set the servo amplifier capacity and type parameters to values that are compatible with the system application. The protective functions may not function if the settings are incorrect.
- Use the program commands for the program with the conditions specified in the instruction manual.

(3) Transportation and installation

## ⚠CAUTION

- Transport the product with the correct method according to the mass.
- Use the servo motor suspension bolts only for the transportation of the servo motor. Do not transport the servo motor with machine installed on it.
- Do not stack products past the limit.
- When transporting, installing, and removing the position board, never touch the print board inner part and electronic components. Hold the front panel or edge of the print board.
- When transporting the position board or servo amplifier, never hold the connected wires or cables.
- When transporting the servo motor, never hold the cables, shaft or detector.
- When transporting the position board or servo amplifier, never hold the front case as it may fall off.
- When transporting, installing or removing the position board or servo amplifier, never hold the edges.
- Install the unit according to the instruction manual in a place where the mass can be withstood.
- Do not get on or place heavy objects on the product.
- Always observe the installation direction.
- Mount the position board to a connector or slot that is compatible with standards, and keep the designated clearance between the position board and other boards.
- Keep the designated clearance between the position board or servo amplifier and control panel inner surface or the position board and servo amplifier, position board or servo amplifier and other devices.
- Do not install or operate position board, servo amplifiers or servo motors that are damaged or that have missing parts.
- Do not block the intake/outtake ports of the servo amplifier and servo motor with cooling fan.
- Do not allow conductive matter such as screw or cutting chips or combustible matter such as oil enter the position board, servo amplifier or servo motor.
- The position board, servo amplifier and servo motor are precision machines, so do not drop or apply strong impacts on them.
- Securely fix the position board, servo amplifier and servo motor to the machine according to the instruction manual. If the fixing is insufficient, these may come off during operation.

## ⚠CAUTION

- Always install the servo motor with reduction gears in the designated direction. Failing to do so may lead to oil leaks.
- Store and use the unit in the following environmental conditions.

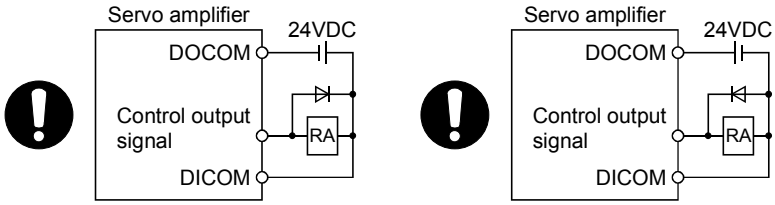
| Environment | Conditions | |
|---|---|---|
| | Position board/Servo amplifier | Servomotor |
| Ambient temperature | According to each instruction manual. | 0°C to +40°C (With no freezing)<br>(32°F to +104°F) |
| Ambient humidity | According to each instruction manual. | 80% RH or less<br>(With no dew condensation) |
| Storage temperature | According to each instruction manual. | -20°C to +65°C<br>(-4°F to +149°F) |
| Atmosphere | Indoors (where not subject to direct sunlight).<br>No corrosive gases, flammable gases, oil mist or dust must exist | |
| Altitude | 1000m (3280.84ft.) or less above sea level | |
| Vibration | According to each instruction manual | |

- When coupling with the synchronous encoder or servo motor shaft end, do not apply impact such as by hitting with a hammer. Doing so may lead to detector damage.
- Do not apply a load larger than the tolerable load onto the synchronous encoder and servo motor shaft. Doing so may lead to shaft breakage.
- When not using for a long time, disconnect the power line from the servo amplifier.
- Place the position board and servo amplifier in static electricity preventing vinyl bags and store.
- When storing for a long time, please contact with our sales representative.
  Also, execute a trial operation.
- When fumigants that contain halogen materials such as fluorine, chlorine, bromine, and iodine are used for disinfecting and protecting wooden packaging from insects, they cause malfunction when entering our products.
  Please take necessary precautions to ensure that remaining materials from fumigant do not enter our products, or treat packaging with methods other than fumigation (heat method).
  Additionally, disinfect and protect wood from insects before packing products.

(4) Wiring

## ⚠CAUTION

- Correctly and securely wire the wires. Reconfirm the connections for mistakes and the terminal screws for tightness after wiring. Failing to do so may lead to run away of the servo motor.
- After wiring, install the protective covers such as the terminal covers to the original positions.
- Do not install a phase advancing capacitor, surge absorber or radio noise filter (option FR-BIF) on the output side of the servo amplifier.
- Correctly connect the output side (terminal U, V, W) and ground. Incorrect connections will lead the servo motor to operate abnormally.
- Do not connect a commercial power supply to the servo motor, as this may lead to trouble.
- Do not mistake the direction of the surge absorbing diode installed on the DC relay for the control signal output of brake signals, etc. Incorrect installation may lead to signals not being output when trouble occurs or the protective functions not functioning.




For the sink output interface　　For the source output interface

- Do not connect or disconnect the connection cables between each unit or the encoder cable while the power is ON.
- Securely tighten the cable connector fixing screws and fixing mechanisms. Insufficient fixing may lead to the cables coming off during operation.
- Do not bundle the power line or cables.

(5) Trial operation and adjustment

## ⚠CAUTION

- Confirm and adjust the program and each parameter before operation. Unpredictable movements may occur depending on the machine.
- Extreme adjustments and changes may lead to unstable operation, so never make them.
- When using the absolute position system function, on starting up, and when the position board or absolute position motor has been replaced, always perform a home position return.
- Before starting test operation, set the parameter speed limit value to the slowest value, and make sure that operation can be stopped immediately by the forced stop, etc. if a hazardous state occurs.

(6) Usage methods

## ⚠CAUTION

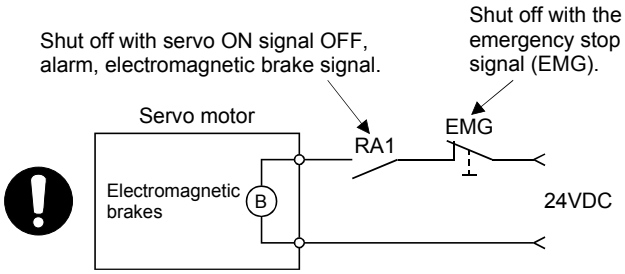
- Immediately turn OFF the power if smoke, abnormal sounds or odors are emitted from the position board, servo amplifier or servo motor.
- Always execute a test operation before starting actual operations after the program or parameters have been changed or after maintenance and inspection.
- Do not attempt to disassemble and repair the units excluding a qualified technician whom our company recognized.
- Do not make any modifications to the unit.
- Keep the effect or electromagnetic obstacles to a minimum by installing a noise filter or by using wire shields, etc. Electromagnetic obstacles may affect the electronic devices used near the position board or servo amplifier.
- When using the CE Mark-compliant equipment, refer to this manual for the position boards and refer to the corresponding EMC guideline information for the servo amplifiers, inverters and other equipment.
- Use the units with the following conditions.

| Item | Conditions |
|---|---|
| Input power | According to each instruction manual. |
| Input frequency | According to each instruction manual. |
| Tolerable momentary power failure | According to each instruction manual. |

(7) Corrective actions for errors

## ⚠CAUTION

- If an error occurs in the self diagnosis of the position board or servo amplifier, confirm the check details according to the instruction manual, and restore the operation.
- If a dangerous state is predicted in case of a power failure or product failure, use a servo motor with electromagnetic brakes or install a brake mechanism externally.
- Use a double circuit construction so that the electromagnetic brake operation circuit can be operated by emergency stop signals set externally.




- If an error occurs, remove the cause, secure the safety and then resume operation after alarm release.
- The unit may suddenly resume operation after a power failure is restored, so do not go near the machine. (Design the machine so that personal safety can be ensured even if the machine restarts suddenly.)

(8) Maintenance, inspection and part replacement

## ⚠CAUTION

- Perform the daily and periodic inspections according to the instruction manual.
- Perform maintenance and inspection after backing up the program and parameters for the position board and servo amplifier.
- Do not place fingers or hands in the clearance when opening or closing any opening.
- Periodically replace consumable parts such as batteries according to the instruction manual.
- Do not touch the lead sections such as ICs or the connector contacts.
- Before touching the position board, always touch grounded metal, etc. to discharge static electricity from human body. Failure to do so may cause the position board to fail or malfunction.
- Do not directly touch the position board's conductive parts and electronic components. Touching them could cause an operation failure or give damage to the position board.
- Do not place the position board or servo amplifier on metal that may cause a power leakage or wood, plastic or vinyl that may cause static electricity buildup.
- Do not perform a megger test (insulation resistance measurement) during inspection.
- When replacing the position board or servo amplifier, always set the new position board settings correctly.
- When the position board or absolute value motor has been replaced, carry out a home position return operation from the user program. Failing to do so may cause position displacement.
- After maintenance and inspections are completed, confirm that the position detection of the absolute position detector function is correct.
- Do not drop or impact the battery installed to the module. Doing so may damage the battery, causing battery liquid to leak in the battery. Do not use the dropped or impacted battery, but dispose of it.
- Do not short circuit, charge, overheat, incinerate or disassemble the batteries.
- The electrolytic capacitor will generate gas during a fault, so do not place your face near the position board or servo amplifier.
- The electrolytic capacitor and fan will deteriorate. Periodically replace these to prevent secondary damage from faults. Replacements can be made by our sales representative.
- Lock the control panel and prevent access to those who are not certified to handle or install electric equipment.
- Do not burn or break a position board and servo amplifier. Doing so may cause a toxic gas.

(9) About processing of waste

When you discard position board, servo amplifier, a battery (primary battery) and other option articles, please follow the law of each country (area).

## ⚠CAUTION

- This product is not designed or manufactured to be used in equipment or systems in situations that can affect or endanger human life.
- When considering this product for operation in special applications such as machinery or systems used in passenger transportation, medical, aerospace, atomic power, electric power, or submarine repeating applications, please contact your nearest Mitsubishi sales representative.
- Although this product was manufactured under conditions of strict quality control, you are strongly advised to install safety devices to forestall serious accidents when it is used in facilities where a breakdown in the product is likely to cause a serious accident.

(10) General cautions

- All drawings provided in the instruction manual show the state with the covers and safety partitions removed to explain detailed sections. When operating the product, always return the covers and partitions to the designated positions, and operate according to the instruction manual.

REVISIONS

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

| Print Date | ＊ Manual Number | Revision |
|---|---|---|
| Dec., 2013 | IB(NA)-0300223-A | First edition |
| Dec., 2014 | IB(NA)-0300223-B | [Additional model]<br>MR-MC240, MR-MC241<br>[Additional function]<br>Speed-torque control, Mark detection, Continuous operation to torque control, External forced stop disabled<br>[Additional correction]<br>Alarm history, Home position return change while system is running, High speed monitor position droop, Table map, Log data (event code list, information for each event), Parameters (servo parameters, control parameters), Monitor number (operation information), Alarm number (system alarm, operation alarm), Supplementary explanation for the use of linear servo system, Supplementary explanation for the use of SSCNETⅢ compatible servo amplifier, Connector exterior dimensions |
| Aug., 2015 | IB(NA)-0300223-C | [Additional model]<br>MR-JE-□B<br>[Additional function]<br>SSCNETⅢ/H head module connection, transient transmit, hot line forced stop function, event detection function<br>[Additional correction]<br>About manuals, Summary, System configuration, Restriction's by the software's version, I/O table setting, Point table loop method, I/O device, Log data (event code list, information for each event), Table map, Parameters (system parameters, servo parameters, control parameters, RIO control parameters), Monitor number (servo information (1), RIO information, RIO control information, system information), Alarm number (RIO module alarm, operation alarm, RIO control alarm, system error), Supplementary explanation for the use of servo amplifier (MR-JE-□B), Supplementary explanation for the use of SSCNETⅢ compatible servo amplifier (MR-J3(W)-□B) |
| | | |

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INTRODUCTION

Thank you for choosing the Mitsubishi position board MR-MC210/MR-MC211/MR-MC240/MR-MC241. Before using the equipment, please read this manual carefully to develop full familiarity with the functions and performance of the position board you have purchased, so as to ensure correct use.

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About Manuals

The following manuals are also related to this product.

In necessary, order them by quoting the details in the tables below.

Related Manuals

(1) Position Board

| Manual Name | Manual Number (Model Code) |
|---|---|
| MR-MC210/MR-MC211/MR-MC240/MR-MC241 Position Board User's Manual (Details)<br>This manual explains specifications of the position board, information on how to establish a system, maintenance/inspection, trouble shooting, functions for the positioning control of the position board, programming, dual port memory and others. | IB-0300223<br>(1XB968) |
| MR-MC210/MR-MC211/MR-MC240/MR-MC241 Position Board User's Manual (API Library)<br>This manual explains the library of functions and others that the host controller uses to control the position board. | IB-0300225<br>(1XB970) |

(2) Servo amplifier

| Manual Name | Manual Number (Model Code) |
|---|---|
| SSCNETⅢ/H interface AC Servo MR-J4_B(-RJ)/MR-J4_B4(-RJ)/MR-J4_B1(-RJ) Servo amplifier Instruction Manual<br>This manual explains the I/O signals, parts names, parameters, start-up procedure and others for AC Servo MR-J4_B(-RJ)/MR-J4_B4(-RJ)/MR-J4_B1(-RJ) Servo amplifier. | SH-030106<br>(1CW805) |
| SSCNETⅢ/H interface Multi-axis AC Servo MR-J4W2-_B/MR-J4W3-_B Servo amplifier Instruction Manual<br>This manual explains the I/O signals, parts names, parameters, start-up procedure and others for Multi-axis AC Servo MR-J4W2-_B/MR-J4W3-_B Servo amplifier. | SH-030105<br>(1CW806) |
| SSCNETⅢ/H interface AC Servo MR-JE-_B Servo amplifier Instruction Manual<br>This manual explains the I/O signals, parts names, parameters, start-up procedure and others for AC Servo MR-JE-_B Servo amplifier. | SH-030152<br>(1CW750) |
| SSCNETⅢ interface MR-J3-□B Servo amplifier Instruction Manual<br>This manual explains the I/O signals, parts names, parameters, start-up procedure and others for MR-J3-□B Servo amplifier. | SH-030051<br>(1CW202) |
| SSCNETⅢ Compatible Linear Servo MR-J3-□B-RJ004U□ Instruction Manual<br>This manual explains the I/O signals, parts names, parameters, start-up procedure and others for Linear Servo MR-J3-□B-RJ004U□ Servo amplifier. | SH-030054<br>(1CW943) |
| SSCNETⅢ Compatible Fully Closed Loop Control MR-J3-□B-RJ006 Servo amplifier Instruction Manual<br>This manual explains the I/O signals, parts names, parameters, start-up procedure and others for Fully Closed Loop Control MR-J3-□B-RJ006 Servo amplifier. | SH-030056<br>(1CW304) |
| SSCNETⅢ interface 2-axis AC Servo AmplifierMR-J3W-0303BN6/MR-J3W-□B Servo amplifier Instruction Manual<br>This manual explains the I/O signals, parts names, parameters, start-up procedure and others for 2-axis AC Servo Amplifier MR-J3W-0303BN6/MR-J3W-□B Servo amplifier. | SH-030073<br>(1CW604) |
| SSCNETⅢ Interface Direct Drive Servo MR-J3-□B-RJ080W Servo amplifier Instruction Manual<br>This manual explains the I/O signals, parts names, parameters, start-up procedure and others for Direct Drive Servo MR-J3-□B-RJ080W Servo amplifier. | SH-030079<br>(1CW601) |
| SSCNETⅢ interface Drive Safety integrated MR-J3-□B Safety Servo amplifier Instruction Manual<br>This manual explains the I/O signals, parts names, parameters, start-up procedure and others for safety integrated MR-J3-□B Safety Servo amplifier. | SH-030084<br>(1CW205) |

# MEMO

# 1. SUMMARY



## 1.1 Summary

This manual describes the specifications and handling of SSCNETⅢ/H compatible position board (MR-MC210/MR-MC211/MR-MC240/MR-MC241).

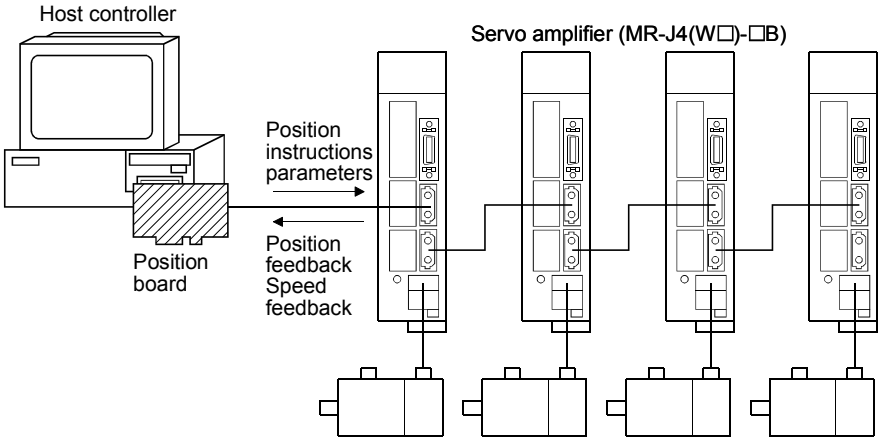
In this manual, the following abbreviations are used.

| Generic term/Abbreviation | Description |
|---|---|
| MR-MC2□□ or position board | General name for PCI bus compatible position board MR-MC210/MR-MC211/ PCI Express® bus compatible position board MR-MC240/MR-MC241. |
| Host controller | General name for computer equipped with position board and operates user program. |
| MR-J4(W□)-□B | Servo amplifier model MR-J4-□B/MR-J4W□-□B. |
| MR-J3(W)-□B | Servo amplifier model MR-J3-□B/MR-J3W-□B. |
| MR-JE-□B | Servo amplifier model MR-JE-□B. |
| Servo amplifier | General name for SSCNETⅢ/H compatible servo amplifier. |
| Utility software | General name for the Position Board Utility2 (MRZJW3-MC2-UTL) which includes test tool for start-up and examination, and the API library for position board. |
| Test tool | Abbreviation for start-up and examination tool for position board. |
| API library | General name for the library of functions for positioning control that the host controller uses to control the position board. |
| MR Configurator2 | Abbreviation for the Servo set-up software MR Configurator2 version 1.10L or later. |
| User program | Program created by the user that operates on the host controller. |
| System program | Internal program that controls the position board. |
| SSCNETⅢ/H(Note) | High-speed synchronized network between the position board and the servo amplifier. |
| SSCNETⅢ(Note) | |
| SSCNETⅢ(/H)(Note) | General name for SSCNETⅢ/H, SSCNETⅢ. |
| Board Ver. | System version of position board. |
| API Ver. | Software version of the API library for position board. |
| Remote I/O module | General name for modules that connect I/O modules and intelligent function modules to SSCNETⅢ/H, including the SSCNETⅢ/H head module. |
| SSCNETⅢ/H head module | General name for MELSEC L series SSCNETⅢ/H head module (LJ72MS15). |
| Remote register (RWr) | Information for inputting to the position board from the SSCNETⅢ/H head module in a 16-bit (1 word) basis. |
| Remote register (RWw) | Information for outputting to the SSCNETⅢ/H head module from the position board in a 16-bit (1 word) basis. |
| Remote input (RX) | Information input from the SSCNETⅢ/H head module to the position board in a1-bit basis. |
| Remote output (RY) | Information output from the position board to the SSCNETⅢ/H head module in a1-bit basis. |
| Link device | Internal devices (RX/RY/RWr/RWw) of the position board and SSCNETⅢ/H head module. |

Note. SSCNET: Servo System Controller NETwork

(1) PCI bus compatible position board

The PCI bus compatible position board (MR-MC210/MR-MC211) is a board compatible with PCI bus mounted to the host controller and controls our servo amplifiers and SSCNETⅢ/H head module (LJ72MS15). The PCI bus compatible position board and the servo amplifiers are connected with SSCNETⅢ/H, which is a high speed synchronous network.




For the PCI bus compatible position board, there are two types, MR-MC210 and MR-MC211.

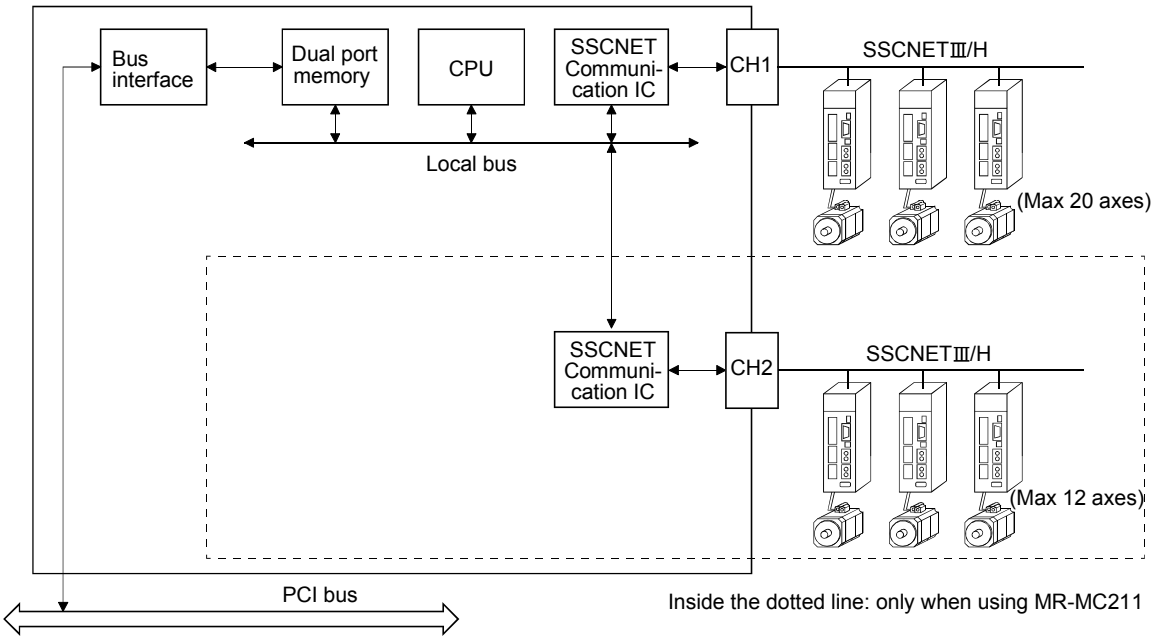
The MR-MC210 has one SSCNET control channel (hereinafter: CH) and one SSCNET communication line (hereinafter: line), and can control positioning for up to 20 axes and remote I/O control for up to 4 stations.

The MR-MC211 has one SSCNET control channel and two SSCNET communication lines, and can control positioning for up to 32 axes (up to 20 axes per line) and remote I/O control for up to 4 stations. By reading and writing the dual port memory mapped to the memory space of the PCI bus, the host controller can command position board to start operation, and get servo amplifier status. The host controller can also receive position pass and positioning complete interruptions via PCI bus.

The position board is equipped with standard mode and interface mode for positioning control. The positioning control mode that corresponds with the application can be selected by parameter. The mode cannot be changed during SSCNET communication (while system is running). Positioning in standard mode is performed using a point table mapped on the dual port memory of the position board. Arbitrary positioning is possible by writing data to this point table from the host controller.

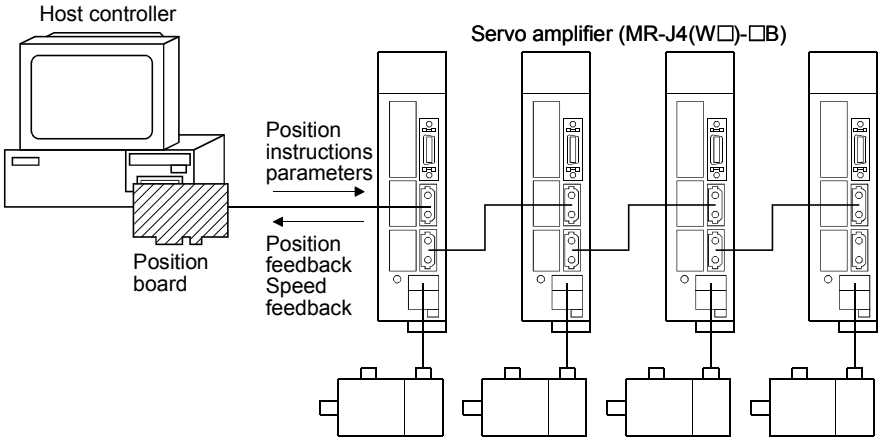
Also, startup of JOG operation and home position return, etc. as well as parameters changing and monitoring are possible through accessing this dual port memory on the position board from the host controller.

Interface mode is a sequential positioning command method that uses a user program on the host controller. The user program controls the servo amplifier with an arbitrary acceleration/deceleration pattern by writing the position command to the position command buffer of the position board every communication cycle (control cycle). Some functions from standard mode cannot be used, or are restricted when in interface mode.


Bus interface
Dual port memory
CPU
SSCNET Communi-cation IC
CH1
SSCNETⅢ/H
Local bus
(Max 20 axes)
SSCNET Communi-cation IC
CH2
SSCNETⅢ/H
(Max 12 axes)
PCI bus
Inside the dotted line: only when using MR-MC211

(2) PCI Express® bus compatible position board

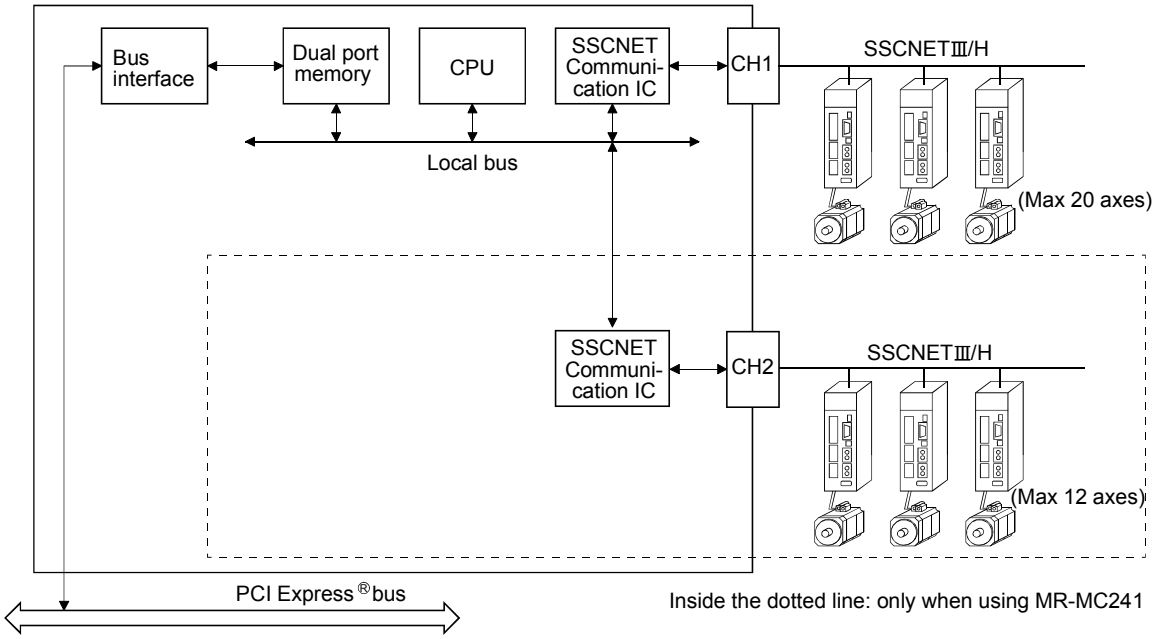
The PCI Express® bus compatible position board (MR-MC240/MR-MC241) is a board compatible with PCI Express® bus mounted to a PCI Express® system and controls our servo amplifiers and SSCNETⅢ/H head module (LJ72MS15). The PCI Express® bus compatible position board and the servo amplifiers are connected with SSCNETⅢ/H, which is a high speed synchronous network.




For the PCI Express® bus compatible position board, there are two types, MR-MC240 and MR-MC241.
The MR-MC240 has one SSCNET control channel (hereinafter: CH) and one SSCNET communication line (hereinafter: line), and can control positioning for up to 20 axes and remote I/O control for up to 4 stations.
The MR-MC241 has one SSCNET control channel and two SSCNET communication lines, and can control positioning for up to 32 axes (up to 20 axes per line) and remote I/O control for up to 4 stations. Positioning is performed using a point table mapped on the dual port memory of the PCI Express® bus compatible position board. Arbitrary positioning is possible by writing data to this point table from the PCI bus compatible host controller.
Also, startup of JOG operation and home position return, etc. as well as parameter changing and monitoring are possible through accessing this dual port memory on the position board from the host controller. The dual port memory is mapped on the memory space of the PCI Express® bus.

POINT

- Depending on the specifications of the host controller, the PCI Express® slot may be directly connected to the CPU of the host controller.
  If the PCI Express® compatible position board is mounted to a PCI Express® slot that is directly connected to the CPU of the host controller, it may not be able to operate.
  Mount the PCI Express® compatible position board to a PCI Express® slot that is not directly connected to the CPU of the host controller (connected to a chipset).


Bus interface
Dual port memory
CPU
SSCNET Communi-cation IC
CH1
SSCNETⅢ/H
Local bus
(Max 20 axes)
SSCNET Communi-cation IC
CH2
SSCNETⅢ/H
(Max 12 axes)
PCI Express®bus
Inside the dotted line: only when using MR-MC241

## 1.2 Features

The position board has the following features.

(1) Structuring of SSCNETⅢ/H communication servo system by computer control
The position board can be directly connected to the Mitsubishi servo amplifiers of MR-J4-B series using SSCNETⅢ/H.

(a) By connecting the position board and servo amplifier and servo amplifiers with a high speed synchronous network by SSCNETⅢ/H, the reduction of wiring is achieved. The maximum distance between the position board and servo amplifier, or servo amplifier and servo amplifier for the SSCNETⅢ cable on the same bus is 100(328.08)[m(ft.)]. This increases flexibility at system design.

(b) By using SSCNETⅢ cable (optical communication), the influence of electromagnetic noise etc. from servo amplifiers and such is reduced.

(c) The servo parameters can be set on the position board side and written to the servo amplifier, or read from the servo amplifier using the SSCNET communication.

(d) The current feedback position and error description contained in the servo can be checked by the dual port memory of the position board.

(e) Communication between MR Configurator2 and the servo amplifiers is possible via the position board USB.

(2) Programming in C programming language with the API library
Positioning control for the servo in C programming language is enabled with the API library included with the Position Board Utility2 (MRZJW3-MC2-UTL).

(3) Supports event-driven programming
The host controller is notified by interrupt via PCI 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 interrupt factors.

(4) High-speed operation starting time
High-speed operation starting time within the control cycle (0.22ms fastest) is achieved for the maximum number of synchronous startup axes or less.

(5) Wide variety of positioning control functions

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

(a) Enhanced home position return control

Additional features of home position return control

Ten home position return methods are provided: dog cradle method, dog method, data set method, continuous operation to torque method, limit switch combined method, scale home position signal detection method, limit switch front end method, dog front end method, Z-phase detection method, and scale home position signal detection method 2. Select an applicable method according to the system.

(b) Wide variety of control methods

Positioning control methods such as positioning control are provided.

1) Independent control of each axis

Position control can be performed independently for each axis at any given timing.

2) Interpolation control

Interpolation controls using multiple axes can be performed.

(2-axis to 4-axis linear interpolation control)

3) Tandem drive

Tandem drive for 2 axes can be performed. In scale home position signal detection method and scale home position signal detection method 2, the deviation between the 2 axes at home position return can be compensated.

4) Interface mode

The user program controls the servo amplifier with an arbitrary acceleration/deceleration pattern that is not supported in standard mode by writing the position command to the position command buffer of the position board every communication cycle (control cycle).

(c) Continuous processing of multiple positioning data

Multiple positioning data can be processed continuously within one operation start.

(d) Acceleration/deceleration processing

Four acceleration/deceleration processing methods are provided: Linear acceleration/deceleration, S-curve acceleration/deceleration, start up speed, and smoothing filter.

The acceleration/deceleration curve can be selected according to the machine characteristic.

(6) Supports other axes start function

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

(7) High maintainability

Maintainability is enhanced in the position board.

(a) Data retention without battery

Parameter data can be stored in the flash ROM inside the position board. This feature allows the retaining of data without a battery.

(b) Alarm collection function

The alarm details when an alarm occurs are automatically stored in the flash ROM inside the position board.

Storing the alarm information allows the user to check the alarm from the user program or test tool even after the position board is powered off or reset.

(8) Setting, monitoring, and testing through test tool

Using the test tool of Position Board Utility2 (MRZJW3-MC2-UTL), users can check the validity of the preset parameters and point table by performing test operation of the position board before creating a user program.

The control monitor/graph function allows users to debug programs efficiently.

(9) Forced stop function

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

(10) Easy application to the absolute position system

(a) The MR-J4(W□)-□B series servo amplifiers and servo motors support the absolute position system. Absolute position system can be used by connecting the battery for absolute position system to the servo amplifier.

(b) Once the home position has been established, the home position return operation is unnecessary at the system's power supply ON.

(c) With the absolute position system, the data set method home position return is used to establish the home position. The wiring of proximity dog, etc. is unnecessary.

## 1.3 Specifications

### 1.3.1 General specifications

General specifications of the position board are shown below.

<table>
<tr><th>Items</th><th>Specification</th></tr>
<tr><td>Operating ambient temperature</td><td>0 to 55°C (32 to 131°F)</td></tr>
<tr><td>Storage ambient temperature</td><td>-20 to 65°C (4 to 149°F)</td></tr>
<tr><td>Operating ambient humidity</td><td>10 to 90% RH, non-condensing</td></tr>
<tr><td>Storage ambient humidity</td><td>10 to 90% RH, non-condensing</td></tr>
<tr><td>Operating ambience</td><td>Indoors (where not subject to direct sunlight), no corrosive gas, no significant amount of dirt or dust</td></tr>
<tr><td>Cooling method</td><td>Self cooling</td></tr>
<tr><td>Power supply</td><td>
<table>
<tr><th></th><th>MR-MC210</th><th>MR-MC211</th><th>MR-MC240</th><th>MR-MC241</th></tr>
<tr><td>Power supply voltage</td><td colspan="2">5VDC ± 5%</td><td colspan="2">3.3VDC ± 9%</td></tr>
<tr><td>Leakage current</td><td>Less than 450mA</td><td>Less than 700mA</td><td>Less than 1100mA</td><td>Less than 1500mA</td></tr>
</table>
</td></tr>
</table>

## ⚠CAUTION

- The position board must be stored and used under the conditions listed in the table of specifications above.
- When not using for a long time, disconnect the power line from the servo amplifier.
- Place the position board and servo amplifier in static electricity preventing vinyl bags and store.
- When storing for a long time, please contact with our sales representative.
  Also, execute a trial operation.

### 1.3.2 List of specifications of position board

#### (1) Position board control specifications

| Function | | Contents | | | | Remarks |
|---|---|---|---|---|---|---|
| | | MR-MC210 | MR-MC211 | MR-MC240 | MR-MC241 | |
| System function | Control cycle | 0.88ms/0.44ms/0.22ms (Select using parameters.) | | | | |
| | Control axes | Max 20 | Max 32 | Max 20 | Max 32 | |
| | Control mode | Standard mode: Position controlling method by position board<br>Interface mode : Sequential positioning command method by user program | | | | |
| | SSCNET communication | SSCNETⅢ/H, SSCNETⅢ | | | | |
| Operation function (Note 1, 2) | JOG operation | Provided | | | | |
| | Incremental feed | Provided | | | | |
| | Automatic operation | Point table method, 1 axis control,<br>Continuous operation to torque control | | | | |
| | Linear interpolation | Point table method, MAX 4 axes interpolation is available | | | | Unavailable when the control cycle is 0.22ms |
| | Home position return | Dog cradle method, Dog method, Data set method, Stopper method, Limit switch combined method, Scale home position signal detection method,<br>Limit switch front end method, Dog front end method, Z-phase detection method,<br>Scale home position signal detection method 2 | | | | Can indicate direction for home position return<br>Proximity dog is for level detection<br>Can change home position return method while system is running |
| | | Home position reset (data set) | | | | The current position can be reset to the home position |
| Application function | Electronic gear | Electronic gear numerator : 1 to 5242879<br>Electronic gear denominator : 1 to 589823 | | | | |
| | Speed units | Command unit/min, command unit/s, and r/min can be selected. | | | | |
| | Acceleration/deceleration | Command speed limits: 1 to speed limit<br>Limits of Start speed: 1 to speed limit<br>Time constant limits: 0 to 20000 ms/speed limit<br>Separate setting of constants for deceleration and acceleration: provided<br>Setting of constants for separate points: provided<br>Acceleration/deceleration method:<br>Linear acceleration/deceleration,<br>smoothing filter, start up speed,<br>S-curve acceleration/deceleration<br>(sine acceleration/deceleration) | | | | |
| | Stop function | Forced stop, 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 | | | | |
| | Command change | Location, speed, time constant | | | | |
| | Backlash | Provided | | | | |
| | Position switch | Provided | | | | |
| | Completion of operation signal | Provided | | | | |
| | Interference check | Provided | | | | Unavailable when the control cycle is 0.22ms |
| | Home position search limit | Provided | | | | |

Note 1. The position board can move within the limits of -2147483648 to 2147483647. Movement outside the limits is not covered with warranty. If software limits have been disabled, be careful not to move it outside of the physical limits.

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

| Function | | Contents | | | | Remarks |
|---|---|---|---|---|---|---|
| | | MR-MC210 | MR-MC211 | MR-MC240 | MR-MC241 | |
| Application function | Gain switching | Provided | | | | |
| | PI-PID switching | Provided | | | | |
| | Absolute position detection system | Provided | | | | |
| | Home position return request | Provided | | | | |
| | Other axes start | Provided | | | | |
| | High response I/F | Provided | | | | |
| | In-position signal | Provided | | | | |
| | Digital I/O | Provided | | | | |
| | I/O device | Provided | | | | |
| | Servo amplifier general I/O | Provided | | | | |
| | Dual port memory exclusive control | Provided | | | | |
| | Pass position interrupt | Provided | | | | |
| | Mark detection | Provided | | | | |
| | Continuous operation to torque control | Provided | | | | |
| | SSCNETⅢ/H head module connection | Provided | | | | |
| Help function | Reading/writing parameters | Provided | | | | |
| | Changing parameters at the servo | Provided | | | | |
| | Alarm and system error | Provided | | | | |
| | Monitor | Current command position, Current feedback position, Speed command, Position droop, Electrical current command, Servo alarm number, External signal status, etc. | | | | Can be latched |
| | High speed monitor | Current command position, Current feedback position, Moving speed, Feedback moving speed, External signal, Electrical current feedback, Position droop (interface mode only) | | | | Updated per control cycle<br>Can be latched |
| | Interrupt | During start operation, Operation stoppage (During operation, in-position, during smoothing of stopping, rough match, etc.)<br>When alarm goes off (servo alarm/operation alarm), etc. | | | | Interrupt generation conditions can be selected. |
| | User watchdog function | Provided (Check for the watchdog of the of the user program) | | | | Processed by software.(Note 3) |
| | Software reboot function | Provided | | | | |
| | Parameter backup | Parameters can be saved to the flash ROM. | | | | |
| | Test mode | By connecting MR Configurator2 via the position board, the servo amplifier can be simply tested. | | | | |
| | Reconnect/disconnect function | Provided | | | | |
| | Sampling | The maximum sampling point: 65536.<br>(Ring buffer of 8192 points) | | | | |
| | Log | History of start operation, alarms, etc, can be recorded. | | | | |
| | Operation cycle monitor function | Provided | | | | |
| | External forced stop disabled | Provided | | | | |
| | Amplifier-less axis function | Provided | | | | |
| | Alarm history function | Alarm history is saved to the flash ROM. | | | | |
| | Transient transmit | Provided | | | | |
| Tandem drive | | Up to 2 axes × 8 groups | | | | |
| Interface mode | | Positioning control, speed-torque control, event detection function | | | | |
| Board ID | | 0 to 3 | | | | Select using DIP-SW |
| DI | Limit switch+ | None | | | | DI signals are input from the servo amplifier or the dual port memory, etc. by the parameter setting. |
| | Limit switch－ | None | | | | |
| | Proximity dog | None | | | | |
| | Forced stop | 1 point | | | | |
| DO | | None | | | | |

Note 3. This is not the watch dog for the CPU on the position board.

(2) PCI bus specifications

| Items | Specification |
|---|---|
| Address bit | 32 bit |
| Data bit | 32 bit |
| System clock | 33MHz |
| System voltage | +5V |
| Shape [mm(inch)] | Short size (106.7(4.20) × 167.6(6.60)) |
| Hot swap | Not supported |
| Base address | Set configuration register by BIOS |

(3) PCI Express® bus specifications

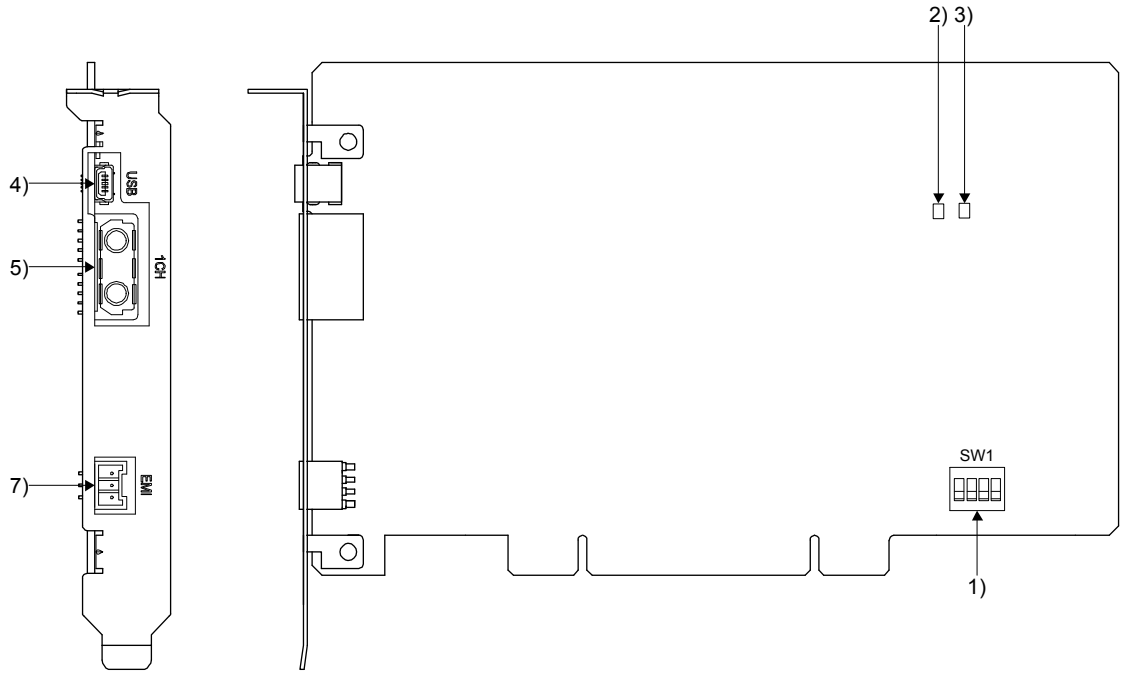
| Items | Specification |
|---|---|
| Bus specification | PCI Express® 1.1 |
| Shape [mm(inch)] | Short size (111.15(4.38) × 167.6(6.60)) |
| Link width | ×1 |
| Transfer rate | 2.5Gbps |
| System voltage | +3.3V |

Note. Depending on the specifications of the host controller, the PCI Express® slot may be directly connected to the CPU of the host controller.
If the PCI Express® compatible position board is mounted to a PCI Express® slot that is directly connected to the CPU of the host controller, it may not be able to operate.
Mount the PCI Express® compatible position board to a PCI Express® slot that is not directly connected to the CPU of the host controller (connected to a chipset).

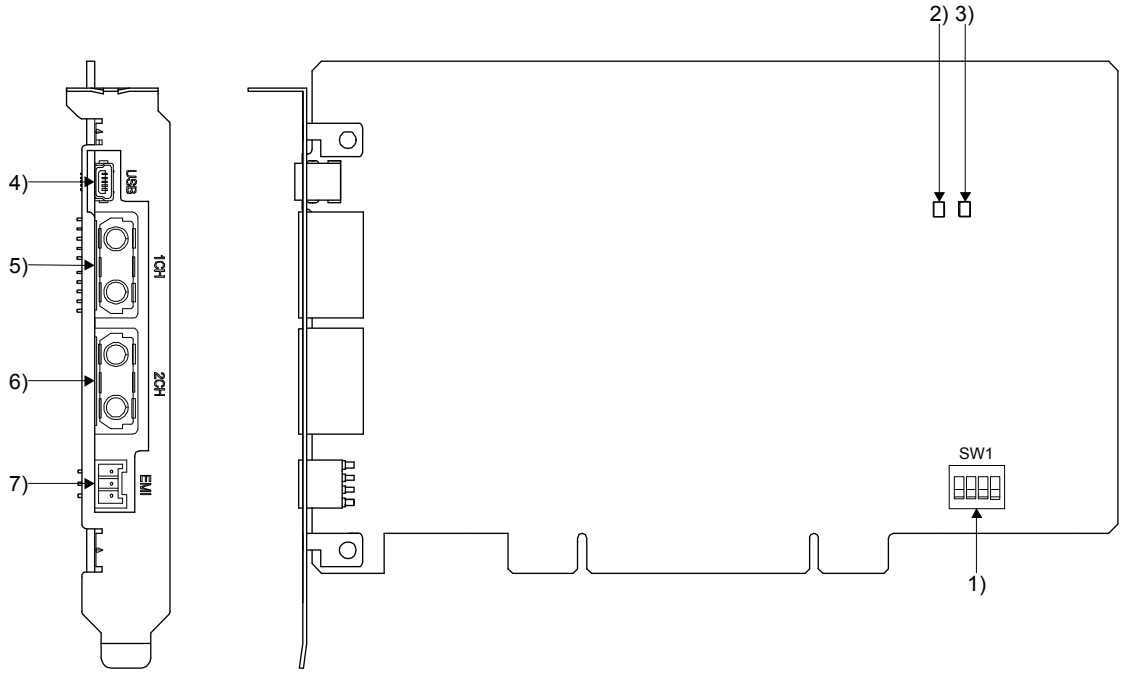
1.4 Name of each section

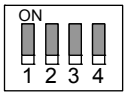
1.4.1 Name of parts for PCI bus compatible position board

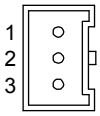
(1) MR-MC210




(2) MR-MC211



<table>
<tr><th>No.</th><th>Item</th><th>Function</th></tr>
<tr><td>1)</td><td>Setting switch (SW1)</td><td>


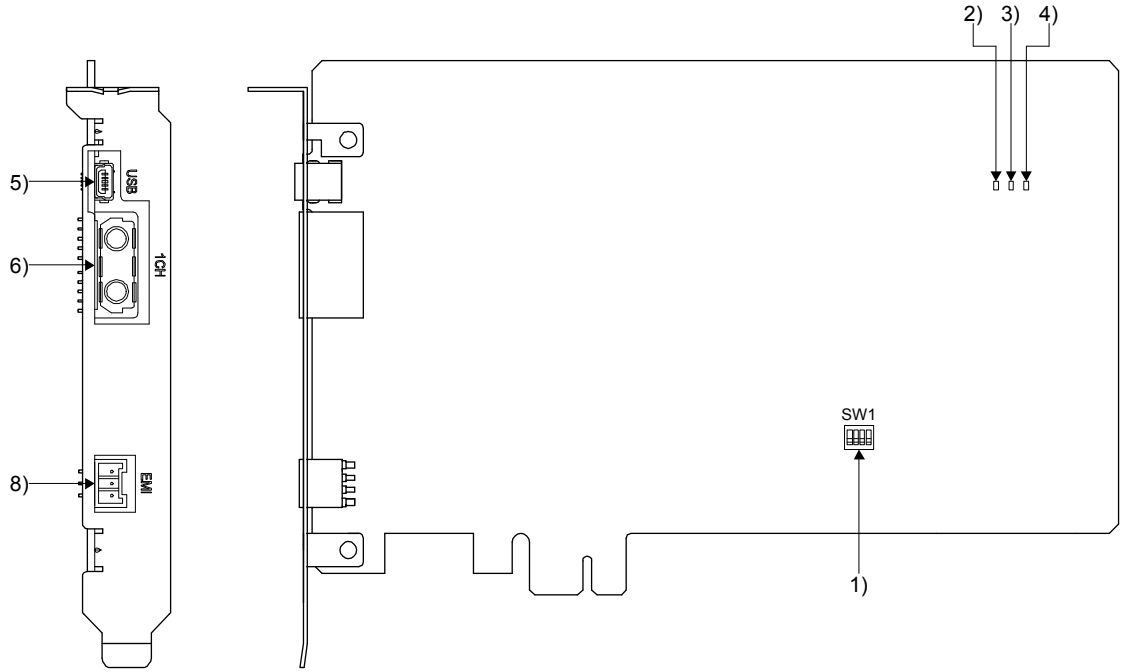
<Board ID selection><br>
Define a board ID in order to distinguish between multiple position boards.
<table>
<tr><th>Switch 2</th><th>Switch 1</th><th>Board ID</th></tr>
<tr><td>ON</td><td>ON</td><td>3</td></tr>
<tr><td>ON</td><td>OFF</td><td>2</td></tr>
<tr><td>OFF</td><td>ON</td><td>1</td></tr>
<tr><td>OFF</td><td>OFF</td><td>0<br>(default value)</td></tr>
</table>
<For manufacturer setting><br>
This switch is provided for manufacturer setting.<br>
Make sure the switch is always OFF.
<table>
<tr><th>Switch 3</th><th>For manufacturer setting</th></tr>
<tr><td>OFF</td><td></td></tr>
</table>
<Interrupt output mask selection><br>
Masks interrupt output when interrupt occurs.
<table>
<tr><th>Switch 4</th><th>Interrupt output mask</th></tr>
<tr><td>ON</td><td>Valid</td></tr>
<tr><td>OFF</td><td>Invalid<br>(default value)</td></tr>
</table>
</td></tr>
<tr><td>2)</td><td>Operation indicator (green)</td><td>At power ON: ON<br>At system startup: Flicker<br>At power OFF: OFF</td></tr>
<tr><td>3)</td><td>Error indicator (red)</td><td>Normal: OFF<br>At system error (E001 to E302) occurrence: ON</td></tr>
<tr><td>4)</td><td>USB connector</td><td>A communication connector to connect with the position board test tool, MR Configurator2.<br>(connects MR-J3USBCBL3M)</td></tr>
<tr><td>5)</td><td>SSCNETⅢ connector (line 1)<br>(Note 1)</td><td rowspan="2">Connector for communication with a servo amplifier. (connects MR-J3BUS□M)</td></tr>
<tr><td>6)</td><td>SSCNETⅢ connector (line 2)<br>(Note 1)</td></tr>
<tr><td>7)</td><td>Forced stop input connector</td><td>The following is the pin layout and connections of the forced stop input connector as viewed from the front.


<table>
<tr><th>Pin No.</th><th>Signal name</th></tr>
<tr><td>1</td><td>EMI</td></tr>
<tr><td>2</td><td>No connect</td></tr>
<tr><td>3</td><td>EMI.COM</td></tr>
</table>
Note. Do not connect to any of the terminals explained as "No connect".<br>
<Cable-side connector model name>
<table>
<tr><th>Manufacturer</th><th>Name</th><th>Model</th><th>Reference</th></tr>
<tr><td rowspan="3">Molex</td><td>Crimp housing</td><td>51103-0300</td><td></td></tr>
<tr><td>Crimp terminal</td><td>50351-8100</td><td>Applicable wire size (AWG): 22, 24, 26, 28<br>Two crimp terminals are required per housing.</td></tr>
<tr><td>Hand crimp tool</td><td>63811-8100</td><td>Applicable terminal: 50351</td></tr>
</table>
</td></tr>
</table>

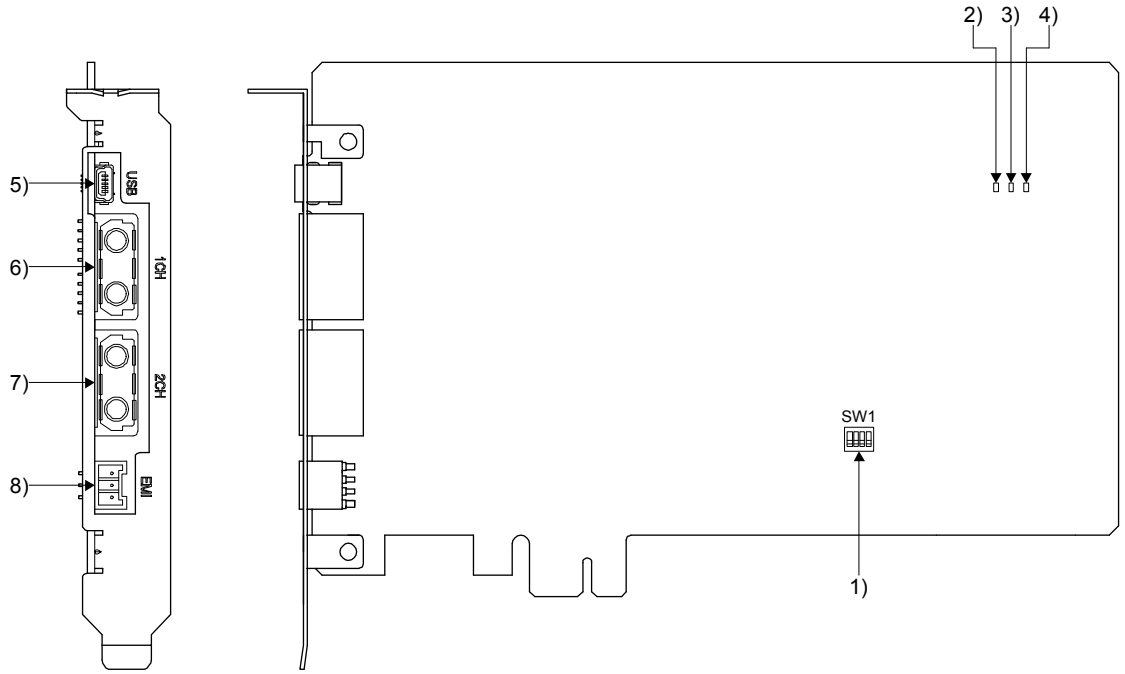
Note 1. Put the SSCNETⅢ cable in the duct or fix the cable at the closest part to the position board with bundle material in order to prevent SSCNETⅢ cable from putting it's own weight on SSCNETⅢ connector.

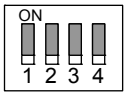
1.4.2 Name of parts for PCI Express® bus compatible position board

(1) MR-MC240




(2) MR-MC241



<table>
<tr><th>No.</th><th>Item</th><th>Function</th></tr>
<tr><td>1)</td><td>Setting switch (SW1)</td><td>


<Board ID selection><br>
Define a board ID in order to distinguish between multiple position boards.
<table>
<tr><th>Switch 2</th><th>Switch 1</th><th>Board ID</th></tr>
<tr><td>ON</td><td>ON</td><td>3</td></tr>
<tr><td>ON</td><td>OFF</td><td>2</td></tr>
<tr><td>OFF</td><td>ON</td><td>1</td></tr>
<tr><td>OFF</td><td>OFF</td><td>0<br>(default value)</td></tr>
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<For manufacturer setting><br>
This switch is provided for manufacturer setting.<br>
Make sure the switch is always OFF.
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<Interrupt output mask selection><br>
Masks interrupt output when interrupt occurs.
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<tr><th>Switch 4</th><th>Interrupt output mask</th></tr>
<tr><td>ON</td><td>Valid</td></tr>
<tr><td>OFF</td><td>Invalid<br>(default value)</td></tr>
</table>
</td></tr>
<tr><td>2)</td><td>PCI Express® link (green)</td><td>PCI Express® link up: ON<br>PCI Express® disconnected: OFF</td></tr>
<tr><td>3)</td><td>Operation indicator (green)</td><td>At power ON: ON<br>At system startup: Flicker<br>At power OFF: OFF</td></tr>
<tr><td>4)</td><td>Error indicator (red)</td><td>Normal: OFF<br>At system error (E001 to E302) occurrence: ON</td></tr>
<tr><td>5)</td><td>USB connector</td><td>A communication connector to connect with the position board test tool, MR Configurator2.<br>(connects MR-J3USBCBL3M)</td></tr>
<tr><td>6)</td><td>SSCNETⅢ connector (line 1)<br>(Note 1)</td><td rowspan="2">Connector for communication with a servo amplifier. (connects MR-J3BUS□M)</td></tr>
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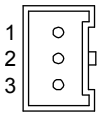

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<tr><th>Pin No.</th><th>Signal name</th></tr>
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Note. Do not connect to any of the terminals explained as "No connect".<br>
<Cable-side connector model name>
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Note 1. Put the SSCNETⅢ cable in the duct or fix the cable at the closest part to the position board with bundle material in order to prevent SSCNETⅢ cable from putting it's own weight on SSCNETⅢ connector.

## 1.5 Bus interface

### 1.5.1 Configuration register

The following shows the configuration register of PCI bus compatible position board (MR-MC210/MR-MC211) and PCI Express® bus compatible position board (MR-MC240/MR-MC241).

(1) PCI bus compatible position board (MR-MC210/MR-MC211)

| Address | 31 to 24 | 23 to16 | 15 to 8 | 7 to 0 | Remarks |
|---|---|---|---|---|---|
| 00 | Device ID<br>0624 | | Vendor ID<br>10BA | | Vender ID: Mitsubishi Electric 10BA<br>Device ID: 0624 |
| 04 | Status | | Command | | |
| 08 | Class Code<br>118000 | | | Revision ID<br>01 | Revision ID: 01<br>Class Code: 118000 (data processing controller) |
| 0C | BIST<br>(Note) | Header Type<br>(Note) | Latency Timer<br>(Note) | Cache Line Size<br>(Note) | |
| 10 | Base Address Register 0 | | | | |
| 14 | Base Address Register 1 | | | | |
| 18 | Base Address Register 2 | | | | Dual port memory (including board ID) leading address<br>Memory Space Indicator (bit0):<br>0 (Memory space)<br>Type (bit1 to 2):<br>00 (32 bits, arbitrary position of address space)<br>Prefetchable (bit3):<br>0 (Prefetch prohibited) |
| 1C | Base Address Register 3 (Note) | | | | |
| 20 | Base Address Register 4 (Note) | | | | |
| 24 | Base Address Register 5 (Note) | | | | |
| 28 | Cardbus CIS Pointer (Note) | | | | |
| 2C | Subsystem ID<br>0601 | | Subsystem Vendor ID<br>10BA | | Subsystem Vender ID: Mitsubishi Electric 10BA<br>Subsystem ID: 0601 |
| 30 | Expansion ROM Base Address (Note) | | | | |
| 34 | (Reserved) (Note) | | | CAP_PTR (Note) | |
| 38 | (Reserved) (Note) | | | | |
| 3C | Max_Lat (Note) | Min_Gnt (Note) | Interrupt Pin 01 | Interrupt Line | Interrupt Pin: 01(INTA use) |

Note. Has not been implemented, therefore, if read an indefinite value will be returned.

(2) PCI Express® bus compatible position board (MR-MC240/MR-MC241)

| Address | 31 to 24 | 23 to16 | 15 to 8 | 7 to 0 | Remarks |
|---|---|---|---|---|---|
| 00 | Device ID<br>0624 | | Vendor ID<br>10BA | | Vender ID: Mitsubishi Electric 10BA<br>Device ID: 0624 |
| 04 | Status | | Command | | |
| 08 | Class Code<br>118000 | | | Revision ID<br>01 | Revision ID: 01<br>Class Code: 118000 (data processing controller) |
| 0C | BIST<br>(Note) | Header Type<br>(Note) | Latency Timer<br>(Note) | Cache Line Size<br>(Note) | |
| 10 | Base Address Register 0 | | | | |
| 14 | Base Address Register 1 | | | | |
| 18 | Base Address Register 2 | | | | Dual port memory (including board ID) leading address<br>Memory Space Indicator (bit0):<br>0 (Memory space)<br>Type (bit1 to 2):<br>00 (32 bits, arbitrary position of address space)<br>Prefetchable (bit3):<br>0 (Prefetch prohibited) |
| 1C | Base Address Register 3 (Note) | | | | |
| 20 | Base Address Register 4 (Note) | | | | |
| 24 | Base Address Register 5 (Note) | | | | |
| 28 | Cardbus CIS Pointer (Note) | | | | |
| 2C | Subsystem ID<br>0601 | | Subsystem Vendor ID<br>10BA | | Subsystem Vender ID: Mitsubishi Electric 10BA<br>Subsystem ID: 0601 |
| 30 | Expansion ROM Base Address (Note) | | | | |
| 34 | (Reserved) (Note) | | | CAP_PTR (Note) | |
| 38 | (Reserved) (Note) | | | | |
| 3C | Max_Lat (Note) | Min_Gnt (Note) | Interrupt Pin 01 | Interrupt Line | Interrupt Pin: 01(INTA use) |
| 40 | PM Capability | | NxtCap | PM Cap | |
| 44 | Data | BSE | PMCSR | | |
| 48 | MSI Control | | NxtCap | MSI Cap | MSI Control (bit0): 0 INTA interrupt |
| 4C | Message Address (Lower) | | | | |
| 50 | Message Address (Upper) | | | | |
| 54 | Reserved | | Message Data | | |
| 58 | PE Capability | | NxtCap | PE Cap | |
| 5C | PCI Express Device Capabilities | | | | |
| 60 | Device Status | | Device Control | | |
| 64 | PCI Express Link Capabilities | | | | |
| 68 | Link Status | | Link Control | | |
| 6C-FF | Reserved Legacy Configuration<br>Space (Returns 0x00000000) | | | | |
| 100 | Next Cap | Capability<br>Version | PCI Express Extended<br>Capability - DSN | | |
| 104 | PCI Express Device Serial Number (1st) | | | | |
| 108 | PCI Express Device Serial Number (2nd) | | | | |
| 10C-FFF | Reserved Extended Configuration<br>Space (Returns Completion with 0x00000000) | | | | |

Note. Has not been implemented, therefore, if read an indefinite value will be returned.

### 1.5.2 Dual port memory map

The bus width of dual port memory is 32 bits. For the address map of the dual port memory on the position board side, refer to Chapter 10.

PCI bus/PCI Express® bus

| Offset address | |
|---|---|
| +000000h<br>+00FFFFh | Memory space of 1CH |
| +010000h<br>+01FFFFh | Reserved |
| +020000h<br>+02000Fh | Module information |

### 1.5.3 Module information

The (R)s in the table designate read only, while the (W)s designate write only capability.

| Address | bit7 | bit6 | bit5 | bit4 | bit3 | bit2 | bit1 | bit0 |
|---|---|---|---|---|---|---|---|---|
| 020000 | Bus type (R) | | Implemented CH information (R) | | Interrupt output mask information (R) | Reserved | Board ID information (R) | |
| 020001 | Reserved | | | | | | Number of SSCNET lines (R) | |
| 020002 | Reserved | | | | | | | |
| 020003 | | | | | | | | |
| 020004 | Reserved | | | | | | Signal during interrupt output (R) | |
| 020005 | Reserved | | | | | | | |
| 020006 | | | | | | | | |
| 020007 | | | | | | | | |
| 020008 | Reserved | | | | | | Interrupt signal clear register (1CH) (W) | |
| 020009 | Reserved | | | | | | | |
| 02000A | | | | | | | | |
| 02000B | | | | | | | | |
| 02000C | Reserved | | | | | | | |
| 02000D | Reserved | | | | | | | |
| 02000E | | | | | | | | |
| 02000F | | | | | | | | |

(1) Board ID information (address 020000h)
Status set with the dip switch is displayed.

| bit1 | bit0 | Content |
|---|---|---|
| 0 | 0 | 0 |
| 0 | 1 | 1 |
| 1 | 0 | 2 |
| 1 | 1 | 3 |

(2) Interrupt output mask information (address 020000h)
Status set with the dip switch is displayed.

| bit3 | Content |
|---|---|
| 0 | Invalid |
| 1 | Valid |

(3) Implemented CH information (address 020000h)

| bit5 | bit4 | Content |
|---|---|---|
| 0 | 0 | 1CH |
| 0 | 1 | Reserved |
| 1 | 0 | Reserved |
| 1 | 1 | Reserved |

(4) Bus type (address 020000h)

| bit7 | bit6 | Content |
|---|---|---|
| 0 | 0 | PCI bus |
| 0 | 1 | Reserved |
| 1 | 0 | PCI Express® bus |
| 1 | 1 | Reserved |

(5) Number of SSCNET lines (address 020001h)

| bit1 | bit0 | Content |
|---|---|---|
| 0 | 0 | 1 line |
| 0 | 1 | 2 lines |
| 1 | 0 | Reserved |
| 1 | 1 | Reserved |

(6) Signal during interrupt output (address 020004h)

| bit1 | bit0 | Content |
|---|---|---|
| 0 | 0 | Interrupts are not generated |
| 0 | 1 | During interrupt output |

(7) Interrupt signal clear register (1CH) (address 020008h)

| bit1 | bit0 | Content |
|---|---|---|
| 0 | 0 | Invalid |
| 0 | 1 | 1CH interrupt signal is cleared |

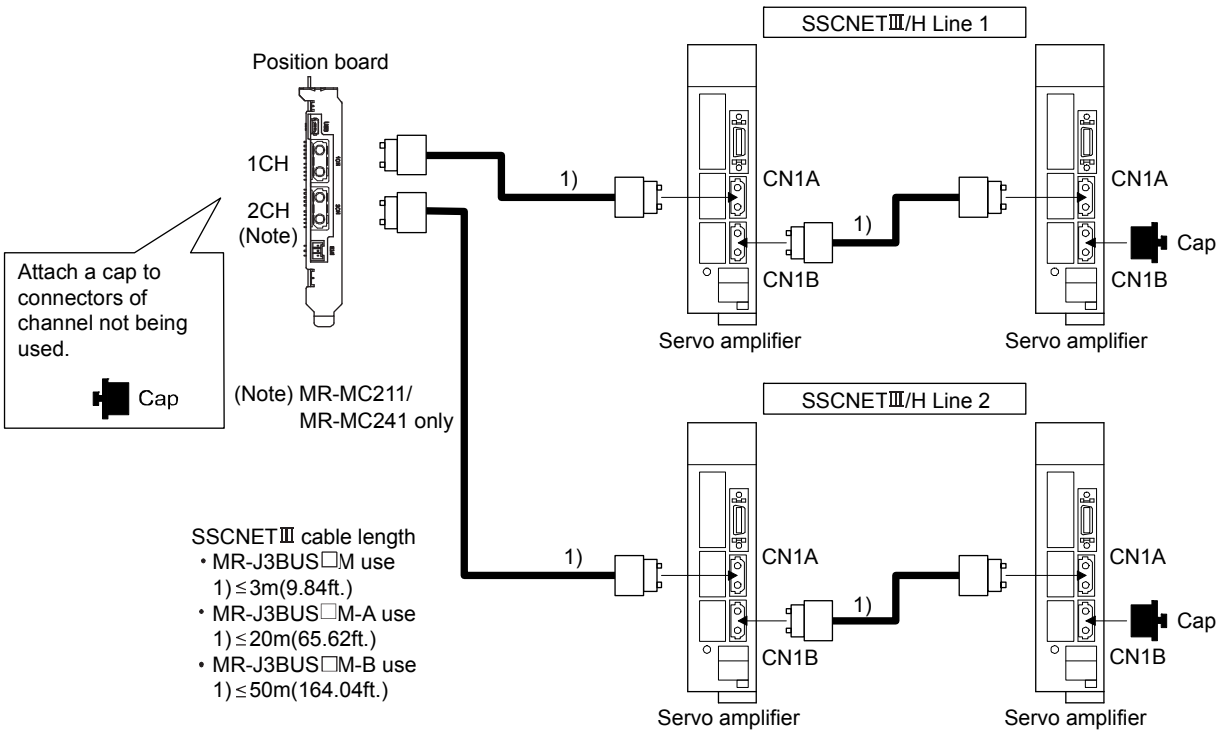
### 1.6 SSCNETⅢ cables

Connect the position board and servo amplifiers, or servo amplifier and servo amplifier by SSCNETⅢ cable. When using MR-MC210/MR-MC240, the SSCNETⅢ cable for connecting servo amplifiers can be used for one line only. When using MR-MC211/MR-MC241, the SSCNETⅢ cable for connecting servo amplifiers can be used for up to two lines (use 1CH and 2CH). Up to 32 servo amplifiers can be connected.

(1) SSCNETⅢ cable specifications

| Model name | | Cable length [m(ft.)] | Description |
|---|---|---|---|
| MR-J3BUS□M | MR-J3BUS015M | 0.15 (0.49) | • Position board ↔ Servo amplifier<br>• Servo amplifier ↔ Servo amplifier |
| | MR-J3BUS03M | 0.3 (0.98) | |
| | MR-J3BUS05M | 0.5 (1.64) | |
| | MR-J3BUS1M | 1 (3.28) | |
| | MR-J3BUS3M | 3 (9.84) | |
| MR-J3BUS□M-A | MR-J3BUS5M-A | 5 (16.40) | |
| | MR-J3BUS10M-A | 10 (32.81) | |
| | MR-J3BUS20M-A | 20 (65.62) | |
| MR-J3BUS□M-B | MR-J3BUS30M-B | 30 (98.43) | |
| | MR-J3BUS40M-B | 40 (131.23) | |
| | MR-J3BUS50M-B | 50 (164.04) | |

(2) Connection between the position board and servo amplifiers
Connect the SSCNETⅢ cables to the following connectors.
Refer to Section 3.2.1 for the connection and disconnection of SSCNETⅢ cable.




Note. It cannot communicate if the connection of CN1A and CN1B is mistaken.

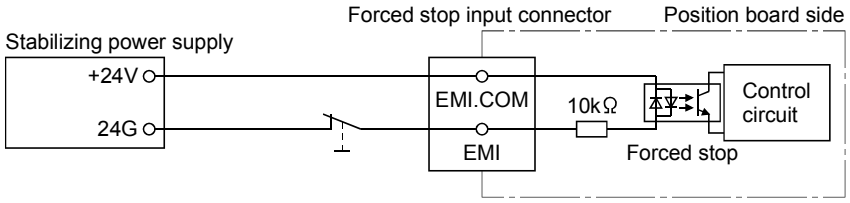
## 1.7 Forced stop input terminal

### (1) Table of the forced stop input terminal specifications

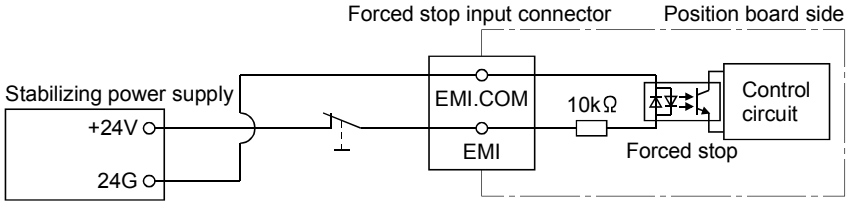
| Item | | Specifications |
|---|---|---|
| Number of input points | | Forced stop signal: 1 point |
| Input method | | Positive common/Negative common shared type |
| Rated input current | | 2.4mA |
| Isolation method | | Photocoupler |
| Operating voltage range | | 20.4 to 26.4VDC<br>(+10/ -15%, ripple ratio 5% or less) |
| ON voltage/current | | 17.5VDC or more/2.0mA or more |
| OFF voltage/current | | 1.8VDC or less/0.18mA or less |
| Input resistance | | Approx. 10kΩ |
| Response time | OFF to ON | 1ms or less |
| | ON to OFF | |
| External connector type | | 3 pin connector |
| Recommended wire size | | 0.08 to 0.32mm$^2$ (AWG22 to AWG28) |

### (2) Forced stop circuit

(a) Positive common




(b) Negative common



# MEMO

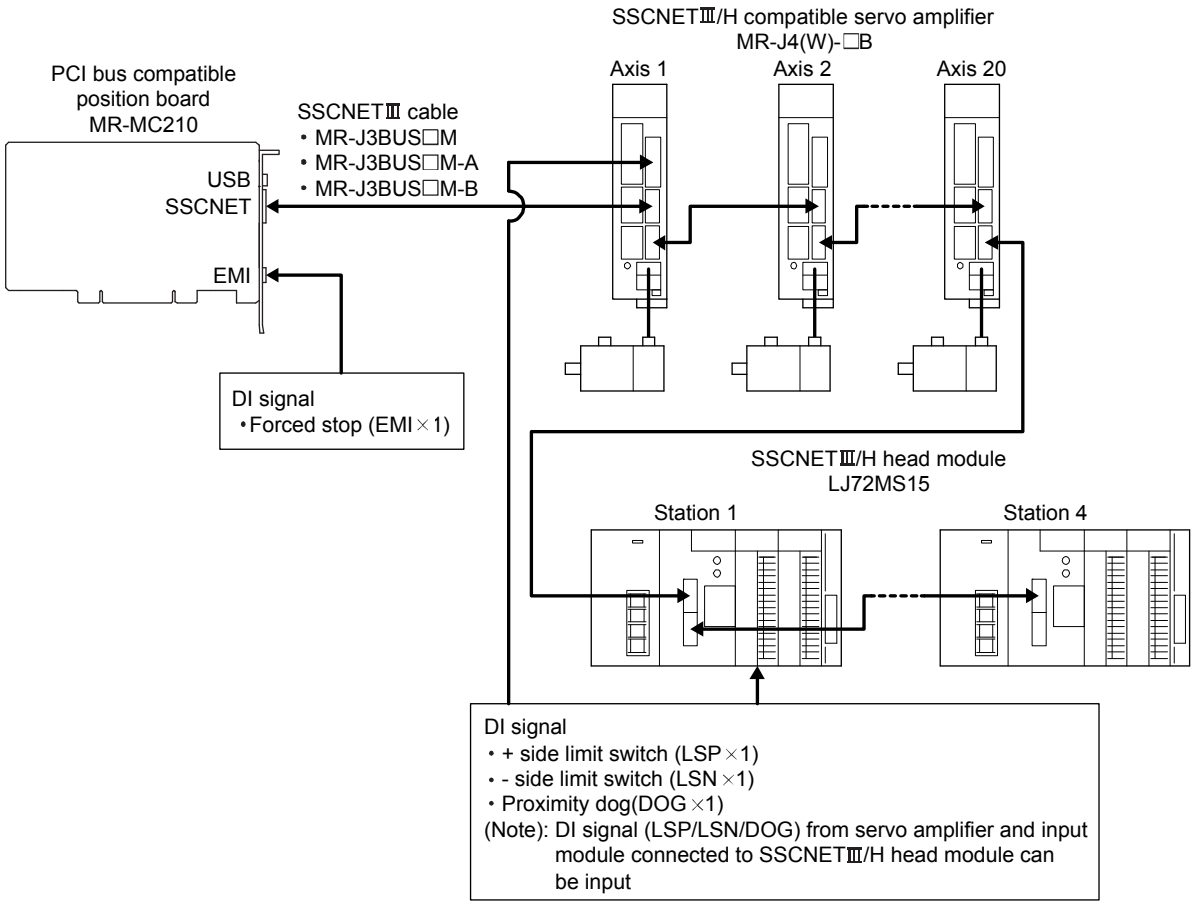
# 2. SYSTEM CONFIGURATION

This section describes the system configuration and equipment settings for the position board.

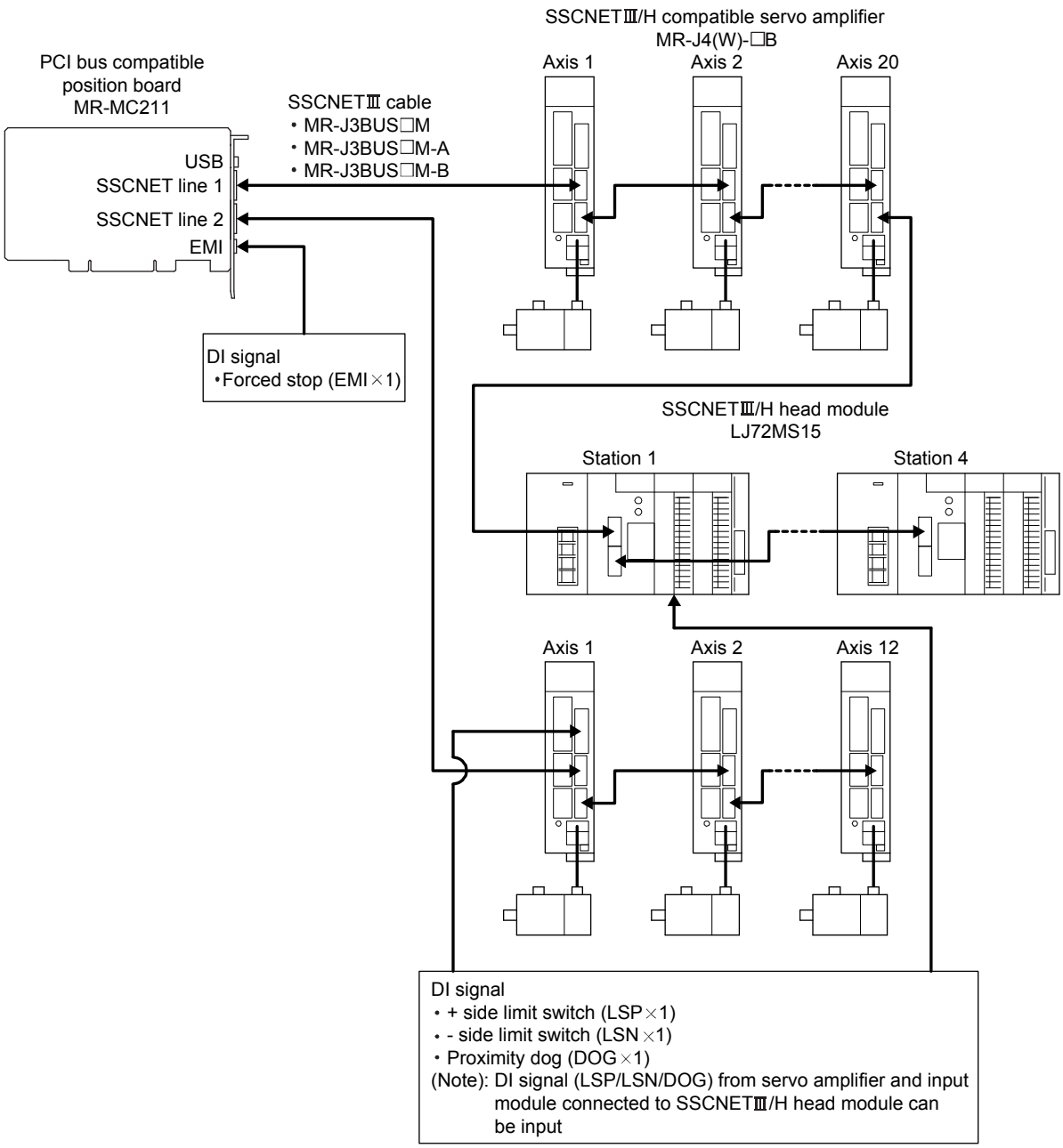
## 2.1 Position board configuration

### 2.1.1 MR-MC210 system configuration



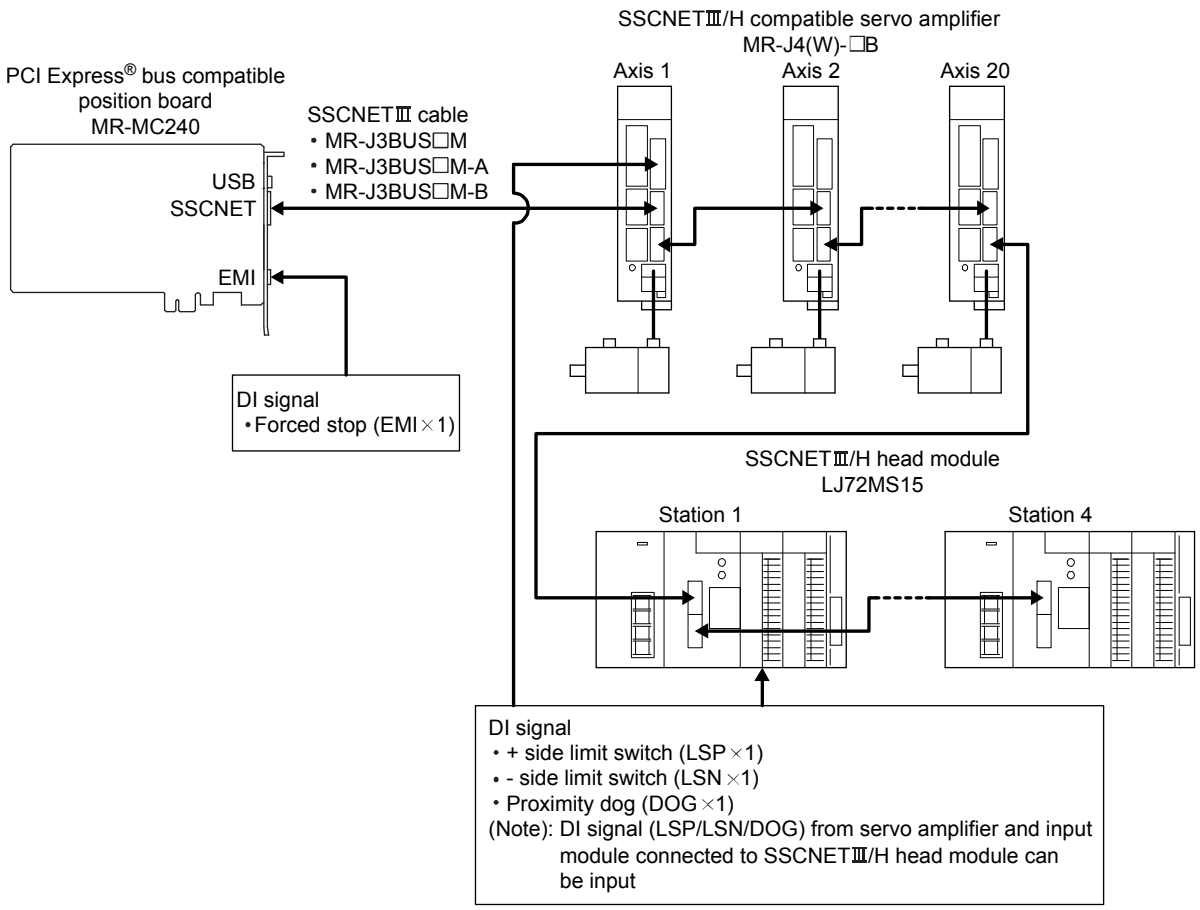


### 2.1.2 MR-MC211 system configuration

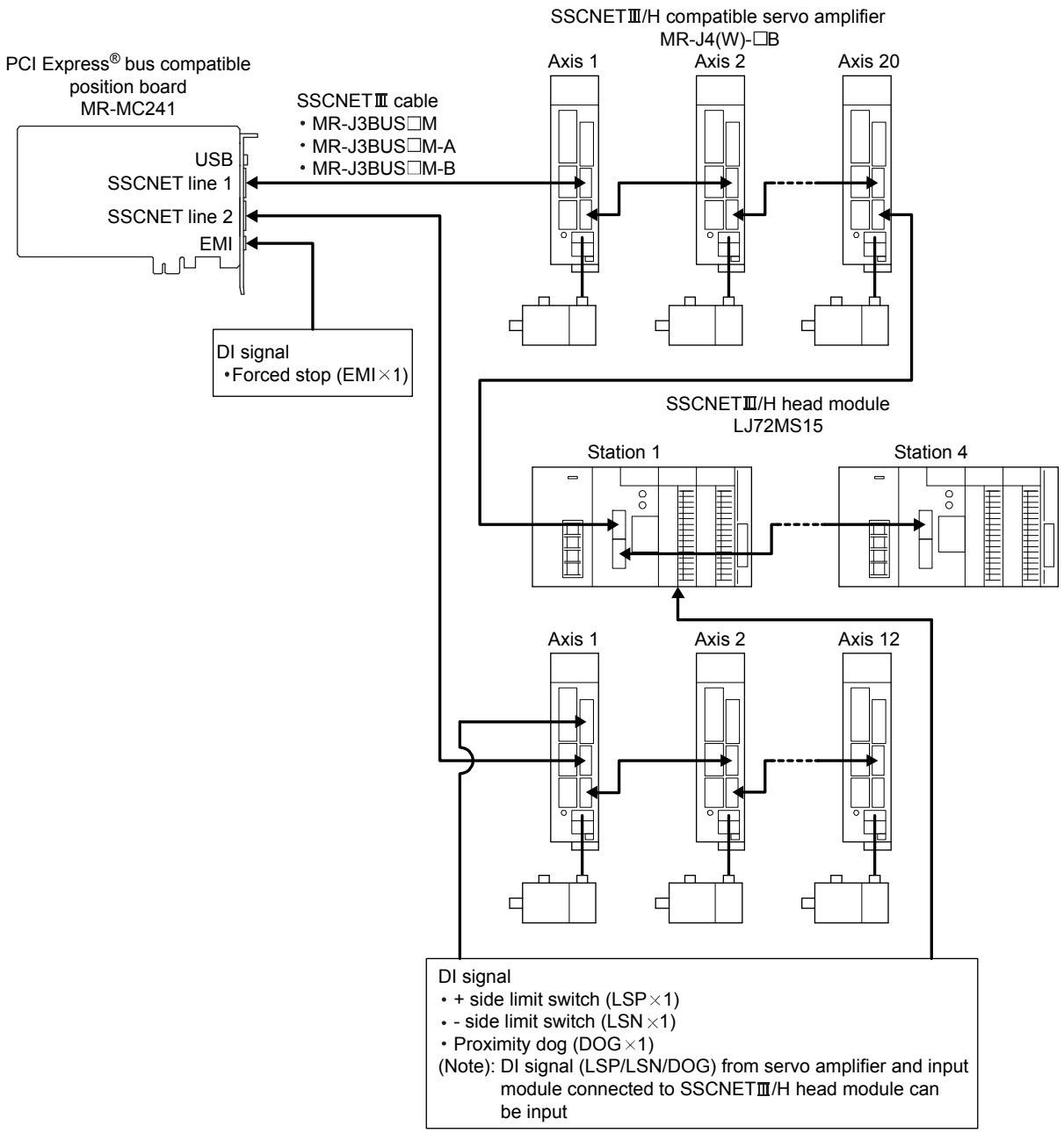



| POINT |
|---|
| ・Refer to Section 4.5.6 and Section 6.33.3 to change the number of axes (stations) distributed to line 1 and line 2 |

### 2.1.3 MR-MC240 system configuration



### 2.1.4 MR-MC241 system configuration




| POINT |
|---|
| ・Refer to Section 4.5.6 and Section 6.33.3 to change the number of axes (stations) distributed to line 1 and line 2. |

## 2.2 System configuration equipment

### (1) MR-MC2□□ related module

| Part name | Model name (Note 1) | Description |
|---|---|---|
| Position board | MR-MC210 | Up to 20 axes control, Operation cycle 0.22[ms], 0.44[ms], 0.88[ms], PCI bus compatible (Note 2) |
| | MR-MC211 | Up to 32 axes control, Operation cycle 0.22[ms], 0.44[ms], 0.88[ms], PCI bus compatible (Note 2) |
| | MR-MC240 | Up to 20 axes control, Operation cycle 0.22[ms], 0.44[ms], 0.88[ms], PCI Express® bus compatible (Note 2) |
| | MR-MC241 | Up to 32 axes control, Operation cycle 0.22[ms], 0.44[ms], 0.88[ms], PCI Express® bus compatible (Note 2) |
| USB cable | MR-J3USBCBL3M | Position board MR-MC2□□ ↔ host controller |
| SSCNETⅢ cable | MR-J3BUS□M | • MR-MC2□□ ↔ MR-J4(W□)-□B/MR-J4(W□)-□B ↔ MR-J4(W□)-□B<br>• Standard cord for inside panel 0.15m(0.49ft.), 0.3m(0.98ft.), 0.5m(1.64ft.), 1m(3,28ft.), 3m(9.84ft.) |
| | MR-J3BUS□M-A | • MR-MC2□□ ↔ MR-J4(W□)-□B/MR-J4(W□)-□B ↔ MR-J4(W□)-□B<br>• Standard cable for outside panel 5m(16.40ft.), 10m(32.81ft.), 20m(65.62ft.) |
| | MR-J3BUS□M-B (Note 3) | • MR-MC2□□ ↔ MR-J4(W□)-□B/MR-J4(W□)-□B ↔ MR-J4(W□)-□B<br>• Long distance cable 30m(98.43ft.), 40m(131.23ft.), 50m(164.04ft.) |

Note 1. □=Cable length (015: 0.15m(0.49ft.), 03: 0.3m(0.98ft.), 05: 0.5m(1.64ft.), 1: 1m(3.28ft.), 2: 2m(6.56ft.), 3: 3m(9.84ft.), 5: 5m(16.40ft.), 10: 10m(32.81ft.), 20: 20m(65.62ft.), 25: 25m(82.02ft.), 30: 30m(98.43ft.), 40: 40m(131.23ft.), 50: 50m(164.04ft.)

2. Cable for forced stop input is not attached to the position board. The cable should be made by the customer.

3. Please contact your nearest Mitsubishi sales representative for the cable of less than 30m(98.43ft.).

### (2) Equipment with SSCNETⅢ(/H) connection

| Part name | Model name | Description | Remarks |
|---|---|---|---|
| MR-J4 series servo amplifier | MR-J4-□B | | Refer to the servo amplifier instruction manuals. |
| | MR-J4-□B-RJ | | |
| | MR-J4W-□B | For 2-axis type, 3-axis type | |
| MR-J3 series servo amplifier | MR-J3-□B | | |
| | MR-J3W-□B | For 2-axis type | |
| | MR-J3-□B-RJ006 | For fully closed control | |
| | MR-J3-□B-RJ004 | For linear servo motor | |
| | MR-J3-□B-RJ080W | For direct drive motor | |
| | MR-J3-□B Safety | For drive safety servo | |
| | MR-J3W-0303BN6 | For 2-axis type | |
| MR-JE series servo amplifier | MR-JE-□B | | |
| SSCNETⅢ/H head module | LJ72MS15 | Maximum link points input 64 bytes, output 64 bytes | Refer to MELSEC-L SSCNETⅢ/H Head Module User's manual. |

### (3) Software packages

#### (a) Utility software

| Model name | Software package |
|---|---|
| Position Board Utility2 | MRZJW3-MC2-UTL |

#### (b) Servo set-up software package

| Model name | Software package |
|---|---|
| MR Configurator2 | SW1DNC-MRC2-E |

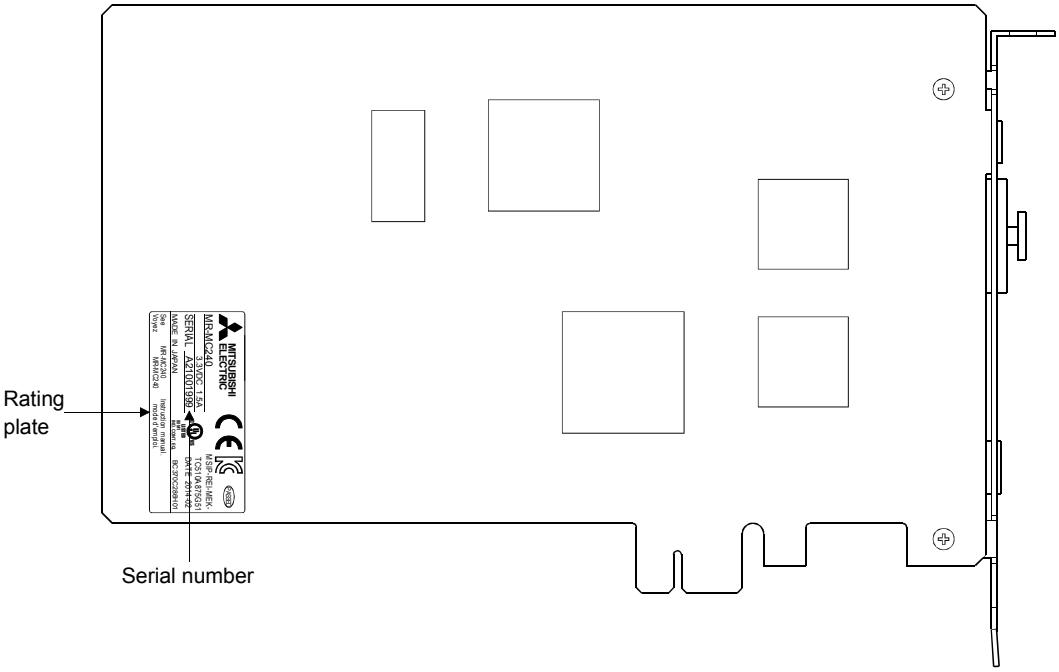
## 2.3 Checking serial number and operating system software version

Checking for the serial number of position board and software version are shown below.

### 2.3.1 Checking serial number

(1) Rating plate

The serial number is printed on the rating plate which is on the position board.




| POINT |
|---|
| • When the position board is mounted to the host controller, the serial number cannot be checked. Take note of the serial number before mounting. |

### 2.3.2 Checking software version

The software version of the position board can be checked on the system program software version (0030h to 003Fh) of system information. System program software version is stored as ASCII code.

| | 0030h | 0031h | 0032h | 0033h | 0034h | 0035h | 0036h | 0037h | 0038h | 0039h | 003Ah | 003Bh | 003Ch | 003Dh | 003Eh | 003Fh |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| System program software version | B (42h) | C (43h) | D (44h) | - (2Dh) | B (42h) | 5 (35h) | 2 (32h) | W (57h) | 1 (31h) | 0 (30h) | 1 (31h) | - (2Dh) | A (41h) | 3 (33h) | ␣ (20h) | \0 (00h) |

Software type name

Type name
101: MR-MC21□

Version

Note. In (): ASCII code
␣ : Space

| API LIBRARY |
|---|
| • To check the software version, use the sscGetBoardVersion function. |

## 2.4 Restrictions by the software's version

There are restrictions in the function that can be used by the version of the software.

| Function/Item name | Change details | Software version | |
|---|---|---|---|
| | | MR-MC2□□ | MRZJW3-MC2-UTL |
| Digital I/O | Addition | A1 or later | 1.20 or later |
| Servo amplifier general I/O | Addition | A1 or later | 1.20 or later |
| Digital output signal control for the other axes start | Addition | A1 or later | 1.20 or later |
| Dual port memory exclusive control | Addition | A1 or later | 1.20 or later |
| Pass position interrupt | Addition | A1 or later | 1.20 or later |
| Interface mode | Addition | A3 or later | 1.50 or later |
| Alarm history function | Addition | A3 or later | 1.50 or later |
| Addition of waiting for SSCNET response (0009h) to system status code | Addition | A3 or later | 1.50 or later |
| Speed-torque control (interface mode only) | Addition | A4 or later | 1.60 or later |
| Addition of operation cycle alarm to system alarms | Addition | A4 or later | 1.60 or later |
| Addition of position droop to high speed monitor (interface mode only) | Addition | A4 or later | 1.60 or later |
| Mark detection function compatible | Addition | A5 or later | 1.70 or later |
| Change home position return method while system is running. | Addition | A5 or later | 1.70 or later |
| Continuous operation to torque control (automatic operation in standard mode only) | Addition | A5 or later | 1.70 or later |
| External forced stop disabled function | Addition | A5 or later | 1.70 or later |
| Point table loop method | Addition | A6 or later | 1.70 or later |
| Servo amplifier (MR-JE-□B) compatible | Addition | A7 or later | 1.70 or later |
| Addition of forced stop to system interrupt factor | Addition | A7 or later | 1.70 or later |
| SSCNETⅢ/H head module connection | Addition | A8 or later | 1.80 or later |
| Transient transmit compatible | Addition | A8 or later | 1.80 or later |
| Addition of station No. in order of connection to monitor | Addition | A8 or later | 1.80 or later |
| I/O device compatible | Addition | A8 or later | 1.80 or later |

# MEMO

# 3. INSTALLATION AND WIRING

## 3.1 Board installation

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

### 3.1.1 Instructions for handling

The following explains instructions for handling.

**⚠CAUTION**

- Do not touch any connectors while power is ON. Doing so may cause electric shock or malfunction.
- Do not directly touch any conductive parts and electronic components of the board. Doing so may cause malfunction or failure of the board.
- Do not disassemble or modify the board. Doing so may cause failure, malfunction, injury, or fire.
- Before handling the 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 board to fail or malfunction.
- Handle the board in a place where static electricity will not be generated. Failure to do so may cause a failure or malfunction.
- The 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 board. Doing so may cause a failure or malfunction.



### 3.1.2 Installation environment

For installation of the host controller in which the position board is installed, refer to the manual for the host controller.

(1) Instructions for board installation environment
Use the 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.

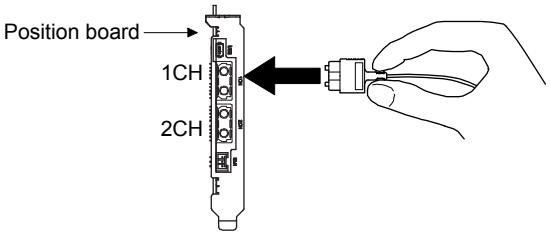
(2) Instructions for host controller installation environment
Always ground the host controller to the protective ground conductor. Failure to do so may cause a malfunction.

## 3.2 Connection and disconnection of cable

### 3.2.1 SSCNETⅢ cable

(1) Precautions for handling the SSCNETⅢ cable

- Do not stamp the SSCNETⅢ cable.
- When laying the SSCNETⅢ cable, be sure to secure the minimum cable bend radius or more. If the bend radius is less than the minimum cable bend radius, it may cause malfunctions due to characteristic deterioration, wire breakage, etc.
- For connection and disconnection of SSCNETⅢ cable, hold surely a tab of cable connector.




(2) Connection of SSCNETⅢ cable

- For connection of SSCNETⅢ cable to the position board, connect it to the SSCNETⅢ connector 1CH or 2CH of position board while holding a tab of SSCNETⅢ cable connector. Be sure to insert it until it clicks.
- If the cord tip for the SSCNETⅢ cable is dirty, optical transmission is interrupted and it may cause malfunctions. If it becomes dirty, wipe with a bonded textile, etc. Do not use solvent such as alcohol.

(3) Disconnection of SSCNETⅢ cable

- For disconnection of SSCNETⅢ cable, pull out it while holding a tab of SSCNETⅢ cable connector or the connector.
- After disconnection of SSCNETⅢ cable, be sure to put a cap (attached to position board or servo amplifier) to the position board and servo amplifier.
- For SSCNETⅢ cable, attach the tube for protection optical cord's end face on the end of connector.

(4) Precautions of SSCNETⅢ cable wiring

SSCNETⅢ cable is made from optical fiber. If optical fiber is added a power such as a major shock, lateral pressure, haul, sudden bending or twist, its inside distorts or breaks, and optical transmission will not be available. Especially, as optical fiber for MR-J3BUS□M and MR-J3BUS□M-A is made of synthetic resin, it melts down if being left near the fire or high temperature. Therefore, do not make it touched the part, which becomes high temperature, such as radiator or regenerative option of servo amplifier, or servo motor. Be sure to use optical fiber within the range of operating temperature described in this manual. Read described item of this section carefully and handle it with caution.

(a) Minimum bend radius

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

| Model name of SSCNETⅢ cable | Minimum bend radius[mm(inch)] |
|---|---|
| MR-J3BUS□M | 25(0.98) |
| MR-J3BUS□M-A | Enforced covering cord : 50 (1.97)<br>Cord : 25 (0.98) |
| MR-J3BUS□M-B | Enforced covering cord : 50 (1.97)<br>Cord : 30 (1.18) |

(b) Tension

If tension is added on the SSCNETⅢ cable, the increase of transmission loss occurs because of external force which concentrates on the fixing part of SSCNETⅢ cable or the connecting part of SSCNETⅢ connector. At worst, the breakage of SSCNETⅢ cable or damage of SSCNETⅢ connector may occur. For cable laying, handle without putting forced tension. (Refer to "APPENDIX 7.1 SSCNETⅢ cables" for the tension strength.)

(c) Lateral pressure

If lateral pressure is added on the SSCNETⅢ cable, the cable itself distorts, internal optical fiber gets stressed, and then transmission loss will increase. At worst, the breakage of SSCNETⅢ cable may occur. As the same condition also occurs at cable laying, do not tighten up SSCNETⅢ cable with a thing such as nylon band (TY-RAP). Do not trample it down or tuck it down with the door of control panel or others.

(d) Twisting

If SSCNETⅢ cable is twisted, it will become the same stress added condition as when local lateral pressure or bend is added. Consequently, transmission loss increases, and the breakage of SSCNETⅢ cable may occur at worst.

(e) Disposal

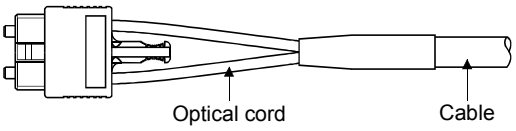
When incinerating optical cable (cord) used for SSCNETⅢ cable, hydrogen fluoride gas or hydrogen chloride gas which is corrosive and harmful may be generated. For disposal of SSCNETⅢ cable, request for specialized industrial waste disposal services who has incineration facility for disposing hydrogen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

POINT

- Be sure to connect SSCNETⅢ cable with the above connector. If the connection is mistaken, between the position board and servo amplifier cannot be communicated.
- Forced removal of the SSCNETⅢ cable from the position board will damage the position board and SSCNETⅢ cables.
- After removal of the SSCNETⅢ cable, be sure to put a cap on the SSCNETⅢ connector. Otherwise, adhesion of dirt deteriorates in characteristic and it may cause malfunctions.
- Do not remove the SSCNETⅢ cable while turning on the power supply of position board and servo amplifier.
  Do not see directly the light generated from SSCNETⅢ connector of position board or servo amplifier and the end of SSCNETⅢ cable. When the light gets into eye, may feel something is wrong for eye. (The light source of SSCNETⅢ cable complies with class1 defined in JISC6802 or IEC60825-1.)
- If the SSCNETⅢ cable is added a power such as a major shock, lateral pressure, haul, sudden bending or twist, its inside distorts or brakes, and optical transmission will not be available.
  Be sure to take care enough so that the short SSCNETⅢ cable is added a twist easily.
- Be sure to use the SSCNETⅢ cable within the range of operating temperature described in this manual. Especially, as optical fiber for MR-J3BUS□M and MR-J3BUS□M-A are made of synthetic resin, it melts down if being left near the fire or high temperature. Therefore, do not make it touched the part which becomes high temperature, such as radiator or regenerative option of servo amplifier, or servomotor.
- When laying the SSCNETⅢ cable, be sure to secure the minimum cable bend radius or more.
- Put the SSCNETⅢ cable in the duct or fix the cable at the closest part to the position board with bundle material in order to prevent SSCNETⅢ cable from putting its own weight on SSCNETⅢ connector.
  When laying cable, the optical cord should be given loose slack to avoid from becoming smaller than the minimum bend radius, and it should not be twisted.
  When bundling the cable, fix and hold it in position by using cushioning such as sponge or rubber which does not contain migratable plasticizing.
  If using adhesive tape for bundling the cable, fire resistant acetate cloth adhesive tape 570F (Teraoka Seisakusho Co., Ltd) is recommended.

POINT

- Migratable plasticizer is used for vinyl tape. Keep the MR-J3BUS□M, and MR-J3BUS□M-A cables away from vinyl tape because the optical characteristic may be affected.




| SSCNETⅢ cable | Cord | Cable |
|---|---|---|
| MR-J3BUS□M | △ | |
| MR-J3BUS□M-A | △ | △ |
| MR-J3BUS□M-B | ○ | ○ |

○: Normally, cable is not affected by plasticizer.

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

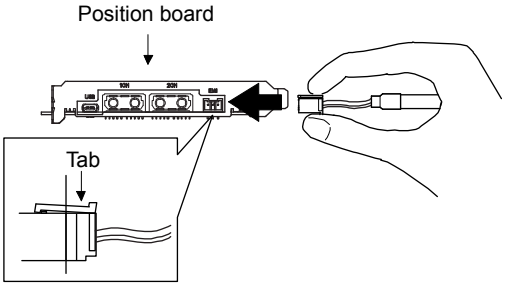
Generally, soft polyvinyl chloride (PVC), polyethylene resin (PE) and fluorine resin contain non-migratable plasticizer and they do not affect the optical characteristic of SSCNETⅢ cable. However, some wire sheaths and cable ties, which contain migratable plasticizer (phthalate ester), may affect MR-J3BUS□M and MR-J3BUS□M-A cables (made of plastic). In addition, MR-J3BUS□M-B cable (made of quartz glass) is not affected by plasticizer.

- If the adhesion of solvent and oil to the cord part of SSCNETⅢ cable may lower the optical characteristic and machine characteristic. If it is used such an environment, be sure to do the protection measures to the cord part.
- When keeping the position board or servo amplifier, be sure to put on a cap to connector part so that a dirt should not adhere to the end of SSCNETⅢ connector.
- SSCNETⅢ connector to connect the SSCNETⅢ cable is put a cap to protect light device inside connector from dust. For this reason, do not remove a cap until just before connecting SSCNETⅢ cable. Then, when removing SSCNETⅢ cable, make sure to put a cap.
- Keep the cap and the tube for protecting light cord end of SSCNETⅢ cable in a plastic bag with a zipper of SSCNETⅢ cable to prevent them from becoming dirty.
- When exchanging the position board or servo amplifier, make sure to put a cap on SSCNETⅢ connector. When asking repair of position board or servo amplifier for some troubles, make also sure to put a cap on SSCNETⅢ connector. When the connector is not put a cap, the light device may be damaged at the transit. In this case, exchange and repair of light device is required.

### 3.2.2 Forced stop input cable

(1) Precautions for handling the forced stop input cable

- For connection or removal of the forced stop input cable, do it surely while holding a connector of forced stop input cable.




(2) Connection of the forced stop input cable

- For connection of a forced stop input cable to the position board, connect it surely to an EMI connector of position board while holding a connector. Be sure to insert it until it clicks.

(3) Removal of the forced stop input cable

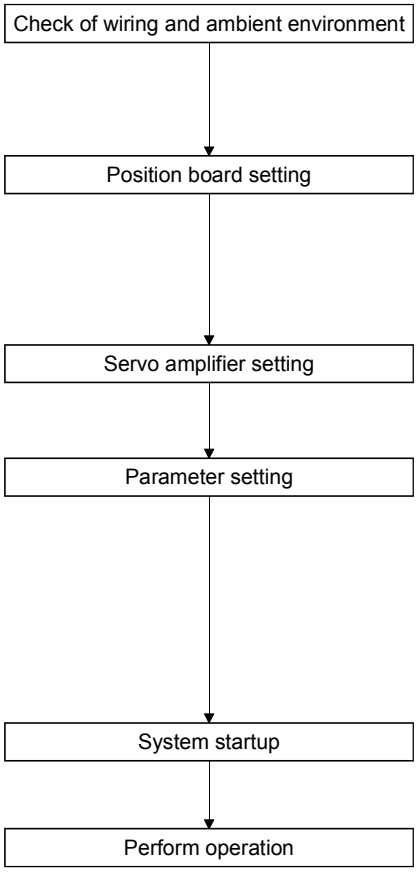
- For removal of the forced stop input cable, push a tab and pull out the cable while holding a connector.

| POINT |
| --- |
| The following handling will damage the position board or forced stop input cable.<br>• Forced removal of the forced stop input cable from the position board.<br>• The forced stop input cable is twined other cables.<br>• Excessive power is applied at cable laying.<br>Wire the cable correctly. |

# 4. SYSTEM STARTUP

The following explains the preparations and settings for system startup.
When using a SSCNETⅢ/H head module, refer to Section 6.33.

## 4.1 Startup procedures




Visually check whether the position board and servo amplifier are wired correctly. Also check the ambient environment.
(Refer to Section 4.2 Check of wiring and ambient environment)

Set board ID by position board ID selection (SW1).
(Refer to Section 4.3 Position board setting)

Set axis No. on the axis selection rotary switch of the servo amplifier.
(Refer to Section 4.4 Servo amplifier setting)

Set parameter initialization (system command code: 0003h).
After parameter initialization, set the parameters according to the system for control cycle, control option 1, sensor input option, vendor ID, and type code. For other parameters, set them according to need.
(Refer to Section 4.5 Parameter setting)

Set start system startup (system command code: 000Ah).
(Refer to Section 4.6 System startup processing)

Then operate where necessary.

**POINT**

- When a test operation is necessary before creating a user program, parameter settings, system startup, operation and such can be performed using the test tool attached to the utility software.

## 4.2 Check of wiring and ambient environment

(1) Wiring

Refer to "Chapter 3 INSTALLATION AND WIRING".

(2) Cable treatment

The wiring cables should not be strained.

The connector part should not be strained.

(3) Environment

Signal cables and bus of host controller are not shorted by wire offcuts and metallic dust.

## 4.3 Position board setting

Board ID is set by board ID selection (SW1) switch of the position board.

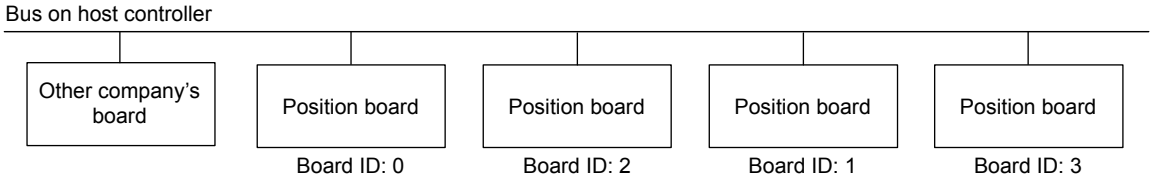
(1) Board ID

Board ID and board ID selection switch No. are correlated as shown on the table below. Set board ID so that it will not be duplicated. If it is duplicated, it may interfere with board identification on the host controller side.

Board ID selection

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

The following is a setting example for controlling four position boards.




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

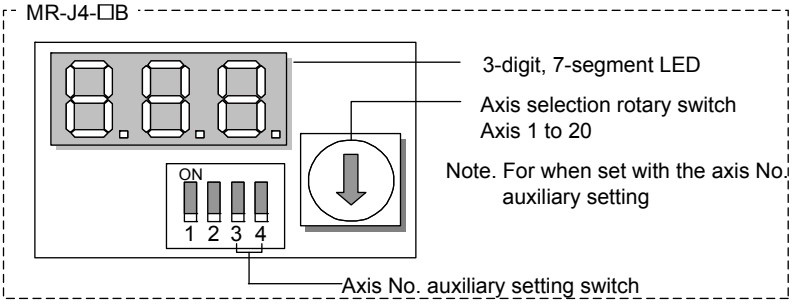
POINT

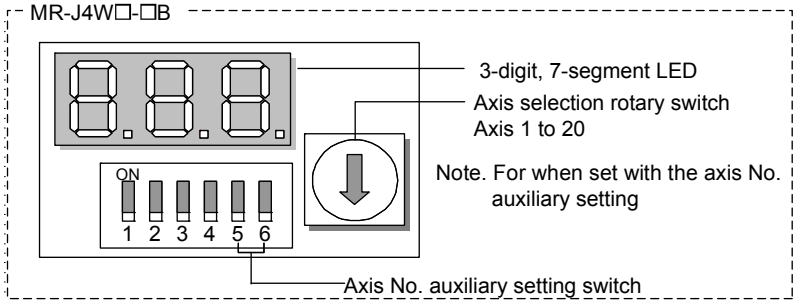
- The board ID may be in no particular order, and can be arbitrarily selected between 0 to 3.
- No. of connectable position boards vary by bus specifications of the host controller.

## 4.4 Servo amplifier setting

(1) MR-J4(W□)-□B

Axis No. of MR-J4(W□)-□B is set by the axis selection rotary switch (SW1) and the axis No. auxiliary setting (SW2) on the servo amplifier.



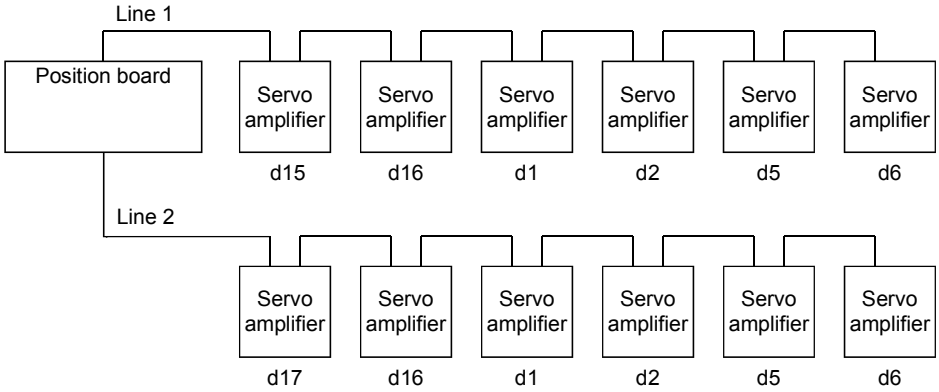




| Servo amplifier axis No. | Axis selection rotary switch | Axis No. auxiliary setting switch | Servo amplifier display (3-digit, 7-segment LED) |
|---|---|---|---|
| d1 | 0 | ON OFF | 01 |
| d2 | 1 | | 02 |
| d3 | 2 | | 03 |
| d4 | 3 | | 04 |
| d5 | 4 | | 05 |
| d6 | 5 | | 06 |
| d7 | 6 | | 07 |
| d8 | 7 | | 08 |
| d9 | 8 | | 09 |
| d10 | 9 | | 10 |
| d11 | A | | 11 |
| d12 | B | | 12 |
| d13 | C | | 13 |
| d14 | D | | 14 |
| d15 | E | | 15 |
| d16 | F | | 16 |
| d17 | 0 | ON OFF | 17 |
| d18 | 1 | | 18 |
| d19 | 2 | | 19 |
| d20 | 3 | | 20 |

POINT

- For each switch setting, refer to the Servo Amplifier Instruction Manual for your servo amplifier.
- If the "An axis that has not been mounted exists" (system error E400) occurred, the axis with wrong axis No. set can be confirmed with "information concerning axis that is not mounted" (monitor No.0480 to 0482).
- The servo amplifier axis No. and the axis No. to be managed on the position board are different. For details, refer to Section 4.5.6.

The following is a setting example for controlling six axes (MR-J4-□B) for each line by control cycle 0.88ms using MR-MC211.




| Line 1 | | | | Line 2 | | | |
|---|---|---|---|---|---|---|---|
| Servo amplifier axis No. | Axis selection rotary switch | Axis No. auxiliary setting switch | | Servo amplifier axis No. | Axis selection rotary switch | Axis No. auxiliary setting switch | |
| | | 3 | 4 | | | 3 | 4 |
| d15 | E | OFF | OFF | d17 | 0 | OFF | ON |
| d20 | 3 | OFF | ON | d16 | F | OFF | OFF |
| d1 | 0 | OFF | OFF | d1 | 0 | OFF | OFF |
| d2 | 1 | OFF | OFF | d2 | 1 | OFF | OFF |
| d5 | 4 | OFF | OFF | d5 | 4 | OFF | OFF |
| d6 | 5 | OFF | OFF | d6 | 5 | OFF | OFF |

POINT

- The servo amplifier axis No. may be in no particular order, and can be arbitrarily selected between d1 to d20.
- No. of connectable servo amplifiers vary by control cycle.

## 4.5 Parameter setting

After parameter initialization, set the parameters according to the system such as for control cycle and external signal (sensor) input option.

### 4.5.1 Parameter initialization

After turning on the position board power, initialize parameter and set before system startup starts.

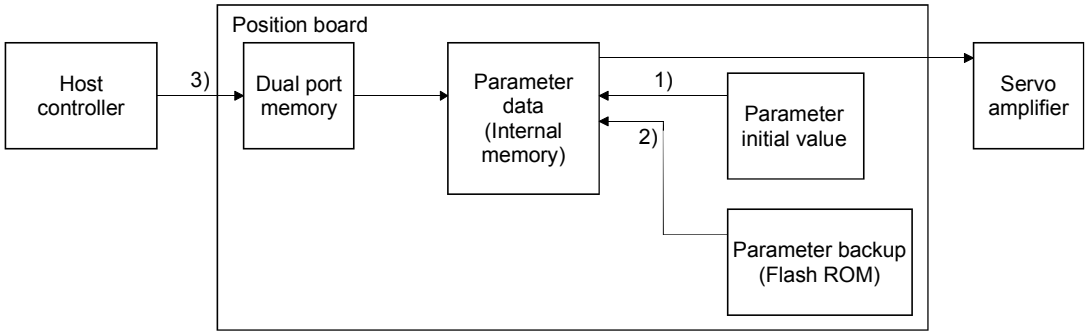



Figure 4.1 Parameter data flow during parameter initialization

| Procedure | Description | | Remarks |
|---|---|---|---|
| 1 | Confirm system preparation completion (system status code 0001h) | | Confirmation of system preparation completion uses sscGetSystemStatusCode. |
| 2 | To read parameter initial values, perform the parameter initialization (system command code: 0003h). | To read parameters from the flash ROM, perform the flash ROM parameter read (system command code: 0004h). | 1) and 2) in Fig. 4.1<br>Always initialize parameter or read parameter from the flash ROM.<br>Procedure 2 and procedure 3 of parameter initialization uses the sscResetAllParameter function. |
| 3 | Check the parameter initialization completion (system status code: 0003h). | Check the flash ROM parameter read completion (system command code: 0004h). | |
| 4 | Write parameter from user program if required | | 3) in Fig. 4.1<br>Parameter writing uses sscChangeParameter/sscChange2Parameter. |

### 4.5.2 System option 1 setting

SSCNET communication method and control cycle is set by System option 1 (parameter No.0001).
SSCNET communication method is used for communication between a position board and connected units such as servo amplifiers and SSCNETⅢ/H method is available.
Control cycle is a cycle in which the position board controls command import, position control, status output, and communication with servo amplifier and 0.88ms, 0.44ms and 0.22ms are available.
Number of servo amplifier axes which a position board can control is shown below for each control cycle.

(1) For MR-MC210/MR-MC240

(a) When SSCNET communication method is SSCNETⅢ/H

| Control cycle | Max. No. of axes connected | Max. No. of axes connected for each line | Controllable axis No. |
|---|---|---|---|
| 0.88ms | 20 axes | 20 axes | Axis 1 to 20 |
| 0.44ms | 16 axes | 16 axes | Axis 1 to 16 |
| 0.22ms | 8 axes | 8 axes | Axis 1 to 8 |

(2) For MR-MC211/MR-MC241

(a) When SSCNET communication method is SSCNETⅢ/H

| Control cycle | Max. No. of axes connected | Max. No. of axes connected for each line | Controllable axis No. |
|---|---|---|---|
| 0.88ms | 32 axes | 20 axes | Axis 1 to 32 |
| 0.44ms | 16 axes | 16 axes | Axis 1 to 16 |
| 0.22ms | 8 axes | 8 axes | Axis 1 to 8 |

Note 1. Do not connect more servo amplifiers than the max. No. of axes connected. When more servo amplifiers are connected than the max. No. of axes connected, system setting error (alarm No. 38, detail 01) will occur.

2. Use servo amplifier software version A3 or later when the control cycle is 0.22ms, and the 3-axis servo amplifier MR-J4W3-□B is used.

Control cycle settings are imported during system startup (system command code: 000Ah), and cannot be changed during system running (system status code: 000Ah).

(1) System parameter

| Parameter No. | Abbreviation | Name | Function |
|---|---|---|---|
| 0001 | *SYSOP1 | System option 1 | 0 [ ] 0 [ ]<br>Control cycle setting<br>Set the control cycle<br>0: 0.88ms<br>1: 0.44ms<br>2: 0.22ms<br>SSCNET communication method<br>Set the SSCNET communication method.<br>0: SSCNETⅢ/H<br>(Note) SSCNET communication method is shared in lines 1 and 2. |

(2) System information

| Address | Name | Description |
|---|---|---|
| 0004h | Control cycle status | 0001h: 0.88ms<br>0002h: 0.44ms<br>0003h: 0.22ms |
| 0005h | | |
| 0006h | Reserved | |
| 0007h | | |

### 4.5.3 System option 2 setting

Set control mode (standard mode or interface mode) by System option 2 (parameter No.0002).
When using interface mode, select "1: Interface mode".
When interface mode is assigned and system is startup, the in interface mode signal (IFMO) turns ON.
Control mode setting is imported during system startup (system command code: 000Ah), and cannot be changed during system running (system status code: 000Ah).

(1) System parameter

| Parameter No. | Abbreviation | Name | Initial value | Units | Setting range | Function |
|---|---|---|---|---|---|---|
| 0002 | *SYSOP2 | System option 2 | 0000h | | 0000h to 1101h | [ ][ ][0][ ]<br>Axis/station No. assignment<br>Set 1 when validating axis/station No. assignment. When axis/station No. assignment is invalid, axis/station No. is automatically assigned.<br>0: Invalid<br>1: Valid<br>Consistency check selection at system startup<br>Set whether to perform consistency check for controlled axes setting at system startup.<br>0: Valid<br>1: Invalid<br>Control mode selection<br>Set the control mode.<br>0: Standard mode<br>1: Interface mode |

### 4.5.4 I/O table setting

Set the I/O table to be used (digital I/O table or I/O device table) by I/O table (parameter No.004A).
When using I/O device table, select "1: Use I/O device table".
I/O table setting is imported during system startup (system command code: 000Ah), and cannot be changed during system running (system status code: 000Ah).

(1) System parameter

| Parameter No. | Abbreviation | Name | Initial value | Units | Setting range | Function |
|---|---|---|---|---|---|---|
| 004A | *IOTBL | I/O table | 0000h | | 0000h to 0001h | 0 0 0 [ ]<br>I/O table selection<br>Set the I/O table to be used.<br>0: Use digital I/O table<br>1: Use I/O device table |

POINT

- In relation to the digital I/O function, the following functions are expanded for the I/O device function. We recommend using the I/O device function.
  - Expansion of I/O points used
  - Supports control of I/O word devices

### 4.5.5 Control option 1 setting

When controlling servo amplifier, set "1: control" for control axis of control option 1 (parameter No.0200). When the axis No. is set out of the controllable range, the corresponding axis will be system setting error (alarm No. 38) and cannot be controlled. If the servo amplifier set is in a state where communication cannot be made, such as not connected or control circuit power is off, the "An axis that has not been mounted exists" (system error E400) will occur during system startup (system command code: 000Ah).

> POINT
> • If the "An axis that has not been mounted exists" (system error E400) occurred, the axis with wrong No. set can be confirmed with "information concerning axis that is not mounted" (monitor No.0402).

Control axis settings are imported during system startup (system command code: 000Ah), and cannot be changed during system running (system status code: 000Ah).

(1) Control parameter

| Parameter No. | Abbreviation | Name | Initial value | Units | Setting range | Function |
|---|---|---|---|---|---|---|
| 0200 | *OPC1 | Control option 1 | 0000h | | 0000h to 2111h | Control axis<br>Set 1 when controlling servo amplifier.<br>0: Do not control<br>1: Control<br><br>Amplifier-less axis function<br>Set 1 when not communicating with servo amplifier.<br>When setting 1 with control axis, operation without servo amplifier (simulation) is available.<br>0: Invalid<br>1: Valid<br><br>No home position<br>Set 1 when setting the position at the time of power on as the home position. After returning to home position, the home position will be the position where home position return is complete.<br>0: Invalid<br>1: Valid<br><br>Speed unit<br>Set the speed command unit.<br>0: Position command unit / min<br>1: Position command unit / s<br>2: r/min |

> POINT
> • When the amplifier-less axis function is valid, the position board simulates the operations of servo amplifier and operates as if it is connected. Operation can be checked without connecting the servo amplifier. When the setting is valid, the position board do not communicate with the servo amplifier.

### 4.5.6 Axis No. assignment

With Axis No. assignment, the axis No. (on the position board) can be assigned by the axis No. on the servo amplifier.

(1) When Axis No. assignment is invalid

When Axis No. assignment is invalid, correspondence between the axis No. on a position board and the axis No. on a servo amplifier is shown in the following table.

(a) When SSCNET communication method is SSCNETⅢ/H

| Servo amplifier axis No. | | Line 1 | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | d1 | d2 | d3 | d4 | d5 | d6 | d7 | d8 | d9 | d10 | d11 | d12 | d13 | d14 | d15 | d16 | d17 | d18 | d19 | d20 |
| Axis No. | 0.88ms | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| | 0.44ms | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | - | - | - | - |
| | 0.22ms | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | - | - | - | - | - | - | - | - | - | - | - | - |

| Servo amplifier axis No. | | Line 2 | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | d1 | d2 | d3 | d4 | d5 | d6 | d7 | d8 | d9 | d10 | d11 | d12 | d13 | d14 | d15 | d16 | d17 | d18 | d19 | d20 |
| Axis No. | 0.88ms | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | - | - | - | - | - | - | - | - |
| | 0.44ms | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | 0.22ms | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

(2) When Axis No. assignment is valid

When Axis No. assignment is valid, the axis Nos. 1 to 32 (on the position board) can be assigned by the servo amplifier axis Nos. d1 to d20 arbitrarily.

To assign the axis Nos., set the following parameters.

**POINT**

- To set servo amplifier axis Nos., use the axis No. assignment (parameter No.0203).
  Valid servo amplifier axis Nos. differ depending on the control cycle. Up to 20 axes can be set.

| Control cycle | SSCNETⅢ/H |
|---|---|
| 0.88ms | 1 to 20 |
| 0.44ms | 1 to 16 |
| 0.22ms | 1 to 8 |

(a) System parameter

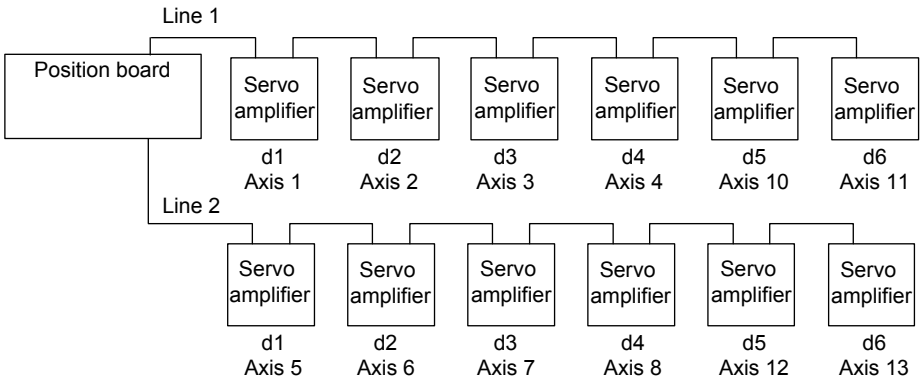
| Parameter No. | Abbreviation | Name | Function |
|---|---|---|---|
| 0002 | *SYSOP2 | System option 2 | 0 0 0 □<br>Axis/station No. assignment selection<br>Set 1 when validating axis/station No. assignment. When axis/station No. assignment is invalid, axis/station No. is automatically assigned.<br>0: Invalid<br>1: Valid |

(b) Control parameter

| Parameter No. | Abbreviation | Name | Initial value | Units | Setting range | Function |
|---|---|---|---|---|---|---|
| 0203 | *AXALC | Axis No. assignment | 0000h | | 0000h to 011Fh | 0 □ □ □<br>Servo amplifier axis No.<br>Set the servo amplifier axis No. to be assigned to the axis Nos. on the position board. (Note 1, 2 and 3)<br>00h: No axis No. assignment<br>01h to 14h: Axis No.<br>Example) 0Ah: Axis No. 10<br>Servo amplifier line No.<br>Set the servo amplifier line No. to be assigned to the axis Nos. on the position board.<br>0 to 1: Line No.-1 |

Note 1. An axis No. out of the valid range causes the system setting error (alarm No. 38, detail 03).
2. Regardless of the control axis setting (parameter No.0200), set the axis No. so that the axis No. assignment is not duplicated. (Except for 00: No axis No. assignment) Duplicated axis Nos. cause the system setting error (alarm No. 38, detail 04).
3. When Control is set in the control axis setting (parameter No.0200), always set the axis Nos. (1 to 20). When 0 is set, system setting error (alarm No. 38, detail 02) will occur.

The following is a setting example for controlling six axes for each line.




| Axis No. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 10 | 11 | 12 | 13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Control parameter No.0203 setting value | 0001h | 0002h | 0003h | 0004h | 0101h | 0102h | 0103h | 0104h | 0005h | 0006h | 0105h | 0106h |
| Servo amplifier axis No. | Line 1 d1 | Line 1 d2 | Line 1 d3 | Line 1 d4 | Line 2 d1 | Line 2 d2 | Line 2 d3 | Line 2 d4 | Line 1 d5 | Line 1 d6 | Line 2 d5 | Line 2 d6 |

### 4.5.7 Sensor input option setting

External signal (sensor) is connected by setting sensor input options (parameter No.0219).

| Parameter No. | Abbreviation | Name | Initial Value | Units | Setting range | Function |
|---|---|---|---|---|---|---|
| 0219 | *SOP | Sensor input options | 0000h | | 0000h to 0304h | 0 \| \| 0 \| \|<br>Sensor input system<br>Set the input system of the sensor (LSP, LSN, DOG).<br>0: Not use<br>1: Driver input<br>2: Digital or input device input<br>3: Not connected (does not detect LSP, LSN, DOG)<br>4: Dual port memory input<br>Limit switch signal selection<br>Set valid / invalid of limit switch.<br>0: LSP/LSN are valid<br>1: LSP is valid, LSN is invalid<br>2: LSP is invalid, LSN is valid<br>3: LSP/LSN are invalid |
| 021A | *SLSP | Sensor signal (LSP) connection specification | 0000h | | 0000 to FFF1h | The setting target differs depending on the I/O table (parameter No.004A) setting.<br>[When using a digital I/O table]<br>\| \| \| \|<br>Digital input assignment<br>Set valid/invalid for the digital input assignment where LSP is connected.<br>0: Not assigned<br>1: Assigned<br>Digital input number assignment<br>Set the digital input number where the LSP is connected.<br>000h to 3FFh: DI_000 to DI_3FF<br>[When using a I/O device table]<br>\| \| \| \|<br>Input device assignment<br>Set valid/invalid for the input device assignment where LSP is connected.<br>0: Not assigned<br>1: Assigned<br>Input device number assignment<br>Set the input device number where the LSP is connected.<br>000h to FFFh: DVI_000 to DVI_FFF |

| Parameter No. | Abbreviation | Name | Initial Value | Units | Setting range | Function |
|---|---|---|---|---|---|---|
| 021B | *SLSN | Sensor signal (LSN) connection specification | 0000h | | 0000 to FFF1h | The setting target differs depending on the I/O table (parameter No.004A) setting.<br>[When using a digital I/O table]<br>Digital input assignment<br>Set valid/invalid for the digital input assignment where LSN is connected.<br>0: Not assigned<br>1: Assigned<br>Digital input number assignment<br>Set the digital input number where LSN is connected.<br>000h to 3FFh: DI_000 to DI_3FF<br>[When using a I/O device table]<br>Input device assignment<br>Set valid/invalid for the input device assignment where LSN is connected.<br>0: Not assigned<br>1: Assigned<br>Input device number assignment<br>Set the input device number where LSN is connected.<br>000h to FFFh: DVI_000 to DVI_FFF |
| 021C | *SDOG | Sensor signal (DOG) connection specification | 0000h | | 0000 to FFF1h | The setting target differs depending on the I/O table (parameter No.004A) setting.<br>[When using a digital I/O table]<br>Digital input assignment<br>Set valid/invalid for the digital input assignment where DOG is connected.<br>0: Not assigned<br>1: Assigned<br>Digital input number assignment<br>Set the digital input number where DOG is connected.<br>000h to 3FFh: DI_000 to DI_3FF<br>[When using a I/O device table]<br>Input device assignment<br>Set valid/invalid for the input device assignment where DOG is connected.<br>0: Not assigned<br>1: Assigned<br>Input device number assignment<br>Set the input device number where DOG is connected.<br>000h to FFFh: DVI_000 to DVI_FFF |

(1) When selecting the driver input

When 1 (driver input) is selected as the sensor destination, the sensor (LSP, LSN, DOG) status connected to the driver (such as a servo amplifier) is imported via SSCNET.

(a) MR-J4(W□)-□B is used as a servo amplifier

1) MR-J4-□B

| Signal Name | Destination connector pin No. | Abbreviation |
|---|---|---|
| LSP | CN3-2 | D11 |
| LSN | CN3-12 | D12 |
| DOG | CN3-19 | D13 |

2) MR-J4W2-□B

| Signal Name | Destination connector pin No. | | Abbreviation (□: A, B) |
|---|---|---|---|
| | A-axis | B-axis | |
| LSP | CN3-7 | CN3-20 | DI1□ |
| LSN | CN3-8 | CN3-21 | DI2□ |
| DOG | CN3-9 | CN3-22 | DI3□ |

3) MR-J4W3-□B

| Signal Name | Destination connector pin No. | | | Abbreviation (□: A, B, C) |
|---|---|---|---|---|
| | 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□ |

POINT

- For sensor connection to the driver, refer to the instruction manual of the driver.
- If communication error (system error E401 to E407) occurs, sensor (LSP, LSN, DOG) input status turns off.
- If communication error (system error E400) occurs, the input status of the corresponding axis turns off.

(2) When selecting the digital input/input device

When 2 (digital or input device input) is selected as the sensor destination, the setting target differs depending on the I/O table (parameter No.004A) setting.

(a) When 0 (use digital I/O table) is set

The digital input signal (DI_□□□) is used as the sensor (LSP, LSN, DOG). Specify the digital input signal (DI_□□□) in the sensor signal connection specification (parameter No.021A to 021C).

(b) When 1 (use I/O device table) is set

The input device signal (DVI_□□□) is used as the sensor (LSP, LSN, DOG). Specify the input device signal (DVI_□□□) in the sensor signal connection specification (parameter No.021A to 021C).

Refer to Section 6.26 to 6.28 and 6.33.

(3) When selecting not connected

When 3 (not connected) is selected 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 position board operates without detected proximity dog.

(4) When selecting dual port memory

When 4 (dual port memory input) is selected 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 | Bit | Abbreviation | Signal Name | When tandem drive is being used |
|---|---|---|---|---|
| 1004 | 0 | ITL | Interlock | Master |
| | 1 | RMONR | High speed monitor latch command | Each axis |
| | 2 | | Reserved | |
| | 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 | | Reserved | |

Note 1: The above address is the address for the axis 1. For the axis 2 and above, add C0h 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. The polarity of the proximity dog input command can be changed by proximity dog input polarity (parameter No.0240).

## ⚠CAUTION

- When "1: driver input" and "2: digital or input device input" are selected as sensor destinations, a delay occurs due to the communication to detect the signal status. Take the delay time due to communication into consideration when installing each sensor.
  - Communication delay when control cycle is 0.88ms: approx. 2ms
  - Communication delay when control cycle is 0.44ms: approx. 1.5ms
  - Communication delay when control cycle is 0.22ms: approx. 1.3ms

### 4.5.8 Vendor ID and type code setting

Available functions, parameter settings and ranges will vary by servo amplifier type. At the time the communication with the servo amplifier has started, the position board will perform consistency check between vendor ID and type code of the servo amplifier connected and the parameter set. If a consistency check error occurs, driver type code error (system error E405) will be output, therefore set correct vendor ID and type code.

> POINT
>
> • If driver type code error (system error E405) occurred, the axis that has set an incorrect type code can be confirmed with "type code erroneous axis information" (monitor No.0484 to 0485).

(1) Control parameters

| Parameter No. | Abbreviation | Name | Function |
|---|---|---|---|
| 021D | *VEND | Vendor ID | Set the vendor ID.<br>0000h: Mitsubishi Electric |
| 021E | *CODE | Type code | Set the type code.<br>1000h: MR-J4(W□)-□B<br>1200h: MR-JE-□B |

## 4.6 System startup processing

### (1) System startup procedure

After parameter initialization, start system startup before performing operations.

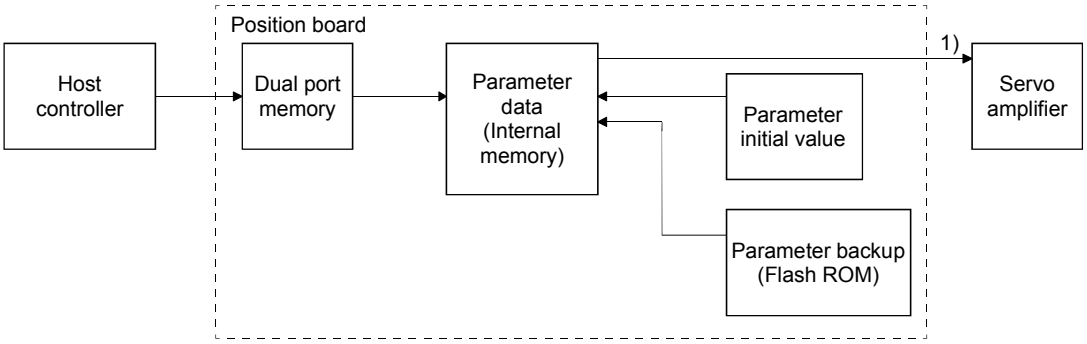


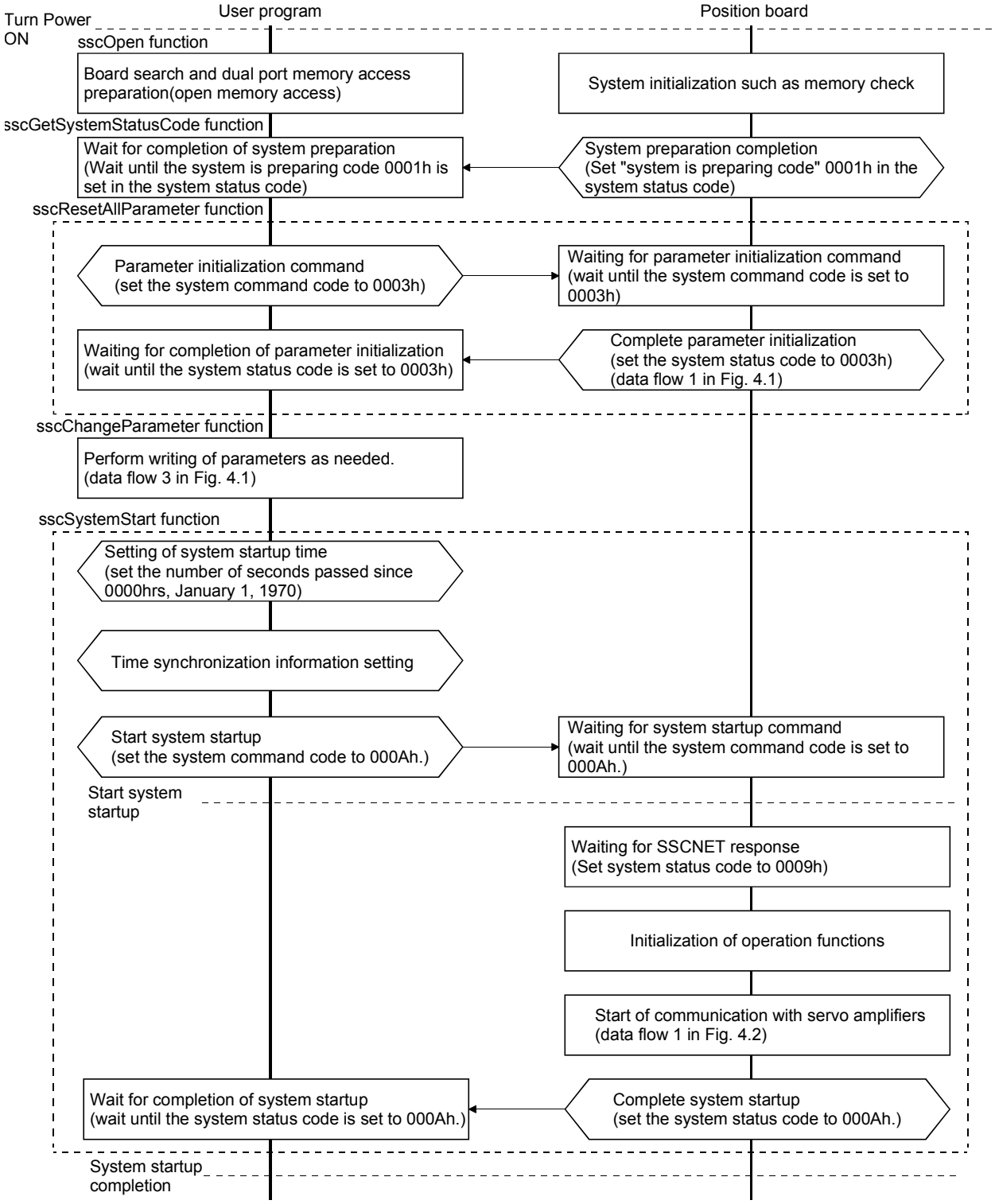

Figure 4.2 Parameter data flow during system startup

| Procedure | Description | Remarks |
|---|---|---|
| 1 | The number of seconds passed since 0000hrs, January 1, 1970 is stored in system startup time. | The time is used to create data for alarm history function. When using the API library, the time is automatically set in the sscSystemStart API function. |
| 2 | Set the time synchronization information. | When using the API library, the time is automatically set in the sscSystemStart API function. |
| 3 | Perform the start system startup command (system command code 000Ah) | 1) of Figure 4.2<br>The position board will start communicating with the servo amplifier and write the servo parameters according to the parameters set (refer to Section 4.5.1), and system running will be in process (system status code: 000Ah).<br>Start of system startup uses the sscSetSystemCommandCode function. |
| 4 | Confirm the during system running (system status code 000Ah). | Confirmation of during system running uses the sscSetSystemCommandCode function. |

API LIBRARY

- Use the sscSystemStart function to start system startup.
- For a detailed procedure for system startup, refer to the sample programs (InterruptDrive/AllParamWrite) contained on the utility software.

(2) Sequence example




Note 1. If an error occurs during system startup, an error code is set in the system status code.
Refer to "Section 13.6 System error" concerning error codes.

2. When the system status code does not become 000Ah (an error code is not stored either.), the following is possible: the SSCNET communication cable is disconnected, the connected equipment is turned off, the SSCNET communication method (parameter No.0001) is incorrect. The set communication method can be confirmed in SSCNET communication method (address 0008h).

3. Communication with the axes for which parameter No.0200 control axis is set to "1: control performed" will be implemented, therefore be sure to set the control axis parameters.

# 5. OPERATIONAL FUNCTIONS

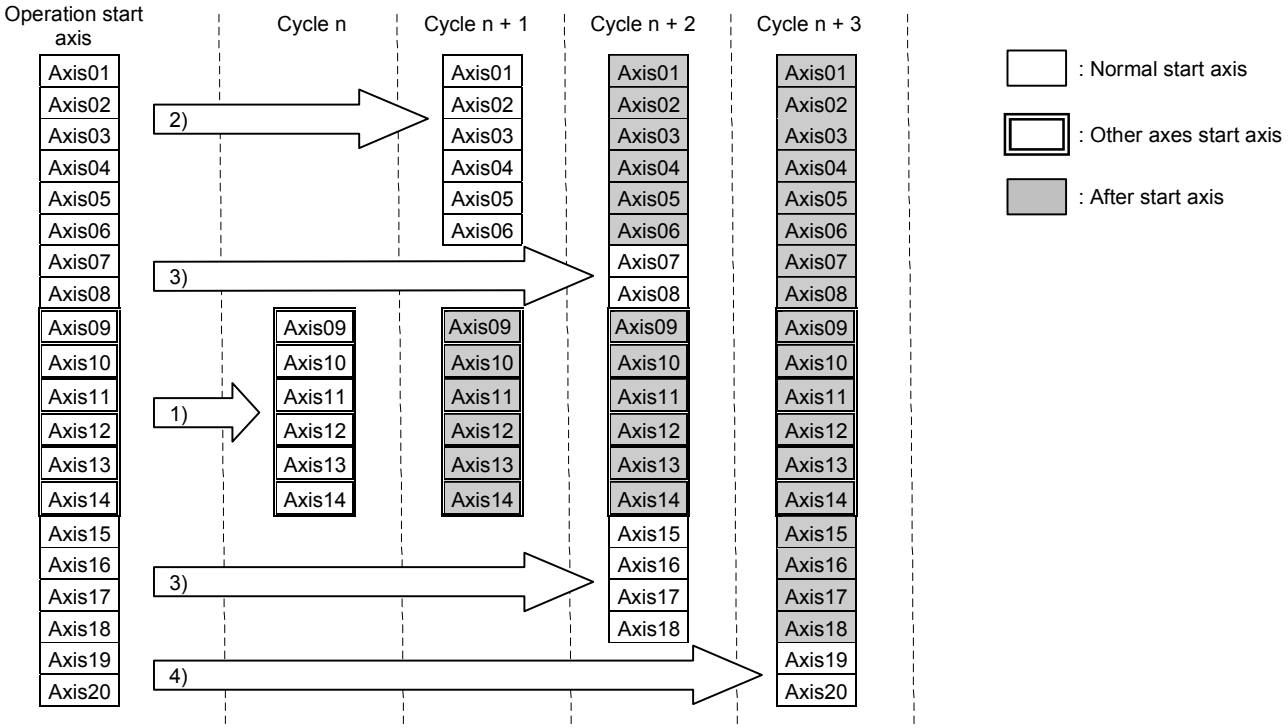
> **POINT**
> - Refer to Chapter 10 for the table bit for each signal.

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

| Control cycle | Max. No. of simultaneous start axes |
|---|---|
| 0.88ms | 16 |
| 0.44ms | 6 |
| 0.22ms | 2 |

> **POINT**
> - For the start operation of linear interpolation, one group is regarded to consist of four axes, irrespective of the number of axes in the group.
> - For the start operation of tandem drive, one group is regarded to consist of one axis.
> - Start operation by other axes start takes priority, the other axes start in order.
> - When the number of axes which is set in 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.

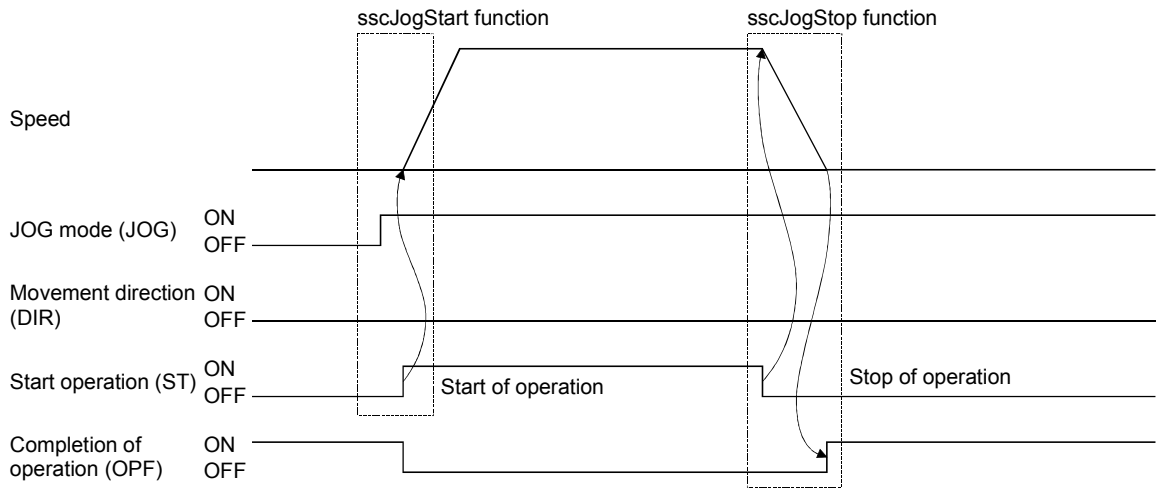
The following shows the operation when axes 9 to 14 are started by other axes start by control cycle of 0.44ms, the other 14 axes are started in normal start operation.



## 5.1 JOG operation

### 5.1.1 Summary

When the movement direction is specified and the start operation signal (ST) input, it starts in the designated direction and movement continues until the start operation signal (ST) is turned OFF. When the start operation signal (ST) is turned off, it slows and comes to a stop. JOG operation can be used without completing home position return. JOG operation can be used without completing home position return (home position return request (ZREQ) is ON).




### 5.1.2 Start operation method

Start operation is performed according to the following procedure.

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

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

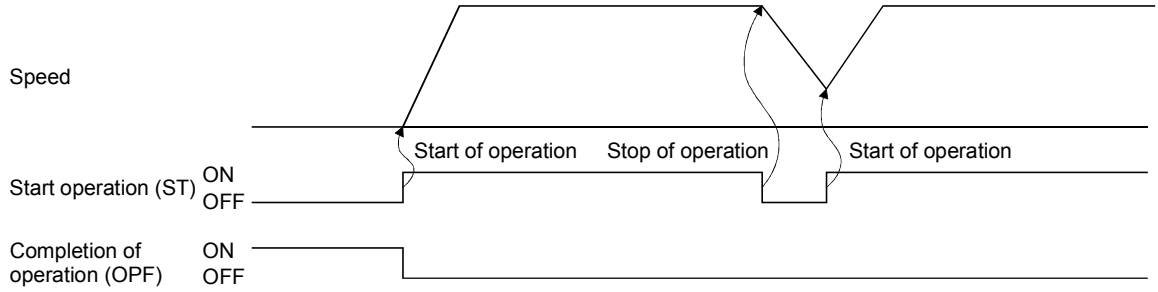
(4) Turn on the start operation signal (ST).

| POINT |
|---|
| ・The manual feed speed, manual feed acceleration constant, manual feed deceleration constant, and movement direction signal (DIR) are read at the leading edge of the start operation signal (ST). It follows that after start operation, even if there are changes to the data or signal, they are ignored. |

| API LIBRARY |
|---|
| ・Use the sscJogStart function to perform procedures (1) to (4) above.<br>・Use the sscJogStop or sscJogStopNoWait functions to perform stop operation. |

### 5.1.3 Resuming operation

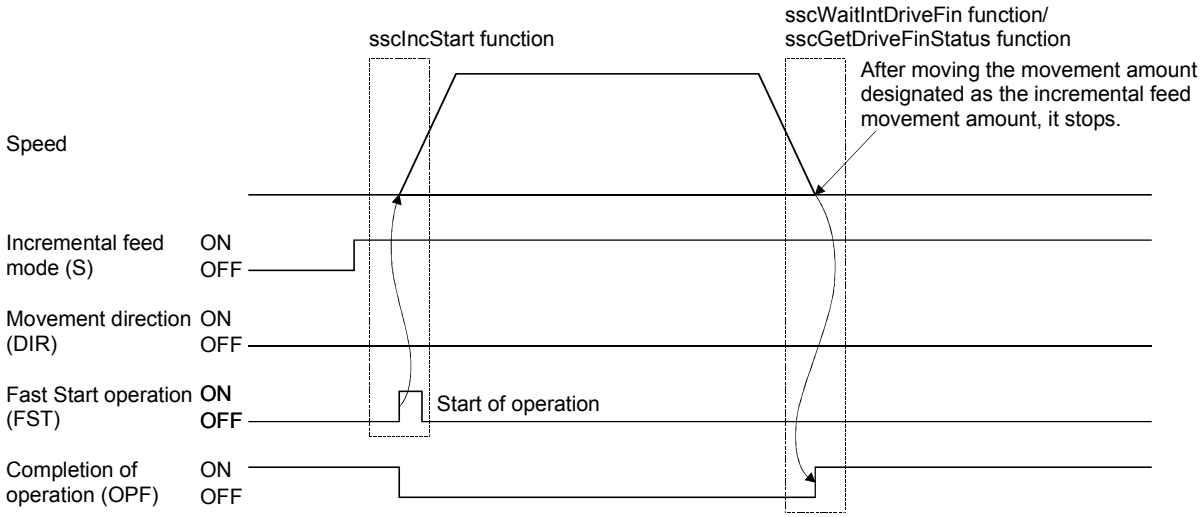
When the start operation signal (ST) is turned off, deceleration is started; however, if the start operation signal (ST) is turned back on while decelerating, it does not completely stop but reaccelerates.



## 5.2 Incremental feed

### 5.2.1 Summary

A prescribed feed amount is implemented for each fast start operation signal (FST). The feed amount is defined using the incremental feed movement amount.
Incremental feed can be used without completing home position return (home position return request (ZREQ) is ON).



### 5.2.2 Start operation method

Start operation is performed according to the following procedure.

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

(2) Set the manual feed speed, manual feed acceleration constant, and manual feed deceleration 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 manual feed speed, manual feed acceleration constant, manual feed deceleration constant, movement direction signal (DIR), and incremental feed movement are read at the leading edge of the fast start operation signal (FST). It follows that after start operation, even if there are changes to the data or signal, they are ignored.
- Only positive numbers are valid for the incremental feed movement amount. Movement direction is designated by the movement direction signal (DIR).

API LIBRARY

- Use the sscIncStart function to perform procedures (1) to (5) above.
- Use the sscGetDriveFinStatus or sscWaitIntDriveFin functions to check completion of operation.
- Use the sscDriveStop or sscDriveStopNoWait functions to perform stop operation.

## 5.3 Automatic operation

### 5.3.1 Summary

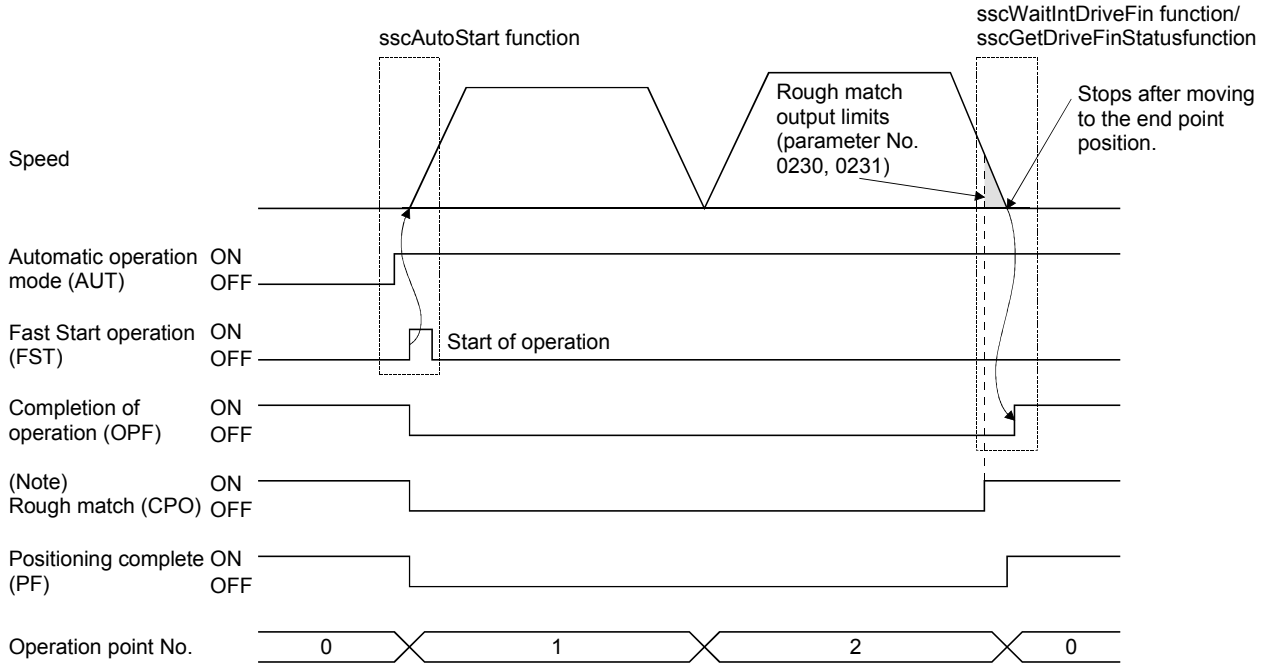
Automatic operation (positioning) uses the point table for operation. Position data and feed speed designation is set in the point table. When the fast start operation signal (FST) is turned on, instructions are executed in order from the instruction set at the start point No. to the end point No. If automatic operation is started prior to completion of home position return (home position return request (ZREQ) is ON), a home position return not complete error (operation alarm 90, detail 01) occurs upon starting operation and the operation stops.

> POINT
> - The first point number for each of the axis point tables is 0000h.
> - The first point number for each of the axis point tables can be designated using point number offset. Refer to Section 10.11 concerning point number offset.

Point table

| Point | Position data [Command units] | Feed speed [Speed units] | (Note) Acceleration time constant [ms] | (Note) Deceleration time constant [ms] | (Note) Dwell/pre dwell [ms] | Auxiliary command | Other axes start specification | S-curve ratio [%] | Reserved |
|---|---|---|---|---|---|---|---|---|---|
| | 4 bytes | 4 bytes | 2 bytes | 2 bytes | 2 bytes | 2 bytes | 4 bytes | 1 bytes | 11 bytes |
| 0000 | 2000 | 2000 | 20 | 30 | 0 | 0000h | 00000000h | 0 | 0 |
| 0001 | 5000 | 2000 | 30 | 50 | 0 | 0000h | 00000000h | 0 | 0 |
| : | : | : | : | : | : | : | : | : | : |

Note. Time specified by the acceleration constant, the deceleration constant and the dwell are rounded off based on the control cycle. (The value is rounded to the nearest integer.)
For example, the dwell is specified to 10ms with the control cycle of 0.88ms, the time until executing point is completed after the completion of the point movement is 11 control cycles (approx. 9.778ms).




Note. 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.

### 5.3.2 Start operation method

Start operation is performed according to the following 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

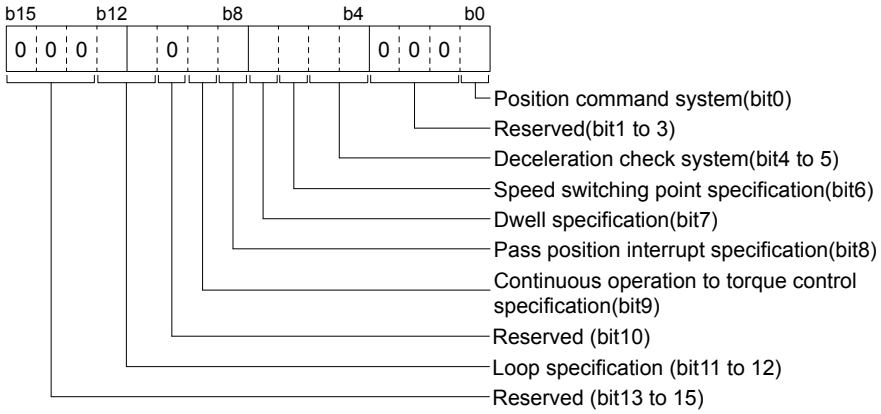
- For stoppage of operation mid way, turn on the stop operation signal (STP).
- The operation point No. can be checked in the operation point No. of the axis status table (same as monitor No.030A).
- The point number starts from 0.
- The point table is a total of 320 points for all axes. The number of points distributed to each axis can be adjusted using the point number offset. For details, refer to Section 10.11.

API LIBRARY

- Use the sscSetPointDataEx function to set up point table in (1) above.
- Use the sscAutoStart function to perform procedures (2) to (4) above.
- Use the sscGetDriveFinStatus or sscWaitIntDriveFin functions to check completion of operation.
- Use the sscDriveStop or sscDriveStopNoWait functions to perform stop operation.
- Use the sscSetPointOffset/sscCheckPointOffset functions to set/get point number offset.
- For a detailed procedure from startup of automatic operation to check completion of operation, refer to the sample programs (InterruptDrive/PollingDrive) contained on the utility software.

### 5.3.3 Auxiliary command

The auxiliary command can be set in the following procedure.




(Example) For designation of position command system as 1 (relative position command) and the deceleration check system as 2 (continue operation), set to "0021h".

(1) Position command system

Select the position data command system.

0: Absolute position command

1: Relative position command

| POINT |
|---|
| ・If the setting of the position command system is incorrect, it causes a point table setting error (operation alarm 25, detail 01) and operation is stopped. |

(a) Absolute position command

Position data is position from the home position.

(b) Relative position command

Position data is the movement distance from the current command position.

(2) Deceleration check system

Designates the point movement completion conditions.

0: In-position stop

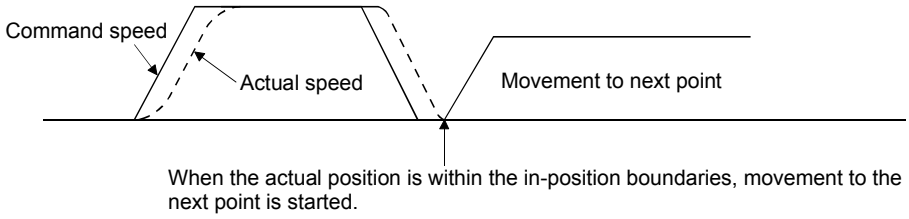
1: Smoothing stop

2: Continue operation

| POINT |
|---|
| ・If the setting of the deceleration check system is incorrect, it causes a point table setting error (operation alarm 25, detail 02) and operation is stopped. |

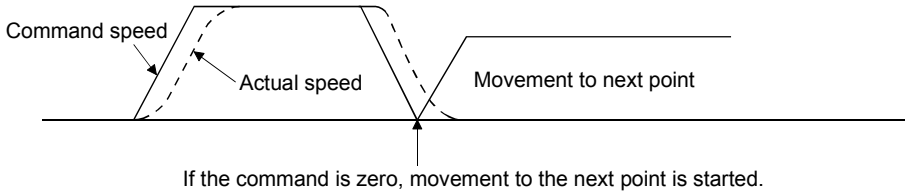
(a) In-position stop

After completion of the command pulse output, if it is in-position, the point movement is completed.




(b) Smoothing stop

After completion of the command pulse output, point movement is complete.




(c) Continue operation

After arriving at the position commanded to go to, the speed is changed to the speed commanded for the next point and movement to the next point is started. The acceleration and deceleration time constants for changing speeds are set to the acceleration and deceleration time constants of the next point.

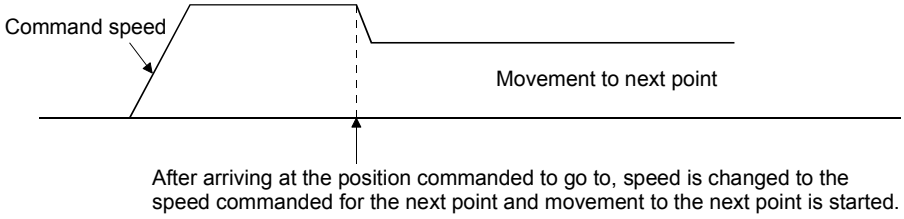
However, continuous operation is not performed under the following conditions.

• When a dwell is set

If there is a dwell defined, after coming to a smoothing stop and completion of the dwell time setting, movement to the next point is started.

• When there is end point

Operation that is the same as a smoothing stop is performed.



For the end point of continuous operation, if the position after deceleration stop exceeds the command position. A selection can be made from the following control option 2 (parameter No.0201).

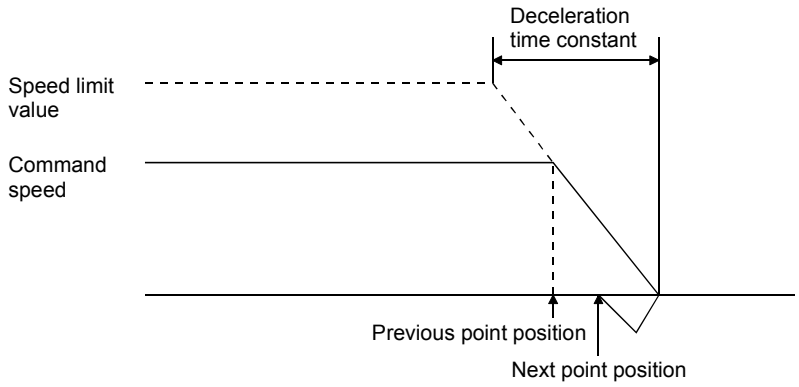
1) Stop by the alarm

2) After completion of the deceleration stop, return to the command position

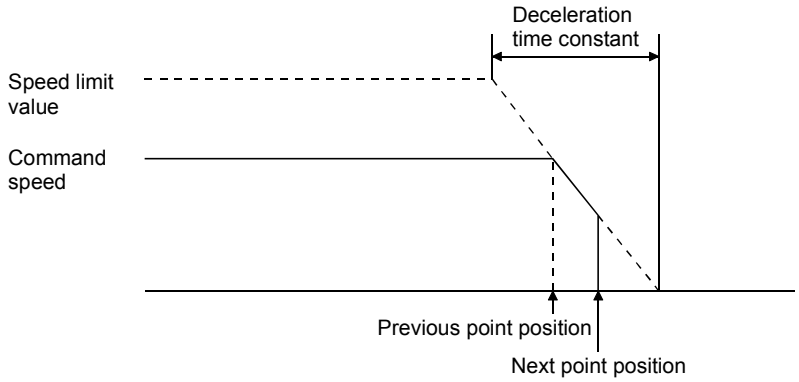
3) Stop at the command position

For selection 2), the stop position over-bound signal (POV) is turned on. The stop position over-bound signal (POV) is turned off at the next start up.

2) After completion of the deceleration stop, return to the command position




3) Stop at the command position




POINT

- There are times, such as that shown below, where the deceleration position exceeds the command position. This causes a position exceeded during positioning (operation alarm 24, detail 01) and operation is stopped.
  - For when the movement direction is reversed when position of the next point from the point designated by the deceleration check system under continuous operation.
  - For the case where deceleration check system goes from continuous operation (point n) to smoothing stop (point n+1) or in-position stop and then goes to reverse direction (point n+2) even when the point table is in this order, if point n+1 positioning distance is not satisfied by the necessary deceleration distance from the point n command speed.

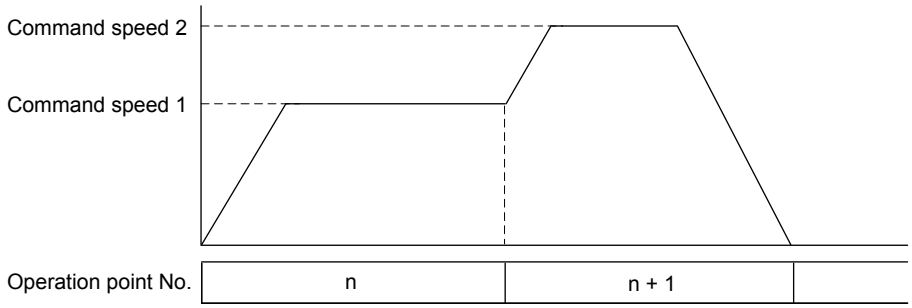
(3) Speed switching point specification

If "2: Continue operation" is selected in the deceleration check system, a point where speed change is completed can be specified.

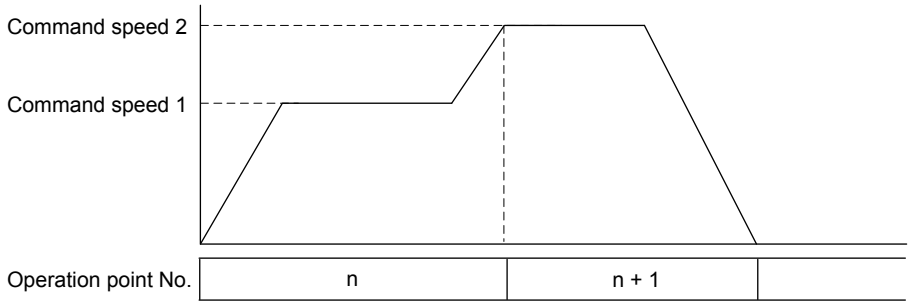
0: After point switching

1: Before point switching

(a) After point switching




(b) Before point switching




POINT

- If "1: Before point switching" is specified, the point table (feed speed) of the next point is imported (read) at start operation or timing when the point switches next point. If the setting of the point table of the next point is incorrect, it causes a point table setting error (operation alarm 25, detail 01) and operation is stopped.

(4) Dwell specification

Specify the system of dwell.

0: Dwell

1: Predwell

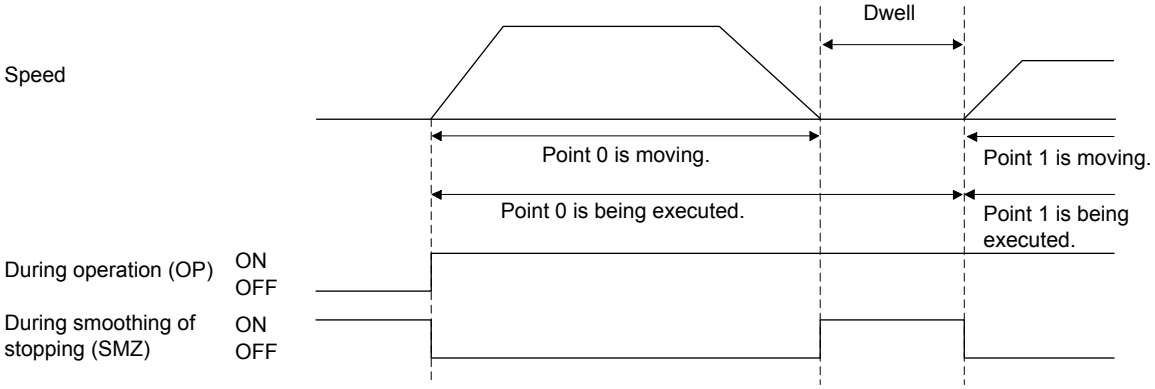
(a) Dwell

Specify the time until executing point is completed after the point movement is completed. For the pass point, after the time specified with dwell has elapsed, the next point starts moving. For the end point, after the time specified with dwell has elapsed, the completion of operation signal (OPF) turns on.

| POINT |
|---|
| ・The setting range of dwell is 0 to 65535ms. |

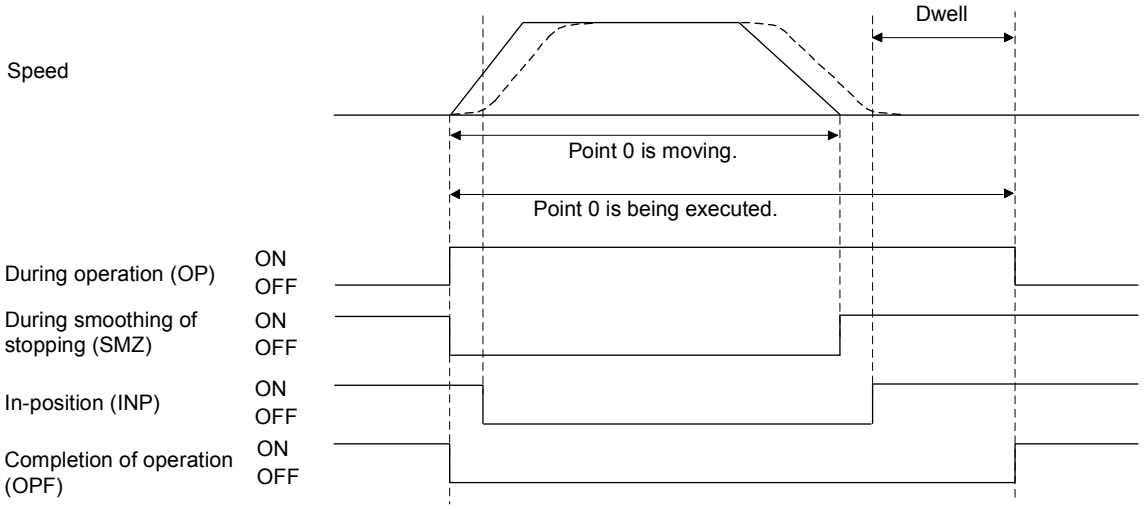
1) When the deceleration check system is Smoothing stop

Time is counted after the during smoothing of stopping signal (SMZ) turns on. The following shows the case for the pass point.




2) When the deceleration check system is In-position stop

Time is counted after the in-position signal (INP) turns on after the during smoothing of stopping signal (SMZ) turns on. The following shows the case for the end point.



3) When the deceleration check system is Continue operation
When dwell is set, the condition of point movement completion is a smoothing stop. Therefore, the control is the same as when Smoothing stop is set to the decelerate check system.

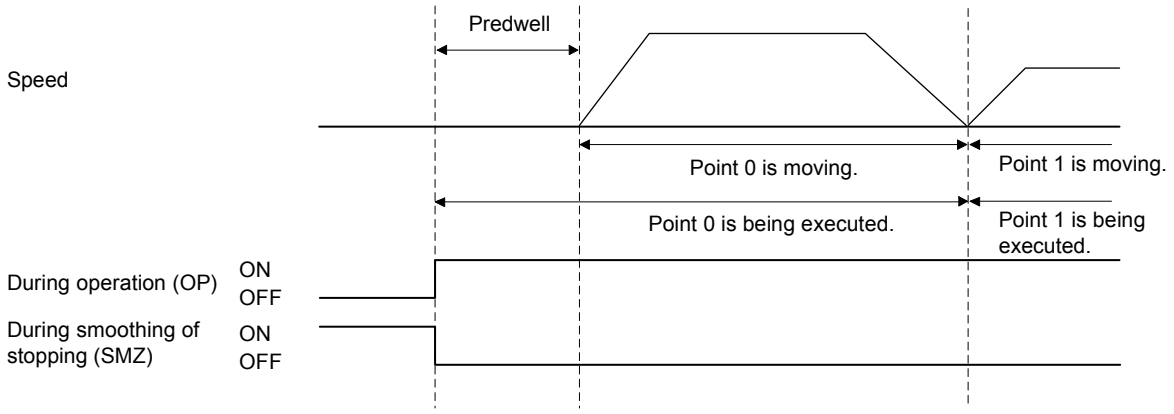
(b) Predwell
Point starts moving after the time specified with predwell has elapsed.

POINT

- The setting of predwell is valid only in the start point. If predwell is set in the other points, it causes a point table setting error (operation alarm 25, detail 0A) and operation is stopped.
- In the initial setting, the setting range of predwell is 0 to 3000ms. If the value which is out of the range is set, it causes a point table setting error (operation alarm 25, detail 0A) and operation is stopped.
  To remove the limit of the setting range, set 1: 0 to 65535ms to predwell setting range (parameter No.0206).

## ⚠CAUTION

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



(5) Pass position interrupt specification

Select valid or invalid for the pass position interrupt.

0: Pass position interrupt invalid

1: Pass position interrupt valid

| POINT |
|---|
| ・This setting in the point data of the start point No. is valid only. If the point data after the start point No. are set, it causes a point table setting error (operation alarm 25, detail 0C) and the operation is stopped. |

(6) Continuous operation to torque control specification

Select valid or invalid for continuous operation to torque control.

0: Continuous operation to torque control invalid

1: Continuous operation to torque control valid

| POINT |
|---|
| • Refer to Section 6.32 for continuous operation to torque control. |

(7) Loop specification

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

0: Not using point table method

1: Loop start point

2' Loop end point

| POINT |
|---|
| • Refer to Section 5.3.6 for loop specification. |

### 5.3.4 Other axes start specification

Set other axes start data number (1 to 32). When the other axes start data number is set, the position board starts the other axes according to other axes start conditions and operation details of their start data. Up to 2 other axes start data number can be set. For details of other axes start function, refer to Section 6.23.

| POINT |
| --- |
| ・ If the setting of the other axes start specification is incorrect, it causes a point table setting error (operation alarm 25, detail 09) and operation is stopped. |

### 5.3.5 S-curve ratio

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

0: S-curve acceleration/deceleration invalid
1 to 100: S-curve acceleration/deceleration

### 5.3.6 Point table loop method

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

(1) Axis data command/status table

Axis data command table

| Address | Content | Setting range |
|---|---|---|
| 102C | Start point No. | 0 to 319 |
| 102D | | |
| 102E | End point No. | 0 to 319 |
| 102F | | |
| 103A | Latest command point No. | 1 to 320 |
| 103B | | |

Axis data status table

| Address | Content | Output range |
|---|---|---|
| 108C | Operation point No. | 0 to 320 |
| 108D | | |

Note 1. The above address is the address for the axis 1. For the axis 2 and above, increase in units of C0h for each axis.
Note 2. Set the latest command point No. to the value of the point number + 1.

(2) Axis status bit

| Address | Bit | Abbreviation | Signal name | When tandem drive is being used |
|---|---|---|---|---|
| 1067 | 0 | PPIOP | Pass position interrupt | Master |
| | 1 | PPIFIN | Pass position interrupt complete | Master |
| | 2 | PPIERR | Pass position interrupt incomplete | Master |
| | 3 | | Reserved | |
| | 4 | | | |
| | 5 | | | |
| | 6 | | | |
| | 7 | AUTLO | In point table loop | Master |

(a) Details on axis command bit

| Abbreviation | Signal name | Function details |
|---|---|---|
| AUTLO | In point table loop | [Function]<br>Indicates that the point table is being used in loop method.<br>[Operation]<br><Conditions for turning on><br>The operation of loop start point set by the auxiliary command loop specification of the operation start point has started.<br><Conditions for turning off><br>One of the following conditions is not satisfied.<br>• The operation of loop end point set by auxiliary command loop specification is completed.<br>• During the operation of a point set by auxiliary command loop specification, an alarm or stop caused the operation to complete. |

(3) Controlling method for using the point table in loop method

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

1) Set the point table and latest command point No.
2) Set the start point No. and end point No. to the start point No. and end point No. of the loop.
3) Turn ON the automatic operation mode signal (AUT).
4) Turn ON the fast start operation signal (FST).
5) After the completion of operation for each point, update (overwrite) the point table, and set the latest command point No.
6) At the completion of operation, set the loop end point to the auxiliary command loop specification, and set the latest command point No.

POINT

- When operation point No. matches the latest command point No., operation waits until the latest command point No. is updated. (Operation is not completed, and remains in a stopped state.)
- When a speed change is conducted during standby, speed change error signal (SCE) turns ON, and speed cannot be changed.
- When a time constant change is conducted during standby, acceleration time constant change error signal (TACE), or deceleration time constant change error signal (TDCE) turns ON, and time constant cannot be changed.
- When the loop start point is specified but the latest command point No. is 0, a point table loop error (operation alarm 5F, detail 01) occurs, and operation does not start.
- When the loop start point is set in one-point operation (start point No. and end point No. are matching), a point table loop error (operation alarm 5F, detail 02) occurs, and operation does not start.
- When a value smaller than start point No. + 1, or a value larger than end point No. + 1 is input to the latest command point No., a point table loop error (operation alarm 5F, detail 03) occurs, followed by a deceleration stop.
- Only the point data for the start point No. is valid for the loop start point of this setting. Point data after the loop start point that is set to the loop start point is invalid.
- After the operation of a point which specifies continuous operation, when the next point has not been updated, a point table loop error (operation alarm 5F, detail 04) occurs, and operation is cancelled with a deceleration stop.
- During an operation that does not use loop method, when the loop end point is specified, a point table loop error (operation alarm 5F, detail 05) occurs, and operation is cancelled with a deceleration stop.
- When specifying switch before point in speed switching point specification, use more three or more points.
- When specifying switch before point in speed switching point specification, update the next point before the start of operation for the specified point. When the next point is not updated before start of operation of the specified point, a point table loop error (operation alarm 5F, detail 06) occurs, and operation is cancelled with a 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 to a point other than the start operation point, the operation is the same as when setting point data after the start point No.

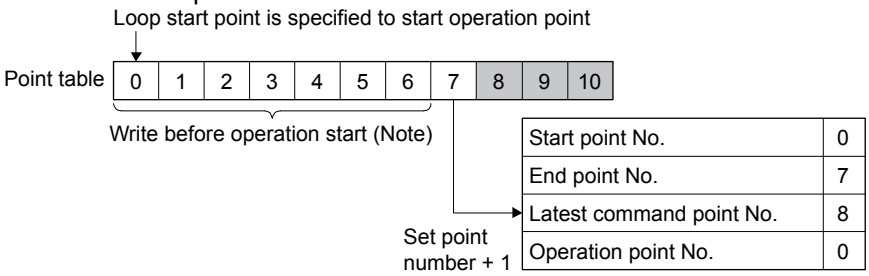
API LIBRARY

- Use the sscSetPointDataEx function for setting of the point table.
- Use the sscSetLatestPointNumber function for setting of the latest command point No.
- Use the sscAutoStart function to perform the procedures in (3) 2) to 4) of this section.
- Use the sscGetDriveFinStatus or sscWaitIntDriveFin functions to check completion of operation.
- Use the sscDriveStop or sscDriveStopNoWait functions to perform stop operation.
- Use the sscSetPointOffset/sscCheckPointOffset functions to set/get point number offset.
- For a detailed procedure from startup of automatic operation to check completion of operation, refer to the sample program "DrivePointLoop" contained on the utility software.

(4) Operation example

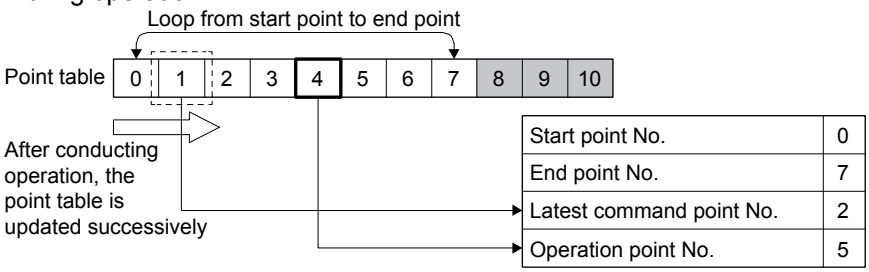
The following is an operation example of using point number 0 to 7.

(a) Before start of operation



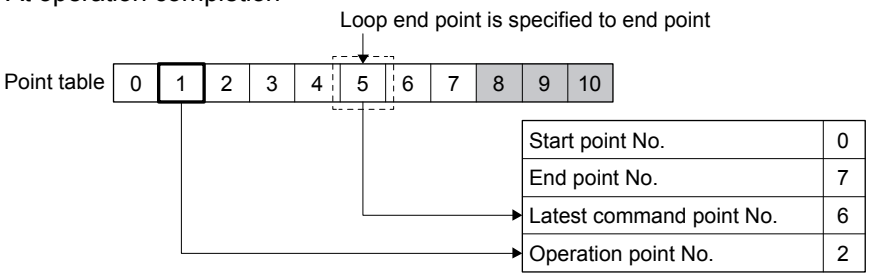

Note. Writing point data for the entire area used in the loop before operation start is not necessary.

(b) During operation




Note. Do not update the point table of operation point No.

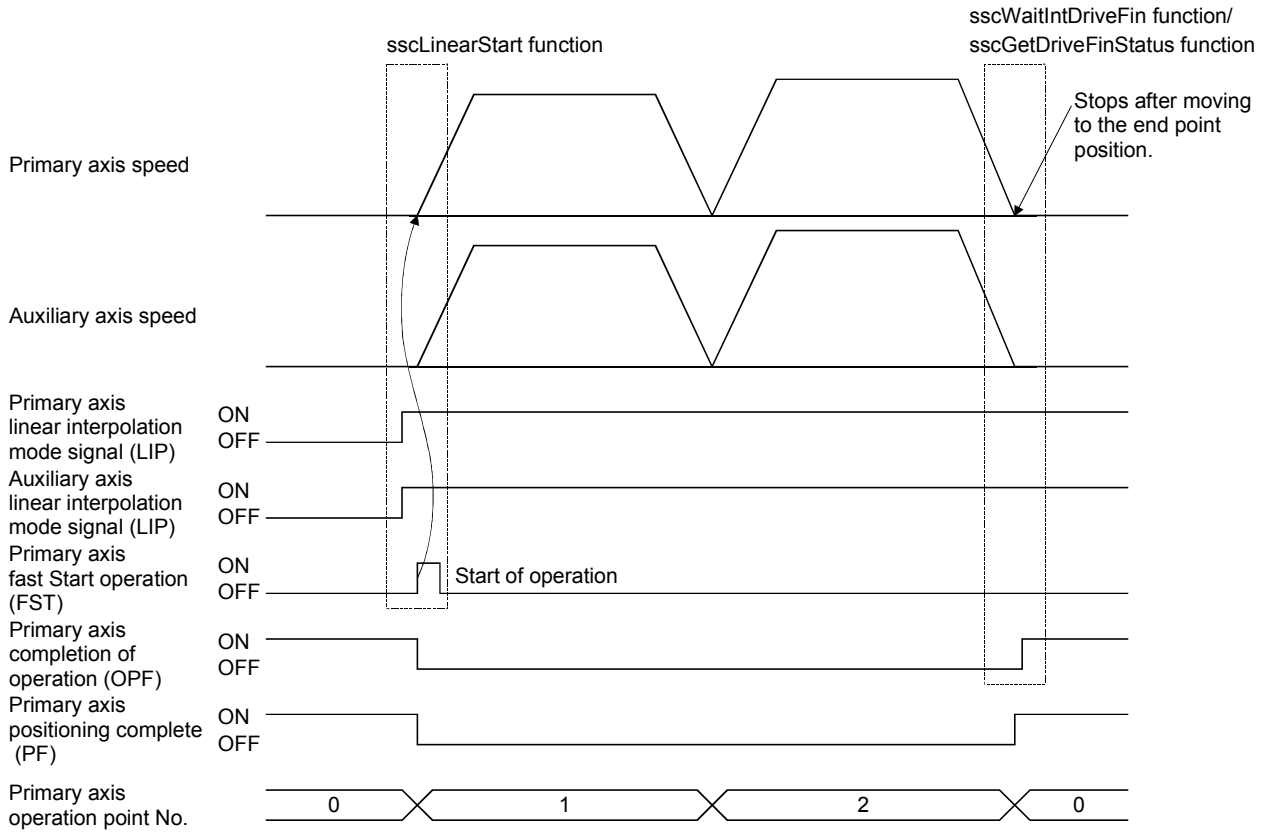
(c) At operation completion



## 5.4 Linear interpolation

### 5.4.1 Summary

Linear interpolation operation has interpolation control performed for the axes set up as a group. This system enables a maximum of 4 axis interpolation control. When the feed speed and position data are defined in the point table and the fast start operation signal (FST) is input, all of the axes setup in the group perform linear interpolation operation. If linear interpolation operation is started prior to completion of home position return (home position return request (ZREQ) is ON), a home position return not complete error (operation alarm 90, detail 01) occurs upon starting operation and the operation stops.
Afterwards, the fast start operation signal (FST) is input on a primary axis and other axes are referred to as auxiliary axes.



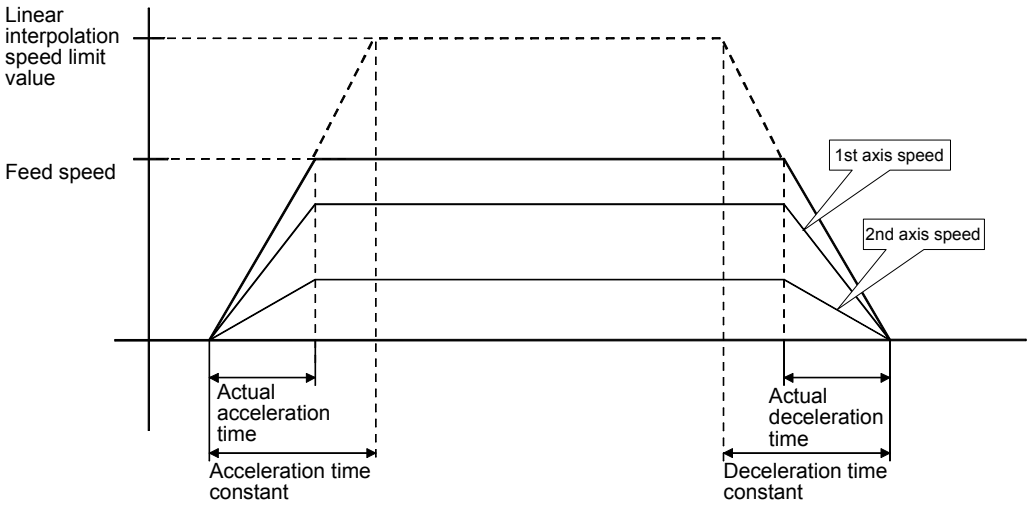

POINT

- The group setting is set using the linear interpolation group (parameter No.0260). If the group number is set to 0, the axis becomes an independent axis, making it so linear interpolation operation can not be performed. The number of groups that can be defined differs with the control cycle and the maximum number of groups is 8.

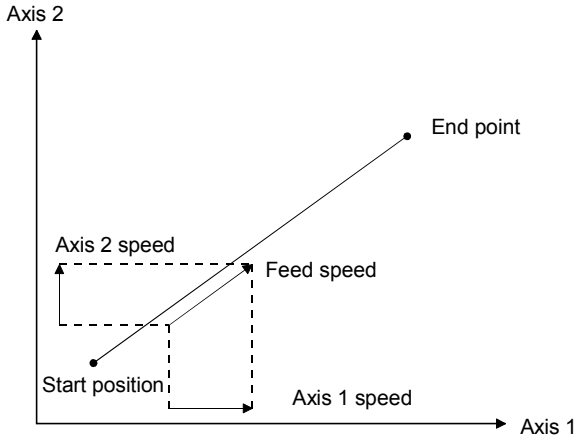
| Control cycle | Valid group number |
|---|---|
| 0.88 ms | 1 to 8 |
| 0.44 ms | 1 to 4 |
| 0.22 ms | 0 |

- The fast start operation signal (FST) is only to be input on a primary axis.

An example of the feed speed and speed of axis 1 and 2 when each axis is interpolated is shown below.




Speed for each axis is figured out by dividing feed speed by distance ratio.



### 5.4.2 Settings

The following items are defined for performing linear interpolation. Refer to Section 5.3 concerning details for the point table.

(1) Setting 1: Items set for all axes to be interpolated.

| Items | Content | Remarks |
|---|---|---|
| Point table | Position data | Define setting within maximum moveable limits.<br>(Maximum moveable limit = 999999999) |
| | Other axes start specification | Define the setting when using the other axes start. |
| | Pass position interrupt specification | Define the setting when using the pass position interrupt. |
| Axis data | Start point No.<br>End point No. | Define the settings such that the number of points between start and finish is the same for all axes in the group configuration. |
| Axis data (command bit) | Linear interpolation mode signal (LIP) | Turn on this bin. |
| Control parameter | Linear interpolation group (parameter No.0260) | Define the valid group number.<br>The maximum number of axes that can be defined for a group is 4.<br>For tandem drive axes, only the master axis must be set. |
| | Speed limit value (parameter No.0222, 0223) | Defines the speed limit for each axis. Used when selecting "speed clamp" or "alarm stop" as control options for excessive speed processing. |

(2) Setting 2: Items defined for the primary axis (axis where start operation signal (ST) is input)

| Items | Content | Remarks |
|---|---|---|
| Point table for primary axis | Feed speed<br>Acceleration time constant (ms)<br>Deceleration time constant (ms)<br>Dwell (ms)<br>Auxiliary command<br>S-curve ratio [%] | |
| Control parameters for the primary axis | Speed units (parameter No.0200)<br>Linear interpolation options (parameter No.0261)<br>Linear interpolation speed limit value (parameter No.0262, 0263)<br>Start up speed (parameter No.0224, 0225)<br>Speed units multiplication factor (parameter No.020E, 020F) | The r/min of the units for speed can not be set. |
| Command data for the primary axis | Latest command point No. | Set when using the point table loop method. |

### 5.4.3 Start operation method

Start operation is performed according to the following procedure.

(1) Define the linear interpolation group, the linear interpolation speed limit, and the linear interpolation options in the control parameters. The group number is valid during system startup. Other than that it is valid during writing of parameters.

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

(3) Set the start point No. and end point No. for all of the axes in the group configuration.
Define the setting so that the numbers of points for all of the aces are the same.

(4) Turn on the linear interpolation 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 stop operation signal (STP) of any axis in the linear interpolation group.
- The operation point No. can be checked in the operation point No. of the axis status table (same as monitor No.030A).
- The point number starts from 0.
- The point table is a total of 320 points for all axes. The number of points distributed to each axis can be adjusted using the point number offset. For details, refer to Section 10.11.
- When using the point table in loop method, the primary axis setting values are valid for the latest command point No., and the start point No. and end point No. of the loop. Update the latest command point No. after writing the point tables of all axes of the group.

API LIBRARY

- Use the sscSetPointDataEx function to set up point data in (2) above.
- Use the sscLinearStart function to perform procedures (3) to (5) above.
- Use the sscDriveStop or sscDriveStopNoWait functions to perform stop operation.
- Use the sscGetDriveFinStatus or sscWaitIntDriveFin functions to check completion of operation.
- Use the sscSetPointOffset/sscCheckPointOffset functions to set/get point number offset.

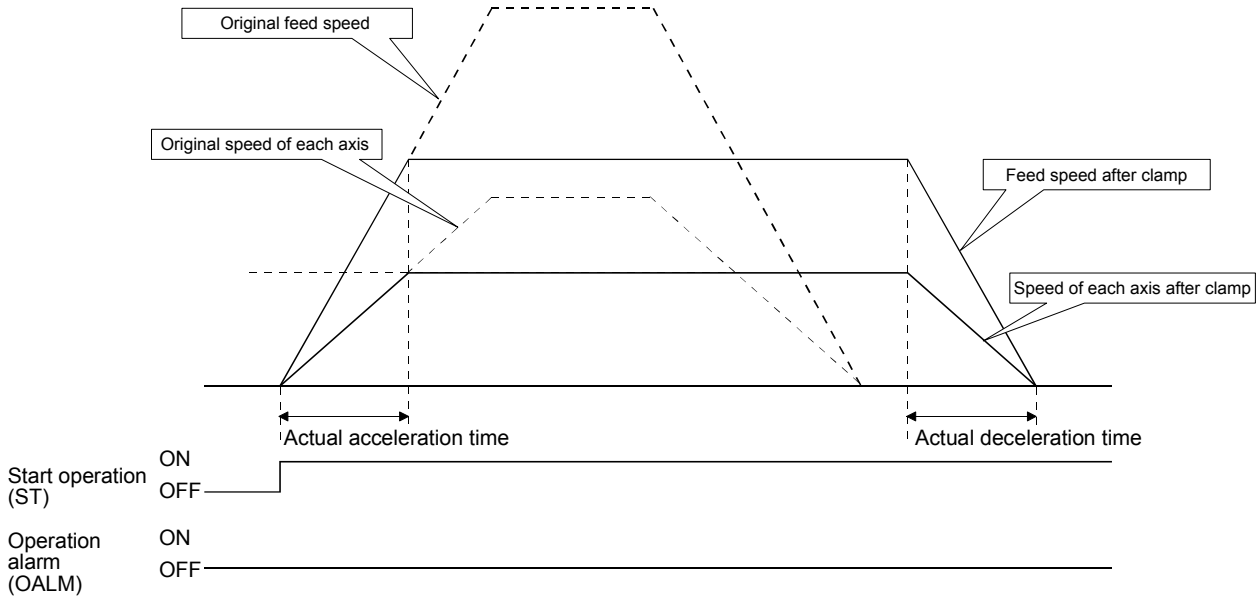
### 5.4.4 Processing for exceeding speed limit for each axis

Processing is different concerning exceeding speed limit for each axis depending on the setting for excessive speed processing (parameter No.0261).

(1) Using a speed clamp

When parameter No.0261 is set to 0, if there is an axis that exceeds the speed limit, other axes grouped with the axis are also clamped.

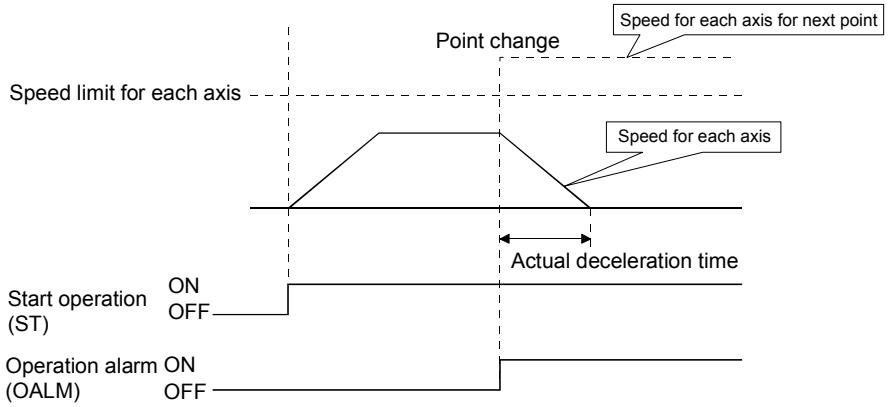
The actual acceleration time is the time until the feed speed after clamping is reached.




(2) For using alarm stop (example for continuous operation point change)

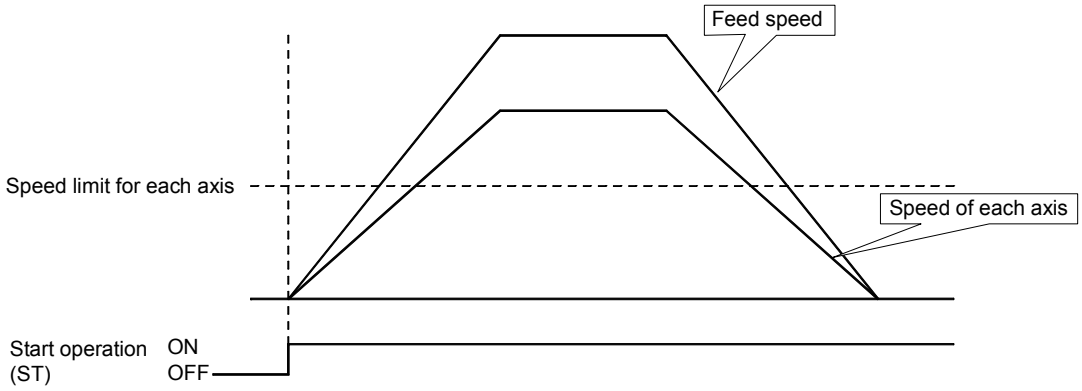
When parameter No.0261 is set to 1, if there is an axis that exceeds the speed limit for point toggling other than start up or continuous operation, an alarm is set and start up can not be performed.

During continuous operation, if there is an axis that exceeds the speed limit, an alarm is set and deceleration to a stop is performed.



(3) No processing

When parameter No.0261 is set to 2, normal operation is continued even if the speed limit is exceeded.




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

5.4.5 Restrictions

The following restrictions apply concerning use of linear interpolation.

(1) A primary axis linear interpolation start up error (operation alarm 40) occurs for the following.
- If axes that have been set to something besides linear interpolation mode (LIP) are included in the same group. (operation alarm 40, detail 01)
- If a single group is defined with 5 or more axes. (operation alarm 40, detail 02)
- If a group number that exceeds the valid group number is defined when performing start operation for linear interpolation. (operation alarm 40, detail 03)
- If the numbers of points defined for axes in the group are different. (operation alarm 40, detail 04)
- If the speed unit (parameter No.0200) is defined to be "2: r/min". (operation alarm 40, detail 05)

(2) A primary axis linear interpolation point data error (operation alarm 41) and an auxiliary axis group error (operation alarm 16, detail 01) occur for the following.
- If there is an axis within the group whose movement amount exceeds the maximum of 999999999. (operation alarm 41, detail 01)
- If the speed limit for the group configured axis is exceeded. (operation alarm 41, detail 02)
  (If excessive speed processing (parameter No.0261) is defined to be "1: alarm stop".)

(3) If there is an auxiliary axis in operation or has an alarm set upon starting linear interpolation mode, "can't start linear interpolation auxiliary axis error" (operation alarm 42) occurs on the primary axis.

(4) If an alarm occurs during operation, the axis that caused the error occurs to the particular alarm and the other axes in the group are set to "group error" (operation alarm 16, detail 01).

(5) If there is an axis such as the axes defined below within the group, a "software limit error" occurs.
- If there is movement from within Software limits to outside the limits. (operation alarm A1, detail 01)
- If there is movement from outside Software limits in the direction of outside the limits. (operation alarm A2, detail 01)

(6) The command change signal is input to the primary axis. Input of the signal to auxiliary axes is invalid.
- When changing speeds.
- When changing time constants.
- When changing position.

## 5.5 Home position return

### 5.5.1 Summary

The home position return enables the establishment of a start position (home position) in positioning control. By performing a home position return, instructed coordinates and machine coordinates will be consistent. When the incremental system method is used, a home position return is required for each power supply. On the other hand, when the absolute positioning detection system is used, performing a home position return restores the current command position even after power supply is turned off. This makes a home position return unnecessary after power is supplied again. Refer to Section 6.21 concerning absolute position detection systems.

The following table shows the methods of home position return. Select the optimum method according to the configuration and application of the machine with the home position return option 1 (parameter No.0240). For any home position return method, when a home position return is completed, the current command position is a position set in the home position coordinates (parameter No.0246, 0247).

| Method | Description |
|---|---|
| Dog method | A method that uses the first Z-phase after the proximity dog rear end as the home position. |
| Data set method | A method that uses a current position as the home position. No proximity dog or Z-phase is necessary. |
| Stopper method | A method that uses the position of the collision stop caused by JOG operation or something similar as the home position. No proximity dog or Z-phase is necessary. |
| Dog cradle method | A method that uses the first Z-phase after the proximity dog front end as the home position. |
| Limit switch combined method | A method that uses the Z-phase prior to the limit switch of the opposite direction to the home position return direction as the home position. |
| Limit switch front end method | A method that uses the limit switch front end of the opposite direction to the home position return direction as the home position. No proximity dog or Z-phase is necessary. |
| Dog front end method | A method that uses the proximity dog front end as the home position. No Z-phase is necessary. |
| Z-phase detection method | A method that uses the nearest Z-phase as the home position. No proximity dog is necessary. |
| Scale home position signal detection method | A method that uses the linear scale home position signal as the home position. |
| Scale home position signal detection method 2 | A method that uses the nearest linear scale home position signal as the home position for home return direction. No proximity dog is necessary. |

POINT

- When using the following home position return methods, set proximity dog signal and limit switch signal so that the Z-phase can be passed during home position return.
  - Dog method
  - Dog cradle method
  - Limit switch combined method
- When performing Z-phase detection method home position return, the Z-phase is required to be passed through with the JOG operation etc.
  When the Z-phase is not passed, not passing Z-phase (operation alarm 91, detail 01) occurs. However, when "1: Not need to pass motor Z phase after the power supply is switched on" is selected in the home position setting condition selection of parameter No.1190 (servo parameter PC17 function selection C-4), the home position return can be executed even when the Z-phase is not passed, and the restriction above is removed.
- Set 1 (valid) in No home position of the control option 1 (parameter No.0200) when setting the position at the time of power on as the home position. Once a home position return is performed, a position determined by the home position return is set to the home position.
- In the home position return, smoothing filter is invalid.
- In the Z-phase detection method, shortcut direction can be selected for home position return direction (parameter No.0240). When shortcut direction is selected in other home position return methods than Z-phase detection method, home position return parameter setting error (operation alarm 9D, detail 03) occurs when the operation starts.

### 5.5.2 Home position return method

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

(1) Software version A4 or before
Set the home position return method with home position return method (parameter No.0240). The value at system startup is effective. Therefore, the system needs to be restarted if the parameters are changed.

(2) Software version A5 or later
The home position return method (parameter No.0240) can be changed while system is running.

POINT

- When home position return method is changed during home position return, the new home position return method becomes valid at the startup of the next home position return.
- Home position return direction and proximity dog input polarity cannot be changed while system is running.
- When Z-phase detection is set to home position return method and shortcut direction is set for home position return direction, the home position return method cannot be changed while system is running. If the home position return is changed, a home position return parameter setting error (operation alarm 9D, detail No.03) occurs at the next home position return startup.
- When a home position return method that does not exist in the home position return setting range is selected, a home position return parameter setting error (operation alarm 9D, detail No.04) occurs at the home position return startup.

5.5.3 Start operation method

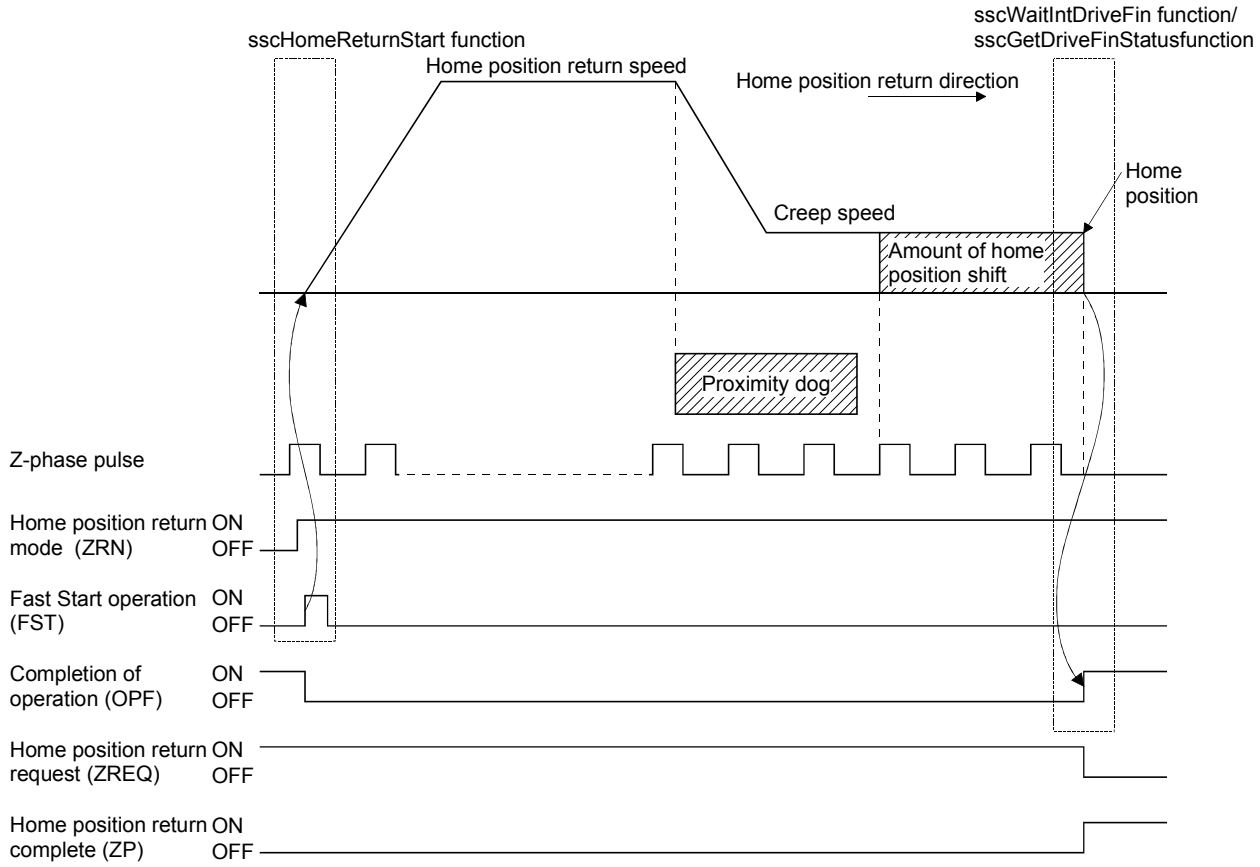
Start operation is performed according to the following procedure.

(1) Set parameters "home position return to speed" (parameter No.0242, 0243), "home position return acceleration time constant" (parameter No.0244), "home position return deceleration time constant" (parameter No.0245), "home position coordinates" (parameter No.0246, 0247), "creep speed" (parameter No.024C), and "home position return direction" (parameter No.0240).

(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 (ZREQ) turns off and the home position return complete signal (ZP) turns on.



POINT

- Set the "amount of home position shift" (parameter No.0248, 0249) and "home position search limit" (parameter No.024A, 024B) if required.
- When a home position return is complete, the home position return complete signal (ZP) turns on. The home position return complete signal (ZP) turns off at the next start operation or at an operation mode change.
- The home position return request (ZREQ) turns on when a home position return starts.

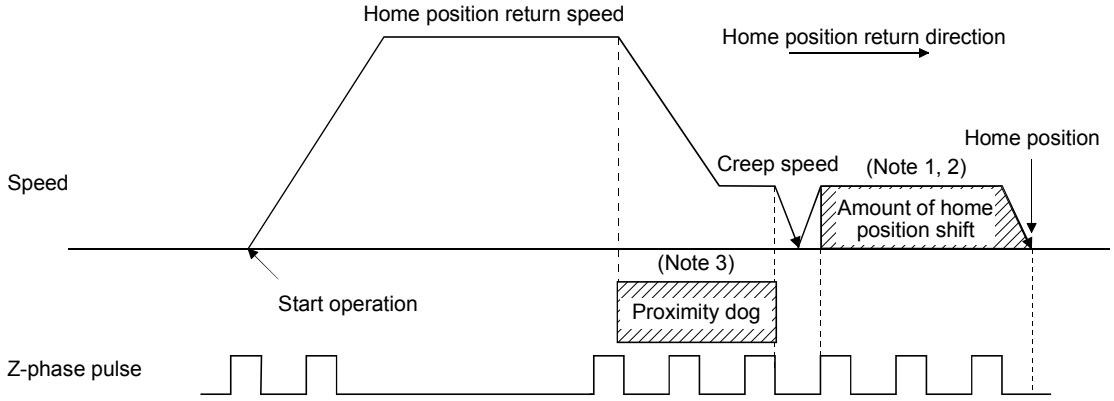
API LIBRARY

- Use the sscHomeReturnStart function to perform procedures (2) to (3) above.
- Use the sscGetDriveFinStatus or sscWaitIntDriveFin functions to check completion of operation.
- Use the sscDriveStop or sscDriveStopNoWait functions to perform stop operation.
- For a detailed procedure from startup of home position return to check completion of operation, refer to the sample programs (InterruptDrive/PollingDrive) contained on the utility software.

### 5.5.4 Home position return using a dog method

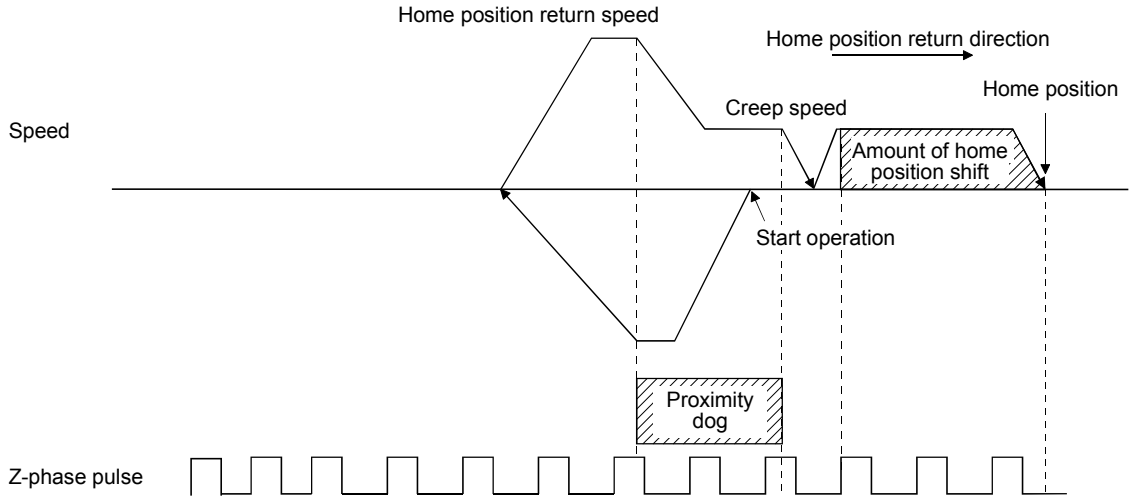
The deceleration is started at the front end of the dog, and the first Z-phase after passing the rear end of the dog is defined as the home position.

(1) When there is a proximity dog in the direction of home position return

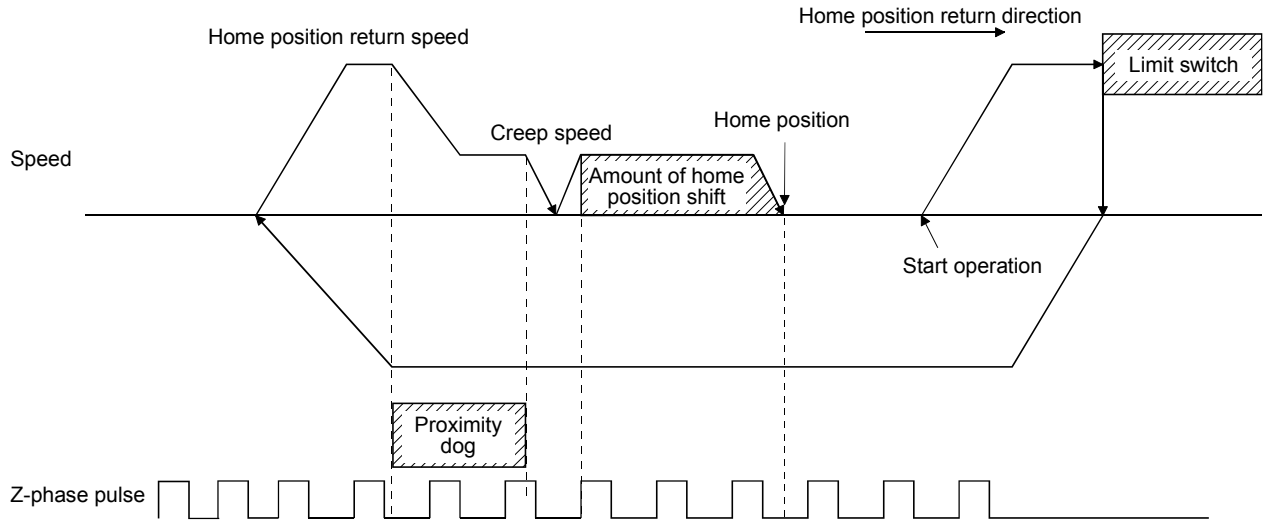



Note 1. The amount of home position offset is set to the amount of shift in the home position (parameter No.0248, 0249).
2. If the amount of shift in the home position is zero, the servo stops above the Z-phase.
3. The polarity of the proximity dog input signal can be changed using home position return option 1 (parameter No.0240). (The above figure shows the case of the normally closed contact.)

(2) When the dog is on at start operation



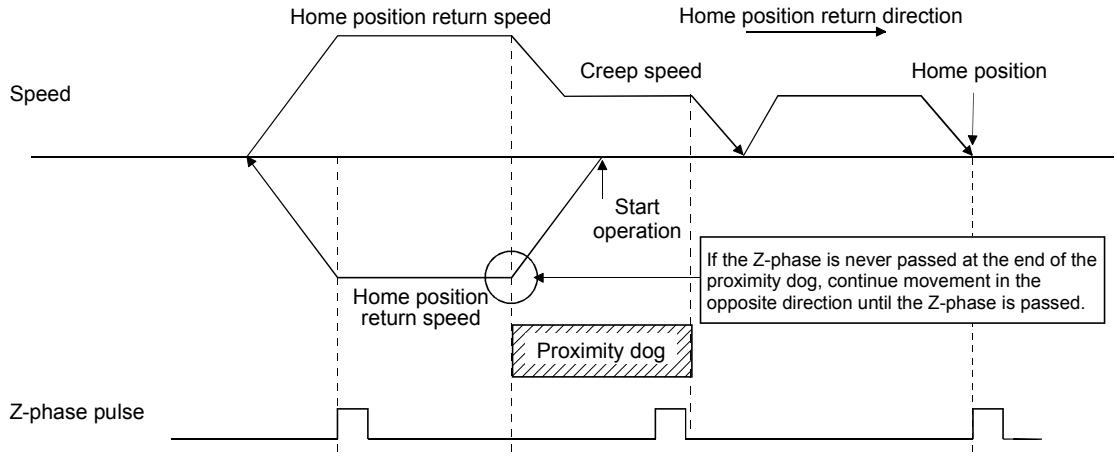
(3) When the proximity dog is in the opposite direction against the direction of home position return




(4) If a limit switch is detected at the start operation position

If a limit switch in the direction of home position return is detected, the home position return should be executed by the (3) pattern. Also, if the limit switch is in the opposite direction against the direction of home position return, the home position return should be executed by the (1) pattern.

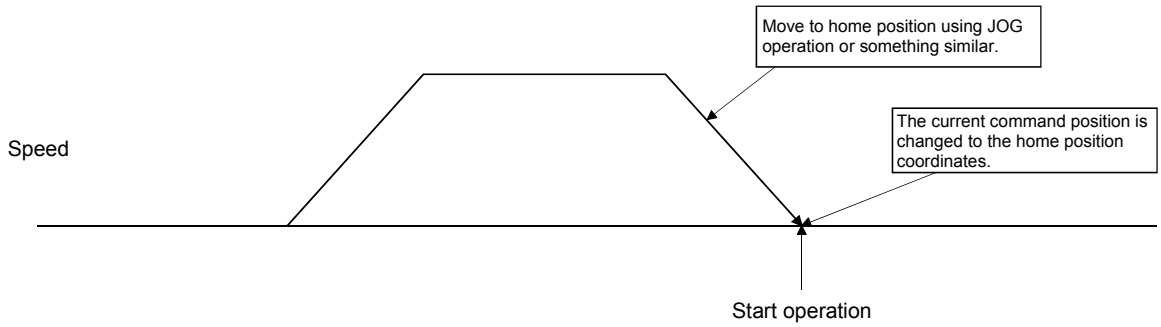
(5) When the start operation position is on a dog and when moving in the opposite direction the Z-phase was not traveled through until the dog is turned off



### 5.5.5 Home position return using a data set method

The command position at the start operation of the home position return is defined as the home position. It is necessary to move to home position using JOG operation or something similar in advance.

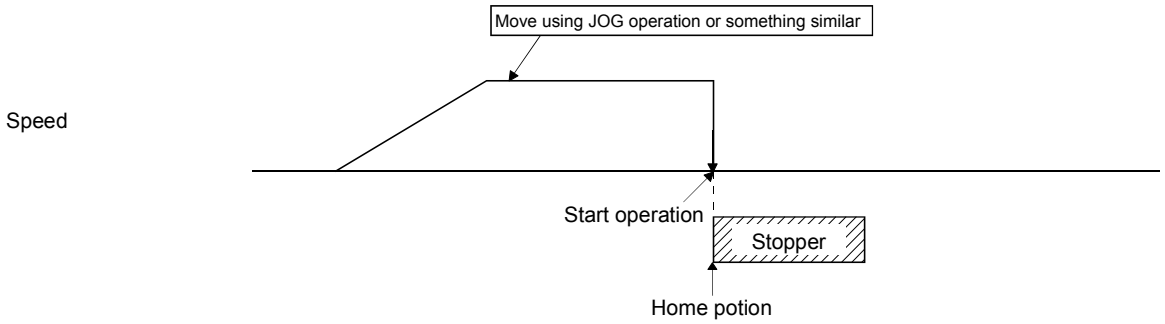
(1) When the home position is the current command position




Note. If limit switch signal is turned off when operation is started, a limit switch (operation alarm A0, detail 01) occurs and home position return cannot be executed.

### 5.5.6 Home position return using a stopper method

When start operation is performed for home position return using stopper method, droop pulse is cleared and current feedback position is defined as the home position.
It is necessary to move using JOG operation or something similar in advance and to execute the collision stop from the stopper using torque limit functions. For the torque limit, refer to Section 6.12.

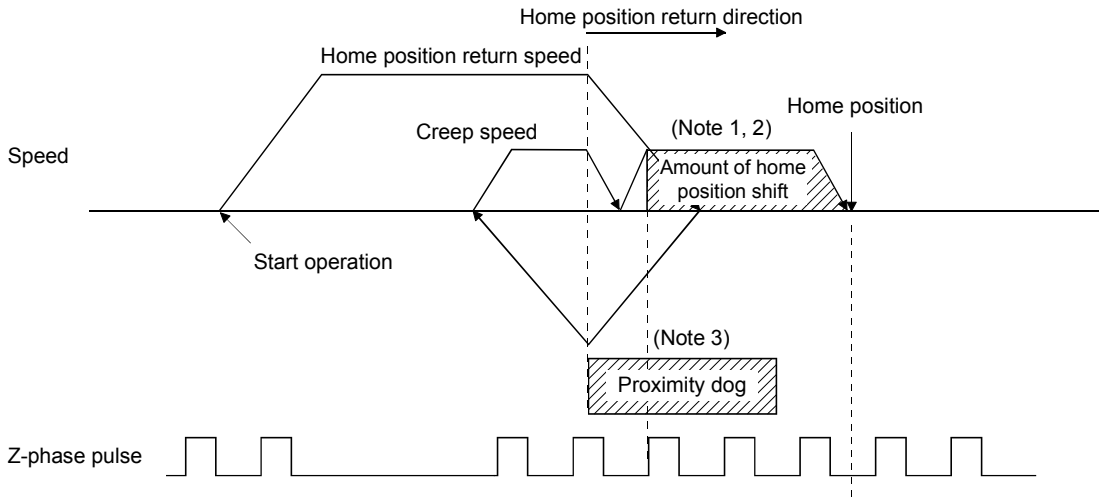



Note1. If torque limit effective signal (TLC) is turned off when operation is started, "Not limiting torque" (operation alarm 95, detail 01) occurs and home position return cannot be executed.
2. If the home position return direction and the stopper method direction are opposite, a home position return direction error (operation alarm 94, detail 01) occurs and the home position return cannot be executed.

### 5.5.7 Home position return using a dog cradle method

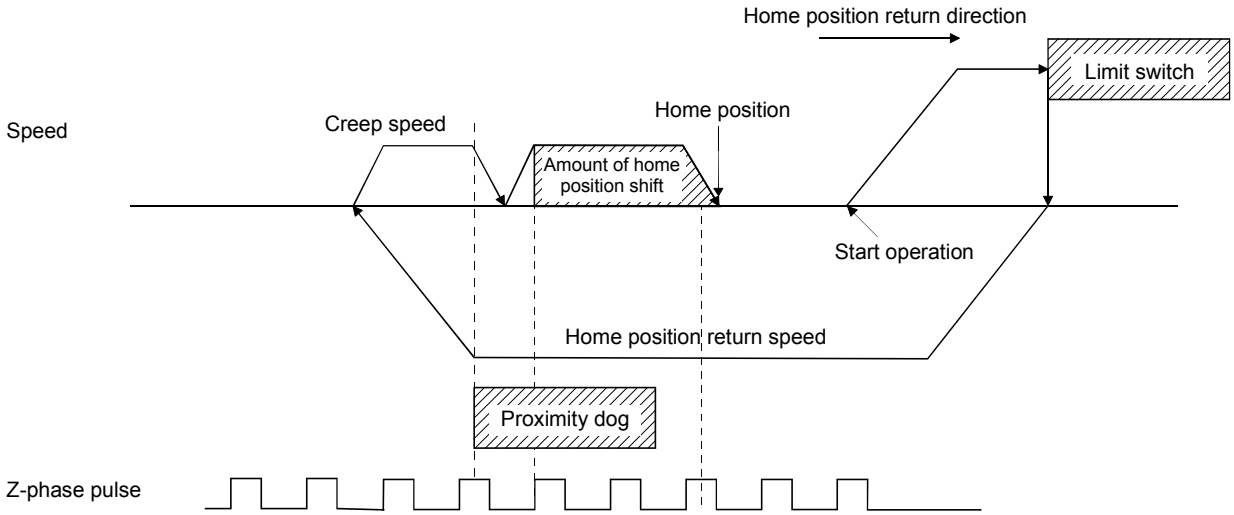
A method where deceleration is started at the front end of the dog, then return briefly to the front end of the dog, and start moving again at a creep, and that uses the first Z-phase after the dog front end passes as the home position.

(1) When there is a proximity dog in the direction of home position return

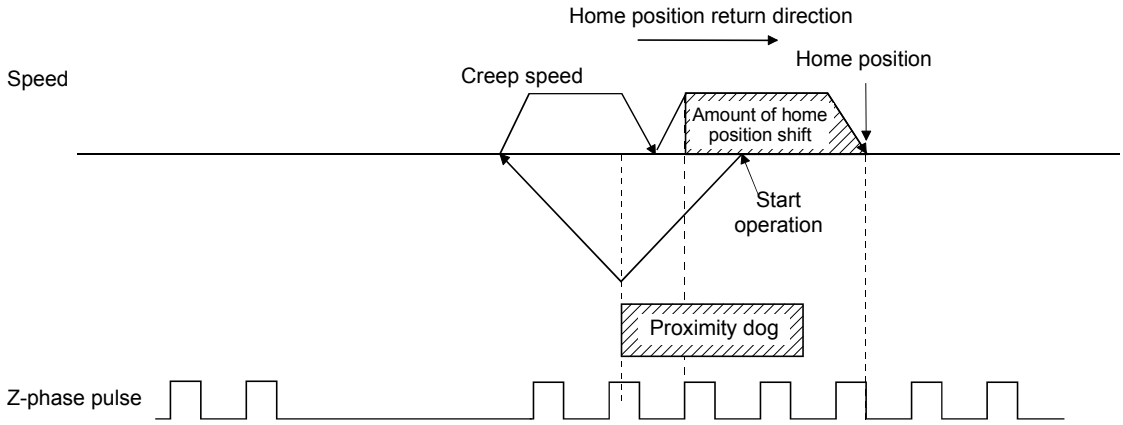



Note 1. The amount of home position offset is set to the amount of shift in the home position (parameter No.0248, 0249).
2. If the amount of shift in the home position is zero, the servo stops above the Z-phase.
3. The polarity of the proximity dog input signal can be changed using home position return option 1 (parameter No.0240).
(The above figure shows the case of the normally closed contact.)

(2) When the proximity dog is in the opposite direction against the direction of home position return.



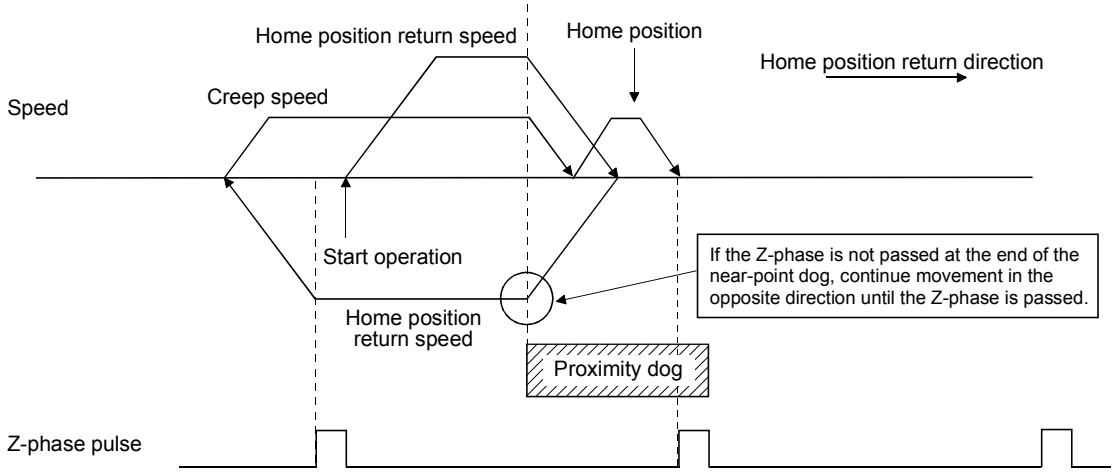
(3) When the start operation position is on the dog



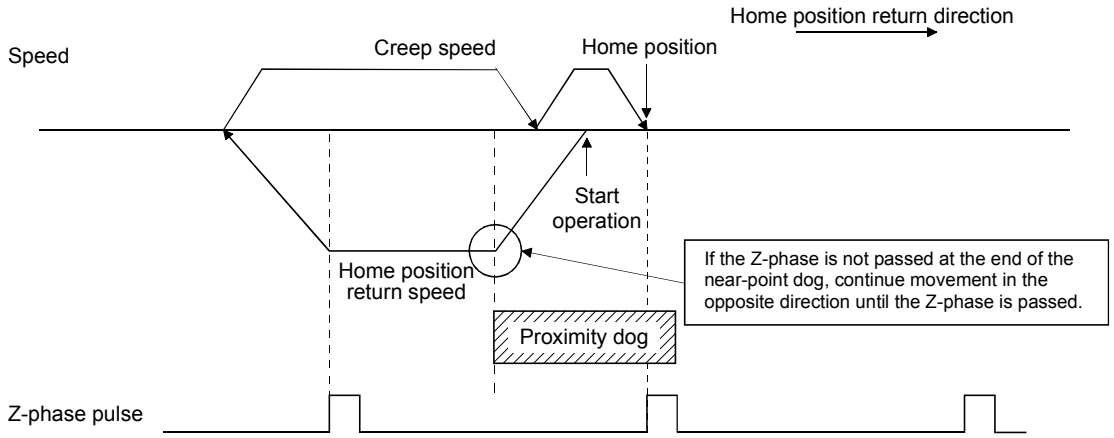

(4) If a limit switch is on at the start operation position

If the limit switch in the direction of home position return is on, the home position return should be executed by the (2) pattern. Also, if the limit switch in the opposite direction against the direction of home position return is on, the home position return should be executed by the (1) pattern.

(5) When the start operation position is on a dog and when moving in the opposite direction the Z-phase is not traveled through until the dog is turned off

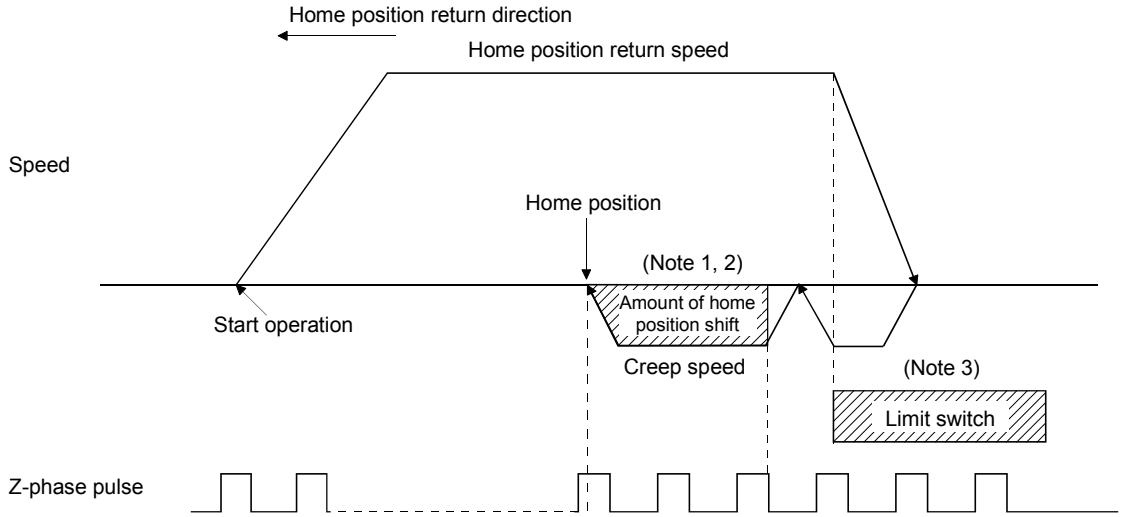



(6) When the start operation position is on a dog and when moving in the opposite direction the Z-phase is not traveled through until the dog is turned off



### 5.5.8 Home position return using a limit switch combined method

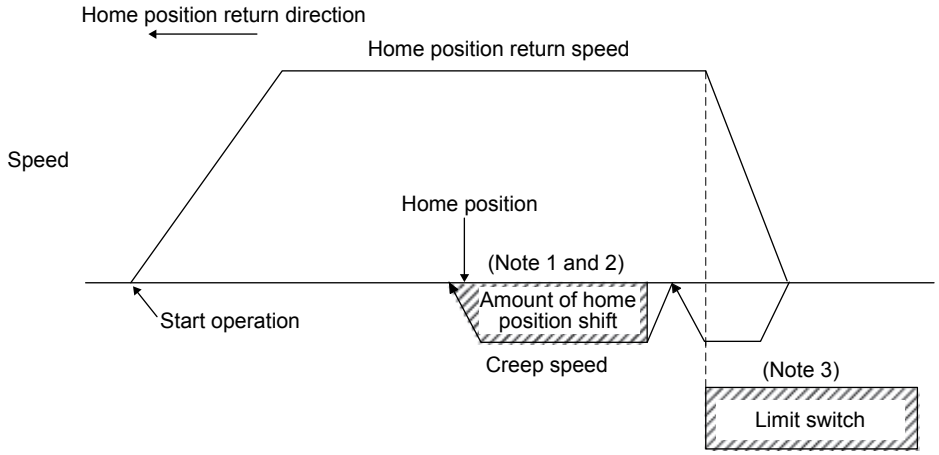
The Z-phase prior to the limit switch of the opposite direction to the home position return direction is defined as the home position.




Note 1. The amount of home position offset is set to the amount of shift in the home position (parameter No.0248, 0249).
2. If the amount of shift in the home position is zero, the servo stops above the Z-phase.
3. Polarity of the limit switch signal is only defined for normally-closed contact.

### 5.5.9 Home position return using a limit switch front end method

In the home position return using a limit switch front end method, the limit switch front end that is opposite to the home position direction is defined as the home position.




Note 1. The amount of home position offset is set to the amount of shift in the home position (parameter No.0248, 0249).
2. If the amount of shift in the home position is zero, the servo stops at the limit switch front end.
3. Polarity of the limit switch signal is only defined for normally-closed contact.

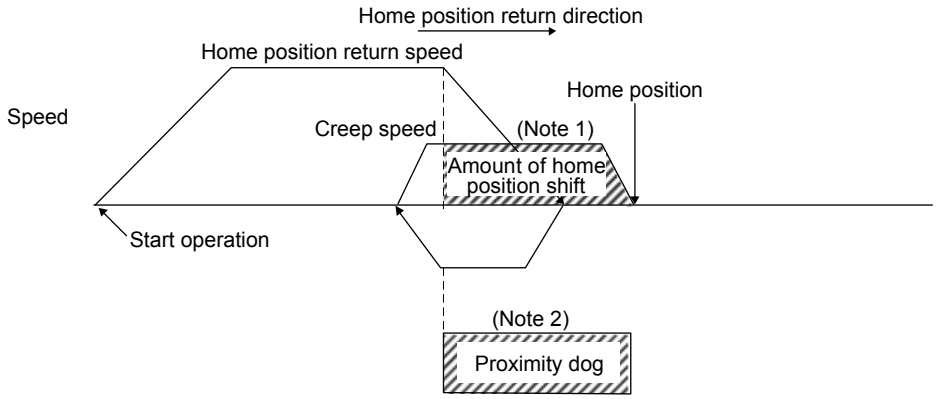
**POINT**

- A dispersion of the home position occurs depending on the detection timing of the limit switch front end. When this dispersion is a problem, the dispersion can be smaller by reducing the creep speed.

### 5.5.10 Home position return using a dog front end method

In the home position return using a dog front end method, the motion detected by the proximity dog slows down to stop, and return to the proximity dog front end, setting there to the home position.

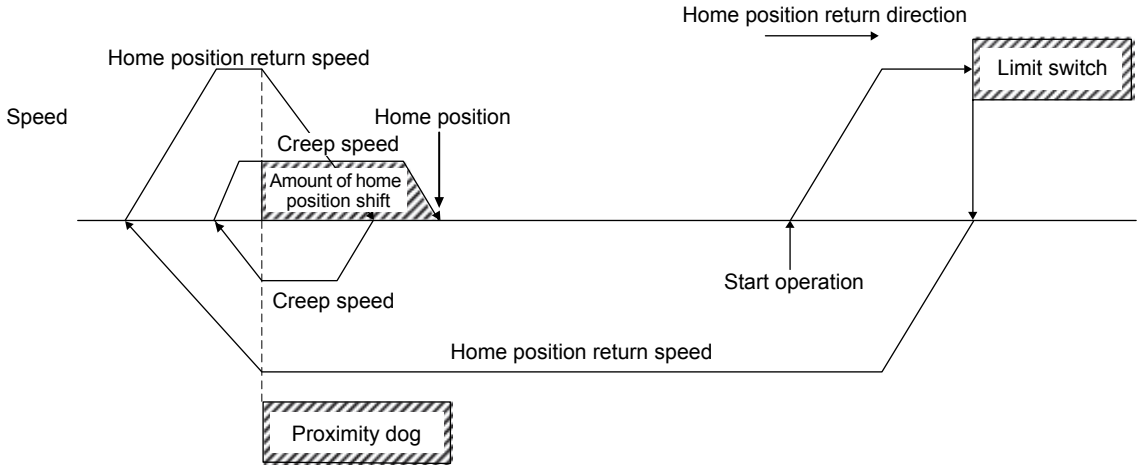
(1) When there is a proximity dog in the direction of home position return



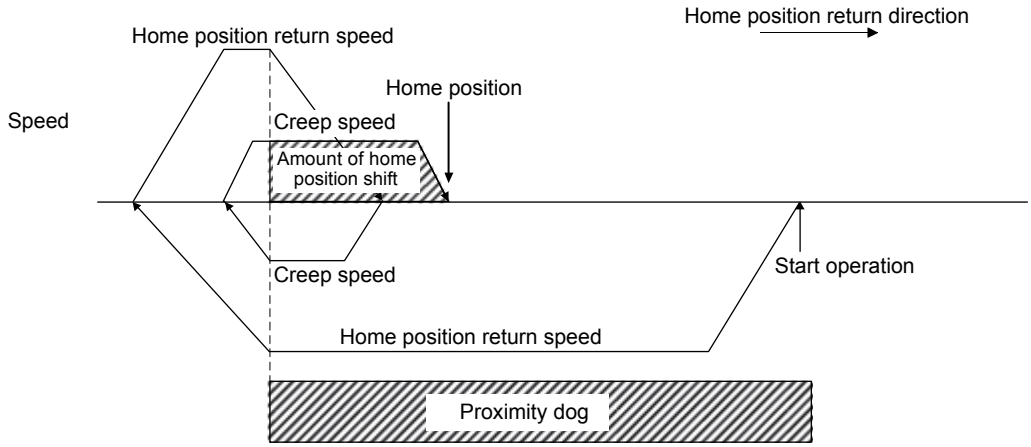

Note 1. The amount of home position offset is set to the amount of shift in the home position (parameter No.0248, 0249).
2. If the amount of shift in the home position is zero, the servo stops at the proximity dog front end.

> **POINT**
>
> ・A dispersion of the home position occurs depending on the detection timing of the dog front end. When this dispersion is a problem, the dispersion can be smaller by reducing the creep speed.

(2) When the proximity dog is in the opposite direction against the direction of home position return



(3) When the start operation position is on the proximity dog

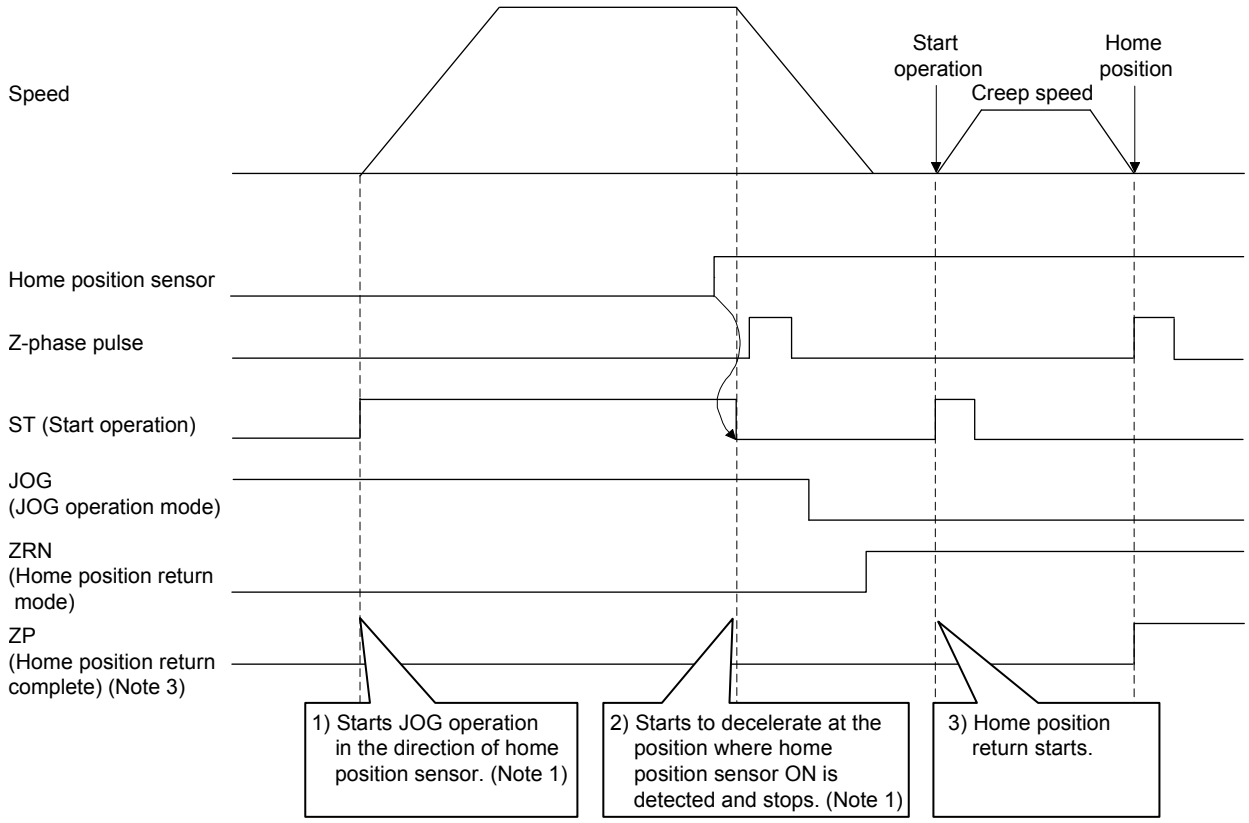



(4) If a limit switch is on at the start operation position

When the limit switch on the same side as the home position return direction is on, the home position return should be executed by the (3) pattern. Also, when the limit switch on the opposite side of the home position return direction is on, the home position return should be executed by the (1) pattern.

### 5.5.11 Home position return using a Z-phase detection method

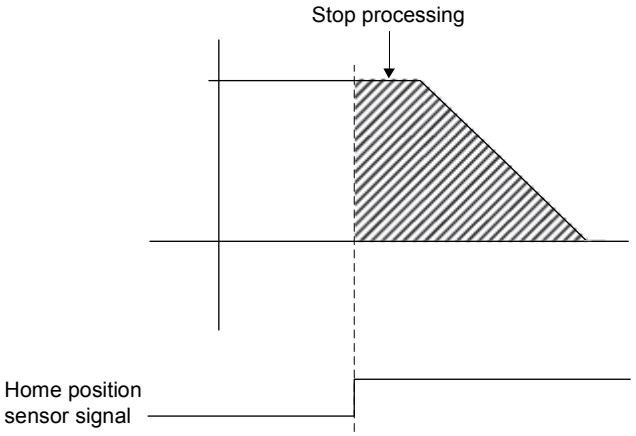
After moving from the position where home position return has started to the nearest Z-phase (in addition, after moving by shift amount when home position shift amount is set), home position return is completed. It is necessary to move to around home position using JOG operation or something similar in advance.
For home position return direction (parameter No.0240), in addition to - direction and + direction, shortcut direction can be selected.
For the shortcut direction, home position return operation is started in the direction where the travel distance to the Z-phase is small. At this time, code of the home position shift amount is consistent with the movement direction from the Z-phase. (Example: If home position shift amount is -100 [command unit], home position is the position moved from Z-phase by -100 [command unit].)




Note1. Home position sensor signal is an externally installed signal and monitored by a user program. Execute the movement to around home position by this signal.
2. When limit switch signal of home position return direction is turned off, limit switch (operation alarm A0, detail 01 to 02) occurs when the operation starts and home position return cannot be executed.
3. When not passing Z-phase (ZPASS) is tuned off, Z-phase not passed (operation alarm 91, detail 01) occurs when the operation starts and home position return cannot be executed. Execute home position return after passing through Z-phase by JOG operation or something similar.
4. When setting of the home position signal re-search (parameter No.0240) is set to "Search again", home position return parameter setting error (operation alarm 9D, detail 02) occurs when the operation starts and home position return cannot be executed. Always set to "Do not search again".

[Cautions]

In the sequence 2) above, stop processing by response delay to the home position sensor signal and deceleration occurs during the time until the axis stops.



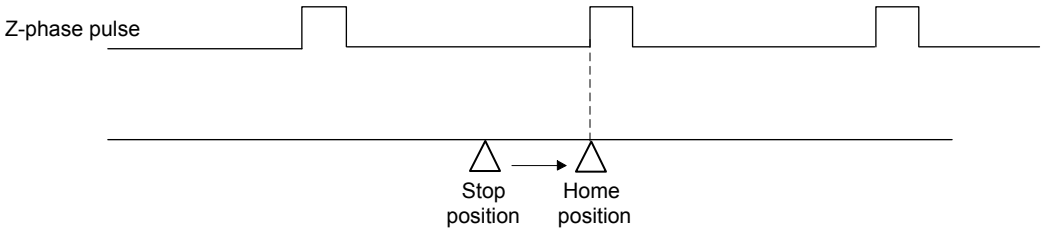

Stop processing = La + Lb + Lc + Ld

La: Travel distance associated with delay time (Ta) from sensor-on to JOG operation stop command issued = (Moving speed)×Ta (Note 1)
Lb: Travel distance associated with delay time (Tb) of position board = (Moving speed)×Tb (Note 2)
Lc: Travel distance associated with delay of servo = (distance equivalent to drop pulse) (Note 3)
Ldc: Distance which deceleration takes =(Moving speed)×(Deceleration time)÷2

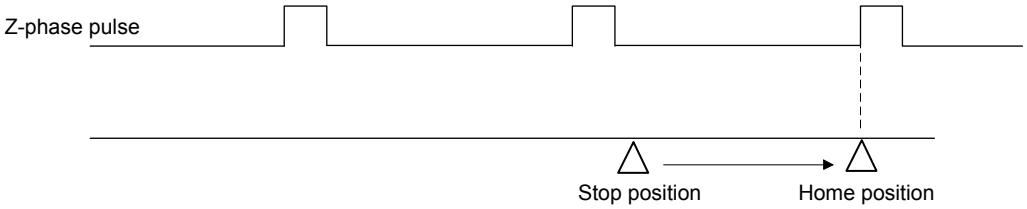
Note 1. Depending on the specification of user program side
2. Tb≒Control cycle×2
3. (Droop pulse)≒(N×Pt)÷(60×PG1)
N: Motor speed (r/min)
Pt: Number of pulses per revolution
PG1: Position loop gain 1
4. The unit of droop pulse calculated here is equivalent to the motor end encoder resolution.

This stop processing changes depending on dispersion of the response delay of the sensor signal. Therefore, reference encoder Z-phase of sequence 3) above may change by one revolution of the motor when stop position is near the encoder Z-phase by the relationship between home sensor position signal and encoder Z-phase.

1) When stop position is before the encoder Z-phase




2) When stop position is after the encoder Z-phase

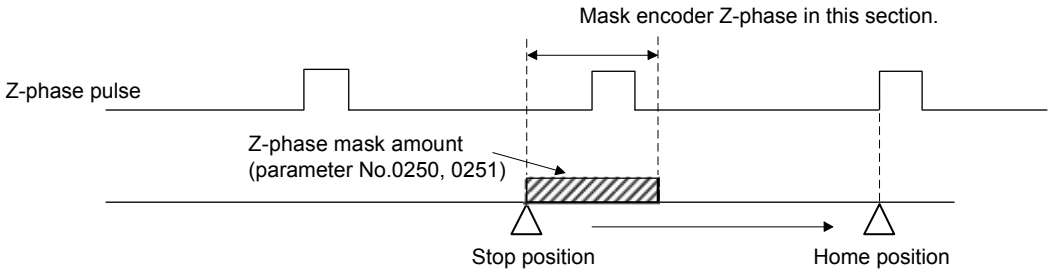



To avoid this event, adjust position relationship between home position sensor signal and encoder Z-phase, adjust the command speed of JOG operation or set correct value to Z-phase mask amount (parameter No.0250, 0251).

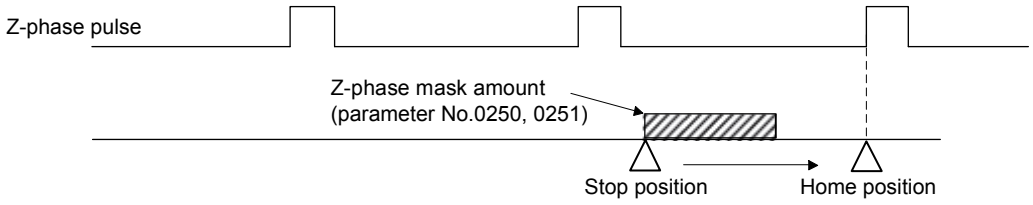
[Encoder Z-phase mask amount]

When the stop position is near the encoder Z-phase by the dispersion, the Z-phase position to be the home position can be fixed by setting encoder Z-phase mask amount.

1) When stop position is before the encoder Z-phase




2) When stop position is after the encoder Z-phase




Note1. When the stop position disperses largely, the home position may change by one revolution of the motor even when encoder Z-phase mask amount is set. In this case, adjust command speed to reduce the dispersion.

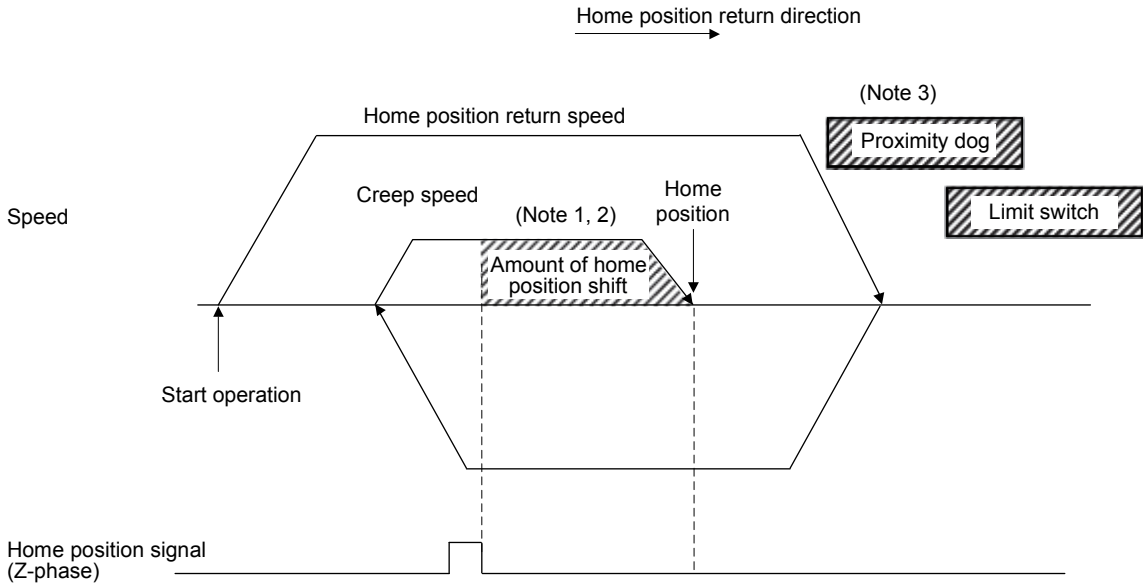
2. When the following conditions are satisfied in the calculation of Z-phase mask amount, Z-phase mask amount setting error (operation alarm 9C, detail 01) occurs when the operation starts and home position return cannot be executed. Reexamine the setting value of the Z-phase mask amount.

(a) The value calculated by Z-phase mask amount × electronic gear numerator (CMX) ÷ electronic gear denominator (CDV) exceeds 32 bits.

(b) The value calculated by the Z-phase mask amount + the travel distance to the Z-phase exceeds 32 bits.

### 5.5.12 Home position return using a scale home position signal detection method

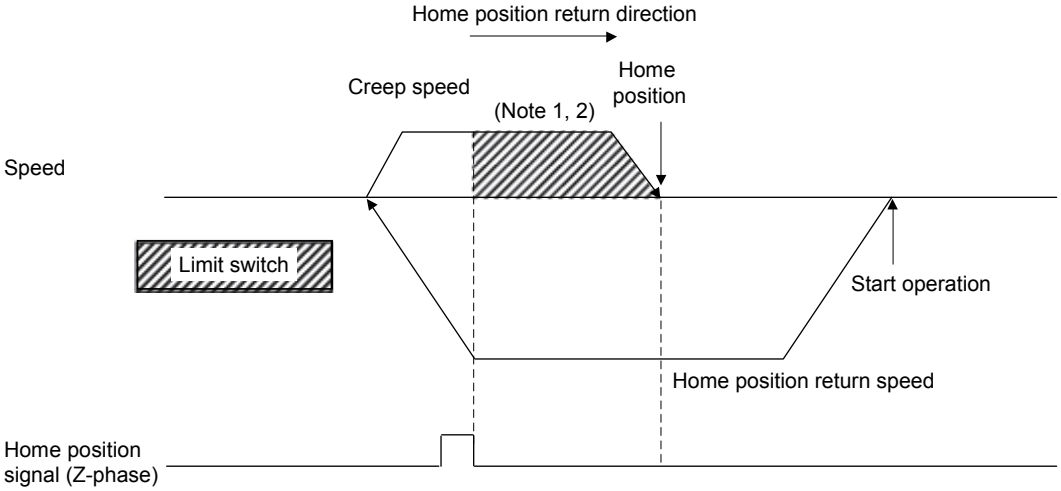
Home position return is performed using a home position signal (Z-phase) on a linear scale. After detecting the proximity dog, move in the opposite direction of the home position and the position where a home position signal is detected is defined to be the home position. When multiple home position signals on the linear scale, the nearest home position signal to the proximity dog is defined as the home position.




Note 1. The amount of home position offset is set to the amount of shift in the home position (parameter No.0248, 0249).
2. If the amount of shift in the home position is 0, the servo stops on the Z-phase.
3. When a limit switch signal is detected, an alarm occurs and execution of return to home position is terminated.
Set the proximity dog signal before the limit switch signal.
Set the proximity dog signal to overlap with the limit switch signal as shown above.

### 5.5.13 Home position return using a scale home position signal detection method 2

Home position return is performed using a home position signal (Z-phase) on a linear scale. Move in the opposite direction of the home position and the position where a home position signal is detected is defined to be the home position. When multiple home position signals in the linear scale, the nearest home position signal in the opposite direction of home position return direction is defined as the home position.




Note 1. The amount of home position offset is set to the amount of shift in the home position (parameter No.0248, 0249).
2. If the amount of shift in the home position is 0, the servo stops on the Z-phase.
3. When a limit switch signal is detected, an alarm occurs and execution of return to home position is terminated. Set the home position signal before the limit switch signal.
4. Start position is needed to be adjusted with a user program so that the Z-phase is passed.
5. When there are multiple Z-phase, start position is needed to be adjusted with a user program so that the reference Z-phase is passed first.
6. Z-phase mask function cannot be used.
7. The servo returns to Z-phase after detecting the Z-phase, movement direction is reversed, which is different from home position return using a Z-phase detection method.

## 5.6 Home position reset function (data set function)

The home position reset function (data set function) is a function that resets the current position to the home position. Prior to executing the home position reset function, set the home position coordinates (parameter No.0246, 0247). The movement is the same as the data set method return to home position, where the current position is changed to the home position coordinates (parameter No.0246, 0247). This function can be used independent of the method for returning to home position. If absolute position detection system is used, whether or not data for absolute position detection system (home position multiple revolution data (parameter No.024D), home position within 1 revolution position (parameter No.024E, 024F)) are changed can be selected using return to home position option 2 (parameter No.0241).
The home position reset function is valid after home position return complete. If the home position reset function is used prior to home position return finish (home position return request (ZREQ) is ON), a home position return not complete error (operation alarm 90, detail 01) occurs.

Start operation is performed according to the following procedure.

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

(2) Set home position coordinates for resetting.

(3) Turn on the home position reset mode (DST).

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

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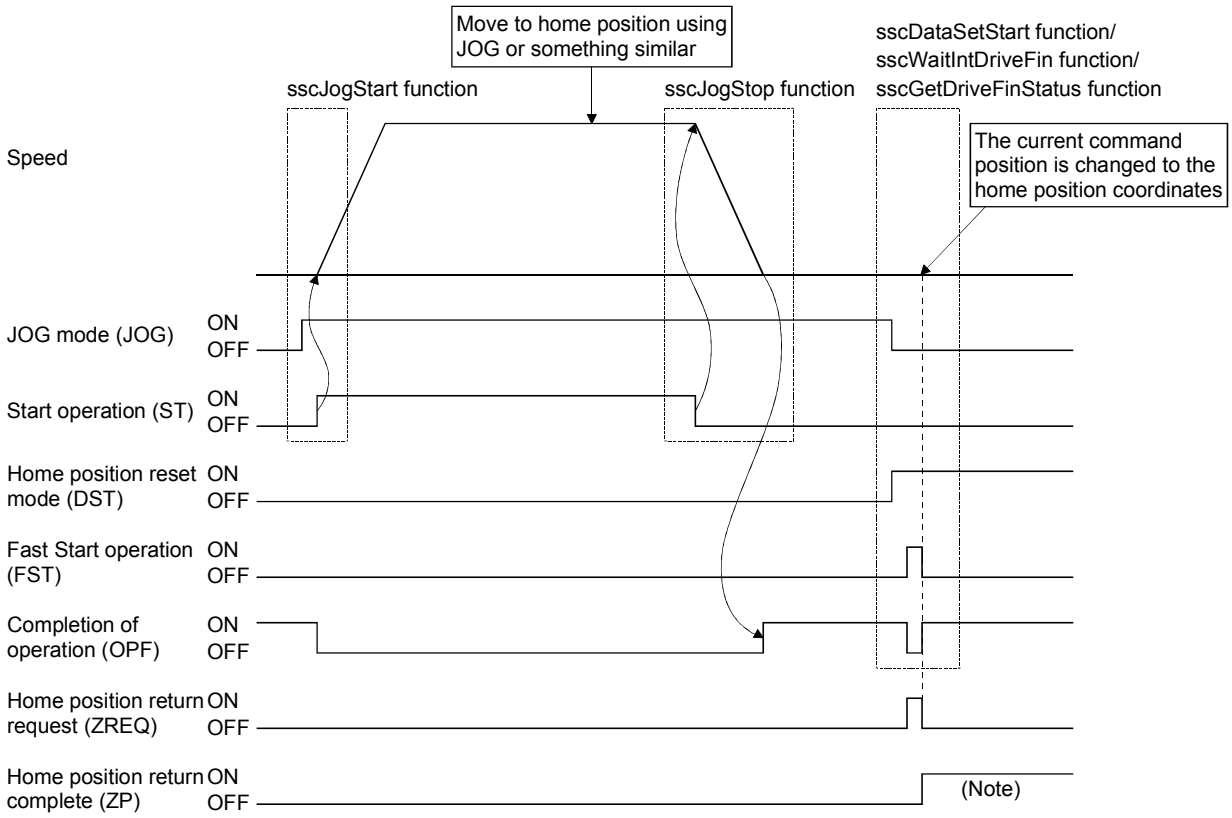
| --- |
| ・Use the sscDataSetStart function to perform procedures (3) to (4) above.<br>・Use the sscGetDriveFinStatus or sscWaitIntDriveFin functions to check completion of operation. |




Note. The home position return complete signal (ZP) is turned off when next start of operation for the following is performed.

# MEMO

# 6. APPLICATION FUNCTIONS

## 6.1 Command units

### 6.1.1 Position command unit - electronic gear

Set position command (such as position data of point table and the incremental movement amount) by position command unit. Electronic gears (parameter No.020A, 020B, 020C, 020D) are used to adjust 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.

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

The number of encoder pulses per revolution is 4194304 or less (normal servo motor, linear servo motor etc.).

| Item | | Setting range | Number of encoder pulses per revolution [pulse] (Note 1) | Maximum speed [r/min] (Note 2,3) |
|---|---|---|---|---|
| Electronic gear | CMX | 1≤CMX≤5242879<br>(When the speed unit is position command unit/s or position command unit/min) | To 67108864<br>(The resolution of up to 26 bit is supported.) | Limits the speed to 2160000 × (262144/number of encoder pulses per revolution) × (CMX/CDV) or less, and to 4893355 × (262144/number of encoder pulses per revolution) or less |
| | | 1≤CMX≤477218<br>(When the speed unit is r/min) | | |
| | CDV | 1≤CDV≤589823 | | |
| | CMX/CDV | 1/16≤CMX/CDV≤100000 | | |

Note 1. When a linear servo motor is used, this becomes the value which is set in "Stop interval setting for home position return" of the linear/direct drive motor function selection 1 (parameter No.1300).

2. When the command speed output to the servo amplifier from the position board exceeds the motor maximum revolution speed, the speed is limited to the motor maximum revolution speed (monitor No.0114).

3. When a linear servo motor is used, this is converted into maximum speed [r/min] by the following formula.

$$\text{Maximum speed [r/min]} = \frac{\text{Motor maximum speed[m/s]}\times1000\times1000\times60}{\text{Linear encoder resolution[μm/pulse]}\times\text{Stop interval setting for home position return[pulse]}}$$

However,

$$\text{Linear encoder resolution [μm/pulse]} = \frac{\text{Linear encoder resolution setting Numerator (Parameter No.1301)}}{\text{Linear encoder resolution setting Denominator (Parameter No.1302)]}}$$

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- Use the sscChange2Parameter/sscCheck2Parameter functions to set/get electronic gear.

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

| Number of encoder pulses per revolution [pulse] | Electronic gear (CMX/CDV) | Maximum speed (limited) [r/min] |
|---|---|---|
| 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 |

Note. 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 user program and make sure the setting value of the electronic gear (CMX/CDV) becomes larger. (The command unit becomes rough.)

### 6.1.2 Settings

Control parameters

| Parameter No. | (Note) Abbreviation | Name | Initial Value | Unit | Setting range | Function |
|---|---|---|---|---|---|---|
| 020A | *CMXL | Electronic gear numerator (lower) | 0001h | | 1 to 5242879 (32 bits) | Set the numerator for electronic gears. |
| 020B | *CMXH | Electronic gear numerator (upper) | 0000h | | | |
| 020C | *CDVL | Electronic gear denominator (lower) | 0001h | | 1 to 589823 (32 bits) | Set the denominator of the electronic gear. |
| 020D | *CDVH | Electronic gear denominator (upper) | 0000h | | | |

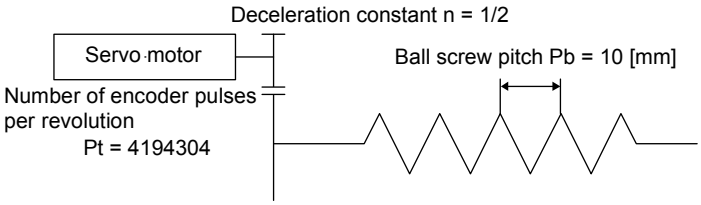
Note. The parameters with a * mark at the front of the parameter abbreviation become valid when the system is started.

### 6.1.3 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 ball screws.

(1) Equipment specification

| Item | Symbol | Value | Unit | Remarks |
|---|---|---|---|---|
| Ball screw lead | Pb | 10 | mm | =10000μm |
| Deceleration ratio | n | 1/2 | | |
| Number of encoder pulses per revolution | Pt | 4194304 | pulse/rev | |




(2) Calculation of electronic gears

$$\frac{CMX}{CDV} = \frac{Pt}{\Delta S} = \frac{Pt}{n \cdot Pb} = \frac{4194304}{1/2 \cdot 10000} = \frac{4194304}{5000} = \frac{400000h}{1388h}$$

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

(3) Parameter settings

Because the value obtained by calculating the electronic gear is within the setting range, the value can be set without reducing.

| Parameter No. | (Note) Abbreviation | Name | Setting value |
|---|---|---|---|
| 020A | *CMXL | Electronic gear numerator (lower) | 0000h |
| 020B | *CMXH | Electronic gear numerator (upper) | 0040h |
| 020C | *CDVL | Electronic gear denominator (lower) | 1388h |
| 020D | *CDVH | Electronic gear denominator (upper) | 0000h |

Note. The settings for the parameters with a * mark at the front of the abbreviation are validated when the system is restarted.

### 6.1.4 Restrictions

The restrictions on electronic gears are shown below.

(1) When the setting of an electronic gear (CMX, CDV, CMX/CDV) is incorrect, an electronic gear setting error (system error E500) occurs at 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.

(2) 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 (ZREQ) turn on. For the absolute position detection system, refer to Absolute position detection system (Section 6.21).

(3) When an electronic gear setting error occurs, the axis with wrong electronic gear set can be confirmed with "electronic gear setting error axis information" (monitor No.0488 to 0489).

## 6.2 Speed unit

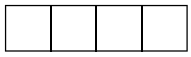
The speed command (feed speed of point table, manual feed speed, etc) is set by the speed unit. Speed units are adjusted using the speed units and the speed units multiplication factor (parameter No.020E, 020F) of the control option 1 (parameter No.0200). Through changing the speed units, movement can be performed at an arbitrary unit and multiplication of speed.

API LIBRARY

- Use the sscChange2Parameter/sscCheck2Parameter functions to set/get speed unit.

### 6.2.1 Settings

Control parameters

| Parameter No. | (Note) Abbreviation | Name | Initial Value | Unit | Setting range | Function |
|---|---|---|---|---|---|---|
| 0200 | *OPC1 | Control option 1 | 0001h | | 0000h to 2111h |  |
| 020E | SUML | Speed units multiplication factor (lower) | 2000h | | 1 to 32768 (32 bit) | Set the speed command multiplication. |
| 020F | SUMH | Speed units multiplication factor (upper) | 0000h | | | |

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

### 6.2.2 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.

(1) Equipment specification
The equipment specification is same as that of Section 6.1.

(2) 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

| Parameter No. | (Note) Abbreviation | Name | Setting value |
|---|---|---|---|
| 0200 | *OPC1 | Control option 1 | 0 ■■■ h |
| 020E | SUML | Speed units multiplication factor (lower) | 03E8h |
| 020F | SUMH | Speed units multiplication factor (upper) | 0000h |

Note. The settings for the parameters with a * mark at the front of the abbreviation are validated when the system is restarted.

### 6.2.3 Speed limit

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

(1) When the speed command exceeds the speed limit (parameter No.0222, 0223), the speed is limited to the speed limit.

Control parameters

| Parameter No. | Abbreviation | Name | Initial Value | Unit | Setting range | Function |
|---|---|---|---|---|---|---|
| 0222 | SPLL | Speed limit value (lower) | 0BB8h | Speed units | 0000h to FFFFh | Set the value for the moving speed limit. |
| 0223 | SPLH | Speed limit value (upper) | 0000h | | 0000h to 7FFFh | |

(2) When the command speed output to the servo amplifier exceeds the motor maximum revolution speed, the speed is limited to the motor maximum revolution speed. The motor maximum revolution speed can be checked in the motor maximum revolution speed (monitor No.0114) and the motor permissible pulse rate (monitor No.0120, 0121).

(3) The position board calculates the command speed of the servo amplifiers using the speed setting, speed units multiplication factor and electronic gears; however, if an overflow occurs in the calculation process due to high command speed etc., the speed is limited to the calculable maximum value. The calculable maximum value is checked in the maximum output pulse rate (monitor No.0122, 0123) of the servo information.

## 6.3 Acceleration/deceleration

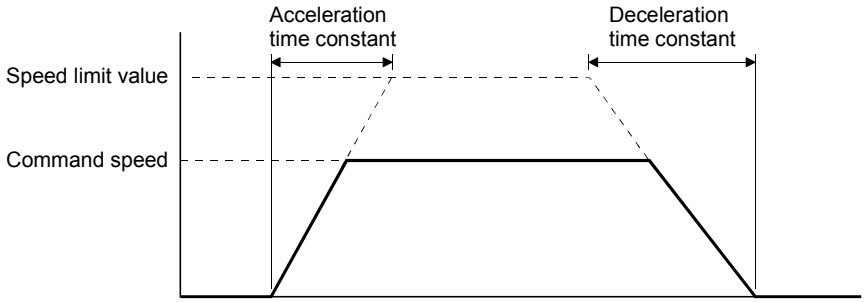
The method of acceleration/deceleration can be set by Speed options (parameter No.0220).

| POINT |
|---|
| ・The setting at starting operation is valid for the method of acceleration/deceleration. If the method of acceleration/deceleration is changed during operation, the change is not made. It is validated (changed) the next time operation is started. |

| API LIBRARY |
|---|
| ・Use the sscChange2Parameter/sscCheck2Parameter functions to set/get speed unit. |

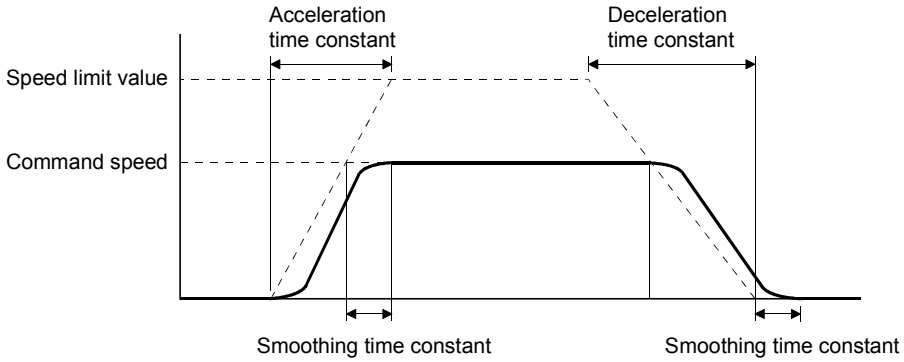
### 6.3.1 Linear acceleration/deceleration

Linear acceleration/deceleration is as shown in the following drawing. The acceleration time constant and deceleration time constant are set the time through where the speed limit value (parameter No.0222, 0223) is reached.



### 6.3.2 Smoothing filter

Setting smoothing filter makes smooth acceleration/deceleration. The smoothing time constants are set using parameter No.0226. The acceleration time and deceleration time make the profile be longer.

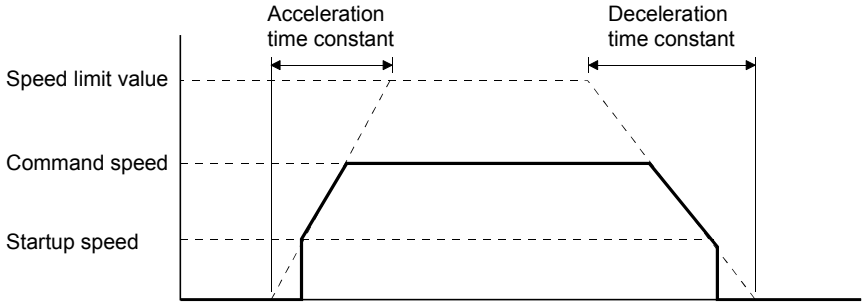



POINT

- The setting at starting operation is valid for the smoothing time constants. If the smoothing time constants are changed during operation, the change is not made. It is validated (changed) the next time operation is started.

### 6.3.3 Start up speed validity

Through setting start up speed validity, the start speed is stepped up to start up speed, it steps to stop from start up speed. The start up speed is set using parameter No.0224, 0225. However, a shock may be transmitted to the mechanical system during acceleration or deceleration.




POINT

- Cannot be used together with smoothing filter.

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

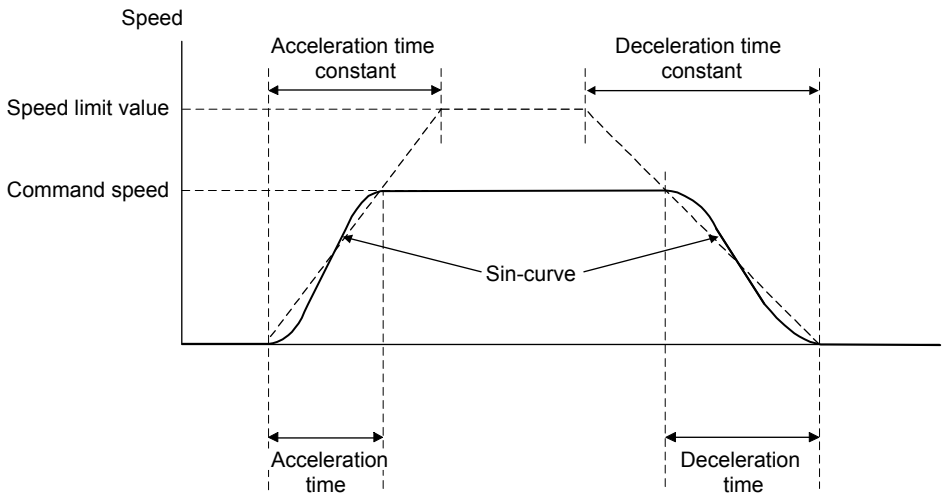
This is a method where acceleration/deceleration is performed gradually based on the Sin-curve. To make the S-curve acceleration/deceleration valid, set the S-curve ratio (1 to 100%). At this time, the acceleration time and deceleration time is the same as in the case of the linear acceleration/deceleration.

**POINT**

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

**API LIBRARY**

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

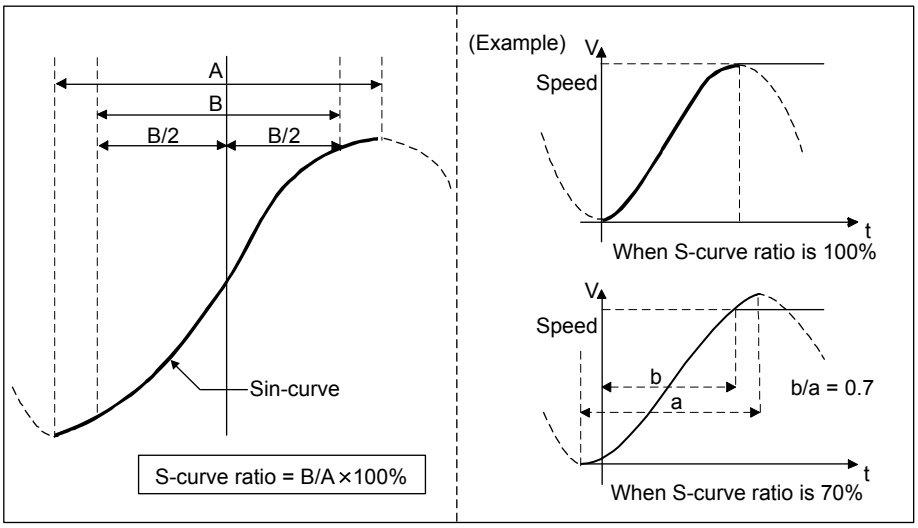



Control parameters

| Parameter No. | Abbreviation | Name | Initial Value | Unit | Setting range | Function |
|---|---|---|---|---|---|---|
| 0221 | SRATE | S-curve ratio | 0 | % | 0 to 100 | Set the S-curve ratio of the S-curve acceleration/deceleration (Sine acceleration/deceleration).<br>0: S-curve acceleration/deceleration invalid<br>1 to 100: S-curve acceleration/deceleration<br>(Note 1) (Note 2) |

Note 1. S-curve acceleration/deceleration is performed for the acceleration/deceleration selected in acceleration/deceleration method (parameter No.0220).
2. The S-curve ratio set by this parameter is used in JOG operation, incremental feed operation and home position return. For automatic operation and linear interpolation operation, set the S-curve ratio in the point table.

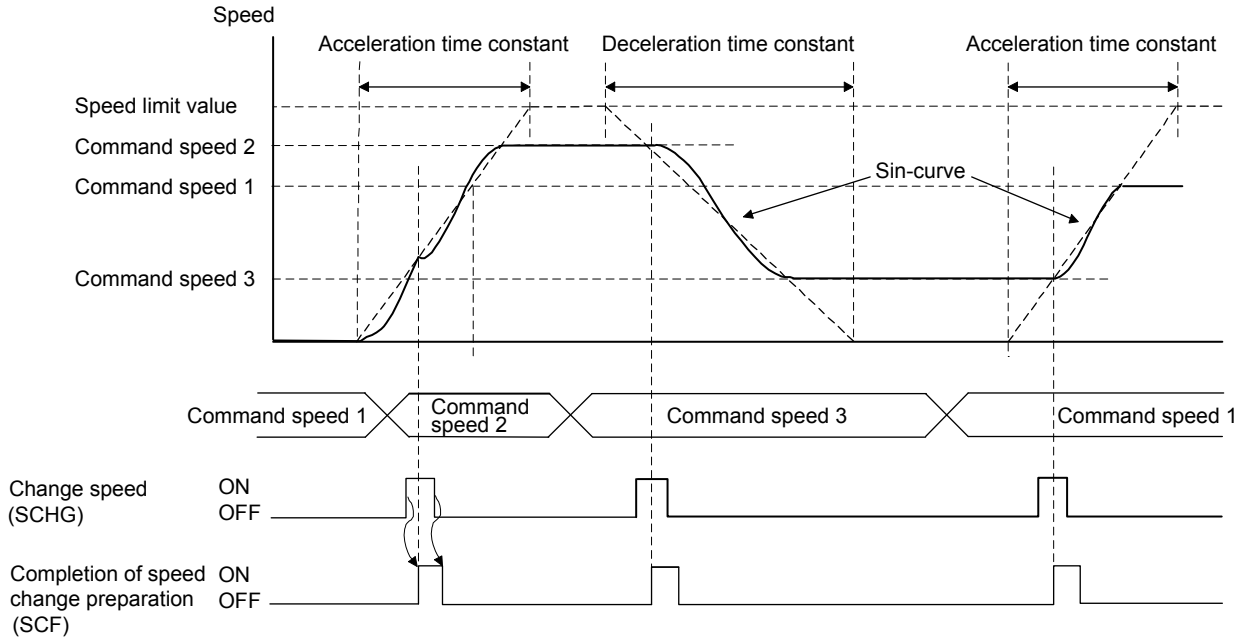
The S-curve ratio indicates which part of the Sin-curve is used to draw the acceleration/deceleration curve as shown in the figure below.



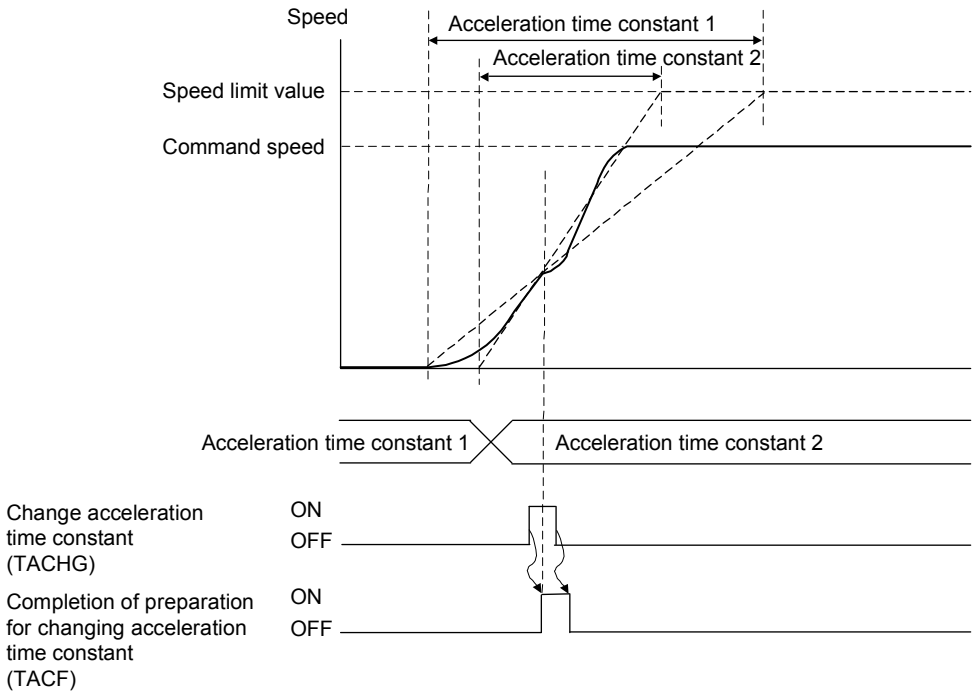

POINT

- The valid limits of 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 operation is valid for the S-curve ratio. If the S-curve ratio is changed during operation, the change is not made. It is validated (changed) the next time operation is started.

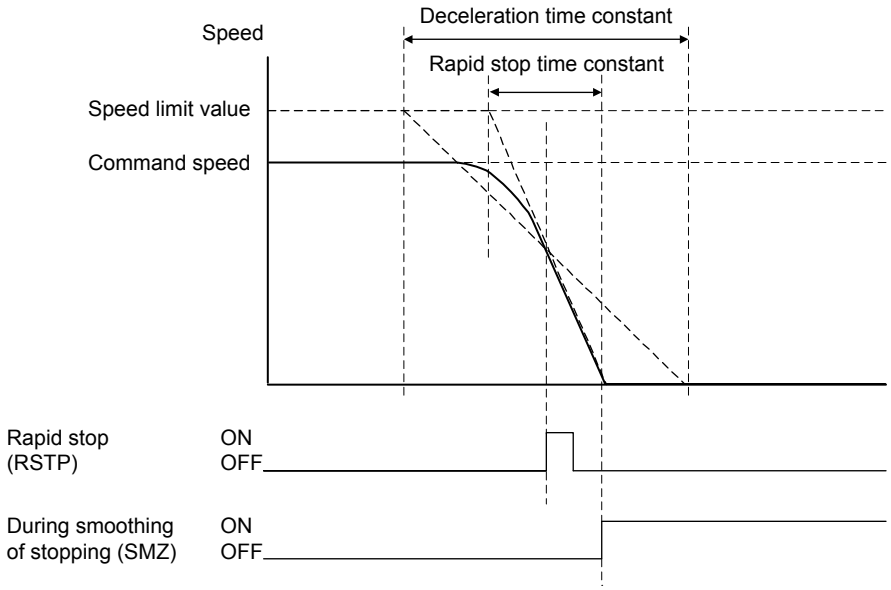
When the change speed is performed, the acceleration/deceleration based on the Sin-curve to the set speed is performed again from the time of the completion of preparation for changing speed.



When the acceleration time constant is changed during the acceleration, acceleration based on the Sin-curve is performed again from the time of the completion of acceleration time constant change preparation.

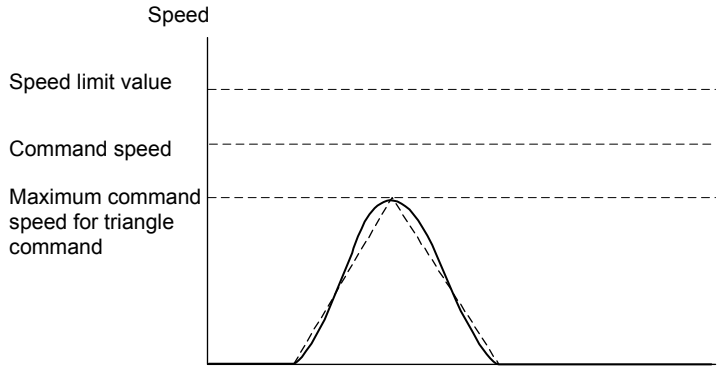



When deceleration to a stop is performed with rapid stop time constants such as rapid stop (RSTP) and interlock (ITL), the S-curve acceleration/deceleration is canceled and linear deceleration is performed. When deceleration to a stop is performed with deceleration time constants such as operation alarms, the S-curve acceleration/deceleration is performed.

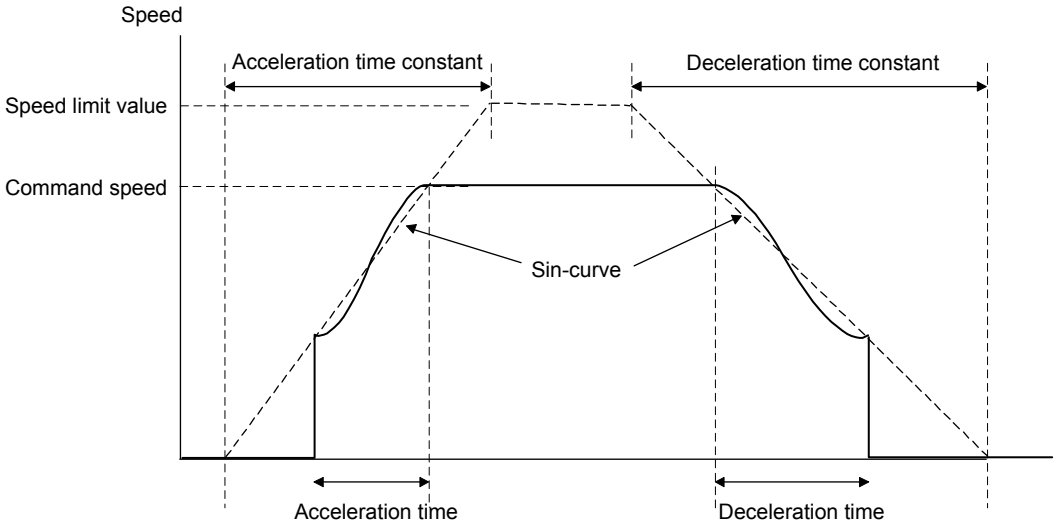



However, when overrun occurs (for example, rapid stop time constant is longer than deceleration time constant.), the S-curve acceleration/deceleration is kept to a stop.

When the original command shape is not in a trapezoid but in a triangle (for example, the travel distance is small.), acceleration/deceleration is performed based on the Sin-curve that peaks at the maximum command speed for triangle command.

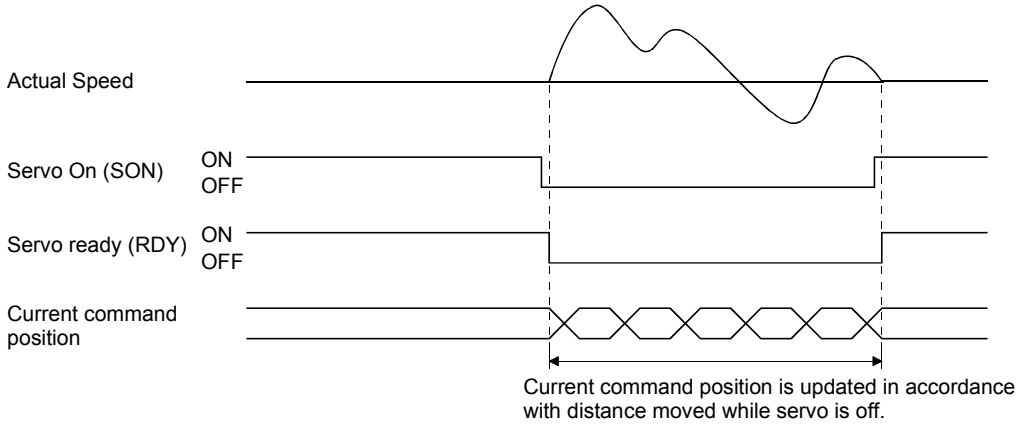



Smoothing filter and S-curve acceleration/deceleration can be used together. In addition, S-curve acceleration/deceleration and start up speed can be used together. When S-curve acceleration/deceleration and start up speed is used together, the acceleration/deceleration as shown in the figure below is performed.

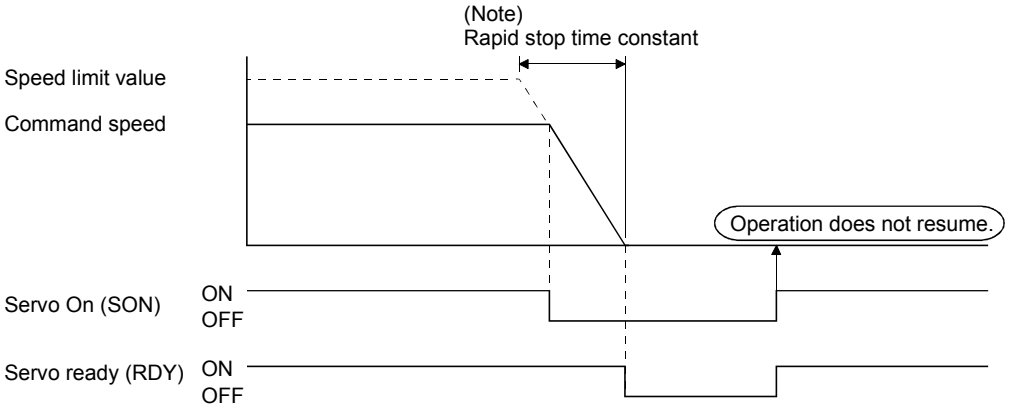


## 6.4 Servo off

If an axis has moved due to an external force while the servo was off, the current command position is updated in accordance with the movement amount (Current feedback position). After the servo has been off, coordinate return processing such as return to home position is not necessary.




If the servo on signal (SON) is turned off during operation, an alarm occurs, movement is rapid stopped, and the servo is turned off. Even if the servo on signal (SON) is turned back on, operation does not resume.



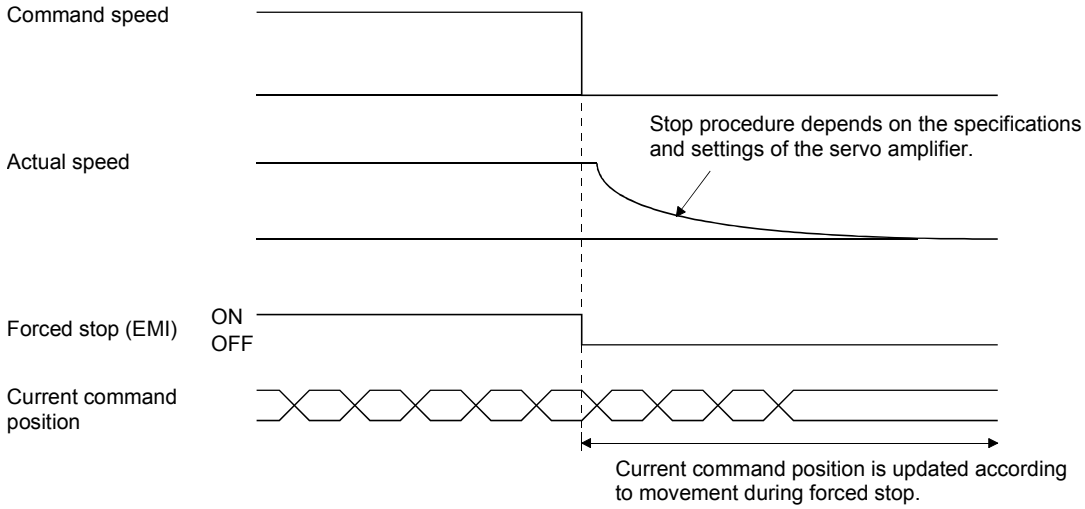

Note. If 1: Smoothing filter is set in Speed options (parameter No.0220), the smoothing time constant is always valid. Therefore, rapid stop as well will use smoothing filter.

**API LIBRARY**

- To turn ON/OFF the servo ON command (SON), set SSC_CMDBIT_AX_SON to the command bit number of the sscSetCommandBitSignalEx function.
- To check if servo ready (RDY) is ON/OFF, set SSC_STSBIT_AX_RDY to the status bit number with the sscGetStatusBitSignalEx or sscWaitStatusBitSignalEx functions.

## 6.5 Forced stop

Commands are turned to "$\phi$" at forced stop. Servo amplifiers become free from the control of the position board and stops according to their specifications or settings such as dynamic brake stop and deceleration to a stop. For details, refer to the Servo Amplifier Instruction Manual on your servo amplifier.
During forced stopping, the current command position is updated according to movement (Current feedback position) therefore, after resetting the forced stop, origin coordinate processing such as home position return is not necessary.



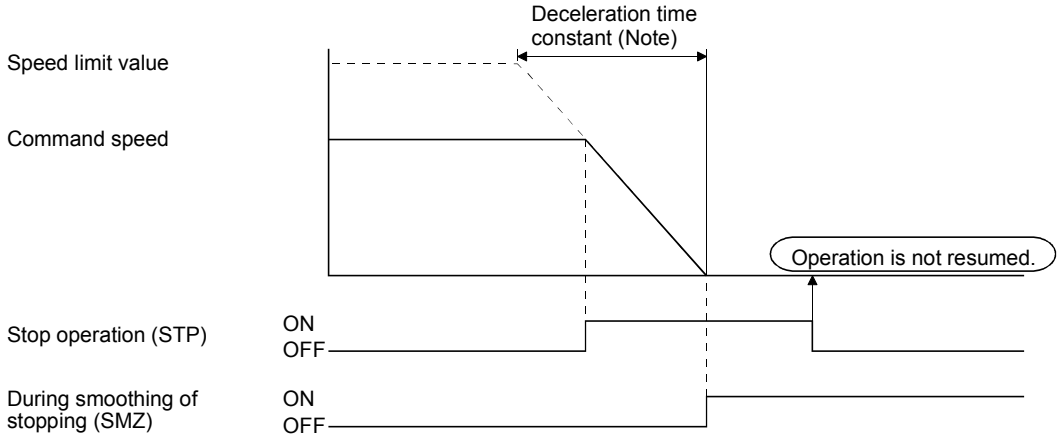

For forced stops, there are an external forced stop using an input signal through the forced stop input connector and a software forced stop signal (SEMI) from a system command bit.
Also, a system error (system status code E□□□h) such as a SSCNET communication error activates the forced stop. The cause of the forced stop can be confirmed using monitor number 0401.

**API LIBRARY**

- To turn ON/OFF the software forced stop command (SEMI), set SSC_CMDBIT_SYS_SEMI to the command bit number of the sscSetCommandBitSignalEx function.
- To check if during forced stop (EMIO) is ON/OFF, set SSC_STSBIT_SYS_EMIO with the sscGetStatusBitSignalEx or sscWaitStatusBitSignalEx function.

## 6.6 Stop operation

When the stop operation signal (STP) is turned on, movement is stopped. (Alarms and warnings are not set.) Even if the stop operation signal (STP) is turned back off, operation is not resumed. The time constant used for stopping for stop operation is the deceleration time constant. If operation is stopped during linear interpolation operation or automatic operation, they do not turn on positioning complete signal (PF).



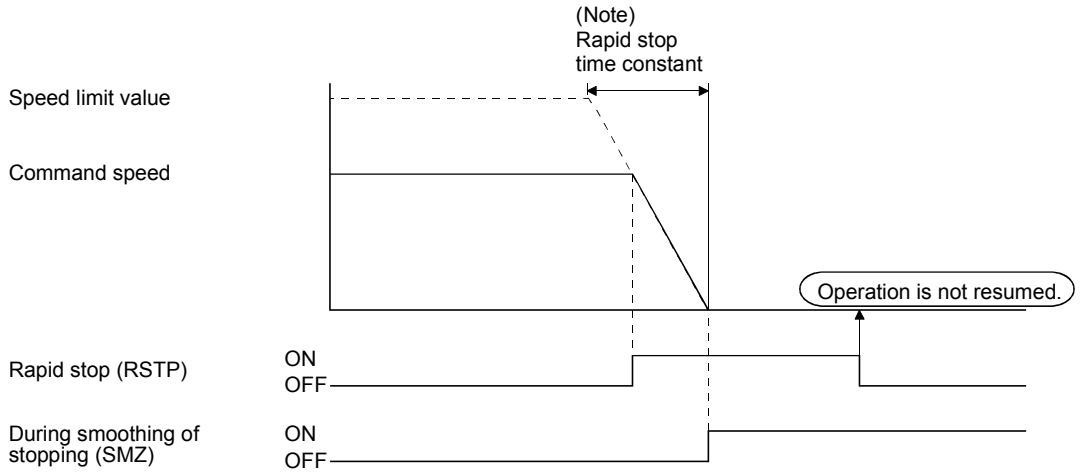

Note. If smoothing filter is set, the smoothing time constant is always valid. Therefore, deceleration stop as well will use smoothing filter.

API LIBRARY

- Use the sscDriveStop or sscDriveStopNoWait functions to perform a stop operation.

## 6.7 Rapid stop operation

When the rapid stop signal (RSTP) is turned on, movement is stopped abruptly. (Alarms and warnings are not set.) Even if the rapid stop signal (RSTP) is turned back off, operation is not resumed. The deceleration time constant used for stopping for rapid stop operation is the rapid stop time constant (parameter No.0227). If operation is abruptly stopped during linear interpolation operation or automatic operation, they do not turn on positioning complete signal (PF).

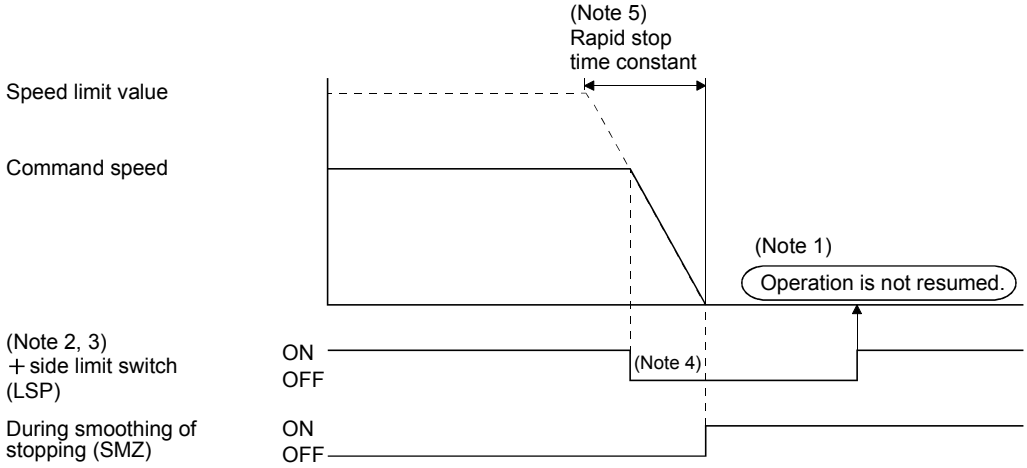



Note. If smoothing filter is set, the smoothing time constant is always valid. Therefore, rapid stop as well will use smoothing filter.

| API LIBRARY |
| --- |
| ・Use the sscDriveRapidStop or sscDriveRapidStopNoWait functions to perform a rapid stop operation. |

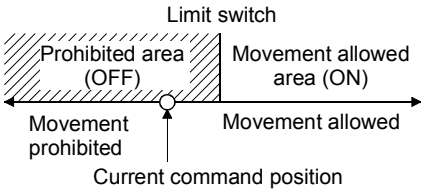
## 6.8 Limit switch (stroke end)

When the limit switch signal corresponding to the movement direction is turned off, an alarm occurs and movement is stopped.
The deceleration time constant used for stopping by the limit switch is the rapid stop time constant.




Note 1. Even if the limit switch signal is turned back on, operation does not resume.
2. The limit switch signal is a signal that is input through the servo amplifier 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 operation stopped by the limit switch during linear interpolation operation or automatic operation, they do not turn on the positioning complete signal (PF).
5. If smoothing filter is set, the smoothing filter time constant is always valid. Therefore, rapid stop as well will use smoothing filter.

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 start operation, after resetting the alarm that has been set.




API LIBRARY

- Use the sscGetIoStatusFast function to check if limit switch (LSP or LSN) is ON/OFF.

## 6.9 Software limit

(1) Using a JOG operation

During JOG operation, if the software limit is reached, a reached software limit (operation alarm A2, detail 01) occurs, the deceleration of the servo is started, and the servo is stopped not to exceed the software limit.

(2) Using incremental feed

If the movement amount designated by an incremental feed exceeds the software limit, an out of software limit boundaries (operation alarm A1, detail 01) occurs and the start operation is not performed.

(3) Using automatic operation

If the point designated by a position command exceeds the software limit, an out of software limit boundaries (operation alarm A1, detail 01) occurs and the start operation is not performed. Also, if the point is designated during operation, an out of software limit boundaries (operation alarm A1, detail 01) occurs when the point is designated and servo is decelerated and stopped.

(4) Using linear interpolation

If the point designated by a position command for an axis within the group exceeds the software limit, an out of software limit boundaries (operation alarm A1, detail 01) occurs and the start operation is not performed. Also, if the point is designated during operation, an alarm occurs when the point is designated and servo is decelerated and stopped.

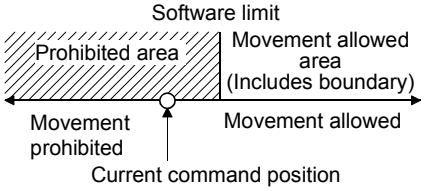
POINT

- If the deceleration check method is in continuous operation and the position command after point switching exceeds the software limit, it will output the out of software limit boundaries (operation alarm A1, detail 01) and will come to a decelerated stop. In this case, if the distance to the software limit is shorter than the distance necessary to make a decelerated stop, it may stop outside the software limit.
- The software limit boundaries are set using parameters No. 0228, 0229, 022A, 022B.
- If an alarm set due to exceeding the software limit, the servo is stopped using the deceleration time constant.

API LIBRARY

- Use the sscChange2Parameter/sscCheck2Parameter function to set/get the software limit.

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.



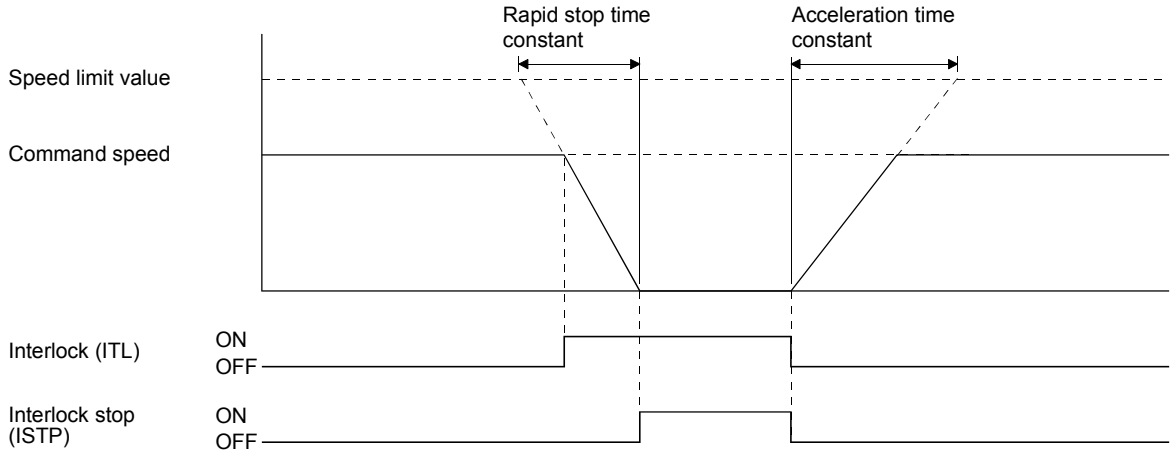

POINT

- If the upper boundary and lower boundary of the software limit are the same value, the software limit are invalid.
- If the lower boundary of the software limit is a higher value than the upper limit, a software limit parameter error (operation alarm A4, detail 01) occurs upon start of operation.
- Software limits are invalid when home position return has not been completed.

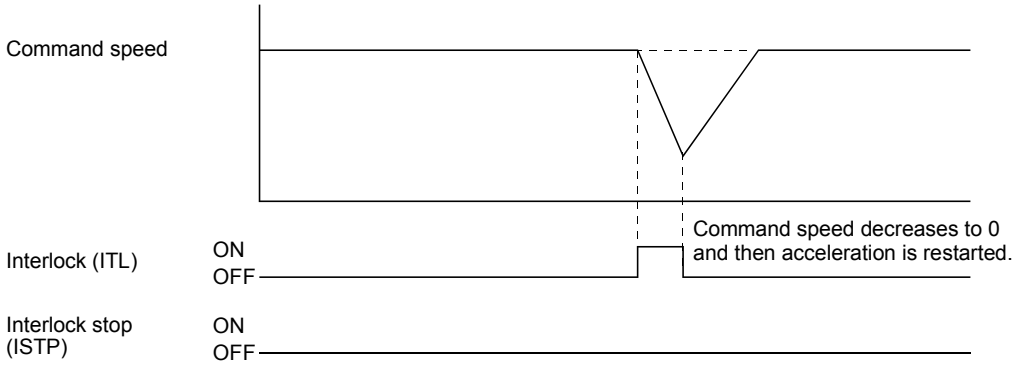
Note. By the position board, the range of movement is -2147483648 to 2147483647. Movement outside the limits is not covered with a guarantee. If software limits have been disabled, be careful not to move it outside of the physical limits.

## 6.10 Interlock

When the interlock signal (ITL) is turned on, movement is temporarily stopped. During stoppage of movement the interlock stop signal (ISTP) is turned on. When the interlock signal (ITL) is turned off, operation is resumed. The interlock signal (ITL) for normally-open contact or 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 interlock to stop the servo, deceleration uses the rapid stop time constant.




If the interlock signal is cancelled during deceleration, operation is re-started after the command speed decreases to 0. For this case, the interlock stop signal (ISTP) does not turn on.



POINT

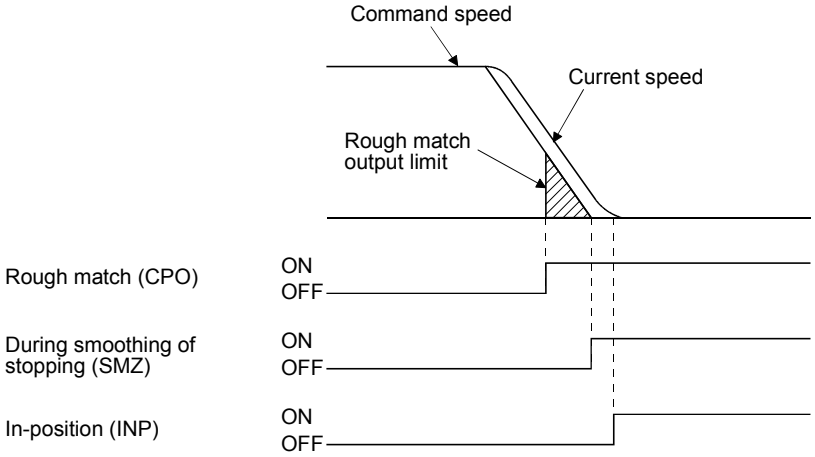
- If the stop operation signal (STP) or rapid stop signal (RSTP) is turned on during interlock stop, operation is not resumed even if the interlock signal is turned off.
- If smoothing filter is set, the smoothing time constant is always valid. Therefore, rapid stop as well will use smoothing filter.
- If start up is executed while the interlock signal is on, the interlock is on alarm (operation alarm 13, detail 01) occurs and the start operation is not performed. Execute the start operation after canceling the interlock.
- During linear interpolation, if the interlock signal for any of the axes in the linear interpolation 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 cancelled, operation is resumed.

API LIBRARY

- To turn ON/OFF the interlock command (ITL), set SSC_CMDBIT_AX_ITL to the command bit number of the sscSetCommandBitSignalEx function.
- To check if interlock stop (ISTP) is ON/OFF, set SSC_STSBIT_AX_ISTP to the status bit number with the sscGetStatusBitSignalEx or sscWaitStatusBitSignalEx function.

## 6.11 Rough match output

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

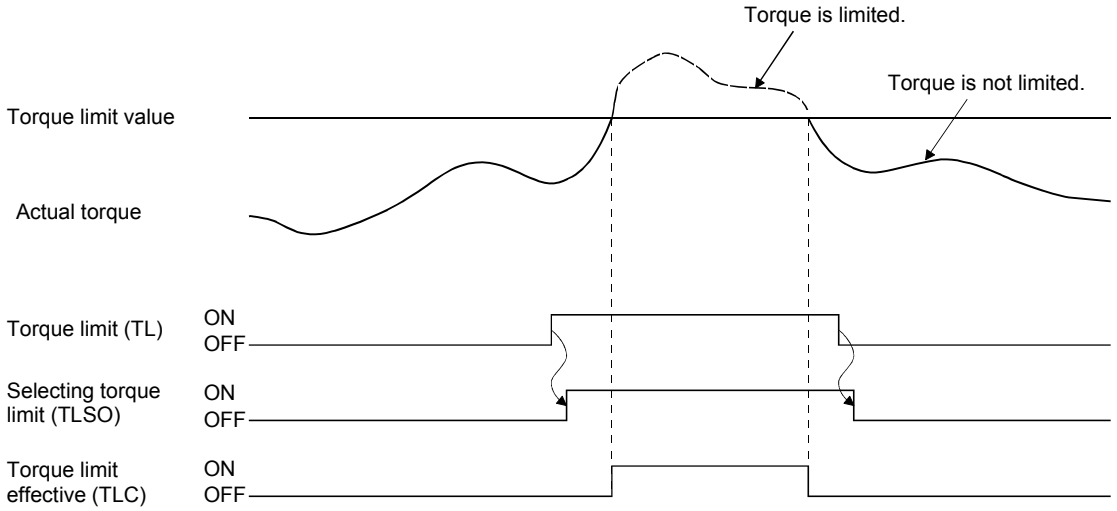



API LIBRARY

- Use the sscChange2Parameter/sscCheck2Parameter function to set/get the rough match output limit.

## 6.12 Torque limit

When the torque limit signal (TL) is turned on, the torque is limited by the torque limit values set in the normal revolution torque limit (parameter No.0210) and the reverse revolution torque limit (parameter No.0211). When torque is limited by the torque limit values, the torque limit effective signal (TLC) is turned on. Even if the torque limit signal (TL) is on, if the actual torque is smaller than the torque limit value, the torque limit effective signal (TLC) is not turned on.



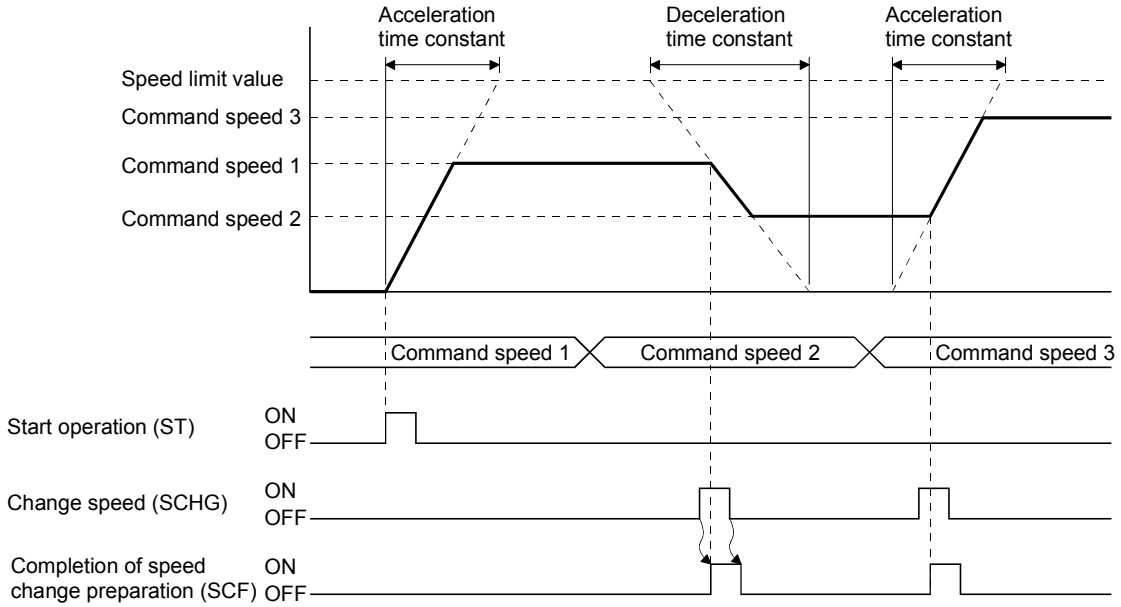

API LIBRARY

- To turn ON/OFF the torque limit command (TL), set SSC_CMDBIT_AX_TL to the command bit number of the sscSetCommandBitSignalEx function.
- To check if selecting torque limit (TLSO) and torque limit effective (TLC) are ON/OFF, set SSC_STSBIT_AX_TLSO, SSC_STSBIT_AX_TLC to the status bit number with the sscGetStatusBitSignalEx or sscWaitStatusBitSignalEx function.

## 6.13 Command change

### 6.13.1 Speed change

Rewriting the command speed followed by turning on the change speed signal (SCHG) changes the speed. For automatic operation and linear interpolation operation, rewrite the feed speed in the operating point table and for JOG operation and incremental feed, rewrite the manual feed speed.
Speed change can also be implemented during acceleration or deceleration.



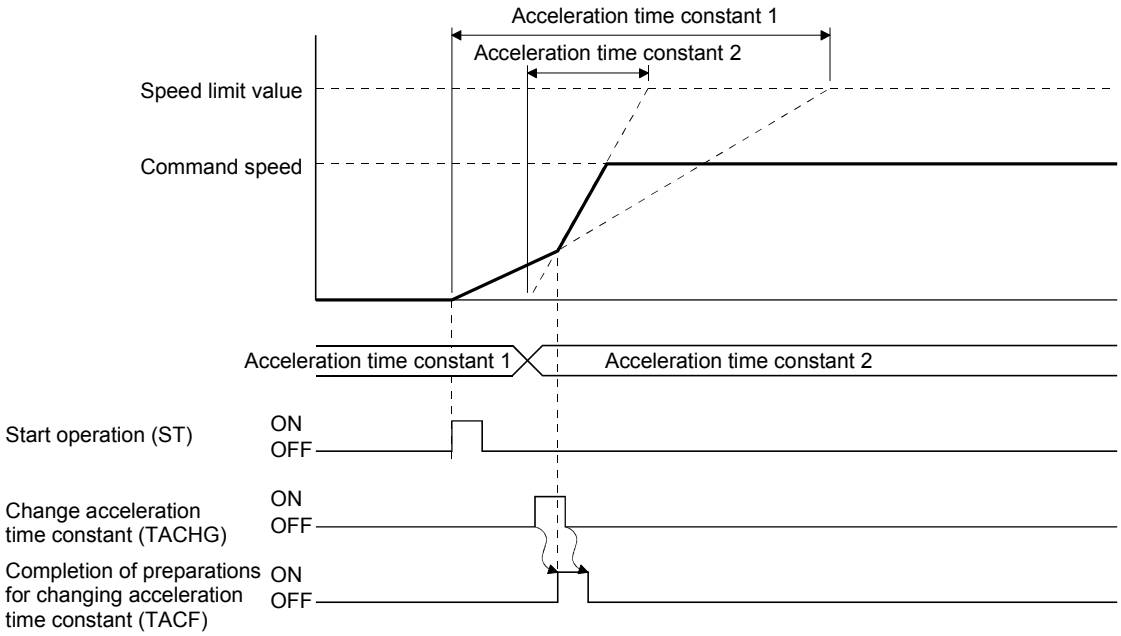

During the following cases, the "speed change error signal" (SCE) turns ON, and speed will not change.
• Operation stop
• Deceleration due to stop command, rapid stop command, alarm etc
• Home position return
• Home position reset
• The command speed after change is zero or below

API LIBRARY

- Use the sscChangeAutoSpeed function to perform a speed change for automatic operation and linear interpolation operation.
- Use the sscChangeManualSpeed function to perform a speed change for JOG operation and incremental feed.

### 6.13.2 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.
For automatic operation and linear interpolation operation rewrite the time constant in the operating point table and for JOG operation and incremental feed, rewrite the manual feed time constant.




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 will not change.
• Operation stop
• Deceleration
• Home position return
• Home position reset

API LIBRARY

- Use the sscChangeAutoAccTime or sscChangeAutoDecTime functions to perform a change of time constants for automatic operation and linear interpolation operation.
- Use the sscChangeManualAccTime or sscChangeManualDecTime functions to perform a change of time constants for JOG operation and incremental feed.

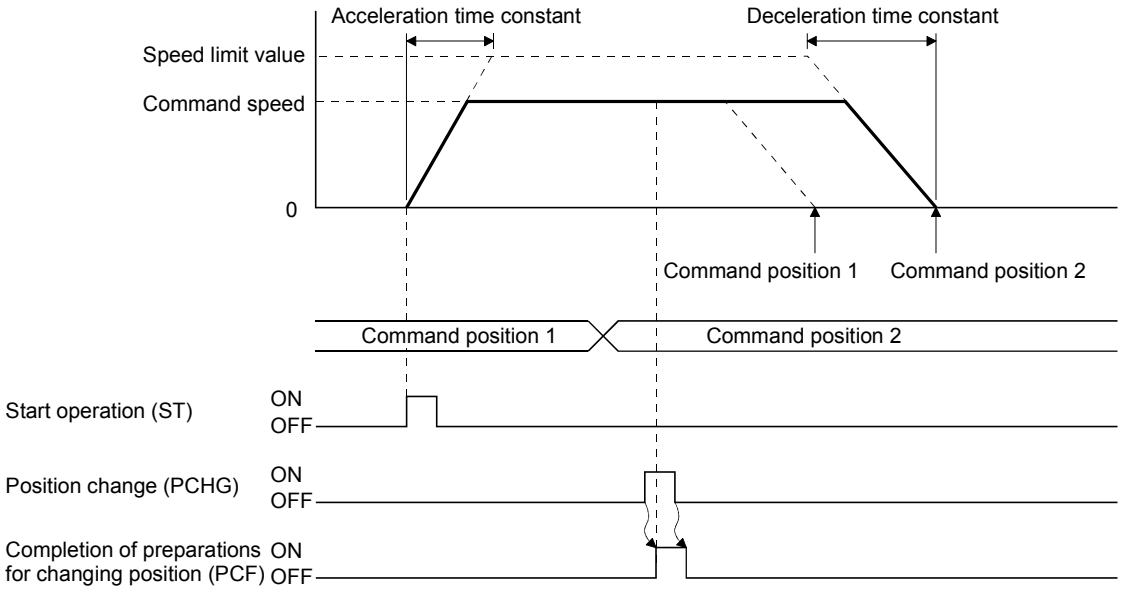
### 6.13.3 Position change

After rewriting the command position, turning the position change signal (PCHG) on causes the command position to be changed. For automatic operation rewrite position data in the operating point table and for incremental feed, rewrite the feed movement amount.
During linear interpolation operation, rewrite the position data in each point table of the axes in the group.

(1) To change the command position to the position which is not yet passed

(a) 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.

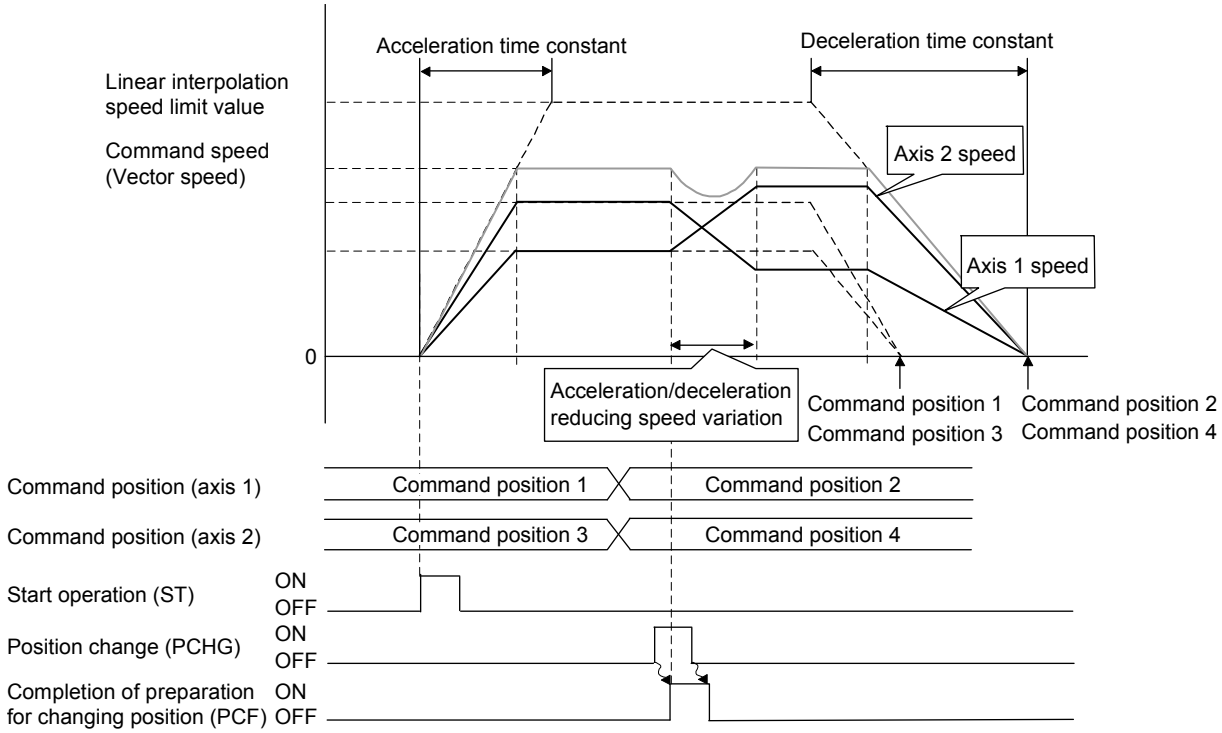



API LIBRARY

- Use the sscChangeAutoPosition function to perform a position change for automatic operation.
- Use the sscChangeLinearPosition function to perform a position change for linear interpolation operation.
- Use the sscChangeManualPosition function to perform a position change for incremental feed.

(b) For linear interpolation operation

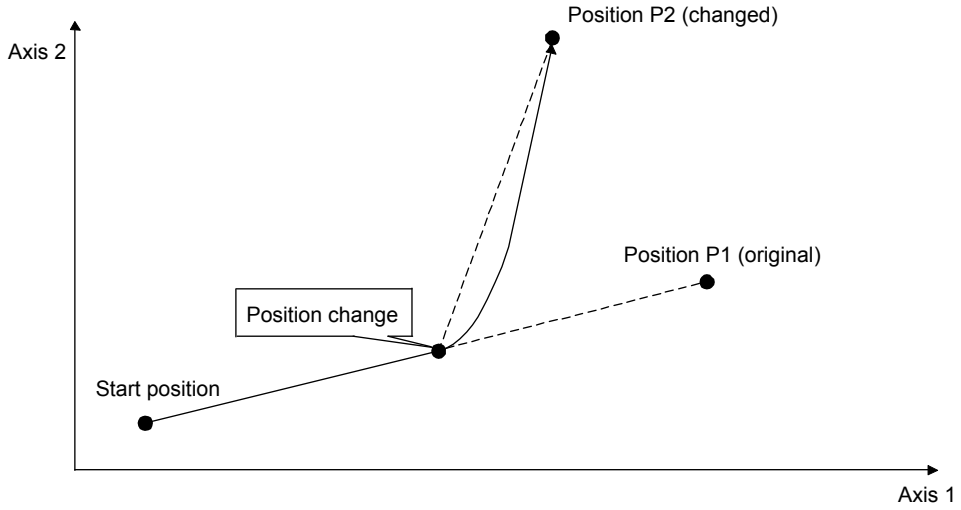
An example of the position change when axis 1 and 2 are linearly interpolated is shown below.




POINT

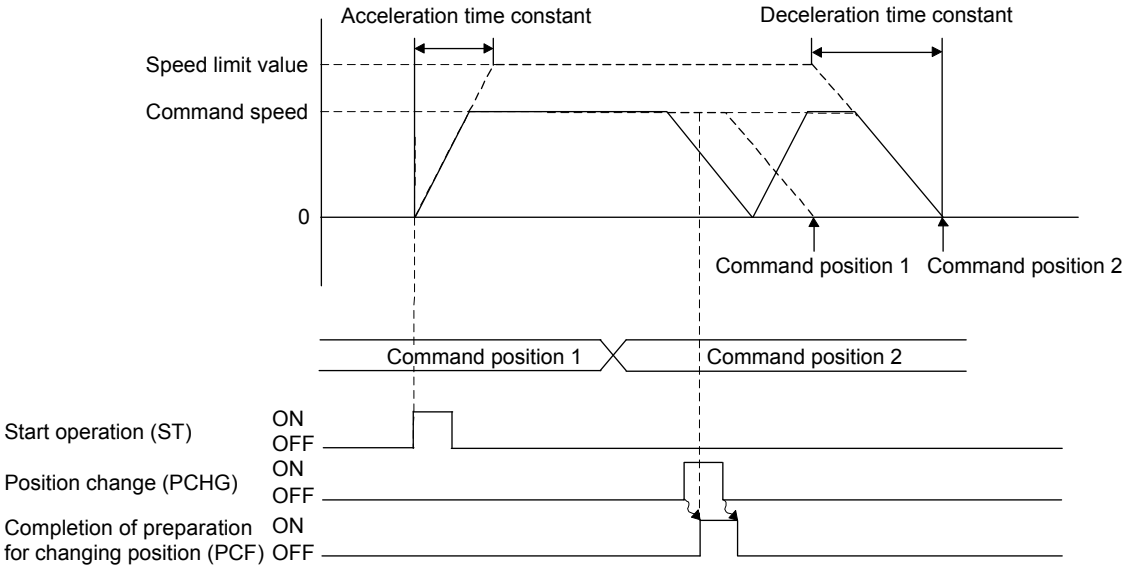
- Acceleration/deceleration of each axis from the current command speed to the command speed after position change is determined by distributing acceleration amount, which is determined by the acceleration time constant, to each axis according to speed variation ratio of the axes. During this time, S-curve acceleration/deceleration and start up speed are invalid, and acceleration/deceleration reducing the speed variation at position change is performed. (That acceleration/deceleration is similar to the linear acceleration/deceleration. However, smoothing filter is valid.)

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.



(2) When position change is performed during deceleration

When position change is performed during deceleration, the deceleration continues. After the axis stops, the positioning to the new position is performed.



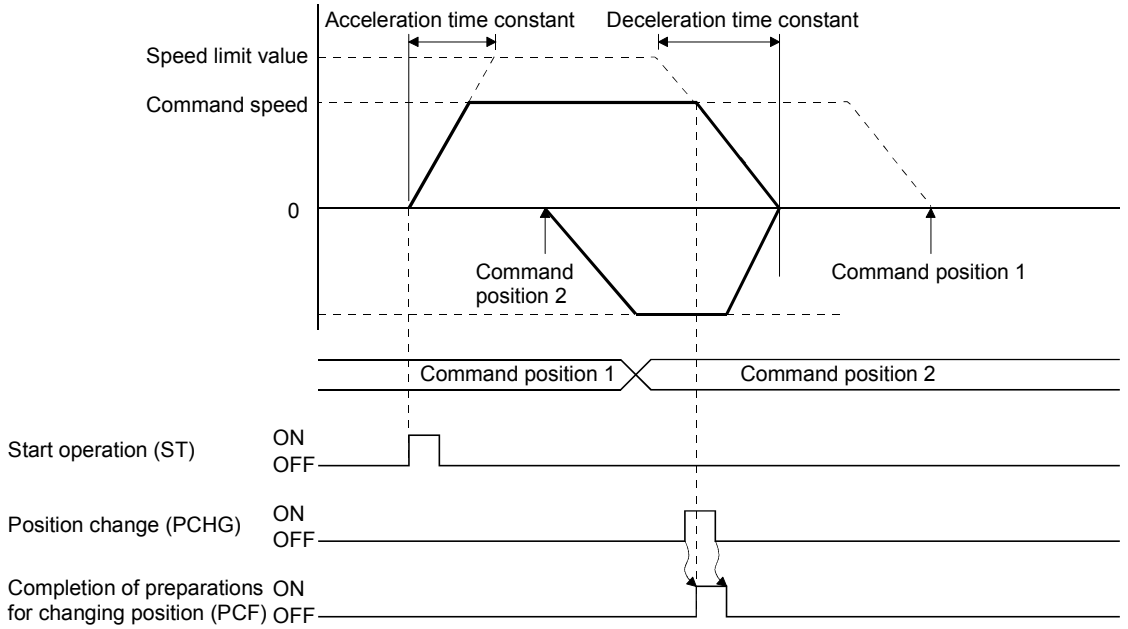

(3) When the new position is already passed

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

(a) For automatic operation and incremental feed

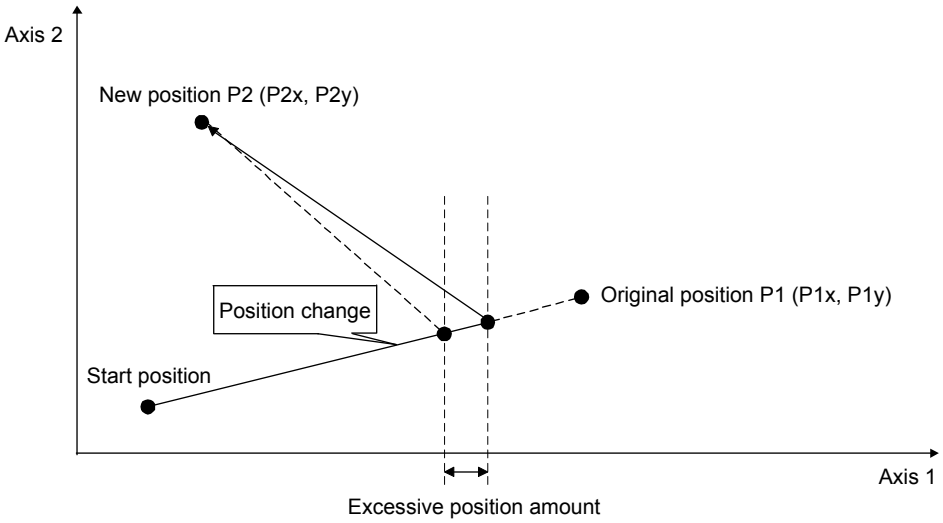
For cases of changing position where the new position has already been passed or if the stop position after deceleration will pass the new position, operation can be selected from "stop with an alarm" or "after deceleration and stop return to new position" using control option 2 (parameter No.0201).

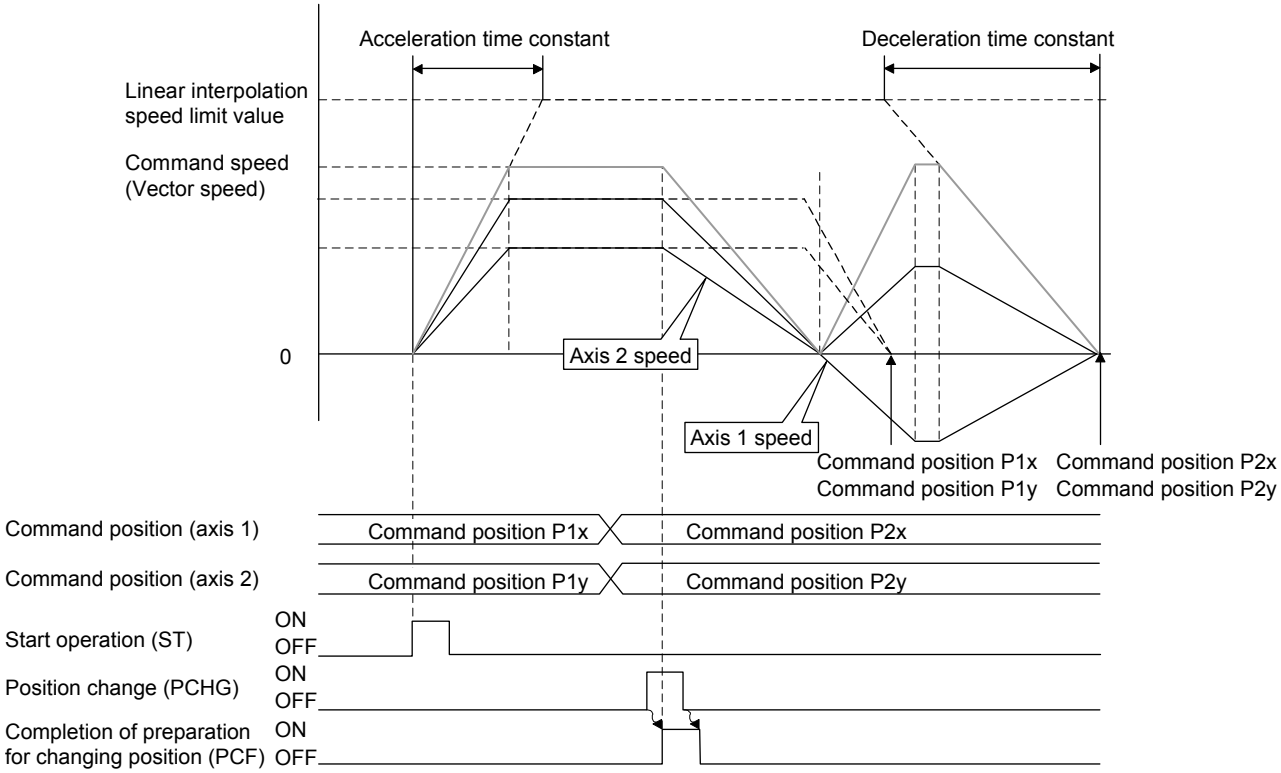
The case for returning to the new position after deceleration and stop is shown in the next diagram. At this time the stop position over-bound signal (POV) is turned on (the stop position over-bound signal (POV) is turned off at the next start up).



(b) For linear interpolation operation

When one or more axes in a linear interpolation 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 stop position over-bound 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).

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

Note. The same feature is applied to linear interpolation for more than 3 axes.

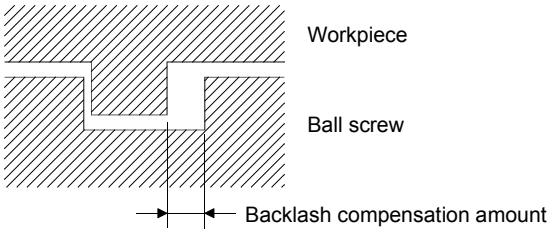
(4) When position change error occurs

During the following cases, the "position change error signal" (PCE) turns on, and the position will not change.

- Operation stop
- JOG operation, home position return, home position reset
- Deceleration due to stop command, rapid stop command, alarm etc.
- The specified value is out of the software limit setting value.
- A position change command is input to an auxiliary axis in linear interpolation.

## 6.14 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).



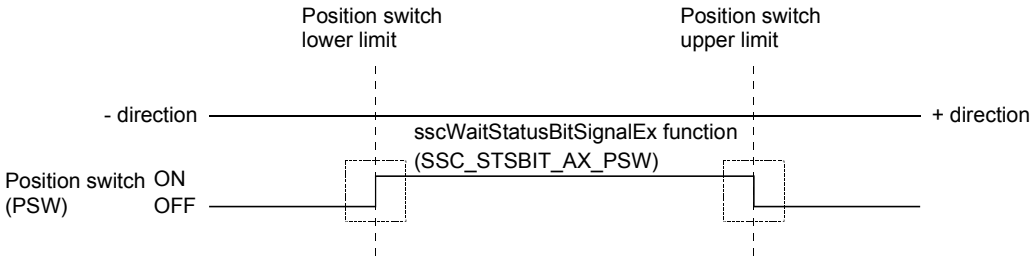

| Condition | Processing details |
|---|---|
| Normal | The compensation amount is added at the timing of switching movement direction. |
| Home position return | Backlash compensation is performed as well as normal. |

API LIBRARY

- Use the sscChange2Parameter/sscCheck2Parameter function to set/get the backlash compensation amount.

## 6.15 Position switch

Position switch is turned on when the axis is within setting range (including the boundary line) which set by position switch upper limit (parameter No.022C, 022D), position switch lower limit: parameter No.022E, 022F).




Two options of current command position or current feedback position can be selected for judgement the condition for the position switch using control option 2 (parameter No.0201).

**POINT**

- If the upper limit and lower limit of the position switch are the same value, the position switch is invalid.
- If the lower limit of the position switch is a higher value than the upper limit, a position switch parameter error (operation alarm A5, detail 01) occurs upon start of operation.
- The position will be valid after completion of home position return.

**API LIBRARY**

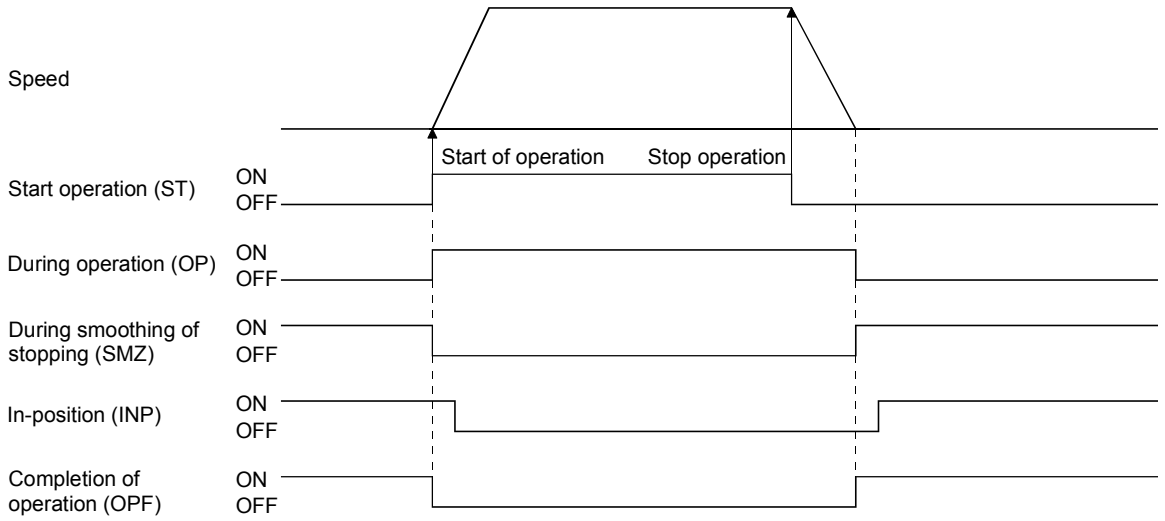
- Use the sscChange2Parameter/sscCheck2Parameter function to set/get the upper limit or lower limit of the position switch.
- To check if position switch (PSW) is ON/OFF, set SSC_STSBIT_AX_PSW to the status bit number with the sscGetStatusBitSignalEx or sscWaitStatusBitSignalEx function.

## 6.16 Completion of operation signal

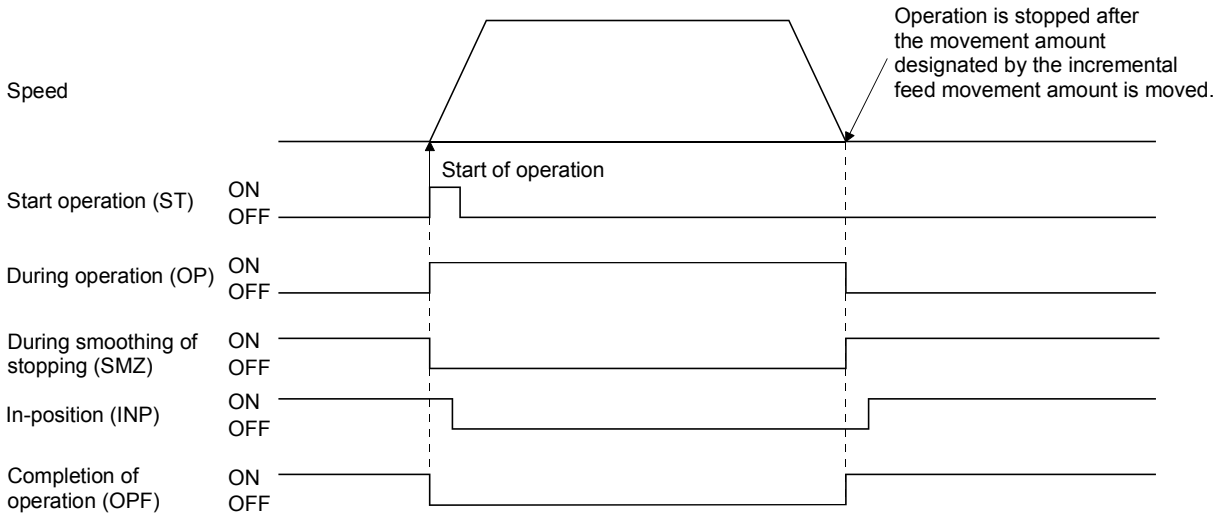
The completion of operation signal (OPF) shows a completion of operation status. At the startup, the "completion of operation signal" (OPF) turns off, and the "completion of operation signal" (OPF) turns on when positioning operation is complete.
Interruption of operation due to an alarm also turns on the completion of operation signal (OPF).
A summary of operation for each operation mode is shown.

| API LIBRARY |
|---|
| ・Use the sscWaitIntDriveFin/sscGetDriveFinStatus function to check the completion of operation. |

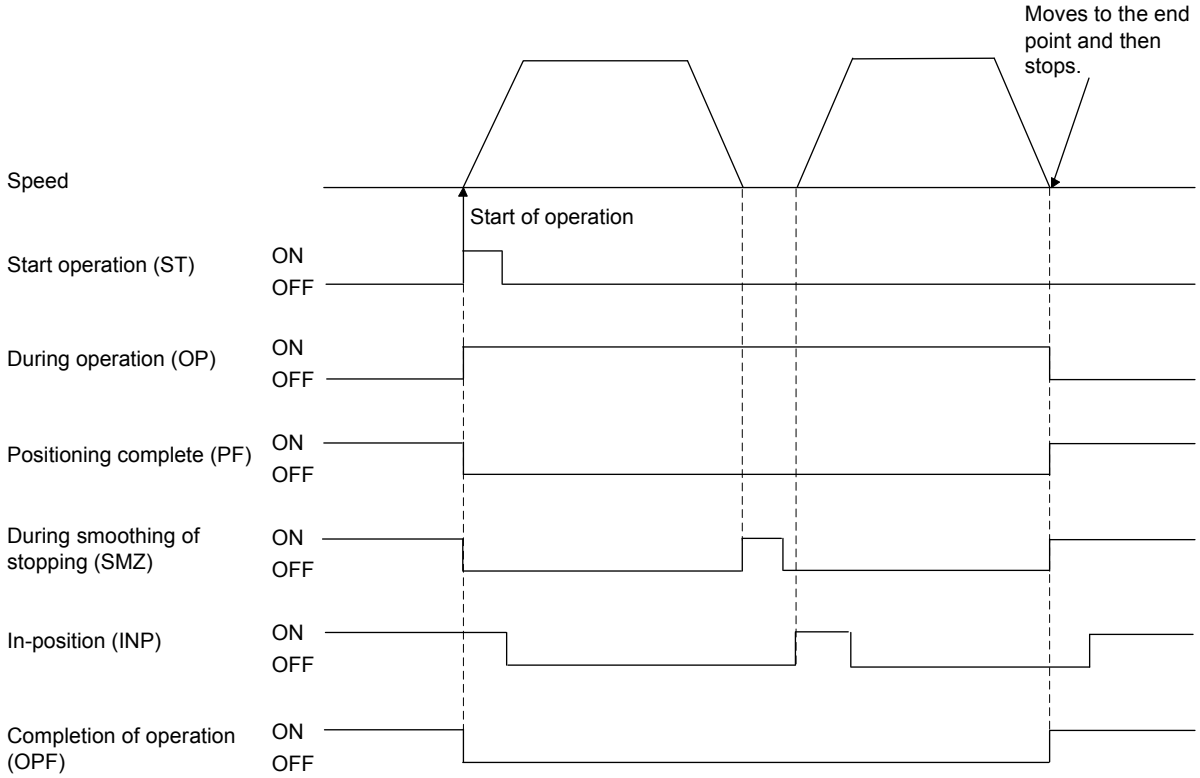
(1) Using a JOG operation



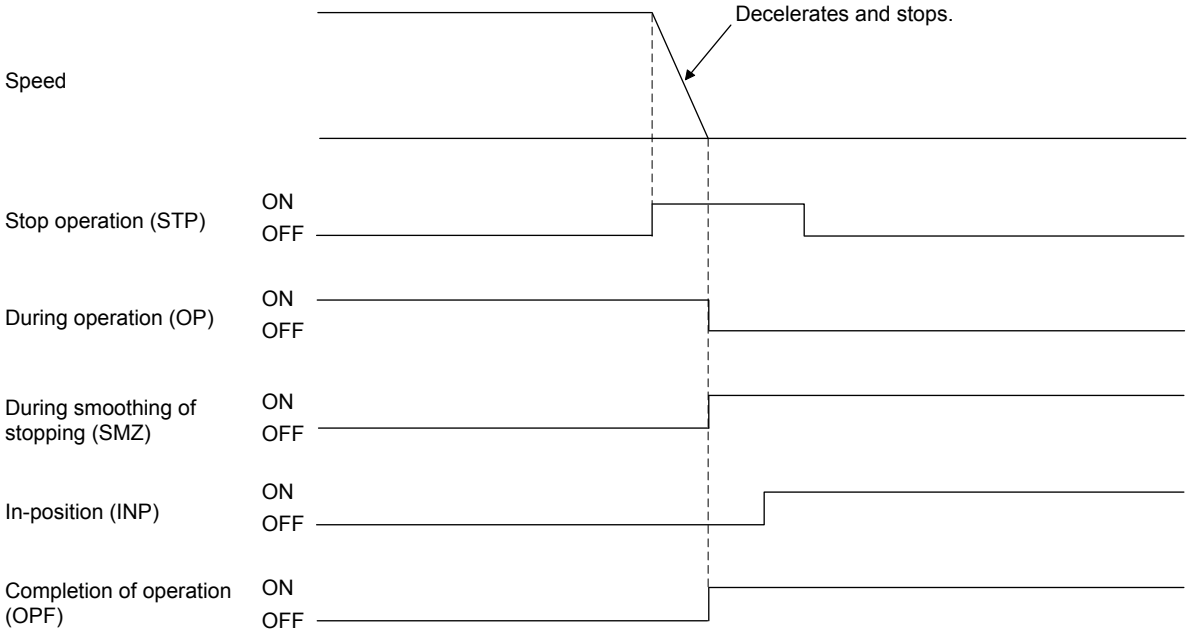

(2) Using incremental feed



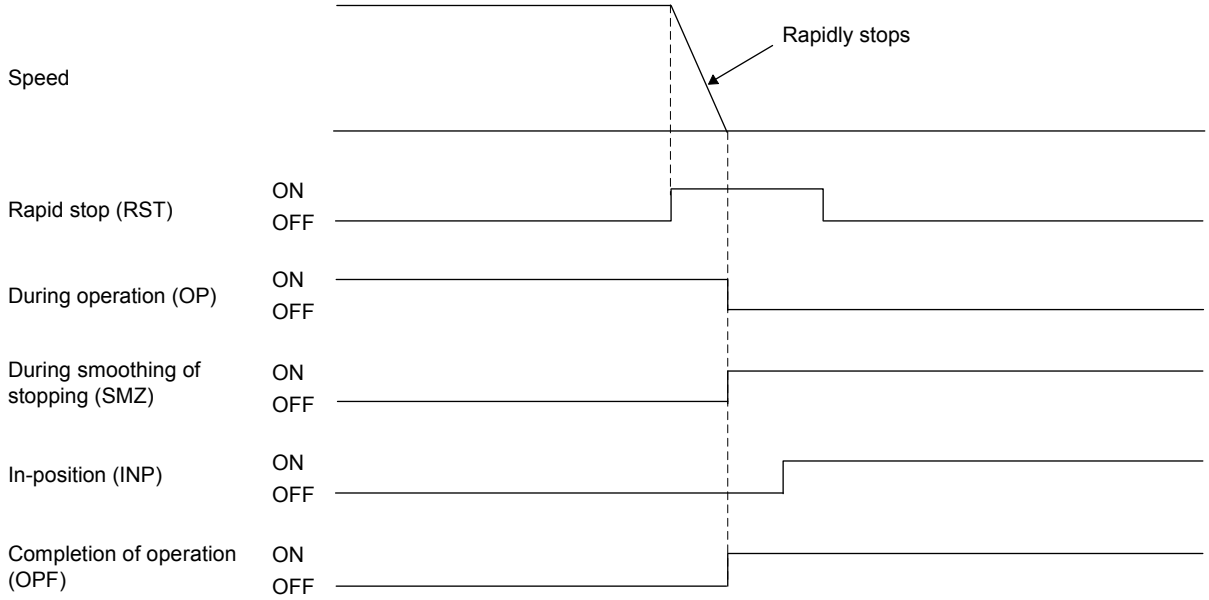
(3) Using an automatic operation



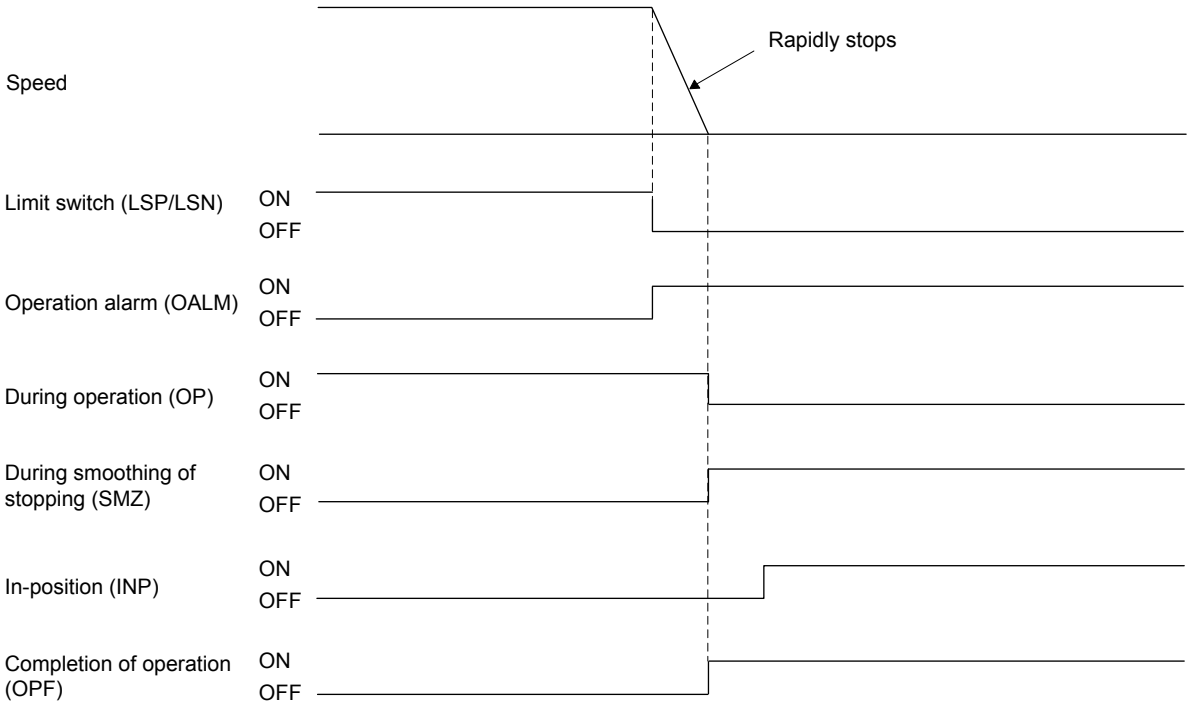

(4) Stop by the stop operation signal



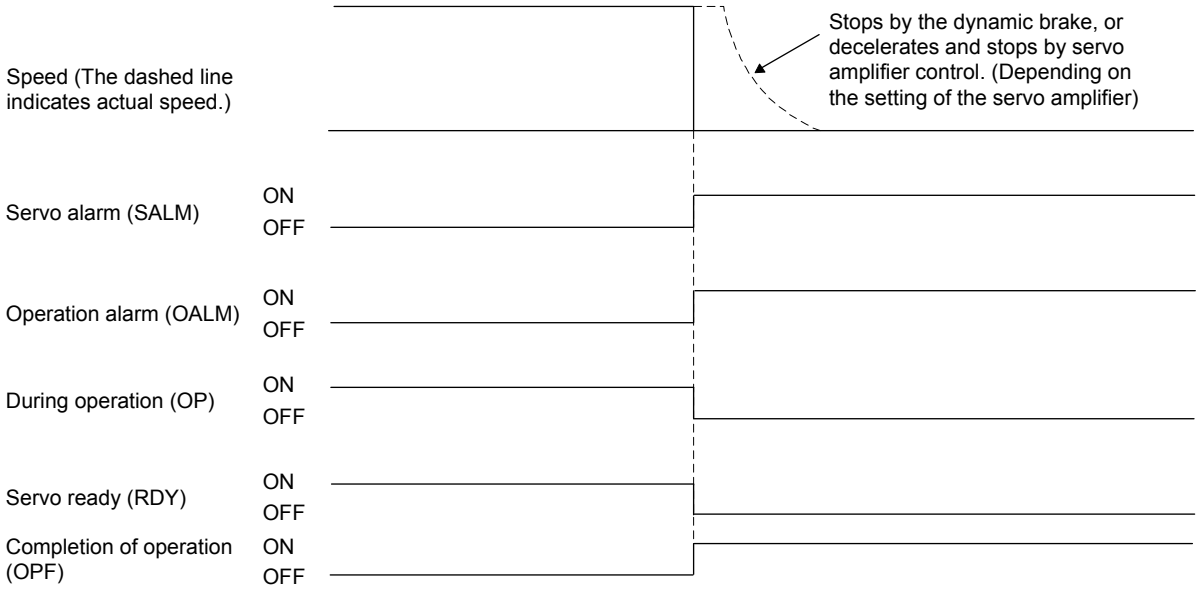
(5) Stop by the rapid stop signal



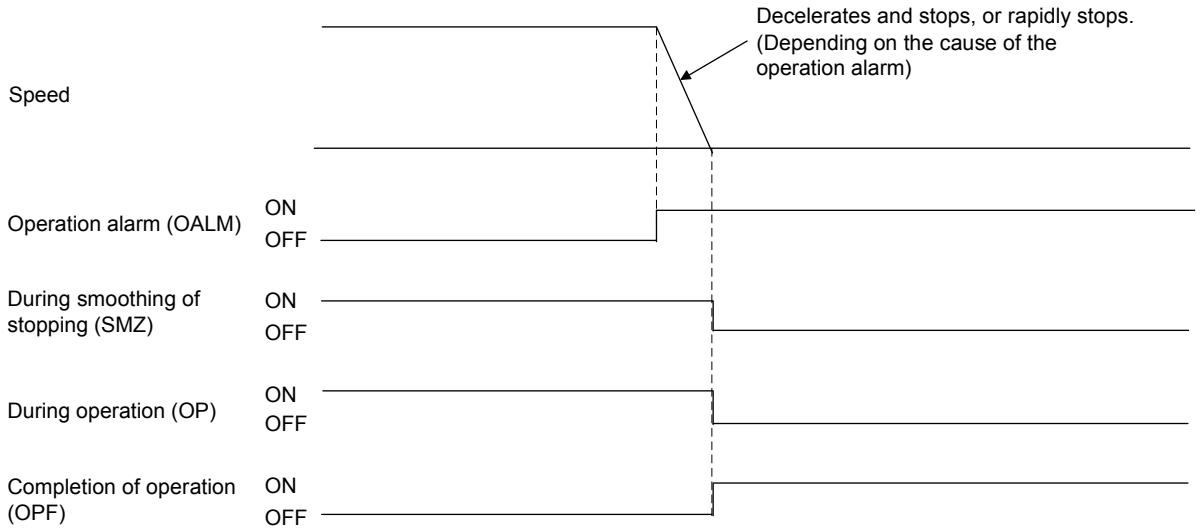

(6) Stop by the limit switch



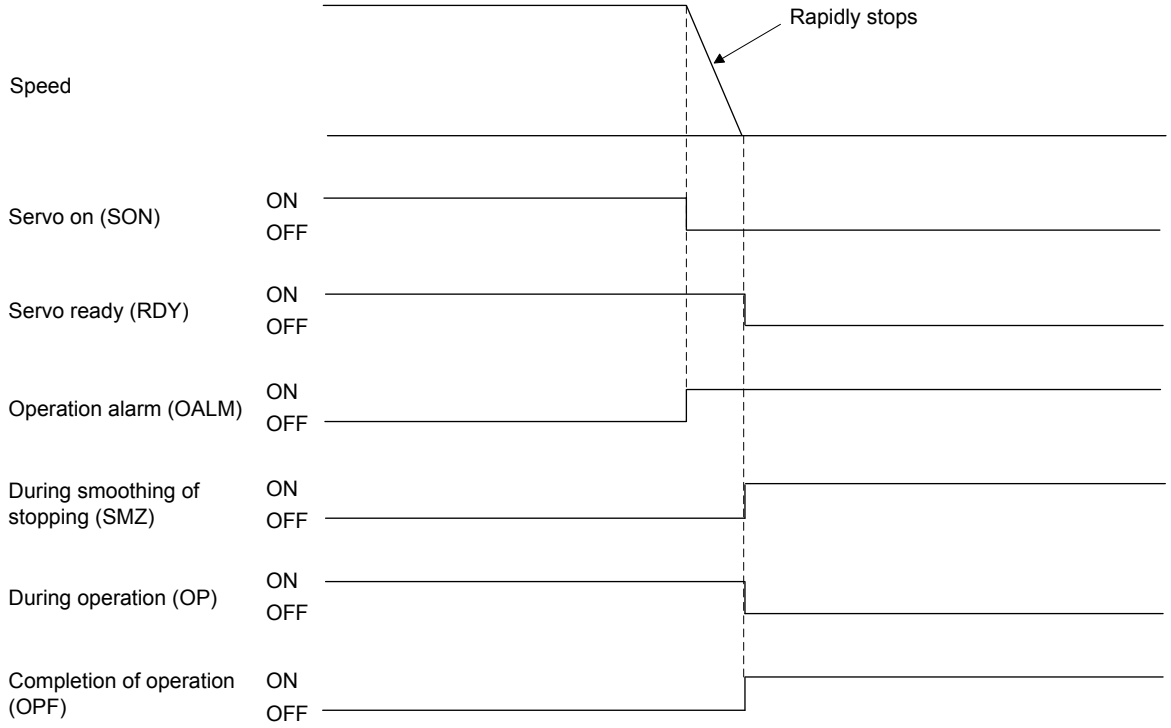
(7) Stop by servo alarm occurrence



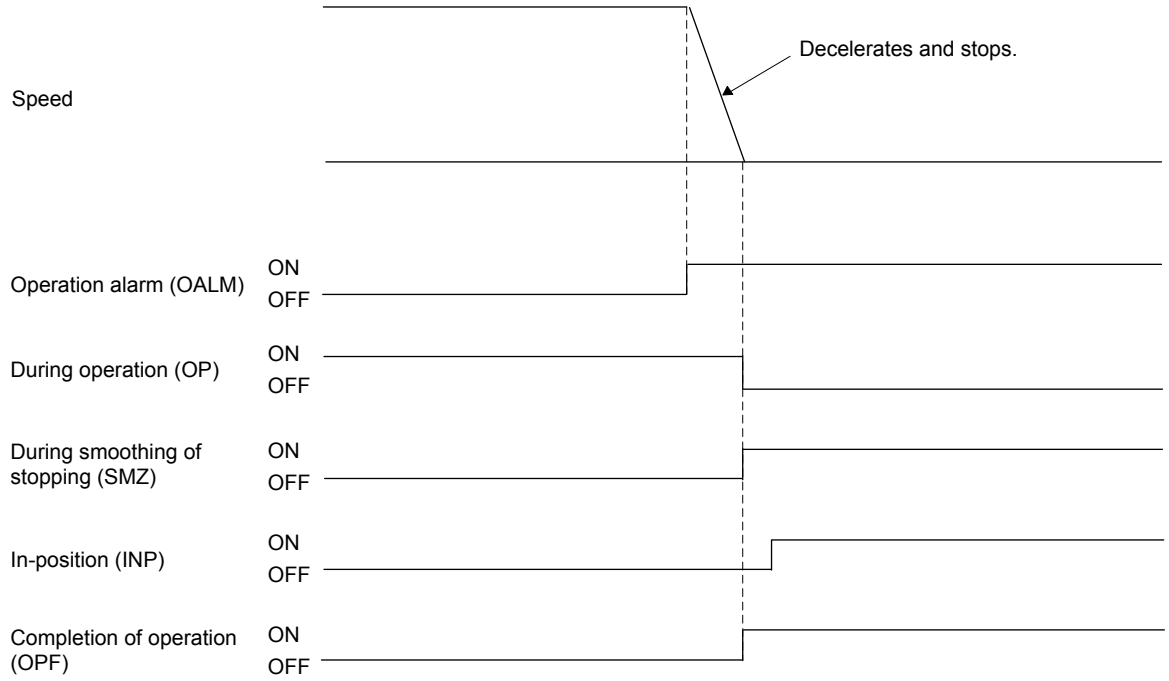

(8) Stop by operation alarm occurrence



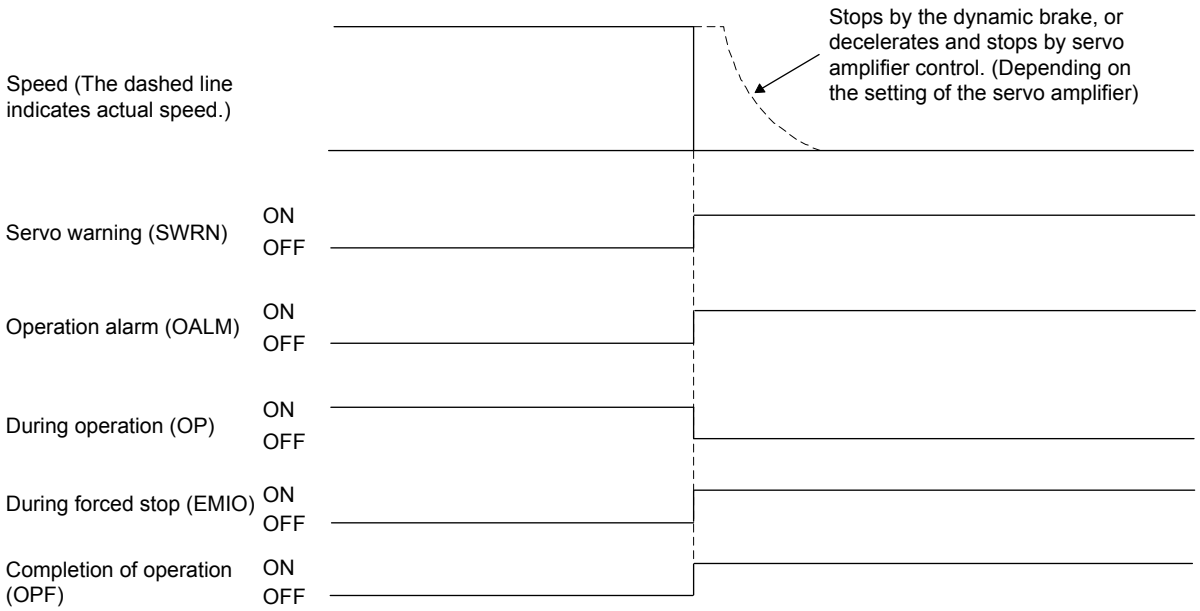
(9) Stop by servo off




(10) Stop by a software limit (Example: In JOG operation)



(11) Stop by forced stop occurrence



## 6.17 Interference check function

Through setting the standard coordinate system for the interference check function, the current command position of all of the axes and movement direction is changed to the standard coordinate system and interference check using relative position is implemented. Therefore, for data used for change of coordinates, the position and direction of the coordinate system with respect to the home position (where the current command position is 0) standard coordinate system can be set using parameters.
Interference checks are performed when operation is started as well as changing of points and if the target position of positioning of the axis is within the interference check area, a command error in interference area (operation alarm 44, detail 01) is output and start of operation is interrupted.
And, for prevention of collision, the current command position is monitored at all times and if the difference of the current command position of the axis and the interference check axis (relative distance) is less than the width for interference checking, an interference standby error (if moving in the same direction) or an entering to interference area error (operation alarm 45, detail 01) occurs and rapid stop is performed.

POINT

- To validate or invalidate the interference check, use the interference check Options (parameter No.0281). The number of axes for which the interference check can be validated differs depending on the control cycle. Up to 8 axes can be set. When the number is set exceeding the maximum number of axes for which the interference check is valid, the parameter error (operation alarm 37, detail 01) occurs on all the axes for which the interference check is valid.

| Control cycle | Maximum number of axes for which the interference check is valid |
|---|---|
| 0.88ms | 8 |
| 0.44ms | 4 |
| 0.22ms | 0 |

- Interference check is valid after home position return complete for the axis and interference check.
- Interference standby is <u>only valid for automatic operation, linear interpolation operation and incremental feed.</u> If while in other operation modes, the difference of the current command position of between the axis and the interference check axis is less than the width of interference checking, an entering interference area error (operation alarm 45, detail 01) occurs and rapid stop is performed.
- Interference check is valid only when the travel direction is the same as the interference check direction.

API LIBRARY

- Use the sscChange2Parameter/sscCheck2Parameter function to set/get anything relating to interference check.

## ⚠CAUTION

- When the axis or the interference check axis is free from the control of the position board, such as in the following cases, this function may not prevent axes from collision.
  - A servo alarm occurs.
  - In torque limit status
  - The power line is disconnected.
  - In inoperable status due to mechanical factors, etc

### 6.17.1 Interface

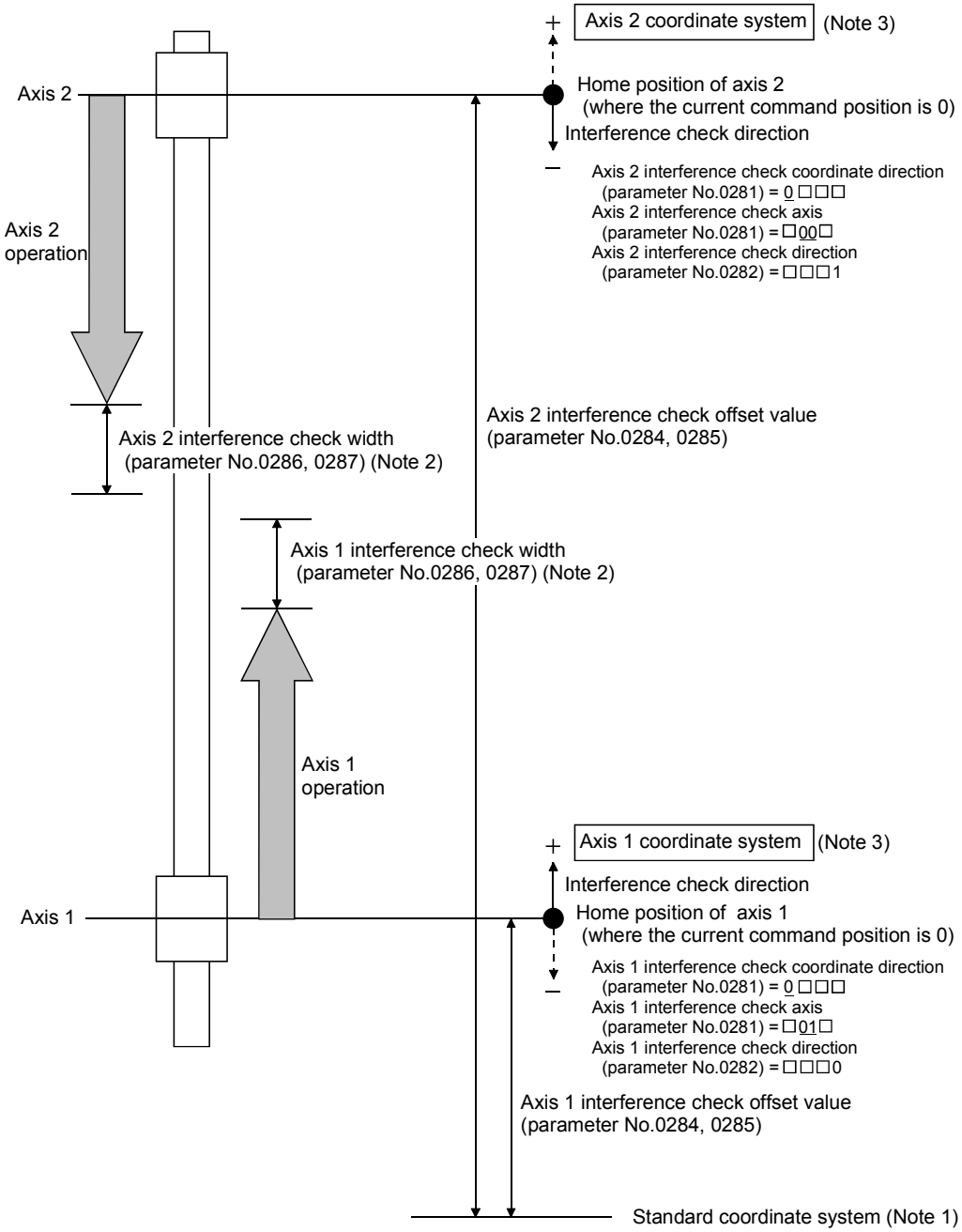
(1) Parameter

| Parameter No. | (Note 1) Abbreviation | Name | Initial Value | Units | Setting range | Function |
|---|---|---|---|---|---|---|
| 0281 | *IOP | Interference check Options | 0000h | | 0000h to 1FF1h | Interference check<br>Set validity/invalidity of interference check<br>0: invalid<br>1: valid<br>Interference check axis (Note 2, 3, 4)<br>Set the other axis for which interference check is performed<br>00 to 1Fh: Interference check axis -1<br>Example: 0: axis No. 1<br>Interference check coordinate direction<br>Set the direction of the coordinate system for the axis from the perspective of the standard coordinate system<br>0: Same direction<br>1: Opposite direction |
| 0282 | *IOP2 | Interference check Options 2 | 0000h | | 0000h to 0011h | 0 0<br>Interference check direction<br>Set the direction for which interference check is performed.<br>0: ＋direction of coordinate system for the axis<br>1: －direction of coordinate system for the axis<br>Interference check standby<br>Set validity/invalidity of interference check standby.<br>0: Invalid<br>1: Valid |
| 0284 | IOFL | Interference check Offset (lower) | 0000h | Command Units | 0000h to FFFFh | Set the position on the home position standard coordinate system. |
| 0285 | IOFH | Interference check Offset (upper) | 0000h | | 0000h to FFFFh | |
| 0286 | IWL | Interference check width (lower) | 0000h | Command Units | 0000h to FFFFh | Set the width from the interference check axis target position of the area where interference check is performed. |
| 0287 | IWH | Interference check width (upper) | 0000h | | 0000h to 7FFFh | |

Note 1. The * mark at the front of the abbreviation shows parameters for which restart is needed after setting them.
2. If the axis No. is set, an interference check axis setting error (operation alarm 43, detail 01) occurs.
3. If an axis in the same linear interpolation group as the axis is set, an interference check axis setting error (operation alarm 43, detail 02) occurs.
4. If axes are designated as tandem drive interference check axes, set up a master axis.

### 6.17.2 Interference check operation image diagram

The following example shows where the direction of the interference check coordinate (the direction of the coordinate system for each axis against the standard coordinate system) is the same direction.




Note 1. The standard coordinate system is virtual, therefore there are not any parameter settings for the standard coordinate system itself.
2. Make sure to set the interference check width. Normally, the same value occurs for independent axes and for interference check axes.
3. The coordinate system direction is positive (direction to which the coordinate values increase).

**POINT**

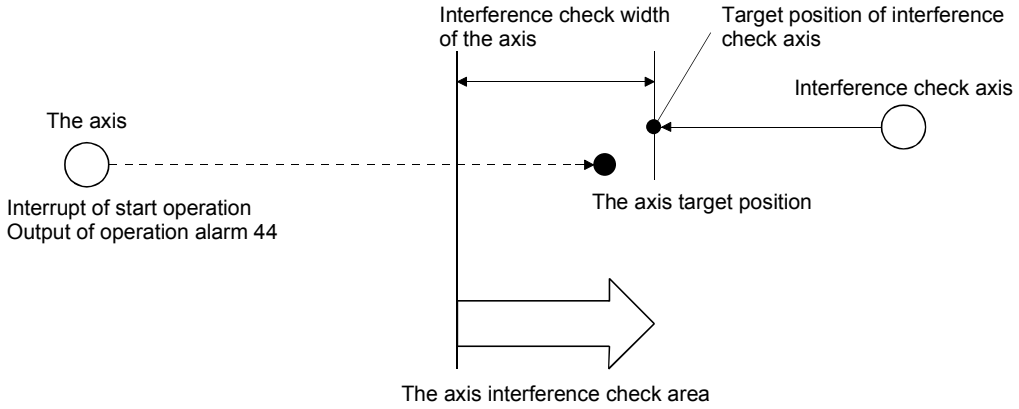
- Interference check is valid when the travel direction is the same as the interference check direction.

### 6.17.3 Checks prior to start up

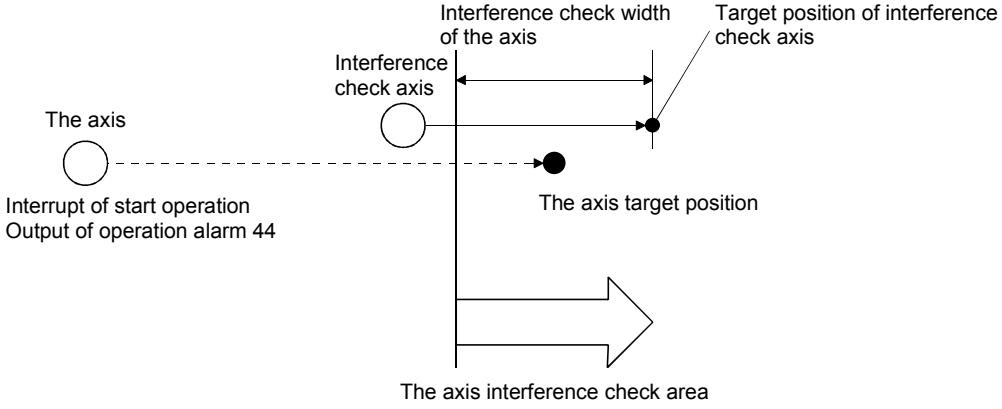
The interference check area is the relative distance from the target position of the interference check axis positioning. Interference checks are performed when operation is started as well as changing of points and if the target position of positioning of the axis is not within the interference check area, a command error in interference area (operation alarm 44, detail 01) is output and start of operation is interrupted.

| POINT |
|---|
| ・For the next, check prior to start up is not performed.<br>・When the operation mode is JOG operation, Home position return and data set.<br>・When the axis is stopping for the interference check. |

(1) If the interference check axis is moving in the direction such that it is getting closer to the axis.




(2) If the interference check axis is moving in the direction such that it is moving away from the axis.

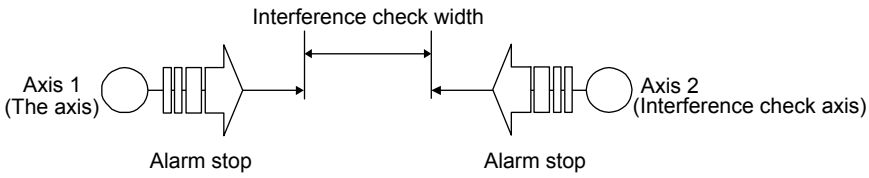


### 6.17.4 Operation check

In order to prevent collision, the current command position is monitored at all times and if the difference between the relative distance of the axis and the interference check axis is judged to be less than the interference check width, rapid stop is executed. The monitored current command position stops, with the travel distance during the rapid stop allowed, so that the distance from the interference check axis does not fall below the interference check width.

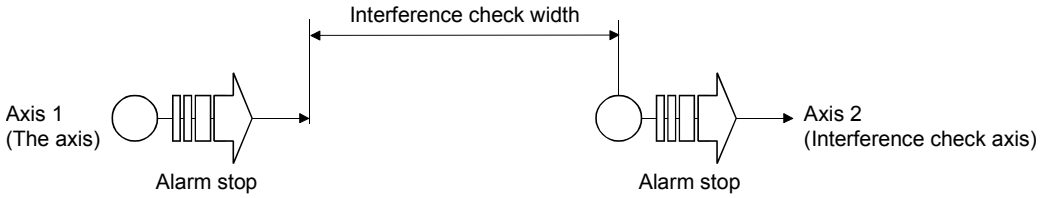
(1) If the interference check axis is moving in the relative distance such that it is getting closer to the axis.
If the distance between the axis and the interference check axis is judged to drop below the interference check width, an entering interference area error (operation alarm 45, detail 01) is output and rapid stop is executed. At the same time, an entering interference area error (operation alarm 45, detail 01) also occurs in the interference check axis and rapid stop is executed.
For the interference check width set the settings so that the following equation is true.

| |
|---|
| Interference check width (Lc) > (Offset from axis one coordinate point to load side)<br>+ (Offset from axis two coordinate point to load side) |



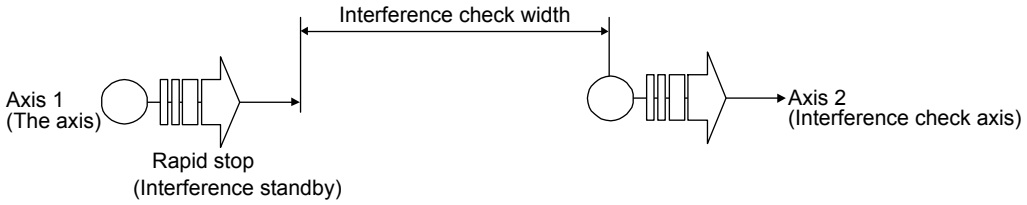

(2) If the interference check axis is moving in the direction such that it is moving away from the axis.
(a) For automatic operation, linear interpolation operation and for using incremental feed
If the distance between the axis and interference check axis is judged to drop below the interference check width while the interference check axis is moving away from the axis and rapid stop is executed. Then, whether to cancel the operation or to restart the operation automatically by conditions can be selected in Interference check standby (parameter No.0282).

1) When Interference check standby is invalid
If the distance between the axis and interference check axis is judged to drop below the interference check width while the interference check axis is moving away from the axis, output an extending to interference area error (operation alarm 45, detail 01) and execute and rapid stop is executed. At the same time, an entering interference area error (operation alarm 45, detail 01) also occurs in the interference check axis and rapid stop is executed.



2) When Interference check standby is valid

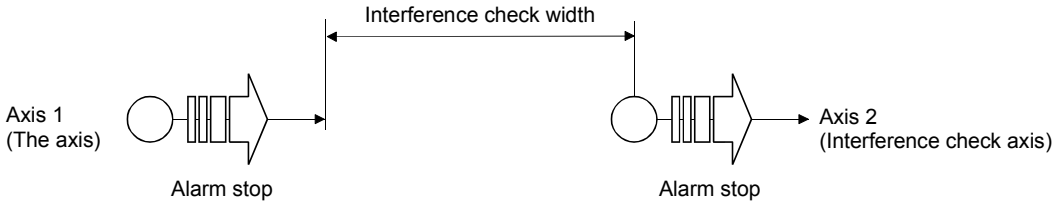
If the distance between the axis and interference check axis is judged to drop below the interference check width while the interference check axis is moving away from the axis, turn the during interference check standby signal (IWT) for the axis on and rapid stop is executed. When the distance between the axis and the interference check axis exceeds the interference check width, operation is automatically resumed and the machine resumes moving to the target position.




| POINT |
|---|
| ・If the interference check axis stops due to an alarm etc. during interference standby, an entering interference area error (operation alarm 45, detail 01) occurs and operation is terminated. |

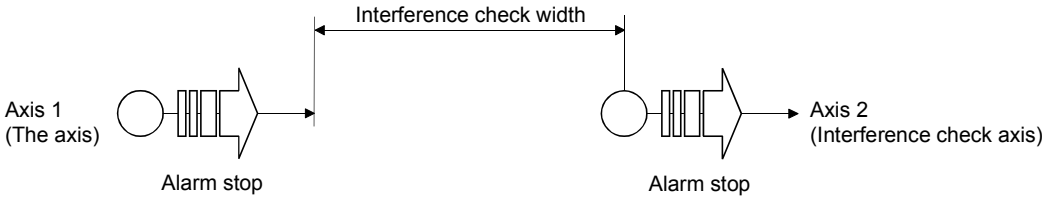
(b) For other than automatic operation, linear interpolation operation and incremental feed

If the distance between the axis and interference check axis is judged to drop below the interference check width while the interference check axis is moving away from the axis, an extending to interference area error (operation alarm 45, detail 01) is output and rapid stop is executed. At the same time, an entering interference area error (operation alarm 45, detail 01) also occurs in the interference check axis and rapid stop is executed.



(3) While the interference check axis is stopped

If the distance between the axis and the interference check axis is judged to drop below the interference check width, an entering interference area error (operation alarm 45, detail 01) is output and rapid stop is executed. At the same time, an entering interference area error (operation alarm 45, detail 01) also occurs in the interference check axis.




The position information for the interference check axis used for making judgement to prevent collision is the following.

(a) If the interference check axis is getting closer to the axis
Perform the check using current command position.

(b) If the interference check axis is getting further away from the axis
Perform the check using current feedback position.

(c) While the interference check axis is stopped
Perform the check using current feedback position.

## 6.18 Home position search limit

### 6.18.1 Summary

The home position search limit function is that while returning to home position, through movement operation in the opposite direction of home position return, if the movement exceeds the parameter set for the home position search limit (parameter No.024A, 024B), a home position search limit error (operation alarm 98, detail 01) occurs and home position return operation is terminated. It is a function used to prevent unexpected operation in case the dog signal and limit switch cannot detect correctly due to a failure. The home position search limit function is valid for the following home position return methods.

(1) Home position return using a dog method

(2) Home position return using the dog cradle method

(3) Home position return using a limit switch combined method

(4) Home position return using a limit switch front end method

(5) Home position return using a dog front end method

(6) Home position return using a scale home position signal detection method

(7) Home position return using a scale home position signal detection method 2

### 6.18.2 Set items

The following items are set for using the home position search limit function.

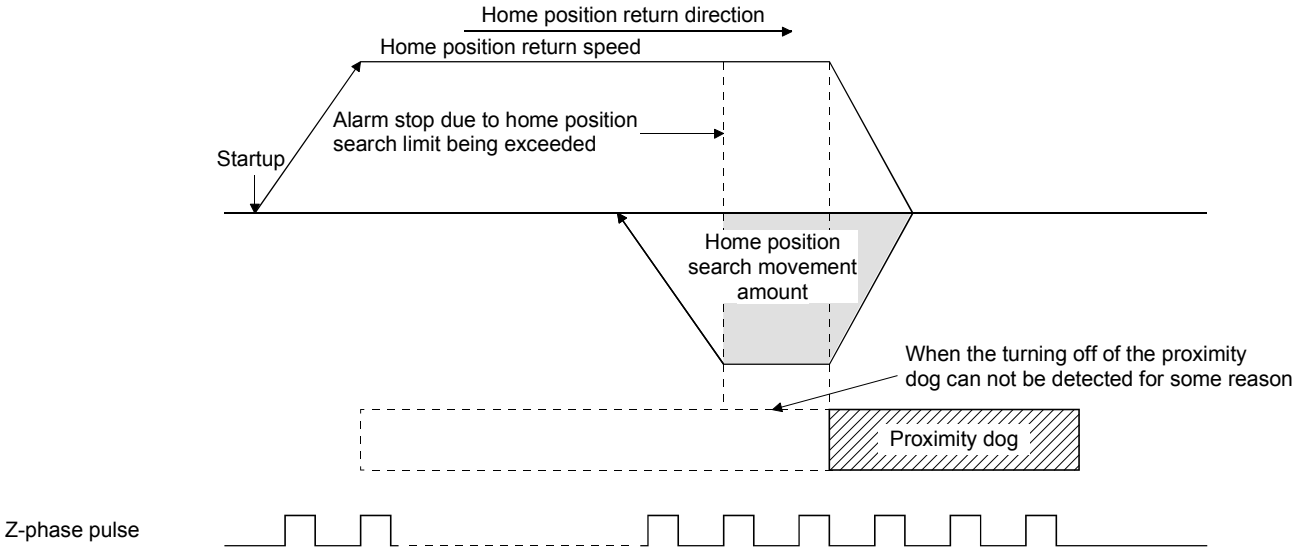
| Parameter No. | Name | Abbreviation | Units | Setting range | Initial Value | Remarks |
|---|---|---|---|---|---|---|
| 024A | Home position search limit (lower) | ZLL | Command Units | 0000h to FFFFh | 0000h | Set a limit on the movement amount when searching for the home position. If the setting for the home position search limit is 0, this function does not operate. |
| 024B | Home position search limit (upper) | ZLH | | 0000h to 7FFFh | 0000h | |

API LIBRARY

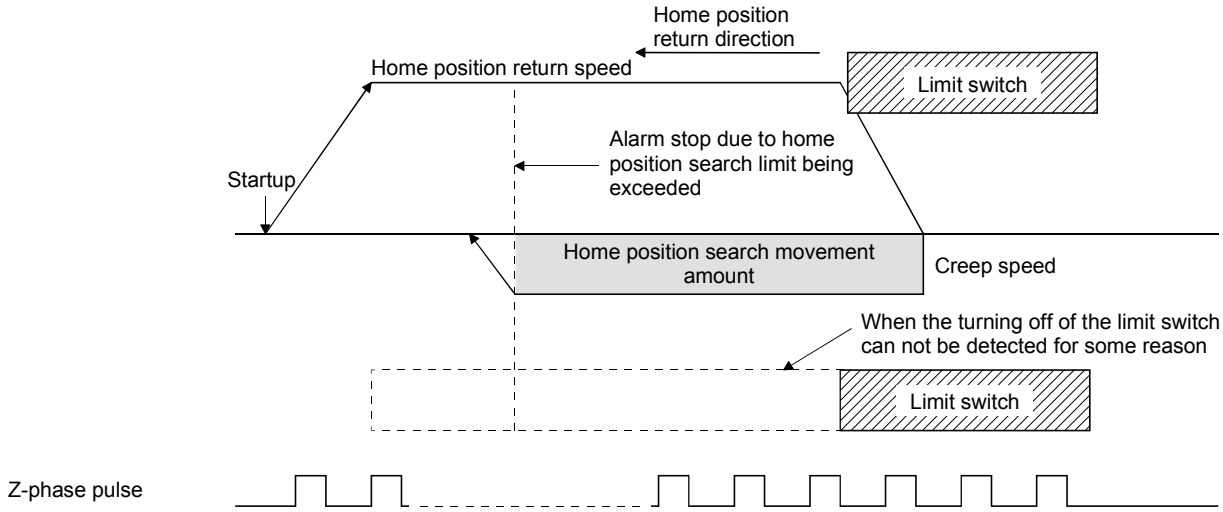
- Use the sscChange2Parameter/sscCheck2Parameter function to set/get the home position search limit.

6.18.3 Home position search limit operation example

(1) For home position return using a dog cradle method (example: when the turning off of the proximity dog can not be detected)




(2) For home position return using a limit switch combined method (example: when the limit switch is not released)



## 6.19 Gain changing

Through turning on the gain changing command signal (GAIN), the gain for the servo amplifier can be changed. This is used to change the gain during revolution and while stopped, as well as changing gain proportional to amount of movement or speed. When the gain changing function is used, set the following servo parameters.

For servo parameters (MR-J4(W□)-□B)

| Parameter No. | MR-J4-B Parameter No. | Abbreviation | Name | Setting value |
|---|---|---|---|---|
| 1159 | PB26 | *CDP | Gain switching function | Arbitrary within setting range |
| 115A | PB27 | CDL | Gain switching condition | Arbitrary within setting range |
| 115B | PB28 | CDT | Gain switching time constant | Arbitrary within setting range |
| 115C | PB29 | GD2B | Gain switching ratio of load inertia moment/load mass ratio | Arbitrary within setting range |
| 115D | PB30 | PG2B | Gain switching position control gain | Arbitrary within setting range |
| 115E | PB31 | VG2B | Gain switching speed control gain | Arbitrary within setting range |
| 115F | PB32 | VICB | Gain switching speed integral compensation | Arbitrary within setting range |
| 1160 | PB33 | VRF11B | Gain switching vibration suppression control 1 vibration frequency setting | Arbitrary within setting range |
| 1161 | PB34 | VRF12B | Gain switching vibration suppression control 1 resonance frequency setting | Arbitrary within setting range |
| 1162 | PB35 | VRF13B | Gain switching vibration suppression control 1 vibration frequency dumping setting | Arbitrary within setting range |
| 1163 | PB36 | VRF14B | Gain switching vibration suppression control 1 resonance frequency setting | Arbitrary within setting range |
| 1177 | PB56 | VRF21B | Gain switching vibration suppression control 2 vibration frequency setting | Arbitrary within setting range |
| 1178 | PB57 | VRF22B | Gain switching vibration suppression control 2 resonance frequency setting | Arbitrary within setting range |
| 1179 | PB58 | VRF23B | Gain switching vibration suppression control 2 vibration frequency dumping setting | Arbitrary within setting range |
| 117A | PB59 | VRF24B | Gain switching vibration suppression control 2 resonance frequency setting | Arbitrary within setting range |
| 117B | PB60 | PG1B | Gain switching model loop gain | Arbitrary within setting range |

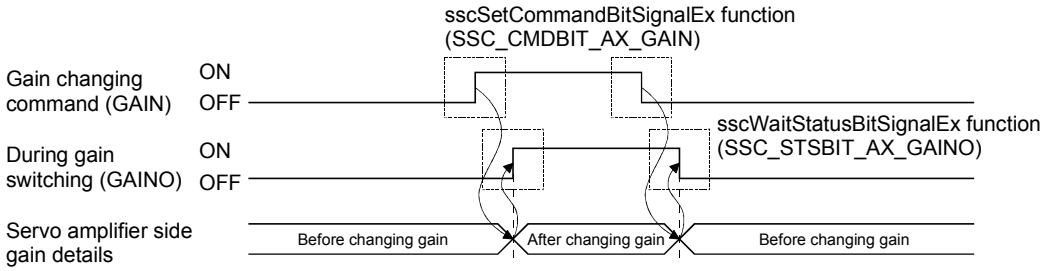
POINT

- Refer to the Servo Amplifier Instruction Manual on your servo amplifier concerning details for the servo parameters.
- To use the gain switching function, first set the gain adjustment mode to a manual mode by changing an auto-tuning mode (parameter No.1107) to 3 (manual mode). If the gain adjustment mode is in an auto-tuning mode, the gain changing function cannot be used.

API LIBRARY

- To turn ON/OFF the gain changing command (GAIN), set SSC_CMDBIT_AX_GAIN to the command bit number of the sscSetCommandBitSignalEx function.
- To check if during gain switching (GAINO) is ON/OFF, set SSC_STSBIT_AX_GAINO to the status bit number with the sscGetStatusBitSignalEx or sscWaitStatusBitSignalEx function.

A timing chart using for gain changing is shown below.



## 6.20 PI-PID switching

By turning on the PID control command signal (CPC), control of the servo amplifier is changed to PID control from PI control. Use this function, for example, to remove any interference (torsion) between tandem drive axes by operating an axis (slave axis) under PID control. When using the PI-PID switching function, set the following servo parameters.

For servo parameter (MR-J4(W□)-□B)

| Parameter No. | MR-J4-B Parameter No. | Abbreviation | Name | Setting value |
|---|---|---|---|---|
| 1157 | PB24 | *MVS | Slight vibration suppression control | □□0□ (PI control is valid (can be switched to PID control by the command from controller).) |

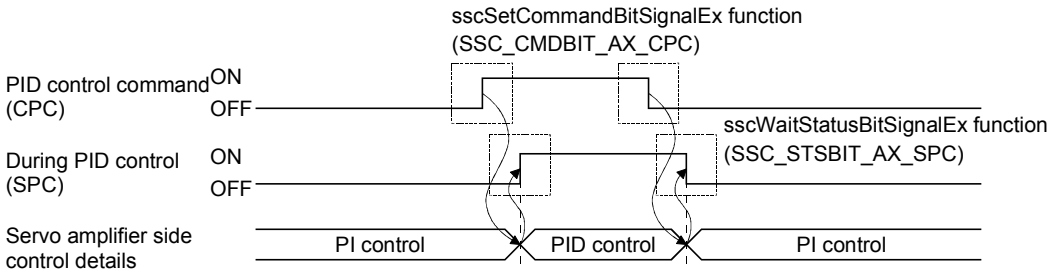
POINT

- Refer to the Servo Amplifier Instruction Manual on your servo amplifier concerning details for the servo parameters.
- To use the PI-PID switching function, first set the gain adjustment mode to a manual mode by changing an auto-tuning mode (parameter No.1107) to 3 (manual mode). If the gain adjustment mode is in an auto-tuning mode, the PI-PID switching function cannot be used.

API LIBRARY

- To turn ON/OFF the PI-PID switching command (CPC), set SSC_CMDBIT_AX_CPC to the command bit number of the sscSetCommandBitSignalEx function.
- To check if during PID control (SPC) is ON/OFF, set SSC_STSBIT_AX_PID to the status bit number with the sscGetStatusBitSignalEx or sscWaitStatusBitSignalEx function.

A timing chart using for PI-PID switching is shown below.



## 6.21 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 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 system startup.
Determination of machinery position is made by the home position return. At home position return and power on, be sure to execute the operation referring to the procedures described in Section 6.21.2.

> API LIBRARY
> ・Use the sscChange2Parameter/sscCheck2Parameter function to set/get the absolute position detection system.

### 6.21.1 Parameters

The parameters related to the absolute position detection system are shown below.

| Parameter No. | (Note) Abbreviation | Name | Initial value | Unit | Setting range | Function |
|---|---|---|---|---|---|---|
| 1102 | *ABS | Absolute position detection system | 0000h | | 0000h to 0001h | 0 0 0 □<br>Absolute position detection system selection<br>0: Used in incremental system<br>1: Used in absolute position detection system |
| 0241 | *OPZ2 | Home position return option 2 | 0000h | | 0000h to 0011h | 0 0 □ □<br>Absolute position data<br>Set the validity/invalidity of restoring the absolute position.<br>0: Invalid<br>1: Valid<br>When 1 is set, the absolute position is restored at system startup, based on the home position multiple revolution data and the home position within 1 revolution position.<br>When 0 is set, the position at system startup is defined to be 0. Perform the home position return prior to automatic operation and linear interpolation.<br>Change of absolute position data on home position reset |
| 024D | *LS0 | Home position multiple revolution data | 0000h | rev | 0000h to FFFFh | Set the home position multiple revolution data. |
| 024E | *CY0L | Home position within 1 revolution position (lower) | 0000h | pulse | 0000h to FFFFh | Set the within 1 revolution home position. |
| 024F | *CY0H | Home position within 1 revolution position (upper) | 0000h | | 0000h to FFFFh | |

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

### 6.21.2 Processing procedure

Be sure to execute the operation referring to the following procedures at home position return and power on.

(1) Processing procedure for returning to home position

(a) Set the absolute position detection system (parameter No.1102) to 1 (Use in absolute position detection system).

(b) If setting the parameter in (a) for the first time, "absolute position erased" (servo alarm 25) occurs. After turning OFF the power supply of servo amplifier, turn power supply ON again and start the system again.

(c) Execute home position return.

(d) When the home position return is completed, the home position return request (ZREQ) turns off and the home position return complete signal (ZP) turns on. Then the home position multiple revolution data (parameter No.024D) and the home position within 1 revolution position (parameter No.024E, 024F) are updated, and the absolute position data of the home position return option 2 (parameter No.0241) is changed to 1 (valid).

(e) After confirming the home position return complete signal (ZP) is on, read the home position multiple revolution data (parameter No.024D) and home position within 1 revolution position (parameter No.024E, 024F) and store a backup copy.

(2) Processing procedure for turning on the power

After executing backup of the position of the home position at (1), execute the following processing before system startup (before setting the system directive code to 000Ah). Performing of this process restores the system to absolute positioning at system startup.

(a) Set the home position multiple revolution data and home position within 1 revolution position stored during backup of (1) to the home position multiple revolution data (parameter No.024D) and home position within 1 revolution position (parameter No.024E, 024F).

(b) Set the absolute position data of the home position return option 2 (parameter No.0241) to 1 (valid).

(3) Cautions for use of absolute position detection system

In the case of the following (a) to (f), the absolute position erased signal (ABSE) is turned on and the absolute position data of the home position return option 2 (parameter No.0241) is changed to 0 (invalid). Furthermore, the servo is not yet finished with home position return, and the home position return request (ZREQ) turns on. Therefore when performing automatic operation, execute home position return again. (In cases other than (a))

| POINT |
|---|
| ・If the absolute position erased signal (ABSE) is turned on, re-execute home position return and read the home position multiple revolution data and home position within one-revolution position. |

(a) When parameters related to the home position return (parameter No.0240, 0246 to 0249, and 024D to 024F), electronic gear (parameter No.020A to 020D), and rotation direction selection (parameter No.110D) are changed. (For software version A5 or later, absolute position erased signal (ABSE) does not turn ON when parameter No.0240 is changed.)

(b) If "absolute position erased " (servo alarm 25) or "absolute position counter warning" (servo alarm E3) occurs, note that these alarms will be cleared by servo amplifier power OFF/ON.

(c) Parameter error (servo alarm 37) occurs.

(d) The setting value for "home position multiple revolution data" (parameter No.024D) or "home position within 1 revolution position" (parameter No.024E, 024F) is incorrect and overflow in calculating absolute position restoration occurs.

(e) "Tandem drive synchronous valid width error" (operation alarm No. 54, detail 01) or "Tandem drive synchronous alignment error" (operation alarm 58, detail 01) occurs.

(f) Electronic gear setting error (system error E500) occurs. This error causes a forced stop status to prevent operation. Reexamine the setting of an electronic gear and start the system again.

POINT

・The position after startup (restoration of absolute position) is determined using the following.

Restoration absolute position (pulse) = (within 1 revolution position at system startup
− home position within 1 revolution position)
+ (multiple revolution data at system startup
− home position multiple revolution data)
× number of encoder pulses per revolution

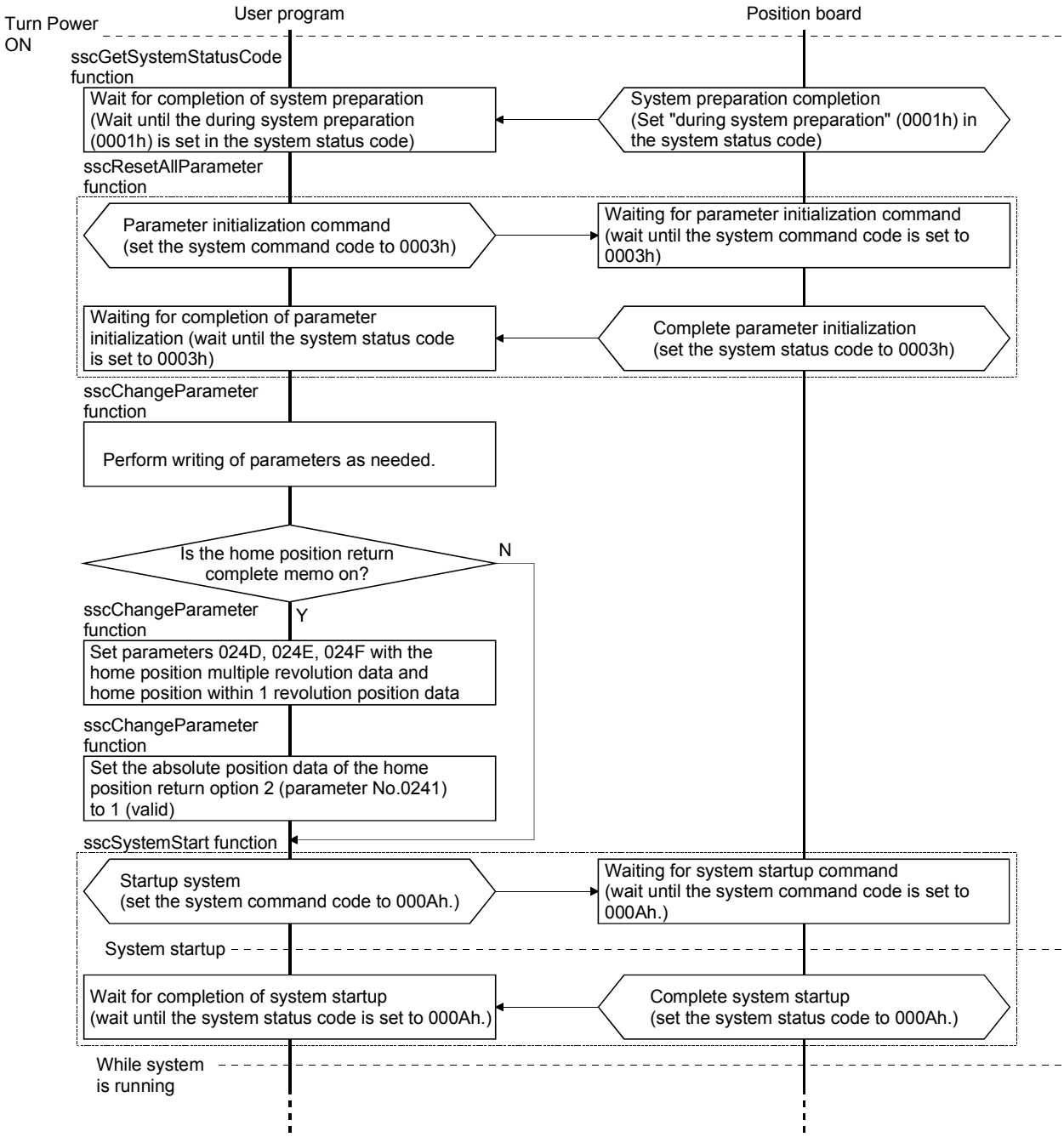
Restoration absolute position (command unit) = restoration absolute position (pulse)
× reciprocal of number of electronic gears (Note)
+ home position coordinate

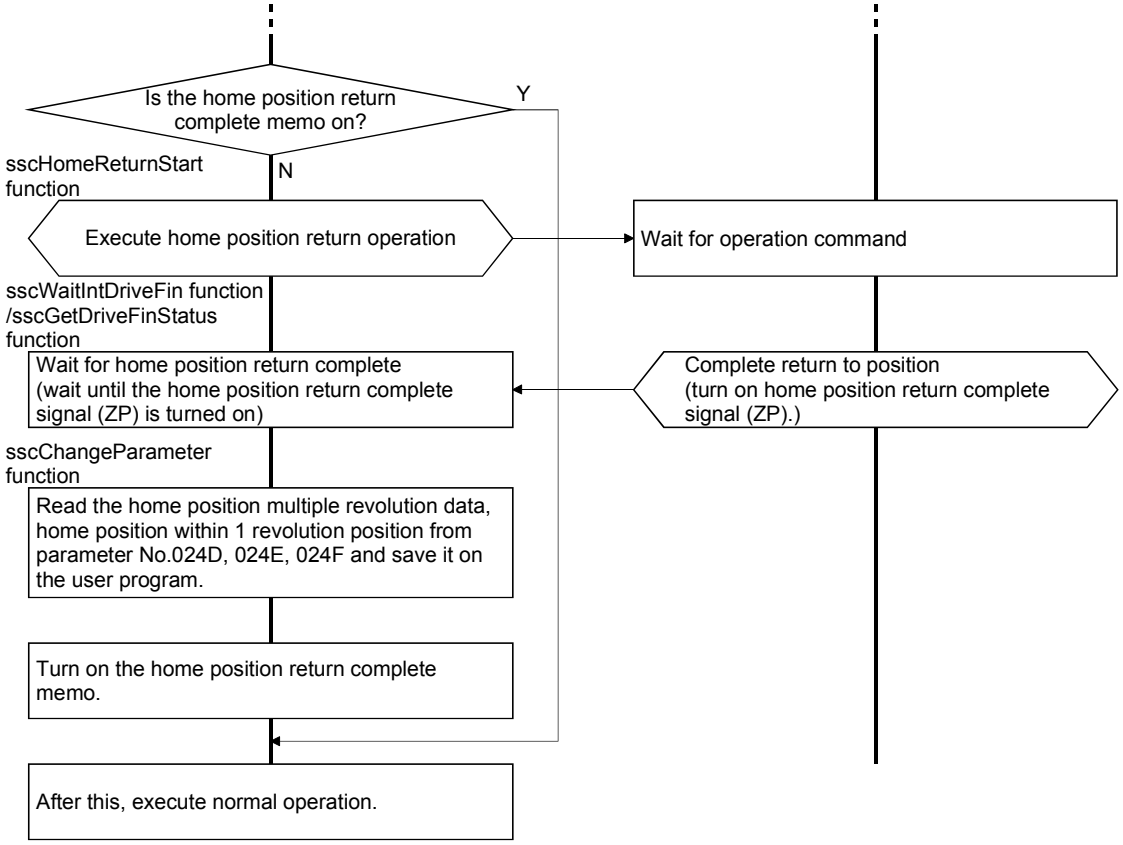
Note. reciprocal of number of electronic gears = electronic gear denominator (CDV)/electronic gear numerator (CMX)

### 6.21.3 Sequence example

Prepare a home position return complete memo showing that the home position has been established on the user program. Turn the home position return complete memo on when home position return is complete. When the home position return complete memo is turned on, execution of 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 home position return.

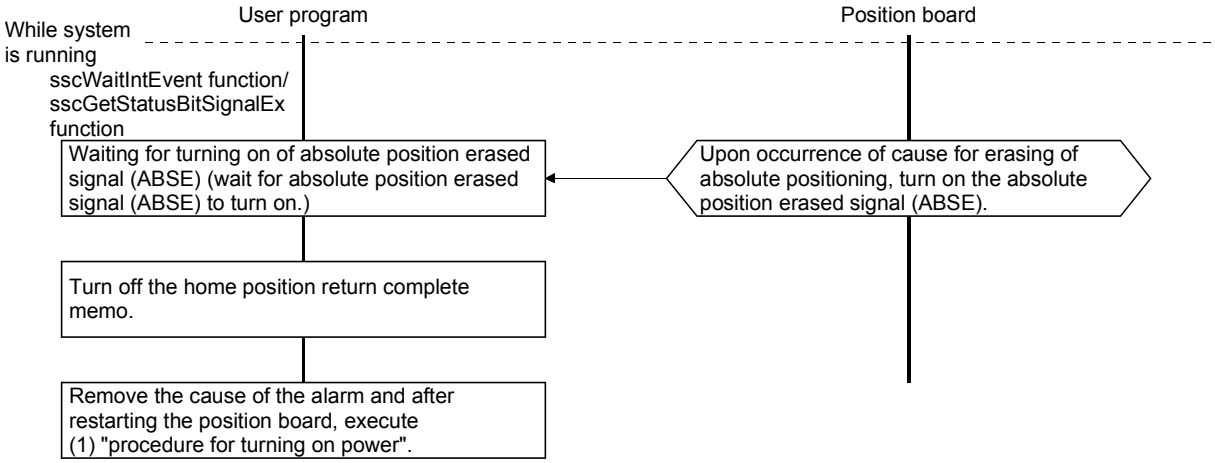
(1) Startup procedure






(2) Procedure for when absolute position disappears.

If the absolute position erased signal (ABSE) is turned on, turn off the home position return complete memo being held at the user program.



## 6.22 Home position return request

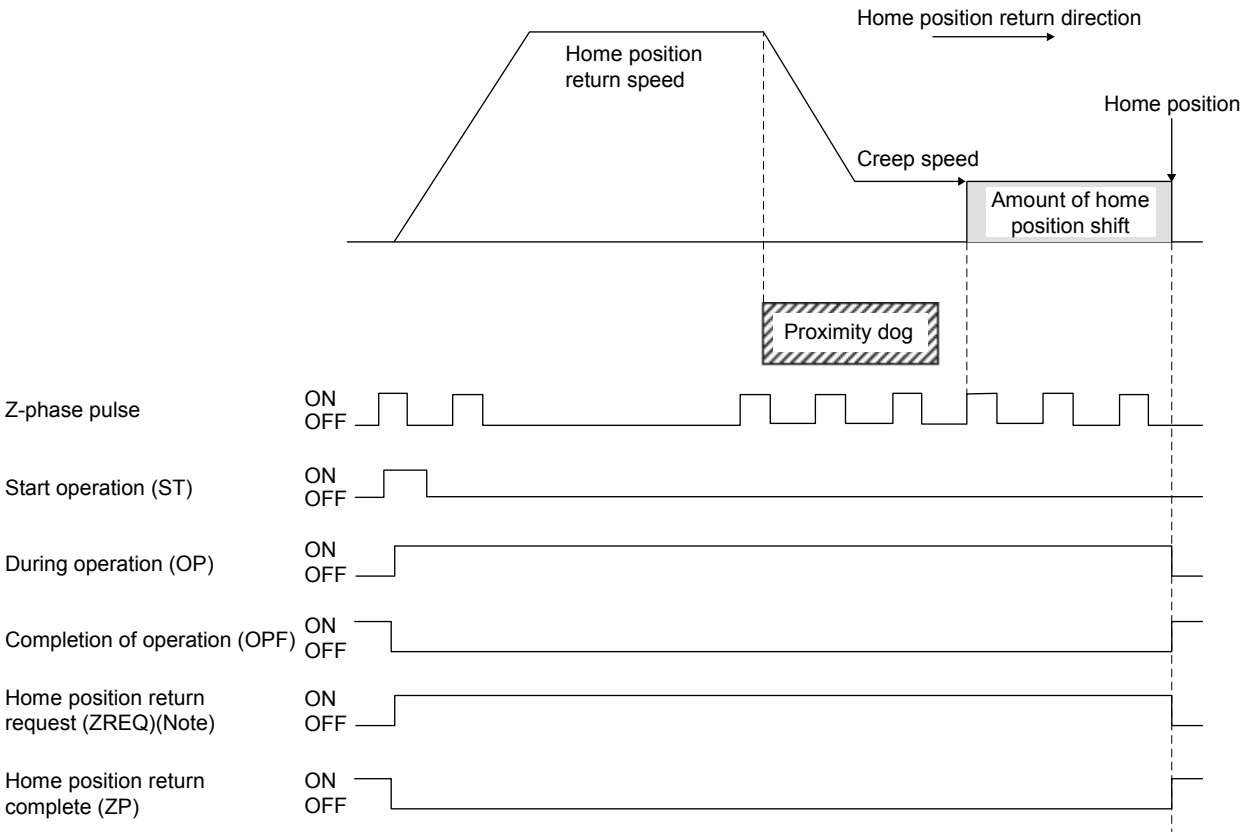
The home position return request (ZREQ) shows the home position return incomplete status. In the home position return incomplete status, the home position return request (ZREQ) turns on. When it is necessary to determine the home position, perform the home position return. When the home position return is completed properly and the home position is determined, the home position return request (ZREQ) turns off.

(1) Axis status bit

| Address (Note) | Bit | Abbreviation | Signal name | When tandem drive is being used |
|---|---|---|---|---|
| 1064 | 0 | ISTP | Interlock stop | Master |
| | 1 | RMRCH | High speed monitor is latched | Each axis |
| | 2 | POV | Stop position over-bound | Master |
| | 3 | STO | Start up acceptance complete | Master |
| | 4 | | Reserved | |
| | 5 | | | |
| | 6 | ZREQ | Home position return request | Master |
| | 7 | | Reserved | |

Note: The address is for the axis 1. For the axis 2 and above, increase in units of C0h for each axis.

Example: Dog method home position return




Note. The home position return request (ZREQ) turns on when a home position return starts.

API LIBRARY

- To check if home position return request (ZREQ) is ON/OFF, set SSC_STSBIT_AX_ZREQ to the status bit number with the sscGetStatusBitSignalEx or sscWaitStatusBitSignalEx function.

(2) The following shows the conditions for the home position return request (ZREQ) to turns on/off.

(a) At system startup

1) Condition of turning on

a) When the axis is a tandem drive axis and does not have home position (parameter No.0200).

b) When "absolute position erased" (servo alarm 25) or "absolute position counter warning" (servo alarm E3) occurs

c) The setting value for "home position multiple revolution data" (parameter No.024D) or "home position within 1 revolution position" (parameter No.024E, 024F) is incorrect and overflow in calculating absolute position restoration occurs.

d) When parameter error (servo alarm 37) occurs

e) When electronic gear setting error (system error E500) occurs

f) When setting of absolute position data (parameter No.0241) is invalid and system is startup

2) Condition of turning off

a) When the absolute position is restored properly at the use of the absolute position detection system

b) When the axis is a monopodium (not a tandem drive axis) and does not have home position (parameter No.0200)

(b) While system is running

1) Condition of turning on

a) When home position return is started

b) "Tandem drive synchronous valid width error" (operation alarm No. 54, detail 01) or "Tandem drive synchronous alignment error" (operation alarm 58, detail 01) occurs.

c) When "Condition of turning ON at system startup" ((a) 1)) is satisfied at SSCNET reconnection

2) Condition of turning off

a) When home position return is completed properly

(3) The following shows the restrictions at home position return incomplete status (home position return request (ZREQ): ON).

(a) Operational functions

Automatic operation, linear Interpolation and home position reset are unavailable. At start operation, home position return not complete (operation alarm 90, detail 01) occurs and start operation is canceled.

(b) Application functions

Software limit, rough match output, backlash, position switch and interference check function are invalid.

(c) Tandem drive

Synchronization for turning servo on is not performed.

## 6.23 Other axes start

### 6.23.1 Summary

The other axes start function is a function that automatically performs the start operation for other axes, and turns on/off the digital output signal or 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 32) 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 automatic operation and linear interpolation operation.

**⚠CAUTION**

- If the digital output signal is updated from the user program during controlling of the digital output 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 controller and position board update the data at the same time to the same digital output area number. In this case, read/write the digital output signal after controlling the possessory right of the digital output signal using the exclusive control function. For the output device signal, use the exclusive control function to perform exclusive control in the same way.

### 6.23.2 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.
- 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 a observed axis.

(1) Point table

Set the other axes start data No. for the other axes start specification.

POINT

- The setting range of the other axes start data No. differs depending on the control cycle. A maximum of 1 to 32 can be set. When the setting is out of the range of the valid other axes start data No., it causes a point table setting error (operation alarm 25, detail 09).

| Control cycle | Valid other axes start data No. |
|---|---|
| 0.88ms | 1 to 32 |
| 0.44ms | 1 to 16 |
| 0.22ms | 1 to 8 |

API LIBRARY

- Use the sscSetPointDataEx/sscCheckPointDataEx functions to set/get point table.
- For a detailed procedure for other axes start, refer to the sample programs (InterruptOas/PollingOas/OasDigitalOutput) contained on the utility software.

| 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 [%] | Reserved |
|---|---|---|---|---|---|---|---|---|---|
| | 4 bytes | 4 bytes | 2 bytes | 2 bytes | 2 bytes | 2 bytes | 4 bytes | 1 byte | 11 bytes |
| 0000 | 2000 | 2000 | 20 | 30 | 0 | 0000h | 00000000h | 100 | 0 |
| 0001 | 2000 | 3000 | 30 | 50 | 0 | 0000h | 00000000h | 100 | 0 |
| 0002 | 1000 | 1000 | 20 | 30 | 0 | 0000h | 00000000h | 100 | 0 |
| : | : | : | : | : | : | : | : | : | : |

(a) Other axes start specification

| Bit 31 | 24 | 16 | 8 | 0 |
|---|---|---|---|---|
| Reserved | Reserved | Other axes start specification 2 | Other axes start specification 1 | |

- Other axes start specification 1 and 2

  0 : Other axes start specification invalid

  1 to 32: Other axes start data No.

Example) Set 00000401h to set 1 and 4 for the other axes start specification 1 and 2, respectively.

1) Cause of alarm

- When the other axes start data set in the other axes start specification at point switching or the start of operation is being used (when the other axes start notice signal (OSOP□) is on), using other axes start data (operation alarm 5B, detail 01) occurs and operation is terminated.
- If the setting of the other axes start specification is incorrect, it causes a point table setting error (operation alarm 25, detail 09) and operation is stopped.

(2) Other axes start data

For the other axes start data (1 to 32), 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 32) is set to the other axes start specification (other axes start specification 1 and 2) of the point table, other axes are started according to the settings of the corresponding other axes start data.

Other axes start data table

| | | | | | |
|---|---|---|---|---|---|
| E100 | Other axes start data 1 | Start condition | E780 | Other axes start data 17 | Start condition |
| | | Operation content | | | Operation content |
| E168 | Other axes start data 2 | Start condition | E7E8 | Other axes start data 18 | Start condition |
| | | Operation content | | | Operation content |
| E1D0 | Other axes start data 3 | Start condition | E850 | Other axes start data 19 | Start condition |
| | | Operation content | | | Operation content |
| E238 | Other axes start data 4 | Start condition | E8B8 | Other axes start data 20 | Start condition |
| | | Operation content | | | Operation content |
| E2A0 | Other axes start data 5 | Start condition | E920 | Other axes start data 21 | Start condition |
| | | Operation content | | | Operation content |
| E308 | Other axes start data 6 | Start condition | E988 | Other axes start data 22 | Start condition |
| | | Operation content | | | Operation content |
| E370 | Other axes start data 7 | Start condition | E9F0 | Other axes start data 23 | Start condition |
| | | Operation content | | | Operation content |
| E3D8 | Other axes start data 8 | Start condition | EA58 | Other axes start data 24 | Start condition |
| | | Operation content | | | Operation content |
| E440 | Other axes start data 9 | Start condition | EAC0 | Other axes start data 25 | Start condition |
| | | Operation content | | | Operation content |
| E4A8 | Other axes start data 10 | Start condition | EB28 | Other axes start data 26 | Start condition |
| | | Operation content | | | Operation content |
| E510 | Other axes start data 11 | Start condition | EB90 | Other axes start data 27 | Start condition |
| | | Operation content | | | Operation content |
| E578 | Other axes start data 12 | Start condition | EBF8 | Other axes start data 28 | Start condition |
| | | Operation content | | | Operation content |
| E5E0 | Other axes start data 13 | Start condition | EC60 | Other axes start data 29 | Start condition |
| | | Operation content | | | Operation content |
| E648 | Other axes start data 14 | Start condition | ECC8 | Other axes start data 30 | Start condition |
| | | Operation content | | | Operation content |
| E6B0 | Other axes start data 15 | Start condition | ED30 | Other axes start data 31 | Start condition |
| | | Operation content | | | Operation content |
| E718 | Other axes start data 16 | Start condition | ED98 | Other axes start data 32 | Start condition |
| | | Operation content | | | Operation content |

POINT

- All axes start data specified in the other axes start specification of the point table upon start of 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 will be invalid.

API LIBRARY

- Use the sscSetOtherAxisStartData/sscGetOtherAxisStartData functions to set/get other axes start data.

(a) Start condition

| Address | Abbreviation | Name | Initial Value | Unit | Setting range | Function |
|---|---|---|---|---|---|---|
| E100 | OSOPN1 | Axis option (4 bytes) | 00000000h | | 00000000h to 00000011h | 0 0 0 0 0 0 ☐ ☐<br>Axis judgment condition<br>Set the judgment condition for the axis.<br>0: Remaining distance specification<br>(The condition is satisfied when the axis remaining distance is equal to or shorter than the axis remaining distance data.)<br>1: Specified position pass specification<br>(The condition is satisfied when the axis position exceeds the axis pass position data.)<br>Axis judgment coordinate<br>Set the judgment coordinate for the axis.<br>0: Current feedback position<br>1: Current command position |
| E104 | OSOPN2 | Observed axis option (4 bytes) | 00000000h | | 00000000h to 00FF1111h | Set here to monitor axes.<br>0 0 ☐ ☐ ☐ ☐ ☐ ☐<br>Observed axis specification<br>Validates the observed axis.<br>0: Invalid<br>1: Valid<br>Observed axis judgment condition<br>Set the judgment condition for the observed axis.<br>0: Not use<br>1: Observed axis specified position pass specification<br>Observed axis judgment coordinate<br>Set the judgment coordinate for the observed axis.<br>0: Current feedback<br>Observed axis specified position pass judgment condition<br>Set the specified position pass judgment condition for the observed axis.<br>0: Condition is satisfied when observed axis position is less than or equal to observed axis specified position data<br>1: Condition is satisfied when observed axis position is more than or equal to observed axis specified position data<br>Observed axis No.<br>Set the observed axis No.<br>00h to 1Fh: Axis No. 1<br>Example) 0Ah: Axis No. 11 |
| E108 | OSPP | Axis remaining distance data (4 bytes) | 0 | Command Units | 0 to 2147483647 | Set the remaining distance data for the axis.<br>(When "0: Remaining distance specification" is set to the axis judgment condition.) |
| | | Axis pass position data (4 bytes) | 0 | Command Units | -2147483648 to 2147483647 | Set the pass position data for the axis.<br>(When "1: Specified position pass specification" is set to the axis judgment condition) |

| Address | Abbreviation | Name | Initial Value | Unit | Setting range | Function |
|---|---|---|---|---|---|---|
| E10C | OSMP | Observed axis specified position data (4 bytes) | 0 | Command Units | -2147483648 to 2147483647 | Set the specified position data of the observed axis set in the observed axis option. |
| E110 to E117 | | Reserved (8 bytes) | | | | |

Note. The addresses in the table are the addresses for the other axes start data 1. For the other axes data 2 and above, increase in units of 68h for each axis.

1) Cause of alarm

An incorrect setting of the other axes start condition causes an other axes start setting error (operation alarm 4D, detail 01) at the start operation or point switching.

- The setting of the axis option, observed axis option, or axis remaining distance data is outside limits.
- The position specified in the axis pass position data cannot be passed.
  (When "1: Specified position pass specification" is set to the axis judgment condition)
  However, the condition above does not cause the error when the specified position is in the opposite direction from the movement direction.
  In this case, the specified position is judged to be already passed, which satisfies the condition.
- When the observed axis specification is valid, a non-existent axis (Note) is set in the observed axis No.

(b) Operation content

| Address | Abbreviation | Name | Unit | Setting range | Function |
|---|---|---|---|---|---|
| E118 | OSAX1 | Start axis designation 1 (4 bytes) | | 00000000h to FFFFFFFFh | Set the axis for which the start operation is performed when the other axes start condition is satisfied.<br>Axis 1 (bit 0) to axis 32 (bit 31)<br>0: Start operation invalid<br>1: Start operation valid |
| E11C to E11F | | Reserved (4 bytes) | | | |
| E120 | OSPS | Start axis start point No. (2 bytes) | | 0 to 319 | Set the start point No. of the other axes start axis. |
| E122 | OSPE | Start axis end point No. (2 bytes) | | 0 to 319 | Set the end point No. of the other axes start axis. |
| E124 to E157 | | Reserved (52 bytes) | | | |
| E158 | OSDOS | Digital output signal specification (2 bytes) | | 0000h to 3F01h | Select the digital output signal (DO_□□□) to control output in units of 16 points when the other axes start conditions are satisfied.<br>□ □ 0 □<br>Digital output signal control<br>Set valid/invalid for the digital output signal control.<br>0: Invalid<br>1: Valid<br>Digital output signal number<br>Set the digital output signal (DO_ □□□) in units of 16 points.<br>00 to 3Fh<br>Example. 00h: DO_000 to DO_00F<br>3Fh: DO_3F0 to DO_3FF<br>(When "0: Use digital I/O table" is selected in I/O table (parameter No.004A)) |
| | | Output device signal specification (2 bytes) | | 0000h to FF01h | Select the output device signal (DVO_□□□) to control output in units of 16 points when the other axes start conditions are satisfied.<br>□ □ 0 □<br>Output device signal control<br>Set valid/invalid for the output device signal control.<br>0: Invalid<br>1: Valid<br>Output device signal number<br>Set the output device signal (DVO_□□□ ) in units of 16 points.<br>00 to FFh<br>Example. 00h: DVO_000 to DVO_00F<br>FFh: DVO_FF0 to DVO_FFF<br>(When "1: Use I/O device table" is selected in I/O table (parameter No.004A)) |

| Address | Abbreviation | Name | Unit | Setting range | Function |
|---|---|---|---|---|---|
| E15A | OSDOE | Digital output signal enable selection (2 bytes) | | 0000h to FFFFh | Set valid/invalid for the digital output signal (DO_□□□) selected in the digital output signal specification.<br>DO_□□0 (bit 0) to DO_□□F (bit 15)<br>Note. □□ is set in the digital output signal specification.<br>0: Invalid<br>1: Valid<br>(When "0: Use digital I/O table" is selected in I/O table (parameter No.004A)) |
| | | Output device signal enable selection (2 bytes) | | | Set valid/invalid for the output device signal (DVO_□□□) selected in the output device signal specification.<br>DVO_□□0 (bit 0) to DVO_□□F (bit 15)<br>Note. □□ is set in the output device signal specification.<br>0: Invalid<br>1: Valid<br>(When "1: Use I/O device table" is selected in I/O table (parameter No.004A)) |
| E15C | OSDOP | Digital output signal command (2 bytes) | | 0000h to FFFFh | Set the digital output signal command (ON/OFF) of the digital output signal (DO_□□□) selected in the digital output signal enable selection.<br>DO_□□0 (bit 0) to DO_□□F (bit 15)<br>Note. □□ is set in the digital output signal specification.<br>0: OFF<br>1: ON<br>(When "0: Use digital I/O table" is selected in I/O table (parameter No.004A)) |
| | | Output device signal command (2 bytes) | | | Set the digital output signal command (ON/OFF) of the output device signal (DVO_□□□) selected in the output device signal enable selection.<br>DVO_□□0 (bit 0) to DVO_□□F (bit 15)<br>Note. □□ is set in the output device signal specification.<br>0: OFF<br>1: ON<br>(When "1: Use I/O device table" is selected in I/O table (parameter No.004A)) |
| E15E to E167 | | Reserved (10 bytes) | | | |

Note 1. The addresses in the table are the addresses for the other axes start data 1. For the other axes data 2 and above, increase in units of 68h for each axis.

[Setting example of output signal]

The following is the setting example for when the digital output signals DO_1F0 to DO_1F3 are turned on after the other axes start conditions are satisfied.

| Address | Abbreviation | Name | Setting value | Setting contents |
|---|---|---|---|---|
| E158 | OSDOS | Digital output signal specification | 1F01h | Digital output signal control: valid, digital output signal number: 1Fh |
| E15A | OSDOE | Digital output signal enable selection | 000Fh | bit0 to bit3: valid, bit4 to bit15: invalid |
| E15C | OSDOP | Digital output signal command | 000Fh | bit0 to bit3: ON |

1) Cause of alarm

An incorrect setting of the other axes operation content causes an other axes start setting error (operation alarm 4D, detail 02) at the start operation or point switching.

- The axis is specified in the start axis designation.
- A non-existent axis (Note) is set in the start axis designation.
- The setting of the start axis start point No. or the start axis end point No. is outside limits.
- The setting of the output signal specification is out of the range.
- The general output of the servo amplifier or output of remote I/O module is not assigned to the digital output signal or output device signal specified in the output signal selection.

Note. A non-existent axis means an axis for which "0: Not controlled" is set to the control axis of the 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 servo amplifier.

### 6.23.3 Interface

(1) Other axes start command/other axes start status bit

The other axes start commands/other axes start statuses related to the other axes start function are shown below.

Other axes start command/status table

| | | | | | |
|---|---|---|---|---|---|
| E080 | Other axes start command/status table 1 | Other axes start command | E0C0 | Other axes start command/status table 17 | Other axes start command |
| | | Other axes start status | | | Other axes start status |
| E084 | Other axes start command/status table 2 | Other axes start command | E0C4 | Other axes start command/status table 18 | Other axes start command |
| | | Other axes start status | | | Other axes start status |
| E088 | Other axes start command/status table 3 | Other axes start command | E0C8 | Other axes start command/status table 19 | Other axes start command |
| | | Other axes start status | | | Other axes start status |
| E08C | Other axes start command/status table 4 | Other axes start command | E0CC | Other axes start command/status table 20 | Other axes start command |
| | | Other axes start status | | | Other axes start status |
| E090 | Other axes start command/status table 5 | Other axes start command | E0D0 | Other axes start command/status table 21 | Other axes start command |
| | | Other axes start status | | | Other axes start status |
| E094 | Other axes start command/status table 6 | Other axes start command | E0D4 | Other axes start command/status table 22 | Other axes start command |
| | | Other axes start status | | | Other axes start status |
| E098 | Other axes start command/status table 7 | Other axes start command | E0D8 | Other axes start command/status table 23 | Other axes start command |
| | | Other axes start status | | | Other axes start status |
| E09C | Other axes start command/status table 8 | Other axes start command | E0DC | Other axes start command/status table 24 | Other axes start command |
| | | Other axes start status | | | Other axes start status |
| E0A0 | Other axes start command/status table 9 | Other axes start command | E0E0 | Other axes start command/status table 25 | Other axes start command |
| | | Other axes start status | | | Other axes start status |
| E0A4 | Other axes start command/status table 10 | Other axes start command | E0E4 | Other axes start command/status table 26 | Other axes start command |
| | | Other axes start status | | | Other axes start status |
| E0A8 | Other axes start command/status table 11 | Other axes start command | E0E8 | Other axes start command/status table 27 | Other axes start command |
| | | Other axes start status | | | Other axes start status |
| E0AC | Other axes start command/status table 12 | Other axes start command | E0EC | Other axes start command/status table 28 | Other axes start command |
| | | Other axes start status | | | Other axes start status |
| E0B0 | Other axes start command/status table 13 | Other axes start command | E0F0 | Other axes start command/status table 29 | Other axes start command |
| | | Other axes start status | | | Other axes start status |
| E0B4 | Other axes start command/status table 14 | Other axes start command | E0F4 | Other axes start command/status table 30 | Other axes start command |
| | | Other axes start status | | | Other axes start status |
| E0B8 | Other axes start command/status table 15 | Other axes start command | E0F8 | Other axes start command/status table 31 | Other axes start command |
| | | Other axes start status | | | Other axes start status |
| E0BC | Other axes start command/status table 16 | Other axes start command | E0FC | Other axes start command/status table 32 | Other axes start command |
| | | Other axes start status | | | Other axes start status |

Other axes start command

| Address | Bit | Abbreviation | Signal name |
|---|---|---|---|
| E080 | 0 | OSSTP □ | Other axes start cancel |
| | 1 | | |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |
| | 8 | | Reserved |
| | 9 | | |
| | 10 | | |
| | 11 | | |
| | 12 | | |
| | 13 | | |
| | 14 | | |
| | 15 | | |

Other axes start status

| Address | Bit | Abbreviation | Signal name |
|---|---|---|---|
| E082 | 0 | OSOP □ | Other axes start notice |
| | 1 | OSFIN □ | Other axes start complete |
| | 2 | OSERR □ | Other axes start incomplete |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |
| | 8 | | |
| | 9 | | Reserved |
| | 10 | | |
| | 11 | | |
| | 12 | | |
| | 13 | | |
| | 14 | | |
| | 15 | | |

Note 1. The addresses in the table above are the addresses for the other axes start command/status table 1. For the other axes data 2 and above, increase in units of 4h for each axis.

Note 2. □ : Other axes start No.

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- Use the sscOtherAxisStartAbortOn or sscOtherAxisStartAbortOff functions to turn ON/OFF the other axes start cancel command (OSSTP).
- Use the sscGetOtherAxisStartStatus function to check if the following other axes start statuses are ON/OFF.
  - Other axes start notice (OSOP□)
  - Other axes start complete (OSFIN□)
  - Other axes start incompletion (OSERR□)

(a) Details concerning other axes start command bits

| Abbreviation | Signal name | Function details |
|---|---|---|
| OSSTP □ | Other axes start cancel | [Function]<br>Cancels the other axes start.<br>[Operation]<br>Turn on this signal to cancel the other axes start when the other axes start notice signal (OSOP □) is on for waiting for the other axes start condition satisfaction. |

(b) Details concerning other axes start status bits

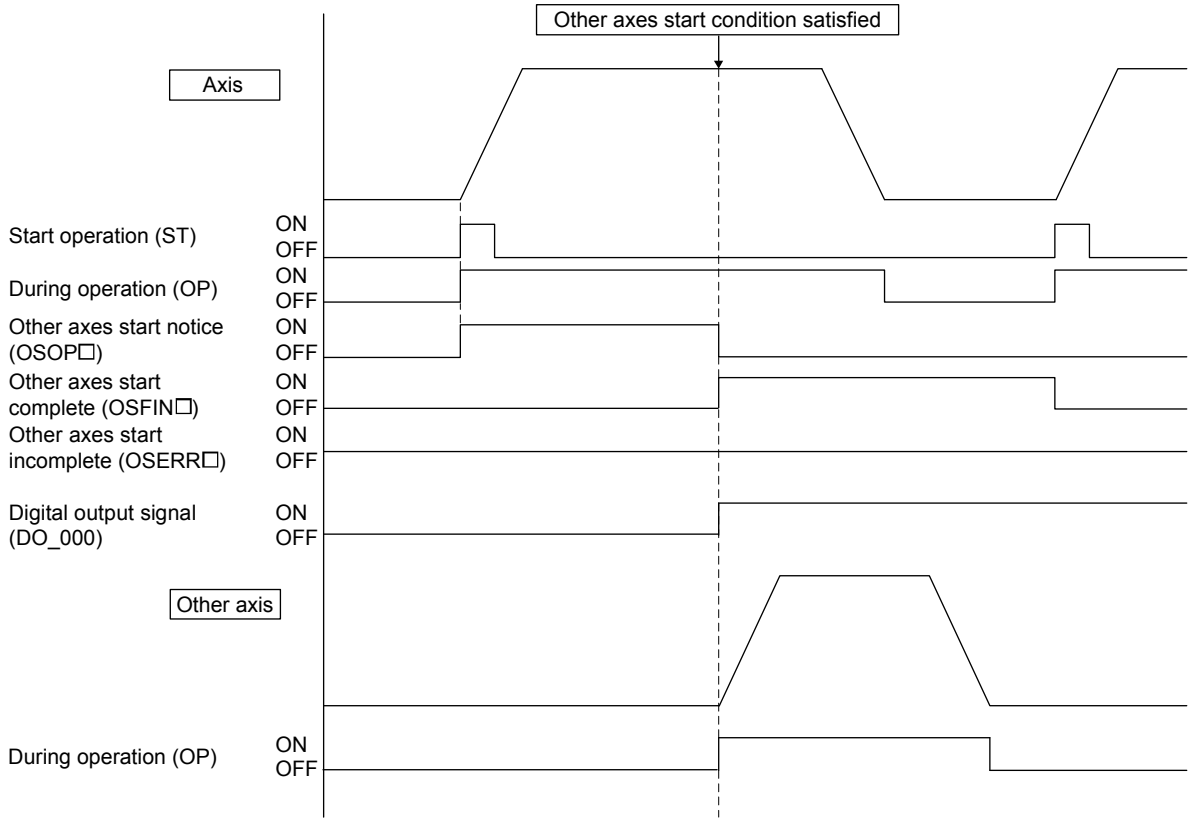
| Abbreviation | Signal name | Function details |
|---|---|---|
| OSOP □ | Other axes start notice | [Function]<br>Notifies the monitoring for the other axes start condition.<br>[Operation]<br><Conditions for turning on><br>The other axis start data is specified in the other axes start specification of the point table for automatic operation and linear interpolation operation, and the axis is monitored for the other axes start condition.<br><Conditions for turning off><br>• The other axes start condition is satisfied.<br>• During monitoring for the other axes start condition (when OSOP □ is on), the other axes start cancel signal (OSSTP □) is turned on. |
| OSFIN □ | Other axes start complete | [Function]<br>Notifies that the other axes start operation content is executed.<br>[Operation]<br><Conditions for turning on><br>The other axes start condition is satisfied, and the other axes start operation content is executed.<br><Conditions for turning off><br>The other axes start data is specified in the other axes start specification in the point table for automatic operation or linear interpolation operation. |
| OSERR □ | Other axes start incomplete | [Function]<br>Notifies that the other axes start has failed.<br>[Operation]<br><Conditions for turning on><br>• The axis specified in the start axis designation is being operated when the other axes start operation content should be executed.<br>• The operation mode of the axis specified in the start axis designation is other than automatic operation and linear interpolation operation when the other axes start operation content should be executed.<br>• During monitoring for the other axes start condition (when OSOP □ is on), operation is canceled due to an operation alarm on the axis or the (rapid) stop operation signal ((R)STP) turned on.<br>• During monitoring for the other axes start condition (when OSOP □ is on), the other axes start cancel signal (OSSTP □) is turned on.<br>• The number of axes set in the start axis designation exceeds the maximum number of simultaneous start axes.<br><Conditions for turning off><br>The other axes start data is specified in the other axes start specification in the point table for automatic operation or linear interpolation operation. |

Note. □ : Other axes start No.

### 6.23.4 Operation example

(1) When other axes start is complete

The other axes start notice (OSOP) turns on between the axis start and the completion of the other axis start. The other axes start complete (OSFIN) turns on when the other axes start notice (OSOP) is turned off on completion of the other axes start.



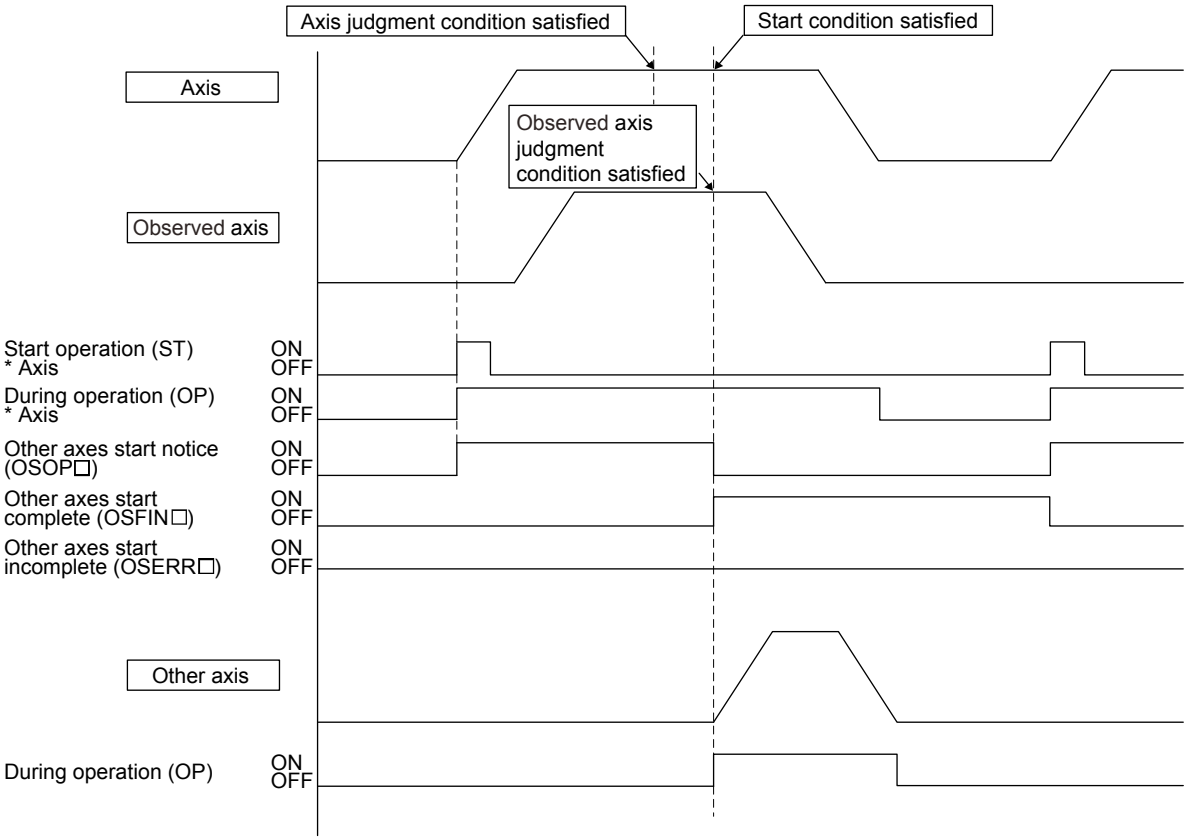

[Digital output signal setting example]

| Address | Abbreviation | Name | Setting value | Setting contents |
|---|---|---|---|---|
| E158 | OSDOS | Digital output signal specification | 0001h | Digital output signal control: valid,<br>digital output signal number: 00h |
| E15A | OSDOE | Digital output signal enable selection | 0001h | bit0: valid, bit1 to bit15: invalid |
| E15C | OSDOP | Digital output signal command | 0001h | bit0: ON |

(2) 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.

(a) Example of when the monitor axis judgment condition are satisfied after the axis judgment condition is satisfied



(3) 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 incomplete (OSERR) turns on. The other axes start incomplete (OSERR) turns on when:

(a) The axis set in the start axis designation 1 is being operated when the other axes start condition is satisfied.

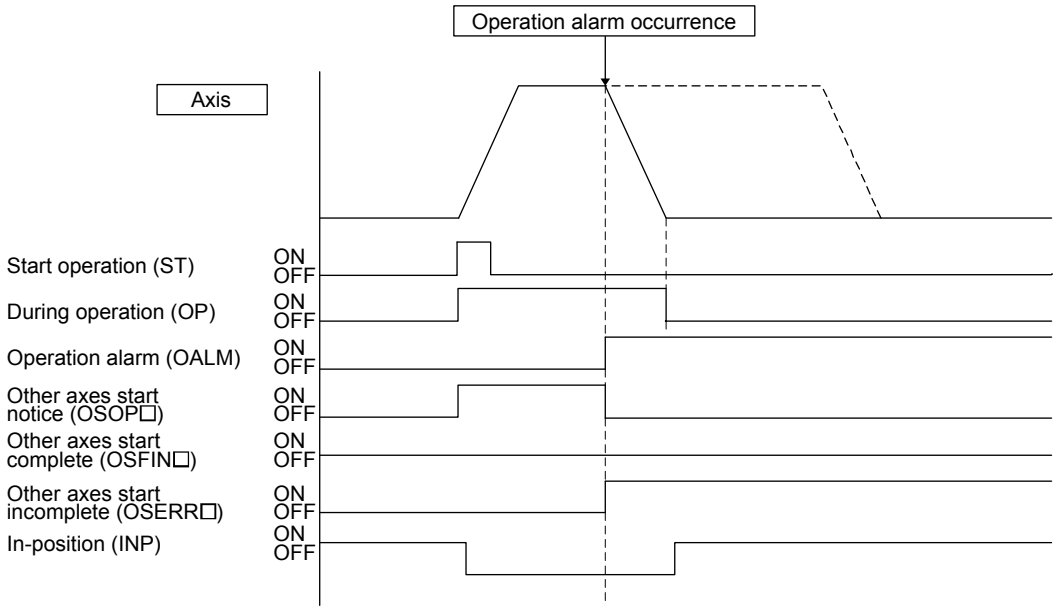
(b) The operation mode of the axis set in the start axis designation 1 is other than automatic operation and linear interpolation operation when the other axes start condition is satisfied.

(c) 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.

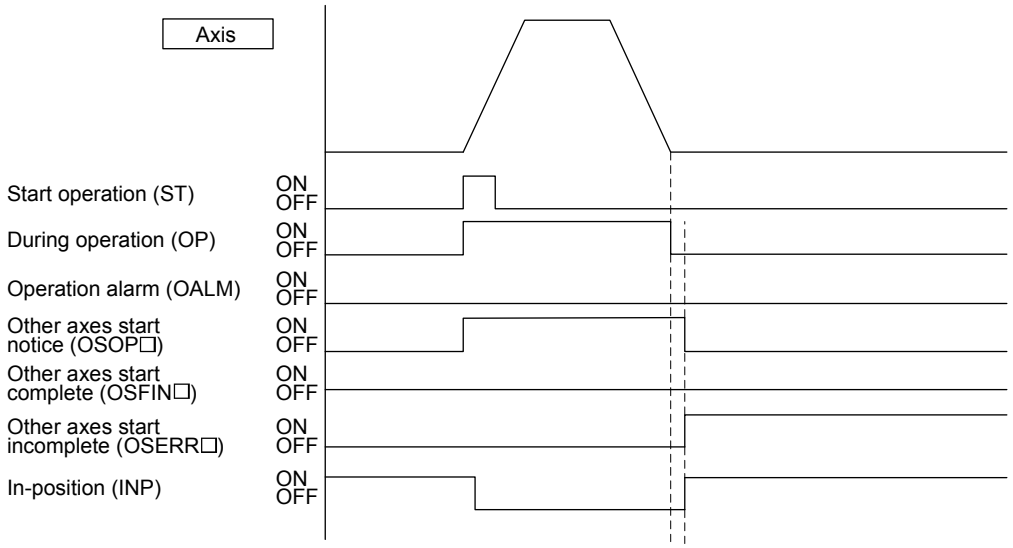
(d) Operation is canceled by an operation alarm, etc. before the other axis start condition is satisfied.

(e) Operation of the axis is completed and the in-position signal is turned on before the other axes start condition is satisfied.

[Example of when an operation alarm occurs]



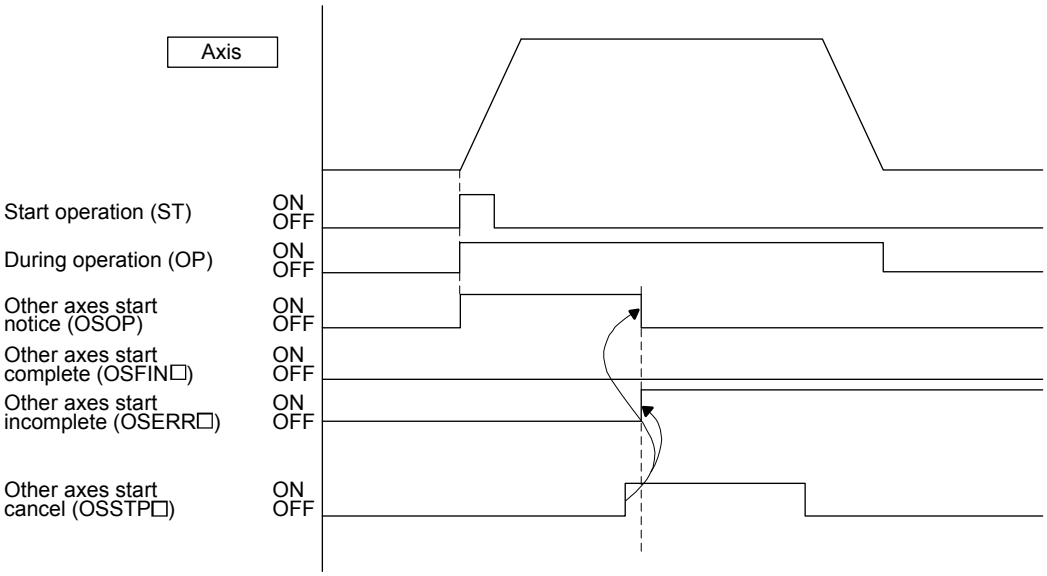
[Example of when operation of the axis is completed]




(4) When other axes start is canceled

When the other axes start cancel (OSSTP) is turned on before the other axes start condition is satisfied, the other axes start incomplete (OSERR) turns on.

[Example of when the other axes start is canceled]



## 6.24 High response I/F

### 6.24.1 Summary

The high response I/F function is a function for shortening time required to check commands and statuses by simplifying the process between the position board and the host controller. The high response I/F function is always valid.
This function simplifies the following processes.
(1) Start operation signal (ST)
(2) Interrupt processing complete signal (ITE)

POINT

- The conventional I/F function which uses the start operation signal (ST) and the interrupt processing complete 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 position board and the host controller.
- The API library uses the high response I/F (except for JOG operation).

API LIBRARY

- High response I/F is implemented by the internal processing of each start operation function (sscAutoStart functions etc.) thus processing by user program is unnecessary.

### 6.24.2 Interface

(1) System command bits

| Address | Bit | Abbreviation | Signal name |
|---|---|---|---|
| 03E4 | 0 | ITFE | Interrupt processing high speed complete |
| | 1 | | Reserved |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

(2) System status bits

| Address | Bit | Abbreviation | Signal name |
|---|---|---|---|
| 0450 | 0 | ITO | Outputting with factor of interrupt |
| | 1 | IITO | During interface mode interrupt valid |
| | 2 | EVDO | Event detection enabled |
| | 3 | HRIF | During highly response I/F valid |
| | 4 | BMA | During system program memory access |
| | 5 | PRINF | Continuous operation to torque control compatible information |
| | 6 | | Reserved |
| | 7 | IFMO | In interface mode |

(3) Axis command bits

| Address | Bit | Abbreviation | Signal name |
|---|---|---|---|
| 1006 | 0 | FST | Fast start operation |
| | 1 | | Reserved |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

Note: The above address is the address for the axis 1. For the axis 2 and above, increase in units of C0h for each axis.

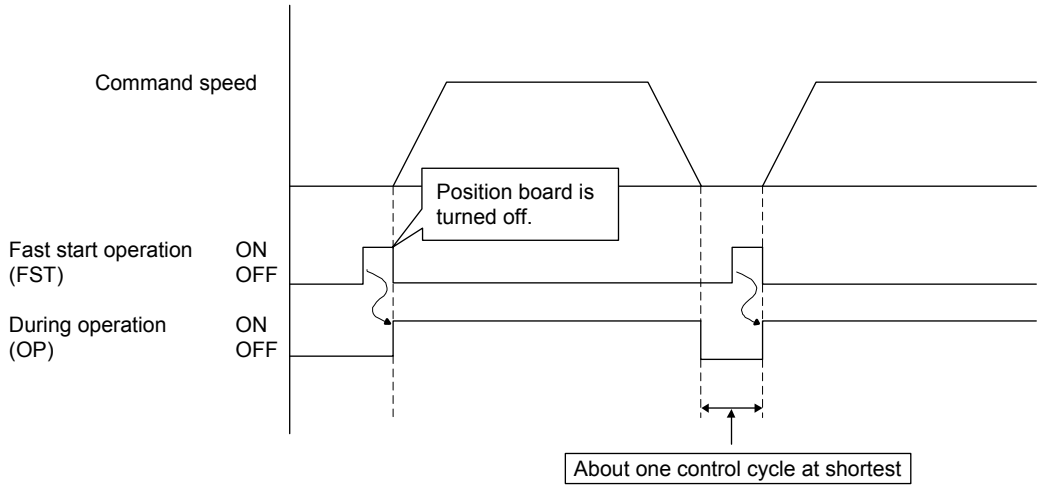
### 6.24.3 Fast start operation

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 JOG operation. Use the start operation signal (ST).

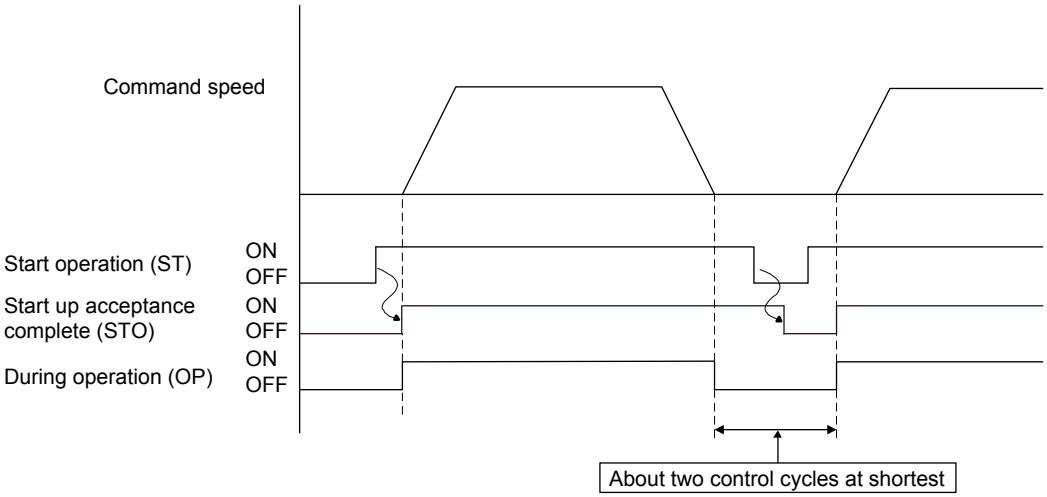
(1) High response start operation using the fast start operation signal (FST)

In the start operation, the user program 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 position board turns off the signal (FST), and operation is started.




(2) 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 complete 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 operation is completed, delays the start operation by about one control cycle until the start up acceptance complete signal (STO) is turned off. In addition, when the start operation signal (ST) is turned off in operation, the start up acceptance complete signal (STO) is off after operation is completed, which provides the same responsiveness as in the start operation using the fast start operation signal (FST).

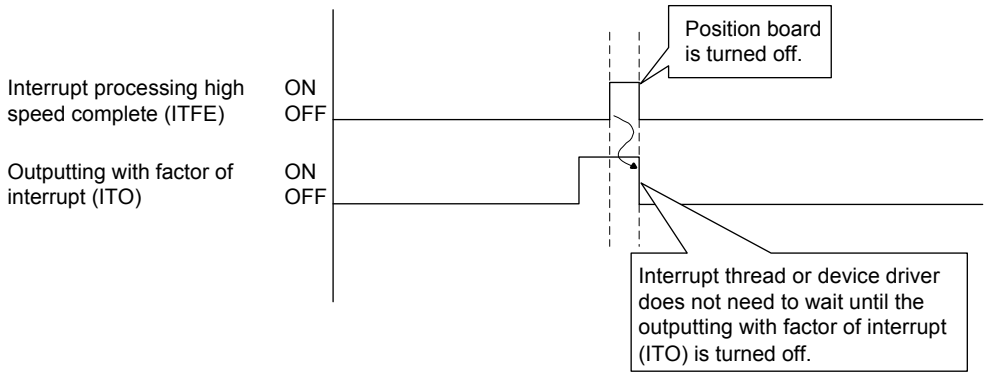


### 6.24.4 Interrupt processing high speed completion

Using the interrupt processing high speed complete signal (ITFE) as a substitute of the interrupt processing complete signal (ITE) shortens the time for interrupt processing completion.

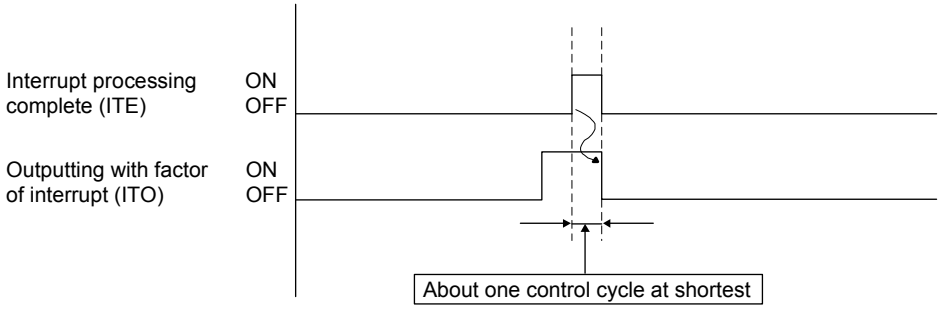
(1) High response interrupt processing completion using the interrupt processing high speed complete signal (ITFE)

For interrupt processing completion, the interrupt thread or device driver turns on the interrupt processing high speed complete signal (ITFE) as a substitute of the interrupt processing complete signal (ITE). On receiving the interrupt processing high speed complete signal (ITFE), the position board turns off the signal (ITFE), and the interrupt processing is completed. The interrupt thread or device driver does not need to wait until the outputting with factor of interrupt (ITO) is turned off, and the next operation can be performed.



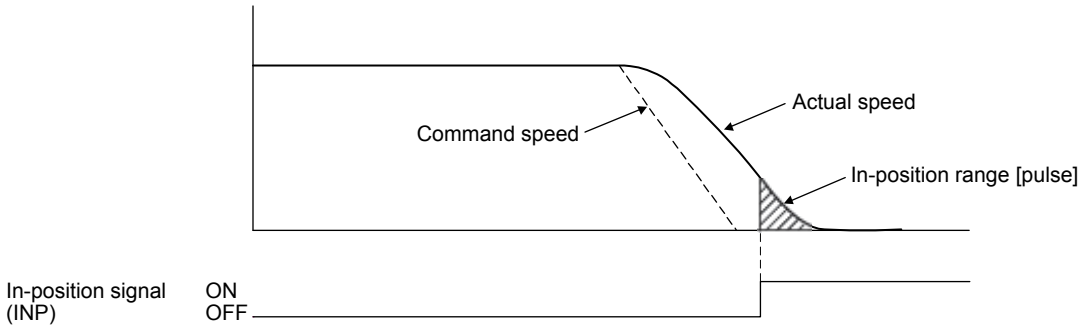

(2) Conventional interrupt processing completion using the interrupt processing complete signal (ITE)

The conventional interrupt processing requires the interrupt processing complete signal (ITE) to be on, then waiting until the outputting with factor of interrupt (ITO) is turned off, and then the interrupt processing complete signal (ITE) to be off. Therefore, interrupt processing completion is delayed by about one control cycle until the outputting with factor of interrupt (ITO) is turned off.



## 6.25 In-position signal

For the in-position signal (INP), the position board checks the in-position range and controls turning on or off the signal.
The in-position signal controlled by the servo amplifier is displayed as the servo amplifier in-position signal (SINP).




API LIBRARY

- To check if in-position (INP) is ON/OFF, check whether SSC_STSBIT_AX_INP is ON/OFF with the sscGetStatusBitSignalEx or sscWaitStatusBitSignalEx functions.

(1) Parameter

For servo parameter (MR-J4(W□)-□B)

| Parameter No. | MR-J4B Parameter No. | Abbreviation | Name | Initial Value | Unit |
|---|---|---|---|---|---|
| 1109 | PA10 | INP | In-position range | 1600 | pulse |

(2) Axis data status bit

| Address | Bit | Abbreviation | Signal name | When tandem drive is being used |
|---|---|---|---|---|
| 1060 | 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 | Servo alarm | Each axis |
| | 6 | SWRN | Servo warning | Each axis |
| | 7 | ABSE | Absolute position erased | Each axis |

| Address | Bit | Abbreviation | Signal name | When tandem drive is being used |
|---|---|---|---|---|
| 1069 | 0 | IWT | Interference check standby | Each axis |
| | 1 | SINP | Servo amplifier in-position | Each axis |
| | 2 | | Reserved | |
| | 3 | | | |
| | 4 | | | |
| | 5 | | | |
| | 6 | | | |
| | 7 | | | |

Note: The above address is the address for the axis 1. For the axis 2 and above, increase in units of C0h for each axis.

## 6.26 Digital I/O

### 6.26.1 Summary

The digital I/O function is a function that controls the general I/O signal of the servo amplifier assigned to the digital I/O table. The user program can check whether the digital I/O signals are on/off by using the digital I/O table. The points for the each I/O signal can be assigned up to 1024.
When using the digital I/O function, set "0: Use digital I/O table" in I/O table (parameter No.004A).

**⚠CAUTION**

- If the digital output signal is updated from the user program during controlling of the digital output 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 controller and position board update the data at the same time to the same digital output area number. In this case, read/write the digital output signal after controlling the possessory right of the digital output signal using the exclusive control function.

POINT

- For detailed specifications and how to assign the I/O signal to the digital I/O table, refer to Section 6.28.
- When using the digital I/O function, the I/O device function cannot be used.
- In relation to the digital I/O function, the following functions are expanded for the I/O device function. We recommend using the I/O device function.
  - Expansion of I/O points used
  - Supports control of I/O word devices

  Refer to Section 6.27 for details of the I/O device function.

API LIBRARY

- Use the sscGetDigitalInputDataBit or sscGetDigitalInputDataWord functions to get digital input.
- Use the sscSetDigitalOutputDataBit or sscSetDigitalOutputDataWord functions to set digital output.
- Use the sscGetDigitalOutputDataBit or sscGetDigitalOutputDataWord functions to get digital output.

### 6.26.2 Interface

The following shows the interfaces related to the digital I/O.

(1) Digital input table

| Address | Digital input area number | Digital input number | Abbreviation | Remarks |
|---|---|---|---|---|
| B000 | Digital input area 0 (2 bytes) | Digital input 0 to digital input 15 | DI_000 to DI_00F | Notifies the status of the digital input signal. The bits are DI_000 (bit0) to DI_00F (bit15). |
| B002 | Digital input area 1 (2 bytes) | Digital input 16 to digital input 31 | DI_010 to DI_01F | Notifies the status of the digital input signal. The bits are DI_010 (bit0) to DI_01F (bit15). |
| B004 | Digital input area 2 (2 bytes) | Digital input 32 to digital input 47 | DI_020 to DI_02F | Notifies the status of the digital input signal. The bits are DI_020 (bit0) to DI_02F (bit15). |
| B006 | Digital input area 3 (2 bytes) | Digital input 48 to digital input 63 | DI_030 to DI_03F | Notifies the status of the digital input signal. The bits are DI_030 (bit0) to DI_03F (bit15). |
| B008 | Digital input area 4 (2 bytes) | Digital input 64 to digital input 79 | DI_040 to DI_04F | Notifies the status of the digital input signal. The bits are DI_040 (bit0) to DI_04F (bit15). |
| B00A | Digital input area 5 (2 bytes) | Digital input 80 to digital input 95 | DI_050 to DI_05F | Notifies the status of the digital input signal. The bits are DI_050 (bit0) to DI_05F (bit15). |
| B00C | Digital input area 6 (2 bytes) | Digital input 96 to digital input 111 | DI_060 to DI_06F | Notifies the status of the digital input signal. The bits are DI_060 (bit0) to DI_06F (bit15). |
| B00E | Digital input area 7 (2 bytes) | Digital input 112 to digital input 127 | DI_070 to DI_07F | Notifies the status of the digital input signal. The bits are DI_070 (bit0) to DI_07F (bit15). |
| : | : | : | : | : |
| B07E | Digital input area 63 (2 bytes) | Digital input 1008 to digital input 1023 | DI_3F0 to DI_3FF | Notifies the status of the digital input signal. The bits are DI_3F0 (bit0) to DI_3FF (bit15). |

(2) Digital output table

| Address | Digital output area number | Digital output number | Abbreviation | Remarks |
|---|---|---|---|---|
| B080 | Digital output area 0 (2 bytes) | Digital output 0 to digital output 15 | DO_000 to DO_00F | Turns on/off the digital output signal. The bits are DO_000 (bit0) to DO_00F (bit15). |
| B082 | Digital output area 1 (2 bytes) | Digital output 16 to digital output 31 | DO_010 to DO_01F | Turns on/off the digital output signal. The bits are DO_010 (bit0) to DO_01F (bit15). |
| B084 | Digital output area 2 (2 bytes) | Digital output 32 to digital output 47 | DO_020 to DO_02F | Turns on/off the digital output signal. The bits are DO_020 (bit0) to DO_02F (bit15). |
| B086 | Digital output area 3 (2 bytes) | Digital output 48 to digital output 63 | DO_030 to DO_03F | Turns on/off the digital output signal. The bits are DO_030 (bit0) to DO_03F (bit15). |
| B088 | Digital output area 4 (2 bytes) | Digital output 64 to digital output 79 | DO_040 to DO_04F | Turns on/off the digital output signal. The bits are DO_040 (bit0) to DO_04F (bit15). |
| B08A | Digital output area 5 (2 bytes) | Digital output 80 to digital output 95 | DO_050 to DO_05F | Turns on/off the digital output signal. The bits are DO_050 (bit0) to DO_05F (bit15). |
| B08C | Digital output area 6 (2 bytes) | Digital output 96 to digital output 111 | DO_060 to DO_06F | Turns on/off the digital output signal. The bits are DO_060 (bit0) to DO_06F (bit15). |
| B08E | Digital output area 7 (2 bytes) | Digital output 112 to digital output 127 | DO_070 to DO_07F | Turns on/off the digital output signal. The bits are DO_070 (bit0) to DO_07F (bit15). |
| : | : | : | : | : |
| B0FE | Digital output area 63 (2 bytes) | Digital output 1008 to digital output 1023 | DO_3F0 to DO_3FF | Turns on/off the digital output signal. The bits are DO_3F0 (bit0) to DO_3FF (bit15). |

## 6.27 I/O device

### 6.27.1 Summary

The I/O device function controls the general I/O signals of the servo amplifier and I/O devices of the remote I/O module assigned to the I/O device table. When using the I/O device function, set "1: Use I/O device table" in I/O table (parameter No.004A). The user program can check the output of output bit devices and output word devices, and check the status of input bit devices and input word devices using the I/O device table. Up to 4096 points for I/O signals can be assigned in bit units, and up to 256 points for I/O signals can be assigned in word units.

**⚠CAUTION**

- If the output device signal is updated from the user program 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 controller and position board update the data at the same time to the same output device area number. In this case, read/write the output device signal after controlling the possessory right of the output device signal using the exclusive control function.

**POINT**

- When using the I/O device function, the digital I/O function cannot be used.
- Refer to Section 6.28 and Section 6.33 for how to assign I/O signals to the I/O device table and detailed specifications.

**API LIBRARY**

- Use the sscGetInputDeviceBit function to get input bit device.
- Use the sscGetInputDeviceWord function to get input word device.
- Use the sscSetOutputDeviceBit function to set output bit device.
- Use the sscSetOutputDeviceWord function to set output word device.
- Use the sscGetOutputDeviceBit function to get output bit device.
- Use the sscGetOutputDeviceWord function to get output word device.

### 6.27.2 Interface

The following shows the interfaces related to the I/O device.

(1) System parameter

| Parameter No. | Abbreviation | Name | Initial value | Units | Setting range | Function |
|---|---|---|---|---|---|---|
| 004A | *IOTBL | I/O table | 0000h | | 0000h to 0001h | 0 0 0 [ ]<br>I/O table selection<br>Set the I/O table to be used.<br>0: Use digital I/O table<br>1: Use I/O device table |

(2) Input device table

| Address | Input word device number | Input bit device number | Abbreviation | Remarks |
|---|---|---|---|---|
| DB00 | Input word device 00<br>(2 bytes) | Input word device 000<br>to<br>Input word device 00F | DVI_000 to<br>DVI_00F | [When bit device is assigned]<br>Notifies the status of the bit device input signal.<br>The bits are DVI_000 (bit0) to DVI_00F (bit15).<br>[When word device is assigned]<br>Notifies the status of the word device input signal. |
| DB02 | Input word device 01<br>(2 bytes) | Input word device 010<br>to<br>Input word device 01F | DVI_010 to<br>DVI_01F | [When bit device is assigned]<br>Notifies the status of the bit device input signal.<br>The bits are DVI_010 (bit0) to DVI_01F (bit15).<br>[When word device is assigned]<br>Notifies the status of the word device input signal. |
| DB04 | Input word device 02<br>(2 bytes) | Input word device 020<br>to<br>Input word device 02F | DVI_020 to<br>DVI_02F | [When bit device is assigned]<br>Notifies the status of the bit device input signal.<br>The bits are DVI_020 (bit0) to DVI_02F (bit15).<br>[When word device is assigned]<br>Notifies the status of the word device input signal. |
| DB06 | Input word device 03<br>(2 bytes) | Input word device 030<br>to<br>Input word device 03F | DVI_030 to<br>DVI_03F | [When bit device is assigned]<br>Notifies the status of the bit device input signal.<br>The bits are DVI_030 (bit0) to DVI_03F (bit15).<br>[When word device is assigned]<br>Notifies the status of the word device input signal. |
| DB08 | Input word device 04<br>(2 bytes) | Input word device 040<br>to<br>Input word device 04F | DVI_040 to<br>DVI_04F | [When bit device is assigned]<br>Notifies the status of the bit device input signal.<br>The bits are DVI_040 (bit0) to DVI_04F (bit15).<br>[When word device is assigned]<br>Notifies the status of the word device input signal. |
| DB0A | Input word device 05<br>(2 bytes) | Input word device 050<br>to<br>Input word device 05F | DVI_050 to<br>DVI_05F | [When bit device is assigned]<br>Notifies the status of the bit device input signal.<br>The bits are DVI_050 (bit0) to DVI_05F (bit15).<br>[When word device is assigned]<br>Notifies the status of the word device input signal. |
| DB0C | Input word device 06<br>(2 bytes) | Input word device 060<br>to<br>Input word device 06F | DVI_060 to<br>DVI_06F | [When bit device is assigned]<br>Notifies the status of the bit device input signal.<br>The bits are DVI_060 (bit0) to DVI_06F (bit15).<br>[When word device is assigned]<br>Notifies the status of the word device input signal. |
| DB0E | Input word device 07<br>(2 bytes) | Input word device 070<br>to<br>Input word device 07F | DVI_070 to<br>DVI_07F | [When bit device is assigned]<br>Notifies the status of the bit device input signal.<br>The bits are DVI_070 (bit0) to DVI_07F (bit15).<br>[When word device is assigned]<br>Notifies the status of the word device input signal. |
| : | : | : | : | : |
| B0FE | Input word device FF<br>(2 bytes) | Input word device FF0<br>to<br>Input word device FFF | DVI_FF0 to<br>DVI_FFF | [When bit device is assigned]<br>Notifies the status of the bit device input signal.<br>The bits are DVI_FF0 (bit0) to DVI_FFF (bit15).<br>[When word device is assigned]<br>Notifies the status of the word device input signal. |

(3) Output device table

| Address | Output word device number | Output bit device number | Abbreviation | Remarks |
|---|---|---|---|---|
| DB00 | Output word device 00 (2 bytes) | Output word device 000 to Output word device 00F | DVO_000 to DVO_00F | [When bit device is assigned] Turns ON/OFF the bit device output signal. The bits are DVO_000 (bit0) to DVO_00F (bit15). [When word device is assigned] Turns ON/OFF the word device output signal. |
| DB02 | Output word device 01 (2 bytes) | Output word device 010 to Output word device 01F | DVO_010 to DVO_01F | [When bit device is assigned] Turns ON/OFF the bit device output signal. The bits are DVO_010 (bit0) to DVO_01F (bit15). [When word device is assigned] Turns ON/OFF the word device output signal. |
| DB04 | Output word device 02 (2 bytes) | Output word device 020 to Output word device 02F | DVO_020 to DVO_02F | [When bit device is assigned] Turns ON/OFF the bit device output signal. The bits are DVO_020 (bit0) to DVO_02F (bit15). [When word device is assigned] Turns ON/OFF the word device output signal. |
| DB06 | Output word device 03 (2 bytes) | Output word device 030 to Output word device 03F | DVO_030 to DVO_03F | [When bit device is assigned] Turns ON/OFF the bit device output signal. The bits are DVO_030 (bit0) to DVO_03F (bit15). [When word device is assigned] Turns ON/OFF the word device output signal. |
| DB08 | Output word device 04 (2 bytes) | Output word device 040 to Output word device 04F | DVO_040 to DVO_04F | [When bit device is assigned] Turns ON/OFF the bit device output signal. The bits are DVO_040 (bit0) to DVO_04F (bit15). [When word device is assigned] Turns ON/OFF the word device output signal. |
| DB0A | Output word device 05 (2 bytes) | Output word device 050 to Output word device 05F | DVO_050 to DVO_05F | [When bit device is assigned] Turns ON/OFF the bit device output signal. The bits are DVO_050 (bit0) to DVO_05F (bit15). [When word device is assigned] Turns ON/OFF the word device output signal. |
| DB0C | Output word device 06 (2 bytes) | Output word device 060 to Output word device 06F | DVO_060 to DVO_06F | [When bit device is assigned] Turns ON/OFF the bit device output signal. The bits are DVO_060 (bit0) to DVO_06F (bit15). [When word device is assigned] Turns ON/OFF the word device output signal. |
| DB0E | Output word device 07 (2 bytes) | Output word device 070 to Output word device 07F | DVO_070 to DVO_07F | [When bit device is assigned] Turns ON/OFF the bit device output signal. The bits are DVO_070 (bit0) to DVO_07F (bit15). [When word device is assigned] Turns ON/OFF the word device output signal. |
| : | : | : | : | : |
| B0FE | Output word device FF (2 bytes) | Output word device FF0 to Output word device FFF | DVO_FF0 to DVO_FFF | [When bit device is assigned] Turns ON/OFF the bit device output signal. The bits are DVO_FF0 (bit0) to DVO_FFF (bit15). [When word device is assigned] Turns ON/OFF the word device output signal. |

## 6.28 Servo amplifier general I/O

### 6.28.1 Summary

The servo amplifier general I/O function is a function that controls the I/O signal connected to the servo amplifier via SSCNET. The user program can control the I/O signal with the digital I/O table or I/O device table, by assigning the servo amplifier general I/O signal to the digital I/O table or I/O device table. The points of the I/O signal differ depending on the servo amplifier model.

POINT

- When a communication error (system error E401 to E407) occurs or SSCNET is disconnected, all the general I/O signals of the servo amplifier turn off.
- The general input signal of the servo amplifier shares the connector pin with the sensor signal (LSP, LSN, DOG). Therefore, the sensor signal cannot be input if general input signal of the servo amplifier is used as other than the sensor signal. In this case, set the sensor input option (parameter No.0219) to "2: Digital or input device input" and assign a digital input signal or input device signal as a sensor signal in the sensor signal connection specification (parameter No.021A to 021C). The sensor signal can be controlled by a command from the user program (writing of the dual port memory) when the sensor input method (parameter No.0219) is set to "4: Dual port memory".
- The delay time from an input of the general I/O signal of the servo amplifier to the update of the digital input table is "approx. 0.88ms + (control cycle × 2)" (approx. 2.7ms when the control cycle is 0.88ms). The delay time is also the same for when using an input device table.
- The delay time from the update of the digital output table by the user program to the output of the general output signal of the servo amplifier is "approx. 0.88ms + (control cycle × 3)" (approx. 3.5ms when the control cycle is 0.88ms).
  In the case of the digital output signal using in the other axes start function, the delay time from other axes start condition satisfaction to the output is "approx. 0.88ms + (control cycle × 2)" (approx. 2.7ms when the control cycle is 0.88ms). The delay time is also the same for when using an output device table.

API LIBRARY

- Use the sscChangeParameter function to set servo amplifier general I/O.

[Compatible servo amplifier]

| Model | Remarks |
|---|---|
| Servo amplifier MR-J4-□B | Input: 3 points/axis<br>Output: 3 points/axis |
| Servo amplifier MR-J4W□-□B | Input: 3 points/axis<br>Output: 1 point/axis + 2 points (common in each axis) |

The following shows the connectors of the servo amplifier to be connected to the general I/O signals. Each general I/O signal is assigned to the digital input signal (DI_□□□) and digital output signal (DO_□□□). For details, refer to Section 6.28.2.

(1) For servo amplifier MR-J4-□B

(a) General input

| Signal name | Destination connector pin No. | Abbreviation |
|---|---|---|
| DI_□□0 | CN3-2 | DI1 |
| DI_□□1 | CN3-12 | DI2 |
| DI_□□2 | CN3-19 | DI3 |

(b) General output

| Signal name | Destination connector pin No. | Abbreviation |
|---|---|---|
| DO_□□0 | CN3-13 | MBR |
| DO_□□1 | CN3-9 | INP |
| DO_□□2 | CN3-15 | ALM |

(2) For servo amplifier MR-J4W□-□B

(a) General input

| Signal name | Destination connector pin No. | | | Abbreviation |
|---|---|---|---|---|
| | Axis A | Axis B | Axis C (Note) | (□: A, B, C) |
| DI_□□0 | CN3-7 | CN3-20 | CN3-1 | DI1-□ |
| DI_□□1 | CN3-8 | CN3-21 | CN3-2 | DI2-□ |
| DI_□□2 | CN3-9 | CN3-22 | CN3-15 | DI3-□ |

Note: Only MR-J4W3-□B is available.

(b) General output

| Signal name | Destination connector pin No. | | | Abbreviation |
|---|---|---|---|---|
| | Axis A | Axis B | Axis C (Note1) | (□: A, B, C) |
| DO_□□0 | CN3-12 | CN3-25 | CN3-13 | MBR-□ |
| DO_□□1 | CN3-11 (Note2) | | | CALM |
| DO_□□2 | CN3-24 (Note2) | | | CINP |

Note 1. Only MR-J4W3-□B is available.

2. The pin is common for each axis. The axis to be used can be selected by the parameter setting. For details, refer to Section 6.28.2.

### 6.28.2 Settings

(1) Servo parameters

When using the general output function of the servo amplifier, set the parameter of the output device selection as shown below.

(a) For servo amplifier MR-J4-□B

| Parameter No. | MR-J4-B parameter No. | Abbreviation | Name | Setting value |
|---|---|---|---|---|
| 11C6 | PD07 | *DO1 | Output device selection 1 | 0021h |
| 11C7 | PD08 | *DO2 | Output device selection 2 | 0022h |
| 11C8 | PD09 | *DO3 | Output device selection 3 | 0023h |

(b) For servo amplifier MR-J4W□-□B

| Parameter No. | MR-J4W-B parameter No. | Abbreviation | Name | Setting value |
|---|---|---|---|---|
| 11C6 | PD07 | *DO1 | Output device selection 1 | 0021h |
| 11C7 | PD08 | *DO2 | Output device selection 2<br>(Note1, 2) | 1022h (when using axis A)<br>2022h (when using axis B)<br>3022h (when using axis C) |
| 11C8 | PD09 | *DO3 | Output device selection 3<br>(Note1, 2) | 1023h (when using axis A)<br>2023h (when using axis B)<br>3023h (when using axis C) |

Note 1. The parameter is shared with the three axes of axis A, B, and C. Always set the same value to all the axes. When the setting value differs, the value of the axis A is valid.

2. Since the pin is shared by each axis, only one axis can be assigned.

(2) Control parameter

The control parameters are used to set the general I/O and to assign to the digital I/O number. When the sensor input method (parameter No.0219) is "Driver input", the input signal of the servo amplifier is used for the sensor (LSP/LSN/DOG). Therefore, the input signal cannot be used as the general input. To use the general input signal of the servo amplifier, set other than "Driver input" to the sensor input method (parameter No.0219).

| Parameter No. | Abbreviation | Name | Initial value | Setting range | Function |
|---|---|---|---|---|---|
| 0213 | *GIOO | General I/O option | 0000h | 0000h to 0011h | 0 0 □ □<br>Servo amplifier general input setting<br>Set whether to use the general input of the servo amplifier.<br>0: Not used<br>1: Used<br>Note: When the general input is used, the limit switch signal and the dog signal cannot be input from the servo amplifier. Set other than "Driver input" to the sensor input method (parameter No.0219).<br>Servo amplifier general output setting<br>Set whether to use the general output of the servo amplifier.<br>0: Not used<br>1: Used |
| 0214 | *GDNA | General I/O number assignment | 0000h | 0000h to FFFFh | Set assignment of the general I/O number.<br>The setting target differs depending on the I/O table (parameter No.004A) setting.<br>[When using a digital I/O table]<br>□ □ □ □<br>General input assignment<br>Specify the first digital input area number to assign the general input.<br>00h to 3Fh: Digital input area 0 to 63<br>Example: When the digital input area number 1 is specified, 16 points are assigned from DI_010 to DI_01F. However, DI_013 to DI_01F are unavailable.<br>General output assignment<br>Specify the first digital output area number to assign the general output.<br>00h to 3Fh: Digital output area 0 to 63<br>Example: When the digital output area number 2 is specified, 16 points are assigned from DO_020 to DO_02F. However, DO_023 to DO_02F are unavailable.<br>[When using a I/O device table]<br>□ □ □ □<br>General input assignment<br>Specify the first input word device number that corresponds with the input bit device number to assign the general input.<br>00h to FFh: Input word device number 0 to FF<br>Example: When the input word device number 01 is specified, 16 points are assigned from DVI_010 to DVI_01F. However, DVI_013 to DVI_01F are unavailable.<br>General output assignment<br>Specify the first output word device number that corresponds with the output bit device number to assign the general input.<br>00h to FFh: Output word device number 00 to FF<br>Example: When the output word device number 2 is specified, 16 points are assigned from DVO_020 to DVO_02F. |

| Parameter No. | Abbreviation | Name | Initial value | Setting range | Function |
|---|---|---|---|---|---|
| 0219 | *SOP | Sensor input option | 0000h | 0000h to 0304h | 0 □ 0 □<br>Sensor input system<br>Set the input system of the sensor (LSP, LSN, DOG).<br>0: Not use<br>1: Driver input<br>2: Digital or input device input<br>3: Not connected (does not detect LSP, LSN, DOG)<br>4: Dual port memory input<br>Limit switch signal selection<br>Set valid/invalid of limit switch.<br>0: LSP/LSN are valid<br>1: LSP is valid, LSN is invalid<br>2: LSP is invalid, LSN is valid |

POINT

- Assign the digital I/O table not to overlap other settings. If the assignment is overlapped or exceeds the maximum points of the digital I/O table, the I/O No. assignment error (system error E510) and I/O No. assignment setting error (operation alarm 39, detail 01 and 02) occur.
- Assign the I/O device table not to overlap other settings. If the assignment is overlapped or exceeds the maximum points of the I/O device table, the I/O No. assignment error (system error E510) and I/O No. assignment setting error (operation alarm 39, detail 01 and 02) occur.

## 6.29 Dual port memory exclusive control

### 6.29.1 Summary

The dual port memory exclusive control function is a function that keeps the consistency of the memory data by temporarily limiting the system program and user program to read/write data to the limited area of the dual port memory.
The output signals in this section refer to digital output signals or output device signals. The target output signal is selected in I/O table (parameter No.004A).

### 6.29.2 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.

API LIBRARY

- The sscSetDigitalOutputDataBit and sscSetDigitalOutputDataWord functions of the API library perform exclusive control of digital output within the function.
- The sscSetOutputDeviceBit function of the API library performs exclusive control of output device within the function.

(1) Interface

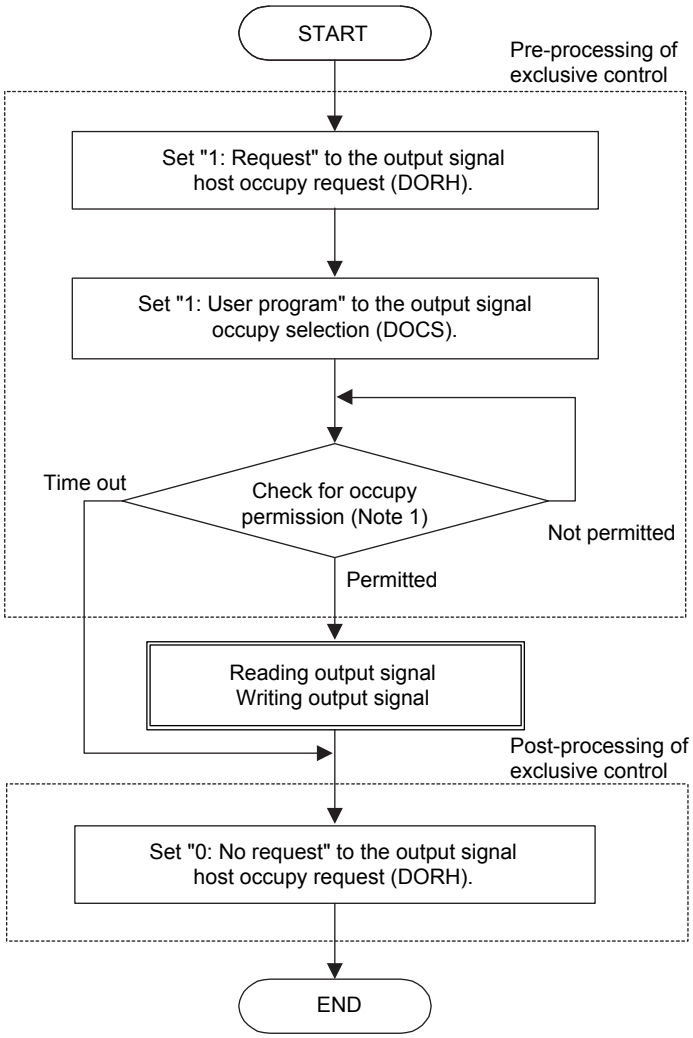
| Address | Abbreviation | Description | Detail (Note 1) | User program data writing |
|---|---|---|---|---|
| EF80 | DORH | Output signal host occupy request | 0: No request<br>1: Request | ○ |
| EF82 | DORB | During output signal board occupy request (Note 2) | 0: No request<br>1: Request | × |
| EF84 | DOCS | Output signal occupy selection | 0: System program<br>1: User program | ○ |
| EF86 to EF8F | | Reserved | | |

Note 1. When the data out of the range is written, the exclusive control error (system error E503) 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 system program. When the data is written from the user program to this area, the exclusive control operates incorrectly.

(2) Exclusive control procedure on user program side

The following shows the procedure to control the output signal exclusively.

(a) Exclusive control procedure




Note 1: Check for occupy permission

(1) Condition for occupy permission
When the during output signal board occupy request (DORB) is "0: No request" or the output signal occupy selection (DOCS) is "0: System program"

(2) Condition for occupy non-permission
When the during output signal board occupy request (DORB) is "1: Request" and the output signal occupy selection (DOCS) is "1: User program"

(b) Condition for occupy permission of output signal

| DORH | DORB | DOCS | Occupy status of output signal | Occupy permitted/not permitted |
|---|---|---|---|---|
| 0 | 0 | 0 | No occupy | No occupy request from user program. |
| 0 | 0 | 1 | No occupy | |
| 0 | 1 | 0 | Occupied by system program. | |
| 0 | 1 | 1 | Occupied by system program. | |
| 1 | 0 | 0 | Occupied by user program. | Occupy permitted |
| 1 | 0 | 1 | Occupied by user program. | |
| 1 | 1 | 0 | Occupied by user program.<br>(Waiting for permission from system program) | |
| 1 | 1 | 1 | Occupied by system program.<br>(Waiting for permission from user program) | Occupy not permitted |

(3) Restrictions

Perform the exclusive control so that the occupy time on the user program side is 5μs or less. If the possessory right is not shifted to the system program even after 5μs at the timing in which the system program accesses the output signal, the access to the output signal is stopped. When the access to the output signal is stopped, the access put on hold until the next control cycle.

## 6.30 Pass position interrupt

### 6.30.1 Summary

The pass position interrupt function is a function that outputs an interrupt at when the pass position condition set in the interrupt table is satisfied. The pass position condition can be specified up to 64 conditions (total for all 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 start and end numbers are imported when the operation is started. The pass position condition is imported and the pass position is judged for each condition from the pass position condition start number.
When the pass position condition is satisfied, the factor of an interrupt corresponding to the pass position condition number is output. Then, the next pass position condition is imported and judged.
The pass position condition is judged until the in-position signal (INP) turns on.
To output the interrupt, set the pass position interrupt to the system interrupt condition (system parameter No.0004) and turn on the interrupt output valid (ITS).

POINT

- This function can be used only in the automatic operation and linear interpolation operation. For the linear interpolation operation, the pass position condition can be set per axis.
- During the pass position interrupt, the pass position interrupt condition numbers from the start to the end are in use. When the pass position condition is in use in other axes, a pass position interrupt error (operation alarm 5C, detail 05) occurs and the start operation is stopped.
- When the operation is started again before all the interrupts by the pass position interrupt are output, a pass position interrupt error (operation alarm 5C, detail 06) occurs and the start operation is stopped.
- 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.

### 6.30.2 Pass position interrupt setting method

The pass position interrupt setting procedure is as follows.

(1) Set the pass position conditions.

(2) Validate the pass position interrupt specifications of the point data.

(3) Set the pass position condition start number and end number.

(4) Start automatic operation or linear interpolation operation.

(5) Wait until the conditions of the pass position interrupt are fulfilled.

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- Use the sscSetIntPassPositionData function for setting of pass position interrupt in (1) above.
- Use the sscSetPointDataEx function for setting of the point table in (2) above.
- Use the sscSetStartingPassNumber function to set pass position condition start number and end number in (3) above.
- Use the sscAutoStart/sscLinearStart functions for starting operations in (4) above.
- Use the sscWaitIntPassPosition function for wait for pass position interrupt in (5) above.
- For a detailed procedure for pass position interrupt, refer to the sample program (InterruptPassPosition) contained on the utility software.

### 6.30.3 Interface

(1) Pass position interrupt table

The pass position condition (pass position option and pass position data) is set to the pass position interrupt table.

The pass position condition is imported when the corresponding pass position condition number is started to be judged.

| POINT |
|---|
| ・When the pass position condition setting is incorrect, a pass position interrupt error (operation alarm 5C, detail 04) occurs and the operation is stopped. |

| API LIBRARY |
|---|
| ・Use the sscSetIntPassPositionData/sscCheckIntPassPositionData functions to set/get pass position interrupt data. |

Pass position interrupt table

| | | |
|---|---|---|
| A640h | Pass position condition 1 (8 bytes) | Pass position option |
| | | Pass position data |
| A648h | Pass position condition 2 (8 bytes) | Pass position option |
| | | Pass position data |
| A650h | Pass position condition 3 (8 bytes) | Pass position option |
| | | Pass position data |
| A658h | Pass position condition 4 (8 bytes) | Pass position option |
| | | Pass position data |
| A660h | Pass position condition 5 (8 bytes) | Pass position option |
| | | Pass position data |
| A668h | Pass position condition 6 (8 bytes) | Pass position option |
| | | Pass position data |
| A670h | Pass position condition 7 (8 bytes) | Pass position option |
| | | Pass position data |
| A678h | Pass position condition 8 (8 bytes) | Pass position option |
| | | Pass position data |
| A680h | Pass position condition 9 (8 bytes) | Pass position option |
| | | Pass position data |
| A688h | Pass position condition 10 (8 bytes) | Pass position option |
| | | Pass position data |
| A690h | Pass position condition 11 (8 bytes) | Pass position option |
| | | Pass position data |
| A698h | Pass position condition 12 (8 bytes) | Pass position option |
| | | Pass position data |
| A6A0h | Pass position condition 13 (8 bytes) | Pass position option |
| | | Pass position data |
| | : | : |
| A838h | Pass position condition 64 (8 bytes) | Pass position option |
| A83Fh | | Pass position data |

(a) Details on pass position option

| Address | Name | Unit | Setting range | Initial value | Remarks |
|---|---|---|---|---|---|
| A640 | Pass position option (4 bytes) | | 00000000h to 00000011h | 00000000h | 0 0 0 0 0 0 ☐ ☐<br>Pass direction<br>Set the pass direction for the pass position data.<br>0: + direction pass position interrupt output<br>1: - direction pass position interrupt output<br>Judgment condition<br>Set the judgment condition for the pass position data.<br>0: Current command position<br>1: Current feedback position<br>Note. Only the setting for the pass position condition start number is valid. |

Note. The above address is the address for the pass position condition 1. For the pass position condition 2 and above, increase in units of 8h for each number.

(b) Details on the pass position data

| Address | Name | Unit | Setting range | Initial value | Remarks |
|---|---|---|---|---|---|
| A644 | Pass position data (4 bytes) | Command unit | -2147483648 to 2147483647 | 0 | Set the pass position data at the pass position interrupt output. |

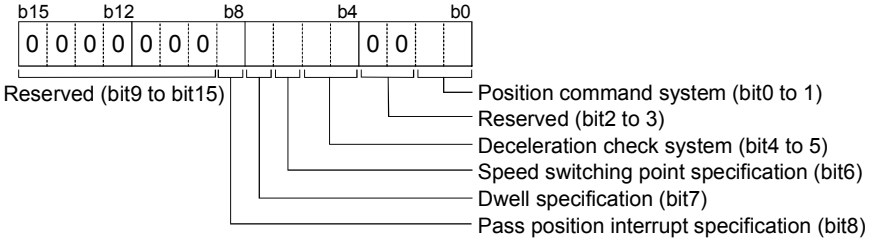
Note. The above address is the address for the pass position condition 1. For the pass position condition 2 and above, increase in units of 8h for each number.

POINT

- 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 number.
- 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 control cycle or longer between two pass position conditions.
- Only the judgment condition for the pass position condition start number 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.

(2) Point table and auxiliary command

To use the pass position interrupt, set the pass position interrupt valid to the auxiliary command of the point table.




(a) Pass position interrupt specification

Select valid/invalid for the pass position interrupt.

0: Pass position interrupt invalid

1: Pass position interrupt valid

| POINT |
|---|
| ・This setting in the point data of the start point No. is valid only. If the point data after the start point No. are set, it causes a point table setting error (operation alarm 25, detail 0C) and the operation is stopped. |

| API LIBRARY |
|---|
| ・Use the sscSetPointDataEx/sscCheckPointDataEx functions to set/get point data. |

(3) Axis command data/axis status data

The pass position is judged according to the pass position condition specified in the start number and end number of the pass position condition.

(a) Axis command data

| Address | Name | Setting range | Remarks |
|---|---|---|---|
| 1034 | Pass position condition start number (2 bytes) | 1 to 64 | Set the start number of the pass position condition for the pass position interrupt. |
| 1036 | Pass position condition end number (2 bytes) | 1 to 64 | Set the end number for the pass position condition for the pass position interrupt. |

Note 1. The above addresses are the addresses for the axis 1. For the axis 2 and above, increase in units of C0h for each axis.

2. When using only one pass position condition, set the same number for the start number and end number.

POINT

- When the pass position condition used in other axis is imported, a pass position interrupt error (operation alarm 5C, detail 05) occurs and the operation is stopped. Do not use the same pass position condition number for multiple axes.
- When the pass position condition start number is out of range, a pass position interrupt error (operation alarm 5C, detail 01) occurs and the operation is stopped.
- When the pass position condition end number is out of range, a pass position interrupt error (operation alarm 5C, detail 02) occurs and the operation is stopped.
- When the pass position condition start number is smaller than the pass position condition end number, a pass position interrupt error (operation alarm 5C, detail 03) occurs and the operation is stopped.

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- Use the sscSetStartingPassNumber function to set the pass condition start and end numbers.

(b) Axis status data

| Address | Name | Output limits | Remarks |
|---|---|---|---|
| 1094 | Executing pass position condition number (2 bytes) | 0 to 64 | Outputs the running pass position condition number.<br>After the pass position condition completion, the last pass position condition number is displayed.<br>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 number where an error occurs is displayed.<br>When the operation is started with the pass position interrupt invalid, 0 is output. |

Note. The above address is the address for the axis 1. For the axis 2 and above, increase in units of C0h for each axis.

(4) Axis command/axis status bit

The axis status bits related to the pass position interrupt function are shown below.

(a) Axis command bit

| Address | Bit | Abbreviation | Signal name |
|---|---|---|---|
| 1007 | 0 | PPISTP | Pass position interrupt cancel |
| | 1 | | Reserved |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

Note. The above address is the address for the axis 1. For the axis 2 and above, increase in units of C0h for each axis.

(b) Axis status bit

| Address | Bit | Abbreviation | Signal name |
|---|---|---|---|
| 1067 | 0 | PPIOP | Pass position interrupt |
| | 1 | PPIFIN | Pass position interrupt complete |
| | 2 | PPIERR | Pass position interrupt incomplete |
| | 3 | | Reserved |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | AUTLO | In point table loop |

Note. The above address is the address for the axis 1. For the axis 2 and above, increase in units of C0h for each axis.

(c) Details on axis command bit

| Abbreviation | Signal name | Function details |
|---|---|---|
| PPISTP | Pass position interrupt cancel | [Function]<br>Cancels the pass position interrupt.<br>[Operation]<br>Turn on this signal to cancel the pass position interrupt when the pass position interrupt signal (PPIOP) is on. |

(d) Details on axis status bit

| Abbreviation | Signal name | Function details |
|---|---|---|
| PPIOP | Pass position interrupt | [Function]<br>Notifies the pass position interrupt is being performed.<br>[Operation]<br><Conditions for turning on><br>The start and end number of the pass position interrupt are specified and the pass position interrupt is performed.<br><Conditions for turning off><br>The pass position interrupt complete signal (PPIFIN) is turned on or the pass position interrupt incomplete signal (PPIERR) is turned on. |
| PPIFIN | Pass position interrupt complete | [Function]<br>Notifies the pass position interrupt is completed.<br>[Operation]<br><Conditions for turning on><br>All interrupt outputs are completed in the pass position interrupt.<br><Conditions for turning off><br>The start and end number of the pass position interrupt are specified and the pass position interrupt is performed. |
| PPIERR | Pass position interrupt incomplete | [Function]<br>Notifies the pass position interrupt is canceled.<br>[Operation]<br><Conditions for turning on><br>• The operation is canceled due to an operation alarm, servo alarm, or an operation stop command while the pass position interrupt signal (PPIOP) is on.<br>• Not all pass position interrupt outputs are completed even when the in-position signal (INP) is turned on after the operation completion while the pass position interrupting signal (PPIOP) is on.<br>• The pass position interrupt cancel signal (PPISTP) is turned on while the pass position interrupt (PPIOP) is on.<br><Conditions for turning off><br>The start and end number of the pass position interrupt are specified and the pass position interrupt is performed. |

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・To turn the pass position interrupt cancel command (PPISTP) ON/OFF, set SSC_CMDBIT_AX_PPISTP to the command bit number of the sscSetCommandBitSignalEx function.

・For the pass position interrupt start statuses below, set the following to the status bit number with the sscGetStatusBitSignalEx or sscWaitStatusBitSignalEx function to check if the statuses are ON/OFF.

・Pass position interrupt (PPIOP) : SSC_STSBIT_AX_PPIOP
・Pass position interrupt complete (PPIFIN) : SSC_STSBIT_AX_PPIFIN
・Pass position interrupt incomplete (PPIERR): SSC_STSBIT_AX_PPIERR

(5) 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 parameter interrupt conditions (parameter No.0004) to validate the interrupt output of the pass position interrupt.

Parameter No.0004 Interrupt conditions

| Bit | Abbreviation | Name |
|---|---|---|
| 0 | SYSE | Current system error |
| 1 | CALM | Current system alarm |
| 2 | EMIO | During forced stop |
| 3 | | Reserved |
| 4 | | |
| 5 | | |
| 6 | | |
| 7 | OCME | Operation cycle alarm |

| Bit | Abbreviation | Name |
|---|---|---|
| 8 | OASF | Outputting with factor of other axes start interrupt |
| 9 | PPI | Outputting with factor of pass position interrupt |
| 10 | | Reserved |
| 11 | | |
| 12 | | |
| 13 | | |
| 14 | | |
| 15 | | |

API LIBRARY

- Use the sscChange2Parameter/sscCheck2Parameter functions to set/get interrupt conditions.

(6) Factor of system interrupt

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- Use the sscResetIntPassPosition/sscSetIntPassPosition/ sscWaitIntPassPosition functions for reset/set/wait of pass position interrupt events.

(a) Factor of system interrupt

| Address | Content |
|---|---|
| 0590 | Factor of system interrupt |
| 0591 | |
| 0592 | Reserved |
| 0593 | |
| 0594 | Factor of other axes start interrupt |
| 0595 | |
| 0596 | |
| 0597 | |
| 0598 | Factor of pass position interrupt |
| 0599 | |
| 059A | |
| 059B | |
| 059C | |
| 059D | |
| 059E | |
| 059F | |
| 05A0 | Reserved |
| : | |
| 05AF | |

(b) Details on factor of system interrupt

When the pass position data is passed, the factor of outputting with factor of pass position interrupt (iPPI) of the details on factor of system interrupt is turned on. For details on the factor of interrupt according to the pass position condition, refer to Section 6.30.3 (7).

| Address | Bit | Abbreviation (Note) | Signal name |
|---|---|---|---|
| 0590 to 0591 | 0 | iSYSE | System error (interrupt) |
| | 1 | iCALM | System alarm (interrupt) |
| | 2 | iEMIO | During forced stop (interrupt) |
| | 3 | | Reserved |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | iOCME | Operation cycle alarm (interrupt) |
| | 8 | iOASF | Outputting with factor of other axes start interrupt (interrupt) |
| | 9 | iPPI | Outputting with factor of pass position interrupt (interrupt) |
| | 10 | | Reserved |
| | 11 | | |
| | 12 | | |
| | 13 | | |
| | 14 | | |
| | 15 | | |

Note. OFF: No factor of interrupt exists.
ON: A factor of interrupt exists.

(7) Factor of pass position interrupt

When the outputting with factor of pass position interrupt (iPPI) is on, the bit corresponding to the pass position condition number of the factor of the pass position interrupt turns on.

| Address | Bit | Abbreviation | Signal name |
|---|---|---|---|
| 0598 to 059B | 0 | iPPI1 | Pass position data 1 (interrupt) |
| | 1 | iPPI2 | Pass position data 2 (interrupt) |
| | 2 | iPPI3 | Pass position data 3 (interrupt) |
| | 3 | iPPI4 | Pass position data 4 (interrupt) |
| | 4 | iPPI5 | Pass position data 5 (interrupt) |
| | 5 | iPPI6 | Pass position data 6 (interrupt) |
| | 6 | iPPI7 | Pass position data 7 (interrupt) |
| | 7 | iPPI8 | Pass position data 8 (interrupt) |
| | 8 | iPPI9 | Pass position data 9 (interrupt) |
| | 9 | iPPI10 | Pass position data 10 (interrupt) |
| | 10 | iPPI11 | Pass position data 11 (interrupt) |
| | 11 | iPPI12 | Pass position data 12 (interrupt) |
| | 12 | iPPI13 | Pass position data 13 (interrupt) |
| | 13 | iPPI14 | Pass position data 14 (interrupt) |
| | 14 | iPPI15 | Pass position data 15 (interrupt) |
| | 15 | iPPI16 | Pass position data 16 (interrupt) |
| | 16 | iPPI17 | Pass position data 17 (interrupt) |
| | 17 | iPPI18 | Pass position data 18 (interrupt) |
| | 18 | iPPI19 | Pass position data 19 (interrupt) |
| | 19 | iPPI20 | Pass position data 20 (interrupt) |
| | 20 | iPPI21 | Pass position data 21 (interrupt) |
| | 21 | iPPI22 | Pass position data 22 (interrupt) |
| | 22 | iPPI23 | Pass position data 23 (interrupt) |
| | 23 | iPPI24 | Pass position data 24 (interrupt) |
| | 24 | iPPI25 | Pass position data 25 (interrupt) |
| | 25 | iPPI26 | Pass position data 26 (interrupt) |
| | 26 | iPPI27 | Pass position data 27 (interrupt) |
| | 27 | iPPI28 | Pass position data 28 (interrupt) |
| | 28 | iPPI29 | Pass position data 29 (interrupt) |
| | 29 | iPPI30 | Pass position data 30 (interrupt) |
| | 30 | iPPI31 | Pass position data 31 (interrupt) |
| | 31 | iPPI32 | Pass position data 32 (interrupt) |

| Address | Bit | Abbreviation | Signal name |
|---|---|---|---|
| 059C to 059F | 0 | iPPI33 | Pass position data 33 (interrupt) |
| | 1 | iPPI34 | Pass position data 34 (interrupt) |
| | 2 | iPPI35 | Pass position data 35 (interrupt) |
| | 3 | iPPI36 | Pass position data 36 (interrupt) |
| | 4 | iPPI37 | Pass position data 37 (interrupt) |
| | 5 | iPPI38 | Pass position data 38 (interrupt) |
| | 6 | iPPI39 | Pass position data 39 (interrupt) |
| | 7 | iPPI40 | Pass position data 40 (interrupt) |
| | 8 | iPPI41 | Pass position data 41 (interrupt) |
| | 9 | iPPI42 | Pass position data 42 (interrupt) |
| | 10 | iPPI43 | Pass position data 43 (interrupt) |
| | 11 | iPPI44 | Pass position data 44 (interrupt) |
| | 12 | iPPI45 | Pass position data 45 (interrupt) |
| | 13 | iPPI46 | Pass position data 46 (interrupt) |
| | 14 | iPPI47 | Pass position data 47 (interrupt) |
| | 15 | iPPI48 | Pass position data 48 (interrupt) |
| | 16 | iPPI49 | Pass position data 49 (interrupt) |
| | 17 | iPPI50 | Pass position data 50 (interrupt) |
| | 18 | iPPI51 | Pass position data 51 (interrupt) |
| | 19 | iPPI52 | Pass position data 52 (interrupt) |
| | 20 | iPPI53 | Pass position data 53 (interrupt) |
| | 21 | iPPI54 | Pass position data 54 (interrupt) |
| | 22 | iPPI55 | Pass position data 55 (interrupt) |
| | 23 | iPPI56 | Pass position data 56 (interrupt) |
| | 24 | iPPI57 | Pass position data 57 (interrupt) |
| | 25 | iPPI58 | Pass position data 58 (interrupt) |
| | 26 | iPPI59 | Pass position data 59 (interrupt) |
| | 27 | iPPI60 | Pass position data 60 (interrupt) |
| | 28 | iPPI61 | Pass position data 61 (interrupt) |
| | 29 | iPPI62 | Pass position data 62 (interrupt) |
| | 30 | iPPI63 | Pass position data 63 (interrupt) |
| | 31 | iPPI64 | Pass position data 64 (interrupt) |

(8) 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 number (1 to 64) turns on.

(a) Details on factor of pass position interrupt

| Address | Content | |
|---|---|---|
| 0FA0 | Details on factor of pass position interrupt (64 bytes) | Details on factor of pass position interrupt 1 |
| 0FA1 | | Details on factor of pass position interrupt 2 |
| 0FA2 | | Details on factor of pass position interrupt 3 |
| 0FA3 | | Details on factor of pass position interrupt 4 |
| : | | : |
| 0FDF | | Details on factor of pass position interrupt 64 |

(b) Details on factor of pass position interrupt □

| Address | Bit | Abbreviation | Signal name |
|---|---|---|---|
| 0FA0 | 0 | iPPIF□ | Pass position interrupt complete □ (interrupt) |
| | 1 | iPPIE□ | Pass position interrupt incompletion□ (interrupt) |
| | 2 | | Reserved |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

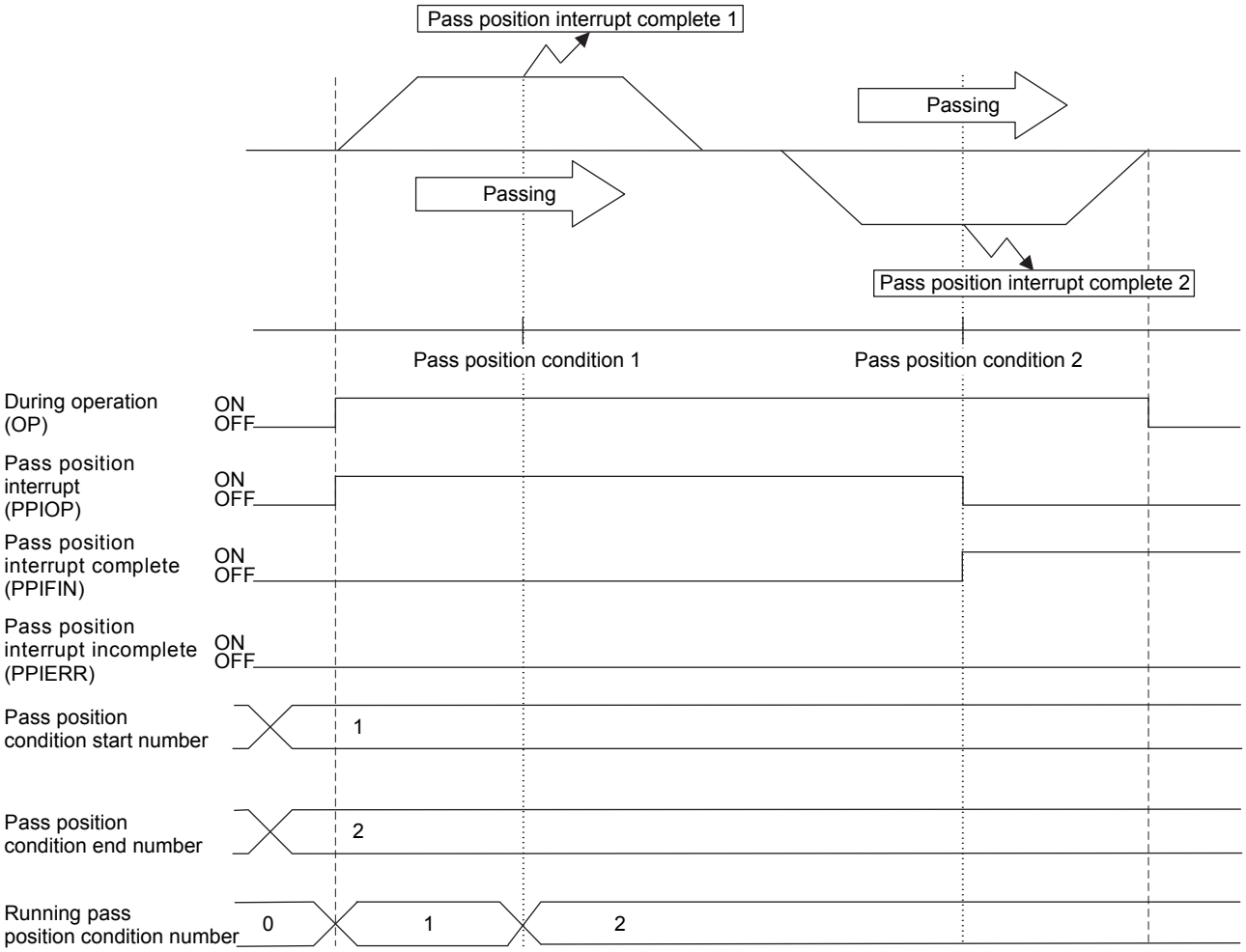
Note 1. The above address is the address for the pass position condition number 1. For the pass position condition number 2 and above, increase in units of 01h for each number.

2. □ indicates the pass position condition number (1 to 64).

### 6.30.4 Operation example

(1) When the pass position interrupt is complete

The pass position interrupt (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 the "pass position interrupt complete □" (□: pass position condition number) turns on and the interrupts are output. The pass position interrupt (PPIOP) turns off and the pass position interrupt complete (PPIFIN) turns on when all of pass position interrupts are output.



(2) 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 incomplete (PPIERR) turns on. The pass position interrupt incomplete (PPIERR) turns on under the following conditions.

At this time, the factor of interrupt of the "pass position interrupt error condition □" (□: pass position condition number) turns on to the running and unexecuted pass position interrupt conditions and the interrupt is output.

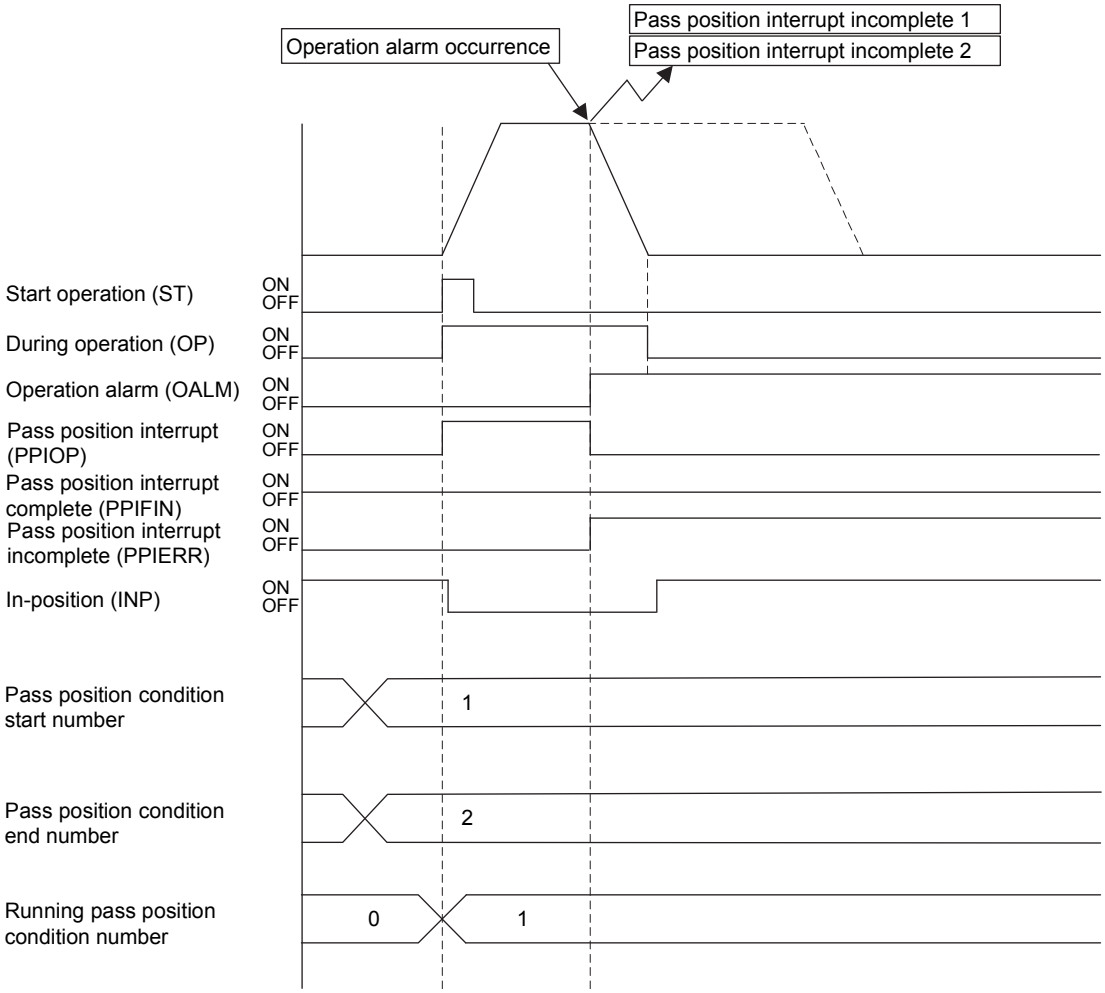
(a) The setting of the pass position condition is incorrect.

(b) Operation is canceled by turning on the stop operation signal (STP) or the rapid stop signal (RSTP) before the pass position condition is satisfied.

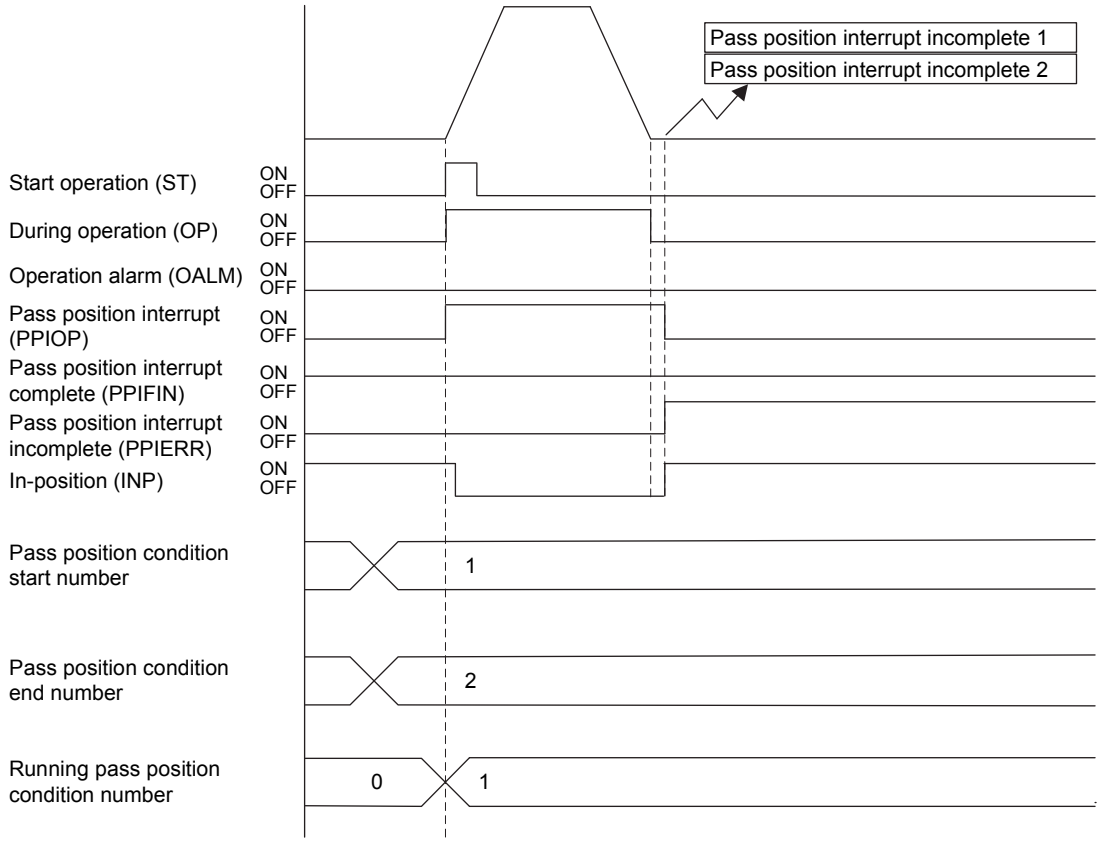
(c) Operation is canceled by an operation alarm, etc. before the pass position condition is satisfied.

(d) 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]



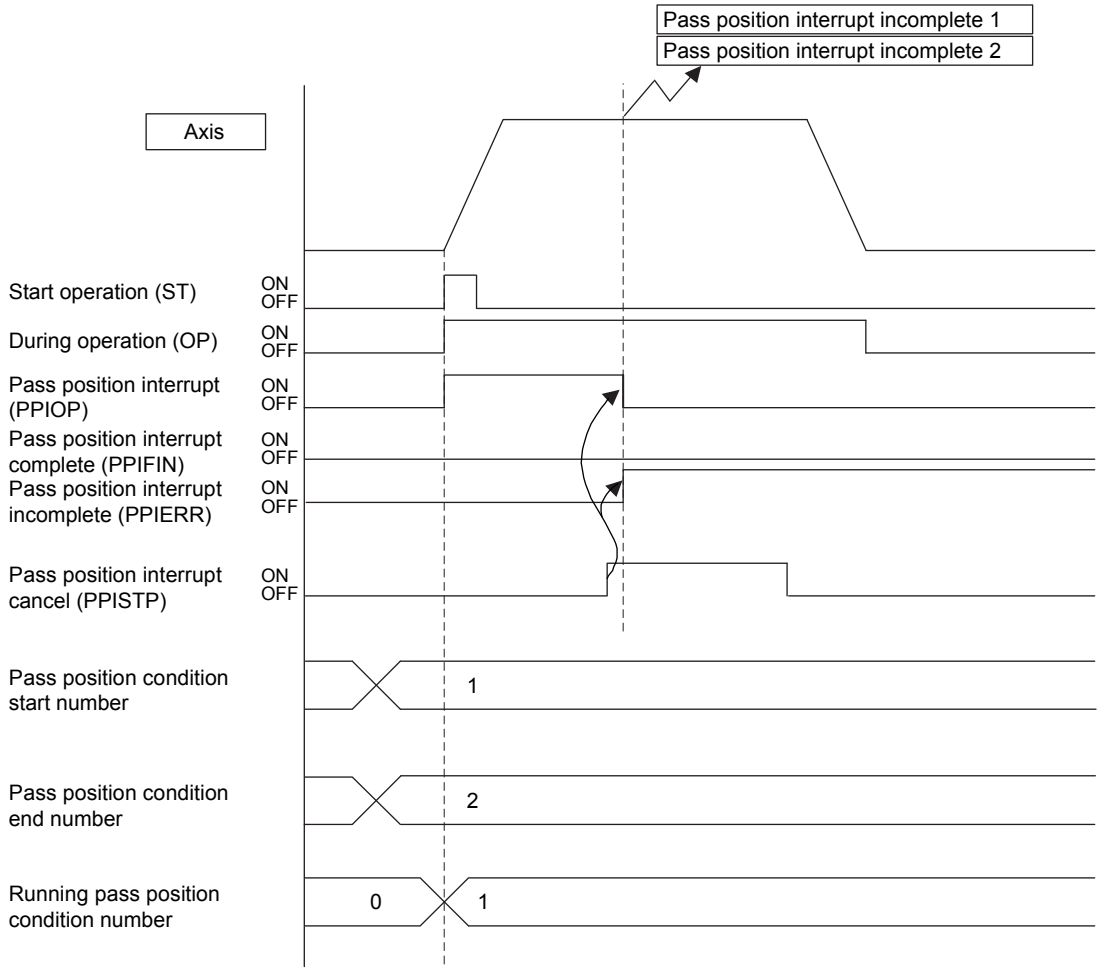
[Example of when operation is completed]



(3) When the pass position interrupt is canceled

When the pass position interrupt cancel (PPISTP) is turned on preceding the satisfaction of the pass position condition, the pass position interrupt incomplete (PPIERR) turns on. At this time, the factor of interrupt of the "pass position interrupt error condition □" (□: pass position condition number) 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]



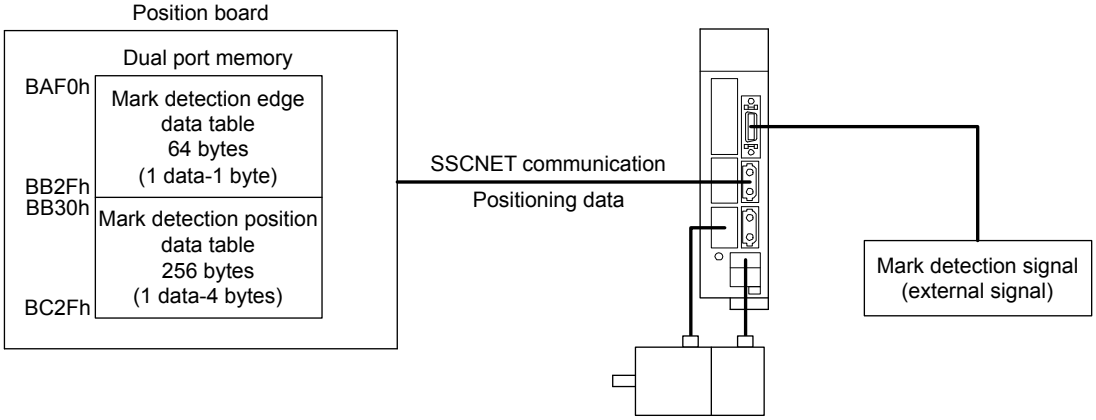

POINT

- When the operation is started with the pass position specification of the point table and auxiliary command valid while the pass position interrupt cancel signal (PPISTP) is on, a pass position interrupt error (operation alarm 5C, detail 07) occurs and the start operation is canceled. At this time, the pass position interrupt incomplete signal (PPIERR) turns on.

## 6.31 Mark detection

### 6.31.1 Summary

Mark detection is a function that gets the positioning data at the timing of when a mark detection signal is input to the servo amplifier, and outputs to the dual port memory. This function is compatible with SSCNETⅢ/H communication method only.



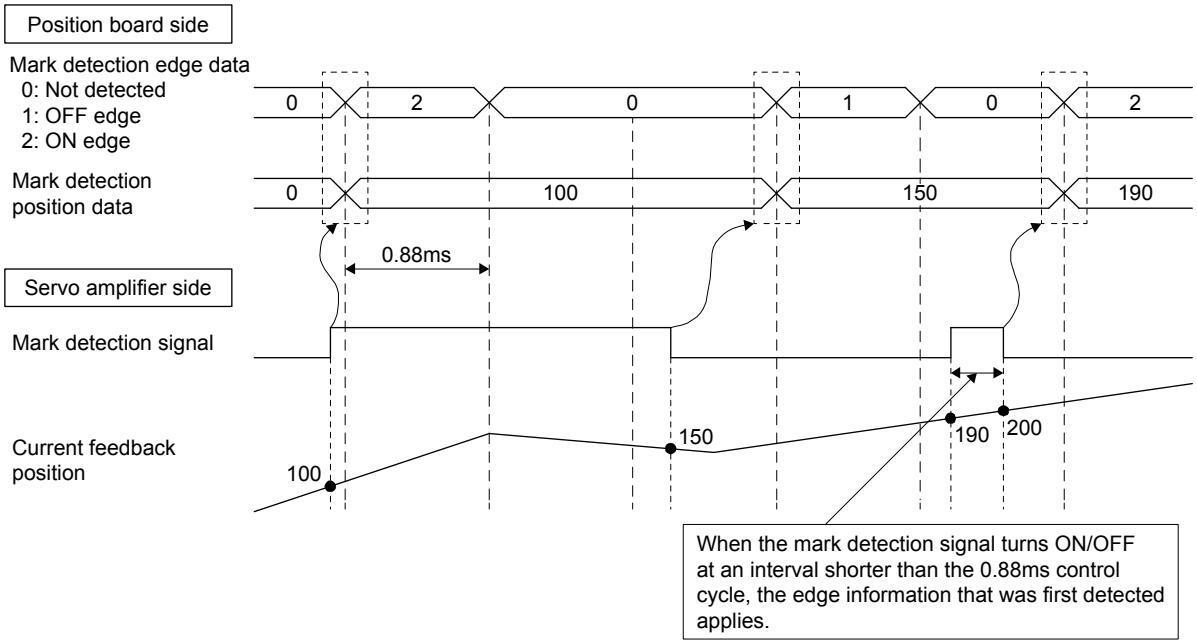

Three methods for mark detection modes can be selected.

- Continuous detection mode
- Specified number of detection mode
- Ring buffer mode

Additionally, the range of the mark detection positioning data can be specified, so only data within the specified range is latched.
When interrupt conditions 2 (parameter No.0205) is enabled and mark detection signal is detected, an interrupt can be generated. However, when not using the interrupt, or in interface mode, the mark detection counter must be monitored at all times.

| Item | Performance specifications |
|---|---|
| Number of mark detection settings | Up to 2 settings for each axis |
| Input signal | External input signal (within DI1 to DI3, 2 points) of each servo amplifier |
| Input signal detection direction | Leading edge/trailing edge detection in logic setting (ON edge detection setting, OFF edge detection setting) of external input signal can be selected |
| Detection accuracy | 55μs (input signal filter (0 to 444 μs) can be selected in parameter setting) |
| Detection delay | 0.3ms or less + filter setting value (0 to 0.444ms)<br>Note. Sensor delay time is not included |
| Input signal minimum width | 0.88ms (make ON/OFF width 0.88ms or more) |
| Latch data | 2 types (current feedback position [command units], current feedback position [pulse]) |
| Number of continuous latch data storages | Up to 64 (the whole system) |
| Latch data range | Within the range of -2147483648 to 2147483647 can be specified |

The following shows the update timing of mark detection positioning data and mark detection edge data when a mark detection signal is detected and both ON/OFF edges are enabled in the mark detection data settings.




Use a software version that supports mark detection for the servo amplifier. Mark detection is compatible with SSCNETⅢ/H communication method only. Servo amplifier software versions that support mark detection are shown in the table below.

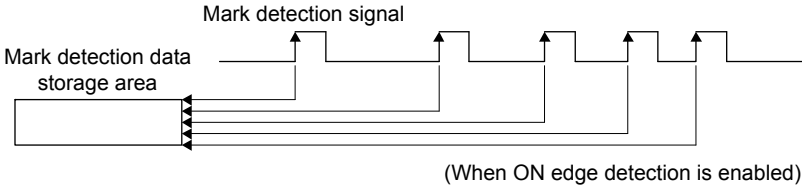
| Servo amplifier model | Software version |
|---|---|
| MR-J4-□B□(-RJ) | B4 or later |
| MR-J4W2-□B | Not supported |
| MR-J4W3-□B | Not supported |

POINT

- For communication methods other than SSCNETⅢ/H, a mark detection setting error (operation alarm 3B, detail No.01) occurs.
- When a servo amplifier that does not support mark detection is used, a mark detection setting error (operation alarm 3B, detail No.02) occurs.
- Check that the user program does not omit any detections to avoid cases where mark detection signals are not properly detected, and communication errors occurrences etc.
- In the following cases, depending on the specifications of the servo amplifier, the correct positioning data may not be got.
  1) The ON/OFF width of mark detection signals is shorter than the control cycle of 0.88ms.
  2) Servo alarm has occurred.
- When an input other than driver input is set to sensor input method (parameter No.0219), and general input setting is set to "Used" for general I/O option (parameter No.0213), the current status of mark detection signals can be checked with servo amplifier general input.
- When driver input is set to sensor input method (parameter No.0219), the current status of mark detection signals can be checked with sensors (LSP/LSN/DOG).

(1) Continuous detection mode

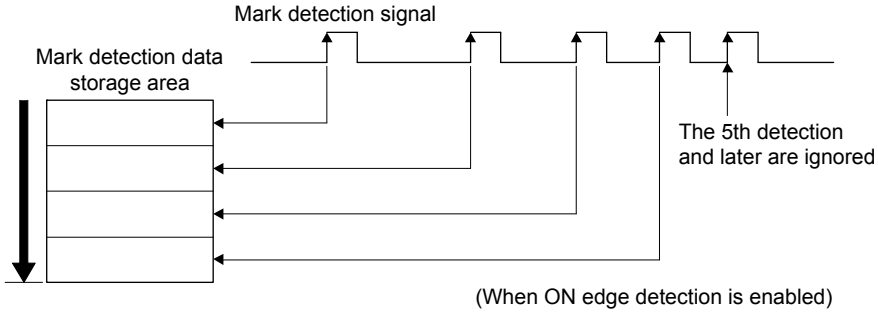
Mark detection data is stored in the mark detection data storage area (one buffer) for every mark detection.




(2) Specified number of detection mode

Only the mark detection data for a set number of detections is stored. When the mark detection signal is continuously input at a high frequency, positions for a set number of mark detections can be collected.

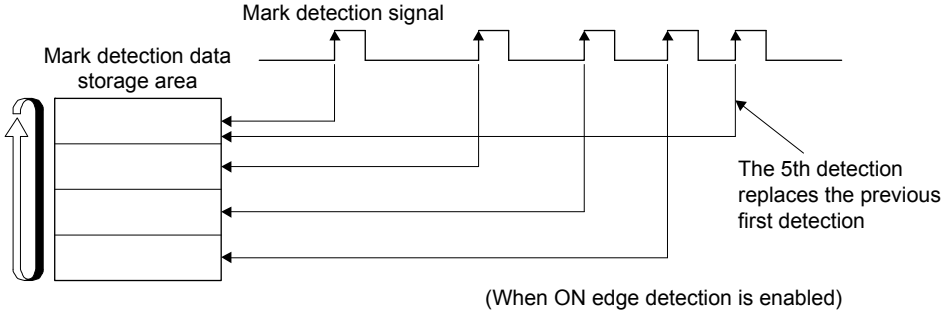
Example: When the number of detections is 4




(3) Ring buffer mode

Latched data is stored in a ring buffer for the specified number of detections (number of continuous latch data storages in parameter settings).

Example: When the number of detections is 4




| POINT |
|---|
| • Because of the time taken to get latch data by SSCNET communication, the delay time for the data to reach the user program side is approximately 0.88ms + (control cycle × 2).<br>(Approximately 2.7ms when control cycle is 0.88ms.) |

### 6.31.2 Interface

(1) Servo parameter (MR-J4-□B□(-RJ))

| Parameter No. | MR-J4-B Parameter No. | Abbreviation | Name | Setting value |
|---|---|---|---|---|
| 11CA | PD11 | *DIF | Input filter setting | Mark detection input signal filter selection<br>Set the mark detection input signal filter selection.<br>0: No setting<br>1: 0.111[ms]<br>2: 0.222[ms]<br>3: 0.444[ms] |

(2) Control parameter

| Parameter No. | Abbreviation | Name | Initial value | Units | Setting range | Function |
|---|---|---|---|---|---|---|
| 02B0 | *MKOP1 | Mark detection option 1 | 0000h | | 0000h to 3F23h | Mark detection signal number specification 1<br>Set the mark detection signal number to be used.<br>0 : Invalid<br>1 to 3: Mark detection signal number (DI1 to DI3)<br>Mark detection mode<br>Set the mark detection mode<br>0: Continuous detection mode<br>1: Specified number of detection mode<br>2: Ring buffer<br>Number of continuous latch data storages (Note)<br>Set the number of data that can be latched continuously.<br>00h to 3Fh: Number of continuous latch data storages-1<br>Note. Up to 64 can be set in the whole system. |
| 02B1 | MKDS1 | Mark detection data setting 1 | 0000h | | 0000h to 0111h | 0<br>ON edge detection setting<br>Set enable/disable for detection at ON edge.<br>0: Disable<br>1: Enable<br>OFF edge detection setting<br>Set enable/disable for detection at OFF edge.<br>0: Disable<br>1: Enable<br>Mark detection data type<br>Set the type of data to be stored as mark detection data.<br>0: Current feedback position [command units]<br>1: Current feedback position[pulse] |
| 02B2 | *MKOP2 | Mark detection option 2 | 0000h | | 0000h to 3F23h | Same as mark detection option 1. |
| 02B3 | MKDS2 | Mark detection data setting 2 | 0000h | | 0000h to 0111h | Same as mark detection data setting 1. |

| Parameter No. | Abbreviation | Name | Initial value | Units | Setting range | Function |
|---|---|---|---|---|---|---|
| 02B4 | MKNL1 | Latch data range lower limit 1 (lower) | 0000h | | 0000h to FFFFh | Specify the range (lower limit) of data to be latched at detection of the mark detection signal of mark detection signal number specification 1. (Note1), (Note 2) |
| 02B5 | MKNH1 | Latch data range lower limit 1 (upper) | 0000h | | 0000h to FFFFh | |
| 02B6 | MKXL1 | Latch data range upper limit 1 (lower) | 0000h | | 0000h to FFFFh | Specify the range (upper limit) of data to be latched at detection of the mark detection signal of mark detection signal number specification 1. (Note1), (Note 2) |
| 02B7 | MKXH1 | Latch data range upper limit 1 (upper) | 0000h | | 0000h to FFFFh | |
| 02B8 | MKNL2 | Latch data range lower limit 2 (lower) | 0000h | | 0000h to FFFFh | Same as latch data range lower limit 1. |
| 02B9 | MKNH2 | Latch data range lower limit 2 (upper) | 0000h | | 0000h to FFFFh | |
| 02BA | MKXL2 | Latch data range upper limit 2 (lower) | 0000h | | 0000h to FFFFh | Same as latch data range upper limit 1. |
| 02BB | MKXH2 | Latch data range upper limit 2 (upper) | 0000h | | 0000h to FFFFh | |

Note 1. When changed while system is running, changes are enabled when a mark detection settings enable command is input.
2. The set units are regarded as command units, or pulse units (the unit set in mark detection data type (parameter No.02B1)).

API LIBRARY

- Use the sscChange2Parameter/sscCheck2Parameter functions to set/get mark detection.

(3) Mark detection command/status data

(a) Mark detection command table

| Address | Name | Setting range | Remarks | When in tandem drive |
|---|---|---|---|---|
| B4F0 | Read complete buffer number 1 | 0 to 255 | Set the mark detection data table number that was read after reading the mark detection edge data and mark detection positioning data of mark detection 1. | Each axis |
| B4F1 | Read complete buffer number 2 | 0 to 255 | Same as read complete buffer number 1. | Each axis |
| B4F2 to B4FF | Reserved | | | |

Note. The addresses above are the addresses for the first axis. For the second axis and after, increase by 20h for each axis.

(b) Mark detection status table

| Address | Name | Output limits | Remarks | When in tandem drive |
|---|---|---|---|---|
| B500 | Start data storage area 1 | 0 to 63 | Stores the start number of latch data storage for the mark detection signal set in mark detection signal number specification 1 (parameter No.02B0). | Each axis |
| B501 | Number of continuous latch data storages 1 | 0 to 64 | Stores the number of continuous latch data storages set in mark detection signal number specification 1 (parameter No.02B0).<br>(Stores 0 for axes not using the mark detection function.) | Each axis |
| B502 | Mark detection counter 1 | Continuous detection: 0 to 255<br>Specified No. of detection, Ring buffer: 0 to 64 | Counter that is incremented when latch data for the mark detection signal set in mark detection signal number specification 1 (parameter No.02B0) is stored.<br>In continuous detection mode, the count starts again from 1 after the 255th count.<br>In ring buffer mode, the count starts again from 1 after the number of continuous latch data storages has been reached.<br>In specified number of detection mode, and ring buffer mode use a "clear command" to clear to 0. | Each axis |
| B503 | Mark detection mode 1 | 0 to 2 | Stores the mark detection mode for mark detection set in mark detection signal number specification 1 (parameter No.02B0).<br>• 0: Continuous detection mode<br>• 1: Specified number of detection mode<br>• 2: Ring buffer mode | Each axis |

Note. The addresses above are the addresses for the first axis. For the second axis and after, increase by 20h for each axis.

| Address | Name | Output limits | Remarks | When in tandem drive |
|---|---|---|---|---|
| B504 | Start data storage area 2 | 0 to 63 | Same as start data storage area 1. | Each axis |
| B505 | Number of continuous latch data storages 2 | 0 to 64 | Same as number of continuous latch data storages 1. | Each axis |
| B506 | Mark detection counter 2 | Continuous detection: 0 to 255 Specified No. of detection, Ring buffer: 0 to 64 | Same as mark detection counter 1. | Each axis |
| B507 | Mark detection mode 2 | 0 to 2 | Same as mark detection mode 1. | Each axis |
| B50C to B50F | Reserved | | | |

Note. The addresses above are the addresses for the first axis. For the second axis and after, increase by 20h for each axis.

(4) Mark detection data table

(a) Mark detection edge data table

| Address | Content |
|---|---|
| BAF0 | Mark detection edge data 0<br>0: Not detected<br>1: OFF edge<br>2: ON edge |
| BAF1 | Mark detection edge data 1 |
| BAF2 | Mark detection edge data 2 |
| BAF3 | Mark detection edge data 3 |
| BAF4 | Mark detection edge data 4 |
| BAF5 | Mark detection edge data 5 |
| BAF6 | Mark detection edge data 6 |
| BAF7 | Mark detection edge data 7 |

| Address | Content |
|---|---|
| BAF8 | Mark detection edge data 8 |
| BAF9 | Mark detection edge data 9 |
| BAFA | Mark detection edge data 10 |
| : | : |
| BB2C | Mark detection edge data 60 |
| BB2D | Mark detection edge data 61 |
| BB2E | Mark detection edge data 62 |
| BB2F | Mark detection edge data 63 |

(b) Mark detection positioning data table

| Address | Content |
|---|---|
| BB30 | Mark detection positioning data 0 |
| BB31 | |
| BB32 | |
| BB33 | |
| BB34 | Mark detection positioning data 1 |
| BB35 | |
| BB36 | |
| BB37 | |
| BB38 | Mark detection positioning data 2 |
| BB39 | |
| BB3A | |
| BB3B | |
| BB3C | Mark detection positioning data 3 |
| BB3D | |
| BB3E | |
| BB3F | |
| BB40 | Mark detection positioning data 4 |
| BB41 | |
| BB42 | |
| BB43 | |
| BB44 | Mark detection positioning data 5 |
| BB45 | |
| BB46 | |
| BB47 | |
| BB48 | Mark detection positioning data 6 |
| BB49 | |
| BB4A | |
| BB4B | |
| BB4C | Mark detection positioning data 7 |
| BB4D | |
| BB4E | |
| BB4F | |

| Address | Content |
|---|---|
| BB50 | Mark detection positioning data 8 |
| BB51 | |
| BB52 | |
| BB53 | |
| BB54 | Mark detection positioning data 9 |
| BB55 | |
| BB56 | |
| BB57 | |
| BB58 | Mark detection positioning data 10 |
| BB59 | |
| BB5A | |
| BB5B | |
| BB5C | : |
| : | |
| BC1F | |
| BC20 | Mark detection positioning data 60 |
| BC21 | |
| BC22 | |
| BC23 | |
| BC24 | Mark detection positioning data 61 |
| BC25 | |
| BC26 | |
| BC27 | |
| BC28 | Mark detection positioning data 62 |
| BC29 | |
| BC2A | |
| BC2B | |
| BC2C | Mark detection positioning data 63 |
| BC2D | |
| BC2E | |
| BC2F | |

POINT

- The mark detection data table allocates continuous latch data storage area automatically from the lowest axis to the highest axis.
- When the current feedback position set in mark detection data settings is specified in command units, the fraction that comes about when converting from pulse units is round down then stored.
- The lower 32 bits of data are latched for data in pulse units that exceeds 32 bits.

API LIBRARY

- Use the sscGetMarkDetectionData function to get mark detection data (mark detection edge data□, mark detection positioning data□).

(5) Axis command/status bit

| Address | Bit | Symbol | Signal name | When in tandem drive |
|---|---|---|---|---|
| 100B | 0 | | Reserved | |
| | 1 | MKC1 | Mark detection clear command 1 | Each axis |
| | 2 | MKD1 | Mark detection disable command 1 | Each axis |
| | 3 | MKSEN1 | Mark detection setting enable command 1 | Each axis |
| | 4 | | Reserved | |
| | 5 | MKC2 | Mark detection clear command 2 | Each axis |
| | 6 | MKD2 | Mark detection disable command 2 | Each axis |
| | 7 | MKSEN2 | Mark detection setting enable command 2 | Each axis |

| Address | Bit | Symbol | Signal name | When in tandem drive |
|---|---|---|---|---|
| 106B | 0 | MKIF1 | Mark detection compatible information 1 | Each axis |
| | 1 | MKCF1 | Mark detection clear complete 1 | Each axis |
| | 2 | MKDO1 | Mark detection disabled 1 | Each axis |
| | 3 | MKSEF1 | Mark detection setting enable complete 1 | Each axis |
| | 4 | MKIF2 | Mark detection compatible information 2 | Each axis |
| | 5 | MKCF2 | Mark detection clear complete 2 | Each axis |
| | 6 | MKD02 | Mark detection disabled 2 | Each axis |
| | 7 | MKSEF2 | Mark detection setting enable complete 2 | Each axis |

Note. The addresses above are the addresses for the first axis. For the second axis and after, increase by C0h for each axis.

(a) Details on axis command bit

| Abbreviation | Signal name | Remarks |
|---|---|---|
| MKC□ | Mark detection clear command□ | [Function]<br>Clears the mark detection positioning data table, mark detection edge data table, and mark detection counter.<br>[Operation]<br>When the mark detection clear signal is turned ON, the following data is cleared.<br>• Mark detection positioning data table<br>• Mark detection edge data table<br>• Mark detection counter |
| MKD□ | Mark detection disable command□ | [Function]<br>Disables data latch at the time of mark detection.<br>[Operation]<br>When the mark detection disable command is turned ON, data is not latched regardless of the latch data range settings. |
| MKSEN□ | Mark detection setting enable command□ | [Function]<br>Reflects the settings for mark detection.<br>[Operation]<br>Reflects the following settings.<br>• Mark detection edge settings<br>• Mark detection data type<br>• Latch data range |

POINT

• Mark detection data that is received while the mark detection clear command is ON is discarded.

(b) Details on axis status bit

| Abbreviation | Signal name | Remarks |
|---|---|---|
| MKIF□ | Mark detection compatible information□ | [Function]<br>Notifies that mark detection function can be used.<br>[Operation]<br><Conditions for turning on><br>The following conditions are satisfied.<br>• Servo amplifier supports mark detection function.<br>• Mark detections settings are enabled.<br><Conditions for turning off><br>One of the following conditions is satisfied.<br>• Servo amplifier does not support mark detection function.<br>• Mark detections settings are disabled.<br>• Mark detection compatible axis is disconnected. |
| MKCF□ | Mark detection clear complete□ | [Function]<br>Notifies that clearing of mark detection information was completed.<br>[Operation]<br><Conditions for turning on><br>Clearing of mark detection information is complete.<br><Conditions for turning off><br>The mark detection clear command signal (MKC□) was turned OFF. |
| MKD0□ | Mark detection disabled□ | [Function]<br>Notifies that data latch at the time of mark detection is disabled.<br>[Operation]<br><Conditions for turning on><br>The mark detection disable command signal (MKD□) was turned ON.<br><Conditions for turning off><br>The mark detection disable command signal (MKD□) was turned OFF. |
| MKSEF□ | Mark detection setting enable complete□ | [Function]<br>Notifies that the mark detection settings have been applied.<br>[Operation]<br><Conditions for turning on><br>The mark detection setting enable command signal (MKSEN□) was turned ON.<br><Conditions for turning off><br>The mark detection setting enable command signal (MKSEN□) was turned OFF. |

API LIBRARY

- Use the sscClearMarkDetectionData function for clearing mark detection data.
- To turn ON/OFF the following axis command bits, set the command bit numbers of the sscSetCommandBitSignalEx function to the following.
  - Mark detection disable (MKD□): SSC_CMDBIT_AX_MKD□
  - Mark detection setting enable (MKSEN□): SSC_CMDBIT_AX_MKSEN□
- To turn ON/OFF the following axis status bits, set the status bit numbers of the sscGetStatusBitSignalEx function or sscWaitStatusBitSignalEx function to the following.
  - Mark detection compatible information (MKIF□): SSC_STSBIT_AX_MKIF□
  - Mark detection disabled (MKDO□): SSC_STSBIT_AX_MKDO□
  - Mark detection setting enable complete (MKSEF□): SSC_STSBIT_AX_MKSEF□

### 6.31.3 Function details

(1) Combinations with sensor input method

By setting the sensor input method to driver input, and setting the mark detection signal numbers (DI1 to DI3), sensors (LSP/LSN/DOG) can be used in combination with the mark detection function.

Example 1: When sensor input method is set to driver input and mark detection signal number specification 1 is set to DI3

| Name | Signal allocation |
|---|---|
| DI1 | LSP |
| DI2 | LSN |
| DI3 | DOG(mark detection 1) |

Example 2: When sensor input method is set to a setting other than driver input and mark detection signal number specification 2 is set to DI1

| Name | Signal allocation |
|---|---|
| DI1 | General input 1<br>(mark detection 2) |
| DI2 | General input 2 |
| DI3 | General input 2 |

(2) Continuous latch data storage allocation

The mark detection data table (the table where the current feedback position data at the input of the mark detection signal is stored) used by each axis allocates according to the number of continuous latch data storages (parameter No.02B0) automatically from the lowest axis to the highest axis.

The following is an example for when continuous latch data storages is 4 points for axis 1, 1 point for axis 2, and 2 points for axis 3.

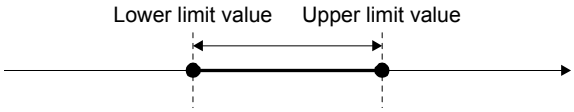
| Mark detection data table | Allocation |
|---|---|
| Mark detection data table 0 | Axis 1 |
| Mark detection data table 1 | |
| Mark detection data table 2 | |
| Mark detection data table 3 | |
| Mark detection data table 4 | Axis 2 |
| Mark detection data table 5 | Axis 3 |
| Mark detection data table 6 | |
| : | : |

(3) Latch data range

When data at mark detection is within the latch data range, the data is stored in the mark detection storage device and the mark detection counter increases by one. When the data is outside of the range the mark detection is not processed. The following explains the upper limit value and lower limit value.

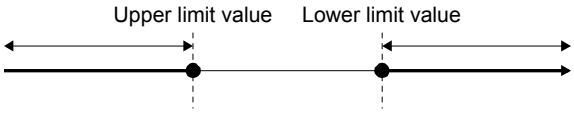
(a) Upper limit value > lower limit value

When the mark detection data is more than the lower limit value and also less than or equal to the upper limit value, the mark detection is processed.




(b) Upper limit value < lower limit value

When the mark detection data is less than the upper limit value or more than the lower limit value, the mark detection is processed.




(c) Upper limit value = lower limit value

The range of the mark detection data is not checked. Mark detection is processed for all ranges.

(4) Mark detection clear command

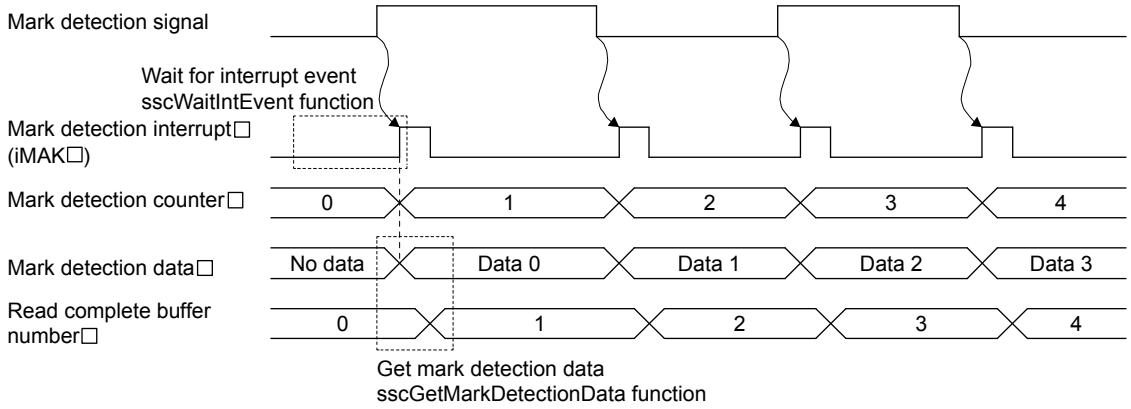
When a mark detection clear command is input the mark detection counter becomes 0, and mark detection edge data and mark detection positioning data is cleared.

### 6.31.4 Operation example

(1) Continuous detection mode

The mark detection counter is incremented at mark detection. After mark detection, read the mark detection data and update the read complete buffer number. When mark detection data is not read before the next mark detection, a mark detection write/read error (operation alarm A6, detail No.01) occurs, followed by a rapid stop.

Example: When both ON/OFF edges are enabled.



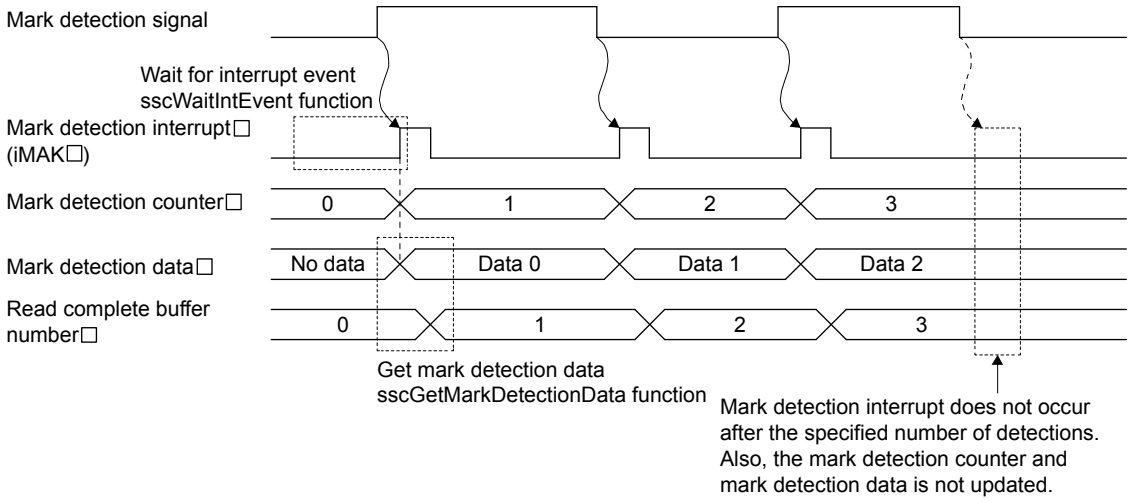

| POINT |
|---|
| • Mark detection interrupt cannot be used for interface mode. The mark detection counter can be continuously monitored by polling. |

| API LIBRARY |
|---|
| • Use the sscGetMarkDetectionData function to get mark detection data.<br>• The read number setting for the read complete buffer number is conducted within the sscGetMarkDetectionData function therefore user program processing is not required.<br>• Use the sscGetMarkDetectionCounter function to get the mark detection counter.<br>• When using mark detection interrupt, use the sscWaitIntEvent function and wait until interrupt is output. If not using mark detection interrupt, use polling. When using polling, use the sscGetMarkDetectionCounter function to periodically check that the mark detection counter is updated. |

(2) Specified number of detection mode

The mark detection counter is incremented at mark detection. After mark detection, read the mark detection data and update the read complete buffer number. If performing mark detection again after the specified number of mark detections, conduct a mark detection clear. The mark detection data that is detected after the mark detection clear is latched.

Example: When both ON/OFF edges are enabled and specified number of mark detections is three.



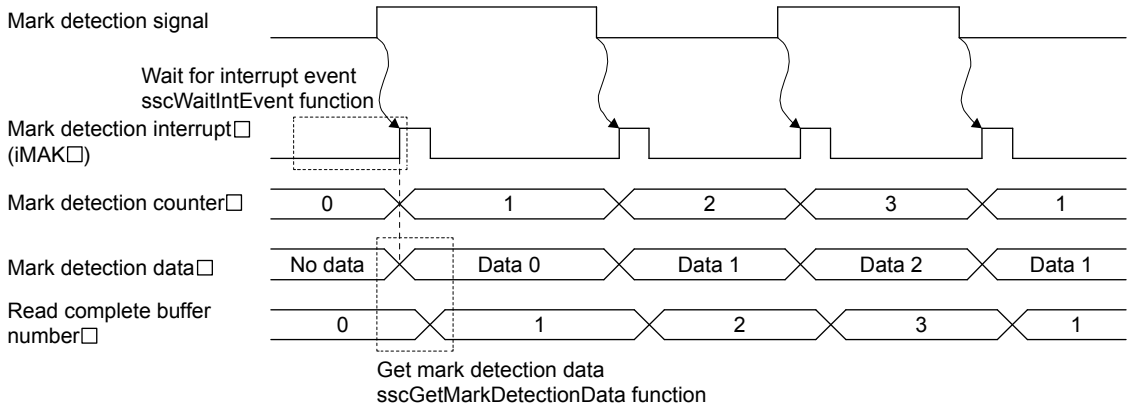

| POINT |
|---|
| • Data for mark detections after the specified number of detections is not latched. |

| API LIBRARY |
|---|
| • Use the sscGetMarkDetectionData function to get mark detection data.<br>• The read number setting for the read complete buffer number is conducted within the sscGetMarkDetectionData function therefore user program processing is not required.<br>• Use the sscGetMarkDetectionCounter function to get the mark detection counter.<br>• When using mark detection interrupt, use the sscWaitIntEvent function and wait until interrupt is output. If not using mark detection interrupt, use polling. When using polling, use the sscGetMarkDetectionCounter function to periodically check that the mark detection counter is updated. |

(3) Ring buffer mode

When using ring buffer mode, the mark detection count is started again from 1 if the number of mark detections exceeds the number of continuous latch data storages. When mark detection data is not read before the next mark detection, a mark detection write/read error (operation alarm A6, detail No.01) occurs with a rapid stop.

Example: When both ON/OFF edges are enabled.




API LIBRARY

- Use the sscGetMarkDetectionData function to get mark detection data.
- The read number setting for the read complete buffer number is conducted within the sscGetMarkDetectionData function therefore user program processing is not required.
- Use the sscGetMarkDetectionCounter function to get the mark detection counter.
- When using mark detection interrupt, use the sscWaitIntEvent function and wait until interrupt is output. If not using mark detection interrupt, use the sscGetMarkDetectionCounter function to periodically check that the mark detection counter is updated.

## 6.32 Continuous operation to torque control

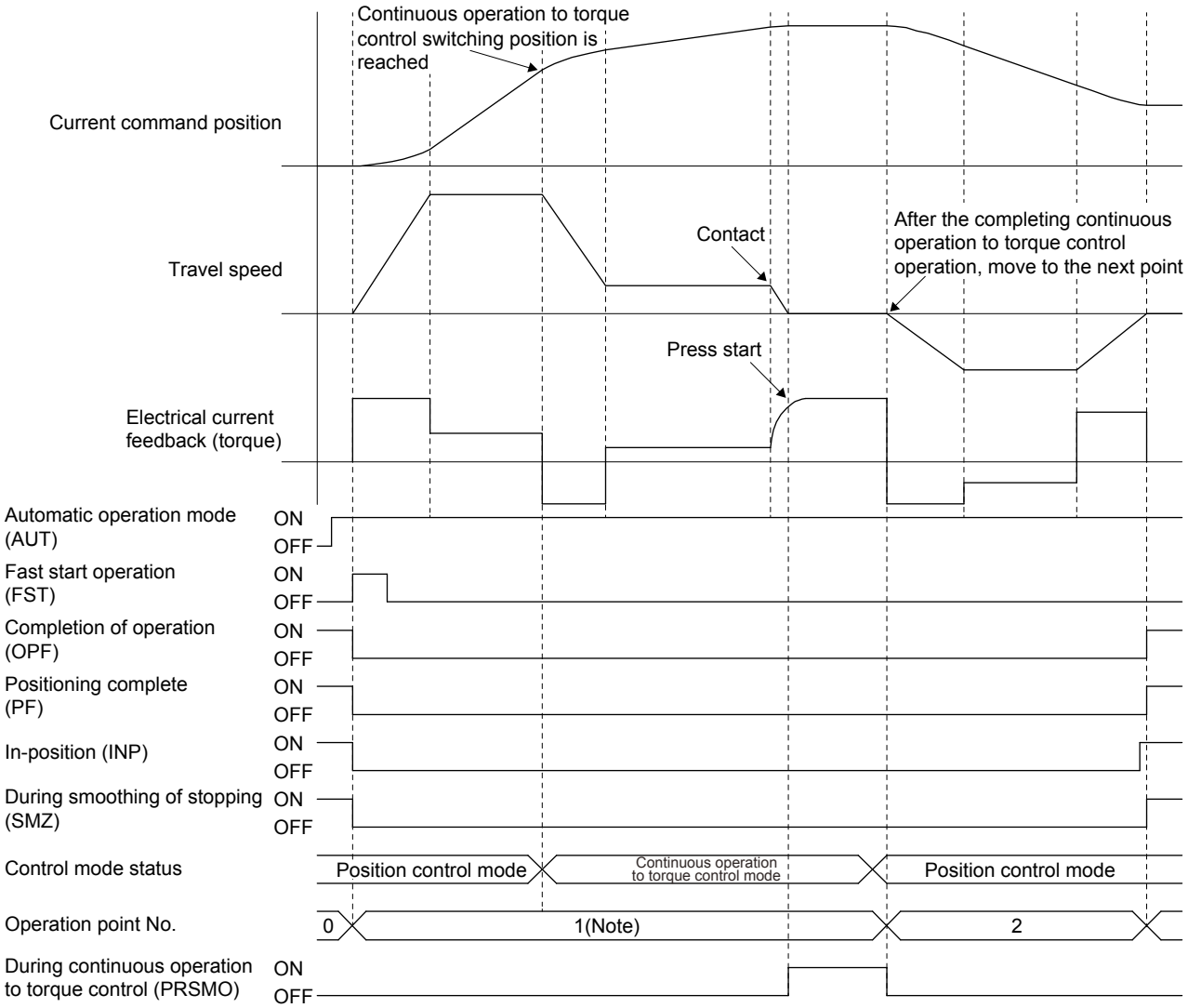
### 6.32.1 Summary

Continuous operation to torque control is a control method that achieves torque control during positioning control without stopping.
To perform continuous operation to torque control, the servo amplifier control mode must be switched to "continuous operation to torque control mode". By setting the "continuous operation to torque control specification" auxiliary command in the point table to "continuous operation to torque control valid", torque control is performed from the position (command position or current feedback position) set in the switch conditions without stopping operation. Continuous operation to torque control is completed based on the continuous operation to torque control data, then returned to position control.
Also, when the continuous operation to torque control operation condition "start switch to continuous operation to torque control condition" is set to "manual switch", a switch to continuous operation to torque control can be made at any given time.
The continuous operation to torque control data becomes 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 |
| --- |
| • Continuous operation to torque control data that is changed during the operation of a continuous operation to torque control point becomes valid at the operation of the next continuous operation to torque control point. |

(1) Operation example

Two-point operation (deceleration check system: In-position stop) including continuous operation to torque control point.




Note. Returning to position control mode after the completion of continuous operation to torque control operation is part of the continuous operation to torque control point, and is performed as a one-point operation.

**POINT**

- When continuous operation to torque control specification is set to valid and automatic operation is started for a servo amplifier that is not supported, continuous operation to torque control error (operation alarm 5D, detail No.06) occurs, and operation does not start.

**API LIBRARY**

- Refer to the sample program "InterruptPressDrive" contained in the utility software for a more specific procedure on continuous operation to torque control.

### 6.32.2 Interface

Set the following data when using continuous operation to torque control.

(1) Parameter

(a) Servo parameter

| Parameter No. | Abbreviation | Name | Initial value | Units | Setting range | Function |
|---|---|---|---|---|---|---|
| 110D | *POL | Rotation direction selection/travel direction selection | 0 | | 0 to 1 | Select the rotation direction or travel direction for the command input pulse. |
| 1142 | TFBGN | Torque feedback loop gain | 18000 | rad/s | 0 to 18000 | Set the torque feedback gain for continuous operation to torque control.<br>By setting a smaller value, the contact load at continuous operation to torque control can be reduced.<br>When setting value is less than 6[rad/s], a setting value of 6[rad/s] is set. |

(b) Control parameter

| Parameter No. | Abbreviation | Name | Initial value | Units | Setting range | Function |
|---|---|---|---|---|---|---|
| 0205 | ITM2 | Interrupt condition 2 | 0000h | | 0000h to FFFFh | Set interrupt condition 2. |
| 0222 | SPLL | Speed limit value (lower) | 0BB8h | Speed units | 0000h to FFFFh | Set the value for the moving speed limit. |
| 0223 | SPLH | Speed limit value (upper) | 0000h | | 0000h to 7FFFh | |

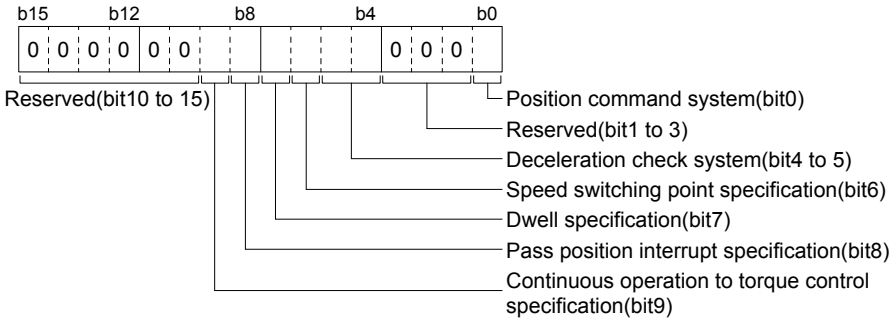
API LIBRARY

- Use the sscChange2Parameter/sscCheck2Parameter functions to set/get parameters.

(2) Point table

Set the points where continuous operation to torque control is performed in "continuous operation to torque control specification" in the auxiliary command.

| Point | Position data [Command units] | Feed speed [Speed units] | Acceleration constant [ms] | Deceleration constant [ms] | Dwell/pre dwell [ms] | Auxiliary command | Other axes start specification | S-curve ratio [%] | Reserved |
|---|---|---|---|---|---|---|---|---|---|
| | 4 bytes | 4 bytes | 2 bytes | 2 bytes | 2 bytes | 2 bytes | 4 bytes | 1 byte | 11 bytes |
| 0000 | -2000 | 3000 | 20 | 30 | 0 | 0000h | 00000000h | 0 | 0 |
| 0001 | -3000 | 1000 | 30 | 50 | 0 | 0000h | 00000000h | 0 | 0 |
| 0002 | -2000 | 1000 | 30 | 50 | 0 | 0000h | 00000000h | 0 | 0 |
| 0003 | 0 | 3000 | 20 | 30 | 0 | 0000h | 00000000h | 0 | 0 |
| : | : | : | : | : | : | : | : | : | : |




(a) Position command method

0: Absolute position command

1: Relative position command

(b) Deceleration check system

Operation is complete at the completion of continuous operation to torque control. Continuous operation is invalid.

(c) Speed switching point specification

Speed switching point specification is invalid.

(d) Dwell specification

0: Dwell (Specify the time for after switching to position control mode)

1: Predwell (point movement starts when the time specified by predwell has passed.)

(e) Pass position interrupt specification

0: Pass position interrupt invalid

1: Pass position interrupt valid

(f) Continuous operation to torque control specification

0: Continuous operation to torque control invalid

1: Continuous operation to torque control valid

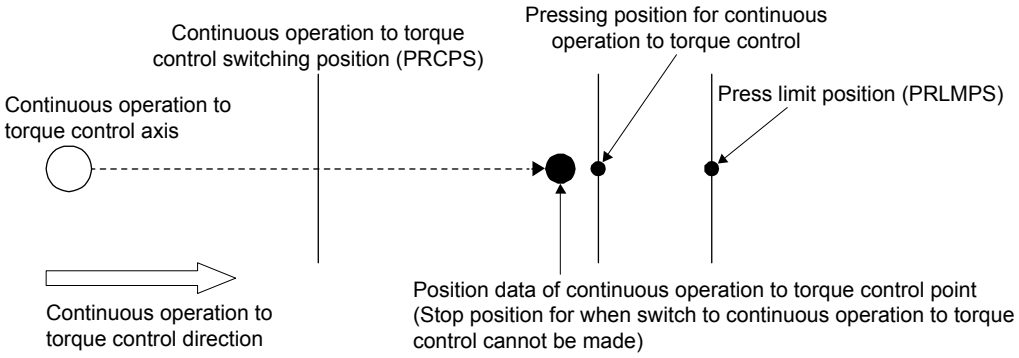
API LIBRARY

- Use the sscSetPointDataEx/sscCheckPointDataEx functions to set/get point data.

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 could not be made, a continuous operation to torque control error (operation alarm 5D, detail No.02) occurs at the completion of position control.
  It is determined that switching to continuous operation to torque control could not be made under the following conditions.
  - When position data is before the continuous operation to torque control switching position.
  - When switching is not performed when manual switch is selected.
- When the control mode switch command (CTLMC) turns ON during the time specified by predwell, control mode switch error (CTLMCE) turns ON, and control mode cannot be switched.

[Setting image]



(3) Continuous operation to torque control data

Set the conditions for performing continuous operation to torque control in the continuous operation to torque control data.

(a) Continuous operation to torque control data

| Address | Abbreviation | Name | Units | Setting range | Function | At manual switch selection |
|---|---|---|---|---|---|---|
| A840 | PRCPS | Continuous operation to torque control switching position (4 bytes) | Command units | -2147483648 to 2147483647 | Set the position for switching to continuous operation to torque control.<br>The position command system depends on the setting of the auxiliary command of the point table. | Invalid |
| A844 | PRLMPS | Press limit position (4 bytes) | Command units | -2147483648 to 2147483647 | Set the limit position for which continuous operation to torque control can operate.<br>It is determined by the feedback position.<br>The position command system depends on the setting of the auxiliary command of the point table. | Valid |
| A848 | PRCTSP | Continuous operation to torque control speed limit value (4 bytes) | Speed units | 1 to 2147483647 | Set the speed limit value during continuous operation to torque control. | Valid |
| A84C | PRTGTR | Target torque (2 bytes) | 0.1% | 0 to 32767 | Set the target torque during continuous operation to torque control. | Valid |
| A84E | PRTM | Press time (2 bytes) | ms | 0 to 65535 | Set the press time during continuous operation to torque control. | Invalid |
| A850 | PRTRW | Torque settle width (2 bytes) | 0.1% | 0 to 65535 | Set the range (difference from the target torque) at which it is regarded that the target torque has been reached during continuous operation to torque control. | Valid |
| A852 | PRWTM | Torque settle waiting time (2 bytes) | ms | 0 to 65535 | Set the time where it is determined that press is occurring (from when entering the torque settle width until during continuous operation to torque control (PRSMO) is output.) | Valid |
| A854 | PRCA | Continuous operation to torque control acceleration time constant (2 bytes) | ms | 0 to 20000 | Set the acceleration time constant for during continuous operation to torque control. | Valid |
| A856 | PRCD | Continuous operation to torque control deceleration time constant (2 bytes) | ms | 0 to 20000 | Set the deceleration time constant for during continuous operation to torque control. | Valid |

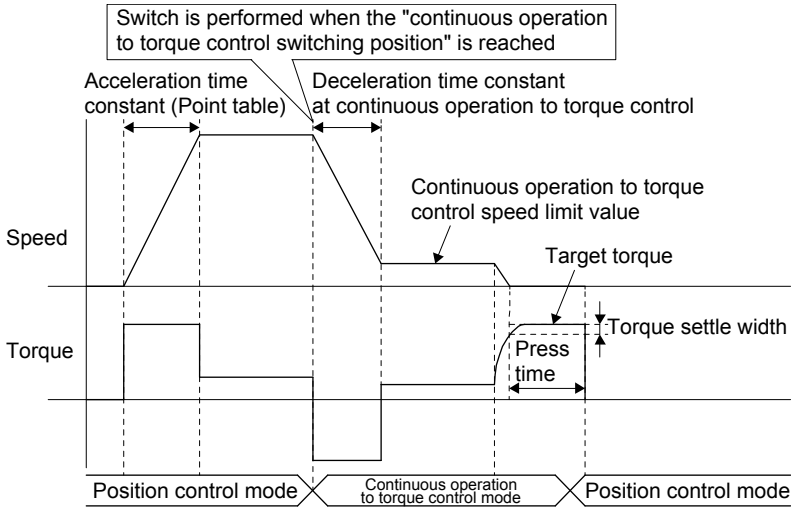
| Address | Abbreviation | Name | Units | Setting range | Function | At manual switch selection |
|---|---|---|---|---|---|---|
| A858 | PRCOP | Continuous operation to torque control operating conditions (2 bytes) | | 0000h to 0012h | 0 0 ☐ ☐<br>Start switch to continuous operation to torque control condition<br>Set the condition for determining the continuous operation to torque control switching position.<br>0: Automatic switch (command position)<br>1: Automatic switch (current feedback position)<br>2: Manual switch<br>End switch to continuous operation to torque control condition<br>Set the condition for determining the control mode switch from continuous operation to torque control.<br>0: Automatic switch<br>1: Manual switch | Valid |
| A85A to A85F | | Reserved | | | | |

Note. The addresses above are the addresses for the first axis. For the second axis and after, increase by 20h for each axis.

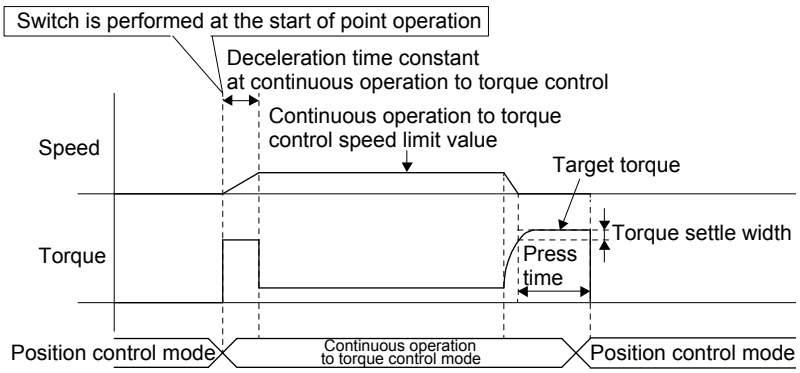
API LIBRARY

- Use the sscSetPressDataEx/sscGetPressDataEx functions to set/get continuous operation to torque control data.

1) When the continuous operation to torque control switching position has not be reached at the start of operation




2) When the continuous operation to torque control switching position has been passed at the start of operation



POINT

- The value for continuous operation to control data at the start of operation at the continuous operation to torque control point is valid.
- Continuous operation to torque control data that is changed during the operation of a continuous operation to torque control point becomes valid at the operation of the next continuous operation to torque control point.
- The press time is the time passed since torque within the torque settle width is continuously output during the torque settle waiting time. (The press time continues even if a value outside the torque settle width occurs part of the way through.)
- When a value outside of the range is set to continuous operation to torque control data and automatic operation is startup, a continuous operation to torque control setting error (operation alarm 5E, detail No.01 to 05) occurs, and the operation is not started.
- When a press limit position is set in the opposite direction of the position control travel direction, a continuous operation to torque control error (operation alarm 5D, detail No.05) occurs, and the operation is not started.
- When a press limit position is set before the positioning data, a continuous operation to torque control error (operation alarm 5D, detail No.08) occurs, and the operation is not started. (A press limit position is not reached during position control mode)
- The press limit position is determined by the current feedback position. When the press limit position is reached during continuous operation to torque control, a continuous operation to torque control error (operation alarm 5D, detail No.03) occurs, and stops at the position where the press limit position was exceeded.
- When target torque is reached during acceleration, it is determined that press has started and the press time measurement begins.
- When the continuous operation to torque control switching position is in the opposite direction of the movement direction, the continuous operation to torque control switching position is judged to be passed.

(4) System status bit

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 0450 | 0 | ITO | Outputting with factor of interrupt |
| | 1 | IITO | During interface mode interrupt invalid |
| | 2 | EVDO | Event detection enabled |
| | 3 | HRIF | During highly response I/F valid |
| | 4 | BMA | During system program memory access |
| | 5 | PRINF | Continuous operation to torque control compatible information |
| | 6 | | Reserved |
| | 7 | IFMO | In interface mode |

(a) Details on system status bits

| Abbreviation | Signal name | Function details |
|---|---|---|
| PRINF | Continuous operation to torque control compatible information | [Function]<br>Notifies that continuous operation to torque control is compatible.<br>[Operation]<br><Conditions for turning on><br>Continuous operation to torque control is compatible.<br><Conditions for turning off><br>Continuous operation to torque control is not compatible. |

API LIBRARY

- To check if the following system status bits are ON/OFF, set the status bit numbers of the sscGetStatusBitSignalEx function or sscWaitStatusBitSignalEx function to the following.
  - Continuous operation to torque control compatible information (PRINF): SSC_STSBIT_AX_PRINF

(5) Axis command/status bit

The axis command/status bits for continuous operation to torque control are shown below.

| Address | Bit | Symbol | Signal name | When in tandem drive |
|---|---|---|---|---|
| 1008 | 0 | GAIN | Gain switching command | Each axis |
| | 1 | FCLS | Fully closed loop control change command | Each axis |
| | 2 | | Reserved | |
| | 3 | CPC | PID control command | Each axis |
| | 4 | | Reserved | |
| | 5 | | | |
| | 6 | | | |
| | 7 | | | |

| Address | Bit | Symbol | Signal name | When in tandem drive |
|---|---|---|---|---|
| 1068 | 0 | GAINO | During gain switching | Each axis |
| | 1 | FCLSO | Fully closed loop control changing | Each axis |
| | 2 | TLSO | Selecting torque limit | Each axis |
| | 3 | SPC | During PID control | Each axis |
| | 4 | | Reserved | |
| | 5 | | | |
| | 6 | | | |
| | 7 | PRSMO | During continuous operation to torque control | Not supported |

| Address | Bit | Symbol | Signal name | When in tandem drive |
|---|---|---|---|---|
| 100C | 0 | | Reserved | |
| | 1 | | | |
| | 2 | | | |
| | 3 | | | |
| | 4 | CTLMC | Control mode switch command | Not supported |
| | 5 | | Reserved | |
| | 6 | | | |
| | 7 | | | |

| Address | Bit | Symbol | Signal name | When in tandem drive |
|---|---|---|---|---|
| 106C | 0 | | Reserved | |
| | 1 | | | |
| | 2 | | | |
| | 3 | | | |
| | 4 | CTLMCF | Control mode switch complete | Not supported |
| | 5 | CTLMCE | Control mode switch error | Not supported |
| | 6 | | Reserved | |
| | 7 | | | |

Note. The addresses above are the addresses for the first axis. For the second axis and after, increase by C0h for each axis.

(a) Details on axis command bit

| Abbreviation | Signal name | Remarks |
|---|---|---|
| CTLMC | Control mode switch command | [Function]<br>Switch the control mode of the servo amplifier based on the control mode command.<br>[Operation]<br>When all of the following conditions are satisfied, the control mode is switched to the specified control mode.<br>• "Continuous operation to torque control specification" within the "auxiliary command" of the point in operation is set to "continuous operation to torque control valid".<br>• Control mode switch condition is set to "2: Manual switch".<br>• "Control mode command" is set to "Position control mode" or "continuous operation to torque control mode". |

(b) Details on axis status bit

| Abbreviation | Signal name | Remarks |
|---|---|---|
| PRSMO | During continuous operation to torque control | [Function]<br>Notifies 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.<br>[Operation]<br><Conditions for turning on><br>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.<br><Conditions for turning off><br>Control mode was changed to position control mode. |
| CTLMCF | Control mode switch complete | [Function]<br>Notifies that switching of control mode of the servo amplifier was completed.<br>[Operation]<br><Conditions for turning on><br>The switching of the control mode of the servo amplifier was completed normally. (Turns ON even when switching to a control mode the same as the current control mode)<br><Conditions for turning off><br>The control mode switch command signal (CTLMC) was turned OFF. |
| CTLMCE | Control mode switch error | [Function]<br>Notifies that switching of control mode of the servo amplifier could not be performed.<br>[Operation]<br><Conditions for turning on><br>When one of the following conditions below is satisfied and the control mode switch command is turned ON.<br>• Switch command is input during automatic operation during an operation other than continuous operation to torque control points.<br>• A mode other than position control mode and continuous operation to torque control mode, or a mode outside of the range is specified.<br>• A control mode switch command set to other than manual switch was input during operation.<br><Conditions for turning off><br>The control mode switch command signal (CTLMC) was turned OFF. |

API LIBRARY

- Use the sscChangeControlMode function for switching the control mode of the servo amplifier.
- To check if the following system status bits are ON/OFF, set the status bit numbers of the sscGetStatusBitSignalEx function or sscWaitStatusBitSignalEx function to the following.
- During continuous operation to torque control (PRSMO): SSC_STSBIT_AX_PRSMO

(6) Axis command/status data

The axis command/status data for continuous operation to torque control are shown below.

(a) Axis command table

| Address | Name | Setting range | Remarks | When in tandem drive |
|---|---|---|---|---|
| 1032<br>1033 | Control mode command | Refer to remarks | Set the mode to switch to.<br>0000h: Position control mode<br>0001h: Speed control mode (interface mode only)<br>0002h: Torque control mode (interface mode only)<br>0010h: Continuous operation to torque control mode (standard mode only) | Not supported |

Note. The addresses above are the addresses for the first axis. For the second axis and after, increase by C0h for each axis.

(b) Axis status table

| Address | Name | Output limits | Remarks | When in tandem drive |
|---|---|---|---|---|
| 1092<br>1093 | Control mode status | Refer to remarks | The current control mode is shown below.<br>□□□□<br>000h: Position control mode<br>001h: Speed control mode<br>002h: Torque control mode<br>010h: Continuous operation to torque control<br>0: Control mode switch normal<br>8: Control mode switch error (Note 1) | Not supported |

Note 1. When the control mode switch error (CTLMCE) is ON, the status is control mode switch error.

2. The addresses above are the addresses for the first axis. For the second axis and after, increase by C0h for each axis.

POINT

- When a selection other than manual switch is selected for the continuous operation to torque control operating conditions, control mode switch is automatically performed by the position board.

API LIBRARY

- Use the sscChangeControlMode function for switching the control mode of the servo amplifier.

### 6.32.3 Control mode switch

For control mode switch, there are the two following methods that can be selected for both "switching from position control mode to continuous operation to torque control mode" and "switching from continuous operation to torque control to position control mode"

• Automatic switch
• Manual switch

(1) Control mode switch setting

The setting contents and setting values required for each switch pattern are shown in the following table.

| Switch pattern | Switch method | Setting items | Setting values |
|---|---|---|---|
| Switching from position control mode to continuous operation to torque control mode | Automatic switch | Continuous operation to torque control switching position | Position to switch to continuous operation to torque control mode [command units] |
| | | Start switch to continuous operation to torque control condition | 0000h, 0001h: Automatic switch (position command)<br>0010h, 0011h: Automatic switch (current feedback position) |
| | Manual switch | Start switch to continuous operation to torque control condition | 0002h, 0012h: Manual switch |
| Switching from continuous operation to torque control mode to position control mode | Automatic switch | End switch to continuous operation to torque control condition | 0000h to 0002h: Automatic switch |
| | Manual switch | End switch to continuous operation to torque control condition | 0010h to 0012h: Manual switch |

(2) Procedure for switching from position control mode to continuous operation to torque control mode

(a) Switch method: Automatic switch

1) The position board automatically switches the control mode thus processing by user program is not required.
(The position board determines the continuous operation to torque control switching position, and automatically switches to continuous operation to torque control mode once the position is reached.)

(b) Switch method: Manual switch

1) Set the control mode command to "3: Continuous operation to torque control mode".
2) Turn ON control mode switch command (CTLMC). (Have the switch timing determined by user program)
3) After confirming control mode switch complete (CTLMCF) is ON, turn OFF control mode switch command (CTLMC).

(3) Procedure for switching from continuous operation to torque control mode to position control mode

(a) Switch method: Automatic switch

1) The position board automatically switches the control mode thus processing by user program is not required.
(Control mode is automatically returned to position control mode after the press time has passed since the starting of torque output within the torque settle width of the target torque.)

(b) Switch method: Manual switch

1) Set the control mode command to "0: Position control mode".
2) Turn ON control mode switch command (CTLMC). (Have the switch timing determined by user program)
3) After confirming control mode switch complete (CTLMCF) is ON, turn OFF control mode switch command (CTLMC).

POINT

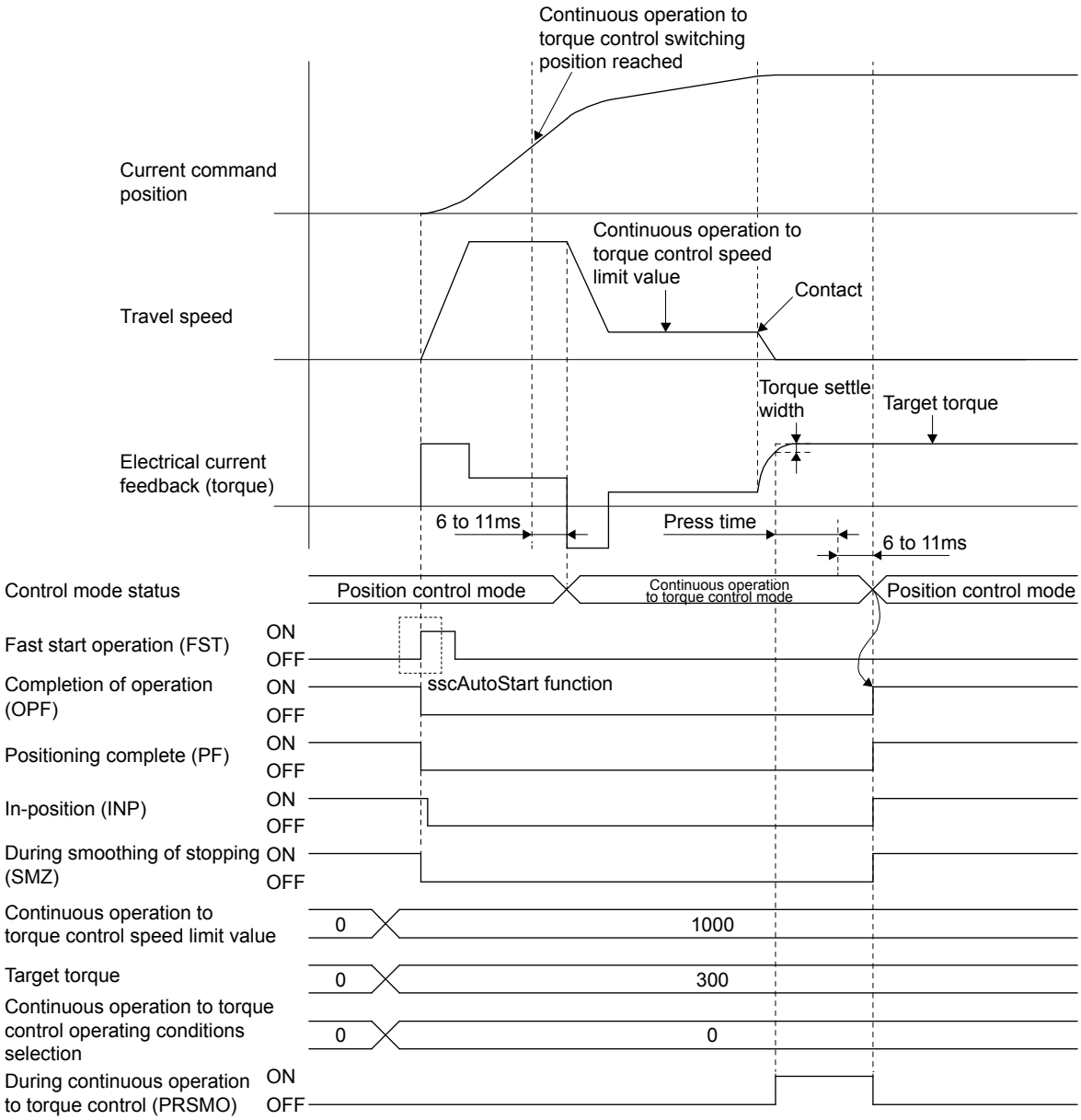
- Operation is completed with the switching completion to position control mode.
- When operation is stopped by forced stop, operation alarms etc., the position board automatically switches to position control mode regardless of "start continuous operation to torque control switch conditions".
- When a control mode that cannot be switched to is input to the control mode command and control mode switch command (CTLMC) is turned ON, control mode switch error (operation alarm 2E, detail No.02 or 04) occurs, followed by a deceleration stop.

API LIBRARY

- Use the sscChangeControlMode function for switching the control mode of the servo amplifier.

### 6.32.4 Operation timing

(1) Automatic switch (Start switch and end switch)



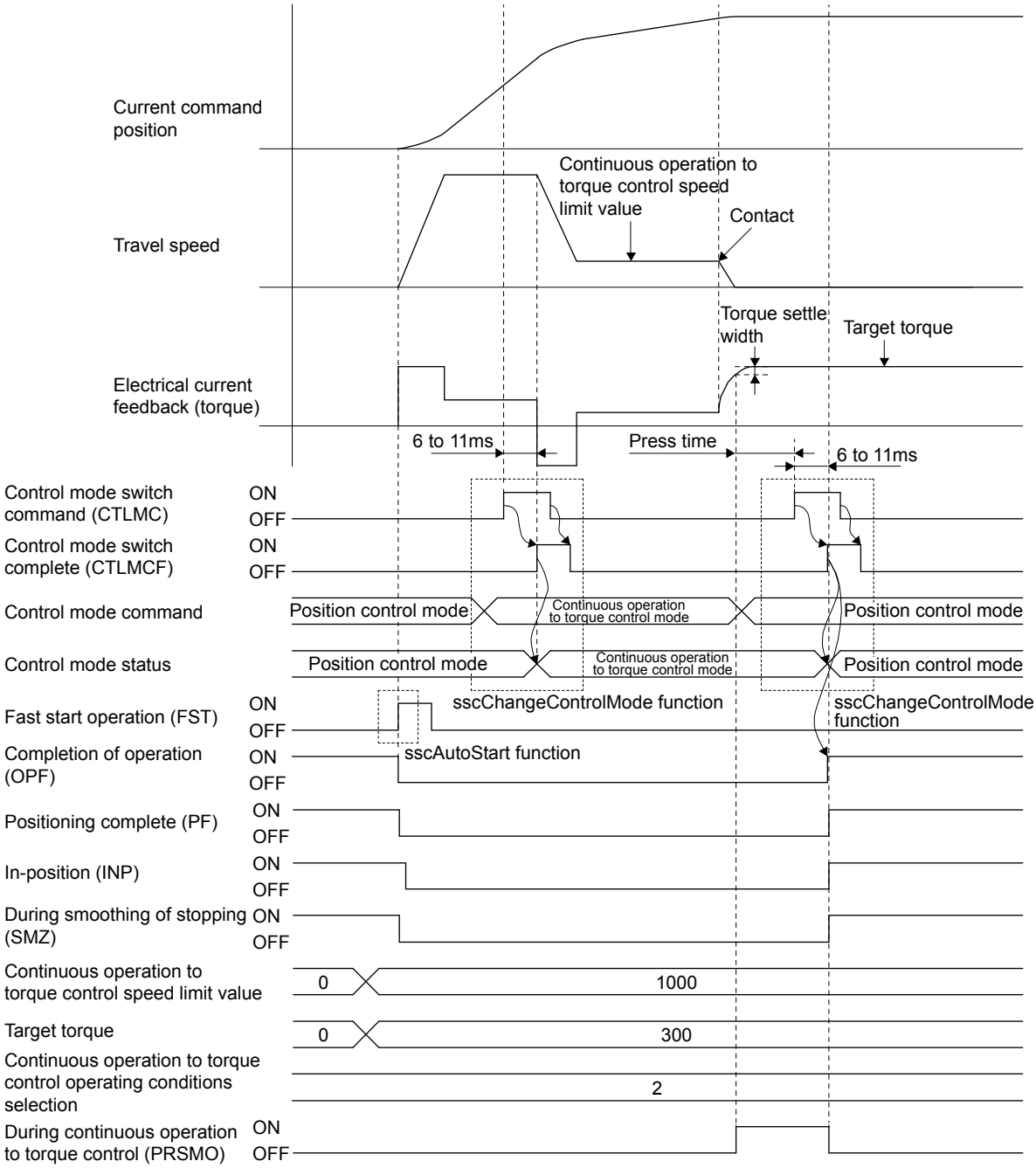
POINT

- It takes approximately 6 to 11ms for the servo amplifier to switch modes after reaching the continuous operation to torque control switching position and press time has passed.
- The rough match (CPO) turns ON based on the distance remaining to the position data of the point table.
- Positioning complete (PF), during smoothing of stopping (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.
- When operation is completed without reaching the continuous operation to torque control switching position, a continuous operation to torque control error (operation alarm 5D, detail No.02) occurs.

API LIBRARY

- Use the sscAutoStart function for operation startup.
- Refer to the sample program "InterruptPressDrive" contained in the utility software for a more specific procedure on continuous operation to torque control.
  Operate by automatic switch by setting chg_ctrl_mode_condition to CHG_CTRL_MODE_AUTO.

(2) Manual switch (Start switch and end switch)




**POINT**

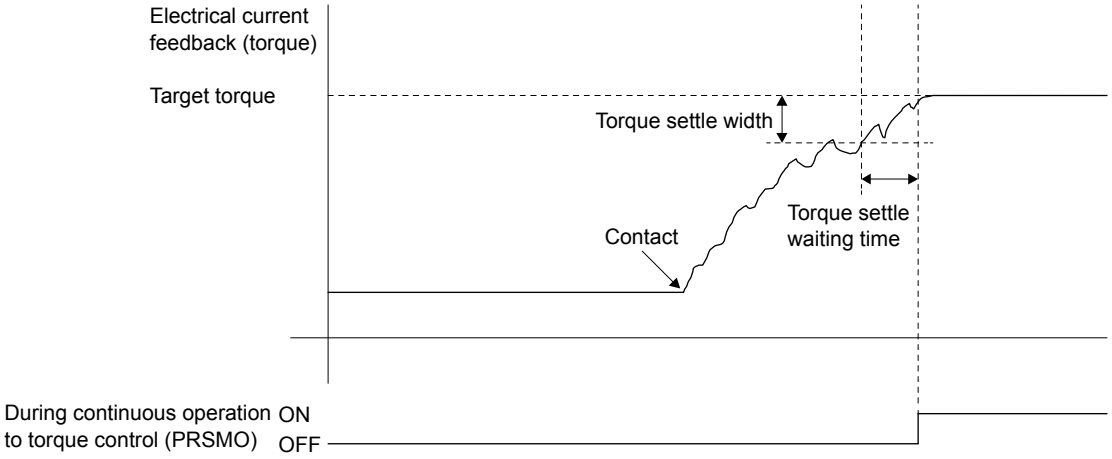
- After confirming the leading edge of control mode switch complete (CTLMCF), turn OFF the control mode switch command (CTLMC).
- Switch the control mode command to position control mode before input of control mode switch command (CTLMC). Turn ON the control mode switch command (CTLMC) after continuous operation to torque control switching conditions are satisfied (manage press conditions with user program).
- Operation is complete at the completion of switching to position control mode.

API LIBRARY

- Use the sscAutoStart function for operation startup.
- Refer to the sample program "InterruptPressDrive" contained in the utility software for a more specific procedure on continuous operation to torque control.
  Operate by manual switch by setting chg_ctrl_mode_condition to CHG_CTRL_MODE_MANUAL.
- Use the sscChangeControlMode function for switching the control mode of the servo amplifier.

(3) Timing of during continuous operation to torque control determination

The misjudgment of continuous operation to torque control when the torque fluctuation range is large can be managed by setting the torque settle waiting time. When torque within the torque settle width is continuously output during the torque settle waiting time, during continuous operation to torque control (PRSMO) is turned ON.




POINT

- When a value outside the torque settle width occurs part of the way through torque settle waiting time, the torque settle waiting time is measured again from the beginning.

### 6.32.5 Operation during continuous operation to torque control mode

When switching to continuous operation to torque control mode, torque is controlled so that it becomes the torque set as "target torque", while speed is accelerated/decelerated from the current speed to the speed set in "continuous operation to torque control speed limit value". 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", the motor rotation direction of the motor conforms to the travel direction specified by the point table.
For the current torque value, check the electrical current feedback of the high speed monitor.

The acceleration/deceleration processes are trapezoidal acceleration/deceleration.
The "continuous operation to torque control speed limit value" is restricted by the speed limit value (parameter No.0222, No.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 servo amplifier, check "movement speed" (monitor No.0304, No.0305 or No.1304).

### 6.32.6 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 5D, detail No.03 |
| Control mode was changed to position control mode during travel in continuous operation to torque control mode (before target torque is reached). | Deceleration stop | Operation alarm 5D, detail No.07 |
| Interference check conditions were satisfied.<br>(Including interference check standby) | Immediate stop | Operation alarm 45, detail No.01 |
| A control mode that cannot be switched to was input to the control mode command, and control mode switch was conducted. | Deceleration stop | Operation alarm 2E, detail No.02 or 04 |
| Operation mode was changed. | Deceleration stop | Operation alarm 23, detail No.01 |
| Servo off was performed. | Rapid stop | Operation alarm B3, detail No.01 |
| Forced stop (external forced stop or software forced stop) was turned ON. | Immediate stop | Operation alarm 12, detail No.01 |
| Stop operation (STP) was turned ON. | Deceleration stop | — |
| Rapid stop (RSTP) was turned ON. | Rapid stop | — |
| Limit switch was turned ON. | Immediate stop | Operation alarm A0, detail No.01 or 02 |
| Interlock was turned ON. | Rapid stop | Operation alarm 5D, detail No.04 |
| Control of servo amplifier is no longer possible. (disconnected) | Immediate stop | System error E400<br>Operation alarm B0, detail No.02 |
| A servo alarm occurred. | Immediate stop | Operation alarm B1, detail No.01 |

POINT

- For all patterns, the control mode is automatically changed to position control by the position board after zero speed (ZSP) turns ON.
- The stopping process for each stop factor is a deceleration process in continuous operation to torque control mode. (For immediate stops, control mode switches to position control mode at the current position and stops immediately.)
- The time constant at a rapid stop is that of rapid stop time constant (control 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, a position that takes into account the operation after exceeding the press limit position should be set.
- The software limit is determined by the current feedback position during continuous operation to torque control. As there is a possibility of stopping at a position that exceeds the software limit, set the press limit position before the software limit. When the software limit is set before the press limit position, continuous operation to torque control error (operation alarm 5D, detail No.05) occurs, and operation does not start.
- If interlock (ITL) turns ON during position control mode for points with continuous operation to torque control set to valid, continuous operation to torque control error (operation alarm 5D, detail No.04) occurs.
- The interference check standby is invalid during position control mode in continuous operation to torque control points.
- The above also applies when a stop factor occurs during switching to continuous operation to torque control mode.
- An immediate stop occurs when a stop factor occurs during switching to position control mode from continuous operation to torque control mode.

### 6.32.7 Combinations of continuous operation to torque control and other functions

The following shows the combinations of continuous operation to torque control with each function.

| Classification | Function | | Compatibility | Remarks |
|---|---|---|---|---|
| System function | SSCNET communication method | SSCNETⅢ/H | ○ | |
| | | SSCNETⅢ | ○ | |
| | Control mode | Standard mode | ○ | |
| | | Interface mode | × | |
| Operation function | JOG operation | | — | |
| | Incremental feed | | — | |
| | Automatic operation | | ○ | Automatic switch/Manual switch can be selected. |
| | Linear interpolation | | × | Linear interpolation ×. When starting up a continuous operation to torque control point, "continuous operation to torque control error (operation alarm 5D, detail No.0A)" occurs. |
| | Home position return | | — | |
| | Home position reset function | | — | |
| Application function | Command unit | Electronic gear | ○ | |
| | Speed unit | Speed unit | ○ | Set the continuous operation to torque control speed limit value in speed units. |
| | | Speed units multiplication factor | ○ | |
| | | Speed limit | ○ | The continuous operation to torque control speed limit value is restricted by speed limit value (control parameter No.0222, No.0223) |
| | Acceleration/ deceleration | Linear acceleration/deceleration | ○ | |
| | | Smoothing filter | △ | Invalid during continuous operation to torque control. |
| | | Start up speed validity | △ | Valid when starting up operation point. However, it is invalid during continuous operation to torque control. |
| | | S-curve acceleration/deceleration (Sine acceleration/deceleration) | △ | Invalid during continuous operation to torque control. |
| | Servo off | | ○ | Control mode is automatically changed to position control mode after an operation alarm occurrence. |
| | Forced stop | | ○ | Control mode is automatically changed to position control mode after an operation alarm occurrence. |
| | Stop operation | | ○ | Control mode is automatically changed to position control mode after an operation alarm occurrence. |
| | Rapid stop operation | | ○ | Control mode is automatically changed to position control mode after an operation alarm occurrence. |
| | Limit switch (stroke end) | | ○ | Control mode is automatically changed to position control mode after an operation alarm occurrence. |
| | Software limit | | ○ | Control mode is automatically changed to position control mode after an operation alarm occurrence. |
| | Interlock | | × | Control mode is automatically changed to position control mode after an operation alarm occurrence. |
| | 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 is within the rough match output range. |
| | Torque limit | | × | During continuous operation to torque control and torque limit, torque limit stays OFF. |

○: Usable ×: Unusable △: Restriction —: Not applicable

| Classification | Function | | Compatibility | Remarks |
|---|---|---|---|---|
| Application function | Command change | Speed change | × | Speed change error signal (SCE) turns ON. |
| | | Change of time constants | × | Acceleration time constant change error signal (TACE), or deceleration time constant change error signal (TDCE) turns ON. |
| | | Position change | × | Position change error signal turns ON. |
| | Backlash | | ○ | When following up by current feedback position, a position that takes into account the backlash is is followed up. |
| | Position switch | | △ | Determined by the current feedback position. |
| | Completion of operation signal | | ○ | Output after position control switch. |
| | Interference check function | | △ | Interference check function is invalid. |
| | Home position search limit | | — | |
| | Gain switching | | ○ | |
| | PI-PID switching | | ○ | |
| | Home position set | | — | |
| | Absolute position detection system | | ○ | |
| | Home position return request | | ○ | |
| | High response I/F | | ○ | |
| | Other axes start | | △ | When current command position is set to the axis judgment coordinate of start condition, a current command position matching the current feedback position is determined. |
| | Digital I/O | | — | |
| | I/O device | | — | |
| | Servo amplifier general I/O | | — | |
| | Dual port memory exclusive control | | — | |
| | Pass position interrupt | | △ | When current command position is set to the axis judgment coordinate of start condition, a current command position matching the current feedback position is determined. Therefore when a current command position is specified, it may not be correctly determined. |
| | Mark detection | | ○ | |
| | SSCNETⅢ/H head module connection | | — | |
| Auxiliary function | Reading/writing parameters | | — | |
| | Changing parameters at the servo | | — | |
| | Alarm and system error | | ○ | |
| | Monitor function | | ○ | The speed limit value output to the servo amplifier is output for the "travel speed" during continuous operation to torque control mode. |
| | High speed monitor function | | ○ | The speed limit value output to the servo amplifier is output for the "travel speed" during continuous operation to torque control mode. |
| | Interrupt | | ○ | During continuous operation to torque control is notified from when the output torque reaches the torque settle width and press time passes, until return to position control mode. |
| | Interrupt output cycle | | — | |
| | Command data update cycle | | — | |
| | User watchdog function | | — | |
| | Software reboot function | | — | |
| | Parameter backup | | — | |

○: Usable ×: Unusable △: Restriction —: Not applicable

| Classification | Function | Compatibility | Remarks |
|---|---|---|---|
| Auxiliary function | Test mode | — | |
| | Reconnect/disconnect function | ○ | When reconnecting, startup is in position control mode. |
| | Sampling | — | |
| | Log | ○ | |
| | Operation cycle monitor function | — | |
| | Amplifier-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 operation is completed after the continuous operation to torque control time has passed.<br>For electrical current feedback, torque 0% occurs before reaching the speed limit value, and target torque occurs after reaching the speed limit value. |
| | Alarm history function | ○ | |
| | External forced stop disable | ○ | |
| | Transient transmit | — | |
| Tandem drive | Tandem drive | × | When continuous operation to torque control is startup "continuous operation to torque control error (operation alarm 5D, detail No.01)" occurs. |

○: Usable ×: Unusable △: Restriction —: Not applicable

### 6.32.8 Restrictions on servo amplifier functions

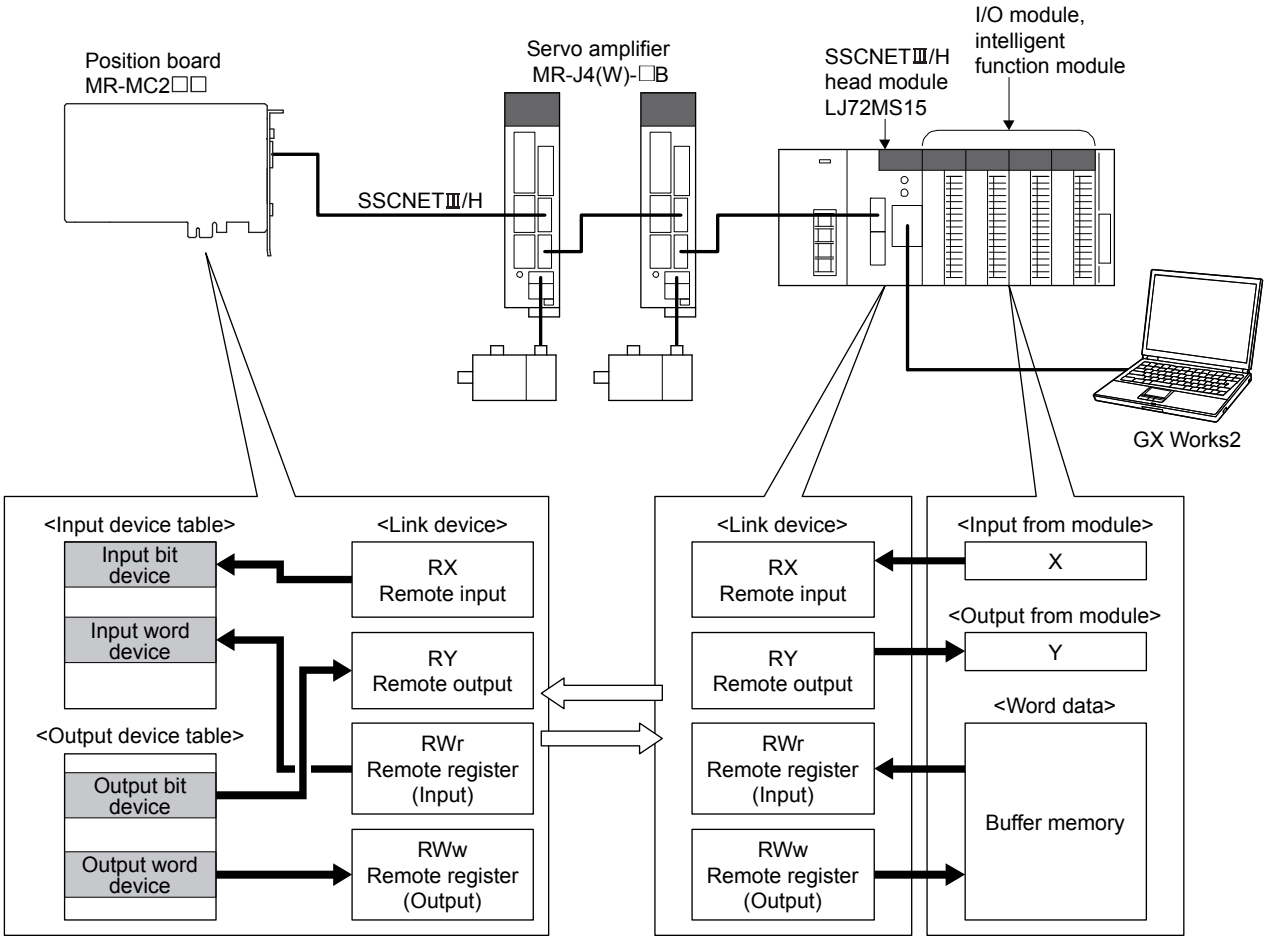
The following servo amplifier functions cannot be used during continuous operation to torque control mode.

- Base cut delay time function
- Forced stop deceleration function
- Vertical axis freefall prevention function

## 6.33 SSCNETⅢ/H head module connection

### 6.33.1 Summary

The SSCNETⅢ/H head module can connect MELSEC-L series I/O modules and intelligent function modules on SSCNETⅢ/H. The SSCNETⅢ/H head module controls input and output of I/O modules and intelligent function modules using link devices.
By assigning inputs and outputs of modules mounted to the SSCNETⅢ/H head module to the I/O device table, they can be used as position board inputs and outputs.
Additionally, by using the transient transmit function, the SSCNETⅢ/H head module can access the buffer memory of intelligent function modules.
Settings for the SSCNETⅢ/H head module and modules mounted to the SSCNETⅢ/H head module are made in GX Works2.




(1) Number of connectable stations

The head module can use up to four stations.

The following shows the number of stations that can be controlled depending on the control cycle.

| Control cycle | Maximum number of stations connected | Maximum number of stations connected per line |
|---|---|---|
| 0.88ms | 4 stations | 4 stations |
| 0.44ms | 2 stations | 2 stations |
| 0.22ms | Not supported | Not supported |

### 6.33.2 Supported functions

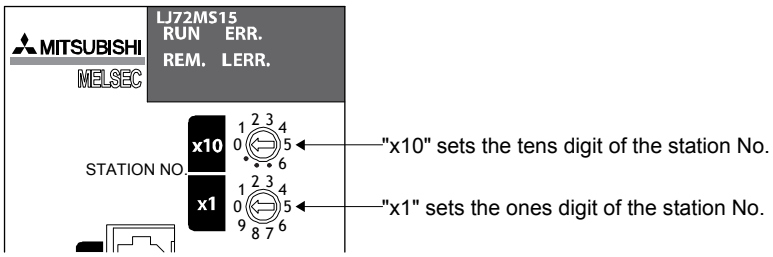
| Classification | Function | Compatibility | Remarks |
|---|---|---|---|
| Application function | Forced stop | × | Inputting a forced stop has no affect on the I/O status of bit devices. |
| | Other axes start | ○ | Can turn ON/OFF output bit devices in line with other axes start conditions. |
| Auxiliary function | Reading/writing parameters | △ | Supports RIO control parameters only (Cannot read/write parameters for the SSCNETⅢ/H head module). |
| | Alarm and system error | ○ | Detail RIO module alarm No. are fixed at 0. |
| | Remote I/O disconnect | ○ | |
| | Monitor function | ○ | |
| | Interrupt | ○ | |
| | Parameter backup | △ | Supports RIO control parameters only (Cannot backup RIO module parameters). |
| | Test mode | × | |
| | Reconnect/disconnect function | ○ | |
| | Sampling | △ | Sampling of I/O devices is supported in the test tool only. |
| | Log | ○ | |
| | Alarm history function | ○ | When a RIO module alarm occurs, the RIO module alarm No. (upper/lower) is stored in alarm history data. (Detail RIO module alarm No. are not stored) |
| | Transient transmit | ○ | |

Note. ○: Usable △: Restriction ×: Unusable

### 6.33.3 System startup

(1) Station No. setting parameter

Station No. settings are made with the station No. setting switch.




The station No. and station No. setting switch number are correlated as shown on the table below. Set the station No. so that it will not duplicate in the same line. If it is duplicated, the "An axis that has not been mounted exists" (system error E400) will occur at the time of system startup (system command code: 000Ah).

| Station No. on remote I/O module | Station No. setting switch | Available/unavailable |
|---|---|---|
| Station 1 | 1 | Unavailable |
| Station 2 | 2 | |
| Station 3 | 3 | |
| Station 4 | 4 | |
| Station 5 | 5 | |
| Station 6 | 6 | |
| Station 7 | 7 | |
| Station 8 | 8 | |
| Station 9 | 9 | |
| Station 10 | 10 | |
| Station 11 | 11 | |
| Station 12 | 12 | |
| Station 13 | 13 | |
| Station 14 | 14 | |
| Station 15 | 15 | |
| Station 16 | 16 | |
| Station 17 | 17 | |
| Station 18 | 18 | |
| Station 19 | 19 | |
| Station 20 | 20 | |
| Station 21 | 21 | Available |
| Station 22 | 22 | |
| Station 23 | 23 | |
| Station 24 | 24 | |

(2) Station No. assignment

With station No. assignment, station No. (station No. on the position board) are assigned to station No. on remote I/O modules.

Also refer to axis No. assignment (Section 4.5.6) for station No. assignment.

When station No. assignment is invalid, correspondence between the station No. on a remote I/O module and the station No. is shown in the following table.

| Station No. on remote I/O module | | Line 1 | | | |
|---|---|---|---|---|---|
| | | 21 | 22 | 23 | 24 |
| Station No. | 0.88ms | 1 | 2 | 3 | 4 |
| | 0.44ms | 1 | 2 | - | - |
| | 0.22ms | - | - | - | - |

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- When setting the API function argument "Axis No." to a station No., set a negative value. (Station 1: -1, station 2: -2, station 3: -3, station 4: -4)

(3) Remote I/O module I/O setting

When using remote I/O modules, set the I/O table selection of I/O table (parameter No.004A) to "1: Use I/O device table".

Also, set the points of the I/O devices controller by the position board, and the start No. to be assigned to the I/O device table.

(4) Vendor ID and type code setting

Available functions, parameter settings and ranges will vary by remote I/O module type. At the time the communication with the remote I/O module has started, the position board will perform consistency check between vendor ID and type code of the module connected and the parameter set. If a consistency check error occurs, driver type code error (system error E405) will be output, therefore set correct vendor ID and type code.

POINT

- If driver type code error (system error E405) occurred, the station that has set an incorrect type code can be confirmed with "type code erroneous station information" (system information monitor No.04C1).

(a) RIO control parameter

| Parameter No. | Abbreviation | Name | Function |
|---|---|---|---|
| 021D | *VEND | Vendor ID | Set the vendor ID.<br>0000h: Mitsubishi Electric |
| 021E | *CODE | Type code | Set the type code.<br>3000h: SSCNETⅢ/H head module |

### 6.33.4 Interface

(1) Parameter

(a) System parameter

| Parameter No. | Abbreviation | Name | Initial value | Units | Setting range | Function |
|---|---|---|---|---|---|---|
| 004A | *IOTBL | I/O table | 0000h | | 0000h to 0001h | 0 0 0 □<br>I/O table selection<br>Set the I/O table to be used.<br>0: Use digital I/O table<br>1: Use I/O device table<br>Note. For SSCNETⅢ/H head module, set "1: Use I/O device table" |

(b) RIO control parameter

| Parameter No. | Abbreviation | Name | Initial value | Units | Setting range | Function |
|---|---|---|---|---|---|---|
| 0200 | *OPC1 | Control option 1 | 0000h | | 0000h to 0011h | 0 0 □ □<br>Control station<br>Set to 1 for implementing control of a remote I/O module.<br>0: Not controlled<br>1: Controllled<br>Remote I/O disconnect<br>Set to 1 when remote I/O communication is not implemented.<br>When set to 1 together with the control station, it is possible to run without a remote I/O (simulate).<br>0: Invalid<br>1: Valid |
| 0201 | OPC2 | Control option 2 | 0000h | | 0000h to 0001h | 0 0 0 □<br>RI control at communication error<br>Set input device control at communication error(system error E401 to E407)<br>0: All points OFF<br>1: Maintain status |
| 0202 | *UTALC | Station No. assignment | 0000h | | 0000h to 011Fh | 0 □ □ □<br>Remote I/O station No.<br>Set the remote I/O station No. to be assigned to the station No. on the position board.<br>00h : No station No. assignment<br>15h to 18h : Station No.<br>Example) 16h: Remote I/O station No. 22<br>Remote I/O line No.<br>Set the remote I/O line No. to be assigned to the station No.on the position board<br>0 to 1: Line No. - 1 |
| 0203 | ITM | Interrupt condition | 0000h | | 0000h to FFFFh | Set interrupt condition. |

| Parameter No. | Abbreviation | Name | Initial value | Units | Setting range | Function |
|---|---|---|---|---|---|---|
| 0210 | *BDIO | Input bit device points | 0000h | | 0000h to 0200h | Set the points used for input bit device.<br>0000h to 0200h: 0 to 512<br>Note. Only a multiple of 16 can be selected. |
| 0211 | *BDINA | Input bit device start number | 0000h | | 0000h to 0FF0h | Set the start of the input bit device number assigned to RX.<br>0000h to 0FF0h: 0 to 4080<br>Note. Only a multiple of 16 can be selected.<br>Example: When the input points are 64, and input bit device 020 is specified as the start, assign the 64 points of DVI_020 to DVI_05F. |
| 0212 | *WDIO | Input word device points | 0000h | | 0000h to 0020h | Set the points used for input word device.<br>0000h to 0020h: 0 to 32<br>Note. The size used is 1 word × set value. |
| 0213 | *WDINA | Input word device start number | 0000h | | 0000h to 00FFh | Set the start of the input word device number assigned to RWr.<br>0000h to 00FFh: 0 to 255<br>Example: When the input points are 2, and input word device 06 is specified as the start, assign input word devices 06 to 07. |
| 0214 | *BDOO | Output bit device points | 0000h | | 0000h to 0200h | Set the points used for output bit device.<br>0000h to 0200h: 0 to 512<br>Note. Only a multiple of 16 can be selected. |
| 0215 | *BDONA | Output bit device start number | 0000h | | 0000h to 0FF0h | Set the start of the output bit device number assigned to RY.<br>0000h to 0FF0h: 0 to 4080<br>Note. Only a multiple of 16 can be selected.<br>Example: When the output points are 64, and output bit device 040 is specified as the start, assign the 64 points of DV0_040 to DVO_07F. |
| 0216 | *WDOO | Output word device points | 0000h | | 0000h to 0020h | Set the points used for output word device.<br>0000h to 0020h: 0 to 32<br>Note. The size used is 1 word × set value. |
| 0217 | *WDONA | Output word device start number | 0000h | | 0000h to 00FFh | Set the start of the output word device number assigned to RWw.<br>0000h to 00FFh: 0 to 255<br>Example: When the output points are 2, and output word device 08 is specified as the start, assign output word devices 08 to 09. |
| 021D | *VEND | Vendor ID | 0000h | | 0000h to FFFFh | Set the vendor ID.<br>0000h: Mitsubishi Electric |
| 021E | *CODE | Type code | 3000h | | 0000h to FFFFh | Set the type code.<br>3000h: SSCNETⅢ/H head module |

POINT

- Set "1: Use I/O device table" for the I/O table setting. When "0: Use digital I/O table" is set, system setting error (operation alarm No. 38, detail 05 to 06) will occur.
- Assign the I/O device table not to overlap other settings. If the assignment is overlapped or exceeds the maximum points of the I/O device table, the I/O No. assignment error (system error E510) and I/O No. assignment setting error (RIO control alarm 39, detail 01 and 02) occur.

(3) RIO data command/status table

(a) RIO status bit

| Address | Bit | Abbreviation | Signal name |
|---|---|---|---|
| 3440 | 0 | RURDY | Receiving controller ready on |
| | 1 | RUA | Outputting DO |
| | 2 | | Reserved |
| | 3 | | |
| | 4 | | |
| | 5 | RUALM | RIO module alarm |
| | 6 | RUWRN | RIO module warning |
| | 7 | | Reserved |

1) Details on RIO status bit

| Abbreviation | Signal name | Remarks |
|---|---|---|
| RURDY | Receiving controller ready on | [Function]<br>Shows the operating status of remote I/O module.<br>RURDY: OFF, RUA: OFF..... No communication<br>RURDY: ON, RUA: OFF ..... Stop<br>RURDY: ON, RUA: ON ..... Run<br>RURDY: OFF, RUA: ON ..... Error |
| RUA | Outputting DO | |

(4) I/O device table

(a) Input device table

| Address | Input word device number | Input bit device number | Abbreviation | Remarks |
|---|---|---|---|---|
| DB00 | Input word device 00<br>(2 bytes) | Input word device 000<br>to<br>Input word device 00F | DVI_000 to<br>DVI_00F | [When bit device is assigned]<br>Notifies the status of the bit device input signal.<br>The bits are DVI_000 (bit0) to DVI_00F (bit15).<br>[When word device is assigned]<br>Notifies the status of the word device input signal. |
| DB02 | Input word device 01<br>(2 bytes) | Input word device 010<br>to<br>Input word device 01F | DVI_010 to<br>DVI_01F | [When bit device is assigned]<br>Notifies the status of the bit device input signal.<br>The bits are DVI_010 (bit0) to DVI_01F (bit15).<br>[When word device is assigned]<br>Notifies the status of the word device input signal. |
| DB04 | Input word device 02<br>(2 bytes) | Input word device 020<br>to<br>Input word device 02F | DVI_020 to<br>DVI_02F | [When bit device is assigned]<br>Notifies the status of the bit device input signal.<br>The bits are DVI_020 (bit0) to DVI_02F (bit15).<br>[When word device is assigned]<br>Notifies the status of the word device input signal. |
| DB06 | Input word device 03<br>(2 bytes) | Input word device 030<br>to<br>Input word device 03F | DVI_030 to<br>DVI_03F | [When bit device is assigned]<br>Notifies the status of the bit device input signal.<br>The bits are DVI_030 (bit0) to DVI_03F (bit15).<br>[When word device is assigned]<br>Notifies the status of the word device input signal. |
| DB08 | Input word device 04<br>(2 bytes) | Input word device 040<br>to<br>Input word device 04F | DVI_040 to<br>DVI_04F | [When bit device is assigned]<br>Notifies the status of the bit device input signal.<br>The bits are DVI_040 (bit0) to DVI_04F (bit15).<br>[When word device is assigned]<br>Notifies the status of the word device input signal. |
| DB0A | Input word device 05<br>(2 bytes) | Input word device 050<br>to<br>Input word device 05F | DVI_050 to<br>DVI_05F | [When bit device is assigned]<br>Notifies the status of the bit device input signal.<br>The bits are DVI_050 (bit0) to DVI_05F (bit15).<br>[When word device is assigned]<br>Notifies the status of the word device input signal. |
| DB0C | Input word device 06<br>(2 bytes) | Input word device 060<br>to<br>Input word device 06F | DVI_060 to<br>DVI_06F | [When bit device is assigned]<br>Notifies the status of the bit device input signal.<br>The bits are DVI_060 (bit0) to DVI_06F (bit15).<br>[When word device is assigned]<br>Notifies the status of the word device input signal. |
| DB0E | Input word device 07<br>(2 bytes) | Input word device 070<br>to<br>Input word device 07F | DVI_070 to<br>DVI_07F | [When bit device is assigned]<br>Notifies the status of the bit device input signal.<br>The bits are DVI_070 (bit0) to DVI_07F (bit15).<br>[When word device is assigned]<br>Notifies the status of the word device input signal. |
| : | : | : | : | : |
| B0FE | Input word device FF<br>(2 bytes) | Input word device FF0<br>to<br>Input word device FFF | DVI_FF0 to<br>DVI_FFF | [When bit device is assigned]<br>Notifies the status of the bit device input signal.<br>The bits are DVI_FF0 (bit0) to DVI_FFF (bit15).<br>[When word device is assigned]<br>Notifies the status of the word device input signal. |

(b) Output device table

| Address | Output word device number | Output bit device number | Abbreviation | Remarks |
|---|---|---|---|---|
| DB00 | Output word device 00 (2 bytes) | Output word device 000 to Output word device 00F | DVO_000 to DVO_00F | [When bit device is assigned]<br>Turns ON/OFF the bit device output signal.<br>The bits are DVO_000 (bit0) to DVO_00F (bit15).<br>[When word device is assigned]<br>Turns ON/OFF the word device output signal. |
| DB02 | Output word device 01 (2 bytes) | Output word device 010 to Output word device 01F | DVO_010 to DVO_01F | [When bit device is assigned]<br>Turns ON/OFF the bit device output signal.<br>The bits are DVO_010 (bit0) to DVO_01F (bit15).<br>[When word device is assigned]<br>Turns ON/OFF the word device output signal. |
| DB04 | Output word device 02 (2 bytes) | Output word device 020 to Output word device 02F | DVO_020 to DVO_02F | [When bit device is assigned]<br>Turns ON/OFF the bit device output signal.<br>The bits are DVO_020 (bit0) to DVO_02F (bit15).<br>[When word device is assigned]<br>Turns ON/OFF the word device output signal. |
| DB06 | Output word device 03 (2 bytes) | Output word device 030 to Output word device 03F | DVO_030 to DVO_03F | [When bit device is assigned]<br>Turns ON/OFF the bit device output signal.<br>The bits are DVO_030 (bit0) to DVO_03F (bit15).<br>[When word device is assigned]<br>Turns ON/OFF the word device output signal. |
| DB08 | Output word device 04 (2 bytes) | Output word device 040 to Output word device 04F | DVO_040 to DVO_04F | [When bit device is assigned]<br>Turns ON/OFF the bit device output signal.<br>The bits are DVO_040 (bit0) to DVO_04F (bit15).<br>[When word device is assigned]<br>Turns ON/OFF the word device output signal. |
| DB0A | Output word device 05 (2 bytes) | Output word device 050 to Output word device 05F | DVO_050 to DVO_05F | [When bit device is assigned]<br>Turns ON/OFF the bit device output signal.<br>The bits are DVO_050 (bit0) to DVO_05F (bit15).<br>[When word device is assigned]<br>Turns ON/OFF the word device output signal. |
| DB0C | Output word device 06 (2 bytes) | Output word device 060 to Output word device 06F | DVO_060 to DVO_06F | [When bit device is assigned]<br>Turns ON/OFF the bit device output signal.<br>The bits are DVO_060 (bit0) to DVO_06F (bit15).<br>[When word device is assigned]<br>Turns ON/OFF the word device output signal. |
| DB0E | Output word device 07 (2 bytes) | Output word device 070 to Output word device 07F | DVO_070 to DVO_07F | [When bit device is assigned]<br>Turns ON/OFF the bit device output signal.<br>The bits are DVO_070 (bit0) to DVO_07F (bit15).<br>[When word device is assigned]<br>Turns ON/OFF the word device output signal. |
| : | : | : | : | : |
| B0FE | Output word device FF (2 bytes) | Output word device FF0 to Output word device FFF | DVO_FF0 to DVO_FFF | [When bit device is assigned]<br>Turns ON/OFF the bit device output signal.<br>The bits are DVO_FF0 (bit0) to DVO_FFF (bit15).<br>[When word device is assigned]<br>Turns ON/OFF the word device output signal. |

POINT

- When a communication error (system error E401 to E407) occurs or SSCNET is disconnected, the status of the input device table is the same as RI control at communication error of control option 2 (parameter No.0201). The status of the output device table is maintained.
- When using remote I/O modules, set the I/O table selection of I/O table (parameter No.004A) to "1: Use I/O device table". When "0: Use digital I/O table" is set and I/O devices are assigned, I/O table select error (system error E511), and system setting error (RIO control alarm 38, detail 05 to 06) occur.
- Assign the I/O device not to overlap other settings. If the assignment is overlapped or exceeds the range of the I/O device table, the I/O No. assignment error (system error E510) and I/O No. assignment setting error (RIO control alarm 39, detail 01 and 02) occur.
- Set the total points of the I/O devices assigned to remote I/O when setting I/O device points (parameter No.0210, 0212, 0214, 0216).
- The delay time for the input device table to be updated after the signals of an input module or intelligent function module are input is SSCNETⅢ/H head module input response time + (control cycle × 2). Refer to "MELSEC-L SSCNETⅢ/H Head Module User's Manual" for input response time of SSCNETⅢ/H head module.
- The delay time for the host controller to update the output device table, and signals of an output module or intelligent function module to be output is SSCNETⅢ/H head module output response time + (control cycle × 3). Also, for output of output bit devices using the other axes start function, the delay time from when other axes start conditions are established is head module output response time + (control cycle × 2). Refer to "MELSEC-L SSCNETⅢ/H Head Module User's Manual" for output response time of SSCNETⅢ/H head module.
- When using I/O modules and intelligent function modules the I/O status may not be updated every control cycle depending on the control cycle setting and points used. Refer to "MELSEC-L SSCNETⅢ/H Head Module User's Manual" for I/O status update times.
  When the time for the I/O status of the head module to be updated does not fit in the control cycle, the I/O status of I/O devices may not be updated every control cycle.
  When the I/O status is not updated every control cycle, perform any of the following.
  - Change the control cycle.
  - If more than one head module is being used, change the distribution of I/O modules and intelligent function modules.
  - Increase the number of head modules.

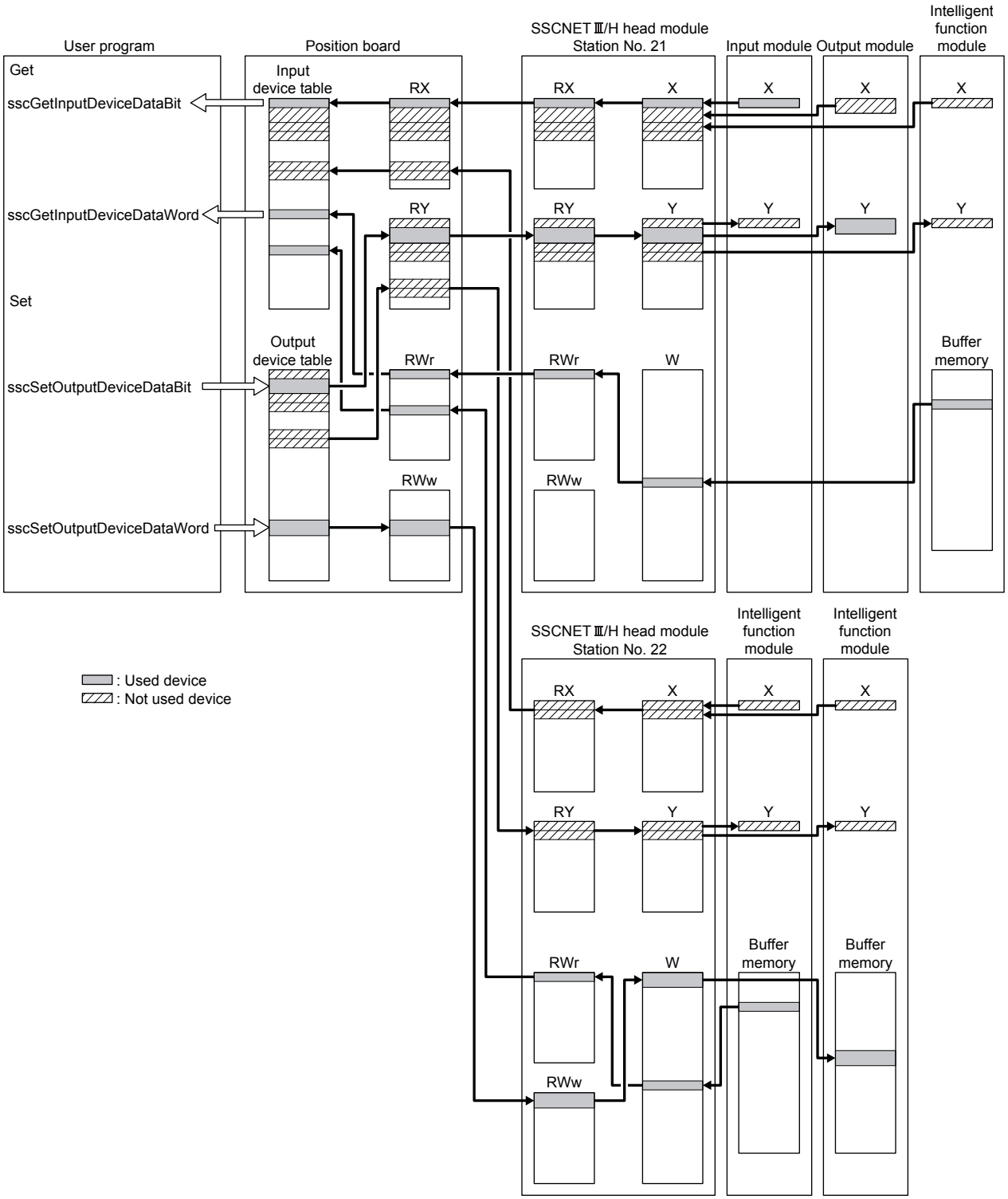
API LIBRARY

- Use the sscGetInputDeviceBit function to get input bit device.
- Use the sscGetInputDeviceWord function to get input word device.
- Use the sscSetOutputDeviceBit function to set output bit device.
- Use the sscSetOutputDeviceWord function to set output word device.
- Use the sscGetOutputDeviceBit function to get output bit device.
- Use the sscGetOutputDeviceWord function to get output word device.

### 6.33.5 Example of setting procedure

The following shows the settings for two SSCNETⅢ/H head modules (station 21 and station 22).

(1) Entire system configuration diagram



| Station No. on module | Station No. | Input/Output | Setting for SSCNETⅢ/H head module (link device assignment) | | | I/O device table | |
|---|---|---|---|---|---|---|---|
| | | | Device name | Points | | Points | Start |
| 21 | 1 | Input | RX | 64 | → | 64 | Input bit device 000 |
| | | | RWr | 1 (1 word) | → | 1 (1 word) | Input word device 0A |
| | | Output | RY | 64 | ← | 64 | Output bit device 000 |
| 22 | 2 | Input | RX | 32 | → | 32 | Input bit device 070 |
| | | | RWr | 1 (1 word) | → | 1 (1 word) | Input word device 10 |
| | | Output | RY | 32 | ← | 32 | Output bit device 080 |
| | | | RWw | 2 (2 words) | ← | 2 (2 words) | Output word device 14 |

(2) SSCNETⅢ/H head module setting

Use GX Works2 to assign I/O of modules and buffer memory to the SSCNETⅢ/H head module link devices. Refer to "MELSEC-L SSCNETⅢ/H Head Module User's Manual" for SSCNETⅢ/H head module settings.

POINT

- When setting SSCNETⅢ/H head module in GX Works2, check that the mode of "SSCNETⅢ/H Network Setting" on the "Communication Head Setting" tab is set to "Online". If the mode is not set to "Online", the position board cannot communicate with the head module. If the system is startup in this state, it stays in a waiting for SSCNET response (system status code 0009) state, or an axis that has not been mounted exists (system error E400) occurs.

(3) Position board setting

In order to allocate SSCNETⅢ/H head module link devices to the position board I/O device table, set the total number of points (in units of 16) of each link device, and the start I/O device number to be assigned.

(a) Station parameter

| Module No. | Parameter No. | Abbreviation | Name | Setting value |
|---|---|---|---|---|
| 1 | 0210 | *BDIO | Input bit device points | 64 |
| | 0211 | *BDINA | Input bit device start number | 0000h |
| | 0212 | *WDIO | Input word device points | 1 |
| | 0213 | *WDINA | Input word device start number | 000Ah |
| | 0214 | *BDOO | Output bit device points | 64 |
| | 0215 | *BDONA | Output bit device start number | 0000h |
| | 0216 | *WDOO | Output word device points | 0 |
| | 0217 | *WDONA | Output word device start number | 0000h |
| 2 | 0210 | *BDIO | Input bit device points | 32 |
| | 0211 | *BDINA | Input bit device start number | 0070h |
| | 0212 | *WDIO | Input word device points | 1 |
| | 0213 | *WDINA | Input word device start number | 0010h |
| | 0214 | *BDOO | Output bit device points | 32 |
| | 0215 | *BDONA | Output bit device start number | 0080h |
| | 0216 | *WDOO | Output word device points | 2 |
| | 0217 | *WDONA | Output word device start number | 0014h |

(4) Setting/getting I/O devices with API functions

Examples of getting input devices and setting/getting output devices are shown in the table below.
Note that the board ID is 0, and channel number is 1.

| Module No. | Device name | Set/get | Setting value |
|---|---|---|---|
| 1 | RX | Get input bit device 002 | sscGetInputDeviceBit (0, 1, 0×0002, &data); |
| | RWr | Get one word of input word device 0A | sscGetInputDeviceWord (0, 1, 0×0000A, 1, &data); |
| | RY | Set output bit device 087 to ON | sscSetOutputDeviceBit (0, 1, 0×0087, SSC_ON); |
| 2 | RWw | Set output word device 14 to 000Ah (one word) | sscSetOutputDeviceWord (0, 1, 0×0014, 1, 0×000A); |

### 6.33.6 SSCNETⅢ/H head module disconnect

The system can be startup with the SSCNETⅢ/H head module disconnected, and simulate can be performed by making remote I/O disconnect valid in control option 1 (parameter No.0200) of the RIO module parameter. However, the input bit devices allocated to SSCNETⅢ/H head module are OFF, and input word devices are 0 and are not updated. Also, any changes made to the status of output bit devices and output word devices allocated to SSCNETⅢ/H head module are not output to the SSCNETⅢ/H head module. (The status of output bit devices and output word devices can only be checked.)

# MEMO

# 7. AUXILIARY FUNCTION

## 7.1 Reading/writing parameters

The parameter data in the position board is accessed using the parameter read/write function. Types of parameters include: system parameters, control parameters, and servo parameters. The parameter read/write function can be used after system preparation completion (system status code: 0001h).

### 7.1.1 Writing parameters

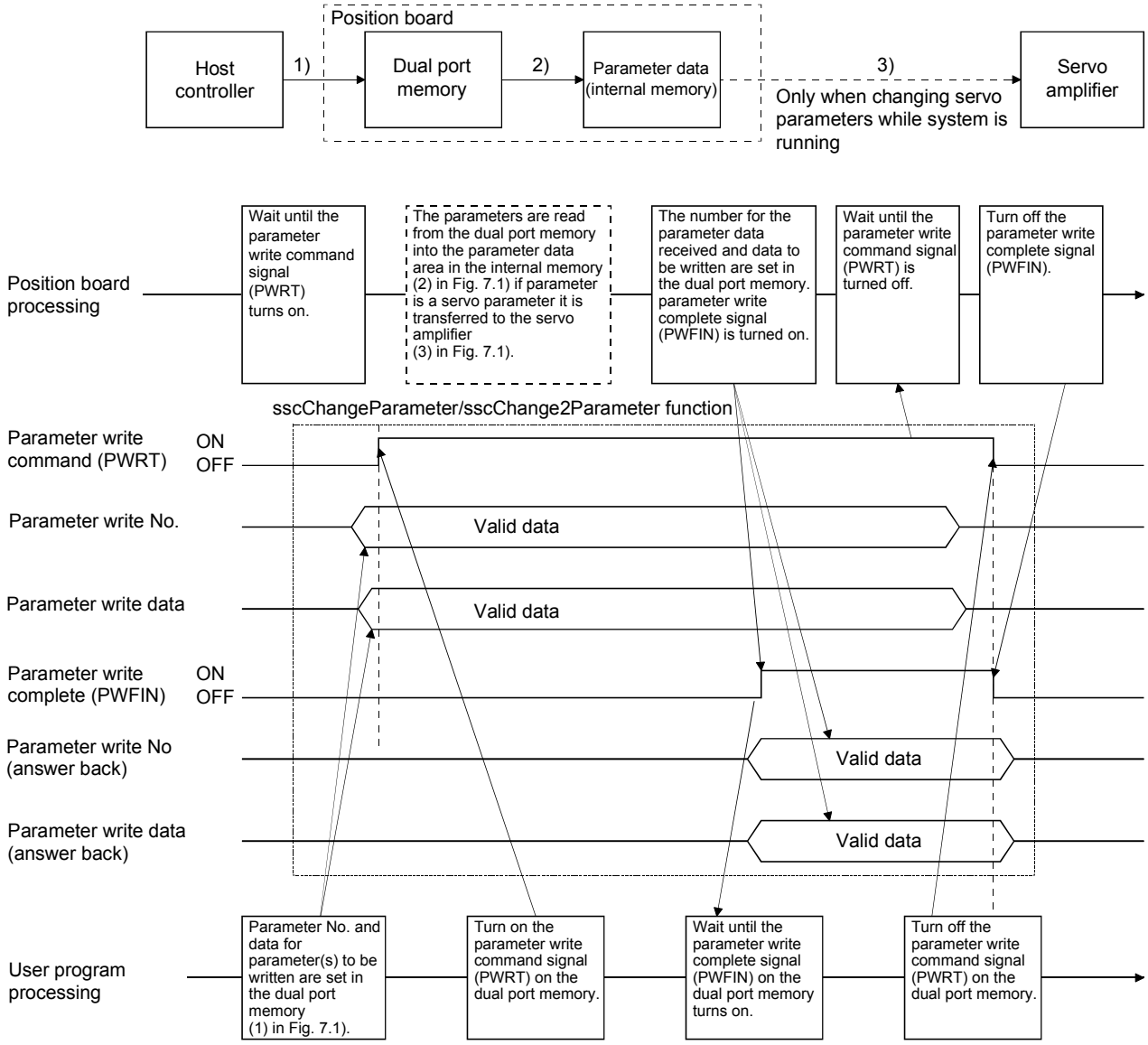



Fig. 7.1 Flow when data is written to parameters

POINT

- In some parameters, changing the settings after the system has started is invalid. Refer to "Chapter 11 PARAMETERS", concerning which parameters this applies to.
- 32 bit length parameters are separated into upper and lower items, therefore change them simultaneously.
  Changing of 32 bit length parameters separately can lead to 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, a parameter number error (PWENn (n = 1 to 2)) is turned on. However, the parameter No.0 is not considered an erroneous parameter No.
- If a parameter setting is outside the setting range, a parameter data out of bounds (PWEDn (n = 1 to 2)) is set.
- Parameter limit checks are not performed before system running (System status code: 000Ah). If the parameter set is incorrect, parameter error (system alarm 37, servo alarm 37, operation alarm 37, detail 01) occurs when the system is started. Check the error parameter number in servo parameter error number (monitor No.0510 to 0537), control parameter error number (monitor No.0330 to 033F) and system parameter error number (monitor No.0410 to 0417), and after rebooting software, set correct parameter and start the system again. Parameter error (system alarm 37, operation alarm 37, detail 01) cannot be reset by the alarm reset.
- In system parameter write, parameter write command (SPWRT), parameter write access complete (SPWFIN), parameter number error (SPWENn (n = 1 to 2)) and parameter data out of bounds (SPWEDn (n = 1 to 2)) are used.

### 7.1.2 Reading parameters

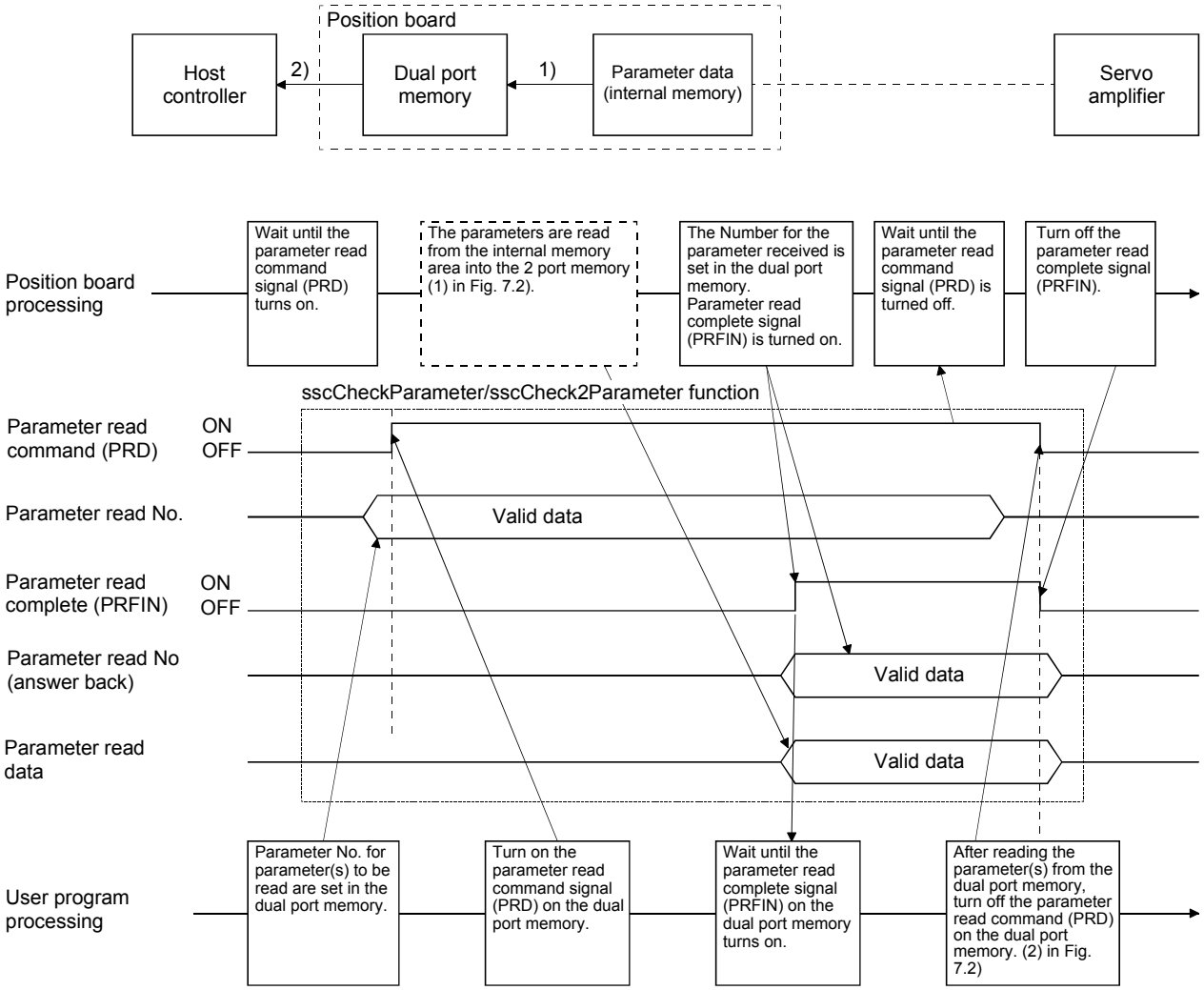



Fig. 7.2 Flow when data is read from parameters

**POINT**

- Two parameters can be read at a time. When reading one parameter, set 0 to the other parameter.
- If an erroneous parameter number is set, a parameter number error (PR ENn (n = 1 to 2)) turned on. However, the parameter number. 0 is not considered an erroneous parameter number.
- In system parameter read, parameter read command (SPRD), parameter read access complete (SPRFIN) and parameter number error (SPRENn (n = 1 to 2)) are used.

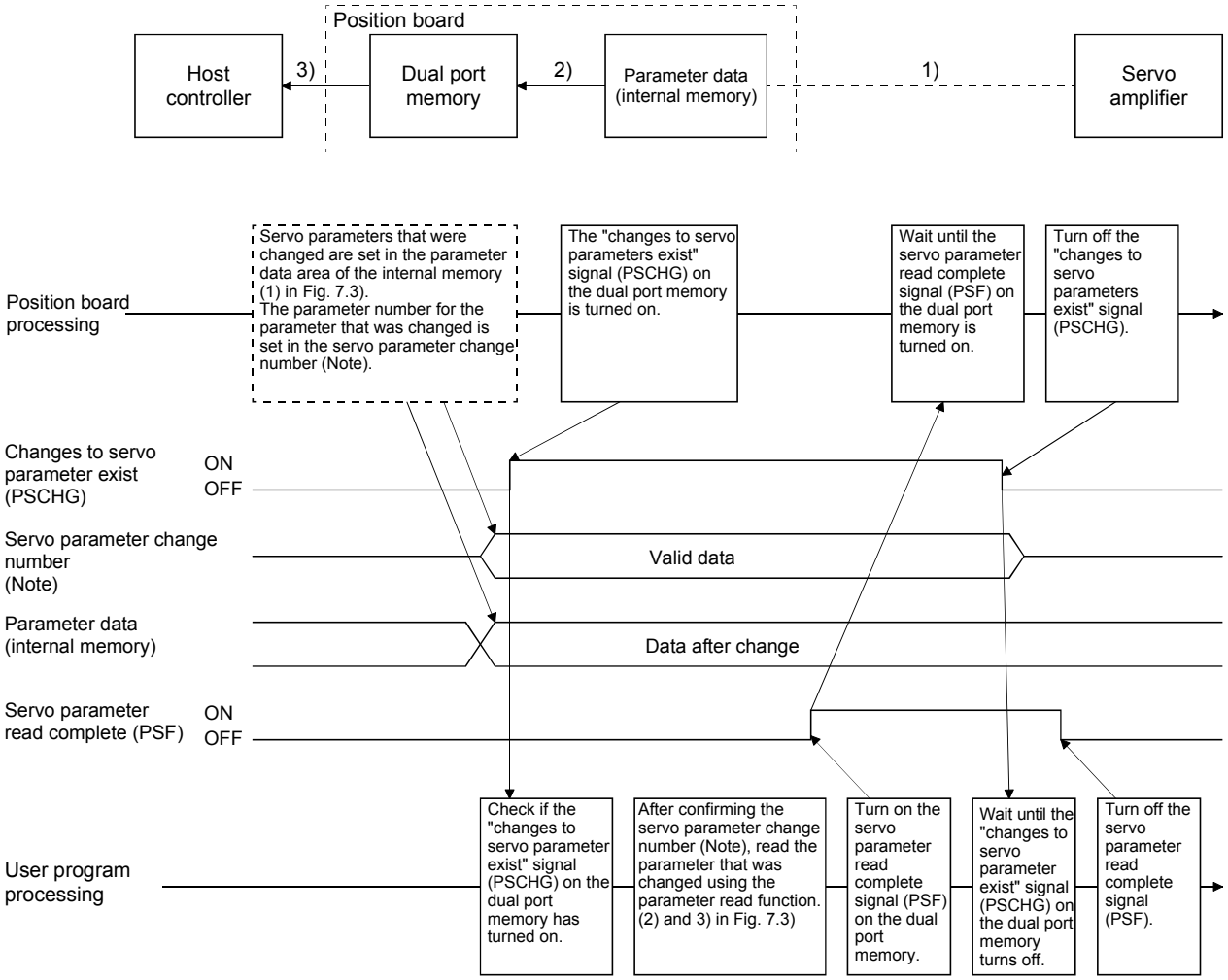
## 7.2 Changing parameters at the servo

The position board has a function of reflecting the results of changes made to parameters on the servo amplifier to the host controller. When parameters are changed on the servo amplifier, the position board changes the parameter data area (internal memory), and notifies the host controller using the "changes to servo parameters exist" (PSCHG) signal. The changed servo parameter numbers are notified in units of 16 to the servo parameter change number table. To identify the changed parameter, check the servo parameter change number (monitor No.0590 to 05B7) corresponding to the notification. Monitor this signal periodically and record parameters for which changes have been made.

POINT

- The reasons that parameters are re-written on the servo amplifier are as follows.
  - When parameters are changed using MR Configurator2 (This includes execution of the machine analyzer and the gain search function).
  - The parameter was automatically changed such as by the real time auto tuning function.
- Refer to the Servo Amplifier Instruction Manual on your servo amplifier concerning servo parameters that are automatically changed.

The sequence for when servo parameters are changed is as follows.




Note. Check the servo parameter change number (monitor No.0590 to 05B7) corresponding to the servo parameter change number 11□□ to 13□□ (PSN11 to PSN13).

Fig. 7.3 Data flow when servo parameter(s) are changed

## 7.3 Alarm and system error

When an incorrect setting or incorrect operation is done, the position board raises an alarm, so make user program monitor the alarm periodically.
The position board can raise the following six alarms: system alarm, servo alarm, operation alarm, RIO module alarm, RIO control alarm, and system error. For the cause of occurrence and treatment for each alarm, refer to Chapter 13.

| API LIBRARY |
|---|
| ・Use the sscGetAlarm/sscResetAlarm functions to get/reset the alarm number. Specify the following in the argument for the alarm type.<br>・System alarm : SSC_ALARM_SYSTEM<br>・Servo alarm : SSC_ALARM_SERVO<br>・Operation alarm : SSC_ALARM_OPERATION<br>・RIO module alarm : SSC_ALARM_UNIT<br>・RIO control alarm : SSC_ALARM_UNIT_CTRL |

(1) System alarm

System alarm is an alarm a position board raises by incorrect setting of a system parameter or each function. When a system alarm occurs, during system alarm signal (CALM) turns on and the alarm number and the detail number are stored in System alarm number and Specific system alarm number.
To reset the system alarm, turn on the system alarm reset signal (CRST).

| POINT |
|---|
| ・Parameter error (system alarm 37) cannot be reset with the system alarm reset signal. Reexamine the parameter and start the system again.<br>・If another system alarm occurs while the system alarm is occurring, the first system alarm is notified to the system alarm number. By using log function, the history of the system alarm number can be checked. |

(2) Servo alarm

Servo alarm is an alarm a servo amplifier raises by incorrect setting of a system parameter. When a servo alarm occurs, during servo alarm signal (SALM) or during servo warning (SWRN) turns on and the alarm number and the detail number are stored in Servo alarm number and Specific servo alarm number. To reset the servo alarm, turn on the servo alarm reset signal (SRST).

| POINT |
|---|
| ・For the reset of servo alarms, it depends on the specifications of the servo amplifier. For details, refer to the Servo Amplifier specification for your servo amplifier.<br>・When servo alarms have occurred by multiple causes, the servo alarm number notified to depends on the specifications of the servo amplifier. |

(3) Operation alarm

Operation alarm is an alarm a position board raises in each axis by incorrect setting of a system parameter or each function. When an operation alarm occurs, during operation alarm signal (OALM) turns on and the alarm number and the detail number are stored in Operation alarm number and Specific operation alarm number. To reset the operation alarm, turn on the operation alarm reset signal (ORST).

| POINT |
|---|
| ・Parameter error (operation alarm 37) and system setting error (operation alarm 38) cannot be reset with the operation alarm reset signal. Check the cause of the alarm and treatment, and start the system again.<br>・ If another operation alarm occurs while the operation alarm is occurring, the first operation alarm is notified to the operation alarm number. By using log function, the history of the operation alarm number can be checked. |

(4) RIO module alarm

RIO module alarms occur from remote I/O modules as a result of incorrect RIO module parameter settings, and remote I/O module hardware errors.

When a RIO module alarm occurs, the RIO module alarm (RUALM), or RIO module warning (RUWRN) signal turns ON, and the alarm number/detail number is stored to the RIO module alarm No./detail RIO module alarm No. To reset the RIO module alarm, turn ON the RIO module alarm reset (RURST) signal.

| POINT |
|---|
| ・The resetting of the RIO module alarm depends on the specifications of the remote I/O module. Refer to the User's Manual of the remote I/O module being used for details.<br>・When a RIO module alarm occurs due to several factors, the RIO module alarm No. that is notified depends on the specification of the remote I/O module. |

(5) RIO control alarm

RIO control alarms occur at each station from the position board as a result of incorrect control parameter settings, and incorrect settings for each function. When a RIO control alarm occurs, the RIO control alarm (RCALM) signal turns ON, and the alarm number/detail number is stored to the RIO control alarm No./detail RIO control alarm No. To reset the RIO control alarm, turn ON the RIO control alarm reset (RCRST) signal.

| POINT |
|---|
| ・The following RIO control alarms cannot be reset. Check the error causes and corrective actions, and start the system again.<br>・Parameter error (RIO control alarm 37)<br>・System setting error (RIO control alarm 38)<br>・I/O No. assignment setting error (RIO control alarm 39)<br>・When another RIO control alarm occurs at the same time a RIO control alarm has already occurred, the RIO control alarm No. of the RIO control alarm that occurred first is notified. The RIO control alarm No. history can be checked by using the log function. |

(6) System error

System error occurs in the case when positioning control cannot be continued, such as when a hardware error of a position board occurs, when SSCNET communication error occurs. Error code of the system error is stored in the system status code.

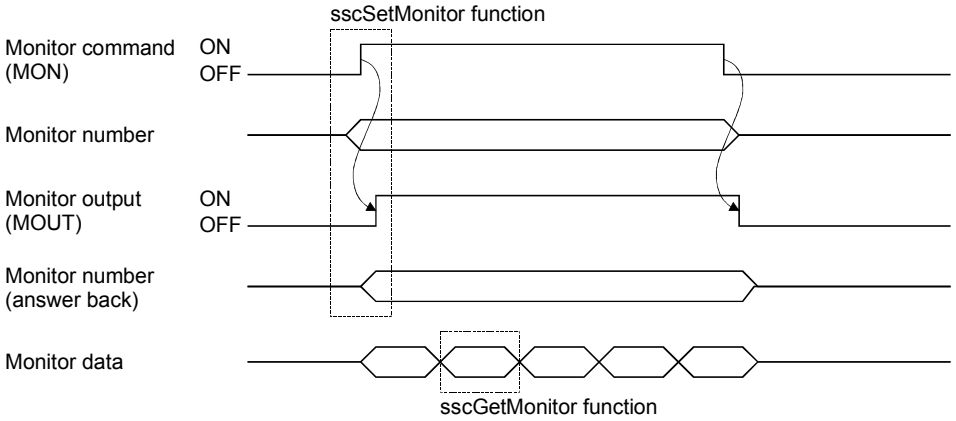
| POINT |
|---|
| ・System error cannot be reset. Reboot the software as necessary and start the system again.<br>・If another system error occurs while the system error is occurring, the error code of the system status code is overwritten. By using log function, the history of the system error occurred while system is running can be checked. |

## 7.4 Monitor function

### 7.4.1 Summary

The monitor function is for referencing servo information such as current command position, speed Feedback etc. and operation information and system information.
When monitoring system information, the monitor area in the system command/status table is used. Also, when monitoring servo information and 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 servo information can be monitored.
While the monitor command signal (MON) is on, the monitor data is continuously updated.

| POINT |
|---|
| ・The update period is the control cycle to several ms and the updated period differs depending on the control status. |



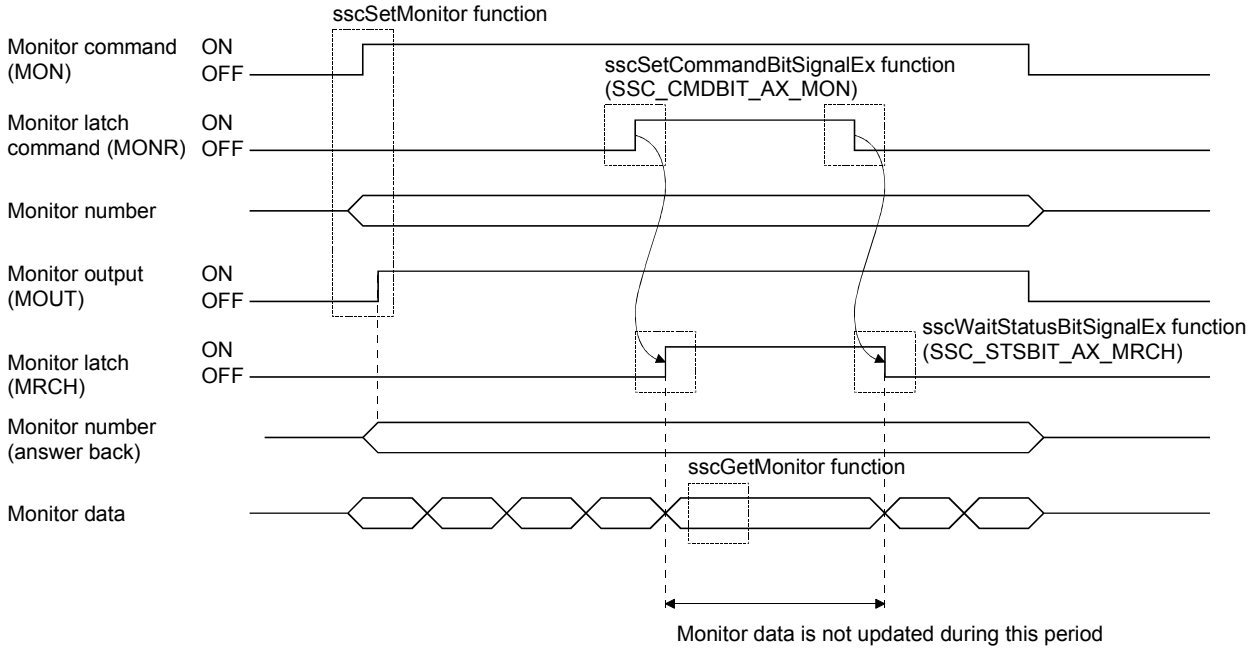

When changing the monitor number, turn off the monitor command signal (MON). Changing of the monitor number is performed on the raising edge of the monitor command signal (MON) (if monitor number is changed while the monitor command is on, it is ignored).
Monitor data is 16 bits per item. For referencing 32 bit data, designate 2 items, upper and lower or designate an operation information (double word) number. For designating operation information (double word) set the monitor number to monitor number 1 or monitor number 3. If the operation information (double word) number is set to monitor number 2 or monitor number 4 a monitor number error occurs.
Also, when designating operation information (double word) using monitor number 1 or monitor number 3, set monitor number 2 and monitor number 4 to 0. If a different monitor number is set for monitor number 2 or monitor number 4, a monitor number error occurs.

POINT

- If an erroneous monitor number is commanded, a monitor number error (MERn (n = 1 to 4)) is turned on. Data for a correct monitor number can be monitored at this time (monitor output is turned on). However, if the monitor number is set to 0, a monitor number error is not set and monitor data is continually set to 0.
- Servo information can not be referenced if the servo amplifier is not connected. If the servo amplifier is not connected, "servo amplifier is not connected" signal (MESV) is turned on.
- When using the monitor function (when monitoring the system information), the monitor command (SMON), monitor output (SMOUT), monitor number error signal (SMERn (n = 1 to 2)) are used.

### 7.4.2 Monitor latch function

Monitor data is not updated while the monitor latch command signal (MONR) is on.




| POINT |
|---|
| ・When using the monitor function (when monitoring the system information), monitor latch command (SMONR) and monitor latch (SMRCH) are used. |

| API LIBRARY |
|---|
| ・To turn ON/OFF the monitor latch command (MONR), set SSC_CMDBIT_AX_MON to the command bit number of the sscSetCommandBitSignalEx function.<br>When using the monitor function (when monitoring the system information), use SSC_CMDBIT_SYS_SMON.<br>・To check if monitor latch (MRCH or SMRCH) is ON/OFF, set SSC_STSBIT_AX_MRCH to the status bit number with the sscGetStatusBitSignalEx or sscWaitStatusBitSignalEx functions.<br>When using the monitor function (when monitoring the system information), use SSC_STSBIT_SYS_SMRCH. |

## 7.5 High speed monitor function

### 7.5.1 Summary

High speed monitor function is a function for monitoring current command position and current feedback position etc. It becomes valid after system is started up, and monitor data is updated every control cycle.

The data that can be referenced with the high speed monitor function are the following 6 items.

| Data item | Units | Data size | (Note 1) Address | Remarks |
|---|---|---|---|---|
| Current command position | Command units | 4 byte | A000h + 20h × (n − 1) | Same as monitor No.300, 301 |
| Current feedback position | Command units | 4 byte | A004h + 20h × (n − 1) | Same as monitor No.302, 303 |
| Moving speed | Speed units | 4 byte | A008h + 20h × (n − 1) | Same as monitor No.304, 305 |
| Feedback moving speed | Speed units | 4 byte | A00Ch + 20h × (n − 1) | Same as monitor No.316, 317 |
| Electrical current feedback | 0.1% | 2 byte | A010h + 20h × (n − 1) | Same as monitor No.20B |
| External signal status (Note 2) | | 2 byte | A012h + 20h × (n − 1) | Same as monitor No.320 |
| Position droop (Note 3) | pulse | 4 byte | A014h + 20h × (n − 1) | Same as monitor No.204, 205 |

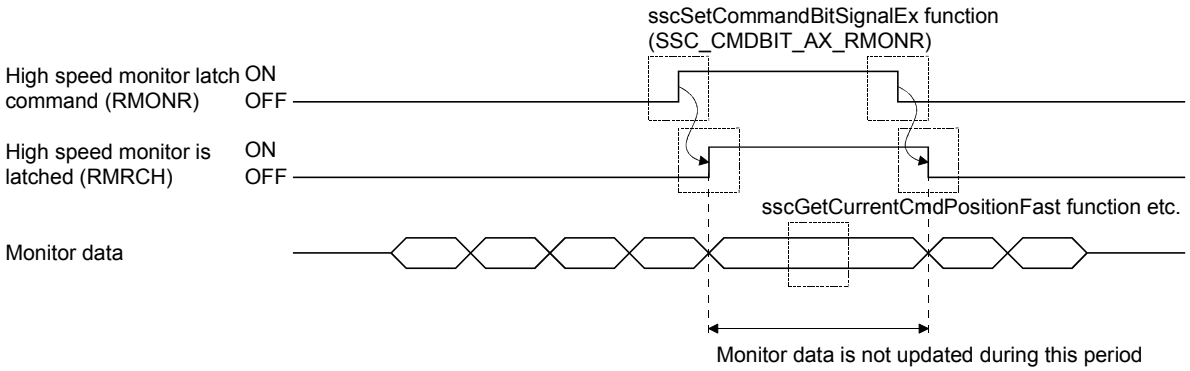
Note 1. n is the axis No.
2. The sensor status specified at the sensor input option (parameter No.0219) is displayed for the external signal status.
3. The position droop monitor is supported by software version A4 or later and only in interface mode.

API LIBRARY

- Use the following functions to get high speed monitor data.
  - Current command position : sscGetCurrentCmdPositionFast
  - Current feedback position : sscGetCurrentFbPositionFast
  - Moving speed : sscGetCmdSpeedFast
  - Feedback moving speed : sscGetFbSpeedFast
  - Electrical current feedback : sscGetCurrentFbFast
  - External signal status : sscGetIoStatusFast

### 7.5.2 Monitor latch function

Monitor data is not updated while the high speed monitor latch command signal (RMONR) is on.




API LIBRARY

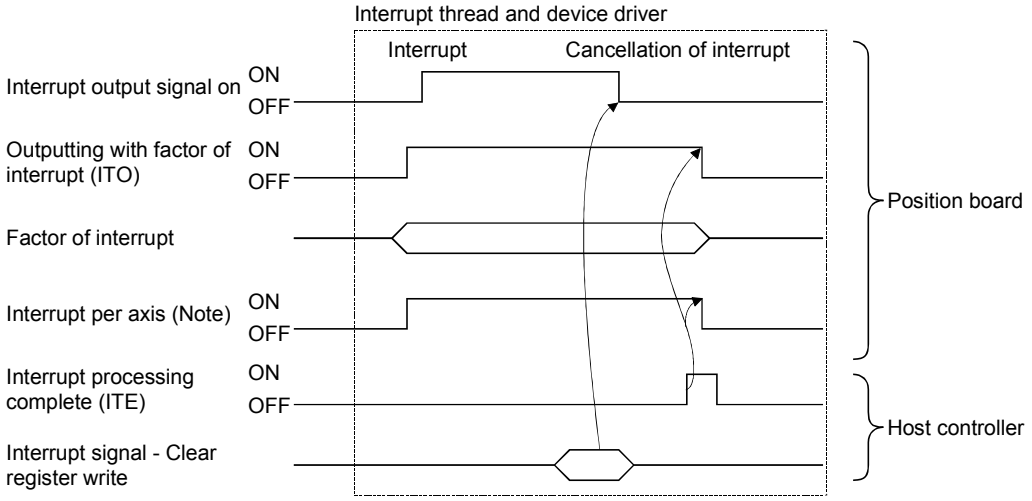
- To turn ON/OFF the high speed monitor latch command (RMONR), set SSC_CMDBIT_AX_RMONR to the command bit number of the sscSetCommandBitSignalEx function.
  When using the monitor function (when monitoring the system information), use SSC_CMDBIT_SYS_SMON.
- To check if high speed monitor is latched (RMRCH) is ON/OFF, set SSC_STSBIT_AX_RMRCH to the status bit number with the sscGetStatusBitSignalEx or sscWaitStatusBitSignalEx function.

## 7.6 Interrupt

### 7.6.1 Interrupt sequence

If the interrupt output valid signal (ITS) is on and interrupt conditions are satisfied (Note1), the position board sets the interrupt trigger on the dual port memory and generates an interrupt.
For cancellation of the interrupt, write 1 to an interrupt signal clear register (Note 2) using a host controller. After cancellation of the interrupt, turn on the interrupt processing complete signal (ITE). The position board turns off the outputting with factor of interrupt signal (ITO) and clears the factor of interrupt to 0 after confirming the interrupt processing complete signal (ITE) is on. The next interrupt output will be put on hold until this operation is performed.

Note 1. The interrupt conditions can be set in system interrupt conditions (parameter No.0004), interrupt conditions 1 and 2 (parameter No.0204, 0205).
2. The interrupt signal clear register (offset of dual port memory is 20008h(CH1)) is changed to 0 automatically after the interrupt signal (IRQ□) is turned off.

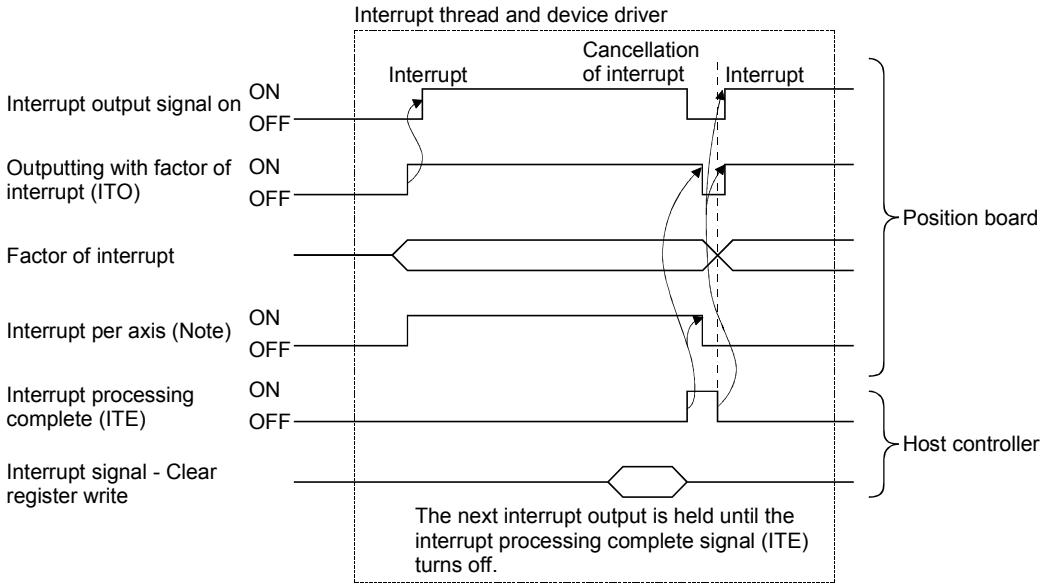



Note. Only the axis signal with an interrupt generated turns on.

| POINT |
|---|
| ・ If multiple interrupt conditions are satisfied during one control cycle, all corresponding factors for interrupts are turned on. |

| API LIBRARY |
|---|
| ・The factor of interrupt check and interrupt clear register are processed by the interrupt thread and device driver that is created when calling the sscIntStart function. Thus processing by user program is unnecessary. |

If another interrupt condition is satisfied while the outputting with factor of interrupt (ITO is on), the factor of interrupt will be put on hold until the interrupt processing complete signal (ITE) turns off from on.




Note. The signal for the axis where the interrupt occurs is turned on.

| POINT |
|---|
| ・After occurrence of an interrupt, if cancel of interrupt processing can not be performed by the host controller due to being backed up or some other reason, the interrupt output from the position board can not be cancelled. In this case, turn off the power for the position board. |

### 7.6.2 Interrupt conditions

(1) 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 parameter interrupt conditions (parameter No.0004).

| API LIBRARY |
|---|
| ・Use sscChangeParameter to set interrupt conditions. |

Parameter No.0004 Interrupt conditions

| Bit | Abbreviation | Name |
|---|---|---|
| 0 | SYSE | Current system error |
| 1 | CALM | Current system alarm |
| 2 | EMIO | During forced stop |
| 3 | | Reserved |
| 4 | | |
| 5 | | |
| 6 | | |
| 7 | OCME | Operation cycle alarm |

| Bit | Abbreviation | Name |
|---|---|---|
| 8 | OASF | Outputting with factor of other axes start interrupt |
| 9 | PPI | Outputting with factor of pass position interrupt |
| 10 | | Reserved |
| 11 | | |
| 12 | | |
| 13 | | |
| 14 | | |
| 15 | | |

(2) 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 the interrupt conditions 1 (parameter No.0204) and the interrupt conditions 2 (parameter No.0205) of the parameter.

Parameter No.0204 Interrupt conditions 1

| Bit | Abbreviation | 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 | Servo alarm |
| 6 | SWRN | Servo warning |
| 7 | ABSE | Absolute position erased |
| 8 | OP | During operation |
| 9 | CPO | Rough match |
| 10 | PF | Positioning complete |
| 11 | ZP | Home position return complete |
| 12 | SMZ | During smoothing of stopping |
| 13 | OALM | Operation alarm |
| 14 | OPF | Completion of operation |
| 15 | PSW | Position switch |

Parameter No.0205 Interrupt conditions 2

| Bit | Abbreviation | Signal name |
|---|---|---|
| 0 | GAINO | During gain switching |
| 1 | | Reserved |
| 2 | TLSO | Selecting torque limit |
| 3 | SPC | During PID control |
| 4 | | Reserved |
| 5 | MAK1 | Mark detection 1 |
| 6 | MAK2 | Mark detection 2 |
| 7 | PRSMO | During continuous operation to torque control |
| 8 | IWT | Interference check standby |
| 9 | SINP | Servo amplifier in-position |
| 10 | | Reserved |
| 11 | | |
| 12 | | |
| 13 | | |
| 14 | | |
| 15 | | |

Interrupts occur on the leading edge of the signal corresponding to the interrupt condition.
Multiple interrupt conditions can be selected.

(3) Interrupt conditions (RIO control parameters)

When interrupts each station are to be validated, set the values that designate ON for the bits that correspond to the conditions shown below to the interrupt conditions (parameter No.0203) of the parameter.

Parameter No.0203 Interrupt conditions

| Bit | Abbreviation | Signal name |
|---|---|---|
| 0 | | Reserved |
| 1 | | |
| 2 | | |
| 3 | | |
| 4 | | |
| 5 | RUALM | RIO module alarm |
| 6 | RUWRN | RIO module warning |
| 7 | | Reserved |

| Bit | Abbreviation | Signal name |
|---|---|---|
| 8 | | Reserved |
| 9 | | |
| 10 | | |
| 11 | | |
| 12 | | |
| 13 | RCALM | RIO control alarm |
| 14 | | Reserved |
| 15 | | |

Interrupts occur on the leading edge of the signal corresponding to the interrupt condition.
Multiple interrupt conditions can be selected.

### 7.6.3 Factor of interrupt

API LIBRARY

- The factor of interrupt check is processed by the interrupt thread that is created when calling the sscIntStart function. Thus processing by user program is unnecessary.
- Use the following functions for wait of factor of interrupt.
  - System and factor of axis interrupt : sscWaitIntEvent/sscWaitIntEventMulti
  - Factor of other axes start interrupt : sscWaitIntOasEvent
  - Factor of pass position interrupt : sscWaitIntPassPosition

(1) Information of outputting with factor of interrupt

When an interrupt occurs, the bit corresponding to the axis No., station No., or system which is the cause of the interrupt turns on.

| Address | Content | Remarks |
|---|---|---|
| 04C0 | Outputting with factor of axis interrupt 1 | Axis 1 (bit 0) to axis 32 (bit 31) |
| 04C1 | | |
| 04C2 | | |
| 04C3 | | |
| 04C4 | Reserved | |
| 04C5 | | |
| 04C6 | | |
| 04C7 | | |
| 04C8 | Outputting with factor of station interrupt | Station 1 (bit0) to station 4 (bit3) |
| 04C9 | Reserved | |
| 04CA | Outputting with factor of system interrupt | System (bit 0) |
| 04CB | Reserved | |
| 04CC | | |
| 04CD | | |
| 04CE | | |
| 04CF | | |

(2) Factor of axis interrupt

(a) Factor of axis interrupt

| Address | Content |
|---|---|
| 04D0 | Factor of interrupt Axis 1 |
| 04D1 | |
| 04D2 | |
| 04D3 | |
| 04D4 | Factor of interrupt Axis 2 |
| 04D5 | |
| 04D6 | |
| 04D7 | |
| 04D8 | Factor of interrupt Axis 3 |
| 04D9 | |
| 04DA | |
| 04DB | |
| 04DC | Factor of interrupt Axis 4 |
| 04DD | |
| 04DE | |
| 04DF | |
| 04E0 | Factor of interrupt Axis 5 |
| 04E1 | |
| 04E2 | |
| 04E3 | |
| 04E4 | Factor of interrupt Axis 6 |
| 04E5 | |
| 04E6 | |
| 04E7 | |
| 04E8 | Factor of interrupt Axis 7 |
| 04E9 | |
| 04EA | |
| 04EB | |
| 04EC | Factor of interrupt Axis 8 |
| 04ED | |
| 04EE | |
| 04EF | |
| 04F0 | Factor of interrupt Axis 9 |
| 04F1 | |
| 04F2 | |
| 04F3 | |
| 04F4 | Factor of interrupt Axis 10 |
| 04F5 | |
| 04F6 | |
| 04F7 | |
| 04F8 | Factor of interrupt Axis 11 |
| 04F9 | |
| 04FA | |
| 04FB | |

| Address | Content |
|---|---|
| 04FC | Factor of interrupt Axis 12 |
| 04FD | |
| 04FE | |
| 04FF | |
| 0500 | Factor of interrupt Axis 13 |
| 0501 | |
| 0502 | |
| 0503 | |
| 0504 | Factor of interrupt Axis 14 |
| 0505 | |
| 0506 | |
| 0507 | |
| 0508 | : |
| : | |
| 054B | |
| 054C | Factor of interrupt Axis 32 |
| 054D | |
| 054E | |
| 054F | |
| 0550 | Reserved |
| : | |
| 058F | |

:

(b) Details on factor of interrupt on axis n

The addresses in the table are the addresses for the axis 1. For the axis 2 and above, increase in units of 04h for each axis.

| Address | Bit | (Note) Abbreviation | Signal name |
|---|---|---|---|
| 04D0 to 04D3 | 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 | Servo alarm (interrupt) |
| | 6 | iSWRN | Servo 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 | iGAINO | During gain switching (interrupt) |
| | 17 | iFCLSO | Fully closed loop control changing (interrupt) |
| | 18 | iTLSO | Selecting torque limit (interrupt) |
| | 19 | iSPC | During PID control (interrupt) |
| | 20 | | Reserved |
| | 21 | iMAK1 | Mark detection 1 (interrupt) |
| | 22 | iMAK2 | Mark detection 2 (interrupt) |
| | 23 | iPRSMO | During continuous operation to torque control (interrupt) |
| | 24 | iIWT | Interference check standby (interrupt) |
| | 25 | iSINP | Servo amplifier in-position (interrupt) |
| | 26 | | Reserved |
| | 27 | | |
| | 28 | | |
| | 29 | | |
| | 30 | | |
| | 31 | | |

Note. OFF: No factor of interrupt exists.
ON: A factor of interrupt exists.

(3) System interrupt factors

(a) System interrupt factors

| Address | Content |
|---|---|
| 0590 | System interrupt factors |
| 0591 | |
| 0592 | Reserved |
| 0593 | |
| 0594 | Factor of other axes start interrupt |
| 0595 | |
| 0596 | |
| 0597 | |
| 0598 | Factor of pass position interrupt |
| 0599 | |
| 059A | |
| 059B | |
| 059C | |
| 059D | |
| 059E | |
| 059F | |
| 05A0 | Reserved |
| : | |
| 05AF | |

(b) Details on system interrupt factors

| Address | Bit | (Note) Abbreviation | Signal name |
|---|---|---|---|
| 0590 to 0591 | 0 | iSYSE | System error (interrupt) |
| | 1 | iCALM | System alarm (interrupt) |
| | 2 | iEMIO | During forced stop (interrupt) |
| | 3 | | Reserved |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | iOCME | Operation cycle alarm (interrupt) |
| | 8 | iOASF | Outputting with factor of other axes start interrupt (interrupt) |
| | 9 | iPPI | Outputting with factor of pass position interrupt (interrupt) |
| | 10 | | Reserved |
| | 11 | | |
| | 12 | | |
| | 13 | | |
| | 14 | | |
| | 15 | | |

Note. OFF: No factor of interrupt exists.
ON: A factor of interrupt exists.

(c) Factor of other axes start interrupt

When the outputting with factor of other axes start interrupt (iOASF) is on, the bit corresponding to other axes start data No. (1 to 32) turns on.

| Address | Bit | Abbreviation | Signal name |
|---|---|---|---|
| 0594 to 0597 | 0 | iOAS1 | Other axes start data 1 (interrupt) |
| | 1 | iOAS2 | Other axes start data 2 (interrupt) |
| | 2 | iOAS3 | Other axes start data 3 (interrupt) |
| | 3 | iOAS4 | Other axes start data 4 (interrupt) |
| | 4 | iOAS5 | Other axes start data 5 (interrupt) |
| | 5 | iOAS6 | Other axes start data 6 (interrupt) |
| | 6 | iOAS7 | Other axes start data 7 (interrupt) |
| | 7 | iOAS8 | Other axes start data 8 (interrupt) |
| | 8 | iOAS9 | Other axes start data 9 (interrupt) |
| | 9 | iOAS10 | Other axes start data 10 (interrupt) |
| | 10 | iOAS11 | Other axes start data 11 (interrupt) |
| | 11 | iOAS12 | Other axes start data 12 (interrupt) |
| | 12 | iOAS13 | Other axes start data 13 (interrupt) |
| | 13 | iOAS14 | Other axes start data 14 (interrupt) |
| | 14 | iOAS15 | Other axes start data 15 (interrupt) |
| | 15 | iOAS16 | Other axes start data 16 (interrupt) |
| | 16 | iOAS17 | Other axes start data 17 (interrupt) |
| | 17 | iOAS18 | Other axes start data 18 (interrupt) |
| | 18 | iOAS19 | Other axes start data 19 (interrupt) |
| | 19 | iOAS20 | Other axes start data 20 (interrupt) |
| | 20 | iOAS21 | Other axes start data 21 (interrupt) |
| | 21 | iOAS22 | Other axes start data 22 (interrupt) |
| | 22 | iOAS23 | Other axes start data 23 (interrupt) |
| | 23 | iOAS24 | Other axes start data 24 (interrupt) |
| | 24 | iOAS25 | Other axes start data 25 (interrupt) |
| | 25 | iOAS26 | Other axes start data 26 (interrupt) |
| | 26 | iOAS27 | Other axes start data 27 (interrupt) |
| | 27 | iOAS28 | Other axes start data 28 (interrupt) |
| | 28 | iOAS29 | Other axes start data 29 (interrupt) |
| | 29 | iOAS30 | Other axes start data 30 (interrupt) |
| | 30 | iOAS31 | Other axes start data 31 (interrupt) |
| | 31 | iOAS32 | Other axes start data 32 (interrupt) |

(d) 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. (1 to 32) turns on.

Details on factor of other axes start interrupt

| Address | Content |
|---|---|
| 0FE0 | Details on factor of other axes start interrupt 1 |
| 0FE1 | Details on factor of other axes start interrupt 2 |
| 0FE2 | Details on factor of other axes start interrupt 3 |
| 0FE3 | Details on factor of other axes start interrupt 4 |
| 0FE4 | Details on factor of other axes start interrupt 5 |
| 0FE5 | Details on factor of other axes start interrupt 6 |
| 0FE6 | Details on factor of other axes start interrupt 7 |
| 0FE7 | Details on factor of other axes start interrupt 8 |
| 0FE8 | Details on factor of other axes start interrupt 9 |
| 0FE9 | Details on factor of other axes start interrupt 10 |
| 0FEA | Details on factor of other axes start interrupt 11 |
| 0FEB | Details on factor of other axes start interrupt 12 |
| 0FEC | Details on factor of other axes start interrupt 13 |
| 0FED | Details on factor of other axes start interrupt 14 |
| 0FEE | Details on factor of other axes start interrupt 15 |
| 0FEF | Details on factor of other axes start interrupt 16 |

| Address | Content |
|---|---|
| 0FF0 | Details on factor of other axes start interrupt 17 |
| 0FF1 | Details on factor of other axes start interrupt 18 |
| 0FF2 | Details on factor of other axes start interrupt 19 |
| 0FF3 | Details on factor of other axes start interrupt 20 |
| 0FF4 | Details on factor of other axes start interrupt 21 |
| 0FF5 | Details on factor of other axes start interrupt 22 |
| 0FF6 | Details on factor of other axes start interrupt 23 |
| 0FF7 | Details on factor of other axes start interrupt 24 |
| 0FF8 | Details on factor of other axes start interrupt 25 |
| 0FF9 | Details on factor of other axes start interrupt 26 |
| 0FFA | Details on factor of other axes start interrupt 27 |
| 0FFB | Details on factor of other axes start interrupt 28 |
| 0FFC | Details on factor of other axes start interrupt 29 |
| 0FFD | Details on factor of other axes start interrupt 30 |
| 0FFE | Details on factor of other axes start interrupt 31 |
| 0FFF | Details on factor of other axes start interrupt 32 |

Details on factor of other axes start interrupt□

| Address | Bit | Abbreviation | Signal name |
|---|---|---|---|
| 0FE0 | 0 | iOSOP□ | Other axes start notice□ (interrupt) |
| | 1 | iOSFIN□ | Other axes start complete□ (interrupt) |
| | 2 | iOSERR□ | Other axes start incomplete□ (interrupt) |
| | 3 | | Reserved |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

Note 1. The addresses in the table above are the addresses for the other axes start status table 1. For the other axes status table 2 and above, increase in units of 1h for each axis.

2. □ : Other axes start No.

(e) Factor of pass position interrupt

When the outputting with factor of pass position interrupt (iPPI) is on, the bit corresponding to the pass position condition number of the factor of the pass position interrupt turns on.

| Address | Bit | Abbreviation | Signal name |
|---|---|---|---|
| 0598 to 059B | 0 | iPPI1 | Pass position condition 1 (interrupt) |
| | 1 | iPPI2 | Pass position condition 2 (interrupt) |
| | 2 | iPPI3 | Pass position condition 3 (interrupt) |
| | 3 | iPPI4 | Pass position condition 4 (interrupt) |
| | 4 | iPPI5 | Pass position condition 5 (interrupt) |
| | 5 | iPPI6 | Pass position condition 6 (interrupt) |
| | 6 | iPPI7 | Pass position condition 7 (interrupt) |
| | 7 | iPPI8 | Pass position condition 8 (interrupt) |
| | 8 | iPPI9 | Pass position condition 9 (interrupt) |
| | 9 | iPPI10 | Pass position condition 10 (interrupt) |
| | 10 | iPPI11 | Pass position condition 11 (interrupt) |
| | 11 | iPPI12 | Pass position condition 12 (interrupt) |
| | 12 | iPPI13 | Pass position condition 13 (interrupt) |
| | 13 | iPPI14 | Pass position condition 14 (interrupt) |
| | 14 | iPPI15 | Pass position condition 15 (interrupt) |
| | 15 | iPPI16 | Pass position condition 16 (interrupt) |
| | 16 | iPPI17 | Pass position condition 17 (interrupt) |
| | 17 | iPPI18 | Pass position condition 18 (interrupt) |
| | 18 | iPPI19 | Pass position condition 19 (interrupt) |
| | 19 | iPPI20 | Pass position condition 20 (interrupt) |
| | 20 | iPPI21 | Pass position condition 21 (interrupt) |
| | 21 | iPPI22 | Pass position condition 22 (interrupt) |
| | 22 | iPPI23 | Pass position condition 23 (interrupt) |
| | 23 | iPPI24 | Pass position condition 24 (interrupt) |
| | 24 | iPPI25 | Pass position condition 25 (interrupt) |
| | 25 | iPPI26 | Pass position condition 26 (interrupt) |
| | 26 | iPPI27 | Pass position condition 27 (interrupt) |
| | 27 | iPPI28 | Pass position condition 28 (interrupt) |
| | 28 | iPPI29 | Pass position condition 29 (interrupt) |
| | 29 | iPPI30 | Pass position condition 30 (interrupt) |
| | 30 | iPPI31 | Pass position condition 31 (interrupt) |
| | 31 | iPPI32 | Pass position condition 32 (interrupt) |

| Address | Bit | Abbreviation | Signal name |
|---|---|---|---|
| 059C to 059F | 0 | iPPI33 | Pass position condition 33 (interrupt) |
| | 1 | iPPI34 | Pass position condition 34 (interrupt) |
| | 2 | iPPI35 | Pass position condition 35 (interrupt) |
| | 3 | iPPI36 | Pass position condition 36 (interrupt) |
| | 4 | iPPI37 | Pass position condition 37 (interrupt) |
| | 5 | iPPI38 | Pass position condition 38 (interrupt) |
| | 6 | iPPI39 | Pass position condition 39 (interrupt) |
| | 7 | iPPI40 | Pass position condition 40 (interrupt) |
| | 8 | iPPI41 | Pass position condition 41 (interrupt) |
| | 9 | iPPI42 | Pass position condition 42 (interrupt) |
| | 10 | iPPI43 | Pass position condition 43 (interrupt) |
| | 11 | iPPI44 | Pass position condition 44 (interrupt) |
| | 12 | iPPI45 | Pass position condition 45 (interrupt) |
| | 13 | iPPI46 | Pass position condition 46 (interrupt) |
| | 14 | iPPI47 | Pass position condition 47 (interrupt) |
| | 15 | iPPI48 | Pass position condition 48 (interrupt) |
| | 16 | iPPI49 | Pass position condition 49 (interrupt) |
| | 17 | iPPI50 | Pass position condition 50 (interrupt) |
| | 18 | iPPI51 | Pass position condition 51 (interrupt) |
| | 19 | iPPI52 | Pass position condition 52 (interrupt) |
| | 20 | iPPI53 | Pass position condition 53 (interrupt) |
| | 21 | iPPI54 | Pass position condition 54 (interrupt) |
| | 22 | iPPI55 | Pass position condition 55 (interrupt) |
| | 23 | iPPI56 | Pass position condition 56 (interrupt) |
| | 24 | iPPI57 | Pass position condition 57 (interrupt) |
| | 25 | iPPI58 | Pass position condition 58 (interrupt) |
| | 26 | iPPI59 | Pass position condition 59 (interrupt) |
| | 27 | iPPI60 | Pass position condition 60 (interrupt) |
| | 28 | iPPI61 | Pass position condition 61 (interrupt) |
| | 29 | iPPI62 | Pass position condition 62 (interrupt) |
| | 30 | iPPI63 | Pass position condition 63 (interrupt) |
| | 31 | iPPI64 | Pass position condition 64 (interrupt) |

(f) 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 number (1 to 64) turns on.

| Address | Content | |
|---|---|---|
| 0FA0 | Details on factor of pass position interrupt (64 bytes) | Details on factor of pass position interrupt 1 |
| 0FA1 | | Details on factor of pass position interrupt 2 |
| 0FA2 | | Details on factor of pass position interrupt 3 |
| 0FA3 | | Details on factor of pass position interrupt 4 |
| : | | : |
| 0FDF | | Details on factor of pass position interrupt 64 |

Details on factor of pass position interrupt□

| Address | Bit | Abbreviation | Signal name |
|---|---|---|---|
| 0FA0 | 0 | iPPIF□ | Pass position interrupt complete□ (interrupt) |
| | 1 | iPPIE□ | Pass position interrupt incomplete□ (interrupt) |
| | 2 | | Reserved |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

Note 1. The address above is for the pass position condition number 1.
For the pass position condition number 2 and above, increase in units of 01h for each number.

2. □ indicates the pass position condition number (1 to 64).

(4) Station interrupt factors

(a) Station interrupt factors

| Address | Content |
|---|---|
| 05B0 | Station interrupt factor station 1 |
| 05B1 | |
| 05B2 | Station interrupt factor station 2 |
| 05B3 | |
| 05B4 | Station interrupt factor station 3 |
| 05B5 | |
| 05B6 | Station interrupt factor station 4 |
| 05B7 | |
| 05B8 | Reserved |
| 05B9 | |
| 05BA | |
| 05BB | |
| 05BC | |
| 05BD | |
| 05BE | |
| 05BF | |

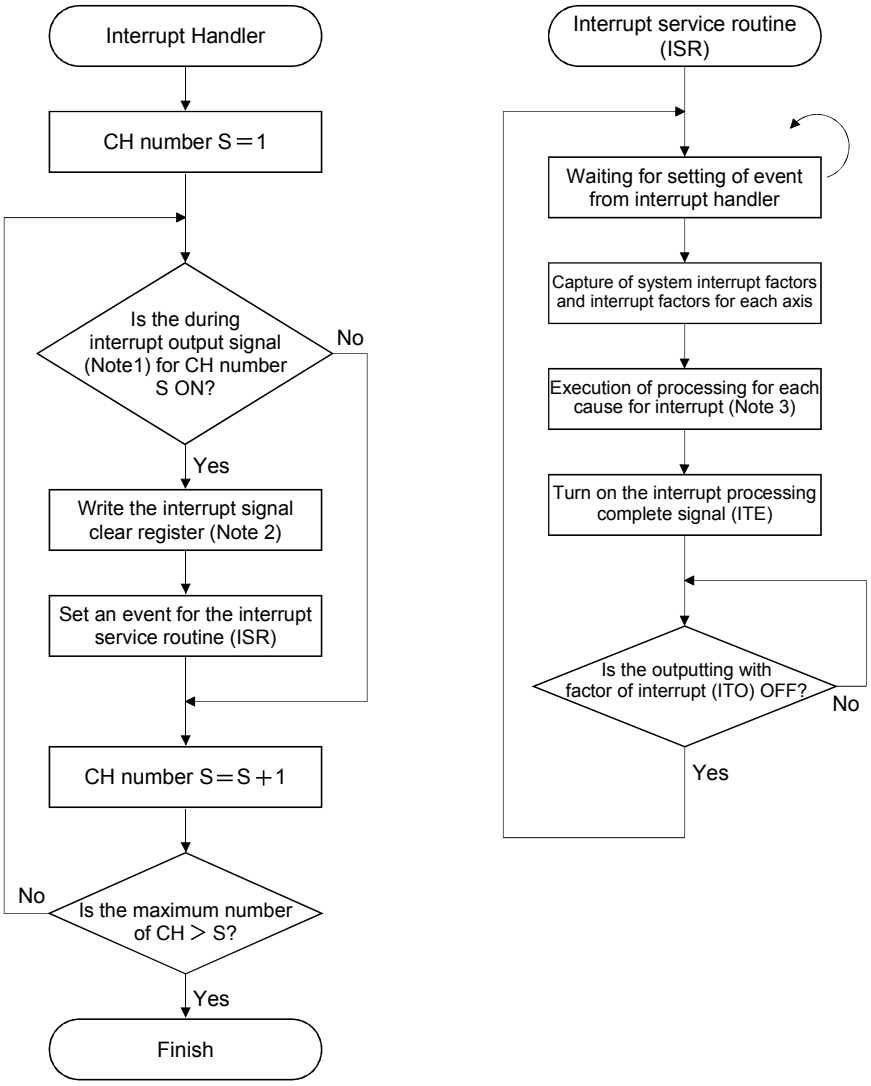
(b) Details on station n interrupt factors

The addresses in the table are the addresses for the axis 1. For the axis 2 and above, increase in units of 02h for each axis.

| Address | Bit | (Note) Abbreviation | Signal name |
|---|---|---|---|
| 05B0 to 05B1 | 0 | | Reserved |
| | 1 | | |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | iRUALM | RIO module alarm (interrupt) |
| | 6 | iRUWRN | RIO module warning (interrupt) |
| | 7 | | Reserved |
| | 8 | | |
| | 9 | | |
| | 10 | | |
| | 11 | | |
| | 12 | | |
| | 13 | iRCALM | RIO control alarm |
| | 14 | | Reserved |
| | 15 | | |

Note. OFF: No factor of interrupt exists.
ON: A factor of interrupt exists.

### 7.6.4 Interrupt processing example




Note 1. Confirm the bit(s) for the during interrupt output signal (address 20004h on the dual port memory).
(If the bit(s) are on: a current interrupt is being output, while if the bit(s) are OFF: there is not a current interrupt)

2. When 1 is written in the interrupt signal clear register (address 20008h (CH1) on the dual port memory), the output of the interrupt is cancelled.

3. Implement processing necessary for the different causes of interrupts, such as for completion of operation and generation of an operation alarm.
(example) When an operation alarm occurs, send a stop request to other axes that are in operation.

| API LIBRARY |
| --- |
| ・This interrupt processing example is processed by the device driver thus processing by user program is unnecessary. |

## 7.7 User watchdog function

User watchdog function is a function that checks for errors of the user program. Reset the value of watchdog check counter on the dual port memory using a host controller on a periodic basis. If the watchdog check counter value is not reset at the designated time (watchdog timer counts down to zero), it is determined that the host controller error and a forced stop status is entered.
The position board decrements the watchdog timer on each control cycle until the watchdog check counter value is reset. When the watchdog check counter value is reset, it is reset to the value set for the watchdog timer start counter.

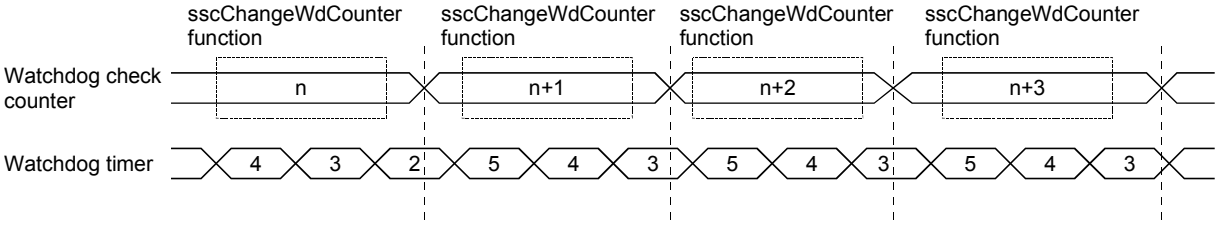
**POINT**

- When the watchdog timer start counter is set to 0, user watchdog is not executed.

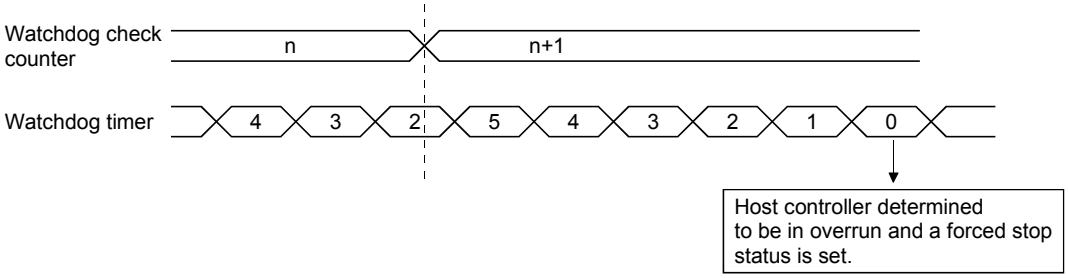
**API LIBRARY**

- Use the sscWdEnable/sscWdDisable functions to enable/disable user watchdog function.
- Use the sscChangeWdCounter function to update the watchdog check counter.
- For a detailed procedure for watchdog, refer to the sample program (WatchDog) contained on the utility software.

(1) Normal conditions

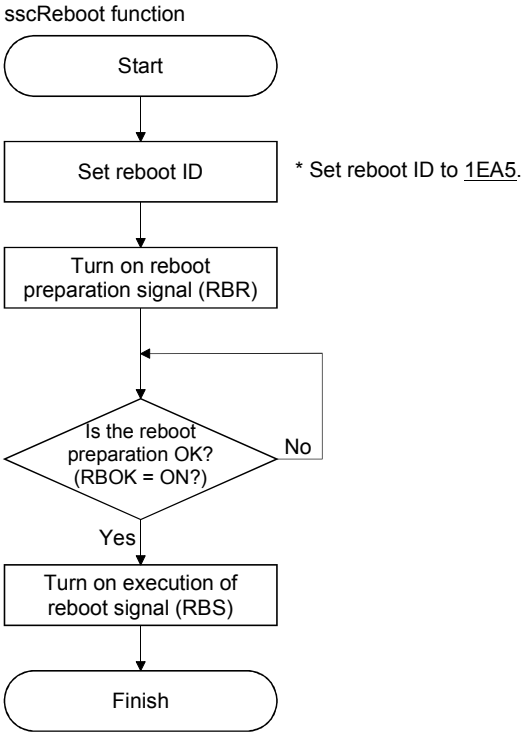



(2) When host controller overruns



## 7.8 Software reboot function

Through using the software reboot function, the host controller can restart the position board using software. Perform the software reboot according to the following procedure. (Refer to the system data table for the command/status signal.)




| POINT |
|---|
| ・When reboot preparation is turned on, it becomes a forced stop status.<br>・If an erroneous reboot ID is set and reboot preparation turned on or execution of reboot turned on without performing reboot preparation, a reboot preparation error occurs. If a reboot preparation error occurs, turn off reboot preparation and execution of reboot and restart the process from the beginning. |

| API LIBRARY |
|---|
| ・Use the sscReboot function to perform software reboot. |

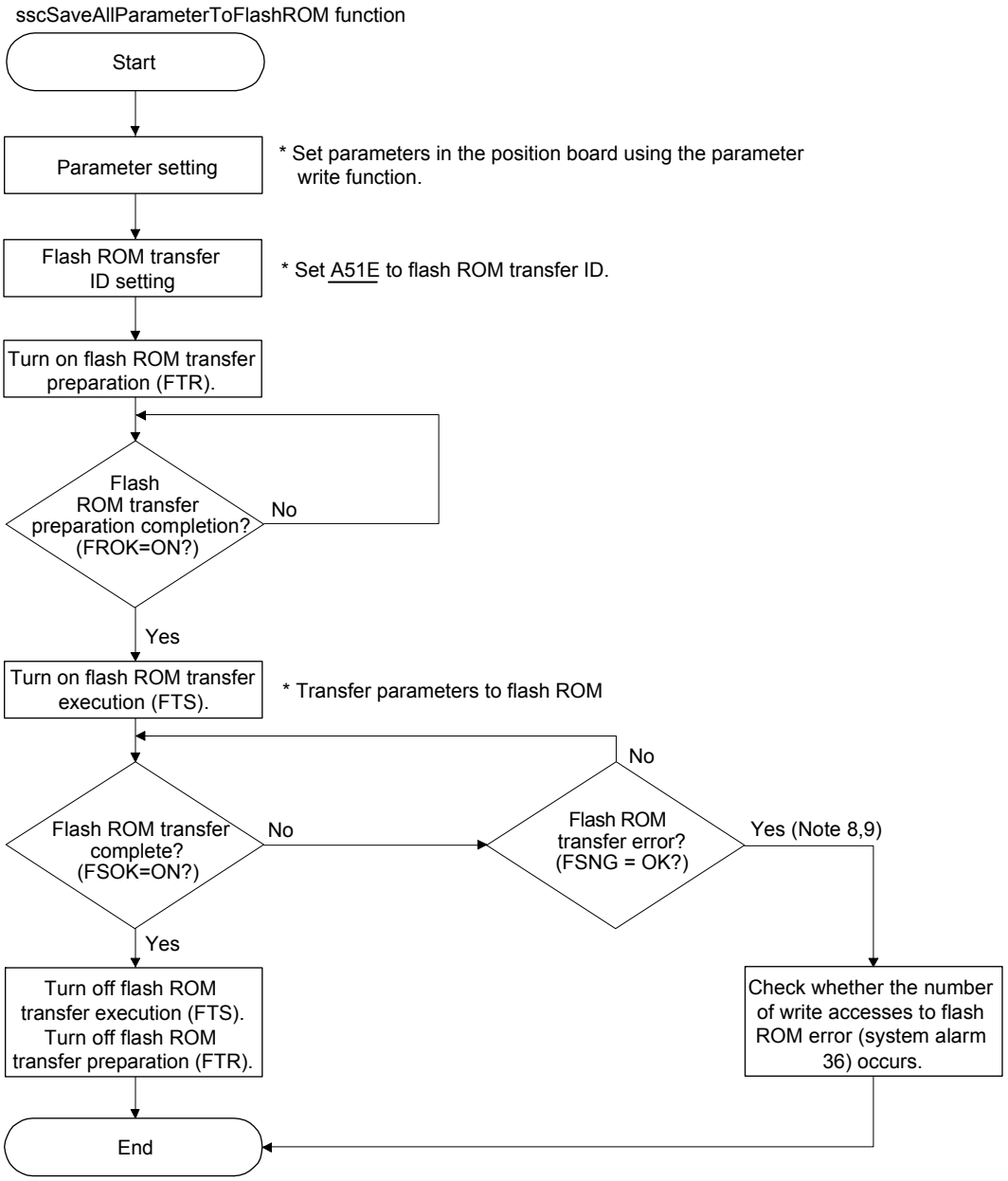
## 7.9 Parameter backup

> **POINT**
>
> ・When there are a lot of changing parameters of the position board and servo amplifier and the parameter changing time effects the system startup, saving parameters in the flash ROM of the position board by this function can shorten the time of system startup.

### (1) Flash ROM parameter backup

The contents of the parameter data area in the position board can be backed up to the flash ROM. When executing flash ROM parameter read (system command code: 0004h) at system preparation completion (system status code: 0001h), backup the parameter in the flash ROM with this function. Execute parameter backup in the flash ROM in the following procedure.

Note. At factory shipment, the initial value is set to each parameter.

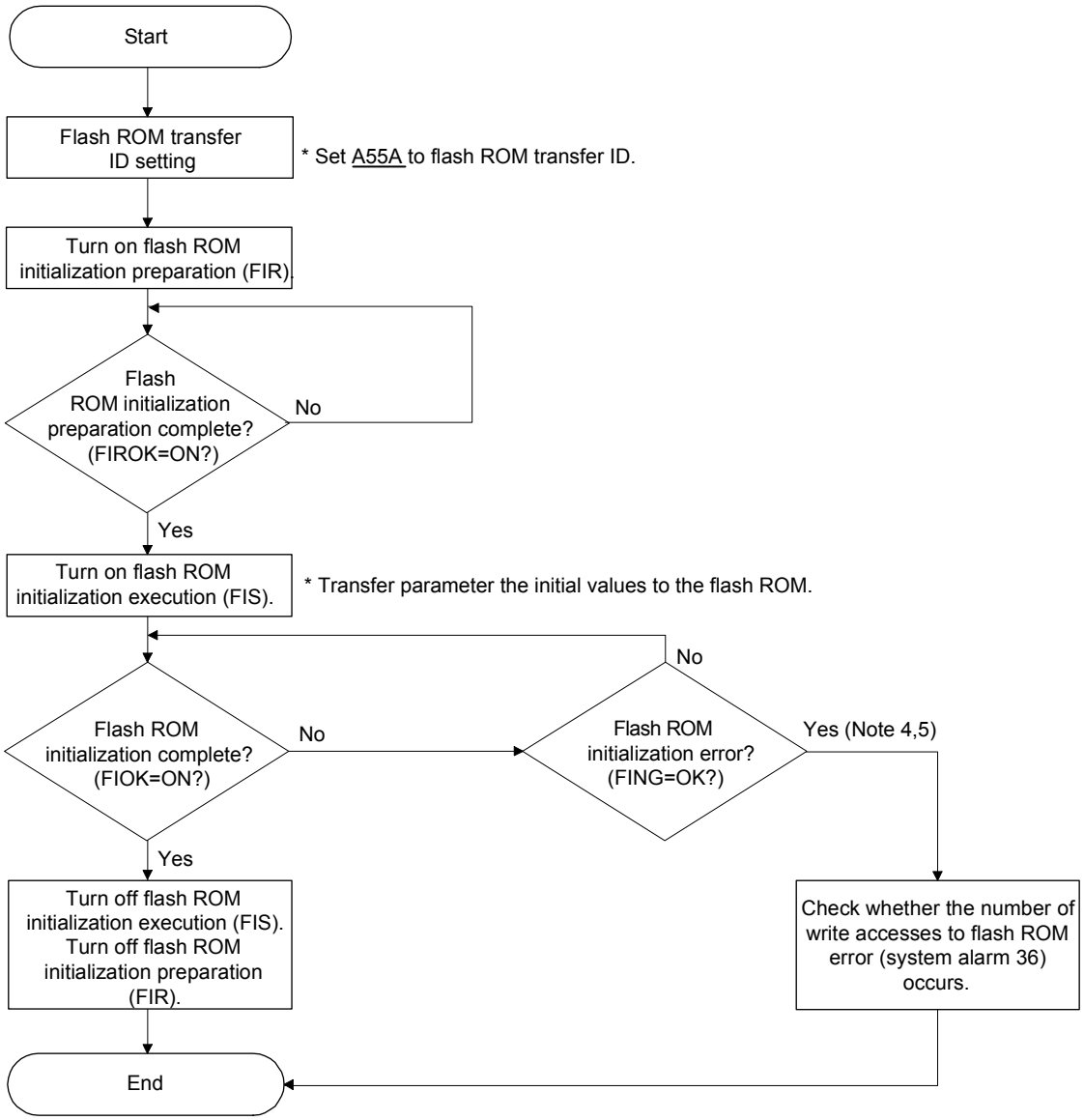


Note 1. The flash ROM parameter backup function becomes available after the system preparation completion (system status code: 0001h).

2. When the flash ROM transfer preparation error (FRNG) or the flash ROM transfer error (FSNG) occurs, check the procedure and restart the process from the beginning.
3. Do not turn off the power supply of the position board during the parameter backup in the flash ROM. If flash ROM parameter read is executed before normal backup completion, flash ROM parameter read error (system status code: 0005h) occurs. In this case, execute parameter initialization (system command code: 0003h), set parameters as required and backup data to flash ROM again.
4. When flash ROM parameter read is executed, the value of gain of the servo amplifier is the backed up value in the flash ROM, so vibration or abnormal sound may occur even when auto tuning is valid. Execute flash ROM backup after adjusting the gain of the servo amplifier.
5. Execute flash ROM backup after home position return is performed when the absolute position detection system is used.
6. Execute Note 5 above when changing a servo motor.
7. Execute flash ROM backup after changing a position board.
8. The flash ROM can be rewritten up to 100,000 times. If it exceeds 100,000 times, number of write accesses to flash ROM error (system alarm 36, detail 01) occurs and parameter backup will not be performed.
9. The flash ROM can be rewritten up to 25 times after every system preparation completion. If it exceeds 25 times, number of write accesses to flash ROM error (system alarm 36, detail 03) occurs and parameter backup will not be performed. Rewriting times to the flash ROM is cleared to 0 by resetting the system alarm or the software reboot. The parameter backup times executed after system preparation completion can be checked in the parameter backup times (system monitor No.040A).
10. Perform the parameter backup while the operation of all axes is stopped.
11. Writing and reading parameters are impossible during the flash ROM transfer.

(2) Flash ROM parameter initialization

The contents of the parameters which is backed up in the flash ROM is changed to the initial value.




Note 1. The flash ROM initialization function becomes available after the parameter initialization completion (system status code: 0003h) or the flash ROM parameter read (system status code: 0004h) is executed.

2. When the flash ROM initialization preparation error (FIRNG) or the flash ROM initialization error (FING) occurs, check the procedure and restart the process from the beginning.

3. Do not turn off the power supply of the position board while transferring parameter initial values to the flash ROM. If flash ROM parameter read is executed before normal initialization completion, flash ROM parameter read error (system status code: 0005h) occurs.

4. The flash ROM can be rewritten up to 100,000 times. If it exceeds 100,000 times, number of write accesses to flash ROM error (system alarm 36, detail 01) occurs and parameter initialization will not be performed. The parameter backup times executed (including flash ROM parameter initialization times) can be checked in the parameter backup times (system monitor No.040C, 040D).

5. The flash ROM can be rewritten up to 25 times after every system preparation completion. If it exceeds 25 times, number of write accesses to flash ROM error (system alarm 36, detail 03) occurs and parameter backup will not be performed. Rewriting times to the flash ROM is cleared to 0 by resetting the system alarm or the software reboot. The parameter backup times executed after system preparation completion can be checked in the parameter backup times (system monitor No.040A).

6. Perform the flash ROM parameter initialization while the operation of all axes is stopped.

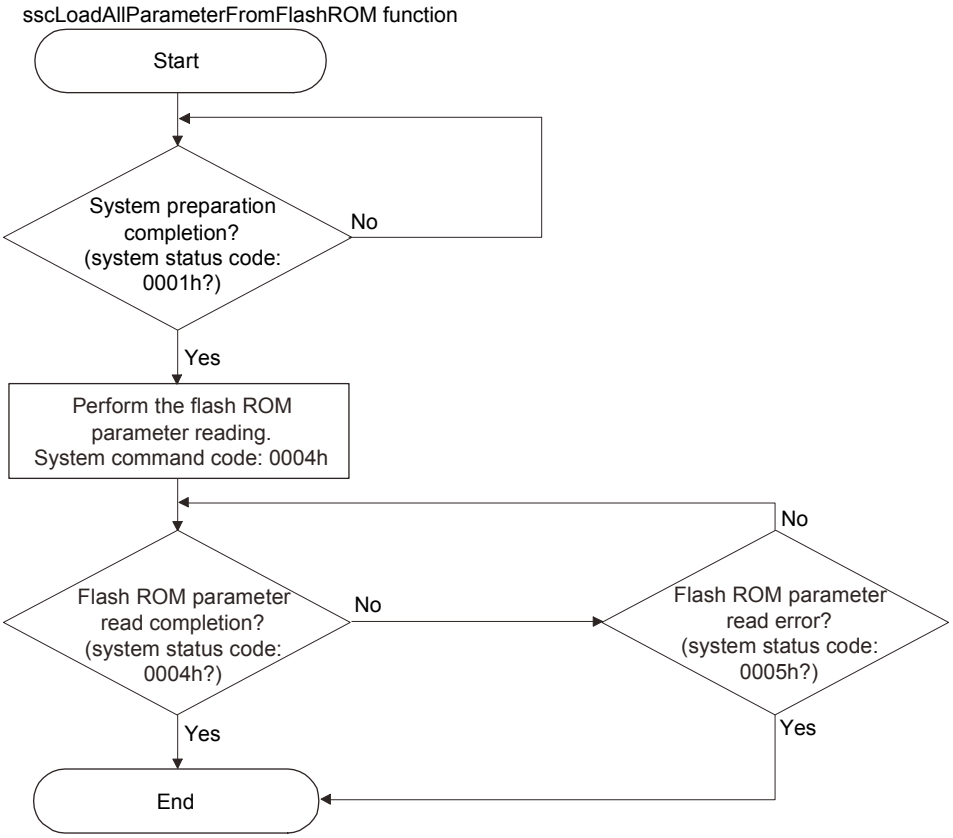
7. Writing and reading parameters are impossible during the flash ROM initialization.

API LIBRARY

- For flash ROM parameter initialization, save the flash ROM parameters with the sscSaveAllParameterToFlashROM function after initializing the parameters with the sscResetAllParameter function.

(3) Flash ROM parameter reading

The parameters backed up in the flash ROM is read when the system preparation is completed (system status code: 0001h).



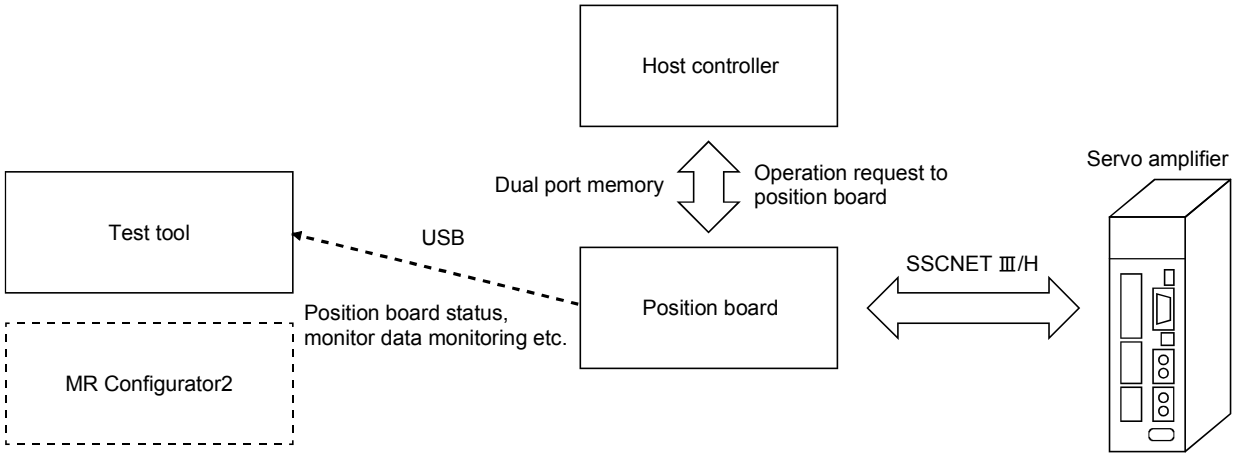
## 7.10 Test mode

Servo amplifier can be adjusted using test operation function (JOG, test positioning, machine analyzer etc.) of the MR Configurator2 attached to the position board using a USB connection. This sets the position board to test mode signal (TSTO) and operation (such as automatic operation) from the position board can not be performed. In order to perform operations using the position board, the system must be restarted. Refer to the servo amplifier instruction manual on your servo amplifier and/or MR Configurator2 help concerning MR Configurator2 test operation.

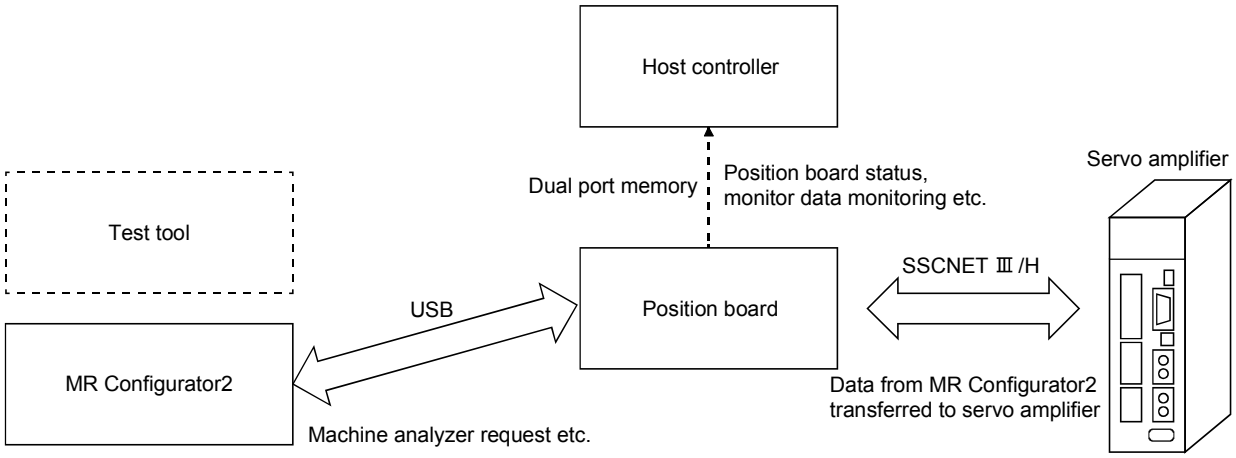
| API LIBRARY |
|---|
| ・To check if test mode (TSTO) is ON/OFF, check if SSC_STSBIT_AX_TSTO is ON/OFF with the sscGetStatusBitSignalEx or sscWaitStatusBitSignalEx function. |

### 7.10.1 Structural diagram

(1) Under normal operation




(2) While in test mode



### 7.10.2 Test operation mode

(1) Limitations

(a) If operation is started using the position board, an in test mode error (operation alarm 1A, detail 01) occurs and operation can not be performed.

(b) The commands to servo amplifier (servo-on/off, servo alarm reset, torque limit command etc.) are invalid. Monitoring and reading and writing of parameters can be performed as normal.

(2) Transition to test mode

In the following cases, it is not possible to transit to test mode. Confirm error messages on the MR Configurator2.

(a) While not in system running (system status code 000Ah)

(b) While an axis is in operation

(c) While an axis has servo alarm

(3) When a servo parameter has been changed using the MR Configurator2

If a servo parameter is changed at the MR Configurator2 using the machine analyzer etc., it is necessary to reflect the parameters that are managed by the host controller for all the parameters that were changed. As the parameters that were changed can be confirmed using the "servo parameter change number", read the parameter and reflect it to the parameters being managed by the host controller.

## 7.11 Reconnect/disconnect function

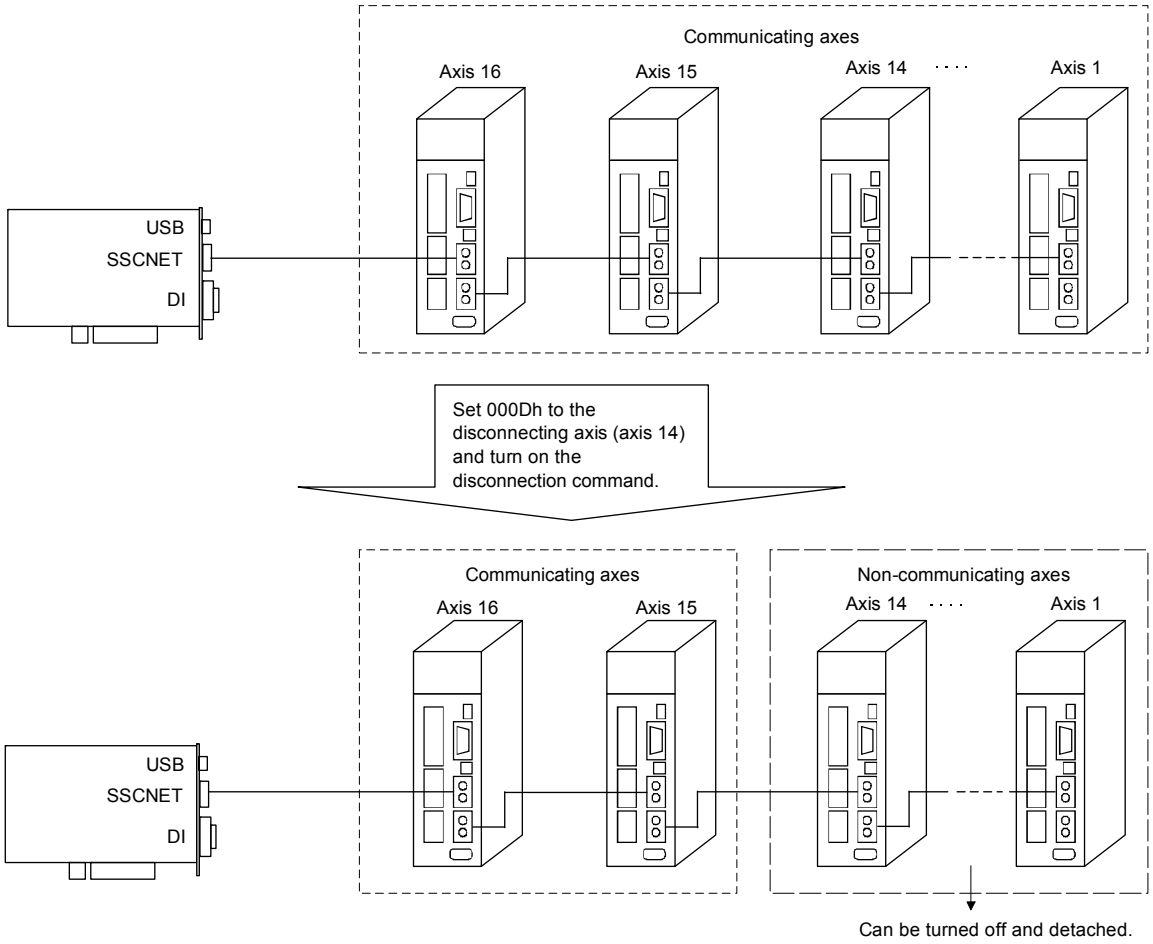
### 7.11.1 Disconnection function summary

By turning on the disconnection command, SSCNET communication with selected axis and later can be disconnected.
To use this function, set the consistency check selection at system startup of the control cycle (parameter No.0002) to invalid. This function becomes available after the system is started.
The axes whose communication is disconnected become non-communicating axes, so their power supplies can be turned off and SSCNET cables can be detached. At this time, communicating axes are not affected.

Note. If the power supplies of communicating axes are turned off or their SSCNETⅢ cables are detached, a system error of the position board occurs and the axes enter forced stop status.

| POINT |
|---|
| ・Refer to the controlling axis information after the disconnection is completed to check the bit corresponding to the non-communicating axis is off. |

| API LIBRARY |
|---|
| ・Use the sscDisconnectSSCNET function to disconnect SSCNET communication. |



### 7.11.2 Reconnect function summary

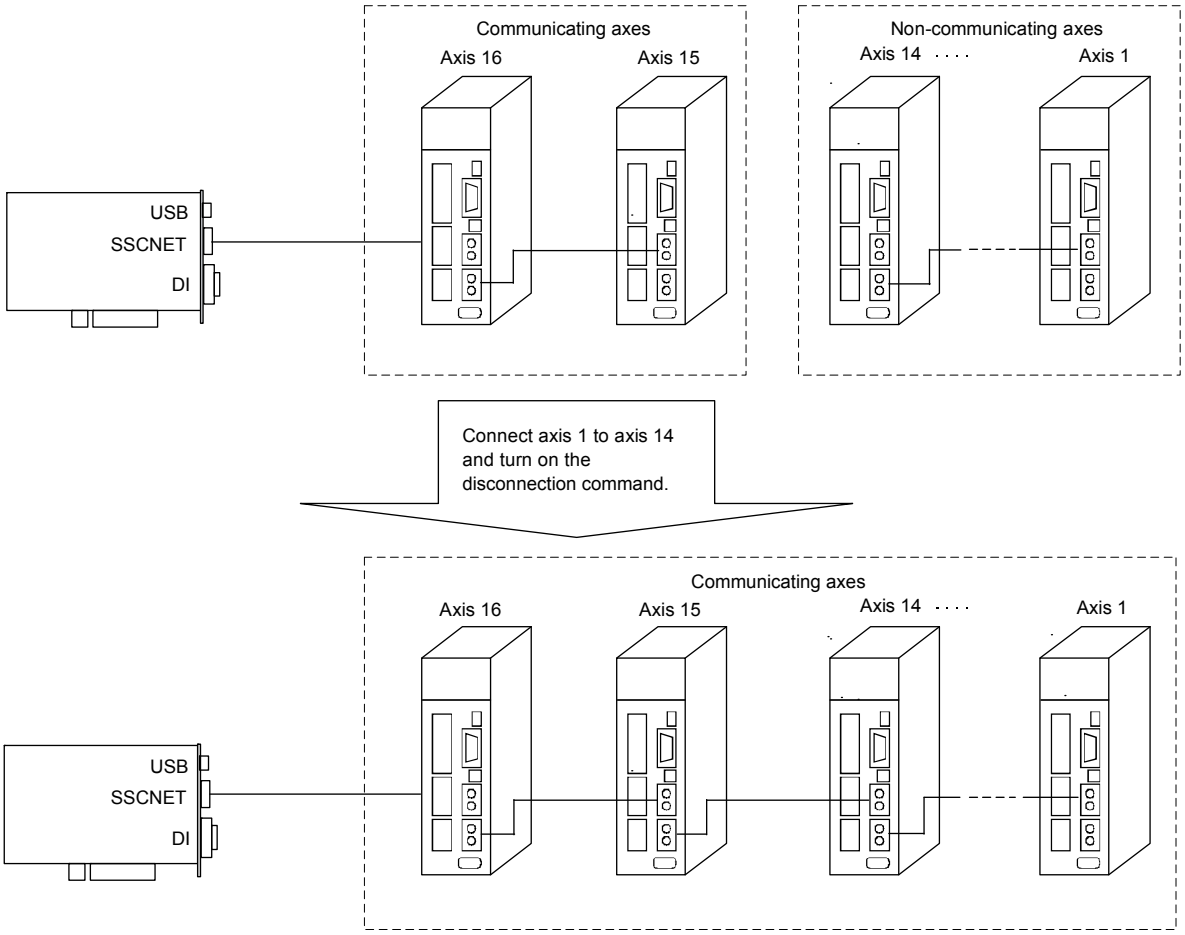
This function is a function that searches for controlled and non-communicating axes from all connected axes and starts SSCNET communication with them by turning on the reconnection command (RCC).
To use this function, set the consistency check selection at system startup of the control cycle (parameter No.0002) to invalid. This function becomes available after the system is started.

POINT

- Set all parameters related to reconnecting axes before system startup, including the setting of control axis (parameter No.0200).
- Update time synchronization information before turning ON reconnection command (RCC).
- Refer to the controlling axis information after the reconnection is completed to check the bit corresponding to the communicating axis is on.
- When an axis which has completed home position return is reconnected after being disconnected, it is in a home position return incomplete status (home position return request (ZREQ) is ON) at the time of reconnection. (Except for when absolute position detection system is valid and absolute position was correctly restored, and when no home position is valid (parameter No.0200))

API LIBRARY

- Use the sscReconnectSSCNET function to reconnect SSCNET communication.
- Update the time synchronization information with the sscReconnectSSCNET function.


Communicating axes
Axis 16
Axis 15
Non-communicating axes
Axis 14
Axis 1
USB
SSCNET
DI
Connect axis 1 to axis 14
and turn on the
disconnection command.
Communicating axes
Axis 16
Axis 15
Axis 14
Axis 1
USB
SSCNET
DI

### 7.11.3 Interface

#### (1) System command/system status

| Address | Content |
|---|---|
| 0434 | Disconnection axis No. |
| 0435 | |

| Address | Content |
|---|---|
| 04A4 | Error code of reconnection/disconnection |
| 04A5 | |

Note. Set the axis No. by 0000h (axis 1) to 001Fh (axis 32), and station No. by 8000h (station 1) to 8003h (station 4).

[Error code of reconnection/disconnection]

| No. | Content | Detail |
|---|---|---|
| 0001h | Disconnected axis specification error | The axis (station) specified as the disconnecting axis (station) is not in communication. |
| 0002h | Reconnected axis No. duplication error | The axis No. (station No.) of the reconnected axis (station) is already used. |
| 0003h | Reconnected axis type code error | The vendor ID and type code of the reconnected axis (station) differ from the setting of the parameter (parameter No.021D, 021E). |
| 0004h | Reconnection error during communication error | Execute reconnection during communication error. |
| 0006h | Communication cycle error | An axis (station) that is not compatible with the set control cycle (communication cycle) is connected. |

#### (2) System command/status bit

| Address | Bit | Abbreviation | Signal name |
|---|---|---|---|
| 03EB | 0 | RCC | Reconnection command |
| | 1 | | Reserved |
| | 2 | | |
| | 3 | CCC | Disconnection command |
| | 4 | | Reserved |
| | 5 | | |
| | 6 | | |
| | 7 | | |

| Address | Bit | Abbreviation | Signal name |
|---|---|---|---|
| 045B | 0 | RCO | During reconnection processing |
| | 1 | RCF | Reconnection complete |
| | 2 | RCE | Reconnection error |
| | 3 | CCO | During disconnection processing |
| | 4 | CCF | Disconnection complete |
| | 5 | CCE | Disconnection error |
| | 6 | | Reserved |
| | 7 | | |

#### (3) System parameter

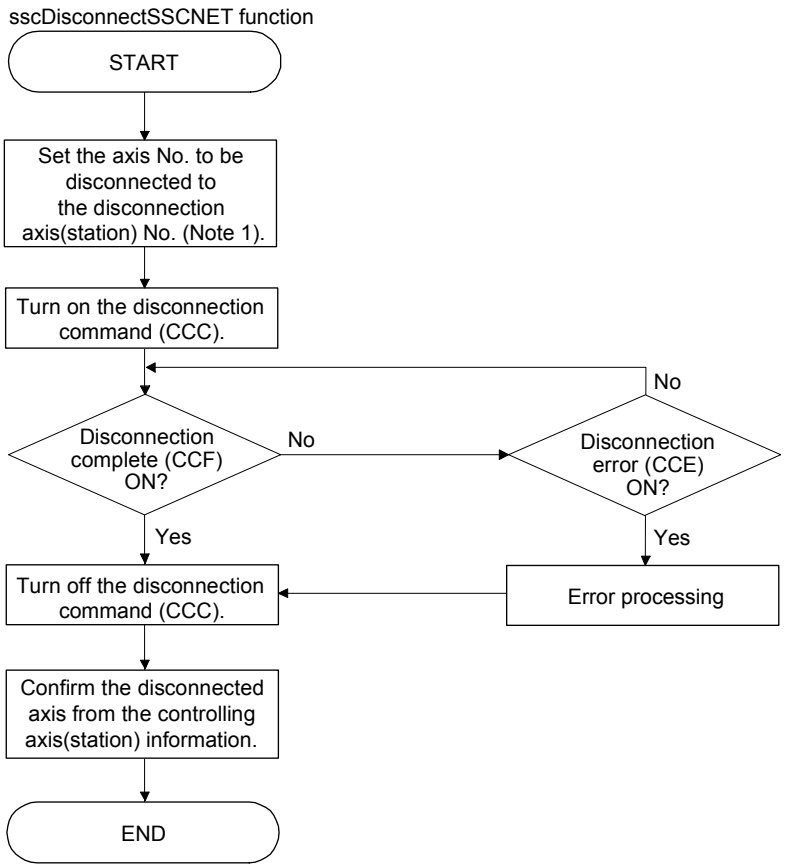
| Parameter No. | Abbreviation | Name | Initial value | Unit | Setting range | Function |
|---|---|---|---|---|---|---|
| 0002 | *SYSOP2 | System option 2 | 0000h | | 0000h to 0101h | 0 \| \| 0 \| 0<br>Consistency check selection at system startup<br>Set whether to perform consistency check selection for controlled axes setting at system startup.<br>0: Valid<br>1: Invalid |

(4) System configuration information table

| Address | Content | Remarks |
|---|---|---|
| 06E0 | Controlling axis information (lower) (4-byte) | The bit corresponding to the SSCNET communicating axis or the amplifier-less axis turns on.<br>The bit is the axis 1 (bit 0) to the axis 32 (bit 31). |
| 06E4 | Controlling axis information (upper) (4-byte) | Fixed at 0. |
| 06E8 | Controlling station information (2-byte) | The bit corresponding to the SSCNET communicating station or the remote I/O disconnect station turns on.<br>The bit is the station 1 (bit 0) to the station 4 (bit3). |

### 7.11.4 Disconnection method

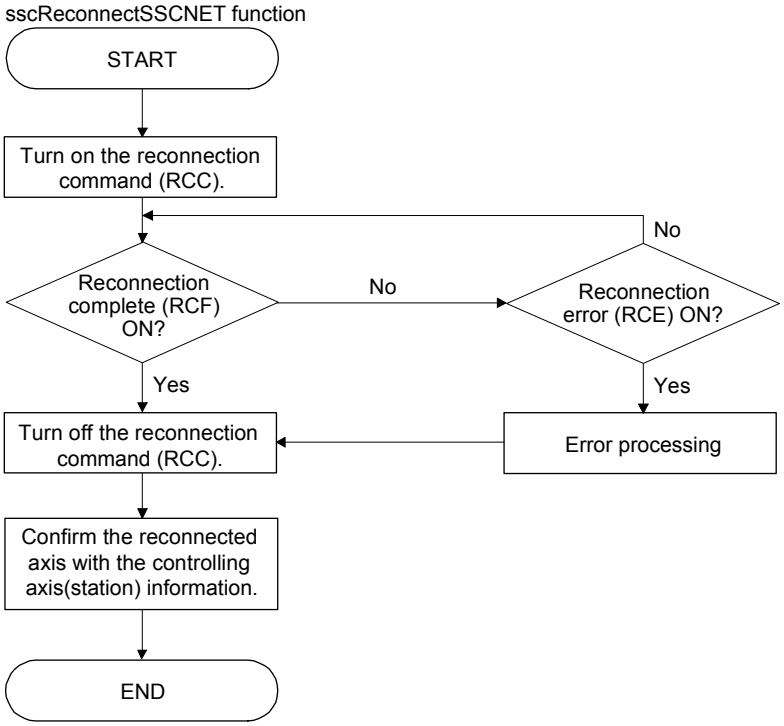
SSCNET communication disconnection is executed by turning on the disconnection command after the axis No. of the axis to be disconnected is specified.
The flowchart of the disconnection is shown below.




Note 1. Set the axis No. by 0000h (axis 1) to 001Fh (axis 32), and station No. by 8000h (station 1) to 8003h (station 4).
2. When the consistency check selection at system startup of the control cycle (parameter No.0002) is valid, disconnection error (CCE) turns on.

### 7.11.5 Reconnection method

SSCNET communication reconnection is executed by turning on the reconnection command. The axis No. to be connected axis is not needed to be specified.
The flowchart of the reconnection is shown below.



### 7.11.6 Restrictions

The restrictions for SSCNET reconnect/disconnect function are shown below.

(1) Linear interpolation startup
When the axis allocated to the same linear interpolation group is not connected, a primary axis linear interpolation startup error (operation alarm 40, detail 01) occurs.

(2) Tandem drive
When the axis allocated to the same tandem drive group is not connected, servo cannot be turned on during in the synchronous mode.
During operation in non-synchronous micro-adjustment mode, the servo operates normally.

(3) Disconnect during operation
When SSCNET disconnection is executed to the axis which is during operation, servo is not controllable (operation alarm B0, detail 02) occurs and the servo stops by the dynamic brake or decelerates to stop depending on the setting of the servo amplifier.

(4) Multi-axis amplifier
When using SSCNET disconnect function in multi-axis amplifier such as MR-J4W□-□B, make sure that all axes in the unit are simultaneously disconnected.
When the disconnection command is sent to the second axis or later in the same unit, the disconnection error (CCE) turns on.

(5) Turning off the power supply after disconnection
Turn off the power supply of the servo amplifier after confirming the LED indicates "AA" and SSCNET disconnection completed.
For the SSCNETⅢ/H head module, check that the REM.LED is OFF before turning OFF power supply of the SSCNETⅢ/H head module.

(6) Operation at the system startup
When the consistency check selection at system startup of the control cycle (parameter No.0002) is set to invalid and all control axes are not connected when system is started, an axis that has not been mounted exists (system error E400) does not occur and the system is started with the only connected axis.

(7) Input device signal
When a limit switch is allocated to a remote I/O input device and that input device allocated to the module is disconnected, the limit is continuously detected. However, when maintain status is set for RI control at communication error for control option 2 (parameter No.0201), the status before disconnection is maintained.

## 7.12 Sampling

### 7.12.1 Summary

The sampling function is a function that monitors the servo amplifier status and samples this data. After sending the sampling start signal (SMPS), the following data is sampled every sampling period. The data is sampled in the sampling data buffer area in the position board up to 8192 points. In sampling with the sampling points exceeding 8192, the user program always needs to read sampling data during sampling. Data can be sampled up to 65536 points. (For details, refer to Section 7.12.10.)

POINT

- The sampling function can be used in the test tool.
- When using the graph function of the test tool using a USB connection, the data can be sampled up to 8192 points since enough data transfer speed cannot be ensured.

API LIBRARY

- For a detailed procedure for sampling, refer to the sample program (Sampling) contained on the utility software.

The sampled data can be read to the sampling data read area (address: BE00h to CE80h) by specifying the sampling read page number. The sampled data is stored in the position board internal memory and initialized by power off of the position board or the software reboot.

### 7.12.2 Command/status bit

System command/status bits related to sampling function are shown below.

System command

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 03E1 | 0 | SMPS | Sampling start |
| | 1 | | Reserved |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

System status

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 0451 | 0 | SMPW | Waiting for sampling trigger |
| | 1 | SMPO | Sampling is being performed |
| | 2 | SMPF | Sampling is complete |
| | 3 | SMPE | Sampling error |
| | 4 | | Reserved |
| | 5 | | |
| | 6 | | |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 03F2 | 0 | SMPSW | Sampling setting write command |
| | 1 | | Reserved |
| | 2 | | |
| | 3 | | |
| | 4 | SMPSR | Sampling setting read command |
| | 5 | | Reserved |
| | 6 | | |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 0462 | 0 | SWFIN | Sampling setting write complete |
| | 1 | SWEN | Sampling setting number error |
| | 2 | SWED | Sampling setting data out of bounds |
| | 3 | | Reserved |
| | 4 | SRFIN | Sampling setting read complete |
| | 5 | SREN | Sampling setting number error |
| | 6 | | Reserved |
| | 7 | | |

(1) Details concerning system command bits

| Symbol | Signal name | Function details |
|---|---|---|
| SMPS | Sampling start | [Function]<br>Starts sampling.<br>[Operation]<br>When the sampling start signal (SMPS) is turned on, storage of sampling data is started. |
| SMPSR | Sampling setting read command | [Function]<br>Reads sampling setting.<br>[Operation]<br>Reads sampling setting set to sampling setting read number. When the sampling setting read number is incorrect, sampling setting read will not be performed.<br>(Remarks) The sampling setting read command is valid only while system is running. |
| SMPSW | Sampling setting write command | [Function]<br>Writes sampling setting.<br>[Operation]<br>Writes sampling setting set to sampling setting write number. When the sampling setting write number is incorrect and the sampling setting to be written is outside the setting range, the sampling setting write will not be performed.<br>(Remarks) The sampling setting write command is valid only while system is running. |

(2) Details concerning system status bits

| Symbol | Signal name | Function details |
|---|---|---|
| SMPW | Waiting for sampling trigger | [Function]<br>Notifies concerning the status of waiting for sampling trigger.<br>[Operation]<br><Conditions for turning on><br>Turning on of sampling start signal (SMPS), and waiting for the sample trigger.<br><Conditions for turning off><br>• The sampling start signal (SMPS) is turned off.<br>• The trigger for the start sampling trigger axis is met. |
| SMPO | Sampling is being performed | [Function]<br>Notifies that sampling is now being performed.<br>[Operation]<br><Conditions for turning on><br>Turning on of sampling start signal (SMPS), and sampling is now being performed.<br><Conditions for turning off><br>• The sampling start signal (SMPS) is turned off.<br>• Sampling is completed. |
| SMPF | Sampling is complete | [Function]<br>Notifies that sampling was completed normally.<br>[Operation]<br><Conditions for turning on><br>Sampling is completed normally.<br><Conditions for turning off><br>The sampling start signal (SMPS) is turned off. |
| SMPE | Sampling error | [Function]<br>Notifies that sampling was not completed normally.<br>[Operation]<br><Conditions for turning on><br>• The sampling setting error occurs.<br>• The sampling item error occurs.<br>• The next page number of the sampling completion page number is the same as the sampling read page number. (The data was not sampled in time.)<br>• The sampling start signal (SMPS) is turned on when the read sampled data completion page number is -1.<br>• The page number 0 is designated from the page number other than 0 when the sampling is being performed.<br><Conditions for turning off><br>The start sampling signal (SMPS) is turned off. |
| SWFIN | Sampling setting write complete | [Function]<br>Notifies that writing of the sampling setting was completed.<br>[Operation]<br><Conditions for turning on><br>The sampling setting write number and the setting value in the range are set correctly and the sampling setting write command (SMPSW) is turned on.<br><Conditions for turning off><br>The sampling setting write command signal (SMPSW) is turned off. |
| SWEN | Sampling setting number error | [Function]<br>Notifies that the sampling setting number is incorrect.<br>[Operation]<br><Conditions for turning on><br>The sampling setting number is set incorrectly and the sampling setting write command (SMPSW) is turned on.<br><Conditions for turning off><br>The sampling setting write command signal (SMPSW) is turned off. |

| Symbol | Signal name | Function details |
|---|---|---|
| SWED | Sampling setting data out of bounds | [Function]<br>Notifies that the sampling setting value is outside the setting range.<br>[Operation]<br><Conditions for turning on><br>The sampling setting value which is outside the setting range is set and the sampling setting write command (SMPSW) is turned on.<br><Conditions for turning off><br>The sampling setting write command signal (SMPSW) is turned off. |
| SRFIN | Sampling setting read complete | [Function]<br>Notifies that reading of the sampling setting was completed.<br>[Operation]<br><Conditions for turning on><br>The sampling setting read number is set correctly and the sampling setting read command (SMPSR) is turned on.<br><Conditions for turning off><br>The sampling setting read command signal (SMPSR) is turned off. |
| SREN | Sampling setting number error | [Function]<br>Notifies that the sampling setting number is incorrect.<br>[Operation]<br><Conditions for turning on><br>The sampling setting read number is set incorrectly and the sampling setting read command (SMPSR) is turned on.<br><Conditions for turning off><br>The sampling setting read command signal (SMPSR) is turned off. |

### 7.12.3 Command/status data

The system command/status data related to the sampling function are shown below.

(1) Sampling setting write (command)

| Address | Name | Setting range | Remarks |
|---|---|---|---|
| BDA0 | Sampling setting write number | 0000h to 00AFh | Set the sampling setting number to be written.<br>Note. For 0000h, sampling setting number error does not occur. |
| BDA1 | | | |
| BDA2 | Reserved | | |
| BDA3 | | | |
| BDA4 | Sampling setting write data | 00000000h to FFFFFFFFh | Set the data of the sampling setting number to be written. |
| BDA5 | | | |
| BDA6 | | | |
| BDA7 | | | |

(2) Sampling setting write (status)

| Address | Name | Output limits | Remarks |
|---|---|---|---|
| BDA8 | Sampling setting write number | 0000h to FFFFh | Displays the sampling setting number which was written. |
| BDA9 | | | |
| BDAA | Reserved | | |
| BDAB | | | |
| BDAC | Sampling setting write data | 00000000h to FFFFFFFFh | Displays the data of the sampling setting number which was written. |
| BDAD | | | |
| BDAE | | | |
| BDAF | | | |

(3) Sampling setting read (command)

| Address | Name | Setting range | Remarks |
|---|---|---|---|
| BDB0 | Sampling setting read number | 0000h to 00AFh | Set the sampling setting number to be read.<br>Note. For 0000h, sampling setting number error does not occur. |
| BDB1 | | | |
| BDB2 | Reserved | | |
| BDB3 | | | |
| BDB4 | | | |
| BDB5 | | | |
| BDB6 | | | |
| BDB7 | | | |

(4) Sampling setting read (status)

| Address | Name | Output limits | Remarks |
|---|---|---|---|
| BDB8 | Sampling setting read number | 0000h to FFFFh | Displays the sampling setting number which was read. |
| BDB9 | | | |
| BDBA | Reserved | | |
| BDBB | | | |
| BDBC | Sampling setting read data | 00000000h to FFFFFFFFh | Displays the data of the sampling setting number which was read. |
| BDBD | | | |
| BDBE | | | |
| BDBF | | | |

(5) Sampling error information

| Address | Name | Output limits | Remarks |
|---|---|---|---|
| BDC0 | Sampling axis error information 1 | 100000000h to FFFFFFFFh | Turns on the bit of the axis which cannot be controlled.<br>Axis No. 1 (bit 0) to 32 (bit 31) |
| BDC1 | | | |
| BDC2 | | | |
| BDC3 | | | |
| BDC4 | Reserved | | |
| BDC5 | | | |
| BDC6 | | | |
| BDC7 | | | |
| BDC8 | | | |
| BDC9 | | | |
| BDCA | | | |
| BDCB | | | |
| BDCC | | | |
| BDCD | | | |
| BDCE | | | |
| BDCF | | | |
| BDD0 | Sampling data error information | 00000000h to FFFFFFFFh | Turns on the bit of the sampling data which became sampling error.<br>Sampling data 1 (bit 0) to 32 (bit 31) |
| BDD1 | | | |
| BDD2 | | | |
| BDD3 | | | |
| BDD4 | Reserved | | |
| BDD5 | | | |
| BDD6 | | | |
| BDD7 | | | |
| BDD8 | Sampling bit error information | 00000000h to 0000FFFFh | Turns on the bit of the sampling bit information which became sampling error.<br>Sampling data information 1 (bit 0) to 16 (bit 15) |
| BDD9 | | | |
| BDDA | | | |
| BDDB | | | |
| BDDC | Reserved | | |
| BDDD | | | |
| BDDE | | | |
| BDDF | | | |

(6) Sampled data read command

| Address | Name | Setting range | Remarks |
|---|---|---|---|
| BDE0 | Sampling read page number | 0 to 256 | Set the page number which is read in the sampling data read area. 12 points of sampled data are read per page.<br>Note. When start sampling, set 0. |
| BDE1 | | | |
| BDE2 | Reserved | | |
| BDE3 | | | |
| BDE4 | | | |
| BDE5 | | | |
| BDE6 | | | |
| BDE7 | | | |

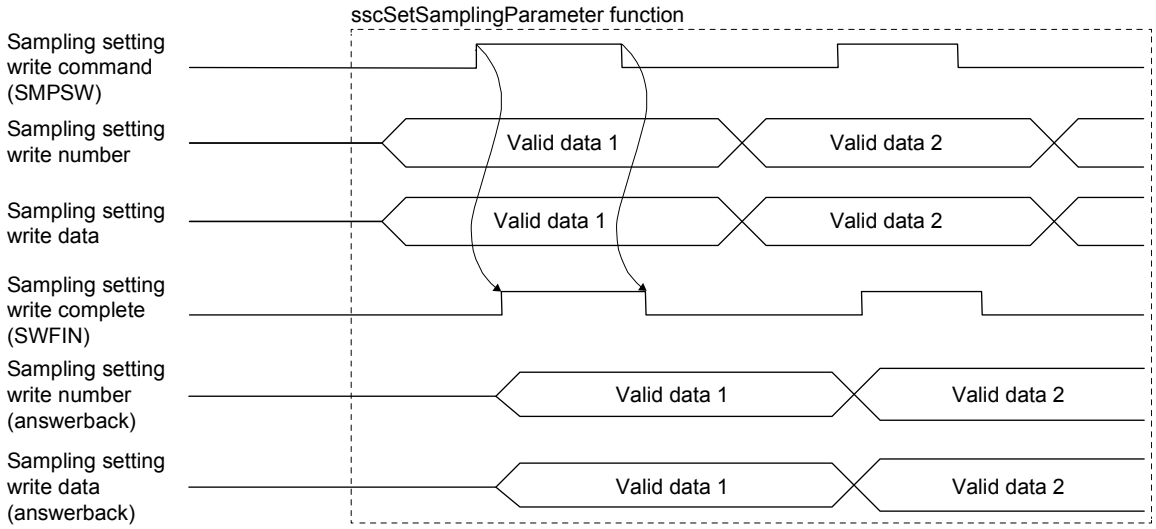
(7) Sampled data read status

| Address | Name | Output limits | Remarks |
|---|---|---|---|
| BDE8 | Read sampled data completion page number | −2 to 256 | The page number which is transferred to the sampling data read area is stored.<br>−2: Sampling read error<br>−1: Sampling reading<br>0: When sampling read number is 0<br>1 to 256: Page number whose sampled data is read |
| BDE9 | | | |
| BDEA | Valid read sampled points | 0 to 16 | The number of sampled data in the page where sampling read is completed is stored.<br>The user program 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.<br>0 to 16 points: Data points sampled in a page |
| BDEB | | | |
| BDEC | Sampling completion page number | 0 to 256 | The page number where sampling is completed by the position board is stored.<br>0: Sampling trigger waiting or the page number 1 (only the first time) is being sampled<br>1 to 256: Sampling completion page number |
| BDED | | | |
| BDEE | Reserved | | |
| BDEF | | | |

### 7.12.4 Sampling setting write/read

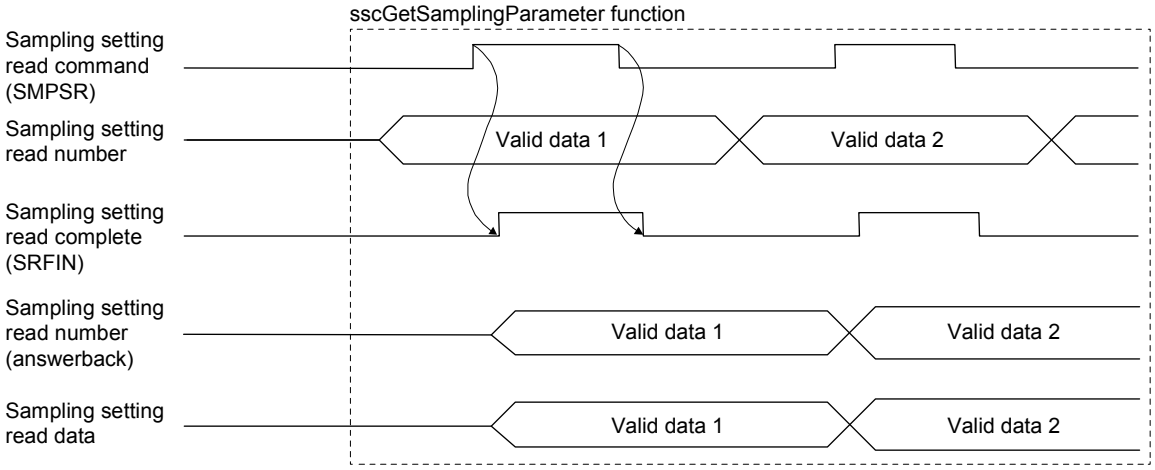
The conditions for sampling and contents of sampling can be set. Also, the current sampling setting can be read. The sampling setting write/read is valid after executing parameter initialization (system command code: 0003h).

(1) When writing the sampling setting




| POINT |
|---|
| ・The sampling setting write data is written in 4 bytes. |

(2) When reading the sampling setting




| POINT |
|---|
| ・The sampling setting read data is read in 4 bytes. |

### 7.12.5 Details for sampling function settings

Settings related to sampling function are shown below. Each setting is imported when the sampling is started (SMPS: ON). The sampling setting cannot be changed while Waiting for sampling trigger (SMPW) is on and Sampling is being performed (SMPO) is on.

(1) Sampling setting

| Setting No. | Name | Initial value | Setting range | Remarks |
|---|---|---|---|---|
| 0001 | Sampling option | 00000000h | 00000000h to 000029FFh | 0 0 0 0 [ ] [ ] [ ] [ ]<br>Sampling cycle<br>Set the sampling cycle.<br>00h to FFh: Control cycle ×(setting +1)<br>[Example]<br>If the sampling cycle is set to 3 with the control cycle set to 0.44ms, sampling is executed every 1.777ms.<br>Pre-trigger<br>Set the timing that the trigger condition is satisfied.<br>0 to 9: Setting ×10%<br>[Example]<br>When pre-trigger is 10% with 8192 points of sampling points, 819 points of data<br>Trigger mode<br>Set the trigger mode.<br>0: Trigger turns on when the sampling is started.<br>1: Trigger turns on when one of each trigger condition is satisfied.<br>2: Trigger turns on when all of the trigger conditions are satisfied. |
| 0002 | Sampling points | 8192 | 0 to 65536 | Set the points to be sampled. |
| 0003 | For manufacturer setting | 00000000h | | |
| 0004 | | 00000000h | | |
| 0005 | | 00000000h | | |
| 0006 | | 00000000h | | |
| 0007 | | 00000000h | | |
| 0008 | | 00000000h | | |
| 0009 | | 00000000h | | |
| 000A | | 00000000h | | |
| 000B | | 00000000h | | |
| 000C | | 00000000h | | |
| 000D | | 00000000h | | |
| 000E | | 00000000h | | |
| 000F | | 00000000h | | |

| Setting No. | Name | Initial value | Setting range | Remarks |
|---|---|---|---|---|
| 0010 | Sampling trigger 1 setting | 00000000h | 00000000h to 10041F01h | 0 0 0 0 0 0 0 [ ]<br>Trigger 1 sampling items<br>Selects the sampling items referred by trigger 1.<br>0: Sampling data<br>1: Sampling bit information<br><br>The following settings differ up to Trigger 1 sampling items.<br>▪ When Sampling data is selected<br>[ ] 0 0 [ ] [ ] [ ] 0 0<br>Trigger 1 sampling data number<br>Set the sampling data number referred by trigger 1 in hexadecimal.<br>Example: 00h to 1Fh: Sampling data 1 to 32<br>Trigger 1 condition<br>Set the trigger 1 condition.<br>0: Trigger 1 setting invalid<br>1: Fulfilled when passing through trigger value 1 in increase direction<br>2: Fulfilled when passing through trigger value 1 in decrease direction<br>3: Fulfilled with trigger value 1 or higher<br>4: Fulfilled with trigger value 1 or lower<br>Trigger 1 code<br>Set the code of sampling data referred by trigger 1.<br>0: Without code<br>1: With code<br><br>▪ When Sampling bit information is selected<br>0 0 0 [ ] [ ] [ ] 0 1<br>Trigger 1 sampling bit information number<br>Set the number of the sampling bit information referred by trigger 1 in hexadecimal.<br>Example: 00h to 0Fh: sampling data 1 to 16<br>Trigger 1 condition<br>Set the trigger 1 condition.<br>0: Trigger 1 setting invalid<br>1: Fulfilled by leading edge of bit<br>2: Fulfilled by trailing edge of bit<br>3: Fulfilled while bit is on<br>4: Fulfilled while bit is off |
| 0011 | Sampling trigger 2 setting | 00000000h | 00000000h to 10041F01h | Same as the sampling trigger 1 setting. |
| 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. |

| Setting No. | Name | Initial value | Setting range | Remarks |
|---|---|---|---|---|
| 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 | | 00000000h | | |
| 0019 | | 00000000h | | |
| 001A | | 00000000h | | |
| 001B | | 00000000h | | |
| 001C | | 00000000h | | |
| 001D | | 00000000h | | |
| 001E | | 00000000h | | |
| 001F | | 00000000h | | |
| 0020 | Sampling trigger value 1 | 00000000h | 00000000h to FFFFFFFFh | Set the threshold for trigger 1.<br>Note 1. Set the threshold in double word regardless of the size of the data set in the sampling trigger 1 setting.<br>2. 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 trigger 2.<br>The setting contents are the same as the sampling trigger value 1. |
| 0022 | Sampling trigger value 3 | 00000000h | 00000000h to FFFFFFFFh | Set the threshold for trigger 3.<br>The setting contents are the same as the sampling trigger value 1. |
| 0023 | Sampling trigger value 4 | 00000000h | 00000000h to FFFFFFFFh | Set the threshold for trigger 4.<br>The setting contents are the same as the sampling trigger value 1. |
| 0024 | Sampling trigger value 5 | 00000000h | 00000000h to FFFFFFFFh | Set the threshold for trigger 5.<br>The setting contents are the same as the sampling trigger value 1. |
| 0025 | Sampling trigger value 6 | 00000000h | 00000000h to FFFFFFFFh | Set the threshold for trigger 6.<br>The setting contents are the same as the sampling trigger value 1. |
| 0026 | Sampling trigger value 7 | 00000000h | 00000000h to FFFFFFFFh | Set the threshold for trigger 7.<br>The setting contents are the same as the sampling trigger value 1. |
| 0027 | Sampling trigger value 8 | 00000000h | 00000000h to FFFFFFFFh | Set the threshold for trigger 8<br>The setting contents are the same as the sampling trigger value 1. |
| 0028 | For manufacturer setting | 00000000h | | |
| 0029 | | 00000000h | | |
| 002A | | 00000000h | | |
| 002B | | 00000000h | | |
| 002C | | 00000000h | | |
| 002D | | 00000000h | | |
| 002E | | 00000000h | | |
| 002F | | 00000000h | | |

| Setting No. | Name | Initial value | Setting range | Remarks |
|---|---|---|---|---|
| 0030 | Sampling data 1 setting | 00000000h | 00000000h to 00FF14FFh | 0 0 ☐ ☐ ☐ ☐ ☐ ☐<br>Monitor No.<br>Specify the monitor number to be sampled.<br>0000h: Not selected<br>0100h to 01FFh: servo information (1)<br>0200h to 02FFh: servo information (2)<br>0300h to 03FFh: operation information<br>1300h to 13FFh: operation information (double word)<br>0400h to 04FFh: system information<br>1400h to 14FFh: system information (double word)<br>Note. Axis No. is not needed to be set in the system information.<br>Axis No.<br>Set the axis No. of sampling data 1.<br>00h to 1Fh: Axis No.-1<br>Example: 00h: Axis No.1 |
| 0031 | Sampling data 2 setting | 00000000h | 00000000h to 00FF14FFh | Same as the sampling data 1 setting. |
| 0032 | Sampling data 3 setting | 00000000h | 00000000h to 00FF14FFh | Same as the sampling data 1 setting. |
| 0033 | Sampling data 4 setting | 00000000h | 00000000h to 00FF14FFh | Same as the sampling data 1 setting. |
| 0034 | Sampling data 5 setting | 00000000h | 00000000h to 00FF14FFh | Same as the sampling data 1 setting. |
| 0035 | Sampling data 6 setting | 00000000h | 00000000h to 00FF14FFh | Same as the sampling data 1 setting. |
| 0036 | Sampling data 7 setting | 00000000h | 00000000h to 00FF14FFh | Same as the sampling data 1 setting. |
| 0037 | Sampling data 8 setting | 00000000h | 00000000h to 00FF14FFh | Same as the sampling data 1 setting. |
| 0038 | Sampling data 9 setting | 00000000h | 00000000h to 00FF14FFh | Same as the sampling data 1 setting. |
| 0039 | Sampling data 10 setting | 00000000h | 00000000h to 00FF14FFh | Same as the sampling data 1 setting. |
| 003A | Sampling data 11 setting | 00000000h | 00000000h to 00FF14FFh | Same as the sampling data 1 setting. |
| 003B | Sampling data 12 setting | 00000000h | 00000000h to 00FF14FFh | Same as the sampling data 1 setting. |
| 003C | Sampling data 13 setting | 00000000h | 00000000h to 00FF14FFh | Same as the sampling data 1 setting. |
| 003D | Sampling data 14 setting | 00000000h | 00000000h to 00FF14FFh | Same as the sampling data 1 setting. |
| 003E | Sampling data 15 setting | 00000000h | 00000000h to 00FF14FFh | Same as the sampling data 1 setting. |
| 003F | Sampling data 16 setting | 00000000h | 00000000h to 00FF14FFh | Same as the sampling data 1 setting. |

| Setting No. | Name | Initial value | Setting range | Remarks |
|---|---|---|---|---|
| 0040 | Sampling data 17 setting | 00000000h | 00000000h to 00FF14FFh | Same as the sampling data 1 setting. |
| 0041 | Sampling data 18 setting | 00000000h | 00000000h to 00FF14FFh | Same as the sampling data 1 setting. |
| 0042 | Sampling data 19 setting | 00000000h | 00000000h to 00FF14FFh | Same as the sampling data 1 setting. |
| 0043 | Sampling data 20 setting | 00000000h | 00000000h to 00FF14FFh | Same as the sampling data 1 setting. |
| 0044 | Sampling data 21 setting | 00000000h | 00000000h to 00FF14FFh | Same as the sampling data 1 setting. |
| 0045 | Sampling data 22 setting | 00000000h | 00000000h to 00FF14FFh | Same as the sampling data 1 setting. |
| 0046 | Sampling data 23 setting | 00000000h | 00000000h to 00FF14FFh | Same as the sampling data 1 setting. |
| 0047 | Sampling data 24 setting | 00000000h | 00000000h to 00FF14FFh | Same as the sampling data 1 setting. |
| 0048 | Sampling data 25 setting | 00000000h | 00000000h to 00FF14FFh | Same as the sampling data 1 setting. |
| 0049 | Sampling data 26 setting | 00000000h | 00000000h to 00FF14FFh | Same as the sampling data 1 setting. |
| 004A | Sampling data 27 setting | 00000000h | 00000000h to 00FF14FFh | Same as the sampling data 1 setting. |
| 004B | Sampling data 28 setting | 00000000h | 00000000h to 00FF14FFh | Same as the sampling data 1 setting. |
| 004C | Sampling data 29 setting | 00000000h | 00000000h to 00FF14FFh | Same as the sampling data 1 setting. |
| 004D | Sampling data 30 setting | 00000000h | 00000000h to 00FF14FFh | Same as the sampling data 1 setting. |
| 004E | Sampling data 31 setting | 00000000h | 00000000h to 00FF14FFh | Same as the sampling data 1 setting. |
| 004F | Sampling data 32 setting | 00000000h | 00000000h to 00FF14FFh | Same as the sampling data 1 setting. |
| 0050 | For manufacturer setting | 00000000h | | |
| : | | : | | |
| 006F | | 00000000h | | |

| Setting No. | Name | Initial value | Setting range | Remarks |
|---|---|---|---|---|
| 0070 | Sampling bit information setting 1 (Note) | 00000000h | 00000000h to 0FFF03FFh | 0 ☐☐☐☐☐☐☐<br>Monitor No.<br>Set the monitor number including the bit information to be sampled.<br>0000h: Not selected<br>0300h to 03FFh: operation information<br>Axis No./Station No.<br>Set the axis No. of sampling data 1.<br>00h to 1Fh: Axis No.-1<br>Example: 00h: Axis No.1<br>80h to 83h: Station No.-1+80h<br>Example: 80h: Station No.1<br>Bit No.<br>Set the bit number of the sampling bit information 1.<br>0h to Fh: Bit No.0 to F |
| 0071 | Sampling bit information 2 setting | 00000000h | 00000000h to 0FFF04FFh | Same as the sampling bit information 1 setting. |
| 0072 | Sampling bit information 3 setting | 00000000h | 00000000h to 0FFF04FFh | Same as the sampling bit information 1 setting. |
| 0073 | Sampling bit information 4 setting | 00000000h | 00000000h to 0FFF04FFh | Same as the sampling bit information 1 setting. |
| 0074 | Sampling bit information 5 setting | 00000000h | 00000000h to 0FFF04FFh | Same as the sampling bit information 1 setting. |
| 0075 | Sampling bit information 6 setting | 00000000h | 00000000h to 0FFF04FFh | Same as the sampling bit information 1 setting. |
| 0076 | Sampling bit information 7 setting | 00000000h | 00000000h to 0FFF04FFh | Same as the sampling bit information 1 setting. |
| 0077 | Sampling bit information 8 setting | 00000000h | 00000000h to 0FFF04FFh | Same as the sampling bit information 1 setting. |
| 0078 | Sampling bit information 9 setting | 00000000h | 00000000h to 0FFF04FFh | Same as the sampling bit information 1 setting. |
| 0079 | Sampling bit information 10 setting | 00000000h | 00000000h to 0FFF04FFh | Same as the sampling bit information 1 setting. |
| 007A | Sampling bit information 11 setting | 00000000h | 00000000h to 0FFF04FFh | Same as the sampling bit information 1 setting. |
| 007B | Sampling bit information 12 setting | 00000000h | 00000000h to 0FFF04FFh | Same as the sampling bit information 1 setting. |
| 007C | Sampling bit information 13 setting | 00000000h | 00000000h to 0FFF04FFh | Same as the sampling bit information 1 setting. |
| 007D | Sampling bit information 14 setting | 00000000h | 00000000h to 0FFF04FFh | Same as the sampling bit information 1 setting. |
| 007E | Sampling bit information 15 setting | 00000000h | 00000000h to 0FFF04FFh | Same as the sampling bit information 1 setting. |
| 007F | Sampling bit information 16 setting | 00000000h | 00000000h to 0FFF04FFh | Same as the sampling bit information 1 setting. |
| 0080 | For manufacturer setting | 00000000h | | |
| : | | : | | |
| 00AF | | 00000000h | | |

Note. For the bits which are able to be sampled and their settings (monitor number and bit number), refer to the Section 7.12.7 Sampling items.

### 7.12.6 Number of sampled points

By setting the number of sampled 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) is specified by percentage to the number of sampled points. However, when the number of sampled points exceeds 8192, the percentage is to 8192.
For when the number of sampled points is 8192 or less, and 8193 or more, the characteristics are shown below.

(1) When the number of sampled points is 8192 or less
When sampling of the points set in the sampling points (sampling setting No.0002) is completed, sampling itself is completed automatically. Since the host controller is required to read the sampling data buffer area after the sampling is completed, the load on the host controller is light, however, on the other hand, sampling for a long time cannot be executed.

(2) When the number of sampled points is 8193 or more
Points which are set to the sampling points (sampling setting No.0002) are sampled by the position board. However, the host controller is required to read sampled data during the sampling, the load on the host controller is high.
The sampling data buffer area of the position board internal memory is regarded as the ring buffer of 256 pages (8192 points), and the host controller and the position board read the sampling data read area with executing exclusive control based on the page number.

| POINT |
| --- |
| ・The larger the pre-trigger setting is, the higher the load on the host controller is since it is required to read the sampling data in a short time after the trigger conditions are met. As an example, when pre-trigger is set to 90%, after the trigger conditions are met, the host controller is required to complete reading the data sampled by pre-trigger (at least 1 page) before the position board completes the sampling of 10% left. |

### 7.12.7 Sampling items

Sampling items are sampling data and sampling bit information. By setting axis No./station No. and monitor number to be sampled in sampling data, arbitrary monitor data can be sampled. Up to 32 items of monitor data can be specified. Axis data command/status bit (address 1000h to 100Fh, 1060h to 106Fh) can be sampled as sampling bit information. Up to 16 items of bit information can be specified.
Examples of the sampling items are shown below.

(1) For operation information
Monitor No.0300, 0301 (current command position), monitor No.0302, 0303 (current feedback position), monitor No.0304, 0305 (moving speed) etc. For details, refer to Section 12.4.

(2) For servo information
Monitor No.0200, 0201 (position feedback), monitor No.0204, 0205 (position droop) etc. For details, refer to Section 12.2.

(3) For axis bit information
During operation signal (OP), completion of operation signal (OPF), servo alarm signal (SALM) etc. For details, refer to the following tables.

(a) Axis data command bit

| Monitor No. | Content |
|---|---|
| 0380 | |
| 0381 | |
| 0382 | |
| 0383 | |

**0380**

| Bit No. | Abbreviation | Signal name |
|---|---|---|
| 0 | SON | Servo on |
| 1 | | Reserved |
| 2 | | |
| 3 | | |
| 4 | TL | Torque limit |
| 5 | SRST | Servo alarm reset |
| 6 | | Reserved |
| 7 | | |

| Bit No. | Abbreviation | Signal name |
|---|---|---|
| 8 | ST | Start operation |
| 9 | DIR | Movement direction |
| 10 | STP | Stop operation |
| 11 | RSTP | Rapid stop |
| 12 | | Reserved |
| 13 | ORST | Operation alarm reset |
| 14 | | Reserved |
| 15 | | |

**0381**

| Bit No. | Abbreviation | Signal name |
|---|---|---|
| 0 | AUT | Automatic operation mode |
| 1 | ZRN | Home position return mode |
| 2 | JOG | JOG operation mode |
| 3 | S | Incremental feed mode |
| 4 | | Reserved |
| 5 | LIP | Linear interpolation mode |
| 6 | DST | Home position reset mode |
| 7 | | Reserved |

| Bit No. | Abbreviation | Signal name |
|---|---|---|
| 8 | | Reserved |
| 9 | | |
| 10 | | |
| 11 | | |
| 12 | | |
| 13 | | |
| 14 | | |
| 15 | | |

**0382**

| Bit No. | Abbreviation | Signal name |
|---|---|---|
| 0 | ITL | Interlock |
| 1 | RMONR | High speed monitor latch command |
| 2 | | Reserved |
| 3 | | |
| 4 | LSPC | + side limit switch input |
| 5 | LSNC | - side limit switch input |
| 6 | DOGC | Proximity dog input |
| 7 | | Reserved |

| Bit No. | Abbreviation | Signal name |
|---|---|---|
| 8 | SCHG | Change speed |
| 9 | TACHG | Change acceleration time constant |
| 10 | TDCHG | Change deceleration time constant |
| 11 | PCHG | Position change |
| 12 | | Reserved |
| 13 | | |
| 14 | | |
| 15 | | |

**0383**

| Bit No. | Abbreviation | Signal name |
|---|---|---|
| 0 | FST | Fast start operation |
| 1 | | Reserved |
| 2 | | |
| 3 | | |
| 4 | | |
| 5 | | |
| 6 | | |
| 7 | | |

| Bit No. | Abbreviation | Signal name |
|---|---|---|
| 8 | PPISTP | Pass position interrupt cancel |
| 9 | | Reserved |
| 10 | | |
| 11 | | |
| 12 | | |
| 13 | | |
| 14 | | |
| 15 | | |

| Monitor No. | Content |
|---|---|

**0384**

| Bit No. | Abbreviation | Signal name |
|---|---|---|
| 0 | GAIN | Gain switching command |
| 1 | FCLS | Fully closed loop control change command |
| 2 | | Reserved |
| 3 | CPC | PID control command |
| 4 | | Reserved |
| 5 | | |
| 6 | | |
| 7 | | |

| Bit No. | Abbreviation | Signal name |
|---|---|---|
| 8 | | Reserved |
| 9 | | |
| 10 | | |
| 11 | | |
| 12 | | |
| 13 | | |
| 14 | | |
| 15 | | |

**0385**

| Bit No. | Abbreviation | Signal name |
|---|---|---|
| 0 | | Reserved |
| 1 | | |
| 2 | | |
| 3 | | |
| 4 | ZSC | Home position set command |
| 5 | | Reserved |
| 6 | | |
| 7 | | |

| Bit No. | Abbreviation | Signal name |
|---|---|---|
| 8 | | Reserved |
| 9 | MKC1 | Mark detection clear command 1 |
| 10 | MKD1 | Mark detection disable command 1 |
| 11 | MKSEN1 | Mark detection setting enable command 1 |
| 12 | | Reserved |
| 13 | MKC2 | Mark detection clear command 2 |
| 14 | MKD2 | Mark detection disable command 2 |
| 15 | MKSEN2 | Mark detection setting enable command 2 |

**0386**

| Bit No. | Abbreviation | Signal name |
|---|---|---|
| 0 | | Reserved |
| 1 | | |
| 2 | | |
| 3 | | |
| 4 | CTLMC | Control mode switch command |
| 5 | | Reserved |
| 6 | | |
| 7 | | |

| Bit No. | Abbreviation | Signal name |
|---|---|---|
| 8 | | Reserved |
| 9 | | |
| 10 | | |
| 11 | | |
| 12 | | |
| 13 | | |
| 14 | | |
| 15 | | |

**0387**

| Bit No. | Abbreviation | Signal name |
|---|---|---|
| 0 | | Reserved |
| 1 | | |
| 2 | | |
| 3 | | |
| 4 | | |
| 5 | | |
| 6 | | |
| 7 | | |

| Bit No. | Abbreviation | Signal name |
|---|---|---|
| 8 | | Reserved |
| 9 | | |
| 10 | | |
| 11 | | |
| 12 | | |
| 13 | | |
| 14 | | |
| 15 | | |

(b) Axis data status bit

| Monitor No. | Content |
|---|---|

**03A0**

| Bit No. | Abbreviation | 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 | Servo alarm |
| 6 | SWRN | Servo warning |
| 7 | ABSE | Absolute position erased |

| Bit No. | Abbreviation | Signal name |
|---|---|---|
| 8 | OP | During operation |
| 9 | CPO | Rough match |
| 10 | PF | Positioning complete |
| 11 | ZP | Home position return complete |
| 12 | SMZ | During smoothing of stopping |
| 13 | OALM | Operation alarm |
| 14 | OPF | Completion of operation |
| 15 | PSW | Position switch |

**03A1**

| Bit No. | Abbreviation | Signal name |
|---|---|---|
| 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 | | Reserved |
| 5 | LIPO | In linear interpolation mode |
| 6 | DSTO | In home position reset mode |
| 7 | | Reserved |

| Bit No. | Abbreviation | Signal name |
|---|---|---|
| 8 | | Reserved |
| 9 | | |
| 10 | | |
| 11 | | |
| 12 | | |
| 13 | | |
| 14 | | |
| 15 | | |

**03A2**

| Bit No. | Abbreviation | Signal name |
|---|---|---|
| 0 | ISTP | Interlock stop |
| 1 | RMRCH | High speed monitor is latched |
| 2 | POV | Stop position over-bound |
| 3 | STO | Start up acceptance complete |
| 4 | | Reserved |
| 5 | | |
| 6 | ZREQ | Home position return request |
| 7 | | Reserved |

| Bit No. | Abbreviation | Signal name |
|---|---|---|
| 8 | SCF | Completion of preparation for changing speed |
| 9 | TACF | Completion of preparation for changing acceleration time constant |
| 10 | TDCF | Completion of preparation for changing deceleration time constant |
| 11 | PCF | Completion of preparation for changing position |
| 12 | SCE | Speed change error |
| 13 | TACE | Acceleration time constant change error |
| 14 | TDCE | Deceleration time constant change error |
| 15 | PCE | Position change error |

**03A3**

| Bit No. | Abbreviation | Signal name |
|---|---|---|
| 0 | | Reserved |
| 1 | | |
| 2 | | |
| 3 | | |
| 4 | | |
| 5 | | |
| 6 | | |
| 7 | | |

| Bit No. | Abbreviation | Signal name |
|---|---|---|
| 8 | PPIOP | Pass position interrupt |
| 9 | PPIFIN | Pass position interrupt complete |
| 10 | PPIERR | Pass position interrupt incomplete |
| 11 | | Reserved |
| 12 | | |
| 13 | | |
| 14 | | |
| 15 | AUTLO | In point table loop |

| Monitor No. | Content |
|---|---|

**03A4**

| Bit No. | Abbreviation | Signal name |
|---|---|---|
| 0 | GAINO | During gain switching |
| 1 | FCLSO | Fully closed loop control changing |
| 2 | TLSO | Selecting torque limit |
| 3 | SPC | During PID control |
| 4 | | Reserved |
| 5 | | |
| 6 | | |
| 7 | PRSMO | During continuous operation to torque control |

| Bit No. | Abbreviation | Signal name |
|---|---|---|
| 8 | IWT | Interference check standby |
| 9 | SINP | Servo amplifier in-position |
| 10 | | Reserved |
| 11 | | |
| 12 | | |
| 13 | | |
| 14 | | |
| 15 | | |

**03A5**

| Bit No. | Abbreviation | Signal name |
|---|---|---|
| 0 | | Reserved |
| 1 | | |
| 2 | | |
| 3 | | |
| 4 | ZSF | Home position set complete |
| 5 | ZSE | Home position set error |
| 6 | | Reserved |
| 7 | | |

| Bit No. | Abbreviation | Signal name |
|---|---|---|
| 8 | MKIF1 | Mark detection compatible information 1 |
| 9 | MKCF1 | Mark detection clear complete 1 |
| 10 | MKDO1 | Mark detection disabled 1 |
| 11 | MKSEF1 | Mark detection setting enable complete 1 |
| 12 | MKIF2 | Mark detection compatible information 2 |
| 13 | MKCF2 | Mark detection clear complete 2 |
| 14 | MKDO2 | Mark detection disabled 2 |
| 15 | MKSEF2 | Mark detection setting enable complete 2 |

**03A6**

| Bit No. | Abbreviation | Signal name |
|---|---|---|
| 0 | | Reserved |
| 1 | | |
| 2 | | |
| 3 | | |
| 4 | CTLMCF | Control mode switch complete |
| 5 | CTLMCE | Control mode switch error |
| 6 | | Reserved |
| 7 | | |

| Bit No. | Abbreviation | Signal name |
|---|---|---|
| 8 | | Reserved |
| 9 | | |
| 10 | | |
| 11 | | |
| 12 | | |
| 13 | | |
| 14 | | |
| 15 | | |

**03A7**

| Bit No. | Abbreviation | Signal name |
|---|---|---|
| 0 | | Reserved |
| 1 | | |
| 2 | | |
| 3 | | |
| 4 | | |
| 5 | | |
| 6 | | |
| 7 | | |

| Bit No. | Abbreviation | Signal name |
|---|---|---|
| 8 | | Reserved |
| 9 | | |
| 10 | | |
| 11 | | |
| 12 | | |
| 13 | | |
| 14 | | |
| 15 | | |

POINT

・Up to 3 items (total of sampling data and sampling bit information) can be specified for the servo information. If more than 4 items are set, sampling error (SMPE: ON) occurs when sampling is started and the bit of the sampling error information corresponding to the fourth item turns on. However, there is no restriction for the number of the items in the following servo information.
  ・Monitor No.0200 (position feedback (lower))
  ・Monitor No.0201 (position feedback (upper))
  ・Monitor No.0204 (position droop (lower))
  ・Monitor No.0205 (position droop (upper))
  ・Monitor No.020B (current feed back)
  ・Monitor No.0220 to 023F (servo parameter error No.)

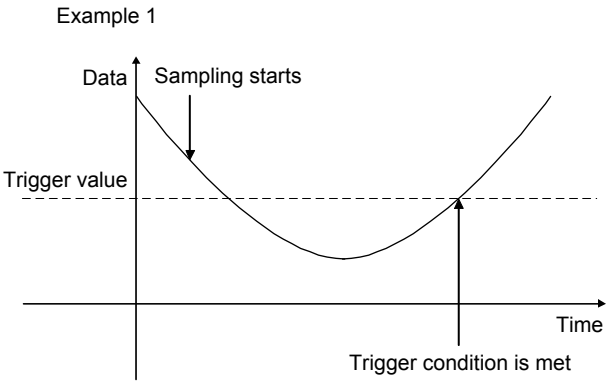
### 7.12.8 Sampling trigger

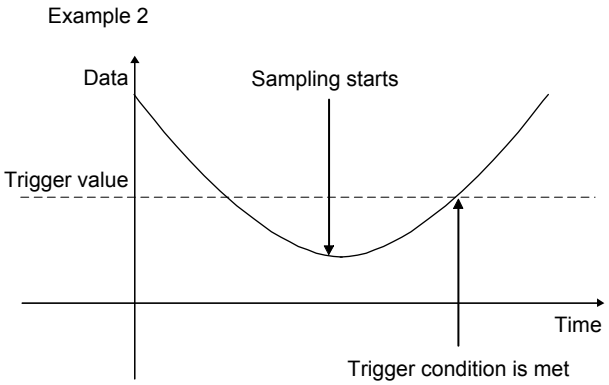
As a trigger for start of sampling, up to 8 conditions can be set. The case when one of the trigger conditions is met or when all of the trigger conditions are met can be set as a trigger. The data or the bit information trigger refers to are selected from set sampling items. There are 4 types of trigger conditions for each of the contents the trigger refers to. (Refer to the following.)

(1) When the trigger content is data

(a) Fulfilled when passing through trigger value in increase direction

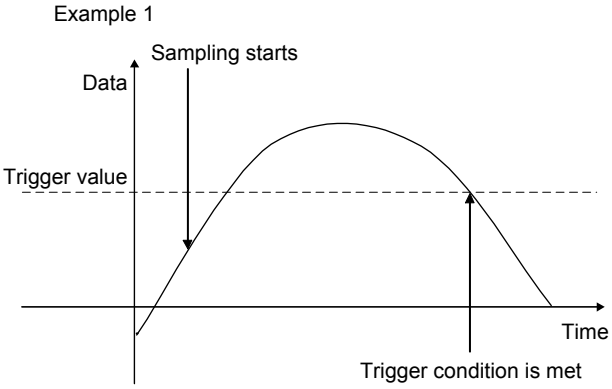
When the data increases from lower than the trigger value to the trigger value or higher, the trigger condition is met.

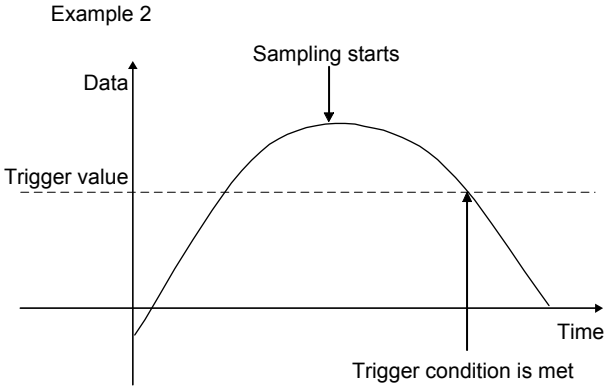



(b) Fulfilled when passing through trigger value in decrease direction

When the data decreases from higher than the trigger value to the trigger value or lower, the trigger condition is met.

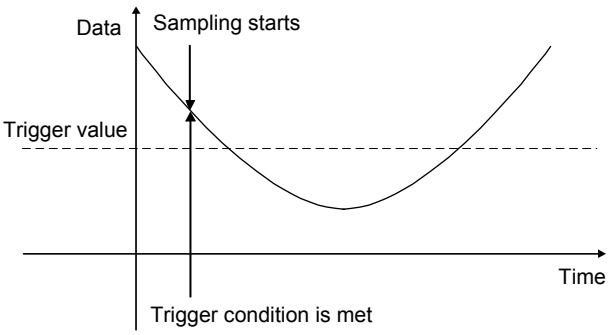


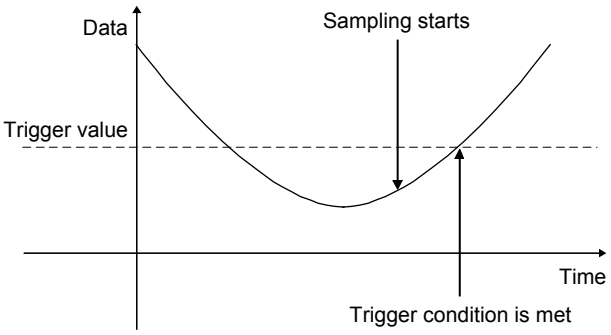
(c) Fulfilled when the data is the same as trigger value or higher

When the data is the same as the trigger value or higher, the trigger condition is met.

Example 1



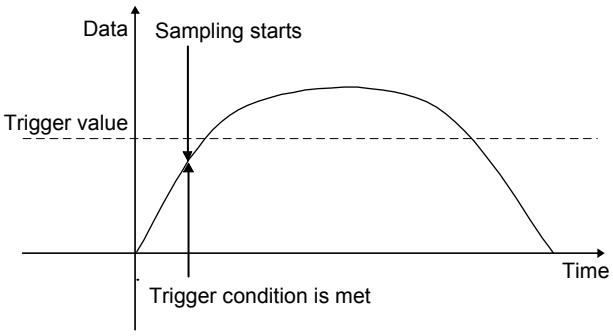

Example 2



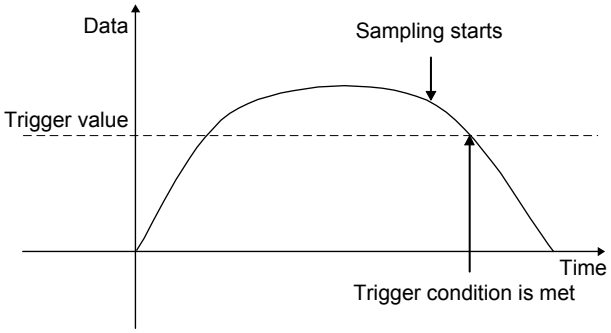

(d) Fulfilled when the data is the same as trigger value or lower

When the data is the same as the trigger value or lower, the trigger condition is met.

Example 1



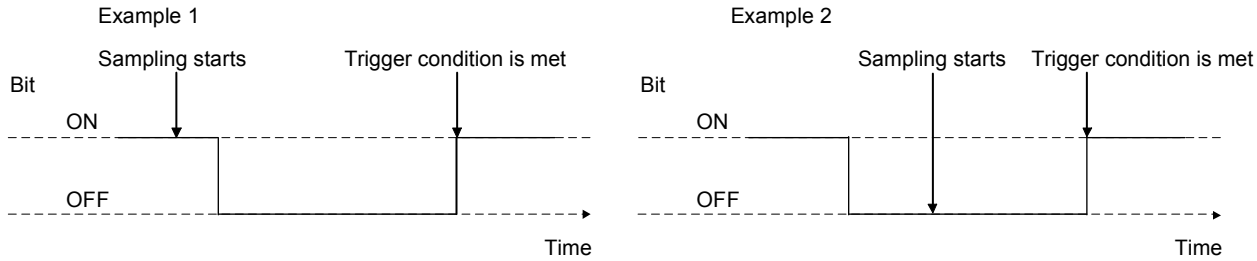

Example 2



(2) When the trigger content is bit information

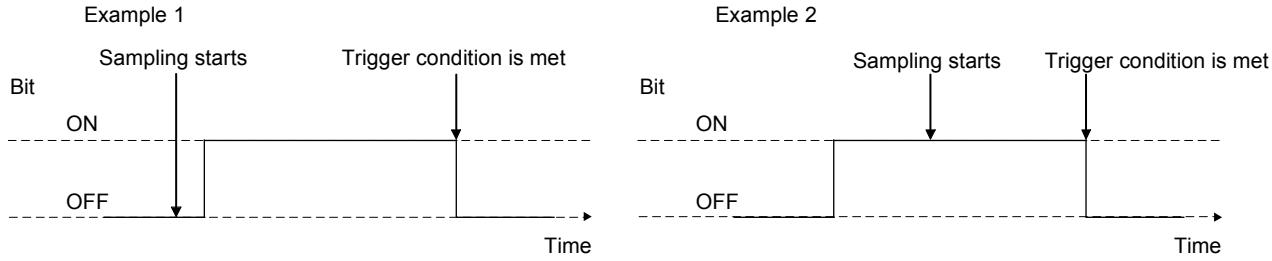
(a) Fulfilled by leading edge of bit

When the bit turns on from off, the trigger conditions are met.



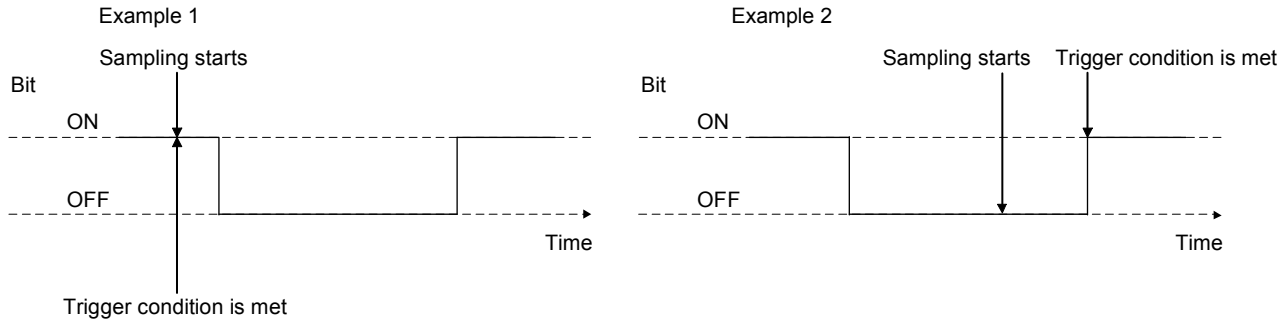

(b) Fulfilled by trailing edge of bit

When the bit turns off from on, the trigger conditions are met.



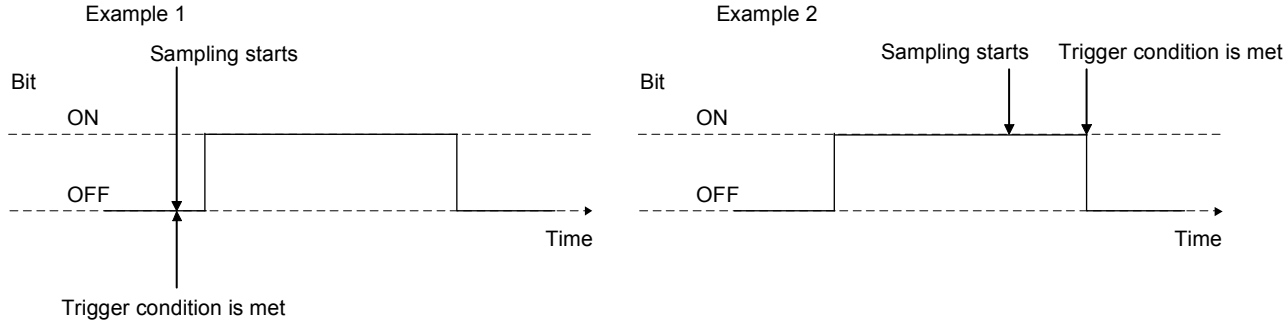

(c) Fulfilled while bit is on

While the bit is on, the trigger condition is met.




(d) Fulfilled while bit is off

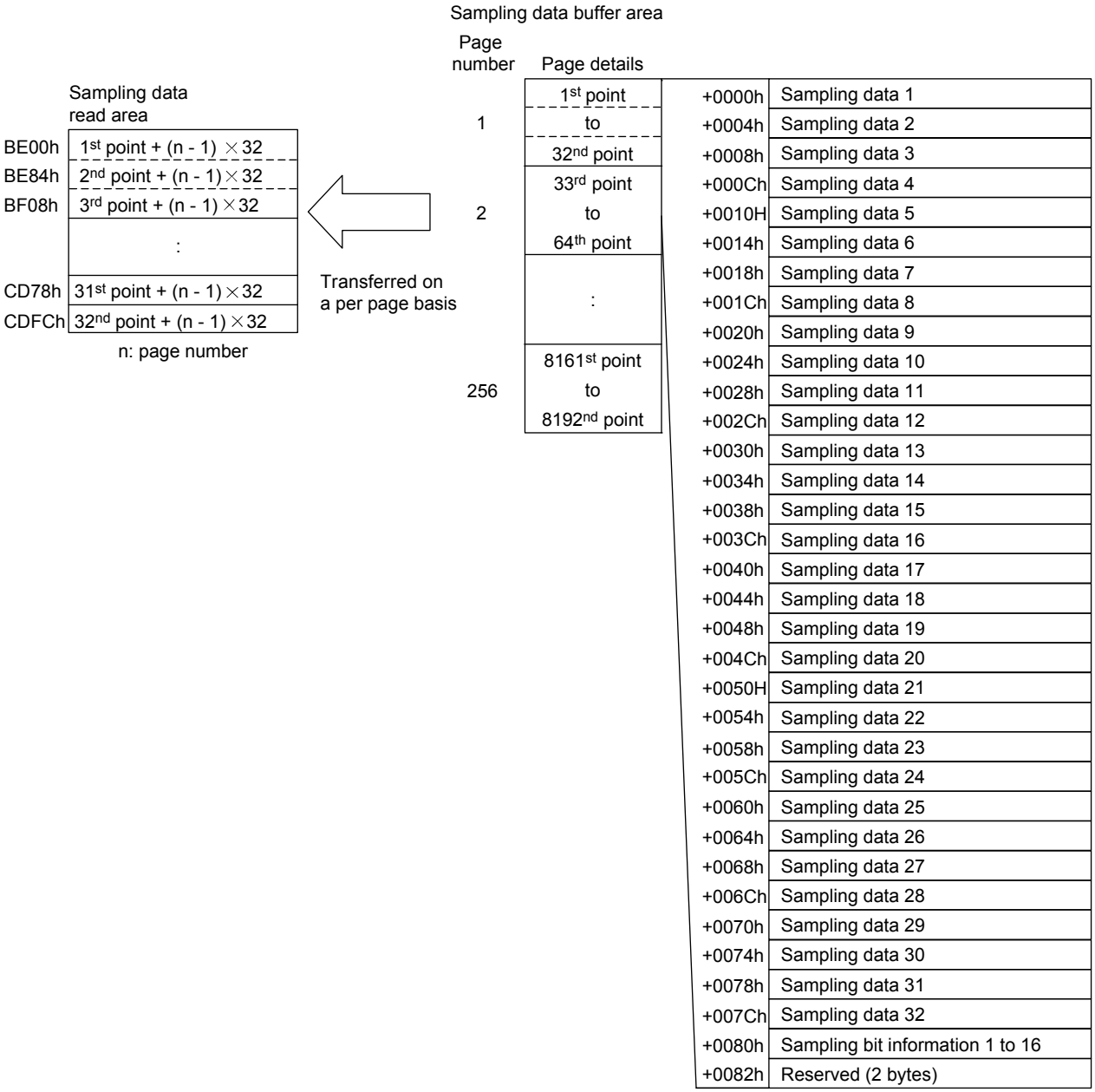
While the bit is off, the trigger condition is met.



### 7.12.9 Sampling data read

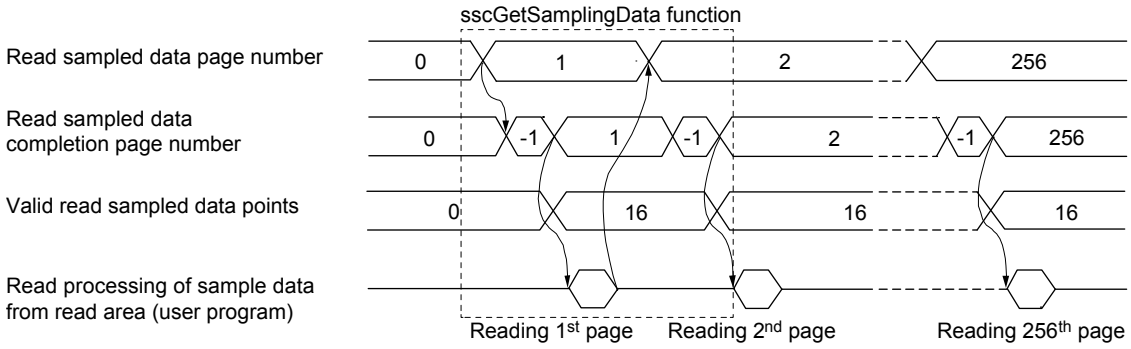
Sampled data of 8192 points is stored in the sampling data buffer area of the position board internal memory. Sampled data is transferred to the sampling data read area divided in units of a page (32 points/page). For the sampling data read during the sampling, refer to the Section 7.12.10.

(1) Sampling data read area



(2) A timing chart of reading of sampled data

To read the sampled data, set the page number to be transferred to the sample read page number. When detecting the change of the sampling read page number, the position board transfers the sampled data corresponding to the page number 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 number 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 number is -2 (sampling read error) and sampled data will not be read.
  - When the sample read page number is incorrect
  - When the next page number of the sampling completion page number is specified during sampling
- When the page number is changed from other than 0 to 0 during sampling, sampling is finished (sampling error (SMPE) turns on). The read sampled data completion page number becomes 0 and sampling data read area is cleared to 0.
- The change of sample read number is invalid while the data is being transferred to the sampling data read area (transferring the page number before changed is continued). After completion of the sample read, the sampled data of changed page number is started to be transferred.
- When 0 is set to the sampling read page number, sampling data read area is cleared to 0.
- The position board does not start transferring sampled data until the sampling read page number is changed. When the same page number is needed to be set, such as to update the contents of the sampling data read area, set the sampling read page number to 0. After confirming the page number is 0, specify the page number to be transferred.

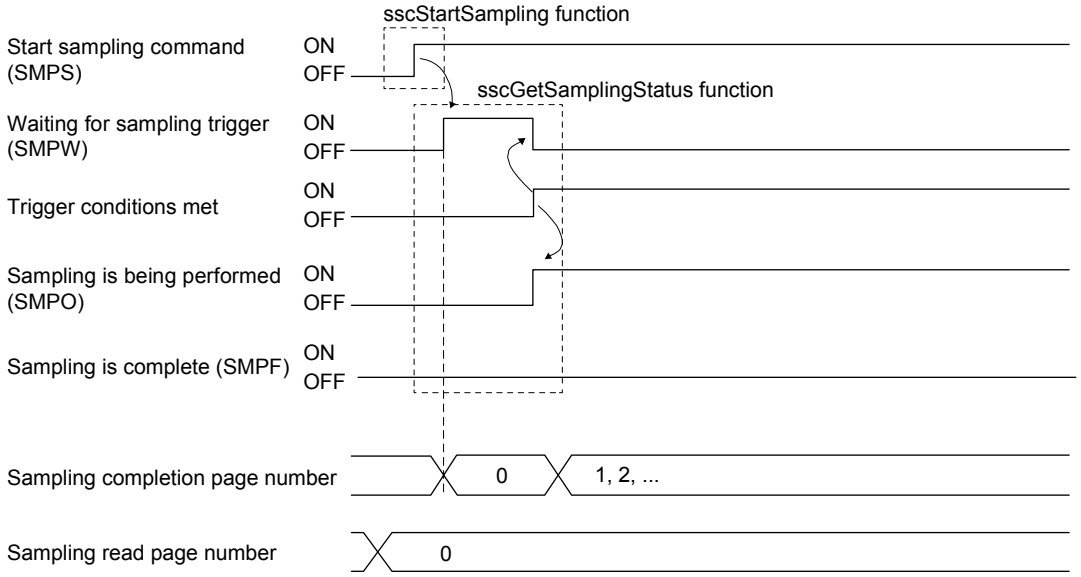
7.12.10 Timing chart for sampling function

A timing chart for the sampling function is shown below.

(1) When the number of sampled points is 8192 or less

1) When setting 8192 to the sampling points and starting sampling of 8192 points

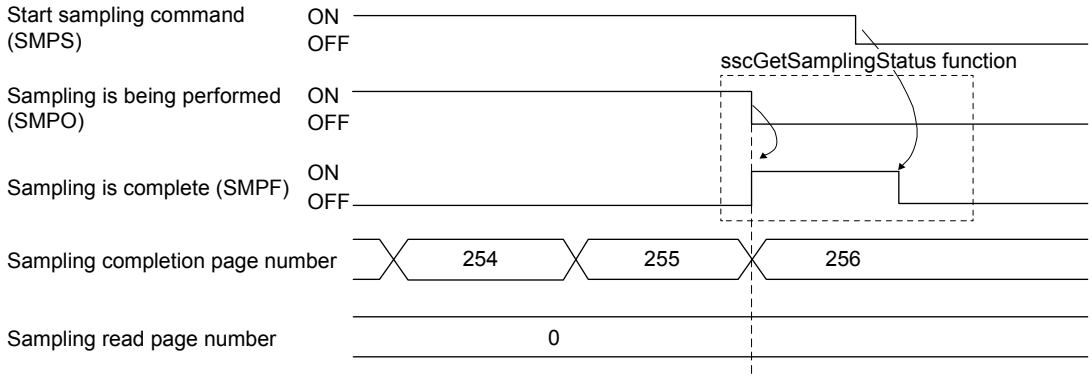
To start the sampling, write the sampling setting previously and turn on the start sampling command (SMPS). When the start sampling command (SMPS) is accepted, the waiting for sampling trigger (SMPW) turns on. Then, after trigger conditions are met, the sampling is being performed (SMPO) turns on.




POINT

- Turn on the start sampling (SMPS) after setting 0 to the sampling read page number.
- In the following cases, sampling error occurs (SMPE: ON).
  - 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 numbers for servo information are designated for the same axis
  - When 0 is not set to the sampling read page number
- When a monitor number is designated for an axis for which communication with the servo amplifier has not been implemented, such as it is not the control axis or an amplifier-less axis, the data to be sampled is always 0 (for bit, off).
  (Sampling error (SMPE) and sampling error information do not turn on.)

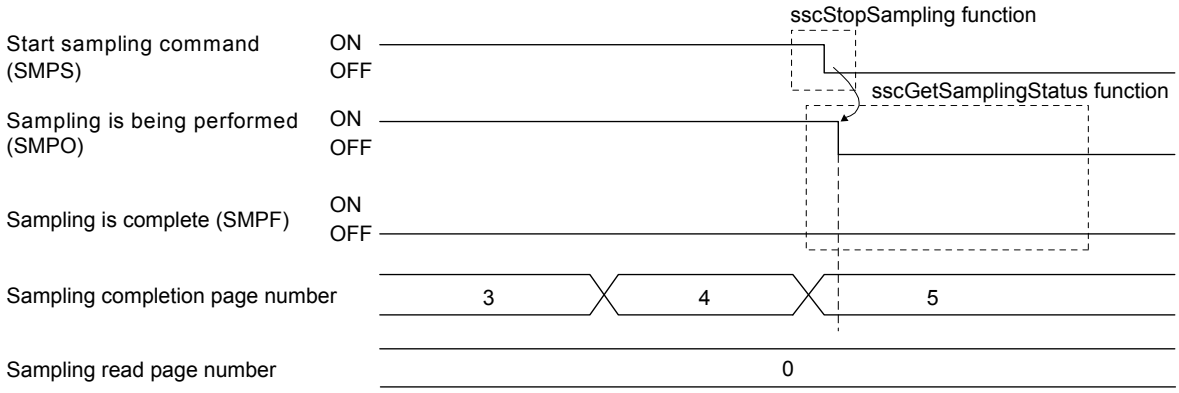
2) When setting 8192 to the sampling points and sampling of 8192 points is completed
When the sampling of specified sampling points is completed, the sampling is completed (SMPF) turns on.




POINT

- In the timing chart above, since 8192 is the multiplication of 32, the valid sampled data (valid sampled read points) in the last page (page 256) are 1 to 32 points.

3) Sampling stopped prior to full completion
When the start sampling command (SMPS) is turned off during the sampling (SMPO: ON), the sampling is being performed (SMPO) turns off and the sampling finishes.

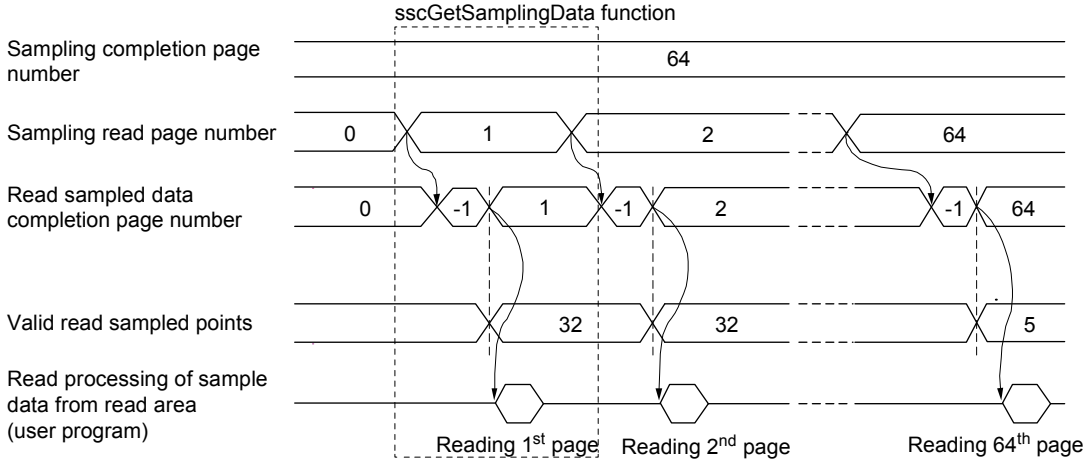



POINT

- The sampling is completed (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.
- When sample data that is read is 0 for points outside of sample valid points.

4) When reading sampled data

After confirming the sampling is being performed (SMPO) is turned off, read the sampled data and valid read sampled points from the page 1 to the page of the sampling completion page number. Sampled data points in the page where the sampling read is completed is stored in the valid read sampled points.



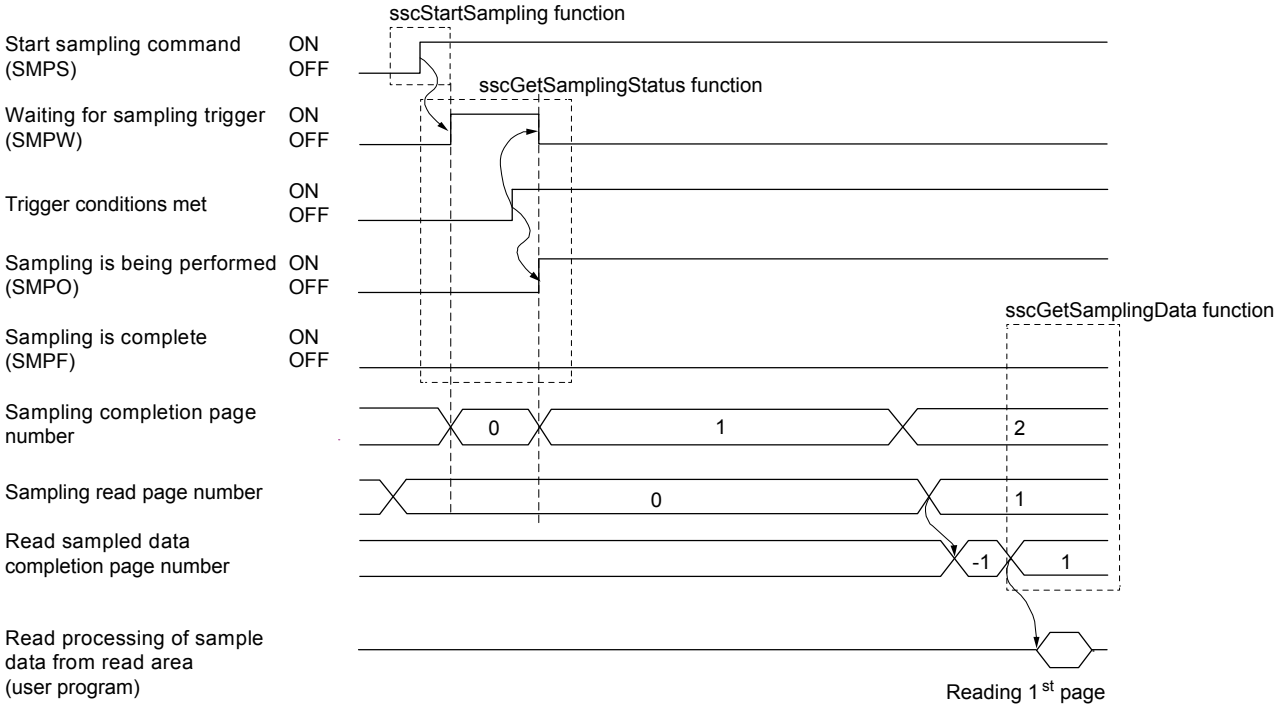

POINT

- 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.
- When sample data that is read is 0 for points outside of sample valid points.
- In the following cases, the sampling read error (Read sampled data completion page number is -2) occurs.
  - When the setting for the sampling read page number is outside of the setting range
  - When the next page number of the sampling completion page number is specified during the sampling

(2) When the number of sampled points is 8193 or more

1) When starting the sampling

To start the sampling, write the sampling setting previously and turn on the start sampling command (SMPS). When the start sampling command (SMPS) is accepted, the waiting for sampling trigger (SMPW) turns on. Then, after trigger conditions are met, the sampling is being performed (SMPO) turns on.



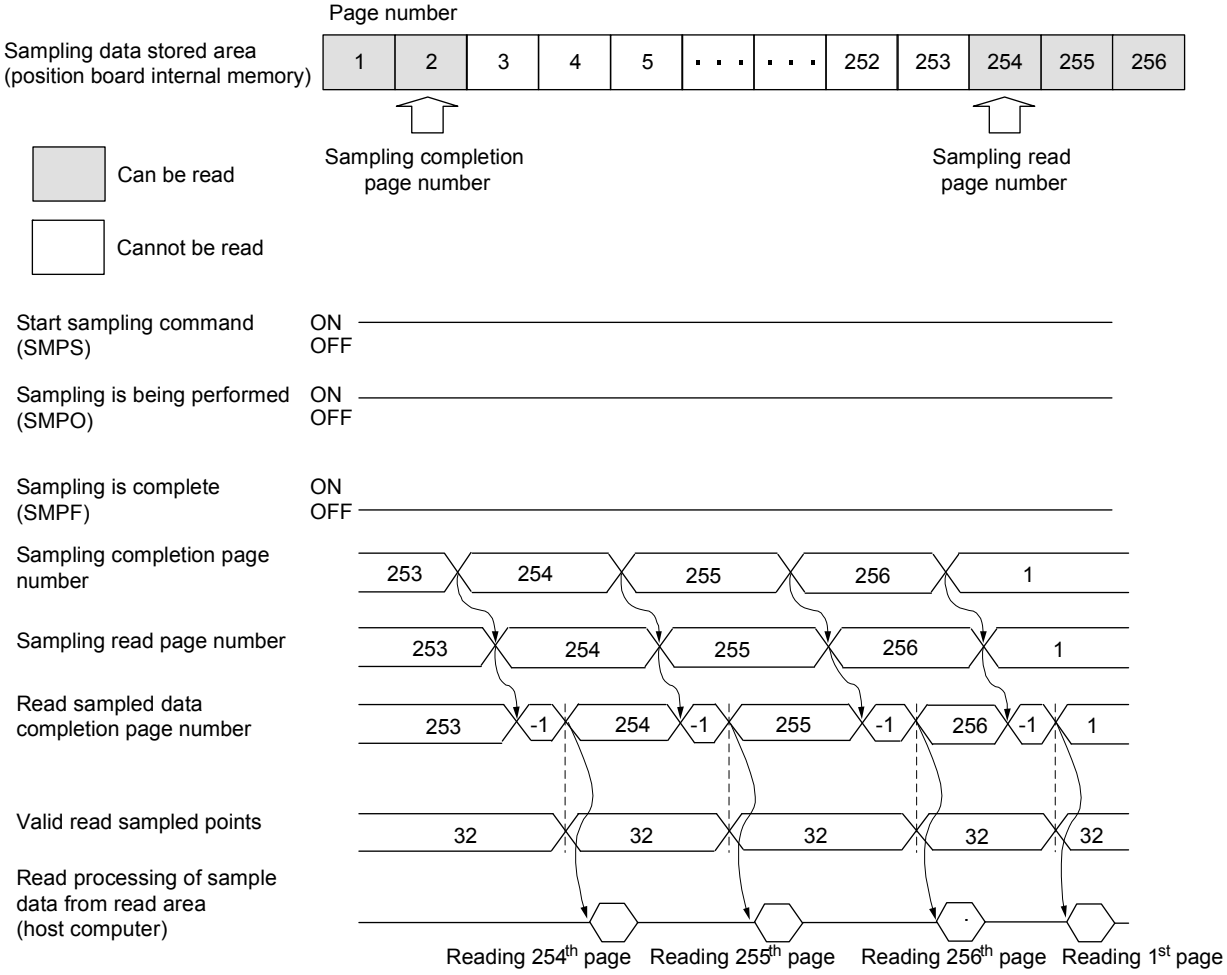

POINT

- Turn on the start sampling (SMPS) after setting 0 to the sampling read page number.
- In the following cases, sampling error occurs (SMPE: ON).
  - 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 numbers for servo information are designated for the same axis
  - When the sampling start signal (SMPS) is turned on when the read sampled data completion page number is -1
- When a monitor number is designated for an amplifier-less axis, the data to be sampled is always 0 (for bit, off).
  (Sampling error (SMPE) and sampling error information do not turn on.)
- When a monitor number related to the servo information is designated for an axis for which communication with the servo amplifier has not been implemented, such as it is not the control axis, the corresponding sampling error information turns on (excluding the amplifier-less axis).
  (The sampling error (SMPE) is not turned on.)

2) Sampling is being performed

The user program reads the sampled data sequentially according to the sampling completion page number.

The user program can read the page from the page of the sampling read page number to the page of the sampling completion page number in numerical order. The sampling data buffer area is a ring buffer of 256 pages. For example, when the sampling read page number is the page 254 and the sampling completion page number is the page 2, the pages 254, 255, 256, 1 and 2 can be read. When the sampling read page number differs from the sampling completion page number, the user program writes the next page number of the sampling read page number and executes the process of reading page.

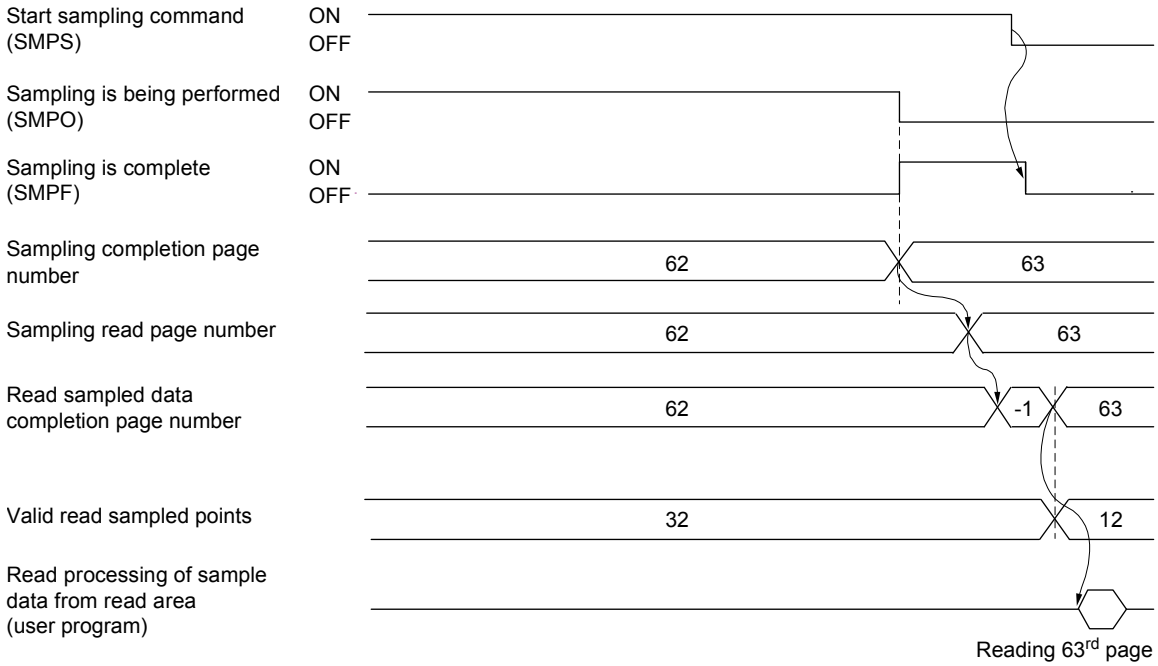


POINT

- In the timing chart above, the sampling read page number differs from the sampling completion page number by 1 page, unless the next page number of the sampling completion page number becomes the sampling read page number, reading sampled data can be delayed.
- In the following cases, the sampling read error (Read sampled data completion page number is -2) occurs.
  - When the setting for the sampling read page number is outside of the setting range.
  - When the next page number of the sampling completion page number is specified during sampling.
- In the following cases during the sampling, sampling error (SMPE: ON) occurs.
  - When the next page number of the sampling completion page number is the same as the sampling read page number.
  - When the sampling completion page number switches to the page 256, with the sampling read page number remaining 0.
  - When the sampling read error (Read sampled data completion page number is -2) occurs.
  - When the page number is changed from other than 0 to 0 during the sampling.
    The read sampled data completion page number becomes 0 and sampling data read area is cleared to 0.

3) When the sampling is completed

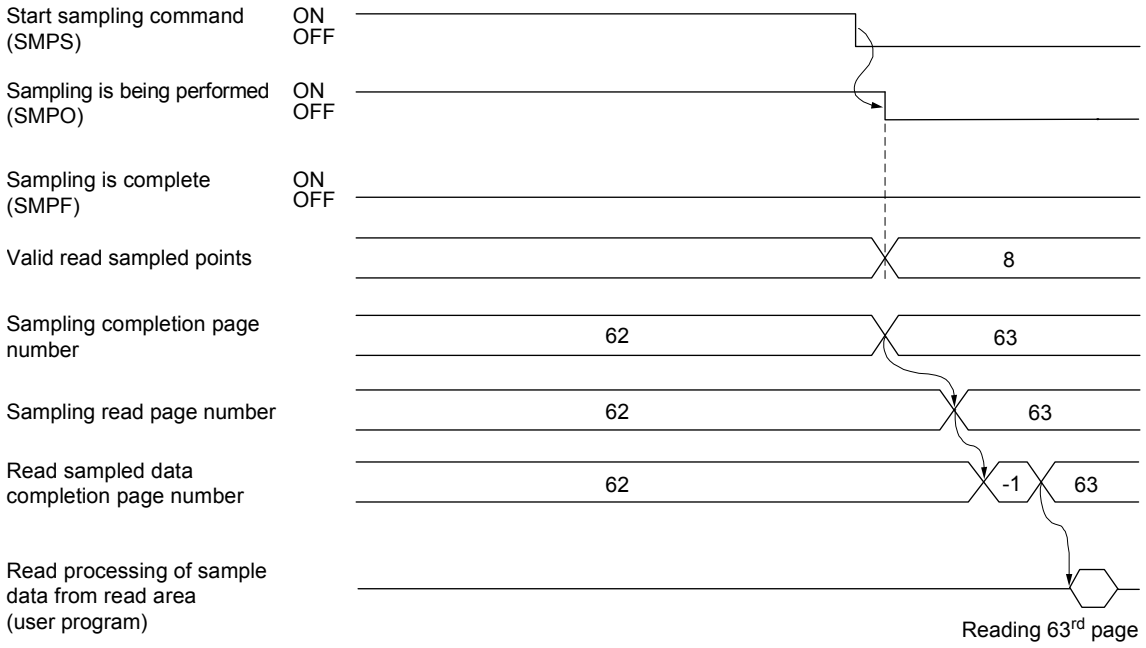
When the sampling of specified points is completed, the sampling is complete (SMPF) turns on.
After confirming the sampling is complete (SMPF) turns on, read until the sampling completion page number.




| POINT |
|---|
| ・In the timing chart above, since the valid read sampled points of the last page of the sampling (63rd page) are 12, the valid sampled data of the last page is 1 to 12 points.<br>・When sample data that is read is 0 for points outside of sample valid points. |

4) Sampling stopped prior to full completion

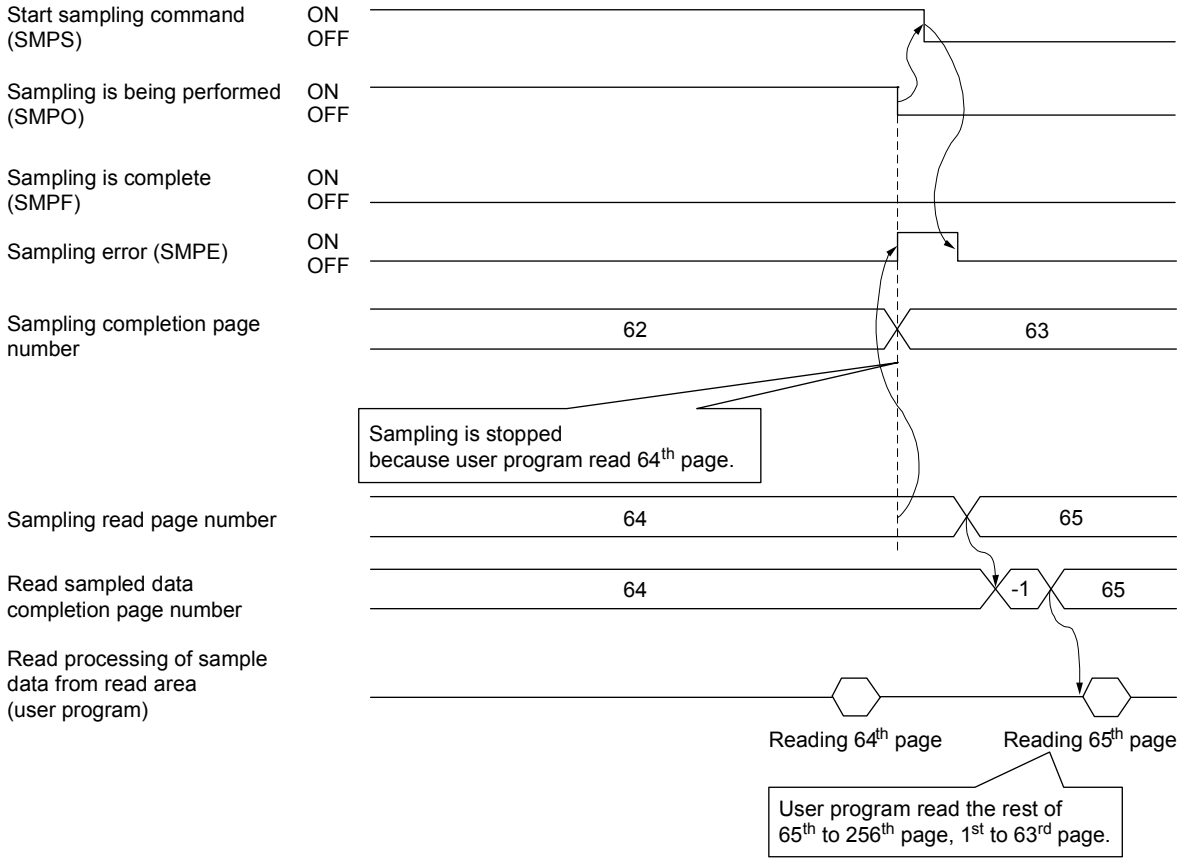
When the start sampling command (SMPS) is turned on during the sampling (SMPO: ON), the sampling is being performed (SMPO) turns off and the sampling finishes. After confirming the sampling is being performed (SMPO) turns off, read until the sampling completion page number.




| POINT |
|---|
| ・In the timing chart above, since the valid read sampled points of the last page of the sampling (63rd page) are 8, the valid sampled data of the last page is 1 to 8 points.<br>・When sample data that is read is 0 for points outside of sample valid points.<br>・The sampling is completed (SMPF) is not turned on. |

5) When the reading of sampled data is not finished in time

When the next page number of the sampling completion page number matches the sampling read page number during the sampling (SMPO: ON), the position board judges that the reading of sampled data is not finished in time and the sampling is finished (the sampling error (SMPE) turns on). After confirming the sampling is being performed (SMPO) turns off, read the unread pages to the page of the read sampled data completion page number and valid read sampled points. The valid data points sampled in the page of the sampling completion page number are stored in the valid sampled read points.

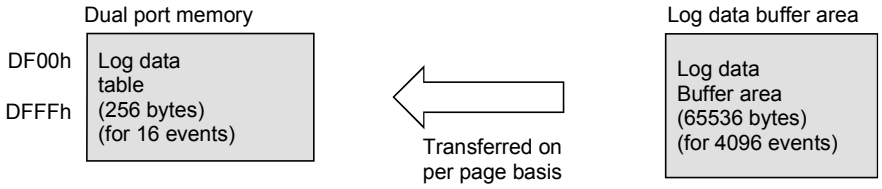



| POINT |
|---|
| ・In the timing chart above, since the sampling is stopped when the sampling of the 63rd page is completed, the valid sampled data of the 63rd page (valid read sampled points) is 32 points.<br>・When sample data that is read is 0 for points outside of sample valid points. |

## 7.13 Log

### 7.13.1 Summary

The log function is a function that stores the status when an event occurs (start operation, completion, alarm occurs etc.) on the position board. The log data is stored in the log data buffer area (internal memory of the position board). When a reading of log data command is generated at a host controller, the log data stored in the log data buffer area is transferred to the dual port memory.
The log data is a ring buffer where the oldest data is deleted sequentially.
The log data is stored in the internal memory of the position board, and the log data is initialized when the power for the position board is turned off, or by a software reboot.




* Log data read to dual port memory from internal memory of position board on per page (for 16 events) basis.

| POINT |
|---|
| ・Reading of log data can be performed in the test tool. |

| API LIBRARY |
|---|
| ・Use the sscStartLog function to start log.<br>・Use the sscStopLog function to stop log.<br>・Use the sscCheckLogStatus function to get log operation status.<br>・Use the sscCheckLogEventNum function to get the number of valid log data events.<br>・Use the sscReadLogData function to get the log data. |

### 7.13.2 Log data details

The log data for 1 event is 16 bytes. The details of the data are shown in the following.

| Offset | Content |
|---|---|
| 0000h | Axis No. |
| 0002h | Event code |
| 0004h | Time stamp |
| 0006h | |
| 0008h | Information for each event |
| 000Ah | |
| 000Ch | |
| 000Eh | |

(1) Axis No.
Axis (station) No. [0 : For events that are common to axes]
[1 to 32 : For events for separate axes]
[1 to 4 : For events for separate stations]

(2) Event code
Refer to Section 7.13.3.

(3) Time stamp
Sets the value of the 32 bit free run counter added to each control cycle. This free run counter value is reset at system start up. It is 0 cleared when a software reboot is performed or when the position board power is turned off and on.

(4) Information for each event
Refer to Section 7.13.4.

### 7.13.3 Event code list

| Event code | Factor | Each axis(station)/common |
|---|---|---|
| 0001h | Start of automatic operation | Each axis |
| 0002h | Start of return to home position | Each axis |
| 0003h | Start of JOG operation | Each axis |
| 0004h | Start of incremental movement | Each axis |
| 0005h | Start of linear interpolation operation | Each axis |
| 0006h | Home position reset startup | Each axis |
| 0011h | Completion of automatic operation | Each axis |
| 0012h | Home position return complete | Each axis |
| 0013h | Completion of JOG operation | Each axis |
| 0014h | Completion of incremental movement | Each axis |
| 0015h | Completion of linear interpolation operation | Each axis |
| 0016h | Home position reset completion | Each axis |
| 0020h | Change speed | Each axis |
| 0021h | Change acceleration time constant | Each axis |
| 0022h | Change deceleration time constant | Each axis |
| 0023h | Position change | Each axis |
| 0100h | Operation alarm occurs | Each axis |
| 0101h | A servo alarm occurs | Each axis |
| 0102h | Start of operation while alarm is set | Each axis |
| 0103h | System alarm occurs | Common |
| 0201h | Parameter initialization | Common |
| 0202h | Writing to parameters | Each axis, Common |
| 0203h | Reading parameters | Each axis, Common |
| 0210h | Backup parameters reading | Common |
| 0211h | Flash ROM parameter backup | Common |
| 0212h | Flash ROM parameter initialization | Common |
| 0300h | Start of system startup | Common |
| 0310h | Completion of system startup | Common |
| 0311h | System error occurs | Common |
| 0402h | Interlock occurs | Each axis |
| 0403h | Interlock cancelled | Each axis |
| 0404h | Stop command (STP) | Each axis |
| 0408h | Rapid stop command (RSTP) | Each axis |
| 0500h | Operation alarm reset | Each axis |
| 0501h | Servo alarm reset | Each axis |
| 0503h | System alarm reset | Common |
| 0601h | Waiting required for interference | Each axis |
| 0602h | Cancellation of waiting for interference | Each axis |
| 0603h | Rough match output | Each axis |
| 0604h | Pass position interrupt start | Each axis |
| 0605h | Pass position interrupt complete | Each axis |
| 0606h | Pass position interrupt incomplete | Each axis |
| 0607h | Pass position interrupt cancel | Each axis |
| 0608h | Pass position interrupt condition satisfied | Each axis |
| 0609h | Point table loop start | Each axis |
| 0800h | Other axes start complete | Common |
| 0801h | Other axes start incomplete | Common |

| Event code | Factor | Each axis(station)/common |
|---|---|---|
| 0900h | SSCNET disconnection command | Common |
| 0901h | SSCNET disconnection complete | Common |
| 0902h | SSCNET disconnection error | Common |
| 0903h | SSCNET reconnection command | Common |
| 0904h | SSCNET reconnection complete | Common |
| 0905h | SSCNET reconnection error | Common |
| 0A00h | Control mode switch complete | Each axis |
| 0A01h | Control mode switch error | Each axis |
| 0B00h | Mark detection signal detection | Each axis |
| 0B01h | Mark detection clear | Each axis |
| 0B02h | Mark detection disable start | Each axis |
| 0B03h | Mark detection disable cancel | Each axis |
| 0B04h | Mark detection setting enable | Each axis |
| 0C00h | Transient transmit start | Each axis |
| 0C01h | Transient transmit error occurrence | Each axis |
| 2100h | RIO control alarm occurrence | Each station |
| 2101h | RIO module alarm occurrence | Each station |
| 2202h | Writing to parameters (remote I/O) | Each station |
| 2500h | RIO control alarm reset | Each station |
| 2501h | RIO module alarm reset | Each station |
| 2C00h | Transient transmit start (remote I/O) | Each station |
| 2C01h | Transient transmit error occurrence (remote I/O) | Each station |

### 7.13.4 Information for each event

Log data set per event is as follows.
Also, details concerning the operation mode noted in the information per event is as follows.

0: Automatic operation
1: Home position return
2: JOG operation
3: Incremental feed
4: Mode not selected
5: Mode error
6: Home position reset
8: Linear interpolation operation

(1) Start of automatic operation

| Offset | Content |
|---|---|
| 0000h | Axis No. |
| 0002h | Event code (0001h) |
| 0004h | Time stamp |
| 0006h | |
| 0008h | Start point No. |
| 000Ah | End point No. |
| 000Ch | Operation startup coordinate |
| 000Eh | |

(2) Start of home position return

| Offset | Content |
|---|---|
| 0000h | Axis No. |
| 0002h | Event code (0002h) |
| 0004h | Time stamp |
| 0006h | |
| 0008h | Home position return speed |
| 000Ah | |
| 000Ch | Creep speed |
| 000Eh | Return to home position mode (Note) |

Note. Follow the home position return method designated in parameter No.0240.

(3) Start of JOG operation

| Offset | Content |
|---|---|
| 0000h | Axis No. |
| 0002h | Event code (0003h) |
| 0004h | Time stamp |
| 0006h | |
| 0008h | Manual feed speed (Note) |
| 000Ah | |
| 000Ch | 0 (fixed value) |
| 000Eh | 0 (fixed value) |

Note. Taken as a negative number when the movement direction is －.

(4) Start of incremental feed

| Offset | Content |
|---|---|
| 0000h | Axis No. |
| 0002h | Event code (0004h) |
| 0004h | Time stamp |
| 0006h | |
| 0008h | Manual feed speed (Note) |
| 000Ah | |
| 000Ch | Incremental feed movement amount |
| 000Eh | |

Note. Taken as a negative number when the movement direction is －.

(5) Start of linear interpolation operation

| Offset | Content |
|---|---|
| 0000h | Axis No. |
| 0002h | Event code (0005h) |
| 0004h | Time stamp |
| 0006h | |
| 0008h | Start point No. |
| 000Ah | End point No. |
| 000Ch | Operation startup coordinate |
| 000Eh | |

(6) Home position reset startup

| Offset | Content |
|---|---|
| 0000h | Axis No. |
| 0002h | Event code (0006h) |
| 0004h | Time stamp |
| 0006h | |
| 0008h | 0 (fixed value) |
| 000Ah | 0 (fixed value) |
| 000Ch | 0 (fixed value) |
| 000Eh | 0 (fixed value) |

(7) Completion of automatic operation

| Offset | Content |
|---|---|
| 0000h | Axis No. |
| 0002h | Event code (0011h) |
| 0004h | Time stamp |
| 0006h | |
| 0008h | Coordinate operation completed |
| 000Ah | |
| 000Ch | 0 (fixed value) |
| 000Eh | 0 (fixed value) |

(8) Home position return complete

| Offset | Content |
|---|---|
| 0000h | Axis No. |
| 0002h | Event code (0012h) |
| 0004h | Time stamp |
| 0006h | |
| 0008h | Completion status (0: normal －1: error) |
| 000Ah | 0 (fixed value) |
| 000Ch | 0 (fixed value) |
| 000Eh | 0 (fixed value) |

(9) Completion of JOG operation

| Offset | Content |
|---|---|
| 0000h | Axis No. |
| 0002h | Event code (0013h) |
| 0004h | Time stamp |
| 0006h | |
| 0008h | Coordinate operation completed |
| 000Ah | |
| 000Ch | 0 (fixed value) |
| 000Eh | 0 (fixed value) |

(10) Completion of incremental feed

| Offset | Content |
|---|---|
| 0000h | Axis No. |
| 0002h | Event code (0014h) |
| 0004h | Time stamp |
| 0006h | |
| 0008h | Coordinate operation completed |
| 000Ah | |
| 000Ch | 0 (fixed value) |
| 000Eh | 0 (fixed value) |

(11) Completion of linear interpolation operation

| Offset | Content |
|---|---|
| 0000h | Axis No. |
| 0002h | Event code (0015h) |
| 0004h | Time stamp |
| 0006h | |
| 0008h | Coordinate operation completed |
| 000Ah | |
| 000Ch | 0 (fixed value) |
| 000Eh | 0 (fixed value) |

(12) Home position reset complete

| Offset | Content |
|---|---|
| 0000h | Axis No. |
| 0002h | Event code (0016h) |
| 0004h | Time stamp |
| 0006h | |
| 0008h | Completion status (0: normal －1: error) |
| 000Ah | 0 (fixed value) |
| 000Ch | 0 (fixed value) |
| 000Eh | 0 (fixed value) |

(13) Change speed

| Offset | Content |
|---|---|
| 0000h | Axis No. |
| 0002h | Event code (0020h) |
| 0004h | Time stamp |
| 0006h | |
| 0008h | Speed after change |
| 000Ah | |
| 000Ch | Status<br>0: Completion of preparation for change<br>1: Change error |
| 000Eh | 0 (fixed value) |

(14) Change acceleration time constant

| Offset | Content |
|---|---|
| 0000h | Axis No. |
| 0002h | Event code (0021h) |
| 0004h | Time stamp |
| 0006h | |
| 0008h | Acceleration time constant after change |
| 000Ah | |
| 000Ch | Status<br>0: Completion of preparation for change<br>1: Change error |
| 000Eh | 0 (fixed value) |

(15) Change deceleration time constant

| Offset | Content |
|---|---|
| 0000h | Axis No. |
| 0002h | Event code (0022h) |
| 0004h | Time stamp |
| 0006h | |
| 0008h | Deceleration time constant after change |
| 000Ah | |
| 000Ch | Status<br>0: Completion of preparation for change<br>1: Change error |
| 000Eh | 0 (fixed value) |

(16) Position change

| Offset | Content |
|---|---|
| 0000h | Axis No. |
| 0002h | Event code (0023h) |
| 0004h | Time stamp |
| 0006h | |
| 0008h | Position after change |
| 000Ah | |
| 000Ch | Status<br>0: Completion of preparation for change<br>1: Change error |
| 000Eh | 0 (fixed value) |

(17) Operation alarm occurs

| Offset | Content |
|---|---|
| 0000h | Axis No. |
| 0002h | Event code (0100h) |
| 0004h | Time stamp |
| 0006h | |
| 0008h | Alarm number |
| 000Ah | Details number |
| 000Ch | 0 (fixed value) |
| 000Eh | 0 (fixed value) |

(18) A servo alarm occurs

| Offset | Content |
|---|---|
| 0000h | Axis No. |
| 0002h | Event code (0101h) |
| 0004h | Time stamp |
| 0006h | |
| 0008h | Alarm number |
| 000Ah | Details number |
| 000Ch | 0 (fixed value) |
| 000Eh | 0 (fixed value) |

(19) Start of operation while alarm is set

| Offset | Content |
|---|---|
| 0000h | Axis No. |
| 0002h | Event code (0102h) |
| 0004h | Time stamp |
| 0006h | |
| 0008h | Alarm number |
| 000Ah | Details number |
| 000Ch | 0 (fixed value) |
| 000Eh | 0 (fixed value) |

(20) System alarm occurs

| Offset | Content |
|---|---|
| 0000h | Axis No. |
| 0002h | Event code (0103h) |
| 0004h | Time stamp |
| 0006h | |
| 0008h | Alarm number |
| 000Ah | Details number |
| 000Ch | 0 (fixed value) |
| 000Eh | 0 (fixed value) |

(21) Parameter initialization

| Offset | Content |
|---|---|
| 0000h | Axis No. |
| 0002h | Event code (0201h) |
| 0004h | Time stamp |
| 0006h | |
| 0008h | System command code |
| 000Ah | 0 (fixed value) |
| 000Ch | 0 (fixed value) |
| 000Eh | 0 (fixed value) |

(22) Writing to parameters

| Offset | Content |
|---|---|
| 0000h | Axis No. |
| 0002h | Event code (0202h) |
| 0004h | Time stamp |
| 0006h | |
| 0008h | Parameter number |
| 000Ah | Parameter setting prior to change |
| 000Ch | Parameter setting after change |
| 000Eh | 0 (fixed value) |

(23) Reading parameters

| Offset | Content |
|---|---|
| 0000h | Axis No. |
| 0002h | Event code (0203h) |
| 0004h | Time stamp |
| 0006h | |
| 0008h | Parameter number |
| 000Ah | Parameter data |
| 000Ch | 0 (fixed value) |
| 000Eh | 0 (fixed value) |

(24) Backup parameters reading

| Offset | Content |
|---|---|
| 0000h | Axis No. |
| 0002h | Event code (0210h) |
| 0004h | Time stamp |
| 0006h | |
| 0008h | 0 (fixed value) |
| 000Ah | 0 (fixed value) |
| 000Ch | 0 (fixed value) |
| 000Eh | 0 (fixed value) |

(25) Flash ROM parameter backup

| Offset | Content |
|---|---|
| 0000h | Axis No. |
| 0002h | Event code (0211h) |
| 0004h | Time stamp |
| 0006h | |
| 0008h | 0 (fixed value) |
| 000Ah | 0 (fixed value) |
| 000Ch | 0 (fixed value) |
| 000Eh | 0 (fixed value) |

(26) Flash ROM parameter initialization

| Offset | Content |
|---|---|
| 0000h | Axis No. |
| 0002h | Event code (0212h) |
| 0004h | Time stamp |
| 0006h | |
| 0008h | 0 (fixed value) |
| 000Ah | 0 (fixed value) |
| 000Ch | 0 (fixed value) |
| 000Eh | 0 (fixed value) |

(27) Start of system startup

| Offset | Content |
|---|---|
| 0000h | Axis No. |
| 0002h | Event code (0300) |
| 0004h | Time stamp |
| 0006h | |
| 0008h | System command code |
| 000Ah | 0 (fixed value) |
| 000Ch | 0 (fixed value) |
| 000Eh | 0 (fixed value) |

(28) Completion of system startup

| Offset | Content |
|---|---|
| 0000h | Axis No. |
| 0002h | Event code (0310h) |
| 0004h | Time stamp |
| 0006h | |
| 0008h | 0 (fixed value) |
| 000Ah | 0 (fixed value) |
| 000Ch | 0 (fixed value) |
| 000Eh | 0 (fixed value) |

(29) System error occurs

| Offset | Content |
|---|---|
| 0000h | Axis No. |
| 0002h | Event code (0311h) |
| 0004h | Time stamp |
| 0006h | |
| 0008h | System status code |
| 000Ah | 0 (fixed value) |
| 000Ch | 0 (fixed value) |
| 000Eh | 0 (fixed value) |

(30) Interlock occurs

| Offset | Content |
|---|---|
| 0000h | Axis No. |
| 0002h | Event code (0402h) |
| 0004h | Time stamp |
| 0006h | |
| 0008h | Operation mode |
| 000Ah | 0 (fixed value) |
| 000Ch | 0 (fixed value) |
| 000Eh | 0 (fixed value) |

(31) Interlock cancelled

| Offset | Content |
|---|---|
| 0000h | Axis No. |
| 0002h | Event code (0403h) |
| 0004h | Time stamp |
| 0006h | |
| 0008h | Operation mode |
| 000Ah | 0 (fixed value) |
| 000Ch | 0 (fixed value) |
| 000Eh | 0 (fixed value) |

(32) Stop command (STP)

| Offset | Content |
|---|---|
| 0000h | Axis No. |
| 0002h | Event code (0404h) |
| 0004h | Time stamp |
| 0006h | |
| 0008h | Operation mode |
| 000Ah | 0 (fixed value) |
| 000Ch | 0 (fixed value) |
| 000Eh | 0 (fixed value) |

(33) Rapid stop command (RSTP)

| Offset | Content |
|---|---|
| 0000h | Axis No. |
| 0002h | Event code (0408h) |
| 0004h | Time stamp |
| 0006h | |
| 0008h | Operation mode |
| 000Ah | 0 (fixed value) |
| 000Ch | 0 (fixed value) |
| 000Eh | 0 (fixed value) |

(34) Operation alarm reset

| Offset | Content |
|---|---|
| 0000h | Axis No. |
| 0002h | Event code (0500h) |
| 0004h | Time stamp |
| 0006h | |
| 0008h | Alarm number when reset is performed |
| 000Ah | Details number when reset is performed |
| 000Ch | 0 (fixed value) |
| 000Eh | 0 (fixed value) |

(35) Servo alarm reset

| Offset | Content |
|---|---|
| 0000h | Axis No. |
| 0002h | Event code (0501h) |
| 0004h | Time stamp |
| 0006h | |
| 0008h | Alarm number when reset is performed |
| 000Ah | Details number when reset is performed |
| 000Ch | 0 (fixed value) |
| 000Eh | 0 (fixed value) |

(36) System alarm reset

| Offset | Content |
|---|---|
| 0000h | Axis No. |
| 0002h | Event code (0503h) |
| 0004h | Time stamp |
| 0006h | |
| 0008h | Alarm number when reset is performed |
| 000Ah | Details number when reset is performed |
| 000Ch | 0 (fixed value) |
| 000Eh | 0 (fixed value) |

(37) Waiting required for interference

| Offset | Content |
|---|---|
| 0000h | Axis No. |
| 0002h | Event code (0601h) |
| 0004h | Time stamp |
| 0006h | |
| 0008h | Operation mode |
| 000Ah | 0 (fixed value) |
| 000Ch | 0 (fixed value) |
| 000Eh | 0 (fixed value) |

(38) Cancellation of waiting for interference

| Offset | Content |
|---|---|
| 0000h | Axis No. |
| 0002h | Event code (0602h) |
| 0004h | Time stamp |
| 0006h | |
| 0008h | Operation mode |
| 000Ah | 0 (fixed value) |
| 000Ch | 0 (fixed value) |
| 000Eh | 0 (fixed value) |

(39) Rough match output

| Offset | Content |
|---|---|
| 0000h | Axis No. |
| 0002h | Event code (0603h) |
| 0004h | Time stamp |
| 0006h | |
| 0008h | Operation mode |
| 000Ah | 0 (fixed value) |
| 000Ch | 0 (fixed value) |
| 000Eh | 0 (fixed value) |

(40) Pass position interrupt start

| Offset | Content |
|---|---|
| 0000h | Axis No. |
| 0002h | Event code (0604h) |
| 0004h | Time stamp |
| 0006h | |
| 0008h | Pass position condition number |
| 000Ah | Pass position option |
| 000Ch | Start coordinate |
| 000Eh | |

(41) Pass position interrupt complete

| Offset | Content |
|---|---|
| 0000h | Axis No. |
| 0002h | Event code (0605h) |
| 0004h | Time stamp |
| 0006h | |
| 0008h | Pass position condition number |
| 000Ah | Pass position option |
| 000Ch | Completion coordinate |
| 000Eh | |

(42) Pass position interrupt incomplete

| Offset | Content |
|---|---|
| 0000h | Axis No. |
| 0002h | Event code (0606h) |
| 0004h | Time stamp |
| 0006h | |
| 0008h | Pass position condition number |
| 000Ah | Pass position option |
| 000Ch | Completion coordinate |
| 000Eh | |

(43) Pass position interrupt cancel

| Offset | Content |
|---|---|
| 0000h | Axis No. |
| 0002h | Event code (0607h) |
| 0004h | Time stamp |
| 0006h | |
| 0008h | Pass position condition number |
| 000Ah | Pass position option |
| 000Ch | Cancel coordinate |
| 000Eh | |

(44) Pass position interrupt condition satisfied

| Offset | Content |
|---|---|
| 0000h | Axis No. |
| 0002h | Event code (0608h) |
| 0004h | Time stamp |
| 0006h | |
| 0008h | Pass position condition number |
| 000Ah | Pass position option |
| 000Ch | Condition satisfied coordinate |
| 000Eh | |

(45) Point table loop start

| Offset | Content |
|---|---|
| 0000h | Axis No. |
| 0002h | Event code (0609h) |
| 0004h | Time stamp |
| 0006h | |
| 0008h | 0 (fixed value) |
| 000Ah | 0 (fixed value) |
| 000Ch | 0 (fixed value) |
| 000Eh | 0 (fixed value) |

(46) Other axes start complete

| Offset | Content |
|---|---|
| 0000h | Axis No. |
| 0002h | Event code (0800h) |
| 0004h | Time stamp |
| 0006h | |
| 0008h | Other axes start data No. |
| 000Ah | 0 (fixed value) |
| 000Ch | 0 (fixed value) |
| 000Eh | 0 (fixed value) |

(47) Other axes start incomplete

| Offset | Content |
|---|---|
| 0000h | Axis No. |
| 0002h | Event code (0801h) |
| 0004h | Time stamp |
| 0006h | |
| 0008h | Other axes start data No. |
| 000Ah | 0 (fixed value) |
| 000Ch | 0 (fixed value) |
| 000Eh | 0 (fixed value) |

(48) SSCNET disconnection command

| Offset | Content |
|---|---|
| 0000h | Axis No. |
| 0002h | Event code (0900h) |
| 0004h | Time stamp |
| 0006h | |
| 0008h | Disconnection axis No. |
| 000Ah | 0 (fixed value) |
| 000Ch | 0 (fixed value) |
| 000Eh | 0 (fixed value) |

(49) SSCNET disconnection complete

| Offset | Content |
|---|---|
| 0000h | Axis No. |
| 0002h | Event code (0901h) |
| 0004h | Time stamp |
| 0006h | |
| 0008h | Controlling axis information (lower) |
| 000Ah | |
| 000Ch | Controlling axis information (upper)<br>(0(fixed value)) |
| 000Eh | 0 (fixed value) |

(50) SSCNET disconnection error

| Offset | Content |
|---|---|
| 0000h | Axis No. |
| 0002h | Event code (0902h) |
| 0004h | Time stamp |
| 0006h | |
| 0008h | Error code of reconnection/disconnection |
| 000Ah | 0 (fixed value) |
| 000Ch | 0 (fixed value) |
| 000Eh | 0 (fixed value) |

(51) SSCNET reconnection command

| Offset | Content |
|---|---|
| 0000h | Axis No. |
| 0002h | Event code (0903h) |
| 0004h | Time stamp |
| 0006h | |
| 0008h | 0 (fixed value) |
| 000Ah | 0 (fixed value) |
| 000Ch | 0 (fixed value) |
| 000Eh | 0 (fixed value) |

(52) SSCNET reconnection complete

| Offset | Content |
|---|---|
| 0000h | Axis No. |
| 0002h | Event code (0904h) |
| 0004h | Time stamp |
| 0006h | |
| 0008h | Controlling axis information (lower) |
| 000Ah | |
| 000Ch | Controlling axis information (upper)<br>(0(fixed value)) |
| 000Eh | 0 (fixed value) |

(53) SSCNET reconnection error

| Offset | Content |
|---|---|
| 0000h | Axis No. |
| 0002h | Event code (0905h) |
| 0004h | Time stamp |
| 0006h | |
| 0008h | Error code of reconnection/disconnection |
| 000Ah | 0 (fixed value) |
| 000Ch | 0 (fixed value) |
| 000Eh | 0 (fixed value) |

(54) Control mode switch complete

| Offset | Content |
|---|---|
| 0000h | Axis No. |
| 0002h | Event code (0A00h) |
| 0004h | Time stamp |
| 0006h | |
| 0008h | Control mode before switch<br>0: Position control mode<br>1: Speed control mode<br>2: Torque control mode |
| 000Ah | Control mode after switch<br>0: Position control mode<br>1: Speed control mode<br>2: Torque control mode |
| 000Ch | 0 (fixed value) |
| 000Eh | 0 (fixed value) |

(55) Control mode switch error

| Offset | Content |
|---|---|
| 0000h | Axis No. |
| 0002h | Event code (0A01h) |
| 0004h | Time stamp |
| 0006h | |
| 0008h | Control mode before switch<br>0: Position control mode<br>1: Speed control mode<br>2: Torque control mode |
| 000Ah | Control mode after switch<br>0: Position control mode<br>1: Speed control mode<br>2: Torque control mode |
| 000Ch | Switch error cause<br>0: Zero speed (ZSP) OFF<br>1: Control mode error<br>2: Incompatible axis<br>3: Switch not possible |
| 000Eh | 0 (fixed value) |

(56) Mark detection signal detection

| Offset | Content |
|---|---|
| 0000h | Axis No. |
| 0002h | Event code (0B00h) |
| 0004h | Time stamp |
| 0006h | |
| 0008h | Mark detection number<br>0: Mark detection setting 1<br>1: Mark detection setting 2 |
| 000Ah | Mark detection edge data<br>1: OFF edge<br>2: ON edge |
| 000Ch | Data latch<br>0: No latch<br>1: Latch |
| 000Eh | 0 (fixed value) |

(57) Mark detection clear

| Offset | Content |
|---|---|
| 0000h | Axis No. |
| 0002h | Event code (0B01h) |
| 0004h | Time stamp |
| 0006h | |
| 0008h | Mark detection setting number |
| 000Ah | 0 (fixed value) |
| 000Ch | 0 (fixed value) |
| 000Eh | 0 (fixed value) |

(58) Mark detection disable start

| Offset | Content |
|---|---|
| 0000h | Axis No. |
| 0002h | Event code (0B02h) |
| 0004h | Time stamp |
| 0006h | |
| 0008h | Mark detection setting number |
| 000Ah | 0 (fixed value) |
| 000Ch | 0 (fixed value) |
| 000Eh | 0 (fixed value) |

(59) Mark detection disable cancel

| Offset | Content |
|---|---|
| 0000h | Axis No. |
| 0002h | Event code (0B03h) |
| 0004h | Time stamp |
| 0006h | |
| 0008h | Mark detection setting number |
| 000Ah | 0 (fixed value) |
| 000Ch | 0 (fixed value) |
| 000Eh | 0 (fixed value) |

(60) Mark detection setting enable

| Offset | Content |
|---|---|
| 0000h | Axis No. |
| 0002h | Event code (0B04h) |
| 0004h | Time stamp |
| 0006h | |
| 0008h | Mark detection setting number |
| 000Ah | 0 (fixed value) |
| 000Ch | 0 (fixed value) |
| 000Eh | 0 (fixed value) |

(61) Transient transmit start

| Offset | Content |
|---|---|
| 0000h | Axis No. |
| 0002h | Event code (0C00h) |
| 0004h | Time stamp |
| 0006h | |
| 0008h | Transient command |
| 000Ah | 0 (fixed value) |
| 000Ch | 0 (fixed value) |
| 000Eh | 0 (fixed value) |

(62) Transient transmit error occurrence

| Offset | Content |
|---|---|
| 0000h | Axis No. |
| 0002h | Event code (0C01h) |
| 0004h | Time stamp |
| 0006h | |
| 0008h | Transient command |
| 000Ah | 0 (fixed value) |
| 000Ch | 0 (fixed value) |
| 000Eh | 0 (fixed value) |

(63) RIO control alarm occurrence

| Offset | Content |
|---|---|
| 0000h | Station No. |
| 0002h | Event code (2100h) |
| 0004h | Time stamp |
| 0006h | |
| 0008h | Alarm number |
| 000Ah | Details number |
| 000Ch | 0 (fixed value) |
| 000Eh | 0 (fixed value) |

(64) RIO module alarm occurrence

| Offset | Content |
|---|---|
| 0000h | Station No. |
| 0002h | Event code (2101h) |
| 0004h | Time stamp |
| 0006h | |
| 0008h | Alarm number |
| 000Ah | Details number |
| 000Ch | 0 (fixed value) |
| 000Eh | 0 (fixed value) |

(65) Writing to parameters (remote I/O)

| Offset | Content |
|---|---|
| 0000h | Station No. |
| 0002h | Event code (2202h) |
| 0004h | Time stamp |
| 0006h | |
| 0008h | Parameter number |
| 000Ah | Parameter setting prior to change |
| 000Ch | Parameter setting after change |
| 000Eh | 0 (fixed value) |

(66) RIO control alarm reset

| Offset | Content |
|---|---|
| 0000h | Station No. |
| 0002h | Event code (2500h) |
| 0004h | Time stamp |
| 0006h | |
| 0008h | Alarm number |
| 000Ah | Details number |
| 000Ch | 0 (fixed value) |
| 000Eh | 0 (fixed value) |

(67) RIO module alarm reset

| Offset | Content |
|---|---|
| 0000h | Station No. |
| 0002h | Event code (2501h) |
| 0004h | Time stamp |
| 0006h | |
| 0008h | Alarm number |
| 000Ah | Details number |
| 000Ch | 0 (fixed value) |
| 000Eh | 0 (fixed value) |

(68) Transient transmit start (remote I/O)

| Offset | Content |
|---|---|
| 0000h | Station No. |
| 0002h | Event code (2C00h) |
| 0004h | Time stamp |
| 0006h | |
| 0008h | Transient command |
| 000Ah | 0 (fixed value) |
| 000Ch | 0 (fixed value) |
| 000Eh | 0 (fixed value) |

(69) Transient transmit error occurrence (remote I/O)

| Offset | Content |
|---|---|
| 0000h | Station No. |
| 0002h | Event code (2C01h) |
| 0004h | Time stamp |
| 0006h | |
| 0008h | Transient command |
| 000Ah | 0 (fixed value) |
| 000Ch | 0 (fixed value) |
| 000Eh | 0 (fixed value) |

POINT

- For change of parameters (event code 0202h), the parameter value prior to change and parameter value after change are compared and only if the setting is different is the parameter change recorded in the log data.
- For occurrence of system errors (event code 0311h), occurrence of system errors related to communication (E400h to) are recorded in the log data. However system errors that show issues with the position board (E001h to E302h) are not recorded in the log data, as the position board is in an error state.

### 7.13.5 Log function interface

(1) Command/status bit

System command/status bits related to log function are shown below.

System command

| Address | Bit | Abbreviation | Signal name |
|---|---|---|---|
| 03EA | 0 | LOGC | Log command |
| | 1 | LOGR | Reading of log data command |
| | 2 | | Reserved |
| | 3 | LOGI | Log data initialization command |
| | 4 | | Reserved |
| | 5 | | |
| | 6 | | |
| | 7 | | |

System status

| Address | Bit | Abbreviation | Signal name |
|---|---|---|---|
| 045A | 0 | LOGO | Log operation being performed |
| | 1 | LOGRF | Reading of log data complete |
| | 2 | LOGRE | Reading of log data error |
| | 3 | LOGIF | Log data initialization is complete |
| | 4 | LOGIE | Log data initialization error |
| | 5 | | Reserved |
| | 6 | | |
| | 7 | | |

(a) Details concerning system command bits

| Abbreviation | Signal name | Function details |
|---|---|---|
| LOGC | Log command | [Function]<br>Starts/stops recording of log data.<br>[Operation]<br>When the log command signal (LOGC) is turned on, recording of log data is started, and log operation being performed signal (LOGO) is turned on. The log operation being performed signal (LOGO) is turned off when the log command signal (LOGC) is turned off. |
| LOGR | Reading of log data command | [Function]<br>Reads the log data stored in the log data buffer area to the log data table on the dual port memory.<br>[Operation]<br>When the reading of log data command signal (LOGR) is turned on, the log data for the page number set as the read log data page number is read into the log data table. When reading of log data is complete, the reading of log data complete signal (LOGRF) is turned on or a reading of log data error signal (SMPRE) is turned on. |
| LOGI | Log data initialization command | [Function]<br>Initialization of the log data stored in the log data buffer area.<br>[Operation]<br>When the log data initialization command signal (LOGI) is turned on, the log data is initialized and the number of valid log data events and time stamp are 0 cleared. |

(b) Details concerning system status bits

| Abbreviation | Signal name | Function details |
|---|---|---|
| LOGO | Log operation being performed | [Function]<br>Notifies that log is now being taken.<br>[Operation]<br><Conditions for turning on><br>The log command signal (LOGC) was turned on.<br><Conditions for turning off><br>The log command signal (LOGC) was turned off. |
| LOGRF | Reading of log data complete | [Function]<br>Notifies that reading of log data was completed normally.<br>[Operation]<br><Conditions for turning on><br>Reading of log data is completed normally.<br><Conditions for turning off><br>Entered reading of data because the log command signal (LOGC) was turned on.<br>Reading of log data command signal (LOGR) was turned off. |
| LOGRE | Reading of log data error | [Function]<br>Notifies that reading of log data was not completed normally.<br>[Operation]<br><Conditions for turning on><br>Reading of log data command signal (LOGR) was turned on while log (LOGO: ON) was being taken.<br>Reading of log data command signal (LOGR) was turned on with a reading of log data page number set outside page number limits.<br><Conditions for turning off><br>Reading of log data command signal (LOGR) was turned off. |
| LOGIF | Log data initialization is complete | [Function]<br>Notifies that log data initialization was completed normally.<br>[Operation]<br><Conditions for turning on><br>Initialization of log data is completed normally.<br><Conditions for turning off><br>Initialization of data entered through turning the log data initialization command signal (LOGI) on.<br>The log data initialization command signal (LOGC) was turned off. |
| LOGIE | Log data initialization error | [Function]<br>Notifies that log data initialization was not completed normally.<br>[Operation]<br><Conditions for turning on><br>Log data initialization command signal (LOGI) was turned on while log operation being performed signal (LOGO) was turned on.<br><Conditions for turning off><br>The log data initialization command signal (LOGC) was turned off. |

(2) System Command/Status Data

(a) System Commands

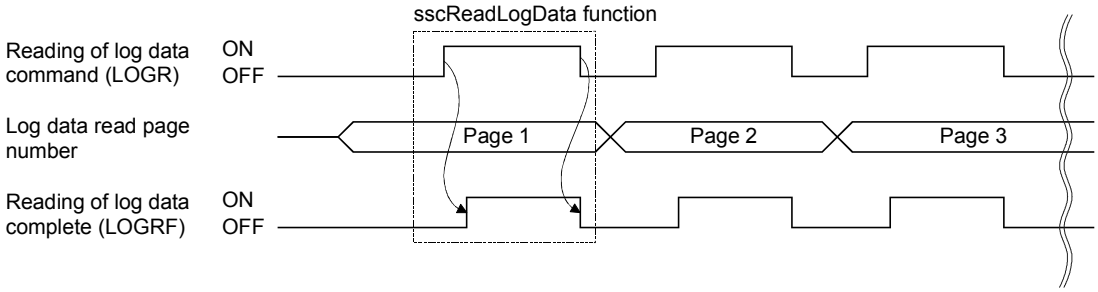
| Address | Name | Setting range | Remarks |
|---|---|---|---|
| 01B0<br>01B1 | Reading of log data Page number | 1 to 256 | Sets the page number for the log data area for logged data to be read to.<br>Data for 16 events of log data are read for each page.<br>Example. When the number of valid events is 345 events<br>345/16＝21・・・9<br>In other words, pages 1 to 22 are read. |

(b) System status

| Address | Name | Output limits | Remarks |
|---|---|---|---|
| 01F0<br>01F1 | Reading of log data Page number | 1 to 256 | Stores the page number that was read.<br>The details for the settings for the page number of the log data that was read using a system command are stored. |
| 01F2<br>01F3 | Number of valid log data events | 0 to 4096 | Stores the number of number of valid events stored in current log data. When the number of valid events reaches 4096 events the number of valid events becomes 4096. |

### 7.13.6 Timing chart for reading of log data

A method for reading log data stored in the log data buffer area is shown below.




> **POINT**
>
> - For reading of log data, turn off the log command signal (LOGC). If log data is read while the log operation being performed signal (LOGO) is turned on, the reading of log data error (LOGRE) is turned on.
> - Log data is stored using a ring buffer format in the log data buffer area of the position board; however, when transferred to the dual port memory, the data is transferred from the oldest (oldest is transferred first) in order.

### 7.13.7 Log acquiring selection

By setting the log acquiring selection (parameter No.0040 to 0042), the axis No. and system for which the log to be acquired can be set.
When the number of log events to be memorized is not enough, set the events (axis and system) for which log is to be acquired, using this function.

(1) System parameter

| Parameter No. | Abbreviation | Name | Initial value | Unit | Setting range | Function |
|---|---|---|---|---|---|---|
| 0040 | LGS1 | Log acquiring selection 1 (Note 1) | 0000h | | 0000h to 0001h | Set whether to acquire the log of the system when the log function is used.<br>System (bit 0)<br>0: Not acquire 1: Acquire |
| 0041 | LGS2 | Log acquiring selection 2 (Note 1) | 0000h | | 0000h to FFFFh | Set the axis No. for which the log is to be acquired.<br>Axis 1 (bit 0) to axis 16 (bit 15)<br>0: Not acquire 1: Acquire |
| 0042 | LGS3 | Log acquiring selection 3 (Note 1) | 0000h | | 0000h to FFFFh | Set the axis No. for which the log is to be acquired.<br>Axis 17 (bit 0) to axis 32 (bit 15)<br>0: Not acquire 1: Acquire |
| 0044 | LGS5 | Log acquiring selection 5 (Note 1) | 0000h | | 0000h to 00FFh | Set the station No. for which the log is to be acquired.<br>Station 1 (bit 0) to station 4 (bit 3)<br>0: Not acquire 1: Acquire |

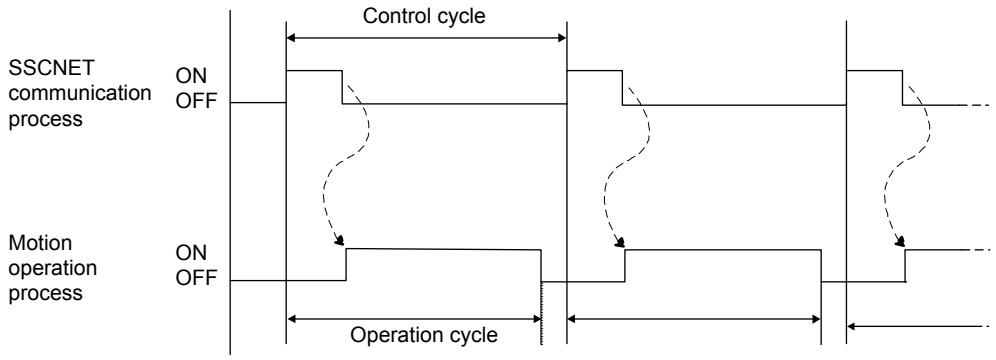
Note 1. When all the system parameters of the log acquiring selection (parameters No. 0040 to 0042, and 0044) are set to 0000h (initial value), log for all axes, stations, and systems will be acquired.
2. Since the parameter for the log acquiring selection is not determined before the system startup, log for all axes, stations, and systems will be acquired.

## 7.14 Operation cycle monitor function

### 7.14.1 Summary

The operation cycle monitor function is a function that monitors the operation cycle current time, operation cycle maximum time, and operation cycle over time. The operation cycle monitor function becomes valid after the system starts.

The operation cycle is the position board processing (SSCNET communication process＋motion operation process) time.




When the operation cycle exceeds the warning level (95% of the control cycle, 0.84ms when control cycle 0.88ms is selected), the operation cycle warning signal (OCMW) turns on. Also, when the operation cycle exceeds the alarm level (100% or more of the control cycle, 0.88ms or more when control cycle 0.88ms is selected), the count of the operation cycle over time (address 0018h) increases and the operation cycle alarm signal (OCME) turns on.

### 7.14.2 Interface

Interfaces related to the operation cycle monitor function are shown below.

(1) System command

| Address | Bit | Abbreviation | Signal name |
|---|---|---|---|
| 03EA | 0 | LOGC | Log command |
| | 1 | LOGR | Reading of log data command |
| | 2 | | Reserved |
| | 3 | LOGI | Log data initialization command |
| | 4 | | Reserved |
| | 5 | OCMC | Operation cycle monitor clear |
| | 6 | | Reserved |
| | 7 | | |

(2) System status

| Address | Bit | Abbreviation | Signal name |
|---|---|---|---|
| 045A | 0 | LOGO | Log operation being performed |
| | 1 | LOGRF | Reading of log data complete |
| | 2 | LOGRE | Reading of log data error |
| | 3 | LOGIF | Log data initialization is complete |
| | 4 | LOGIE | Log data initialization error |
| | 5 | OCMCO | During operation cycle monitor clear |
| | 6 | OCME | Operation cycle alarm |
| | 7 | OCMW | Operation cycle warning |

(3) Operation cycle monitor data

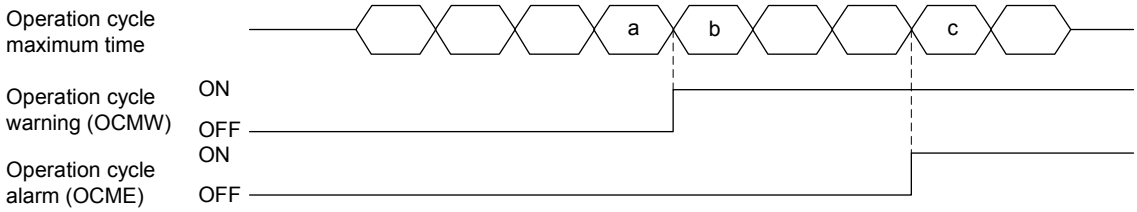
| Address | Size | Name | Unit | Description |
|---|---|---|---|---|
| 0014h | 2 byte | Operation cycle current time | μs | Current processing time is stored |
| 0016h | 2 byte | Operation cycle maximum time | μs | Maximum processing time is stored |
| 0018h | 2 byte | Operation cycle over time | Number of times | The cumulative value of the number of times which exceeds the control cycle is stored |

### 7.14.3 Operation timing

(1) Operation cycle alarm, operation cycle warning occurrence timing

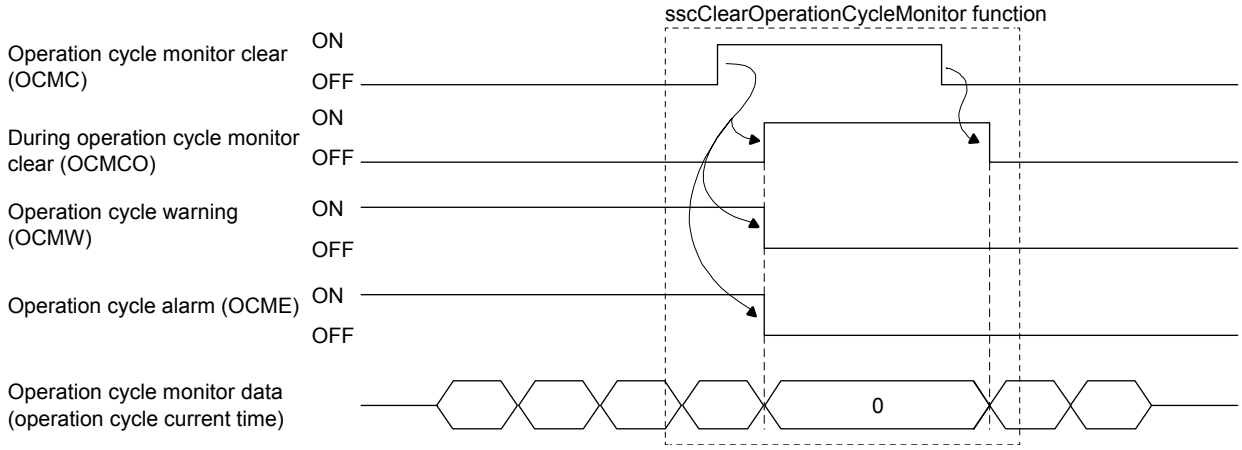
A timing chart for when the operation cycle exceeds the warning level (95% of the control cycle) and alarm level (100% of the control cycle) is shown below.

(The following figure shows: a < Operation cycle 95% < b < Operation cycle 100% < c)




(2) Operation cycle monitor clear timing

When the operation cycle monitor clear signal (OCMC) is turned on, the during operation cycle monitor clear (OCMCO) is turned on. Then, the operation cycle alarm signal (OCME) and operation cycle warning signal (OCMW) are turned off, and each data item in the operation cycle monitor data is cleared to 0.




POINT

- When the operation cycle alarm signal (OCME) and operation cycle warning (OCMW) are turned on, the load of the motion operation is high. Review the following contents.
  - Extend the control cycle in the setting.
    (Example. When the control cycle is 0.44 ms, change it to 0.88 ms.)
  - Set less control axes.
  - Reexamine the operation pattern so that each axis does not start operation simultaneously.
- For software version A4 or later, when operation cycle alarm (OCME) turns ON operation cycle alarm (system alarm 35, detail No.01) occurs. Operation continues even when operation cycle alarm (system alarm 35, detail No.01) has occurred. When clearing operation cycle alarm (system alarm 35, detail No.01) turn ON system alarm reset signal (CRST).

API LIBRARY

- Use the sscGetOperationCycleMonitor function to get the operation cycle current time/operation cycle maximum time/operation cycle over time.

## 7.15 External forced stop disabled

### 7.15.1 Summary

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

Note. Software forced stop by system command bit and forced stops due to system errors such as SSCNET communication errors (system status code E□□□□h) are not disabled.

### 7.15.2 Interface

The interface added for the external forced stop disabled function is as follows.

(1) System status bit

| Address | Bit | Abbreviation | Signal name |
|---|---|---|---|
| 0452 | 0 | EMIO | During forced stop |
| | 1 | | Reserved |
| | 2 | TSTO | In test mode |
| | 3 | | Reserved |
| | 4 | | |
| | 5 | | |
| | 6 | EMID | External forced stop disabled |
| | 7 | | Reserved |

(2) System parameter

| Parameter No. | Abbreviation | Name | Initial value | Unit | Setting range | Function |
|---|---|---|---|---|---|---|
| 000E | *EMID | External forced stop disabled | 0000h | | 0000h to FFFFh | Disable the forced stop by EMI signal.<br>5AE1h : Forced stop disabled<br>Other than 5AE1h : Forced stop enabled |

### 7.15.3 Setting method

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

Note 1. External forced stop disabled (parameter No.000E) settings are imported at the system startup. Changes while the system is running are invalid.

2. External forced stop disabled signal (EMID) turns ON at system startup.

## 7.16 Amplifier-less axis function

### 7.16.1 Summary

The amplifier-less axis function is a function that enables to operate the position board without connecting a servo amplifier. This function enables to debug the user program at the start-up of the device and to simulate the positioning operation.

### 7.16.2 Interface

To use the amplifier-less axis function, set Valid in the amplifier-less axis function (parameter No.0200).

| Parameter No. | Abbreviation | Name | Initial value | Unit | Setting range | Function |
|---|---|---|---|---|---|---|
| 0200 | *OPC1 | Control option 1 | 0000h | | 0000h to 2111h | 0 0 [ ] 0<br>Amplifier-less axis function<br>Set 1 when not communicating with servo amplifier. When 1 is set with the control axis, the position board can be operated (simulated) without a servo amplifier.<br>0: Invalid<br>1: Valid |

### 7.16.3 Control details

The operation details related to the amplifier-less axis function are shown below.

<table>
<tr><th>Item</th><th>Operation</th></tr>
<tr><td>Servo amplifier</td><td>The specification of a supposedly connected servo amplifier is shown below.
<table>
<tr><th>SSCNET communication method</th><th>Number of encoder pulses per revolution [pulse]</th><th>Maximum motor speed [r/min]</th></tr>
<tr><td>SSCNET Ⅲ/H</td><td>4194304</td><td>6000</td></tr>
</table>
Note. 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.)</td></tr>
<tr><td>Home position return</td><td>Home position return using an incremental encoder or incremental linear scale including a scale home position signal detection method and a scale home position signal detection method 2 (home position return which searches a home position signal again) cannot be used.</td></tr>
<tr><td>In-position signal (INP)</td><td>This signal turns on when the current command position and the current feedback position are the same.</td></tr>
<tr><td>Servo alarm</td><td>No servo alarm occurs.</td></tr>
<tr><td>Servo information</td><td>Servo information (monitor No.0100 to 02FF) cannot be referred unless the servo amplifier is connected. Servo amplifier is not connected (MESV) turns on.</td></tr>
<tr><td>High speed monitor</td><td>The current command position of the previous control cycle is displayed in the current feedback position. Electrical current feedback and always 0 is displayed.</td></tr>
<tr><td>Torque limit</td><td>By turning on/off the torque limit signal (TL), on/off of the selecting torque limit signal (TLSO) can be confirmed. However, the torque limit effective signal (TLC) does not turn on and the operation of the amplifier-less axis is not affected.</td></tr>
<tr><td>Gain switching</td><td>By turning on/off the gain switching command signal (GAIN), on/off of the gain switching signal (GAINO) can be confirmed. However, the operation of the amplifier-less axis is not affected.</td></tr>
<tr><td>Fully closed loop control change</td><td>By turning on/off the fully closed loop control change signal (CLD), on/off of the fully closed loop control changing signal (CLDO) can be confirmed. However, the operation of the amplifier-less axis is not affected.</td></tr>
<tr><td>PI-PID switching</td><td>By turning on/off the PID control command signal (CPC), on/off of the during PID control signal (SPC) can be confirmed. However, the operation of the amplifier-less axis is not affected.</td></tr>
<tr><td>Forced stop</td><td>When forced stop occurs, amplifier-less axis continues the positioning operation without controller forced stop warning (servo warning E7).</td></tr>
<tr><td>External signal</td><td>To simulate an operation using a limit switch signal or dog signal (such as home position return), set dual port memory to the sensor input system (parameter No.0219) and control the sensor signal command (LSPC, LSNC, DOGC) with the user program.</td></tr>
<tr><td>Absolute position detection system</td><td>The absolute position detection system cannot be used. The incremental system is always used.</td></tr>
<tr><td>Reconnect/disconnect function</td><td>The amplifier-less axis cannot be disconnected or reconnected.</td></tr>
<tr><td>Continuous operation to torque control</td><td>After reaching the continuous operation to torque control speed limit value, it is regarded that the torque settle width has been reached, and operation is completed after the continuous operation to torque control time has passed.<br>For electrical current feedback, torque 0% occurs before reaching the speed limit value, and target torque occurs after reaching the speed limit value.</td></tr>
<tr><td>Operation with MR Configurator2</td><td>Servo amplifier cannot be operated or monitored with MR Configurator.</td></tr>
</table>

POINT

- The operation of the current feedback position and the timing of the in-position signal (INP) are different from the case where the servo amplifier is connected. Confirm the operation finally with a real machine.

## 7.17 Alarm history function

### 7.17.1 Summary

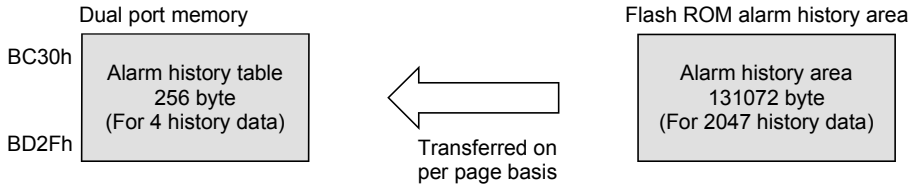
The alarm history function is a function that records the history of system errors and alarms (system, operation, and servo alarms) when they occur. The alarm history data is stored in the alarm history area of the flash ROM. Alarm history can also be checked after the power is turned off.

**POINT**

- History data is also stored at system startup command (when 000Ah, or 000Ch is input to the system command code) and at completion of system startup (when system status code has become 000Ah).
- Alarm history data is stored to the flash ROM once every 10s. (max. 100 alarms each storing)
- When more than 100 alarms occur over 10s, the data passed 100 alarms is discarded.
- If power is turned off or a reboot is performed before alarm history write, the history data is not saved.
- Reading of alarm history data can be performed in the test tool.

**API LIBRARY**

- For a detailed procedure for getting alarm history data, refer to the sample program (AlarmHistory) contained on the utility software.




Note 1. Log data is read to the dual port memory from internal memory of the position board in units of pages (4 data)
2. There is a storage area for 2047 history data. However, when power supply is turned ON, or a software reboot is performed after storing 1536 data or more, the oldest 1024 items of history data are deleted.

(1) API library to be used

| Function name | Description | Remarks |
|---|---|---|
| sscGetAlarmHistoryData | Gets alarm history data | Use the sscGetAlarmHistoryData function to read the alarm history. Calculate the largest page number (divide the number of valid events by 4 and round up to nearest whole number) to be read by using the number of valid events got with the sscCheckAlarmHistoryEventNum function.Use this function to get alarm history data from page 1 to the largest page number to be read. |
| sscCheckAlarmHistoryEventNum | Get the number of valid alarm history data events. | |
| sscClearAlarmHistoryData | Clears (initializes) the alarm history data. | |

### 7.17.2 Alarm history data details

There are three types of history data, system startup command data and completion of system startup data, and alarm history data. One history data is 64 bytes. The details of the data are shown in the following.

(1) System startup command data

| Offset | Content |
|---|---|
| 0000h | System startup time |
| 0001h | |
| 0002h | |
| 0003h | |
| 0004h | |
| 0005h | |
| 0006h | |
| 0007h | |
| 0008h | Free run counter |
| 0009h | |
| 000Ah | |
| 000Bh | |
| 000Ch | Control cycle |
| 000Dh | Event code |
| 000Eh | Reserved |
| 000Fh | |
| 0010h | Communication mode |
| 0011h | Control mode |
| 0012h | Reserved |
| 0013h | |
| 0014h | |
| 0015h | |
| 0016h | |
| 0017h | |
| 0018h | |
| 0019h | |
| 001Ah | |
| 001Bh | |
| 001Ch | |
| 001Dh | |
| 001Eh | |
| 001Fh | |

| Offset | Content |
|---|---|
| 0020h | Reserved |
| 0021h | |
| 0022h | |
| 0023h | |
| 0024h | |
| 0025h | |
| 0026h | |
| 0027h | |
| 0028h | |
| 0029h | |
| 002Ah | |
| 002Bh | |
| 002Ch | |
| 002Dh | |
| 002Eh | |
| 002Fh | |
| 0030h | |
| 0031h | |
| 0032h | |
| 0033h | |
| 0034h | |
| 0035h | |
| 0036h | |
| 0037h | |
| 0038h | |
| 0039h | |
| 003Ah | |
| 003Bh | |
| 003Ch | |
| 003Dh | |
| 003Eh | |
| 003Fh | Checksum |

(a) System startup time

When the API library is used, the number of seconds passed since 0000hrs, January 1, 1970 at the input time for system startup command is stored.

When the API library is not used, "0" is stored.

(b) Free-run counter

Stores the value of the free-run counter at the system startup command.

(c) Control cycle

Stores the control cycle.

00h: 0.88ms
01h: 0.44ms
02h: 0.22ms

(d) Event code

Stores the type of history content.

00h: System startup command
02h: Completion of system startup
10h: System error
11h: System alarm
12h: Servo alarm
13h: Operation alarm
92h: RIO module alarm
93h: RIO control alarm

(e) Communication mode

Stores the communication mode.

00h: SSCNETⅢ/H mode

(f) Control mode

Stores the control mode.

00h: Standard mode
01h: Interface mode

(g) Checksum

Stores the inverted sum of the 1 byte data from the whole area for history data as the checksum data.

| POINT |
|---|
| • If control mode, communication mode, and control cycle for history data are set outside the range in system parameters, the following history is stored.<br>• Control cycle : 00h (0.88ms)<br>• Communication mode : 00h (SSCNETⅢ/H mode)<br>• Control mode : 00h (Standard mode) |

(2) Completion of system startup data

| Offset | Content |
|---|---|
| 0000h | System startup time |
| 0001h | |
| 0002h | |
| 0003h | |
| 0004h | |
| 0005h | |
| 0006h | |
| 0007h | |
| 0008h | Free run counter |
| 0009h | |
| 000Ah | |
| 000Bh | |
| 000Ch | Control cycle |
| 000Dh | Event code |
| 000Eh | Reserved |
| 000Fh | |
| 0010h | |
| 0011h | |
| 0012h | |
| 0013h | |
| 0014h | |
| 0015h | |
| 0016h | |
| 0017h | |
| 0018h | |
| 0019h | |
| 001Ah | |
| 001Bh | |
| 001Ch | |
| 001Dh | |
| 001Eh | |
| 001Fh | |

| Offset | Content |
|---|---|
| 0020h | Reserved |
| 0021h | |
| 0022h | |
| 0023h | |
| 0024h | |
| 0025h | |
| 0026h | |
| 0027h | |
| 0028h | |
| 0029h | |
| 002Ah | |
| 002Bh | |
| 002Ch | |
| 002Dh | |
| 002Eh | |
| 002Fh | |
| 0030h | |
| 0031h | |
| 0032h | |
| 0033h | |
| 0034h | |
| 0035h | |
| 0036h | |
| 0037h | |
| 0038h | |
| 0039h | |
| 003Ah | |
| 003Bh | |
| 003Ch | |
| 003Dh | |
| 003Eh | |
| 003Fh | Checksum |

(a) Free-run counter

Stores the value of the free-run counter at the completion of system startup.

Note. Refer to "(1) System startup command data" of this section for details of other data.

(3) Alarm history data

| Offset | Content |
|---|---|
| 0000h | System startup time |
| 0001h | |
| 0002h | |
| 0003h | |
| 0004h | |
| 0005h | |
| 0006h | |
| 0007h | |
| 0008h | Free run counter |
| 0009h | |
| 000Ah | |
| 000Bh | |
| 000Ch | Control cycle |
| 000Dh | Event code |
| 000Eh | Reserved |
| 000Fh | |
| 0010h | |
| 0011h | |
| 0012h | |
| 0013h | |
| 0014h | Error axis (station) No. |
| 0015h | |
| 0016h | Alarm number |
| 0017h | |
| 0018h | Operation mode |
| 0019h | Reserved |
| 001Ah | |
| 001Bh | |
| 001Ch | Current command position |
| 001Dh | |
| 001Eh | |
| 001Fh | |

| Offset | Content |
|---|---|
| 0020h | Current feedback position |
| 0021h | |
| 0022h | |
| 0023h | |
| 0024h | Reserved |
| 0025h | |
| 0026h | |
| 0027h | |
| 0028h | |
| 0029h | |
| 002Ah | |
| 002Bh | |
| 002Ch | |
| 002Dh | |
| 002Eh | |
| 002Fh | |
| 0030h | |
| 0031h | |
| 0032h | |
| 0033h | |
| 0034h | |
| 0035h | |
| 0036h | |
| 0037h | |
| 0038h | |
| 0039h | |
| 003Ah | |
| 003Bh | |
| 003Ch | |
| 003Dh | |
| 003Eh | |
| 003Fh | Checksum |

(a) Free-run counter

Stores the value of the free-run counter at the alarm occurrence.

(b) Error axis (station) No.

Stores the error axis (station) No. when the event code is an alarm/error.

0000h : System
0001h to 0020h: Axis No.
0001h to 0004h: Station No.

(c) Alarm number

Stores the alarm number (lower), and details number (upper) when the event code is an alarm/error.

(d) Operation mode

Stores the operation mode.

00h: Automatic operation
01h: Home position return
02h: JOG operation
03h: Incremental feed
04h: Mode not selected
05h: Mode error
06h: Home position reset
08h: Linear interpolation operation

Stores "04h: Mode not selected" when the event code is not a servo alarm or operation alarm.

(e) Current command position

Stores the signed current command position [command units] when the event code is a servo alarm or operation alarm.
Stores 0 when the event code is not a servo alarm or operation alarm.

(f) Current feedback position

Stores the signed current feedback position [command units] when the event code is a servo alarm or operation alarm.
Stores 0 when the event code is not a servo alarm or operation alarm.

Note. Refer to "(1) System startup command data" of this section for details of other data.

### 7.17.3 Interface

(1) System Command/Status Bit

System command/status bits related to alarm history function are shown below.

System command

| Address | Bit | Abbreviation | Signal name |
|---|---|---|---|
| 03E1 | 0 | SMPS | Sampling start |
| | 1 | | Reserved |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

System status

| Address | Bit | Abbreviation | Signal name |
|---|---|---|---|
| 0451 | 0 | SMPW | Waiting for sampling trigger |
| | 1 | SMPO | Sampling is being performed |
| | 2 | SMPF | Sampling is complete |
| | 3 | SMPE | Sampling Error |
| | 4 | | Reserved |
| | 5 | AHINF | Alarm history information |
| | 6 | | Reserved |
| | 7 | | |

System command

| Address | Bit | Abbreviation | Signal name |
|---|---|---|---|
| 03F7 | 0 | ALHR | Alarm history read command |
| | 1 | | Reserved |
| | 2 | ALHI | Alarm history initialization command |
| | 3 | | Reserved |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

System status

| Address | Bit | Abbreviation | Signal name |
|---|---|---|---|
| 0467 | 0 | ALHRF | Alarm history read complete |
| | 1 | ALHRE | Alarm history read error |
| | 2 | ALHIF | Alarm history initialization complete |
| | 3 | ALHIE | Alarm history initialization error |
| | 4 | | Reserved |
| | 5 | | |
| | 6 | | |
| | 7 | | |

(a) Details concerning system command bits

| Abbreviation | Signal name | Function details |
|---|---|---|
| ALHR | Alarm history read command | [Function]<br>Reads the alarm history stored in the alarm history buffer area (flash ROM) to the alarm history table on the dual port memory.<br>[Operation]<br>When the alarm history read command signal (ALHR) is turned on, the alarm history for the page number set as the alarm history read page number is read to the alarm history table. When reading of alarm history is complete, the alarm history read complete signal (ALHRF) is turned on or alarm history read error signal (ALHRE) is turned on. |
| ALHI | Alarm history initialization command | [Function]<br>Initialization of the alarm history stored in the alarm history buffer area(flash ROM)<br>[Operation]<br>When the alarm history initialization command signal (ALHI) is turned on, the alarm history is initialized and the number of valid alarm history events are 0 cleared. |

(b) Details concerning system status bits

| Abbreviation | Signal name | Function details |
|---|---|---|
| MINFC | Machine type information (CCF) | [Function]<br>Shows that the controller connected is a position board.<br>[Operation]<br><Conditions for turning on><br>Position board is connected.<br><Conditions for turning off><br>A controller other than position board is connected. |
| AHINF | Alarm history information | [Function]<br>Shows that position board is alarm history compatible.<br>[Operation]<br><Conditions for turning on><br>An alarm history compatible position board is connected.<br><Conditions for turning off><br>A position board that is not alarm history compatible is connected. |
| ALHRF | Alarm history read complete | [Function]<br>Notifies that reading of alarm history was completed normally.<br>[Operation]<br><Conditions for turning on><br>Reading of alarm history is completed normally.<br><Conditions for turning off><br>Alarm history read command signal (ALHR) was turned off. |
| ALHRE | Alarm history read error | [Function]<br>Notifies that reading of alarm history was not completed normally.<br>[Operation]<br><Conditions for turning on><br>Alarm history read command signal (ALHR) was turned on with an alarm history read page number set outside page number limits.<br><Conditions for turning off><br>Alarm history read command signal (ALHR) was turned off. |
| ALHIF | Alarm history initialization complete | [Function]<br>Notifies that alarm history initialization was completed normally.<br>[Operation]<br><Conditions for turning on><br>Initialization of alarm history is completed normally.<br><Conditions for turning off><br>Initialization of data entered through turning the alarm history initialization command signal (ALHI) on.<br>The alarm history initialization command signal (ALHI) was turned off. |
| ALHIE | Alarm history initialization error | [Function]<br>Notifies that alarm history initialization was not completed normally.<br>[Operation]<br><Conditions for turning on><br>Alarm history initialization command signal (ALHI) was turned on with a value other than E15Ah set to the alarm history initialization ID.<br><Conditions for turning off><br>The alarm history initialization command signal (ALHI) was turned off. |

(2) System Command/Status Data

(a) System Commands

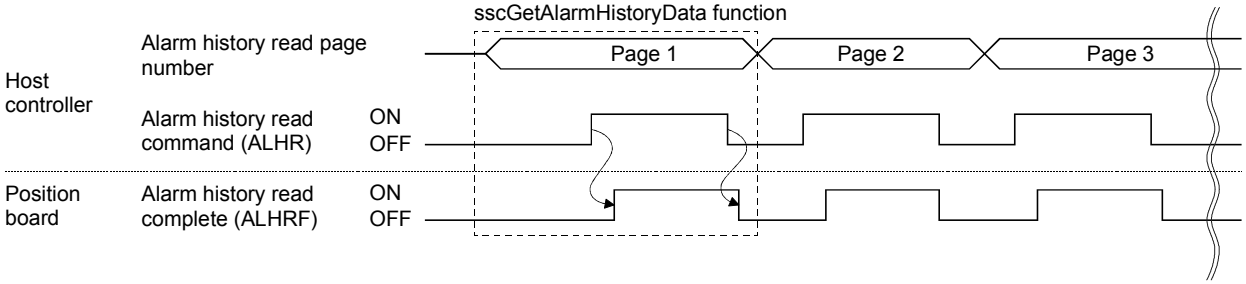
| Address | Name | Setting range | Remarks |
|---|---|---|---|
| 0444<br>0445 | Alarm history read page number | 1 to 512 | Sets the page number for the alarm history area for alarm history to be read to.<br>Data for 4 events of alarm history are read for each page.<br>Example. When the number of valid events is 1250 events<br>1250/4 = 312 ▪ ▪ ▪ 2<br>In other words, pages 1 to 313 are read. |
| 0446<br>0447 | Alarm history initialization ID | E15Ah | When initializing the alarm history, set "E15Ah"<br>Refer to Section 7.17.5 for details. |
| 0448<br>:<br>044F | System startup time | 00000000<br>00000000h<br>to<br>FFFFFFFF<br>FFFFFFFFh | When the API library sscSystemStart function is used, the host controller stores the time of system startup.<br>When the API library is not used, perform system startup after storing the number of seconds since 0000hrs, January 1, 1970.<br>Refer to Section 4.6 for details. |

(b) System status

| Address | Name | Output limits | Remarks |
|---|---|---|---|
| 04B4<br>04B5 | Alarm history read page number | 1 to 512 | Stores the page number that was read.<br>The details of the settings for the alarm history read page number of the system command are stored. |
| 04B6<br>04B7 | Number of valid alarm history events | 0 to 2047 | Stores the number of valid events stored in current alarm history. When the number of valid events reaches 2047 events the number of valid events becomes 2047. |

### 7.17.4 Timing chart for alarm history read

A method for reading alarm history stored in the alarm history area is shown below.

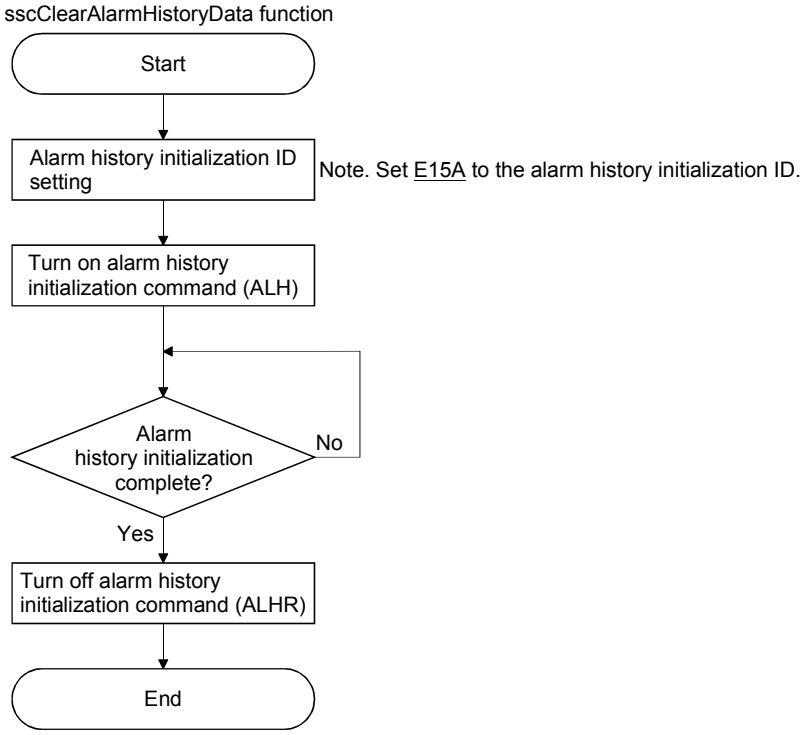



| POINT |
|---|
| ・The alarm history is stored in the alarm history area of the position board flash ROM in ring buffer format. The data is read from the oldest data first when transmitting to the dual port memory. |

| API LIBRARY |
|---|
| ・Use the sscGetAlarmHistoryData function to read the alarm history. Calculate the largest page number (divide the number of valid events by 4 and round up to nearest whole number) to be read by using the number of valid events got with the sscCheckAlarmHistoryEventNum function.<br>Use this function to get alarm history data from page 1 to the largest page number to be read. |

### 7.17.5 Alarm history initialization procedure

The procedure for initialization of parameters are as follows.




**POINT**

- Do not turn off the power supply to the position board during initialization of alarm history.
- Alarm history data cannot be read during initialization of alarm history.

**API LIBRARY**

- Use the sscClearAlarmHistoryData function to initialize alarm history.

### 7.17.6 List of system errors that do not apply to alarm history storage

System errors that do not apply to alarm history storage are shown below.

| Error code | Content |
|---|---|
| E001 | ROM error |
| E002 | RAM error 1 |
| E003 | Dual port memory error |
| E004 | RAM error 2 |
| E006 | SSCNET communication IC error 1 |
| E007 | SSCNET communication IC error 2 |
| E008 | Board error |
| E1□□ | CPU error |
| EF01 | System command code error |

## 7.18 Transient transmit

### 7.18.1 Summary

Using the transient transmit function allows the buffer memory of a servo amplifier or intelligent function module connected to a remote I/O module to be accessed directly from the position board.
Compared to the monitor function, the transient transmit data receives data at a slower speed, however it is used to get data that isn't required to be read at a fixed cycle. Additionally, commands can be sent depending on the data type.

| API LIBRARY |
|---|
| ・Use the sscSendReceiveTransientData function to send and receive data by transient transmit. |

### 7.18.2 Interface

The command/status data related to the transient transmit function are shown below.

(1) Transient transmit command

| Address | Name | Setting range | Remarks |
|---|---|---|---|
| D400 | Command transmission request (2 bytes) | 0000h to 0001h | Requests transmission of transient command.<br>1: Transient request<br>Other than the above: No request<br>Note 1. If the value is changed while processing, the process is not interrupted.<br>Note 2. For "1: Transient request", all data is cleared to 0 upon the completion of all processes. |
| D402 | Transient command (2 bytes) | 0000h to FFFFh | Sets the transient command to be sent.<br>Note. Without checking the value, the set value is sent to the servo amplifier as a command. Do not set values other than those that are set for transient commands as the servo amplifier operation for other values is not guaranteed. |
| D404 | Request data 1 (2 bytes) | 0000h to FFFFh | Sets the request data.<br>Note 1. Without checking the value, the set value is sent to the servo amplifier as a command.<br>Note 2. Set "0" when request data is not defined by command. |
| D406 | Request data 2 (2 bytes) | 0000h to FFFFh | |
| D408 | Request data 3 (2 bytes) | 0000h to FFFFh | |
| D40A | Request data 4 (2 bytes) | 0000h to FFFFh | |
| D40C | Reserved | | |
| D40D | | | |
| D40E | | | |
| D40F | | | |

Note 1. The addresses above are the addresses for the first axis. For the second axis and after, increase by 20h for each axis.
Note 2. The start address for the first station is DA00h. For the second station and after, increase by 20h for each station.

(2) Transient transmit status

| Address | Name | Setting range | Remarks |
|---|---|---|---|
| D410 | Transient status<br>(2 bytes) | 0000h to<br>800Fh | The process after sending transient request is stored.<br>bit0: Transient command processing completion wait<br>bit1: Transient request start<br>bit2: Transient receiving<br>bit3: Transient reception completed normally<br>bitF: Data valid bit<br>1: ON (transient normal)<br>0: OFF (abnormal occurrence)<br>Note. An abnormal occurrence is when there is a failure in communication, or a transient request is conducted to an axis/station other than the send target axis/station. |
| D412 | Reserved | | |
| D413 | | | |
| D414 | Response data 1<br>(2 bytes) | 0000h to<br>FFFFh | The response data is stored.<br>The response data includes valid data and invalid data (0), and is always stored as 4 words. |
| D416 | Response data 2<br>(2 bytes) | 0000h to<br>FFFFh | |
| D418 | Response data 3<br>(2 bytes) | 0000h to<br>FFFFh | |
| D41A | Response data 4<br>(2 bytes) | 0000h to<br>FFFFh | |
| D41C | Reserved | | |
| D41D | | | |
| D41E | | | |
| D41F | | | |

Note 1. The addresses above are the addresses for the first axis. For the second axis and after, increase by 20h for each axis.
Note 2. The start address for the first station is DA10h. For the second station and after, increase by 20h for each station.

### 7.18.3 Transient commands for servo amplifier

| Data type | Transient command | Unit | Number of valid words (Note 1) | Remark |
|---|---|---|---|---|
| Servo motor ID (SSCNETⅢ)/ Encoder ID | 0304 | — | 3 | |
| Servo motor ID (SSCNETⅢ/H) | 0309 | — | 2 | |
| Encoder resolution | 0305 | [pulse] | 2 | |
| Servo amplifier serial number (First 8 characters) | 0306 | [characters] | 4 | |
| Servo amplifier serial number (Last 8 characters) | 0307 | [characters] | 4 | |
| Servo amplifier recognition information (First 8 characters) | 0310 | [characters] | 4 | |
| Servo amplifier recognition information (Last 8 characters) | 0311 | [characters] | 4 | |
| Servo amplifier software number (First 8 characters) | 0312 | [characters] | 4 | |
| Servo amplifier software number (Last 8 characters) | 0313 | [characters] | 4 | |
| Power ON cumulative time | 0319 | [h] | 2 | |
| Inrush relay ON/OFF number | 031A | [times] | 2 | Returns the contactor ON count. |
| Read alarm history number | 0323 | [items] | 1 | |
| Alarm history/Detail #1, #2 | 0324 | — | 4 | |
| Alarm history/Detail #3, #4 | 0325 | — | 4 | |
| Alarm history/Detail #5, #6 | 0326 | — | 4 | |
| Alarm history/Detail/Occurrence time | 0328 | —/[h] | 4 | |
| Alarm occurrence time #1, #2 | 0329 | [h] | 4 | |
| Alarm occurrence time #3, #4 | 032A | [h] | 4 | |
| Alarm occurrence time #5, #6 | 032B | [h] | 4 | |
| Alarm history clear command | 0382 | — | 0 | |
| Home position [command unit] | 0408 | [pulse]/[rev] | 3 | |
| Main circuit bus voltage | 040A | [V] | 1 | |
| Regenerative load ratio | 040B | [%] | 1 | |
| Effective load ratio | 040C | [%] | 1 | |
| Peak load ratio | 040D | [%] | 1 | |
| Estimate inertia moment ratio | 040E | [×0.1%] | 1 | |
| Model loop gain | 040F | [rad/s] | 1 | |
| LED display | 0410 | [characters] | 2 | |
| Load-side encoder information 1 | 0416 | [pulse] | 2 | Fully closed control or synchronous encoder via servo amplifier use |
| Load-side encoder information 2 | 0417 | [pulse] | 2 | |
| Speed feedback | 0418 | [0.01mm/s] | 2 | Linear servo use |
| Servo motor thermistor temperature | 0419 | [°C] | 1 | Linear servo use |
| Z-phase counter | 041A | [pulse] | 2 | |
| Module power consumption | 0424 | [W] | 2 | |
| Module integral power consumption | 0425 | [Wh] | 2 | |
| Disturbance torque | 0427 | [0.1%] | 1 | |
| Instantaneous torque | 0428 | [0.1%] | 1 | |
| Overload alarm margin | 0429 | [0.1%] | 1 | |
| Error excessive alarm margin | 042A | [pulse] | 2 | |
| Settling time | 042B | [ms] | 1 | |
| Overshoot amount | 042C | [pulse] | 1 | |

| Data type | Transient command | Unit | Number of valid words (Note 1) | Remark |
|---|---|---|---|---|
| Servo motor side/load-side position deviation | 042D | — | 2 | Fully closed control use |
| Servo motor side/load-side speed deviation | 042E | — | 2 | |
| Machine diagnostic status | 042F | — | 1 | |
| Friction estimation data | 0430 | [0.1%] | 4 | |
| Vibration estimation data | 0431 | [Hz/0.1%] | 4 | |
| Optional transient command | — | — | 4 | Used when using an optional transient command. |

Note 1. Number of valid words for response data 1 to 4.

(1) Servo motor ID (SSCNETⅢ)/Encoder ID [0304h]

| Request data | Content |
|---|---|
| Request data 1 | Reserved |
| Request data 2 | Reserved |
| Request data 3 | Reserved |
| Request data 4 | Reserved |

| Response data | Content |
|---|---|
| Response data 1 | Servo motor ID (lower) |
| Response data 2 | Servo motor ID (upper) |
| Response data 3 | Encoder ID |
| Response data 4 | Reserved |

(2) Servo motor ID (SSCNETⅢ/H) [0309h]

| Request data | Content |
|---|---|
| Request data 1 | Reserved |
| Request data 2 | Reserved |
| Request data 3 | Reserved |
| Request data 4 | Reserved |

| Response data | Content |
|---|---|
| Response data 1 | Servo motor ID (lower) |
| Response data 2 | Servo motor ID (upper) |
| Response data 3 | Reserved |
| Response data 4 | Reserved |

(3) Alarm history/Detail #1, #2 [0324h]

| Request data | Content |
|---|---|
| Request data 1 | Reserved |
| Request data 2 | Reserved |
| Request data 3 | Reserved |
| Request data 4 | Reserved |

| Response data | Content |
|---|---|
| Response data 1 | Alarm history 1 |
| Response data 2 | Alarm detail 1 |
| Response data 3 | Alarm history 2 |
| Response data 4 | Alarm detail 2 |

(4) Alarm history/Detail/Occurrence time [0328h]

| Request data | Content |
|---|---|
| Request data 1 | Alarm history number (from N=0) |
| Request data 2 | Reserved |
| Request data 3 | Reserved |
| Request data 4 | Reserved |

| Response data | Content |
|---|---|
| Response data 1 | Alarm history number #(N+1) |
| Response data 2 | Alarm history number #(N+1) detail |
| Response data 3 | Alarm history number #(N+1) occurrence time (lower) |
| Response data 4 | Alarm history number #(N+1) occurrence time (upper) |

(5) Alarm history clear command [0382h]

| Request data | Content |
|---|---|
| Request data 1 | Alarm reset command (1EA5h) |
| Request data 2 | Reserved |
| Request data 3 | Reserved |
| Request data 4 | Reserved |

| Response data | Content |
|---|---|
| Response data 1 | Reserved |
| Response data 2 | Reserved |
| Response data 3 | Reserved |
| Response data 4 | Reserved |

(6) Home position [command unit] [0408h]

| Request data | Content |
|---|---|
| Request data 1 | Reserved |
| Request data 2 | Reserved |
| Request data 3 | Reserved |
| Request data 4 | Reserved |

| Response data | Content |
|---|---|
| Response data 1 | Home position within one revolution (lower) |
| Response data 2 | Home position within one revolution (upper) |
| Response data 3 | Home position multiple revolution counter |
| Response data 4 | Reserved |

(7) LED display [0410h]

| Request data | Content |
|---|---|
| Request data 1 | Reserved |
| Request data 2 | Reserved |
| Request data 3 | Reserved |
| Request data 4 | Reserved |

| Response data | Content |
|---|---|
| Response data 1 | Driver display status (7segLED) lower 2 digits |
| Response data 2 | Character [JIS8 code] upper 2 digits |
| Response data 3 | Reserved |
| Response data 4 | Reserved |

(8) Machine diagnostic status [042Fh]

| Request data | Content |
|---|---|
| Request data 1 | Reserved |
| Request data 2 | Reserved |
| Request data 3 | Reserved |
| Request data 4 | Reserved |

| Response data | Content |
|---|---|
| Response data 1 | 0 [ ] [ ] [ ]<br>Forward rotation friction<br>0: Estimating friction<br>1: Estimating complete<br>2: One side operation (motor rotation stays in one direction)<br>3: Parameter threshold exceeded<br>4: Low variation high-speed operation<br>5: Time constant underestimate<br>7: 60 minutes elapsed<br>Reverse rotation friction<br>0: Estimating friction<br>1: Estimating complete<br>2: One side operation (motor rotation stays in one direction)<br>3: Parameter threshold exceeded<br>4: Low variation high-speed operation<br>5: Time constant underestimate<br>7: 60 minutes elapsed<br>Vibration estimation<br>0: Estimating vibration<br>1: Estimating complete |
| Response data 2 | Reserved |
| Response data 3 | Reserved |
| Response data 4 | Reserved |

(9) Friction estimation data [0430h]

| Request data | Content |
|---|---|
| Request data 1 | Reserved |
| Request data 2 | Reserved |
| Request data 3 | Reserved |
| Request data 4 | Reserved |

| Response data | Content |
|---|---|
| Response data 1 | Forward rotation torque static friction [0.1%] |
| Response data 2 | Forward rotation torque kinetic friction (at rated speed) [0.1%] |
| Response data 3 | Reverse rotation torque static friction [0.1%] |
| Response data 4 | Reverse rotation torque kinetic friction (at rated speed) [0.1%] |

(10) Vibration estimation data [0431h]

| Request data | Content |
|---|---|
| Request data 1 | Reserved |
| Request data 2 | Reserved |
| Request data 3 | Reserved |
| Request data 4 | Reserved |

| Response data | Content |
|---|---|
| Response data 1 | Motor stopped/servo amplifier locked Oscillation frequency [Hz] |
| Response data 2 | Motor stopped/servo amplifier locked Vibration level [0.1%] |
| Response data 3 | Motor operating Oscillation frequency [Hz] |
| Response data 4 | Motor operating Vibration level [0.1%] |

POINT

- Input 0 for request data that is reserved.
- Get the "friction estimation data" and "vibration estimation data" with transient command after conducting machine diagnosis estimation.

7.18.4 Example of using transient commands

(1) Friction estimation data/vibration estimation data

Setting "friction estimation data" and "vibration estimation data" to the transient command does not enable the correct values to be stored. With the procedure below, perform machine diagnosis and refer to the values.

(a) Operate the servo motor approximately 20 minutes in the operation pattern of machine diagnosis function - Friction judgement speed (servo parameter No.121E) until the diagnosis function is complete.

(b) Check that the "forward rotation friction", "reverse rotation friction", and "vibration estimation" values of machine diagnostic status are 1: Estimating complete. When the values are not that of estimating complete and machine diagnosis fails, repeat the operating procedure starting from (a).

(c) Set "friction estimation data" and "vibration estimation data" to the transient command, and turn ON the transient request.

POINT

- Refer to Servo Amplifier Instruction Manual for operation pattern of machine diagnosis function.

### 7.18.5 Transient commands for SSCNETⅢ/H head module

| Data type | Transient command | Unit | Number of valid words (Note 1) | Remark |
|---|---|---|---|---|
| Buffer memory read | 0211 | — | 4 | |
| Buffer memory write (2byte) | 0291 | — | 1 | |
| Buffer memory write (4byte) | 0292 | — | 1 | |

Note 1. Number of valid words for response data 1 to 4.

#### (1) Buffer memory read [0211h]

| Request data | Content |
|---|---|
| Request data 1 | Start I/O No.<br>(first 2 digits of 3-digit display) |
| Request data 2 | Buffer memory address |
| Request data 3 | Number of read data (1 to 4) |
| Request data 4 | 0 (fixed value) |

| Response data | Content |
|---|---|
| Response data 1 | 2-byte data of buffer memory address+0 |
| Response data 2 | 2-byte data of buffer memory address+2 |
| Response data 3 | 2-byte data of buffer memory address+4 |
| Response data 4 | 2-byte data of buffer memory address+6 |

#### (2) Buffer memory write (2byte) [0291h]

| Request data | Content |
|---|---|
| Request data 1 | Start I/O No.<br>(first 2 digits of 3-digit display) |
| Request data 2 | Buffer memory address |
| Request data 3 | Write data |
| Request data 4 | 0 (fixed value) |

| Response data | Content |
|---|---|
| Response data 1 | 0 (fixed value) |
| Response data 2 | 0 (fixed value) |
| Response data 3 | 0 (fixed value) |
| Response data 4 | 0 (fixed value) |

#### (3) Buffer memory write (4byte) [0292h]

| Request data | Content |
|---|---|
| Request data 1 | Start I/O No.<br>(first 2 digits of 3-digit display) |
| Request data 2 | Buffer memory address |
| Request data 3 | Write data (lower) |
| Request data 4 | Write data (upper) |

| Response data | Content |
|---|---|
| Response data 1 | 0 (fixed value) |
| Response data 2 | 0 (fixed value) |
| Response data 3 | 0 (fixed value) |
| Response data 4 | 0 (fixed value) |

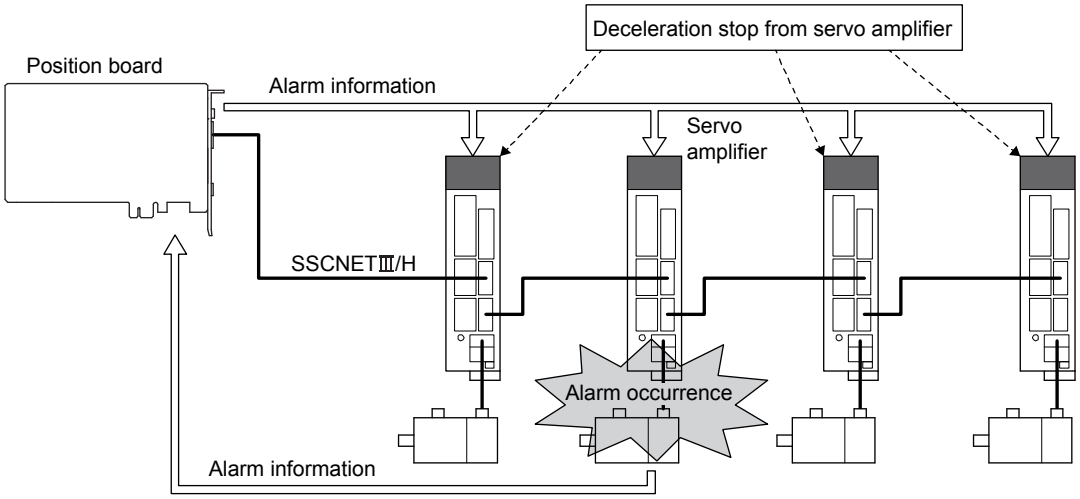
**POINT**

- Set the first 2 digits for the start I/O No. when the start I/O No. of the intelligent function module is a 3-digit display.
  (Example. When start I/O No. is 1F0h, set 1Fh)

## 7.19 Hot line forced stop function

### 7.19.1 Summary

When an alarm occurs in a MR-JE-□B servo amplifier, the hot line forced stop function stops the other axes on the same line with a deceleration stop, allowing the axes to stop safely. When the main circuit power is shut-off at a servo alarm occurrence, use this function.




POINT

- For the MR-JE-□B, the control power supply and main circuit power are integrated. Therefore when L1/2/3, the equivalent of the main circuit power of MR-J4(W□)-□B is shut-off, the control power supply of the servo amplifier is turned OFF. Consequently, SSCNET communication of the axes after the axis where the alarm occurred is disconnected when the wiring is designed to shut-off the main circuit power at an alarm occurrence. When this occurs, the position board can no longer control the disconnected axes and they are stopped by dynamic brake. Thus, if the hot line forced stop function is not used, machinery may cause a collision due to the coasting distance. When SSCNET communication is disconnected, a system error (E40□h) occurs.
- System errors cannot be reset. Reboot the software, restart the system as required.

### 7.19.2 Control details

The hot line forced stop function is set by a servo parameter. By using this function, other axes are stopped with a deceleration stop by a notification from the axis where the servo alarm occurred, without going through the control from the position board. The hot line forced stop function is enabled by factory default in the MR-JE-□B. To disable the function, set 1 (disabled) in hot line forced stop function selection of hot line forced stop function (servo parameter No.111A).
Also, when using MR-JE-□B and MR-J4(W□)-□B together, the hot line forced stop function can stop MR-J4(W□)-□B axes with a deceleration stop when an alarm occurs in a MR-JE-□B.
In order to stop MR-J4(W□)-□B with a deceleration stop as well, set 2 (enabled) in hot line forced stop deceleration stop selection of hot line forced stop function (servo parameter No.111A) of MR-J4(W□)-□B. (The factory default is "0" (disabled).)
Refer to Servo Amplifier Instruction Manual for details.

> POINT
> ・For axes that deceleration stop by the hot line forced stop function, a controller forced stop warning (servo warning E7) occurs.

The setting values for hot line forced stop function selection (servo parameter No.111A), and the operation in the servo amplifier is shown below.

(1) Using MR-JE-□B

| Setting value | Hot line output | Deceleration stop at the receiving of hot line signal |
|---|---|---|
| 0: Enabled (initial value) | Enabled | Enabled |
| 1: Disabled | Disabled | Disabled |

(2) Using MR-J4(W□)-□B

| Setting value | Hot line output | Deceleration stop at the receiving of hot line signal |
|---|---|---|
| 0: Disabled (initial value) | Disabled | Disabled |
| 2: Enabled | Disabled | Enabled |

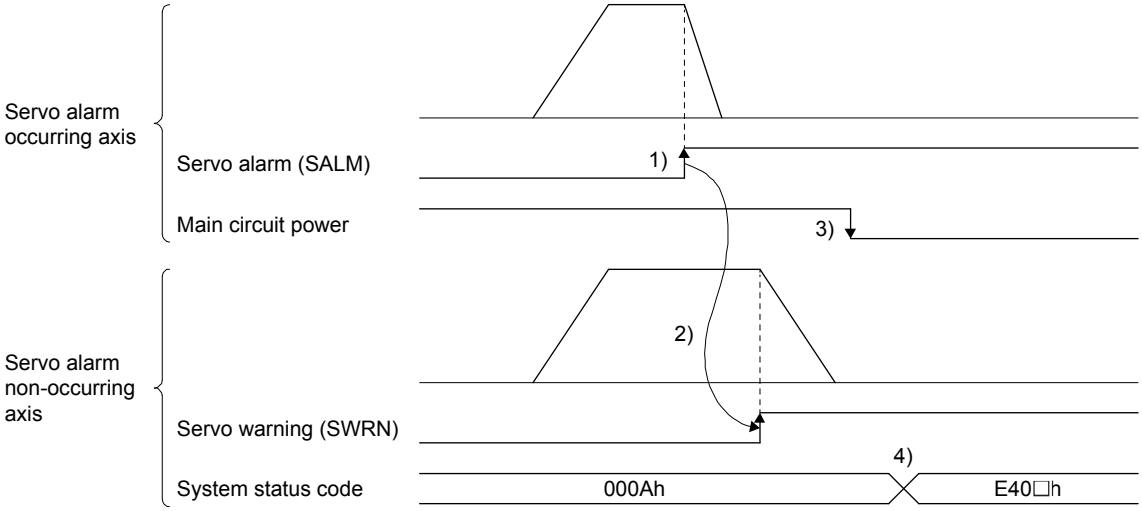
Use a software version that supports hot line forced stop function for the servo amplifier. Servo amplifier software versions that support hot line forced stop function are shown in the table below.

| Servo amplifier model | Software version |
|---|---|
| MR-J4(W□)-B□ | B7 or later |
| MR-JE-□B | B6 or later |

> POINT
> ・Servo amplifiers other than the above do not support the hot line forced stop function and therefore do not perform a hot line output or deceleration stop at the receiving of hot line signal.

7.19.3 Timing for alarm occurrences

A timing chart using for servo alarm occurrence is shown below.




1) A servo alarm occurs, and a stop is performed by dynamic brake.
2) The servo alarm non-occurring axis receives notification from the servo alarm occurring axis, and servo warning (SWRN) turns ON.
3) Checks that servo alarm non-occurring axes are stopped, and main circuit power is shut-off by host controller command. (If the main circuit power is shut-off before servo warning (SWRN) turns ON in the servo alarm non-occurring axis, a deceleration stop by this function may not perform correctly.)
4) System error (E40□h) occurs.

# 8. TANDEM DRIVE

Tandem drive is that 1 axis is physically connected to and driven by 2 motors. The position board provides the same position command to the 2 axes set up for tandem drive.
Tandem drive can be set up for a maximum of 8 sets (16 axes).

## 8.1 Drive modes

For tandem drive there are 2 drive modes; synchronous mode and non-synchronous micro-adjustment control mode.
Types of operation that can be performed for each mode are as follows.

| Operation mode | Drive Modes | |
|---|---|---|
| | Synchronous mode | Non-synchronous mode |
| JOG operation | ○ | ○ |
| Incremental feed | ○ | ○ |
| Automatic operation | ○ | × |
| Linear interpolation operation | ○ | × |
| Home position return | △ (Note) | × |
| Home position reset | ○ | × |

Note. Home position return operation can be performed only using the following home position return method. If a different method is used to perform home position return, the tandem drive excursing error (operation alarm 52, detail 01) occurs.

Compatible home position return method

- Dog cradle method
- Dog method
- Data set method
- Dog front end method
- Z-phase detection method
- Scale home position signal detection method
- Scale home position signal detection method 2

POINT

- Performing start operation with a non-compatible mode during a non-synchronous micro-adjustment mode makes an alarm for tandem drive non-synchronous mode (operation alarm 51, detail 01) occur.

### 8.1.1 Synchronous mode

Through providing the master and slave axes the same position command, they move together. Each axis uses a feedback signal position loop, speed loop, and current loop for control.

### 8.1.2 Non-synchronous micro-adjustment control mode

Non-synchronous micro-adjustment control 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 using incremental feed or JOG operation.
When home position return has been completed, even if the tandem drive mode is switched to non-synchronous micro-adjustment mode, the system is not switched to non-home position return complete (home position return request (ZREQ) is not ON). After the mode is switched to the synchronous mode, automatic operation and linear interpolation can be performed without re-performing home position return.

POINT

- If the synchronization setting (parameter No.0265) is set to valid, 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 synchronization. When automatic operation or linear interpolation is performed with synchronization incomplete, the tandem drive synchronous alignment error (operation error 58, detail 02) occurs.
- When the synchronization setting (parameter No.0265) is set to invalid, the operation in the synchronization mode is performed based on the master axis holding deviation between master axis and slave axis at switching the mode to the synchronization mode.

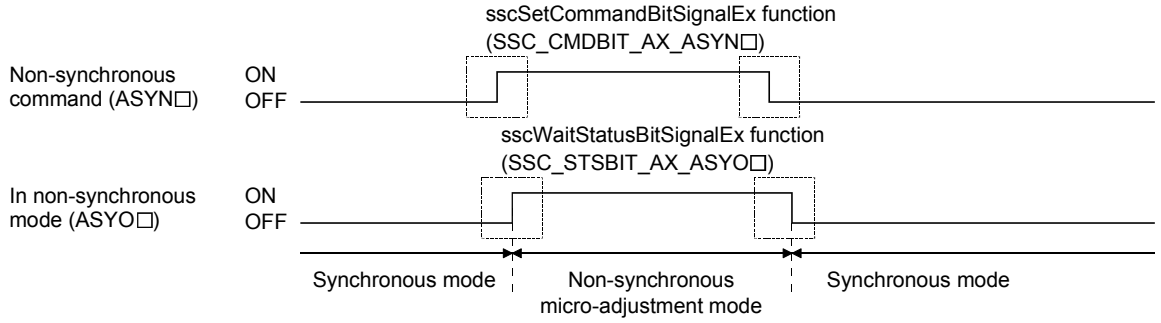
### 8.1.3 Changing of drive mode

The changing of modes is performed using ON/OFF of the non-synchronous command signal (ASYN□: □ is the group number). Changing of mode can be performed on a group basis.
Changing of drive mode can only be performed when all of the following conditions are satisfied.

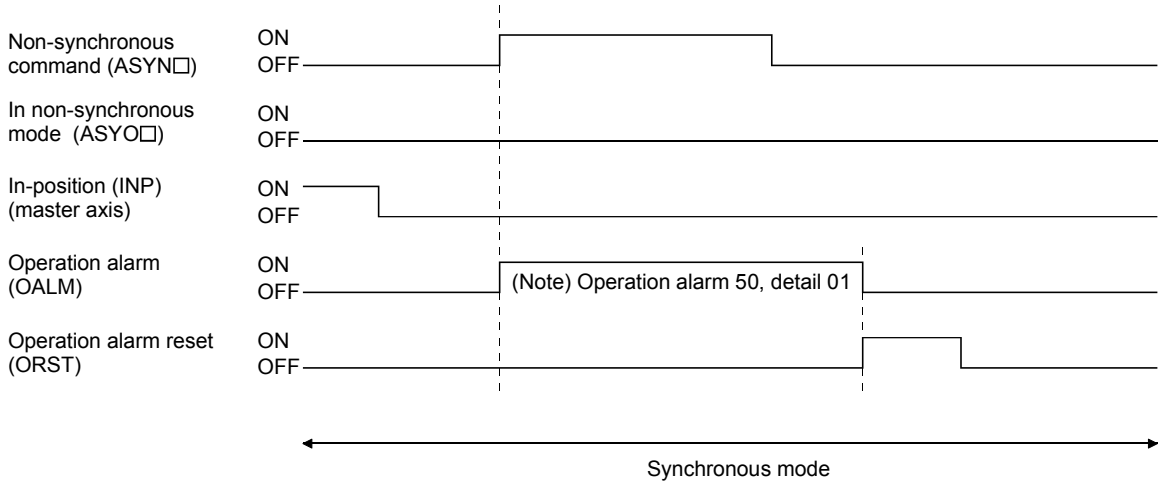
- The during smoothing of stopping (SMZ) is on for both the master axis and the slave axis.
- The in-position signal (INP) is ON for both the master axis and slave axis.
- No operation alarm has occurred for both the master axis and slave axis.
- Neither the master axis nor the slave axis is operating.
- They are not being synchronized.

If even one of the conditions is not satisfied, the tandem drive mode change error (operation alarm 50, detail 01) occurs.

(1) Example when drive mode can be changed




(2) Example when drive mode can not be changed (the in-position signal (INP) of the master axis is OFF)




Note. When the tandem drive mode change error (operation alarm 50, detail 01) has been set, after returning the Non-synchronous command signal (ASYN□) to its normal status, turn the operation alarm reset signal (ORST) on to cancel the operation alarm.

When changing from non-synchronous micro-adjustment mode to synchronous mode, of the axis data for the slave axis, only the data that is valid for the master axis (refer to Section 8.3) is saved from the non-synchronous micro-adjustment mode. Zero clear and the like is not performed.

## 8.2 Parameter settings

### 8.2.1 Designation of tandem drive axes

Setting the group number in the 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 number the axis with the smaller axis No. is the master axis and the axis with the larger axis No. is the slave axis.

| Control cycle | Valid group number |
|---|---|
| 0.88ms | 1 to 8 |
| 0.44ms | 1 to 8 |
| 0.22ms | 1 to 4 |

POINT

- For the following conditions, upon system startup, the tandem drive axis setting value error (operation alarm 52, detail 02) occurs, and tandem drive control can not be performed.
  - If the complement axis is not set up
  - If 3 or more axes are set up with the same group number
  - If the group number exceeds the valid group number

### 8.2.2 Servo parameters

Set the servo parameters to the same values for the axes for which tandem drive is performed. However, the rotation direction selection (servo parameter No.110D) can be different values depending on mechanical specifications.

### 8.2.3 Control parameters

The settings of the control parameters for when using tandem drive can be selected from among the following 3 selections: "only values of master axis are valid", "set master/slave axes to same values", and "master and slave can be set separately". Only master axis values are valid means that the parameter settings of the master axis are used for both the master and the slave. In this case, the parameters of the slave axis are ignored. Refer to Chapter 11 for setting classifications of each control parameter.

## 8.3 Axis data classifications

Axis data for tandem drive axes have 2 data type settings: "only master axis data is valid" and "master axis/slave axis data are separate".

POINT

- Refer to Section 10.7 concerning axis data classifications for tandem drive axes. In this table, "only master axis data is valid" is designated as "master" while "master axis/slave axis data are separate" is designated as "axes separate".
- It is possible to review monitor data for each axis individually.

### 8.3.1 Only data from master axis is valid

(1) Command table data

When the drive mode is synchronous mode, only the command table data from the master axis is valid. For this case the command table data for the slave is ignored. If the drive mode is non-synchronous micro-adjustment mode, each axis becomes valid.

(2) Status table data

When the drive mode is synchronous mode, only the status table data from the master axis is valid. For this case the status table data for the slave axis is optional. If the drive mode is non-synchronous micro-adjustment mode, each axis becomes valid.

### 8.3.2 Individual data for master axis/slave axis

Data that is valid for each axis independent of the drive mode.

## 8.4 Tandem drive axis operation

POINT

- Only have the master axis call the start operation functions of each axis when in synchronous mode.

### 8.4.1 Home position return during tandem drive

Methods for returning to home position while using tandem drive axes include: dog method, dog cradle method, data set method, Z-phase detection method, scale home position signal detection method, and scale home position signal detection method 2. These home position return methods are performed while in synchronous mode.

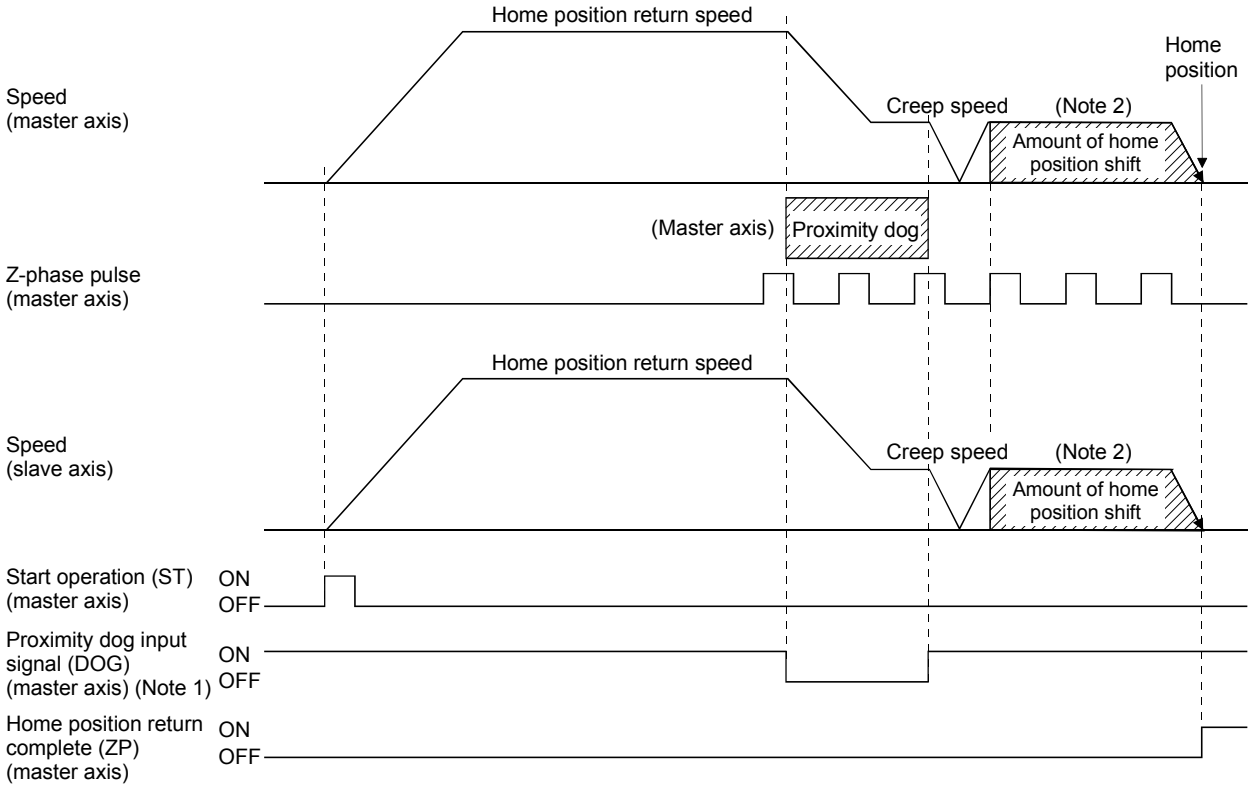
Note 1. If a non-compatible method is used to perform home position return, the tandem drive axis setting error (operation alarm 52, detail 01) occurs when home position return is started.

2. When in non-synchronous micro-adjustment mode, the while in tandem drive non-synchronous mode (operation alarm 51, detail 01) occurs when home position return is started.

POINT

- If a non-compatible method is used to perform home position return, the tandem drive axis setting error (operation alarm 52, detail 01) occurs when home position return is started.
- When in non-synchronous micro-adjustment mode, the while in tandem drive non-synchronous mode (operation alarm 51, detail 01) occurs when home position return is started.
- The amount of home position shift is set using a control parameter No.0248, 0249. The home position can be shifted by setting the amount of home position shift.
- If the balance between tandem drive axes is not good just after turning on the power, it can cause stress to the equipment, therefore use non-synchronous micro-adjustment mode to adjust the balance and perform home position return.
- When home position return is completed, the 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.

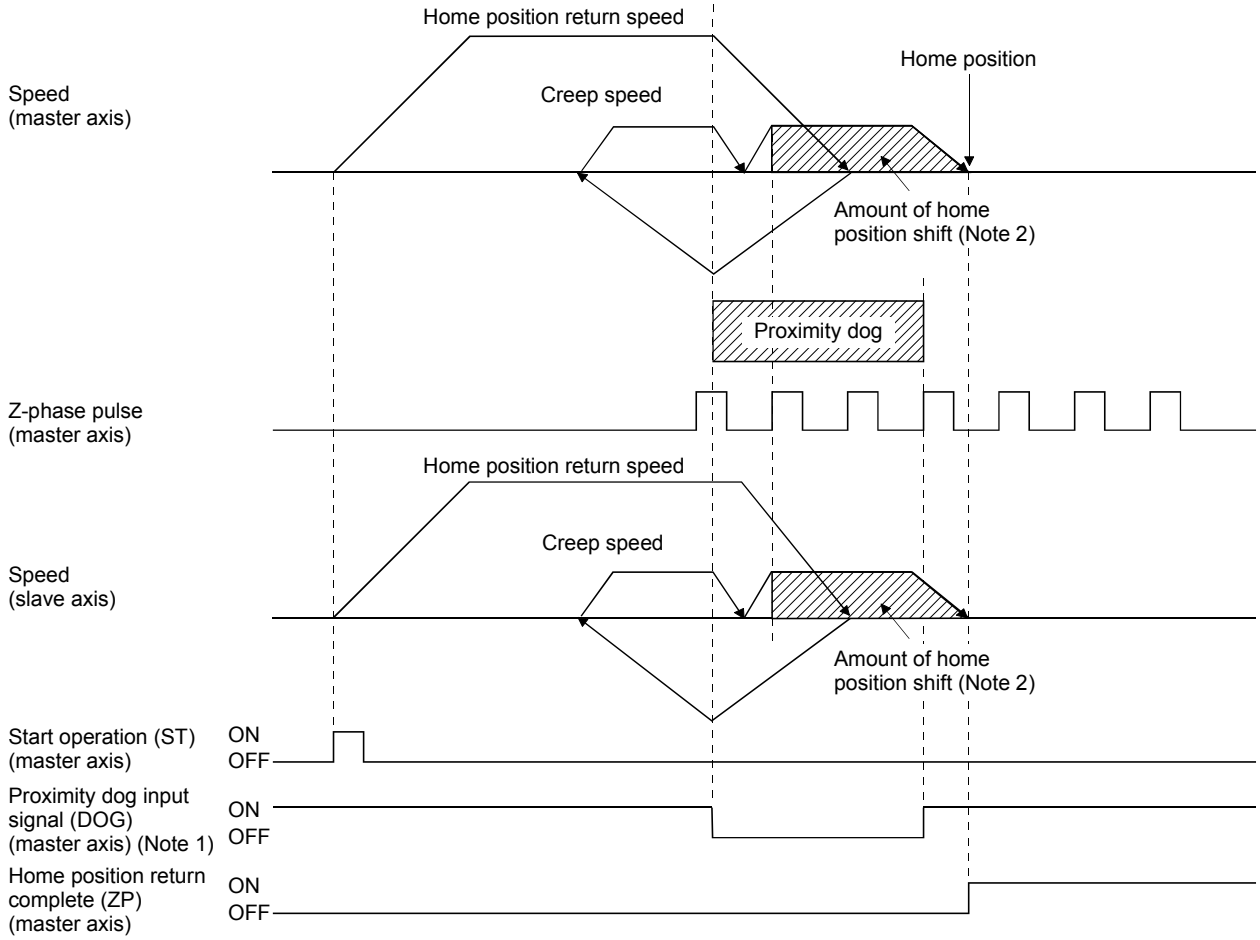
(1) Home position return using a dog method




Note 1. The proximity dog signal for the master is the only valid signal. The slave axis also returns to home position based on the dog signal for the master.

2. The final stop position for both the master axis and the slave axis is based on the final master axis motor Z-phase. Also, only the master axis parameter for the value for the home position shift amount is valid.

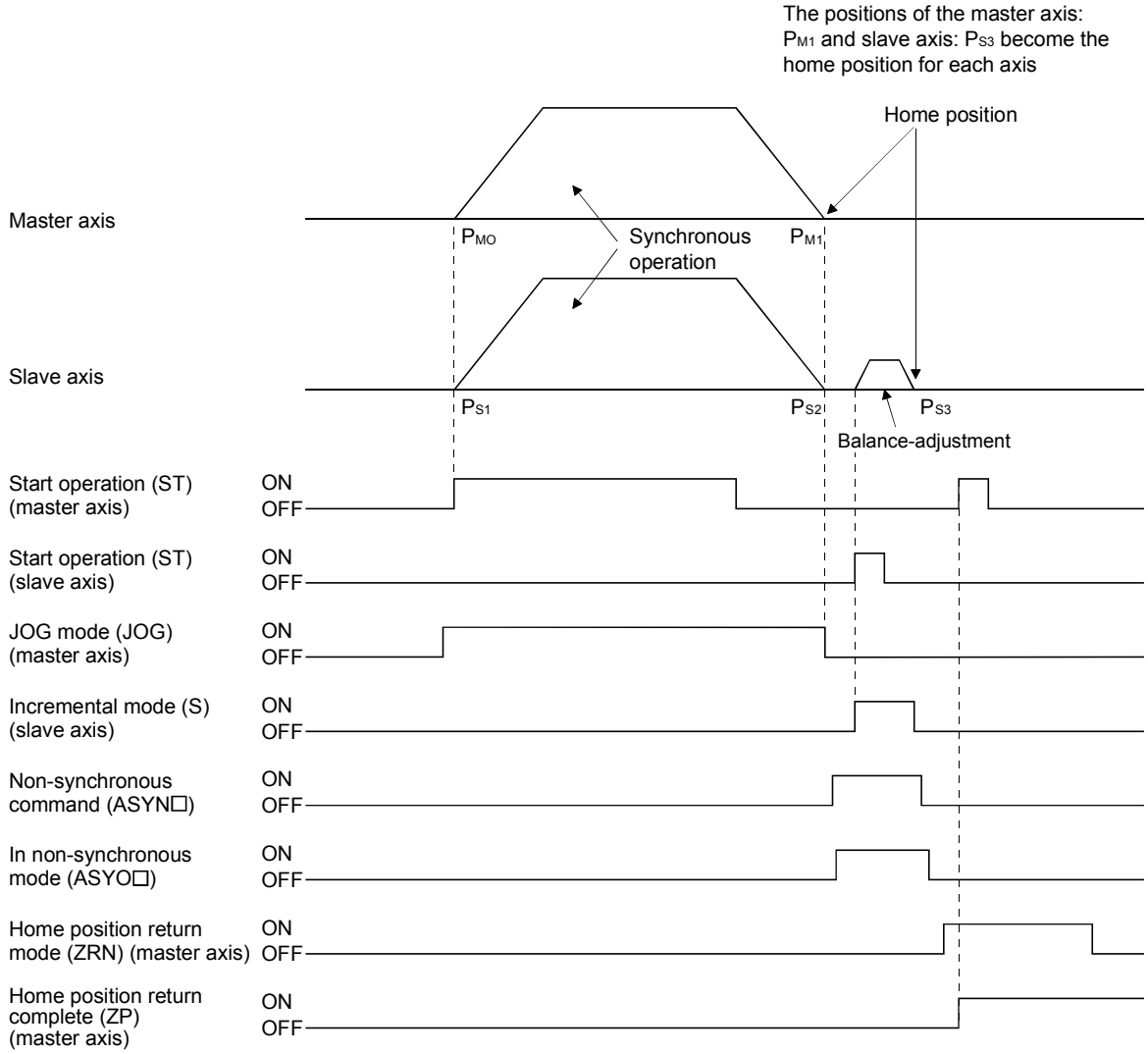
(2) Home position return using the dog cradle method




Note 1. The proximity dog signal for the master is the only valid signal. The slave axis also returns to home position based on the dog signal for the master.

2. The final stop position for both the master axis and the slave axis is based on the final master axis motor Z-phase. Also, only the master axis parameter for the value for the home position shift amount is valid.

(3) Home position return using a data set method




Note. This explanation is an example for using JOG operation for moving to home position.

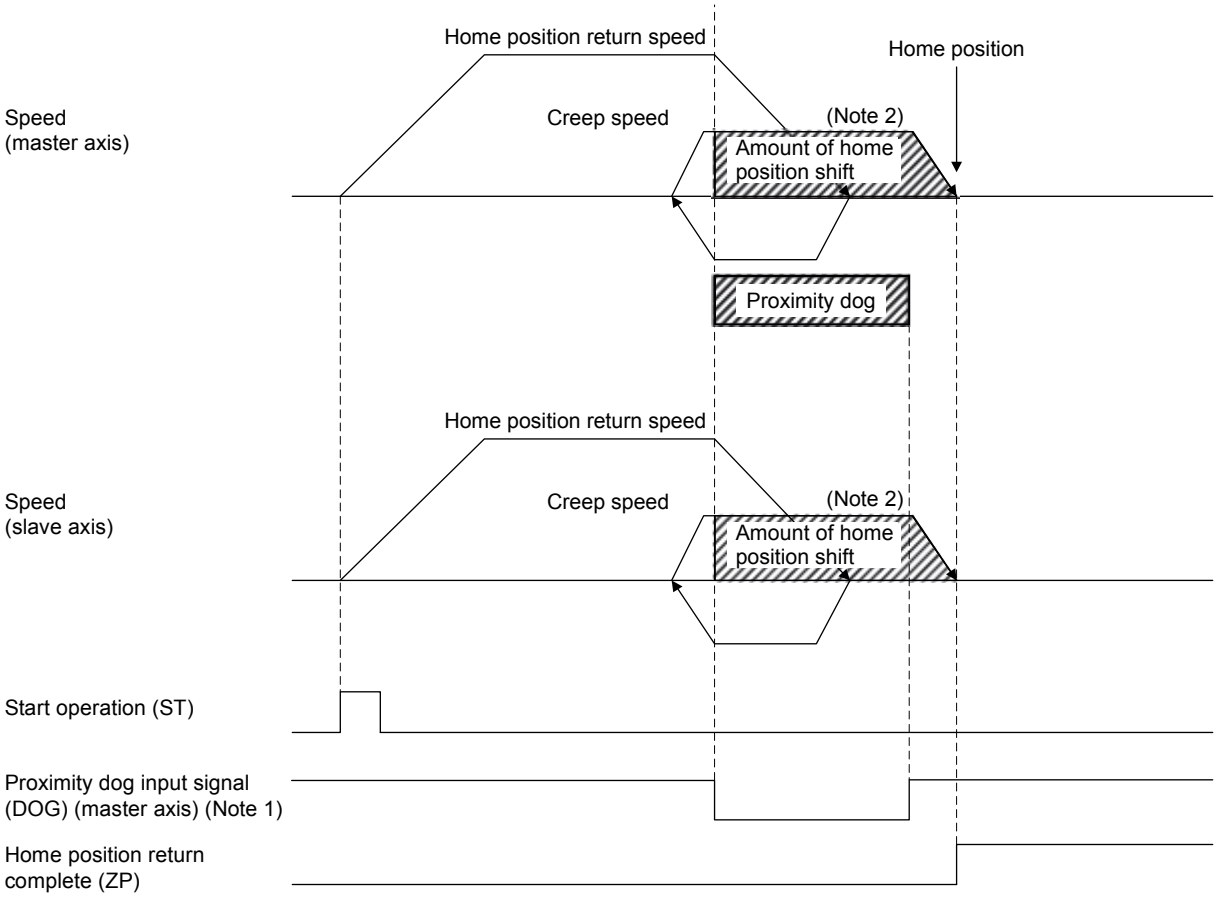
(4) Home position return using a dog front end method

Home position return using a dog front end method uses the proximity dog front end as the home position. The following two methods are available for the home position return using a dog front end method with the tandem drive axes: using the proximity dog front end on the master axis as the home position and detecting each proximity dog front end for the master axis and slave axis to perform tweaking (compensation of deviation between master axis and slave axis). Set either of the methods with the compensation of home position return deviation in the tandem drive options (parameter No.0265).

| Tandem drive options (parameter No.0265) | | Application |
|---|---|---|
| Compensation of home position return deviation | Home position return method | |
| Deviation compensation invalid | | Uses the proximity dog front end as the home position. Use this method when there is no need to consider the mechanical deviation such as the case where no deviations occur between master axis and slave axis. |
| Deviation compensation valid | Adjustment mode | Use this mode to calculate the proximity dog front end offset (amount of deviation in the position of the proximity dog front end for the master axis and slave axis) during mechanical adjustment. |
| | Normal mode | Use this mode to detect the amount of proximity dog front end deviation between master axis and slave axis and perform tweaking (compensation of deviation between master axis and slave axis) in normal operation so that the axis is mechanically at a right angle. |

(a) Deviation compensation invalid

The motion detected by the proximity dog slows down to stop, and return to the proximity dog front end, setting there to the home position. When deviation compensation is invalid, only the proximity dog signal for the master axis is used.




Note 1. The proximity dog signal for the master is the only valid signal. The slave axis also returns to home position based on the proximity dog signal for the master.

2. The final stop position for both the master axis and the slave axis is based on the master axis proximity dog front end. Also, only the master axis parameter for the value for the home position shift amount is valid.

(b) Deviation compensation valid

The motion detected by the proximity dog slows down to stop, and return to the proximity dog front end, setting there to the home position. When deviation compensation is valid, the proximity dog signals for the master axis and for the slave axis are used to calculate the amount of deviation between each dog front end position or to compensate the deviation between the master axis and the slave axis. To perform the calculation or the compensation of deviation amount, designate adjustment mode or normal mode using tandem drive options (parameter No.0265).

1) Adjustment mode

a) Summary

Adjustment mode is used during mechanical adjustment, and is used to calculate the dog front end position offset (amount of deviation in the position of the proximity dog front end for the master axis and slave axis).

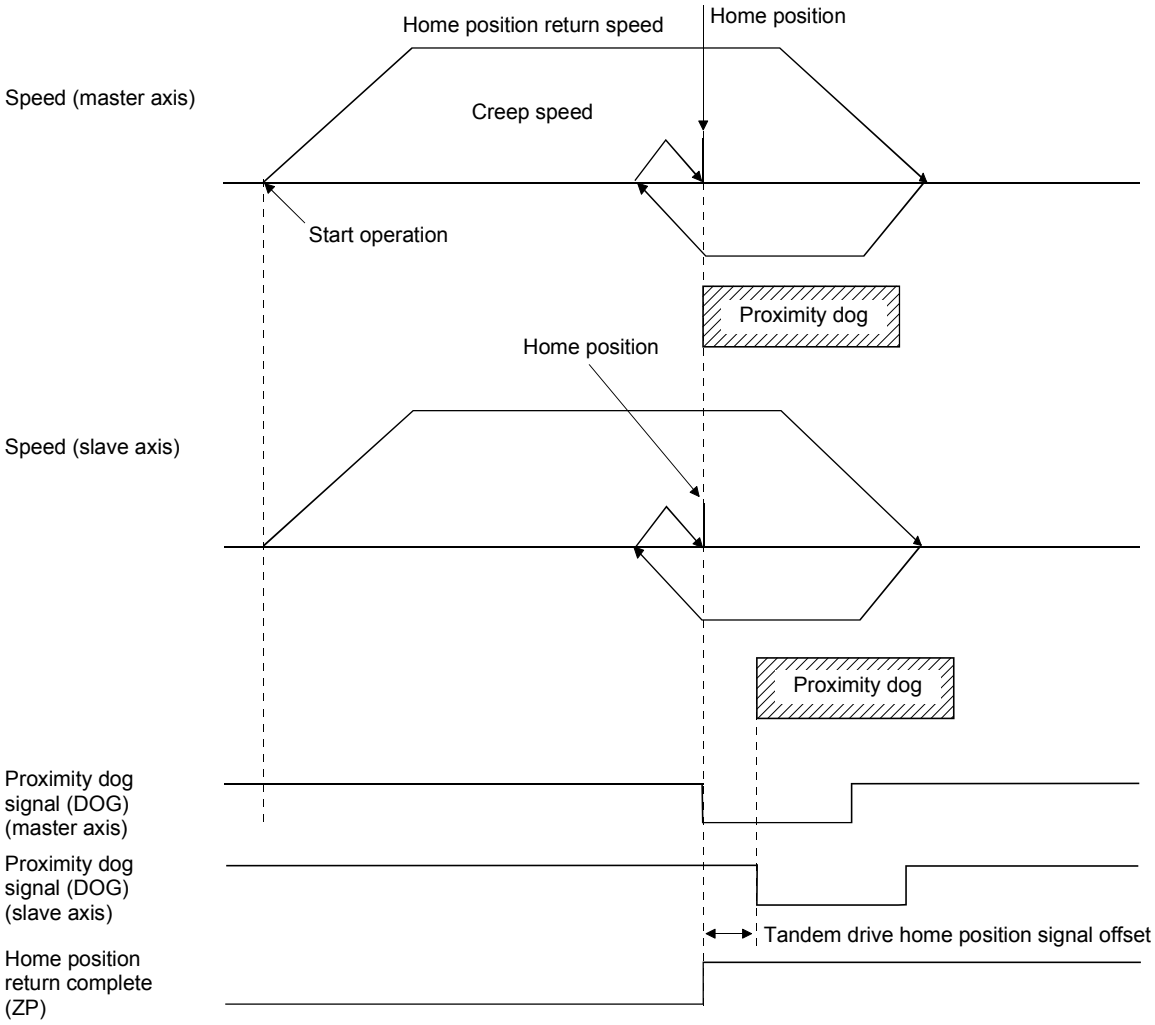
When executing home position return while in adjustment mode, after detecting the master axis dog front end position and the slave axis dog front end position while returning to home position, the axes are moved to the dog front end position of the master axis. At this time the amount of offset from the position of the dog front end for the master axis to the position of the dog front end for the slave axis is calculated and output using the tandem drive home position signal offset (parameter No.026C, 026D). This amount of offset is used when compensating the amount of deviation between the master axis and slave axis when returning to home position; therefore, after completing home position return save this offset on the user program.

Note. Prior to returning to home position, set the axis linking the master axis and slave axis mechanically at a right angle to the movement direction. If it is not at a right angle, the dog front end position offset amount can not be correctly calculated.

b) Start operation method

1. Adjust the axis linking the master axis and slave axis mechanically at a right angle to the movement direction.
2. Set the home position return method (parameter No.0240) to "Dog front end method" and tandem drive option (parameter No.0265) to "Adjustment mode".
3. Start home position return operation.
4. After home position return is complete, read the tandem drive home position signal offset (parameter No.026C, 026D) and save it to the user program.

c) Operation example for adjustment mode




2) Normal mode

a) Summary

In normal mode, the amount of deviation between the master axis and slave axis is detected and tweaking (compensation of deviation between master axis and slave axis) is performed. This movement sets the axis linking the master axis and slave axis mechanically at a right angle to the movement direction.

When home position return is performed using normal mode, after detecting the master axis dog front end position and slave axis dog front end position while returning to home position, calculate the deviation of the master axis and slave axis based on the tandem drive home position signal offset (parameter No.026C, 026D). The master axis moves to the dog front end position and the slave axis moves to the slave axis home position calculated based on the tandem driver home position signal offset and the previously noted deviation.

Note 1. When performing home position return in normal mode, set the tandem drive home position signal offset (parameter No.026C, 026D) to the correct value. If the tandem drive home position signal offset value is erroneous, the axis that links the master axis and slave axis will not be at a right angle.

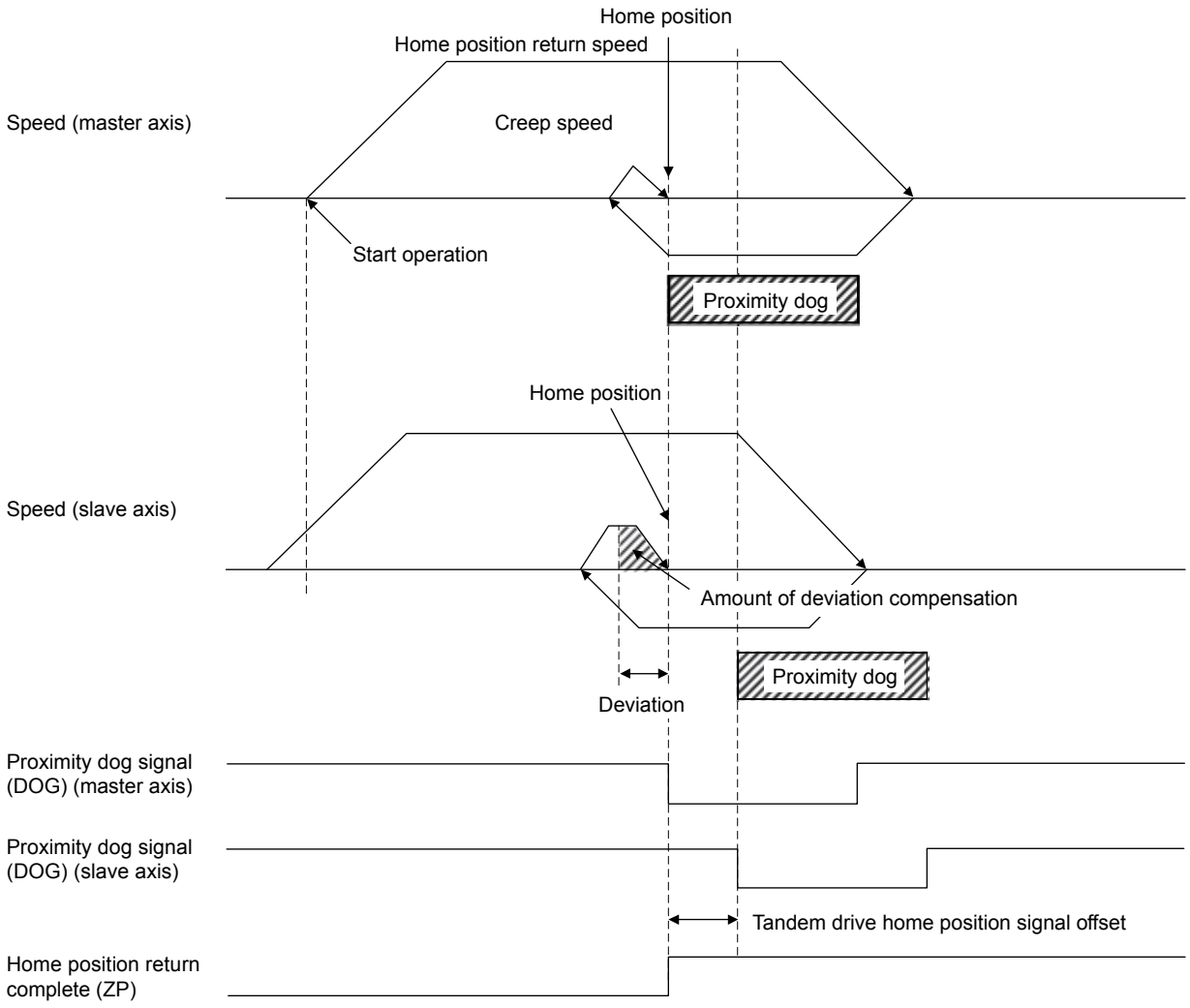
2. If the amount of deviation between the master axis and the slave axis exceeds the value calculated from the valid width of tandem drive deviation compensation (parameter No.026B) × tandem drive deviation compensation units multiplication (parameter No.026E), an exceeding of valid width of tandem drive deviation compensation error (operation alarm 57, detail 01) occurs and home position return operation is terminated. (Tweak movement is not performed.)

b) Start operation method

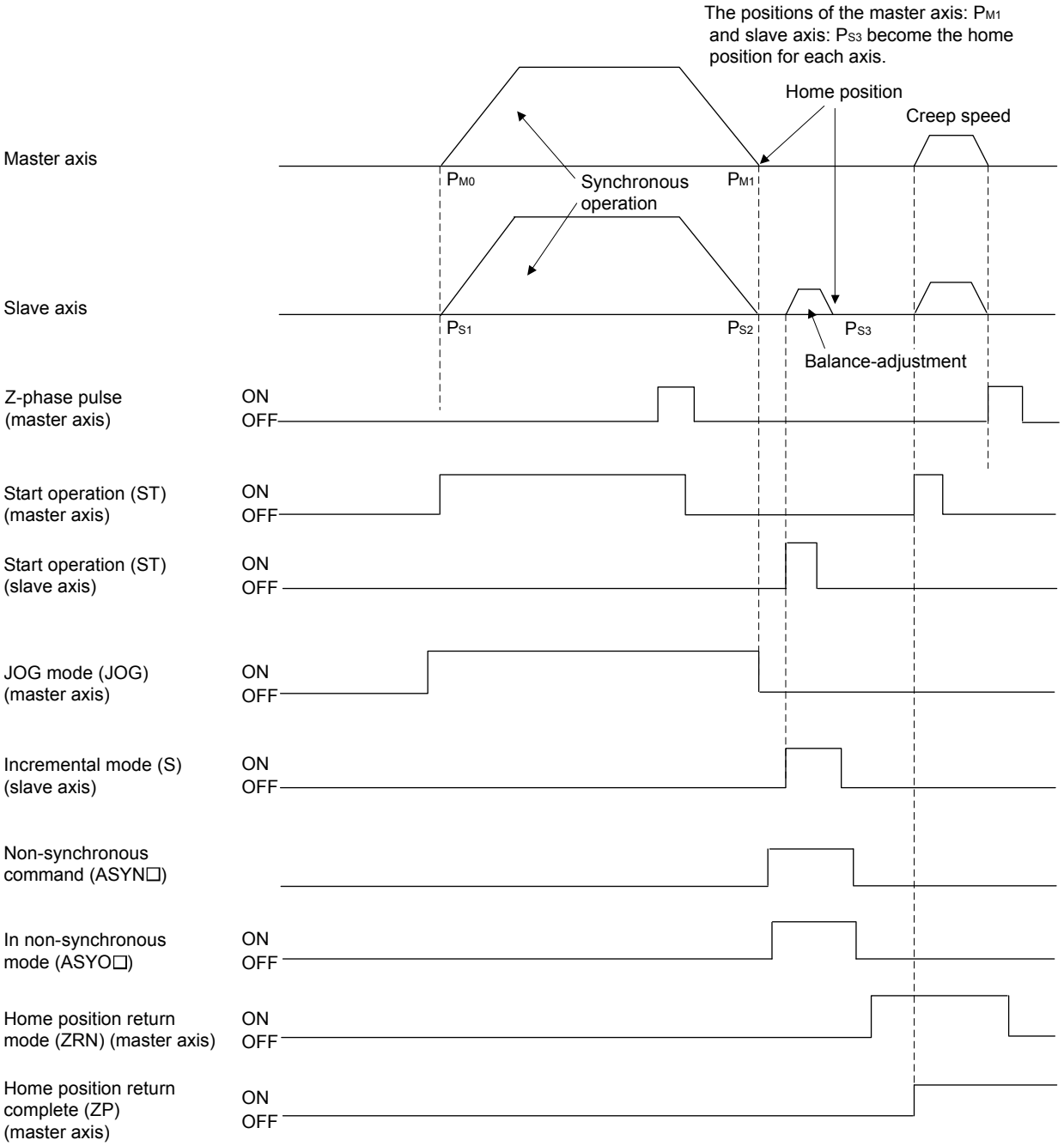
1. Set the home position return method (parameter No.0240) to "Dog front end method" and tandem drive option (parameter No.0265) to "Normal mode".
2. Set the tandem drive home position signal offset (parameter No.026C, 026D).
3. Start home position return operation.

Note. Through setting the amount of home position shift (parameter No.0248, 0249), the position shifted from dog front end position can be defined as the home position.

c) Operation example for normal mode



(5) Home position return using a Z-phase detection method




Note 1. This explanation is an example for using JOG operation for moving to home position.

2. The final stop position for both the master axis and the slave axis is based on the first master axis motor Z-phase in the home position return direction from the start operation position.
Also, only the master axis parameter for the value for the home position shift amount is valid.

(6) Home position return using a scale home position signal detection method

Home position return is performed using a home position signal (Z-phase) on a linear scale. After detecting the proximity dog, move in the direction of the home position and in the opposite direction and the position where a home position signal is detected is defined to be the home position. When using scale home position signal detection home position return for tandem drive axes, designate adjustment mode or normal mode using tandem drive options (parameter No.0265).

(a) Adjustment mode

1) Summary

Adjustment mode is used during mechanical adjustment, and is used to calculate the home position signal offset (amount of deviation in the position of the home position signal for the master axis and slave axis) on a linear scale.

When executing home position return while in adjustment mode, after detecting the master axis home position signal and the slave axis home position signal while returning to home position, the axes are moved to the home position signal of the master axis. At this time the amount of offset from the position where the master home position signal was detected to the position where the slave home position was detected is calculated and output using the tandem drive home position signal offset (parameter No.026C, 026D). This amount of offset is used when compensating the amount of deviation between the master axis and slave axis when returning to home position; therefore, after completing home position return save this offset on the user program.

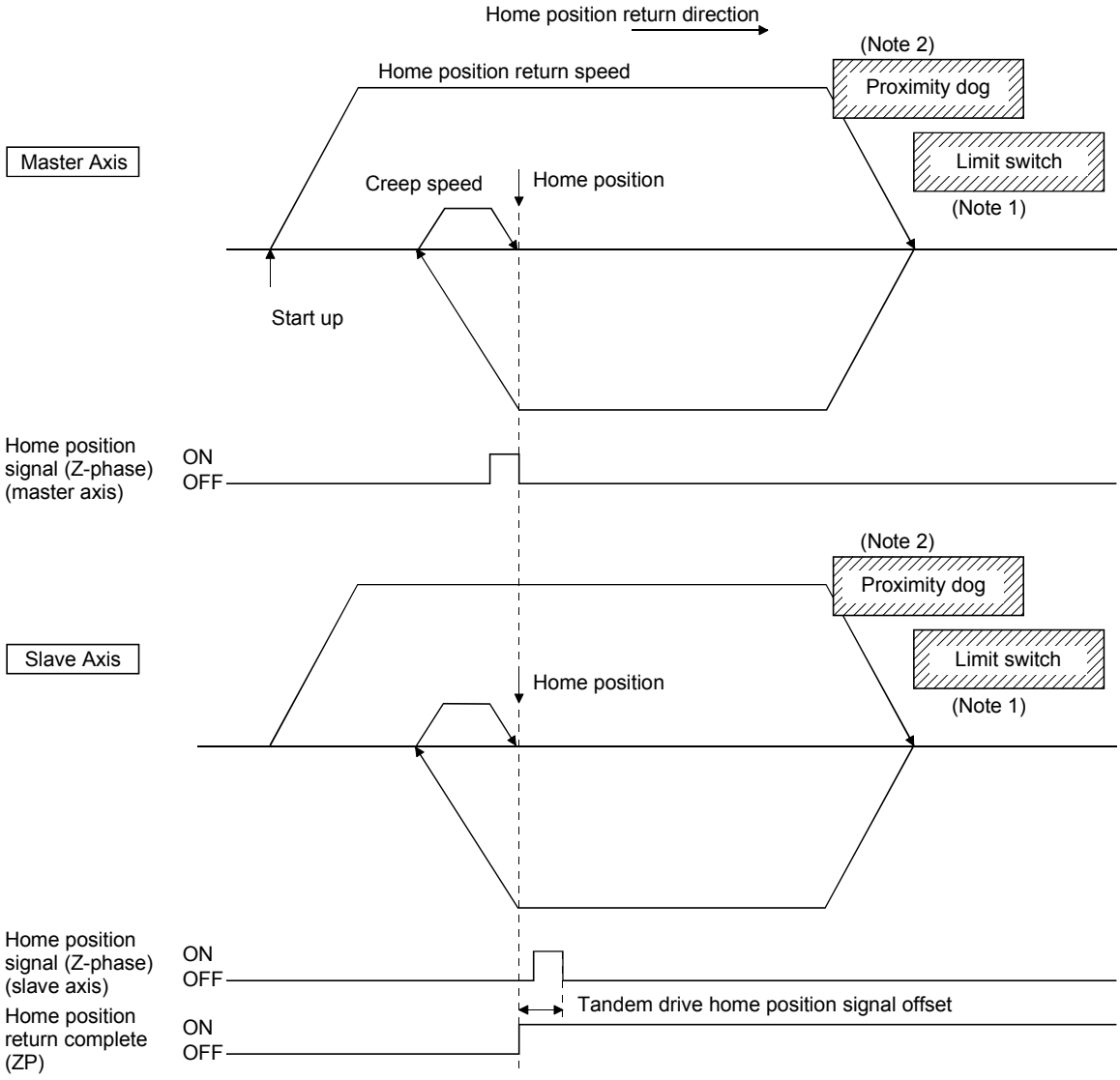
| POINT |
| --- |
| ・Prior to returning to home position, set the axis linking the master axis and slave axis mechanically at a right angle to the movement direction. If it is not at a right angle, the home position signal position offset amount can not be correctly calculated. |

2) Operation example for normal mode

a) Start operation method

1. Adjust the axis linking the master axis and slave axis mechanically at a right angle to the movement direction.
2. Set the home position return method (parameter No.0240) to scale home position signal detection method and tandem drive option (parameter No.0265) to normal mode.
3. Start home position return operation.
4. After home position return is complete, read the tandem drive home position signal offset (parameter No.026C, 026D) and save it to the user program.

b) Timing chart




Note 1. When a limit switch signal is detected, an alarm occurs and execution of home position return is terminated.
Position the proximity dog in front of the limit switch signal.
(As shown in the diagram, position the proximity dog signal so that it overlaps the limit switch signal.)

2. Set the distance between the master axis/slave axis home position signals and the proximity dog so that it is greater than the deviation at maximum tolerance of the master axis and slave axis.

(b) Normal mode

1) Summary

In normal mode, the amount of deviation between the master axis and slave axis is detected and tweaking (compensation of deviation between master axis and slave axis) is performed. This movement sets the axis linking the master axis and slave axis mechanically at a right angle to the movement direction.

When home position return is performed using normal mode, after detecting the master axis home position signal and slave position home position signal while returning to home position, calculate the deviation of the master axis and slave axis based on the tandem drive home position signal offset (parameter No.026C, 026D). The master axis moves to the position of the home position signal and the slave axis moves to the slave axis home position calculated based on the tandem driver home position signal offset and the previously noted deviation.

POINT

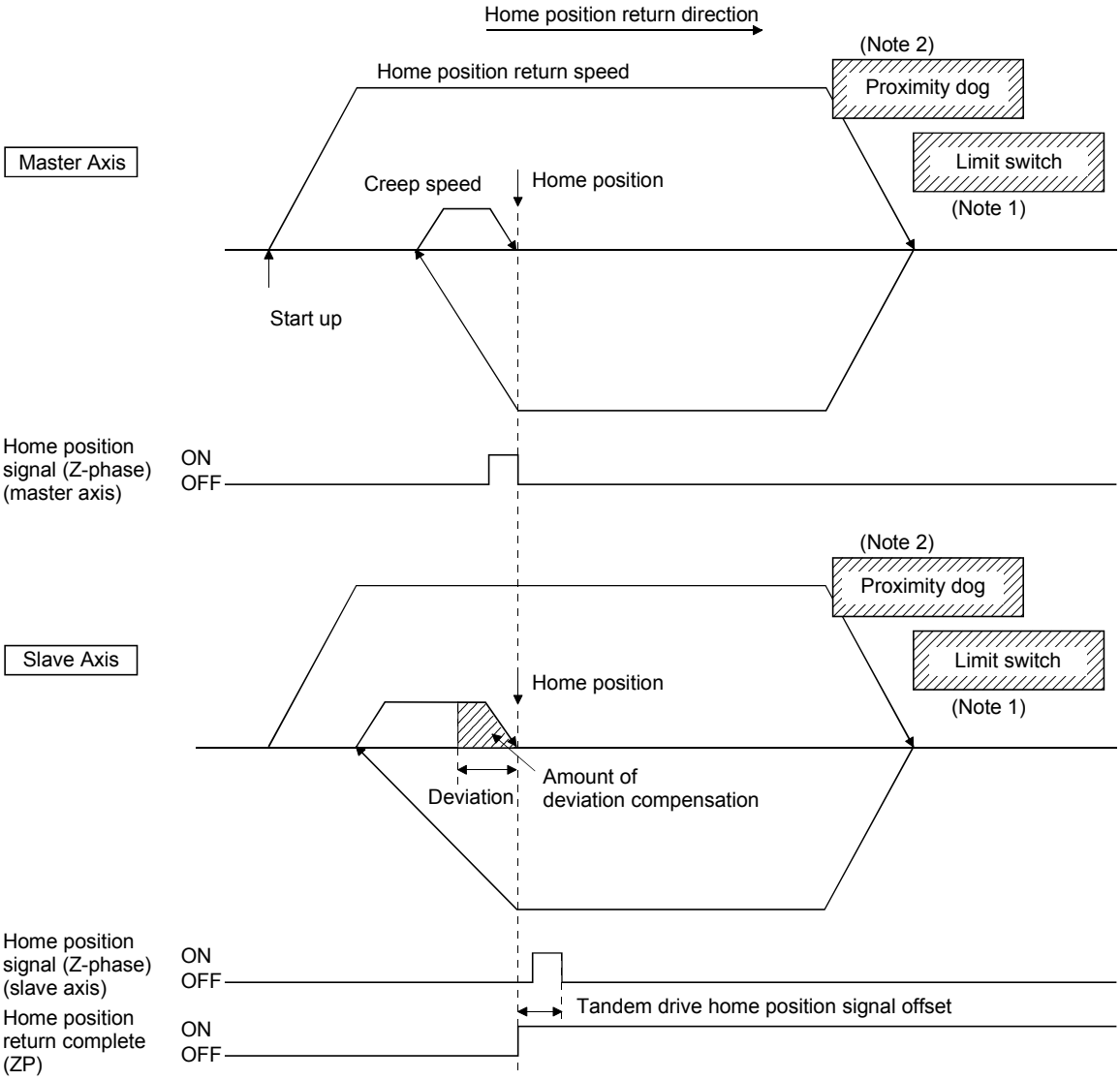
- When performing home position return in normal mode, set the tandem drive home position signal offset (parameter No.026C, 026D) to the correct value. If the tandem drive home position signal offset value is erroneous, the axis that links the master axis and slave axis will not be at a right angle.
- If the amount of deviation between the master axis and the slave axis exceeds the value calculated from the valid width of tandem drive deviation compensation (parameter No.026B) × tandem drive deviation compensation units multiplication (parameter No.026E), an exceeding of valid width of tandem drive deviation compensation error (operation alarm 57, detail 01) occurs and home position return operation is terminated. (Tweak movement is not performed.)

2) Operation example for normal mode

a) Startup method

1. Set the home position return method (parameter No.0240) to scale home position signal detection method and tandem drive option (parameter No.0265) to normal mode.
2. Set the tandem drive home position signal offset (parameter No.026C, 026D).
3. Start home position return operation.

b) Timing chart




Note 1. When a limit switch signal is detected, an alarm occurs and execution of home position return is terminated.
Position the proximity dog in front of the limit switch signal.
(As shown in the diagram, position the proximity dog signal so that it overlaps the limit switch signal.)

2. Set the distance between the master axis/slave axis home position signals and the proximity dog so that it is greater than the deviation at maximum tolerance of the master axis and slave axis.

(7) Home position return using a scale home position signal detection method 2

Home position return is performed using a home position signal (Z-phase) on a linear scale. After the start operation is performed, move in the opposite direction of the home position and the position where a home position signal is detected is defined to be the home position. When using scale home position signal detection home position return for tandem drive axes, designate adjustment mode or normal mode using tandem drive options (parameter No.0265).

(a) Adjustment mode

1) Summary

Adjustment mode is used during mechanical adjustment, and is used to calculate the home position signal offset (amount of deviation in the position of the home position signal for the master axis and slave axis) on a linear scale.

When executing home position return while in adjustment mode, after detecting the master axis home position signal and the slave axis home position signal while returning to home position, the axes are moved to the home position signal of the master axis. At this time the amount of offset from the position where the master home position signal was detected to the position where the slave home position was detected is calculated and output using the tandem drive home position signal offset (parameter No.026C, 026D). This amount of offset is used when compensating the amount of deviation between the master axis and slave axis when returning to home position; therefore, after completing home position return save this offset on the user program.

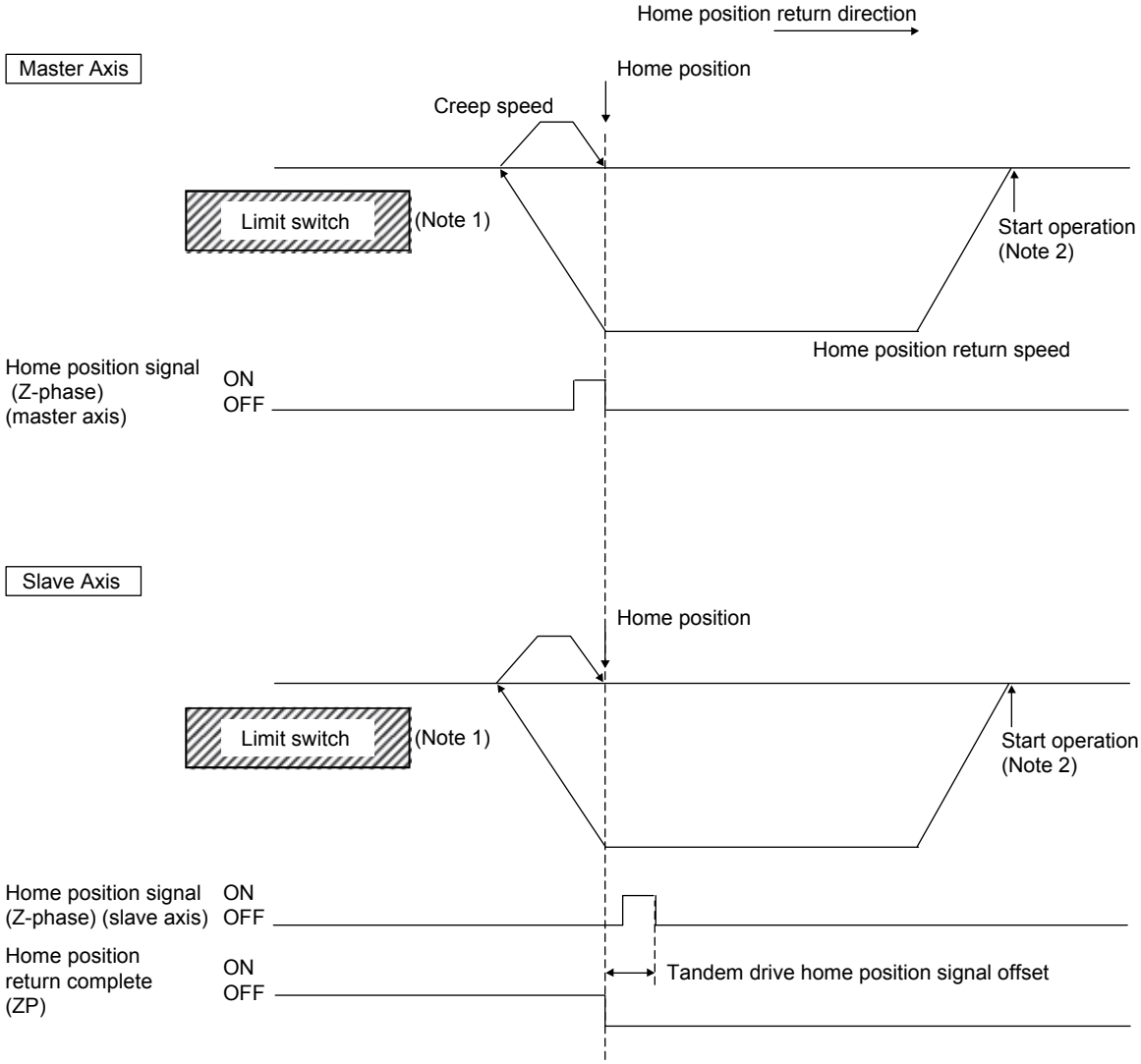
| POINT |
| --- |
| ・Prior to returning to home position, set the axis linking the master axis and slave axis mechanically at a right angle to the movement direction. If it is not at a right angle, the home position signal position offset amount cannot be correctly calculated. |

2) Operation example for adjustment mode

a) Start operation method

1. Adjust the axis linking the master axis and slave axis mechanically at a right angle to the movement direction.
2. Set the home position return method (parameter No.0240) to scale home position signal detection method and tandem drive option (parameter No.0265) to adjustment mode.
3. Start home position return operation.
4. After home position return is complete, read the tandem drive home position signal offset (parameter No.026C, 026D) and save it to the user program.

b) Timing chart




Note 1. When a limit switch signal is detected, an alarm occurs and execution of return to home position is terminated.

2. Set the distance between the master axis/slave axis home position signals and the start operation position so that it is greater than the deviation at maximum tolerance of the master axis and slave axis.

(b) Normal mode

1) Summary

In normal mode, the amount of deviation between the master axis and slave axis is detected and tweaking (compensation of deviation between master axis and slave axis) is performed. This movement sets the axis linking the master axis and slave axis mechanically at a right angle to the movement direction.

When home position return is performed using normal mode, after detecting the master axis home position signal and slave position home position signal while returning to home position, calculate the deviation of the master axis and slave axis based on the tandem drive home position signal offset (parameter No.026C, 026D). The master axis moves to the position of the home position signal and the slave axis moves to the slave axis home position calculated based on the tandem driver home position signal offset and the previously noted deviation.

POINT

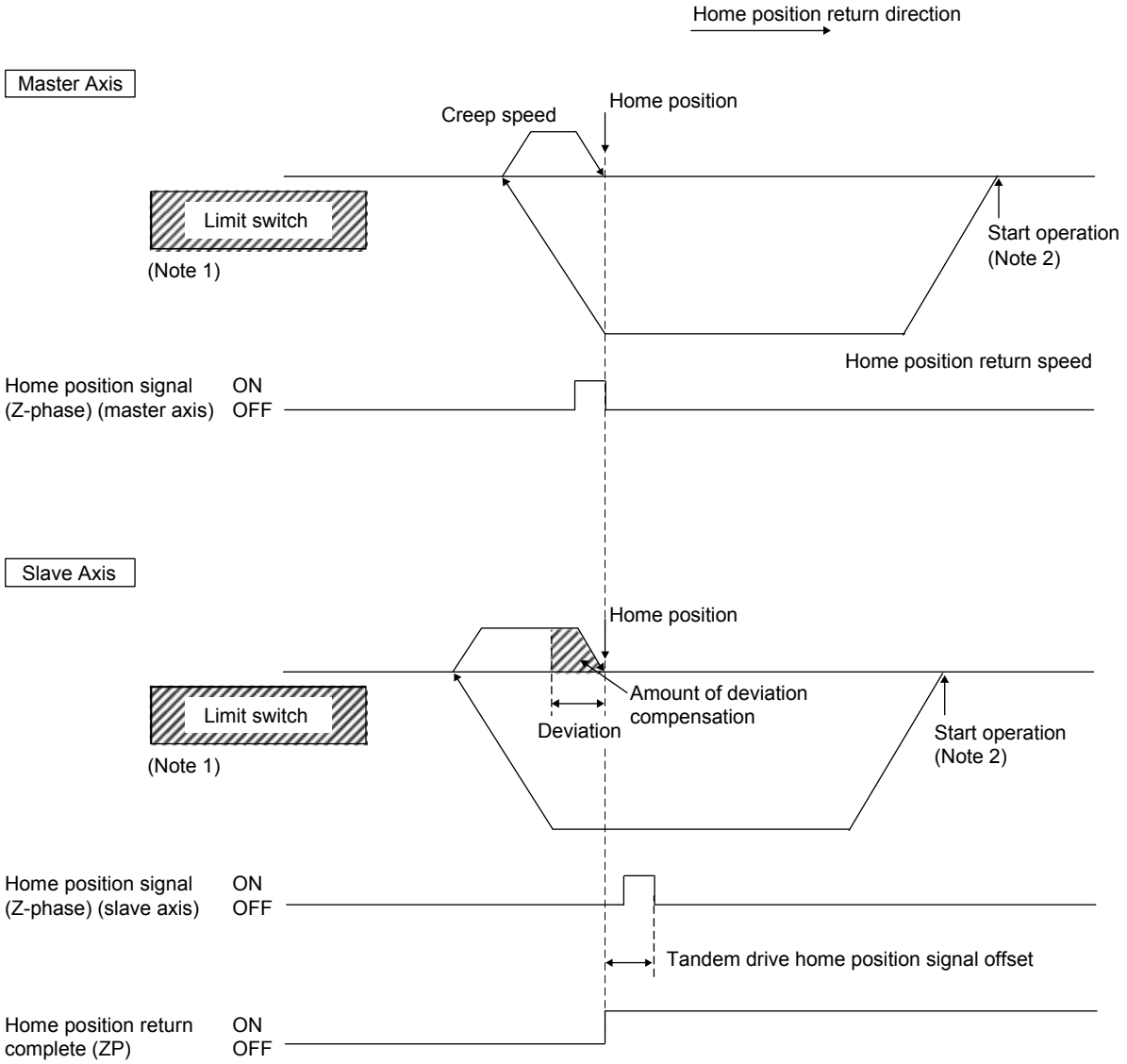
- When performing home position return in normal mode, set the tandem drive home position signal offset (parameter No.026C, 026D) to the correct value. If the tandem drive home position signal offset value is erroneous, the axis that links the master axis and slave axis will not be at a right angle.
- If the amount of deviation between the master axis and the slave axis exceeds the value calculated from the valid width of tandem drive deviation compensation (parameter No.026B) × tandem drive deviation compensation units multiplication (parameter No.026E), an exceeding of valid width of tandem drive deviation compensation error (operation alarm 57, detail 01) occurs and home position return operation is terminated. (Tweak movement is not performed.)

2) Operation example for normal mode

a) Start operation method

1. Set the home position return method (parameter No.0240) to scale home position signal detection method and tandem drive option (parameter No.0265) to normal mode.
2. Set the tandem drive home position signal offset (parameter No.026C, 026D).
3. Start home position return operation.

b) Timing chart



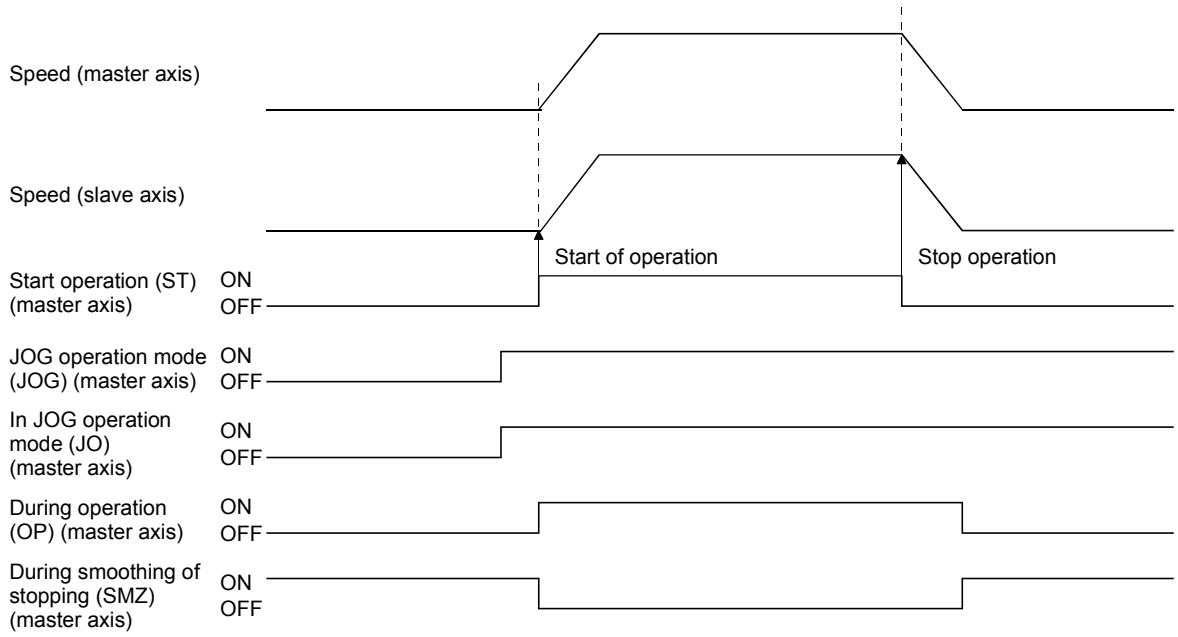

Note 1. When a limit switch signal is detected, an alarm occurs and execution of return to home position is terminated.

2. Set the distance between the master axis/slave axis home position signals and the start operation position so that it is greater than the deviation at maximum tolerance of the master axis and slave axis.

### 8.4.2 JOG operation during tandem drive

(1) Synchronous mode

When JOG operation is performed while in synchronous mode, master axis data and signals are used. An example is shown below.




Important data classifications related to JOG operation during synchronous mode are shown in the following table. For other related data, refer to Section 10.7.

| Type | Items for which only item associated with master is valid | Items defined for each axis |
|---|---|---|
| Command signal/data | JOG operation mode (JOG)<br>Movement direction (DIR)<br>Start operation (ST)<br>Manual feed speed<br>Acceleration time constant<br>Deceleration time constant | None |
| Status signal | In JOG operation mode (JO)<br>During operation (OP)<br>During smoothing of stopping (SMZ) | In-position (INP)<br>Position switch (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 are being used, check the in-position signal (INP) for both the master axis and the slave axis.

For other types of movement, normal axis movement is followed. (Refer to Section 5.1)

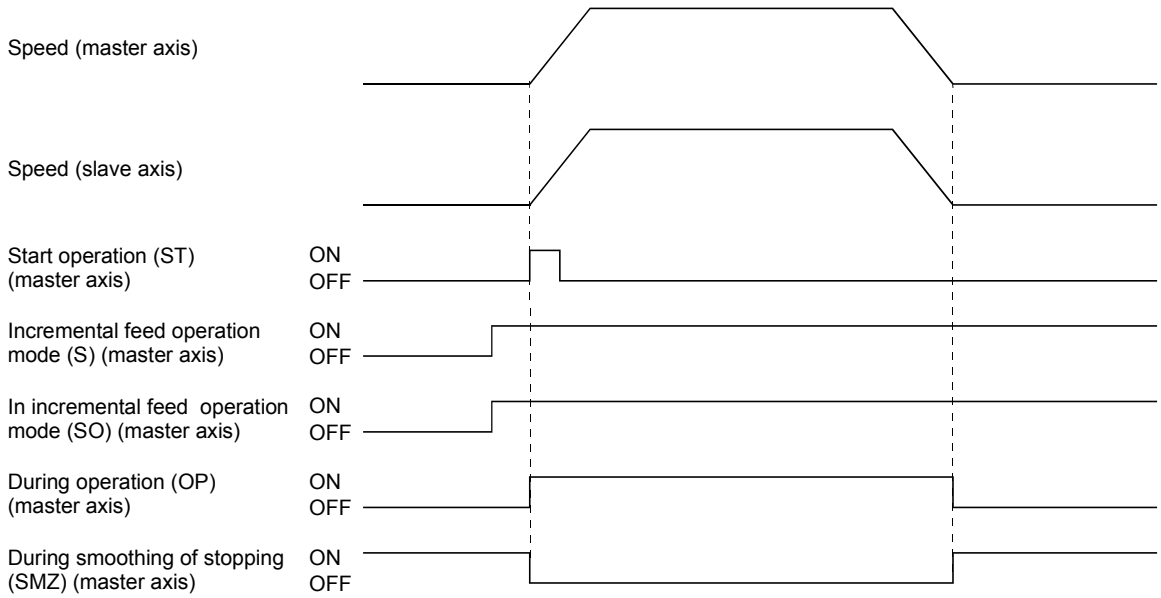
(2) Non-synchronous micro-adjustment mode

Movement is the same as for normal axis movement. (Refer to Section 5.1)

### 8.4.3 Incremental feed while using tandem drive

(1) Synchronous mode

When incremental feed operation is performed while in synchronous mode, master axis data and signals are used. An example is shown below.




Important data classifications related to incremental feed operation during synchronous mode are shown in the following table. For other related data, refer to Section 10.7.

| Type | Items for which only item associated with master is valid | Items defined for each axis |
|---|---|---|
| Command signal/data | Incremental feed operation mode (S)<br>Movement direction (DIR)<br>Start operation (ST)<br>Manual feed speed<br>Acceleration time constant<br>Deceleration time constant<br>Incremental feed movement amount | None |
| Status signal | In incremental feed mode (SO)<br>During operation (OP)<br>During smoothing of stopping (SMZ) | In-position (INP)<br>Position switch (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.

For other types of movement, normal axis movement is followed. (Refer to Section 5.2)

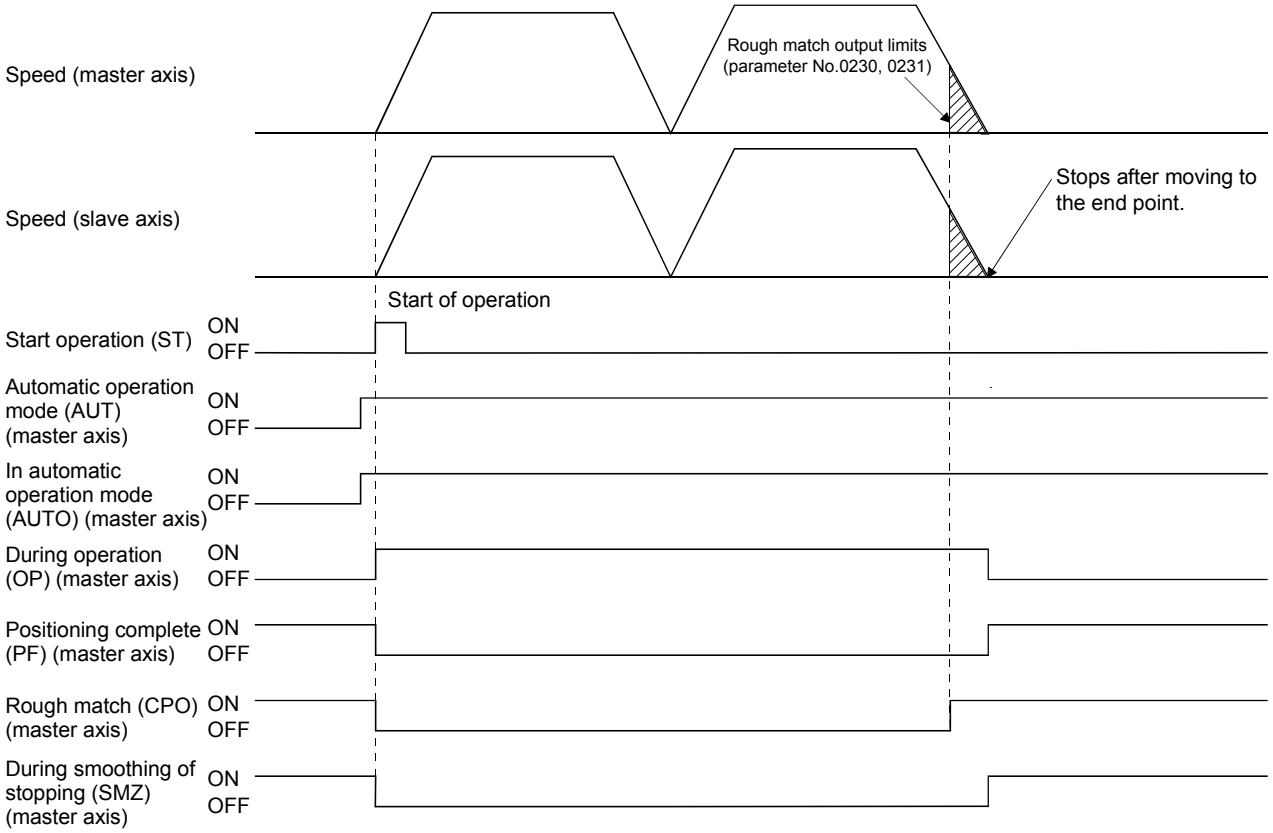
(2) Non-synchronous micro-adjustment mode

Movement is the same as for normal axis movement. (Refer to Section 5.2)

### 8.4.4 Automatic operation during tandem drive

(1) Synchronous mode

When automatic operation is entered while in synchronous mode, master axis data and signals are used. Also, the master axis table is used for the point table. An example is shown below.




Important data classifications related to automatic operation during synchronous mode are shown in the following table. For other related data, refer to Section 10.7.

| Type | Items for which only item associated with master is valid | Items defined for each axis |
|---|---|---|
| Command signal/data | Automatic operation mode (AUT)<br>Start operation (ST)<br>Start point No.<br>End point No.<br>(Point table) | None |
| Status signal | In automatic operation mode (AUTO)<br>During operation (OP)<br>During smoothing of stopping (SMZ)<br>Positioning complete (PF)<br>Rough match (CPO) | In-position (INP)<br>Position switch (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.

For other types of movement, normal axis movement is followed. (Refer to Section 5.3)

(2) Non-synchronous micro-adjustment mode

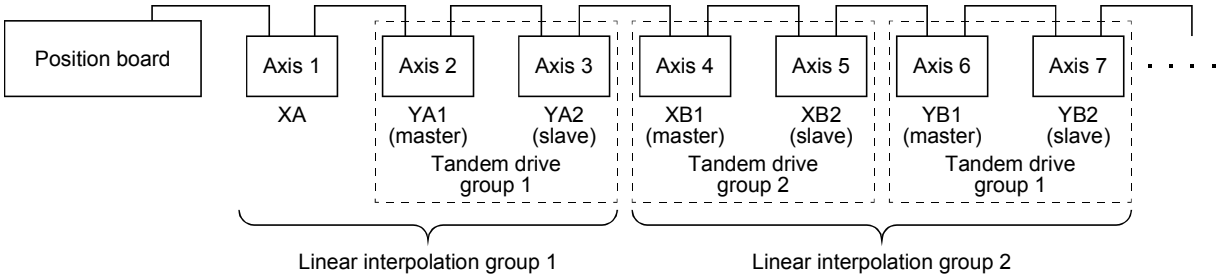
Automatic operation can not be entered while in non-synchronous micro-adjustment mode. The while in tandem drive non-synchronous mode (operation alarm 51, detail 01) occurs upon start of operation.

### 8.4.5 Linear interpolation during tandem drive

When performing linear interpolation operation, it is necessary to group the axes for which linear interpolation is to be set up. The groups are set up using linear interpolation group (parameter No.0260) and the master axis is the only one set up when in tandem drive axis operation. For other types of movement, normal axis movement is followed. (Refer to Section 5.4)

> **POINT**
>
> ・When performing linear interpolation operation, limit the total number of axes to 4, including slave axes. If the total number of axes exceeds 4, the linear interpolation start up error (operation alarm 40, detail 02) occurs upon start of operation.

The following is a system configuration set up example.




| Axis No. | Axis name | Linear interpolation group (parameter No.0260) | Tandem drive group (parameter No.0264) |
|---|---|---|---|
| 1 | XA | 1 | 0 |
| 2 | YA1 | 1 | 1 |
| 3 | YA2 | 0 | 1 |
| 4 | XB1 | 2 | 2 |
| 5 | XB2 | 0 | 2 |
| 6 | YB1 | 2 | 3 |
| 7 | YB2 | 0 | 3 |

The group number of the slave axis is set to the same number of the master axis independent of its setting.

(1) Synchronous mode

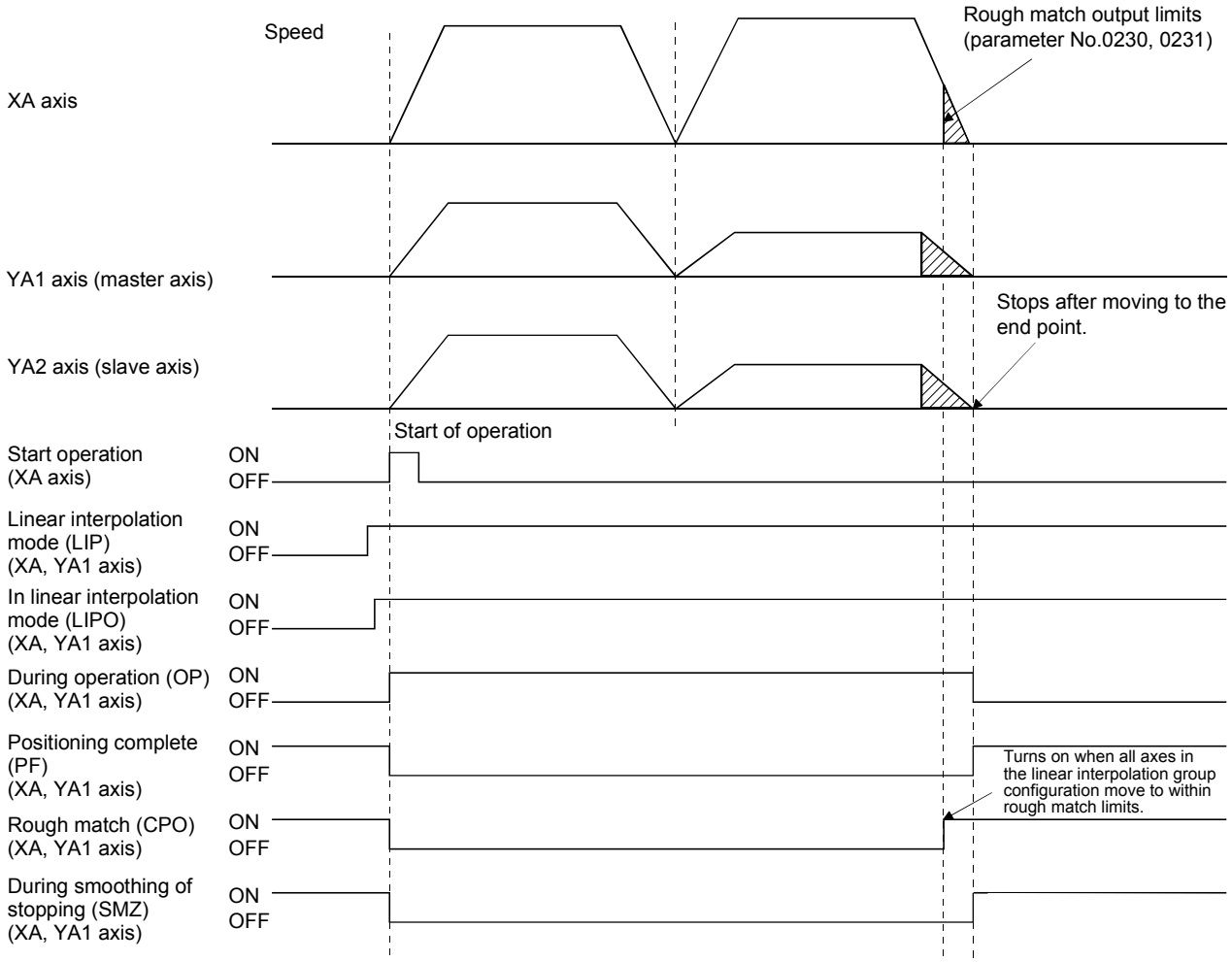
When linear interpolation operation is entered while in synchronous mode, master axis data and signals are used. Also, the master axis table is used for the point table.

Important data classifications related to linear interpolation operation during synchronous mode are shown in the following table. For other related data, refer to Section 10.7.

| Type | Items for which only item associated with master is valid | Items defined for each axis |
|---|---|---|
| Command signal/data | Linear interpolation mode (LIP)<br>Start operation (ST)<br>Start point No.<br>End point No.<br>(Point table) | None |
| Status signal | In linear interpolation mode (LIPO)<br>During operation (OP)<br>During smoothing of stopping (SMZ)<br>Positioning complete (PF)<br>Rough match (CPO) | In-position (INP)<br>Position switch (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 are being used, check the in-position signal for both the master axis and the slave axis.
For other types of movement, normal axis movement is followed. (Refer to Section 5.4)

The following shows an example where start operation is performed for the linear interpolation group 1 from the configuration example on the previous page.




| POINT |
|---|
| ・For Linear interpolation operation, the XA axis and YA1 axis (master axis) are used for linear interpolation operation.<br>The YA2 axis (slave axis) moves synchronously with the master axis. |

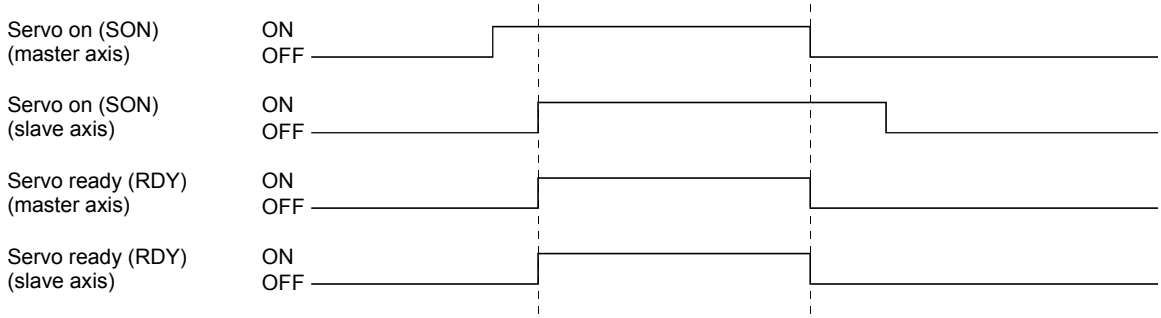
(2) Non-synchronous micro-adjustment mode

Linear interpolation operation cannot be entered while in non-synchronous micro-adjustment mode. The while in tandem drive non-synchronous mode (operation alarm 51, detail 01) occurs upon start of operation.

8.5 Servo on and servo off during tandem drive axis operation

(1) Synchronous mode

When the master axis servo on signal (SON) and 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 slave axis at the servo on, synchronous alignment is performed by aligning the command for the slave axis with the one for the master axis.
During synchronous alignment, "synchronizing" status signal (SYEO□: □ is the group number) turns on.
After confirming the "synchronizing" status signal is off, perform the start operation.
However under the following conditions, the tandem drive synchronous alignment error (operation alarm 58, detail 01) occurs and synchronization is canceled. After the cause for the alarm is removed, turn the servo off and then on to perform synchronization again. When automatic operation or linear interpolation is performed with synchronization incomplete, the tandem drive synchronous alignment error (operation error 58, detail 02) occurs.

(a) If the deviation between the master axes command position and the slave axis command position exceeds the tandem drive synchronous alignment valid width (parameter No.0266), the tandem drive synchronous alignment valid width error (operation alarm 54, detail 01) occurs.

(b) If a stop command (STP, RSTP) is input while synchronizing, the tandem drive synchronous alignment error (operation alarm 58, detail 01) occurs.

POINT

- Synchronization is validated after home position return complete (after home position is established). When the home position return request (ZREQ) is ON, synchronization is not performed.
- Set the speed at synchronization using the tandem drive synchronous alignment speed (parameter No.0267) and the speed units multiplication factor (parameter No.020E, 020F).
- When start operation is performed during synchronization, the tandem drive while performing synchronization (operation alarm 55, detail 01) occurs.
- When drive mode is toggled during synchronization, the tandem drive mode change error (operation alarm 50, detail 01) occurs.
- If the "tandem drive synchronous alignment valid width error" (operation alarm 54, detail 01) or the "tandem drive synchronous alignment error" (operation alarm 58, detail 01) occurs within absolute position detection system, the absolute value will be lost.
  (The absolute position data of the home position return option 2 (parameter No.0241) becomes invalid and "absolute position erased signal" (ABSE) turns on.)
- Implement a stop command on the master axis. Because system is in synchronous mode, a stop command to the slave axis is invalid.
- If the synchronization setting (parameter No.0265) is set to invalid, synchronization for turning servo on is not performed. The position board operates with the deviation between the master axis and the slave axis held. The setting of this parameter becomes valid at the leading edge of servo ready (RDY) signal.
  While 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 user program. In addition, check the deviation between the master axis and the slave axis is within an allowance.
  - At turning on the after turning off the servo
  - At canceling a servo alarm after a servo alarm occurs
  - At resetting a forced stop after a forced stop occurs

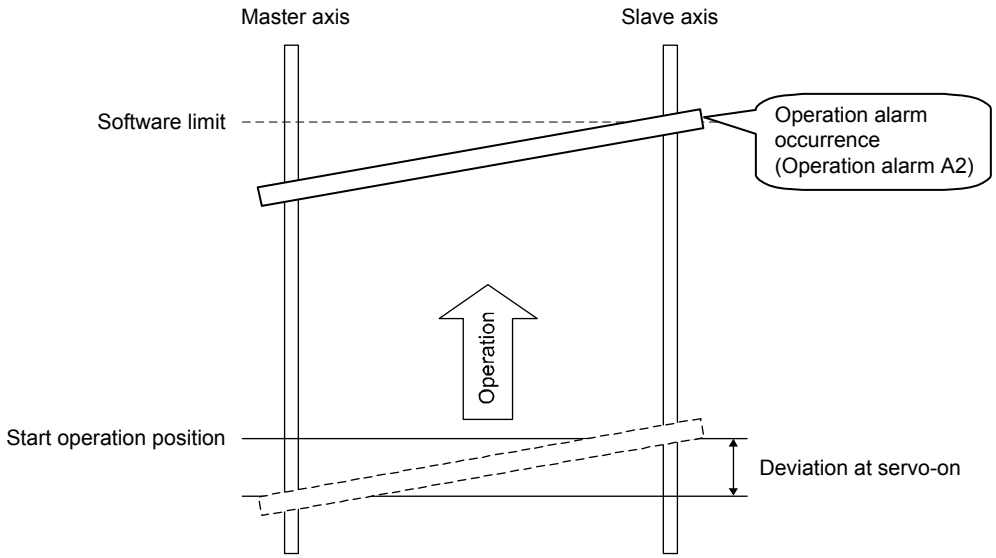
(2) While in non-synchronous micro-adjustment mode
The servos can be turned on and off separately. Movement is as the same as normal axes.
(Refer to Section 6.4)

8.6 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. For other types of movement, normal axis movement is followed. (Refer to Section 6.8)

## 8.7 Tandem drive axis software limit

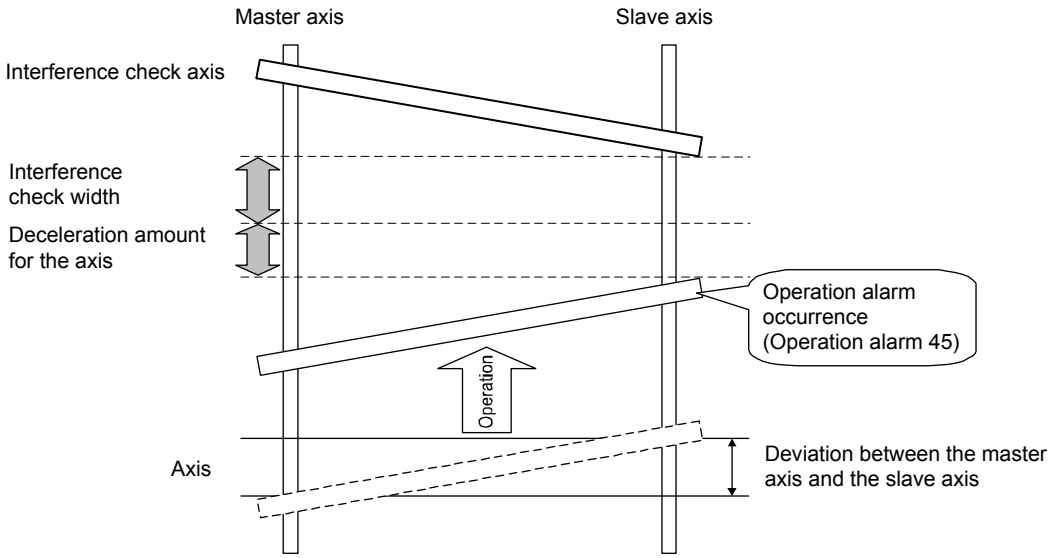
Software limits become valid after completing home position return (home position return request (ZREQ) is off). Software limits are checked for both the master axis and the slave axis. In this case, the software limit boundaries for the master axis become valid.
The following shows an example where the software limit is reached during JOG operation when the synchronization setting (parameter No.0265) is set to invalid and there is a deviation between the master axis and slave axis at servo-on.




For other types of software limit occurrences, normal axis movement is followed.
(Refer to Section 6.9)

## 8.8 Tandem drive interference check

Interference check is performed both for the master axis and slave axis. The parameter value of interference check width for the master axis becomes valid.



## 8.9 Tandem drive axis servo alarms

If an alarm occurs on the master axis or slave axis, dynamic braking and stoppage is implemented for the axis for which the servo alarm did not occur as well. When the cause for an alarm on an axis is cancelled such as through a servo alarm reset, the dynamic brake is cancelled.
This is the same for a servo forced stop warning (E6) or a main circuit off warning (E9) status on either the master axis or the slave axis.
This operation does not exist in drive modes (synchronous mode/non-synchronous micro adjustment mode).

POINT

・Relationship between servo on/off and dynamic brake on/off

| | While Servo On command is ON | While Servo On command is OFF |
|---|---|---|
| Dynamic brake off | Servo control is operating<br>(Positioning can be controlled.) | Servo is coasting<br>(Is easily turned using an external force.) |
| Dynamic brake on | Dynamic brake status<br>(If an external force is placed to try and rotate axis, dynamic brake resists the force.) | |

## 8.10 Deviation monitoring function

A function where if the deviation between the master axis and the slave axis exceeds the tandem drive excessive deviation width (parameter No.0268) during synchronous mode while in tandem drive axis mode, the tandem drive excessive deviation (operation alarm 53, detail 01) 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.

# 9. INTERFACE MODE

## 9.1 Summary

Interface mode is a function for sending the commands for every operation cycle (position commands, speed commands and torque commands) straight to the servo amplifier. By using this function, any given acceleration/deceleration pattern, speed pattern, or torque pattern is possible.
To use interface mode, designate "1: Interface mode" with system option 2 (parameter No.0002), and perform system startup after setting Interface mode option (parameter No.000F).
When system startup is performed in interface mode, operation modes from standard mode such as JOG operation, automatic operation, etc. cannot be used.
The host controller controls the servo amplifier by updating the contents of the command buffer at a timing of either when the host controller receives the interrupt output for each control cycle given by the position board (when interrupt output is valid), or at any given timing (when interrupt output is invalid).
When interrupt output is valid, position control mode, speed control mode, and torque control mode can be used. When interrupt output is invalid, only position control mode can be used.

(1) Software version A3
Only position control mode can be used.

(2) Software version A4 or later
Position control mode, speed control mode, and torque control mode can be used.

POINT

- When using interface mode, all axes operate in interface mode. Cannot operate some axes in standard mode during interface mode.
- Cannot switch control modes (standard mode and interface mode) after system startup.
- When using the test operation function of MR Configurator2 connected to the position board with a USB connection, the position board stops importing commands. If the test operation function is executed while motors are rotating, they come to a stop. Be sure to perform test operation after stopping operation.
  The system must be restarted to control with commands from the position board again.
  For details on test operation refer to Servo Amplifier Instruction Manual, and help of MR Configurator2.
- The test tool is not compatible with interface mode.
  It can get monitors and graphs of servo information.

API LIBRARY

- For a detailed procedure for interface mode, refer to the sample program (InterruptIfmDrive/PollingIfmDrive) contained on the utility software.
- When the response of the host controller operating system is not on time due to the load of the user program etc., increase the number of position command buffers to be used (position control only), or set the command data update cycle longer.

## 9.2 Combinations with functions

The following shows the combinations of interface mode with each function.

| Classification | Function | | Control mode | | | Remarks |
|---|---|---|---|---|---|---|
| | | | Position control | Speed control | Torque control | |
| Operational function | JOG operation | | × | × | × | |
| | Incremental feed | | × | × | × | |
| | Automatic operation | | × | × | × | |
| | Linear interpolation | | × | × | × | |
| | Home position return | | × | × | × | The normal home position return function is invalid. After moving to the home position, use the home position set command. Check the DOG signal status with the high-speed monitor. |
| | Home position reset function | | × | × | × | |
| Application function | Command units | Electronic gear | × | × | × | Command units are always pulse units. |
| | Speed unit | Speed unit | △ | △ | △ | Related only to speed units during monitor output. |
| | | Speed units multiplication factor | △ | △ | △ | Related only to speed units during monitor output. |
| | | Speed limit | × | × | × | |
| | Acceleration/ deceleration | Linear acceleration/deceleration | × | × | × | |
| | | Smoothing filter | × | × | × | |
| | | Start up speed validity | × | × | × | |
| | | S-curve acceleration/ deceleration (Sine acceleration/deceleration) | × | × | × | |
| | Servo off | | × | × | × | The system becomes servo free. Follow up processes are not performed after servo off. Perform them with the user program. Operation stop by servo off is invalid. Perform servo off after a deceleration stop. |
| | Forced stop | | ○ | ○ | ○ | |
| | Stop operation | | × | × | × | |
| | Rapid stop operation | | × | × | × | |
| | Limit switch (stroke end) | | × | × | × | Check the LSP/LSN signal status with the high-speed monitor. |
| | Software limit | | × | × | × | |
| | Interlock | | × | × | × | |
| | Rough match output | | × | × | × | |
| | Torque limit | | ○ | ○ | × | |
| | Command change | Speed change | × | × | × | |
| | | Change of time constants | × | × | × | |
| | | Position change | × | × | × | |
| | Backlash | | × | × | × | |
| | Position switch | | × | × | × | |
| | Completion of operation signal | | × | × | × | |
| | Interference check function | | × | × | × | |
| | Home position search limit | | × | × | × | |
| | Gain switching | | ○ | ○ | ○ | |

○: Usable ×: Unusable △: Restriction

| Classification | Function | Control mode | | | Remarks |
|---|---|---|---|---|---|
| | | Position control | Speed control | Torque control | |
| Application function | PI-PID switching | ○ | × | × | |
| | Home position set | ○ | × | × | If home position set request is turned ON at speed control/torque control, home position set error (ZSE) turns ON. |
| | Absolute position detection system | ○ | ○ | ○ | |
| | Home position return request | × | × | × | |
| | High response I/F | × | × | × | |
| | Other axes start | × | × | × | |
| | Digital I/O | ○ | ○ | ○ | |
| | Servo amplifier general I/O | ○ | ○ | ○ | |
| | Dual port memory exclusive control | ○ | ○ | ○ | |
| | Pass position interrupt | × | × | × | |
| | Mark detection | ○ | ○ | ○ | |
| | Continuous operation to torque control | × | × | × | |
| Auxiliary function | Reading/writing parameters | ○ | ○ | ○ | |
| | Changing parameters at the servo | ○ | ○ | ○ | |
| | Alarm and system error | ○ | ○ | ○ | |
| | Monitor function | ○ | ○ | ○ | |
| | High speed monitor function | ○ | ○ | ○ | |
| | Interrupt | △ | △ | △ | Interrupt output is not performed by factor of interrupt.<br>Interrupt is output according to the interrupt output cycle settings only during interrupt valid. |
| | Interrupt output cycle | ○ | ○ | ○ | Can only be used in interface mode. |
| | Command data update cycle | ○ | ○ | ○ | Can only be used in interface mode. |
| | User watchdog function | ○ | ○ | ○ | |
| | Software reboot function | ○ | ○ | ○ | |
| | Parameter backup | ○ | ○ | ○ | |
| | Test mode | ○ | ○ | ○ | |
| | Reconnect/disconnect function | ○ | △ | △ | When reconnecting, startup is in position control mode. |
| | Sampling | ○ | ○ | ○ | |
| | Log | ○ | ○ | ○ | |
| | Operation cycle monitor function | ○ | ○ | ○ | |
| | Amplifier-less axis function | ○ | ○ | ○ | For torque control mode, operation stops when torque command is 0.0%, or when torque control speed limit value is 0, and zero speed (ZSP) turns ON. |
| | Alarm history function | ○ | ○ | ○ | |
| | External forced stop disabled | ○ | ○ | ○ | |
| Tandem drive | Tandem drive | × | × | × | |

○: Usable ×: Unusable △: Restriction

## 9.3 Parameters

For interface mode, the parameters used and some of the parameter functions change. The following are parameters used in interface mode.

(1) System parameters

(a) System parameters used

| Parameter No. | Abbreviation | Name | Remarks |
|---|---|---|---|
| 0001 | *SYSOP1 | System option 1 | |
| 0002 | *SYSOP2 | System option 2 | Designates interface mode in control mode. |
| 000E | *EMID | External forced stop disabled | |
| 000F | *IFM0 | Interface mode option | Designates the interrupt output cycle and command data update cycle. |
| 0040 | LGS1 | Log acquiring selection1 | |
| 0041 | LGS2 | Log acquiring selection2 | |
| 0042 | LGS3 | Log acquiring selection3 | |

(b) Parameter details

| Parameter No. | Abbreviation | Name | Initial value | Units | Setting range | Function |
|---|---|---|---|---|---|---|
| 0002 | *SYSOP2 | System option 2 | 0000h | | 0000h to 1101h | [ ][0][0][0]<br>Control mode selection<br>Select the control mode.<br>0: Standard mode<br>1: Interface mode |
| 000F | *IFM0 | Interface mode option | 0000h | | 0000h to 0F0Fh | [0][ ][0][ ]<br>Interrupt output cycle<br>When interrupt by interface mode is valid, set the cycle for which the interrupt is output.<br>Interrupt output cycle:<br>Control cycle×(setting value+1)<br>Example: When interrupt output cycle is set to 1 and control cycle is 0.88ms, interrupt is output approximately every 1.77ms.<br>Command data update cycle<br>Set the cycle for which commands are updated in interface mode.<br>Command data update cycle:<br>Control cycle×(setting value+1)<br>Example: When control cycle is 0.88ms and command data update cycle is set to 2, position commands are updated approximately every 2.66ms. |

(2) Servo parameters

There are no differences to standard mode.

(3) Control parameters

(a) Control parameters used

| Parameter No. | Abbreviation | Name | Remarks |
|---|---|---|---|
| 0200 | *OPC1 | Control option 1 | Speed units relates to the units during monitor output. |
| 0203 | *AXALC | Axis No. assignment | |
| 020E | SUML | Speed units multiplication factor (lower) | Speed units multiplication factor relates to the units during monitor output. |
| 020F | SUMH | Speed units multiplication factor (upper) | |
| 0210 | TLP | Forward rotation torque limit value | |
| 0211 | TLN | Reverse rotation torque limit value | |
| 0213 | *GIOO | General I/O option | |
| 0214 | *GDNA | General I/O number assignment | |
| 0219 | *SOP | Sensor input options | Sets the source of input for LSP/LSN/DOG signals. Each signal is used in monitor output only. |
| 021A | *SLSP | Sensor signal (LSP) connection specification | |
| 021B | *SLSN | Sensor signal (LSN) connection specification | |
| 021C | *SDOG | Sensor signal (DOG) connection specification | |
| 021D | *VEND | Vendor ID | |
| 021E | *CODE | Type code | |
| 023F | *IFBN | Interface mode maximum buffer number | Designates the maximum buffer number of the command buffer.<br>Note. When controlling by interface mode with interrupt output invalid, 1 or more must be set. |
| 0241 | *OPZ2 | Home position return Option 2 | Can set valid/invalid of system only. |
| 0246 | ZPSL | Home position coordinates (lower) | Set only for absolute position system. |
| 0247 | ZPSH | Home position coordinates (upper) | |
| 024D | *LSO | Home position multiple revolution data | Set only for absolute position system. |
| 024E | *CYOL | Home position within 1 revolution position (lower) | Set only for absolute position system. |
| 024F | *CYOH | Home position within 1 revolution position (upper) | |

(b) Parameter details

The parameter details regarding interface mode are shown below.

| Parameter No. | Abbreviation | Name | Initial value | Units | Setting range | Function | When in tandem drive |
|---|---|---|---|---|---|---|---|
| 023F | *IFBN | Interface mode maximum buffer number | 0 | | 0 to 63 | Sets the maximum value of the ring buffer number being used in interface mode. The set value+1 is the number of buffers.<br>Note. When controlling by interface mode with interrupt output invalid, 1 or more must be set. | |

## 9.4 Interface

### (1) System information

| Address | Content |
|---|---|
| 0010 | Interrupt output cycle |
| 0011 | |
| 0012 | Command data update cycle |
| 0013 | |

(a) Interrupt output cycle
The interrupt output cycle (control cycle × N) outputs the value of N.

(b) Command data update cycle
The command data update cycle (control cycle × N) outputs the value of N.

### (2) System status table

| Address | Content |
|---|---|
| 0478 | Command buffer read error counter |
| 0479 | |

### (3) System command/status bit

System command

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 03E0 | 0 | ITE | Interrupt processing complete |
| | 1 | ITS | Interrupt output valid |
| | 2 | | Reserved |
| | 3 | | |
| | 4 | HMA | During user program memory access |
| | 5 | | Reserved |
| | 6 | | |
| | 7 | | |

System status

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 0450 | 0 | ITO | Outputting with factor of interrupt |
| | 1 | IITO | During interface mode interrupt valid |
| | 2 | EVDO | Event detection enabled |
| | 3 | HRIF | During highly response I/F valid |
| | 4 | BMA | During system program memory access |
| | 5 | PRINF | Continuous operation to torque control compatible information |
| | 6 | | Reserved |
| | 7 | IFMO | In interface mode |

(a) Details on command bit

| Abbreviation | Signal name | Function details |
|---|---|---|
| ITS | Interrupt output valid | [Function]<br>Commands interrupt output valid.<br>[Operation]<br>Outputs the interrupt each interrupt output cycle when interrupt output valid (ITS) is turned on. |
| HMA | During user program memory access | [Function]<br>Commands when the user program is accessing the command buffer.<br>[Operation]<br>When during user program memory access (HMA) is turned on, the system program recognizes that the user program is accessing the command buffer, and does not access the command buffer. When this happens, the system program counts up on the command buffer read error counter. |

(b) Details on status bit

| Abbreviation | Signal name | Function details |
|---|---|---|
| IITO | During interface mode interrupt valid | [Function]<br>Notifies the interrupt during interface mode is valid.<br>[Operation]<br><Conditions for turning on><br>• Interrupt output valid (ITS) is turned on.<br><Conditions for turning off><br>• Interrupt output valid (ITS) is turned off. |
| EVDO | Event detection enabled | [Function]<br>Notifies the event detection function is valid.<br>[Operation]<br><Conditions for turning on><br>• Interface mode is selected in control mode, and system startup is performed. |
| BMA | During system program memory access | [Function]<br>Notifies the system program is accessing the command buffer.<br>[Operation]<br><Conditions for turning on><br>• The system program is accessing the command buffer.<br><Conditions for turning off><br>• The system program is not accessing the command buffer. |
| IFMO | In interface mode | [Function]<br>Notifies the control mode is in interface mode.<br>[Operation]<br><Conditions for turning on><br>• Interface mode is selected in control mode, and system startup is performed.<br><Conditions for turning off><br>• Standard mode is selected in control mode, and system startup is performed. |

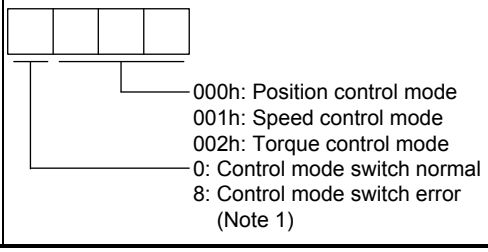
(4) Axis command/status

(a) Axis command

| Address | Name | Setting range | Remarks |
|---|---|---|---|
| 1030 | Latest command buffer number | 0 to 63 | Set the latest command buffer number after updating. |
| 1031 | | | |
| 1032 | Control mode command | Refer to remarks | Set the mode to switch to.<br>0000h: Position control mode<br>0001h: Speed control mode<br>0002h: Torque control mode |
| 1033 | | | |
| 1048 | Torque control speed limit value (0.01r/min) | 0 to 1000000000 | Set the speed limit value when in torque control mode. When a value outside the setting range is set, the previous value that was set within the valid range is the speed limit value. Also, torque control setting error (operation alarm 2F, detail No.01) occurs. |
| 1049 | | | |
| 104A | | | |
| 104B | | | |

Note. The addresses above are the addresses for the first axis. For the second axis and after, increase by C0h for each axis.

(b) Axis status

| Address | Name | Setting range | Remarks |
|---|---|---|---|
| 108E | Maximum buffer number | 1 to 64 | Notifies the maximum buffer number that can be used. |
| 108F | | | |
| 1090 | Transmit buffer number | 0 to 63 | Notifies buffer number that is being transmitted. |
| 1091 | | | |
| 1092 | Control mode status | Refer to remarks | The current control mode is shown below.<br>  <br> |
| 1093 | | | |

Note 1. A control mode switch error occurs when conducting the following operations.

- Switching from position control mode to another control mode while zero speed (ZSP) is OFF.
- Specifying a control mode outside of range to control mode command.

2. The addresses above are the addresses for the first axis. For the second axis and after, increase by C0h for each axis.

(5) Position command buffer

The number of buffers and the addresses that are used differ for each control mode. The buffers for each control mode are shown below.

(a) Position control mode

| Address | Content |
|---|---|
| 5000 | Position command buffer 0 (pulse) |
| 5001 | |
| 5002 | |
| 5003 | |
| 5004 | Position command buffer 1 (pulse) |
| 5005 | |
| 5006 | |
| 5007 | |
| 5008 | Position command buffer 2 (pulse) |
| 5009 | |
| 500A | |
| 500B | |
| 500C | Position command buffer 3 (pulse) |
| 500D | |
| 500E | |
| 500F | |
| 5010 | Position command buffer 4 (pulse) |
| 5011 | |
| 5012 | |
| 5013 | |
| 5014 | Position command buffer 5 (pulse) |
| 5015 | |
| 5016 | |
| 5017 | |
| 5018 | Position command buffer 6 (pulse) |
| 5009 | |
| 501A | |
| 501B | |
| 501C | Position command buffer 7 (pulse) |
| 501D | |
| 501E | |
| 501F | |

| Address | Content |
|---|---|
| 5020 | Position command buffer 8 (pulse) |
| 5021 | |
| 5022 | |
| 5023 | |
| 5024 | Position command buffer 9 (pulse) |
| 5025 | |
| 5026 | |
| 5027 | |
| 5028 | Position command buffer 10 (pulse) |
| 5029 | |
| 502A | |
| 502B | |
| 502C | : |
| : | |
| 50EF | |
| 50F0 | Position command buffer 60 (pulse) |
| 50F1 | |
| 50F2 | |
| 50F3 | |
| 50F4 | Position command buffer 61 (pulse) |
| 50F5 | |
| 50F6 | |
| 50F7 | |
| 50F8 | Position command buffer 62 (pulse) |
| 50F9 | |
| 50FA | |
| 50FB | |
| 50FC | Position command buffer 63 (pulse) |
| 50FD | |
| 50FE | |
| 50FF | |

Note. The addresses in the table are the addresses for the axis 1. For the axis 2 and above, increase the units of 100h for each axis.

(b) Speed control mode

| Address | Content |
|---|---|
| 7800 | Speed command buffer 0 (0.01r/min) |
| 7801 | |
| 7802 | |
| 7803 | |

Note 1. Setting range: -1000000000 (-10000000r/min) to 1000000000 (10000000r/min)
2. The addresses above are the addresses for the first axis.
For the second axis and after, increase by 80h for each axis.

(c) Torque control mode

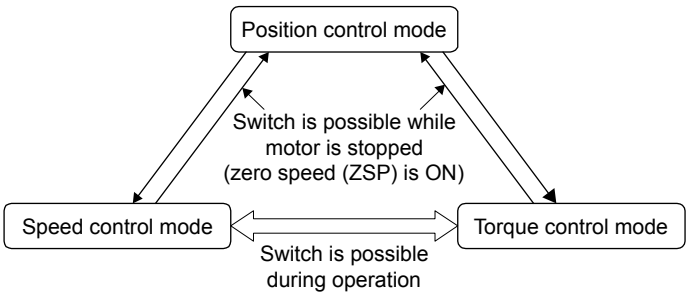
| Address | Content |
|---|---|
| 8C00 | Torque command buffer 0 (0.1%) (When parameter No.010D is 0, positive: CCW, negative: CW) |
| 8C01 | |
| 8C02 | |
| 8C03 | |

Note 1. Setting range: -32768 (-3276.8%) to 32767 (3276.7%)
2. The addresses above are the addresses for the first axis.
For the second axis and after, increase by 80h for each axis.

## 9.5 Control method

### 9.5.1 Control mode

The control mode is switched by specifying the control mode in the "control mode command". Switching to/from position control mode to/from speed control mode/torque control mode is performed while the motor is stopped, and switching between speed control mode and torque control mode is possible at any given time.
Refer to Section 9.5.7 and Section 9.5.8 for details on switching control mode.



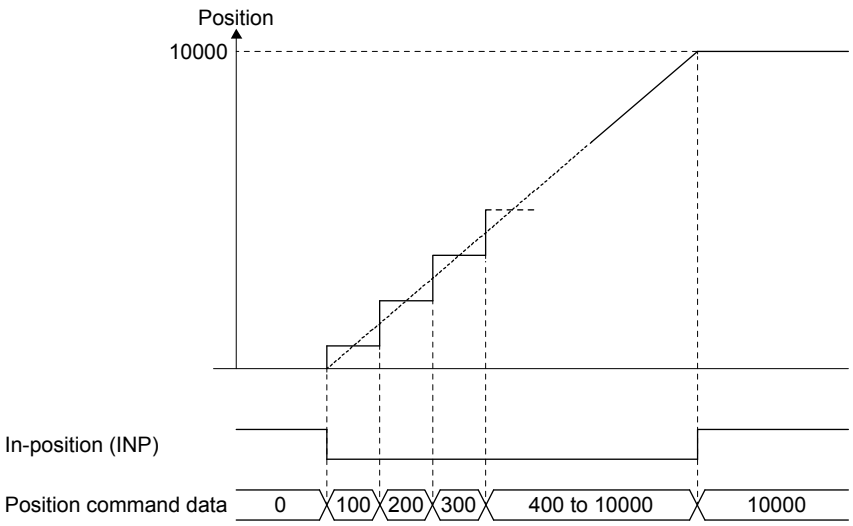

POINT

- After turning power supply ON, or after SSCNET reconnection, the control mode is position control mode.
- When a control mode other than position control mode was specified at power supply ON, or SSCNET reconnection, startup in position control mode, before switching to the specified control mode.
- When a control mode switch error has occurred, return the control mode command to the current control mode before performing the control mode switch again.
- When switching from speed control mode or torque control mode, update the command position with the current feedback position after confirming zero speed (ZSP).
- The data for control mode command is applied at the timing of the command data update cycle.

### 9.5.2 Position control mode

Position control mode is where position commands (absolute position in pulse units) generated by the user program can be sent to the servo amplifier. The position command buffer is made up of position data × a maximum of 64 ring buffers, and is controlled with the latest position command buffer number and the transmitting position buffer number.
Refer to Section 9.5.5 or Section 9.5.6 for the update method of the buffer.

> **POINT**
> - For the setting value of the position command buffer, ensure that the difference between the previous command value and the current command value is no more than 20000000. When the difference between the previous command value and the current command value exceeds 20000000, command data error (operation alarm A7, detail No.03) occurs, followed by an immediate stop.
> - When an alarm other than command data error (operation alarm A7, detail No.03) occurs, conduct a deceleration stop by the user program.




(1) Parameter

(a) System parameter

| Parameter No. | Abbreviation | Name | Remarks |
|---|---|---|---|
| 000F | *IFMO | Interface mode option | Specify the interrupt output cycle and command data update cycle. |

(b) Control parameter

| Parameter No. | Abbreviation | Name | Remarks |
|---|---|---|---|
| 0210 | TLP | Forward rotation torque limit value | Becomes valid when using torque limit. |
| 0211 | TLN | Reverse rotation torque limit value | |
| 023F | *IFBN | Interface mode maximum buffer number | Set the maximum buffer number of the position command buffer.<br>Note. When interrupt output is invalid in interface mode, 1 or higher must be set. |

(2) Axis data command/status table

Axis data command table

| Address | Content | Setting range |
|---|---|---|
| 1030 | Latest position command buffer number | 0 to 63 |
| 1031 | | |

Axis data status table

| Address | Content | Output range |
|---|---|---|
| 108E | Maximum position command buffer number | 1 to 64 |
| 108F | | |
| 1090 | Transmit position command buffer number | 0 to 63 |
| 1091 | | |

Note. The addresses above are the addresses for the first axis. For the second axis and after, increase by C0h for each axis.

(3) Position command buffer

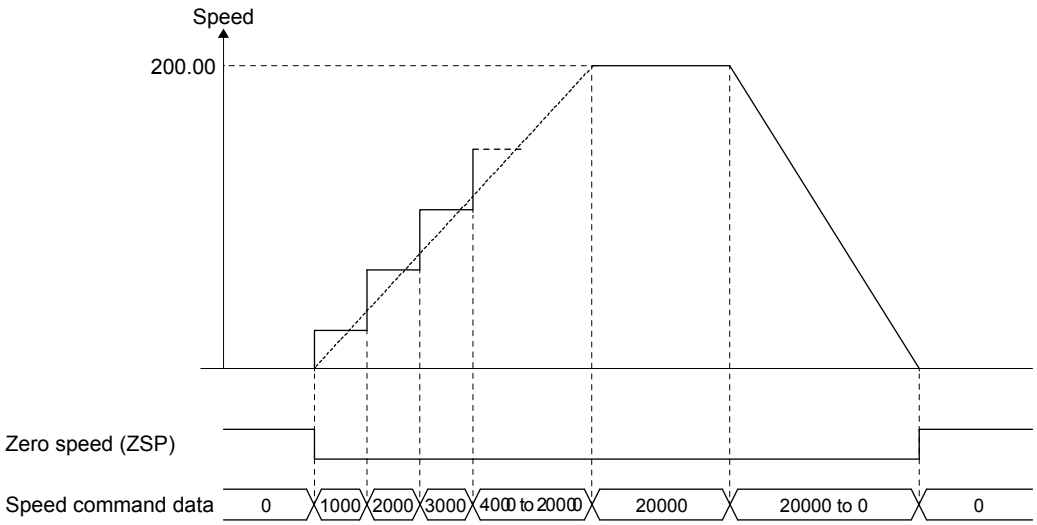
| Address | Name | Initial value | Units | Setting range | Remarks |
|---|---|---|---|---|---|
| 5000 | Position command buffer 0 | 0 | pulse | -2147483648 to 2147483647 | Input the target position in absolute position for every command data update cycle. |
| 5001 | | | | | |
| 5002 | | | | | |
| 5003 | | | | | |
| 5004 | Position command buffer 1 | 0 | pulse | -2147483648 to 2147483647 | Input the target position in absolute position for every command data update cycle. |
| 5005 | | | | | |
| 5006 | | | | | |
| 5007 | | | | | |
| 5008 | : | 0 | pulse | -2147483648 to 2147483647 | Input the target position in absolute position for every command data update cycle. |
| : | | | | | |
| 50FB | | | | | |
| 50FC | Position command buffer 63 | 0 | pulse | -2147483648 to 2147483647 | Input the target position in absolute position for every command data update cycle. |
| 50FD | | | | | |
| 50FE | | | | | |
| 50FF | | | | | |

Note. The addresses in the table are the addresses for the first axis. For the second axis and after, increase by 100h for each axis.

### 9.5.3 Speed control mode

Speed control mode is where speed commands (speed in units of 0.01r/min) generated by the user program can be sent to the servo amplifier. The speed command buffer is made up of speed command data × a maximum of 1 buffer.
Refer to Section 9.5.6 for the update method of the buffer.

> **POINT**
> - If a value outside of the range is input to the speed command buffer, command data error (operation alarm A7, detail No.01) occurs. The speed command value becomes 0[0.01r/min], followed by an immediate stop.
> - When an alarm other than command data error (operation alarm A7, detail No.01) occurs, conduct a deceleration stop by the user program.




(1) Parameter

(a) System parameter

| Parameter No. | Abbreviation | Name | Remarks |
|---|---|---|---|
| 000F | *IFMO | Interface mode option | Specify the interrupt output cycle and command data update cycle. |

(b) Control parameter

| Parameter No. | Abbreviation | Name | Remarks |
|---|---|---|---|
| 0210 | TLP | Forward rotation torque limit value | Becomes valid when using torque limit. |
| 0211 | TLN | Reverse rotation torque limit value | |

(2) Speed command buffer

| Address | Name | Initial value | Units | Setting range | Remarks |
|---|---|---|---|---|---|
| 7800 | Speed command buffer 0 | 0 | 0.01r/min | -1000000000 to 1000000000 | Input the target speed for every command data update cycle. |
| 7801 | | | | | |
| 7802 | | | | | |
| 7803 | | | | | |

Note. The addresses in the table are the addresses for the first axis. For the second axis and after, increase by 80h for each axis.

(3) Monitor

When using speed control mode in interface mode, use the following monitor numbers to monitor/sample the speed commands being sent to the servo amplifier.

(a) Operation information

| Monitor No. | Content | Units | Remarks |
|---|---|---|---|
| 0324 | Speed command (lower) | 0.01r/min | Notifies the speed command during speed control. |
| 0325 | Speed command (upper) | | |

(b) Operation information (double word)

| Monitor No. | Content | Units | Remarks |
|---|---|---|---|
| 1324 | Speed command | 0.01r/min | Notifies the speed command during speed control. |

### 9.5.4 Torque control mode

Torque control mode is where torque commands (torque in units of 0.1%) generated by the user program of the host controller can be sent to the servo amplifier. The torque command buffer is made up of torque command data × a maximum of 1 buffer.
Refer to Section 9.5.6 for the update method of the buffer.

The relationship between the torque command and the direction of the output torque of the servo motor differs depending on the settings of rotation direction selection/movement direction selection (servo parameter No.110D) and function selection C-B (servo parameter No.119C). The torque command during torque control mode is restricted by the torque control speed limit value.
The meanings of the signs for the following data that can referred to by the monitor during torque control mode differ from other control modes.

• Servo information (2)

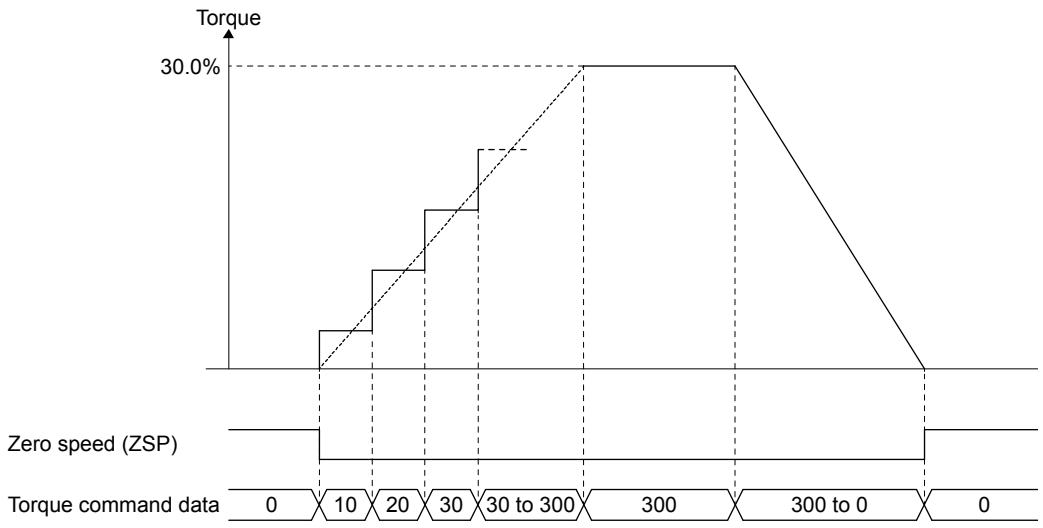
| Monitor No. | Content | Units |
|---|---|---|
| 020A | Electrical current command | 0.1% |
| 020B | Electrical current feedback | 0.1% |

The meanings of the signs for electrical current command (monitor No.020A) and electrical current feedback (monitor No.020B) during torque control mode are as follows.

| Parameter No. | Command direction | Motor revolution direction | Electrical current command/electrical current feedback sign | | |
|---|---|---|---|---|---|
| | | | Position control | Speed control | Torque control |
| 0 | Positive | CCW (positive) | Positive | Positive | Positive |
| | Negative | CW (negative) | Negative | Negative | Negative |
| 1 | Positive | CW (negative) | Negative | Negative | Positive |
| | Negative | CCW (positive) | Positive | Positive | Negative |

POINT

- If a value outside of the range is input to the torque command buffer, command data error (operation alarm A7, detail No.02) occurs. The torque command value becomes the value before the change.
- When an alarm occurs, conduct a deceleration stop by the user program.



(1) Parameter

(a) System parameter

| Parameter No. | Abbreviation | Name | Remarks |
|---|---|---|---|
| 000F | *IFMO | Interface mode option | Specify the interrupt output cycle and command data update cycle. |

(2) Axis data command/status table

Axis data command table

| Address | Content | Setting range |
|---|---|---|
| 1048 | Torque control speed limit value (0.01r/min) | 0 to 1000000000 |
| 1049 | | |
| 104A | | |
| 104B | | |

Note. The addresses above are the addresses for the first axis.
For the second axis and after, increase by C0h for each axis.

(3) Torque command buffer

| Address | Name | Initial value | Units | Setting range | Remarks |
|---|---|---|---|---|---|
| 8C00 | Torque command buffer 0 | 0 | 0.1% | -32768 to 32767 | Input the target torque for every command data update cycle. |
| 8C01 | | | | | |
| 8C02 | | | | | |
| 8C03 | | | | | |

Note. The addresses in the table are the addresses for the first axis. For the second axis and after, increase by 80h for each axis.

### 9.5.5 Control method for interrupt output invalid

Interrupt output invalid is compatible with position control mode only.

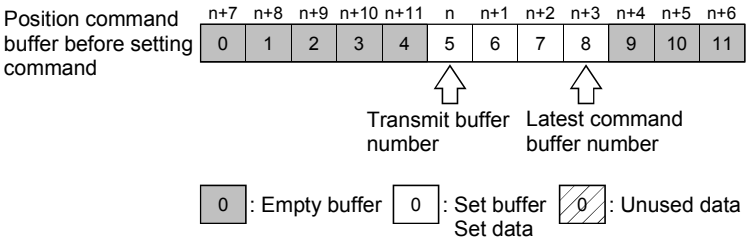
| POINT |
| --- |
| ・When the update of the latest position command buffer number is delayed etc. due to the load, etc. on the user program, and the latest position command buffer number and transmit position command buffer number continue to get closer, the same position command details are transmitted to the servo amplifier, and over time, an axis that was in operation, begins to output a command of speed 0.<br>・When controlling with interrupt output invalid, set the Interface mode maximum buffer number (parameter No.023F) to 1 or more. When set to 0, the position command buffer cannot be updated and thus cannot control. (The same position command is transmitted to the servo amplifier) |

The following is the control method for when interrupt output is invalidated (ITS is turned off).
The user program updates the latest position command buffer number by checking the latest position command buffer number and transmit position command buffer number at any given time, and setting the position command for each command data update cycle to an empty buffer. At this time, do not change the contents of the buffers between the transmit position command buffer number and latest position command buffer number.
The position board transmits the contents of the next buffer every command data update cycle, and updates the transmit position command buffer number.

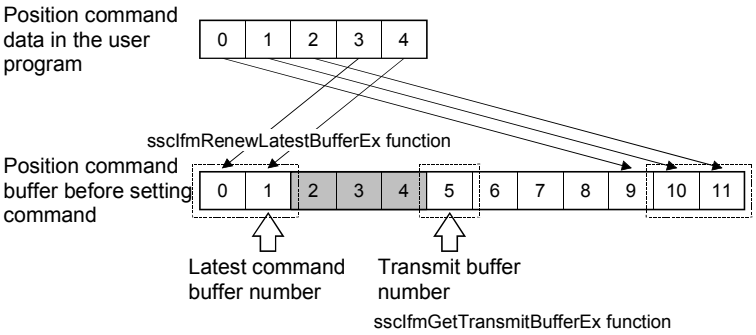
Note. When a value outside the range is set to the latest position command buffer number, a latest command buffer number setting error (operation alarm 2D) is output, and it stops.

The following is an example of when the maximum buffer number is 11.
When the buffer status resembles "Example 1: Before buffer set", and there are 5 cycles of position command data that have been calculated by the user program, set the latest position command buffer number to 1 after setting position command data to empty buffers 9 to 11, and buffers 0 to 1. After processing, the buffer status resembles "Example 2: After buffer set (5 cycles)".
Under the same conditions, when there are 10 cycles of position command data that have been calculated by the user program, set the latest position command buffer number to 4 after setting position command data to buffers 9 to 11, and buffers 0 to 4. At this time, because there are only 8 empty buffers, 2 cycles of position command data cannot be set. Set these buffers the next time the buffers empty. After processing, the buffer status is becomes similar to "Example 3: After buffer set (10 cycles)".

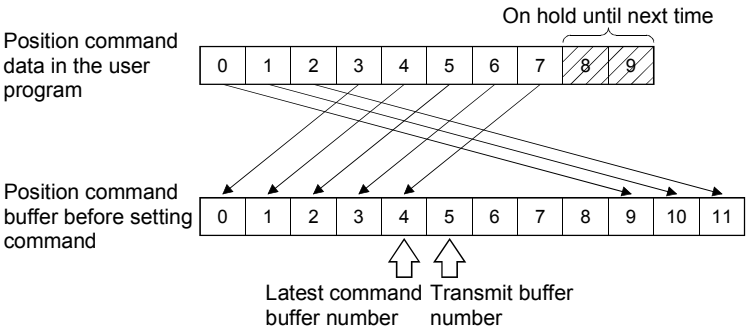
Example 1: Before buffer set




Example 2: After buffer set (5 cycles)

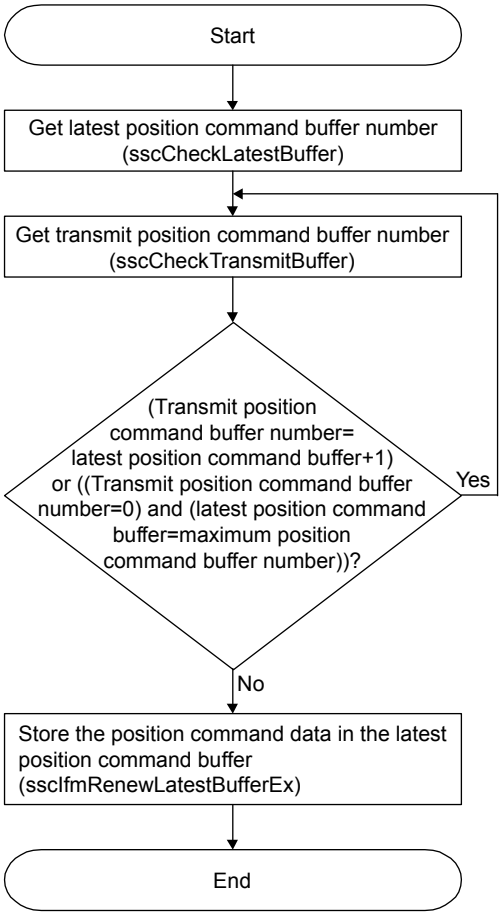



Example 3: After buffer set (10 cycles)



(1) Procedure for updating position command data

The procedure for updating position command data when interrupt output is invalid is shown below.




POINT

- During servo off always perform a follow up (store current feedback position to the latest position command buffer). Immediately after servo on, the motor may operate at a very high speed.
- When servo ready (RDY) switches from ON to OFF due to an alarm factor etc., turn servo on (SON) OFF. After removing the cause, an unexpected operation may occur.

### 9.5.6 Control method for interrupt output valid

There is no difference in control method for position control mode, speed control mode and torque control mode when control method for interrupt output is valid. The control method is as follows.
The following is the control method for when interrupt output is validated (ITS is turned on), and the number of command buffers used is 0.
The position board outputs the command set by the user program for every command data update cycle after the system startup. While ITS is turned on, an interrupt is generated every interrupt output cycle. Have the user program update the command buffer 0, and read the high speed monitor from the generation of an interrupt (interrupt output cycle – control cycle/2). The command data update cycle, and interrupt output cycle can be set in Interface mode option (parameter No.000F).
In the time from the generation of an interrupt until the completion of the above process, turn on the during user program memory access signal (HMA). When the system program reads the command, it checks the during user program memory access signal (HMA). When the signal is on, the update is regarded as incomplete and does not perform the read, and the command buffer read error counter is incremented. When this happens, the previous position command value is sent to the servo amplifier, and when in position control mode, an immediate stop follows. When in speed control mode or torque control mode, operation continues with the previous values and same command data.
While the position board is reading command and writing high speed monitor, the during system program memory access signal (BMA) is turned on. (When it is not a control cycle where command data is updated, during system program memory access signal (BMA) is not turned on).
When in position control mode and using several buffers in interrupt output valid, perform the same process at every interrupt output as interrupt output invalid. Clear the interrupt signal (IRQ) by writing 0 to the interrupt clear register (offset 20008h of dual port memory). Be sure to clear the interrupt signal within the interrupt handler.

Note. For real time processing, the execution of command read, high speed monitor, and communication with servo amplifier within the control cycle are guaranteed processes.

The timing of control differs depending on the settings of the command data update cycle and interrupt output cycle.
Use the table below when referring to the timing charts.

| Command data update cycle | Interrupt output cycle | Reference |
|---|---|---|
| Control cycle × 1 | Control cycle × 1 | Refer to (2)(a) |
| | Control cycle × n<br>(n = 2 to 16) | (Note 2) |
| Control cycle × 2 | Control cycle × 1 | Refer to (3), (Note 1) |
| | Control cycle × 2 | Refer to (2)(b) |
| | Control cycle × n<br>(n = 3 to 16) | (Note 2) |
| Control cycle × 3 | Control cycle × 1 | Refer to (3), (Note 1) |
| | Control cycle × 2 | Unavailable |
| | Control cycle × 3 | Refer to (2)(b) |
| | Control cycle × n<br>(n = 4 to 16) | (Note 2) |
| Control cycle × 4 | Control cycle × 1 | Refer to (3), (Note 1) |
| | Control cycle × 2 | Refer to (3), (Note 1) |
| | Control cycle × 3 | Unavailable |
| | Control cycle × 4<br>(n = 4 to 16) | Refer to (2)(b) |
| | Control cycle × n<br>(n = 5 to 16) | (Note 2) |
| : | : | : |
| Control cycle × m<br>(m = 5 to 16) | Control cycle × n<br>(when n<m, and m is a factor of n) | Refer to (3), (Note 1) |
| | Control cycle × n<br>(when n<m, and m is not a factor of n) | Unavailable |
| | Control cycle × n<br>when n = m | Refer to (2)(b) |
| | Control cycle × n<br>(when n>m) | (Note 2) |

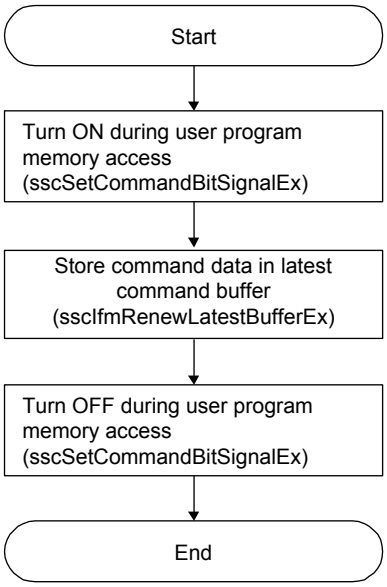
Note 1. When the update of the command is slower than the control cycle, the servo amplifier in-position signal and current feedback position is still used when importing in a cycle shorter than the command data update is necessary.

2. When command data update cycle < interrupt output cycle, and command is updated for every interrupt output cycle, the timing of the update of command data is still too late. For position control mode, the update of several position command buffers every interrupt output cycle is necessary. Set the maximum buffer number so that (command data update cycle) × (maximum buffer number + 1) > (interrupt output cycle), and perform the control method for interrupt output invalid at the timing of the interrupt generation.
For speed control mode or torque control mode, the above setting cannot be used.

(1) Procedure for updating command data

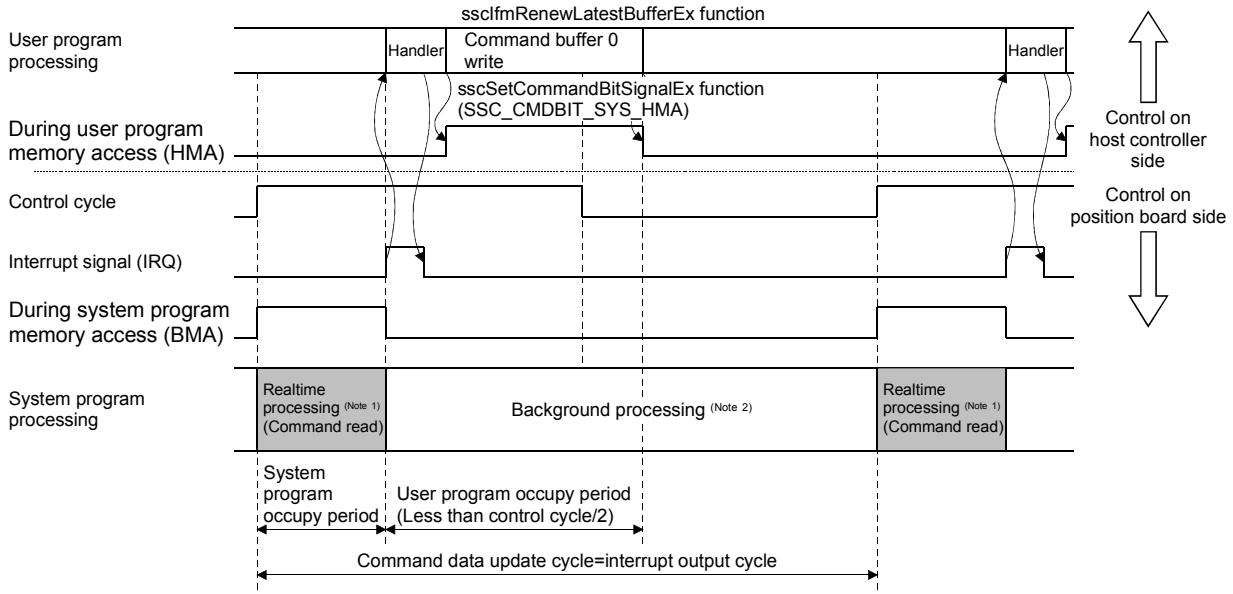
The procedure for storing command data is shown below.

There is no difference in the procedure for position control mode, speed control mode, or torque control mode.



(2) When command data update cycle = interrupt output cycle

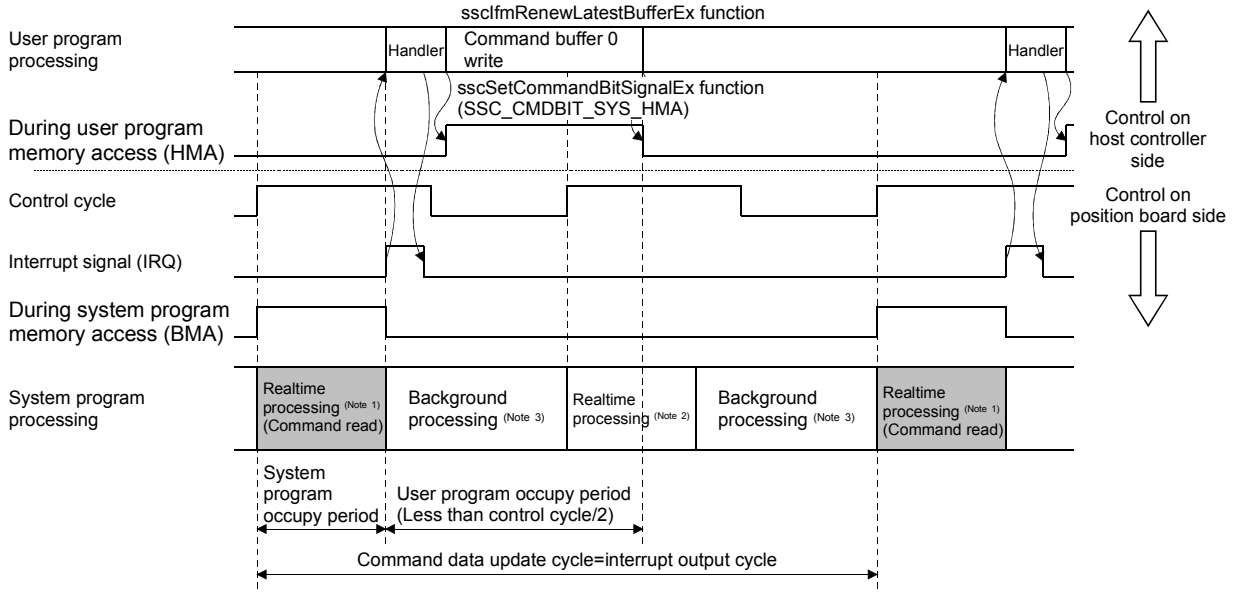
(a) When command data update cycle is control cycle × 1, and interrupt out cycle is control cycle × 1.




Note 1. For real time processing, the execution of command read, high speed monitor, and communication with servo amplifier within the control cycle are guaranteed processes.

2. For background processing, the execution of monitor, parameter read/write within the control cycle are not guaranteed processes.

(b) When command data update cycle is control cycle × n, and interrupt output cycle is control cycle × n. The following is an example of when command data update cycle = interrupt output cycle = control cycle × 2.




Note 1. For real time processing, the execution of command read, high speed monitor, and communication with servo amplifier within the control cycle are guaranteed processes.

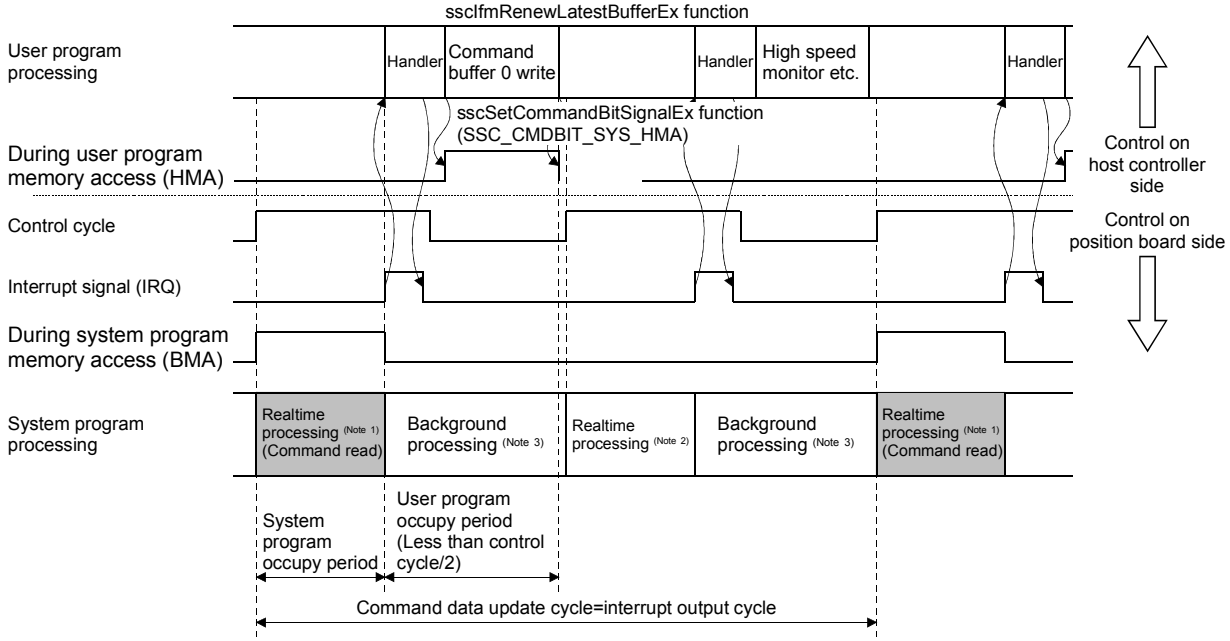
2. Reading of command is not performed for this real time process. (During system program memory access (BMA) does not turn on)

3. For background processing, the execution of monitor, parameter read/write within the control cycle are not guaranteed processes.

(3) When command data update cycle > interrupt output cycle

The following is an example of when command data update cycle is control cycle × 2, and interrupt output cycle is control cycle × 1.

Using the interrupt output cycle as a reference, the user program updates the command buffer during the command data update cycle once only. Make sure the user program occupy period is within (interrupt output cycle) – (control cycle/2).




Note 1. For real time processing, the execution of command read, high speed monitor, and communication with servo amplifier within the control cycle are guaranteed processes.

2. Reading of command is not performed for this real time process. (During system program memory access (BMA) does not turn on)

3. For background processing, the execution of monitor, parameter read/write within the control cycle are not guaranteed processes.

### 9.5.7 Procedure for switching control mode

The procedure when switching control mode is as follows.

(1) Position control mode

Switch to position control mode is performed with the following procedure.

(a) Check that zero speed (ZSP) is turned ON.

(b) Perform a follow up to update the position command to match the current feedback position.

(c) Input "0: Position control mode" to the control mode command.

(d) Check that control mode status is "0: Position control mode".

(e) Stop follow up.

| API LIBRARY |
|---|
| • To check if zero speed (ZSP) is ON/OFF in (a) above, set SSC_STSBIT_AX_ZSP to the status bit number with the sscGetStatusBitSignalEx or sscWaitStatusBitSignalEx functions.<br>• Use the sscIfmRenewLatestBufferEx function to perform follow up in (b) above.<br>• Use the sscIfmSetControlMode function to set control mode command in (c) above.<br>• Use the sscIfmGetControlMode function to check control mode status in (d) above. |

(2) Speed control mode

Switch to speed control mode is performed with the following procedure.

(a) Check that zero speed (ZSP) is turned ON.
(Not required when switching from torque control mode)

(b) Input "1: Speed control mode" to the control mode command.

(c) Check that control mode status is "1: Speed control mode".

| POINT |
|---|
| • Use the value of the torque limit (parameter No.0212, No.0211) during speed control mode. Set the value before switching modes. |

| API LIBRARY |
|---|
| • To check if zero speed (ZSP) is ON/OFF in (a) above, set SSC_STSBIT_AX_ZSP to the status bit number with the sscGetStatusBitSignalEx or sscWaitStatusBitSignalEx functions.<br>• Use the sscIfmSetControlMode function to set control mode command in (b) above.<br>• Use the sscIfmGetControlMode function to check control mode status in (c) above. |

(3) Torque control mode

Switch to torque control mode is performed with the following procedure.

(a) Check that zero speed (ZSP) is turned ON.
(Not required when switching from speed control mode)

(b) Input the speed limit value during torque control mode to the torque control speed limit value.

(c) Input "2: Torque control mode" to the control mode command.

(d) Check that control mode status is "2: Torque control mode".

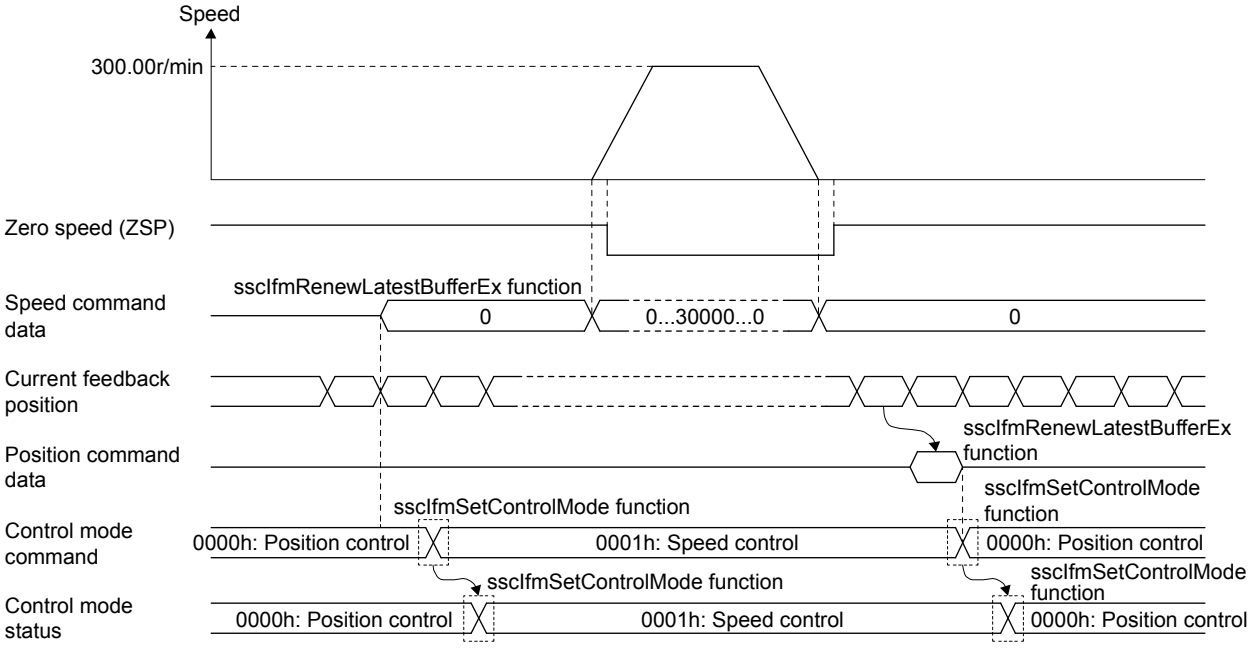
| POINT |
|---|
| • Set the torque control speed limit value before switching modes. |

| API LIBRARY |
|---|
| • To check if zero speed (ZSP) is ON/OFF in (a) above, set SSC_STSBIT_AX_ZSP to the status bit number with the sscGetStatusBitSignalEx or sscWaitStatusBitSignalEx functions.<br>• Use the sscIfmTrqSetSpeedLimit function to set torque control speed limit value in (b) above.<br>• Use the sscIfmSetControlMode function to set control mode command in (c) above.<br>• Use the sscIfmGetControlMode function to check control mode status in (d) above. |

### 9.5.8 Examples of switching control mode

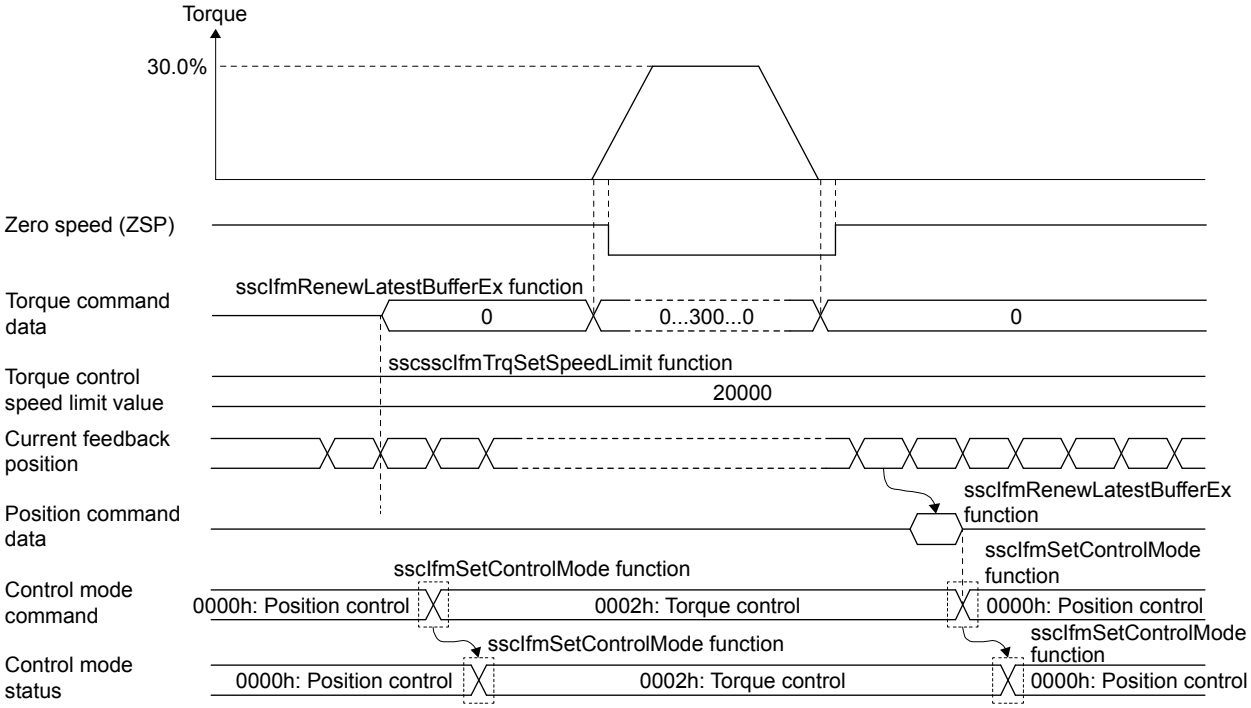
The switch timing for every setting of position control mode, speed control mode, and torque control mode when using interface mode is as follows.

(1) Position control mode ↔ speed control mode




| POINT |
|---|
| • When switching to position control mode and the travel amount at follow up exceeds 20000000, set position command data to the position command buffer to ensure that the travel amount per cycle is 20000000 or less. |

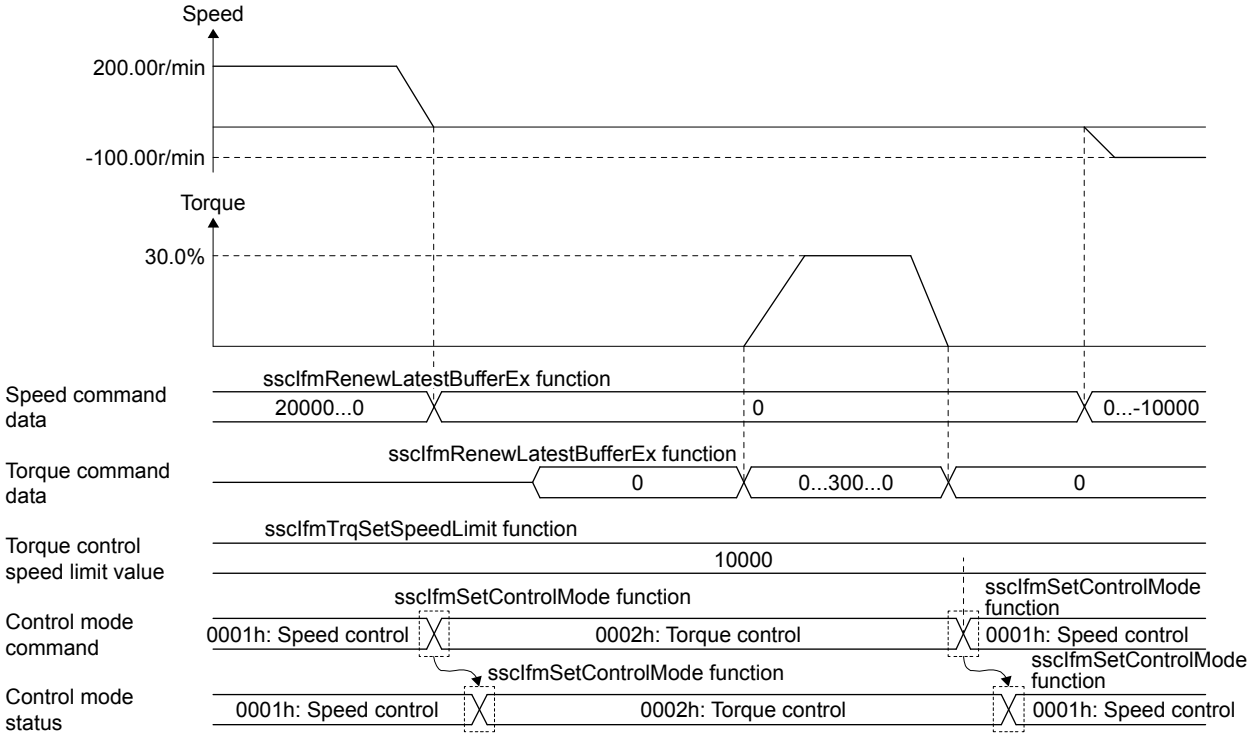
(2) Position control mode ↔ torque control mode




POINT

- Set the torque control speed limit value before switching control modes.
- When returning to position control mode, switch control modes after checking that zero speed (ZSP) is turned ON. If control mode is switched while zero speed (ZSP) is OFF, control mode switch error (operation alarm 2E, detail No.01) occurs.
- When switching to position control mode and the travel amount at follow up exceeds 20000000, set position command data to the position command buffer to ensure that the travel amount per cycle is 20000000 or less.

(3) Speed control mode ↔ torque control mode




Note 1. The torque at speed control, and the speed at torque control depends on the system the servo motor is connected to.

2. When returning to speed control during torque control, set the speed command data before switching to torque control. Depending on the speed command data at this time, the torque may increase/decrease due to torque control.

| POINT |
|---|
| • Set the torque control speed limit value before switching control modes. |

## 9.6 Interrupt output cycle

When several buffer are used in interrupt valid, and interrupt output for every control cycle is not needed, the cycle of interrupt output can be changed by the interrupt output cycle of Interface mode option (parameter No.000F).

### (1) System parameters

| Parameter No. | Abbreviation | Name | Initial value | Units | Setting range | Function |
|---|---|---|---|---|---|---|
| 000F | *IFMO | Interface mode option | 0000h | | 0000h to 0F0Fh | 0 0 0 [ ]<br>Interrupt output cycle<br>When interrupt by interface mode is valid, set the cycle for which the interrupt is output.<br>Interrupt output cycle:<br>Control cycle×(setting value+1)<br>Example: When interrupt output cycle is set to 1 and control cycle is 0.88ms, interrupt is output approximately every 1.77ms. |

### (2) Interrupt output cycle

The relationship between interrupt output cycle and control cycle is shown in the table below.

| Setting value | 0 | 1 | 2 | 3 | ・・ | 8 | ・・ | 15 |
|---|---|---|---|---|---|---|---|---|
| Control cycle 0.88ms | 0.88ms | 1.77ms | 2.66ms | 3.55ms | ・・ | 8.00ms | ・・ | 14.22ms |
| Control cycle 0.44ms | 0.44ms | 0.88ms | 1.33ms | 1.77ms | | 4.00ms | | 7.11ms |
| Control cycle 0.22ms | 0.22ms | 0.44ms | 0.66ms | 0.88ms | | 2.00ms | | 3.55ms |

## 9.7 Command data update cycle

The update cycle of command can be changed by command data update cycle of Interface mode option (parameter No.000F). Have the user program generate the command for every command data update cycle, and set to command buffer.

Note. Because communication with the servo amplifier is performed every control cycle, the current feedback position and other high speed monitors are updated every control cycle.

### (1) System parameters

| Parameter No. | Abbreviation | Name | Initial value | Units | Setting range | Function |
|---|---|---|---|---|---|---|
| 000F | *IFMO | Interface mode option | 0000h | | 0000h to 0F0Fh | 0 \| \| 0 \| 0<br>Command data update cycle<br>Set the cycle for which command is updated in interface mode.<br>Command data update cycle:<br>Control cycle×(setting value+1)<br>Example: When command data update cycle is set to 2 and control cycle is 0.88ms, command is updated approximately every 2.66ms. |

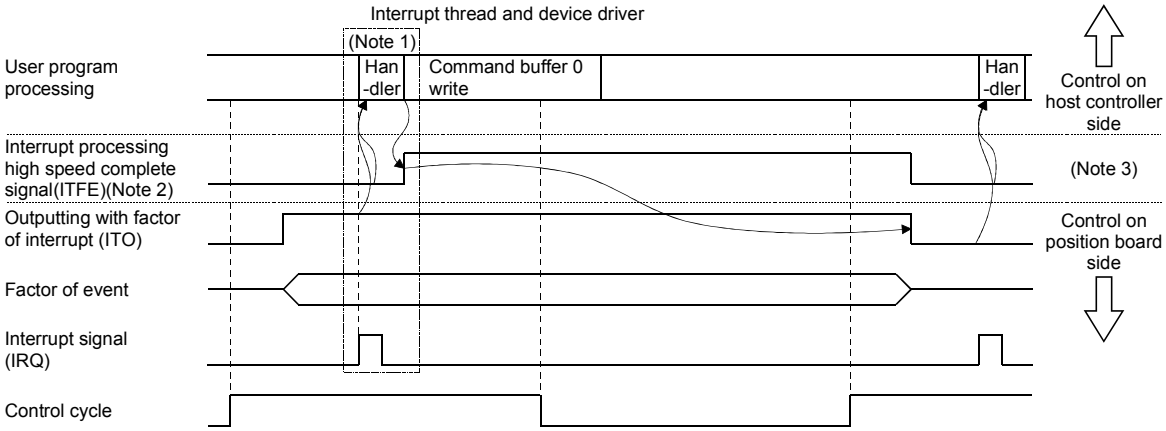
### (2) Command data update cycle

The relationship between command data update cycle and control cycle is shown in the table below.

| Setting value | 0 | 1 | 2 | 3 | ・・ | 8 | ・・ | 15 |
|---|---|---|---|---|---|---|---|---|
| Control cycle 0.88ms | 0.88ms | 1.77ms | 2.66ms | 3.55ms | ・・ | 8.00ms | ・・ | 14.22ms |
| Control cycle 0.44ms | 0.44ms | 0.88ms | 1.33ms | 1.77ms | | 4.00ms | | 7.11ms |
| Control cycle 0.22ms | 0.22ms | 0.44ms | 0.66ms | 0.88ms | | 2.00ms | | 3.55ms |

## 9.8 Event detection function

The event detection function detects the ON/OFF edges of specified status bits. Using this function eliminates the process of getting the status bits for every control cycle, reducing the processing load of the user program.
The event detection function outputs the factor of event to the dual port memory when an event (alarm occurrence, change in the status of sensor input) occurs. The user program monitors the factor of event in addition to referring to outputting with factor of interrupt (ITO), and information of outputting with factor of interrupt.
The event detection function can be used at any time, and no settings are required to use it.
For clearing the factor of event, turn ON the interrupt processing high speed complete signal (ITFE). When the position board receives the interrupt processing high speed complete signal (ITFE), it turns OFF the interrupt processing high speed complete signal (ITFE), and clears the factor of event.




Note 1. The outputting with factor of interrupt (ITO), information of outputting with factor of interrupt, and factor of axis event are read by the interrupt handler.
Note 2. The position board gets the commands for every control cycle.
Note 3. ON is performed on the API library side (interrupt handler), and OFF is performed by the position board.

**POINT**

- When more than one event is detected in the same control cycle, all applicable factors of event turn ON.
- Factors of event are held until interrupt processing high speed complete signal (ITFE) is conducted. However, if the status of a signal changes while it is being held, the last status is retained.
  (Example. While a factor of event is being held, when an OFF edge is detected after the detection of an ON edge, only the OFF edge is output.)
- A factor of event in the system is the same as a system interrupt factor. Refer to Section 7.6.

**API LIBRARY**

- Getting the factor of event and turning ON the interrupt processing high speed complete signal are processed by the interrupt thread and device driver that is created when calling the sscIntStart function. Thus processing by user program is unnecessary.
- Use the sscIfmGetEventStatusBits function for getting factor of event.

(1) Factor of axis event

(a) Factor of axis event

| Address | Content |
|---|---|
| 0EE0 | Factor of event Axis 1 |
| 0EE1 | |
| 0EE2 | |
| 0EE3 | |
| 0EE4 | Factor of event Axis 2 |
| 0EE5 | |
| 0EE6 | |
| 0EE7 | |
| 0EE8 | Factor of event Axis 3 |
| 0EE9 | |
| 0EEA | |
| 0EEB | |
| 0EEC | Factor of event Axis 4 |
| 0EED | |
| 0EEE | |
| 0EEF | |
| 0EF0 | Factor of event Axis 5 |
| 0EF1 | |
| 0EF2 | |
| 0EF3 | |
| 0EF4 | Factor of event Axis 6 |
| 0EF5 | |
| 0EF6 | |
| 0EF7 | |
| 0EF8 | Factor of event Axis 7 |
| 0EF9 | |
| 0EFA | |
| 0EFB | |
| 0EFC | Factor of event Axis 8 |
| 0EFD | |
| 0EFE | |
| 0EFF | |
| 0F00 | Factor of event Axis 9 |
| 0F01 | |
| 0F02 | |
| 0F03 | |
| 0F04 | Factor of event Axis 10 |
| 0F05 | |
| 0F06 | |
| 0F07 | |
| 0F08 | Factor of event Axis 11 |
| 0F09 | |
| 0F0A | |
| 0F0B | |

| Address | Content |
|---|---|
| 0F0C | Factor of event Axis 12 |
| 0F0D | |
| 0F0E | |
| 0F0F | |
| 0F10 | Factor of event Axis 13 |
| 0F11 | |
| 0F12 | |
| 0F13 | |
| 0F14 | Factor of event Axis 14 |
| 0F15 | |
| 0F16 | |
| 0F17 | |
| 0f18 | : |
| : | |
| 0F5B | |
| 0F5C | Factor of event Axis 32 |
| 0F5D | |
| 0F5E | |
| 0F5F | |
| 0F60 | Reserved |
| : | |
| 0F9F | |

:

(b) Details on factor of event on axis n

The addresses in the table are the addresses for the axis 1. For the axis 2 and above, increase in units of 04h for each axis.

| Address | Bit | (Note) Abbreviation | Signal name |
|---|---|---|---|
| 0EE0 to 0EE3 | 0 | iRDYON | Servo ready (ON edge) |
| | 1 | iINPON | In-position (ON edge) |
| | 2 | iZSPON | Zero speed (ON edge) |
| | 3 | iTLCON | Torque limit effective (ON edge) |
| | 4 | iSALMON | Servo alarm (ON edge) |
| | 5 | iSWRNON | Servo warning (ON edge) |
| | 6 | iABSEON | Absolute position erased (ON edge) |
| | 7 | iOALMON | Operation alarm (ON edge) |
| | 8 | iMAK1ON | Mark detection 1 (ON edge) |
| | 9 | iMAK2ON | Mark detection 2 (ON edge) |
| | 10 | | Reserved |
| | 11 | | |
| | 12 | | |
| | 13 | iLSPON | + side limit switch (ON edge) |
| | 14 | iLSNON | - side limit switch (ON edge) |
| | 15 | iDOGON | Proximity dog (ON edge) |
| | 16 | iRDYOF | Servo ready (OFF edge) |
| | 17 | iINPOF | In-position (OFF edge) |
| | 18 | iZSPOF | Zero speed (OFF edge) |
| | 19 | iTLCOF | Torque limit effective (OFF edge) |
| | 20 | iSALMOF | Servo alarm (OFF edge) |
| | 21 | iSWRNOF | Servo warning (OFF edge) |
| | 22 | iABSEOF | Absolute position erased (OFF edge) |
| | 23 | iOALMOF | Operation alarm (OFF edge) |
| | 24 | iMAK1OF | Mark detection 1 (OFF edge) |
| | 25 | iMAK2OF | Mark detection 2 (OFF edge) |
| | 26 | | Reserved |
| | 27 | | |
| | 28 | | |
| | 29 | iLSPOF | + side limit switch (OFF edge) |
| | 30 | iLSNOF | - side limit switch (OFF edge) |
| | 31 | iDOGOF | Proximity dog (OFF edge) |

Note. OFF: No factor of event exists.
ON: A factor of event exists.

## 9.9 Servo off

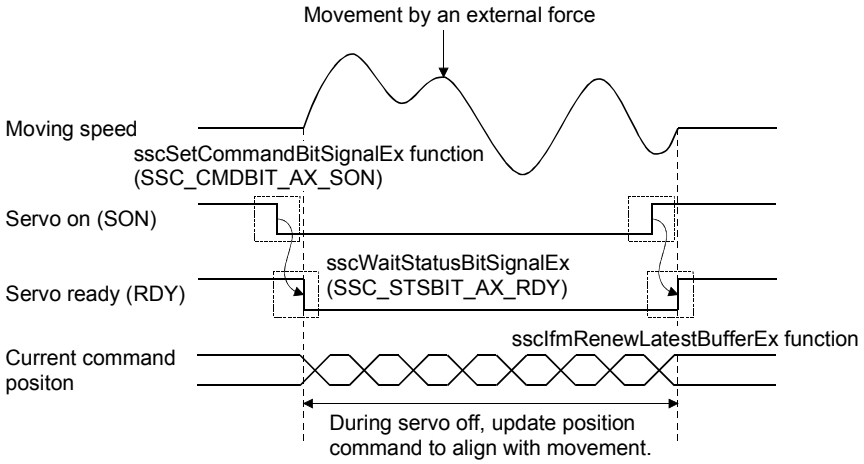
When axes are moved by an external force during servo off, perform a follow up (refer to the formula below) that updates the position command to align with the movement (feedback position).

**⚠CAUTION**

- If a follow up is not performed, the servo amplifiers will align the current command position with the position command at servo on, and the motors may operate at a very high speed.

| | |
|---|---|
| Position command | = Feedback position |
| Machinery command position | = Position command – Home position offset |

Coordinate return processing such as home position return after servo off are not necessary. If servo off is performed during axis operation, a free-run state occurs which is very dangerous. Be sure to servo off after stopping operation.




**POINT**

- After updating the position command to match the current feedback position, do not servo on until the transmit position command buffer number is the same as the latest position command buffer number.
- When the command data update cycle (control cycle × 2 or more) is set, the time of the command data update cycle set to the position board follow up applies. When the command data update cycle is set, make sure servo on is performed at the next command data update or later.

## 9.10 Home position return

When startup is performed in interface mode, the operational function home position return cannot be used. Therefore, for an absolute position detection system, use the following method to perform a home position return. For an incremental system, home position set is not necessary. (The position at power supply ON is treated as 0).

1) Update the position command buffer and move to the home position.
2) Check that the in-position signal (INP) is on.
3) Turn ON the home position set command (ZSC).
4) Check that home position set complete (ZSF) turns ON.
5) Read the home position multiple revolution data (parameter 024D), and home position within 1 revolution position (parameter 024F), and save to the user program.
6) The next time power supply is ON, set the parameters read in 5)
7) The position board will restore the absolute position based on the parameters above.

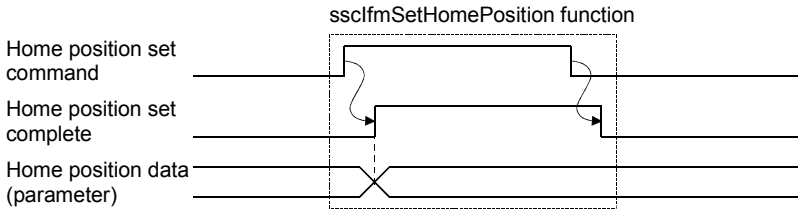
When home position return is performed by this function, coordinate systems such as the current command position and current feedback position are in the same state before home position return and do not change until the power supply is turned OFF/ON again. Therefore after home position return, perform a home position offset for position commands at home position return as shown in the formula below.

| Position command = Machinery command position + Home position offset |
|---|

- Position command : Position provided to the position board. (pulse)
- Machinery command position : The actual position to move the machine to. (pulse)
- Home position offset : The difference between machinery command position and position command. (pulse)

When the home position coordinates are set by parameters, the absolute position is restored so that the place of set home position is the same as the home position coordinates.

When the home position set command turns on during in-position signal (INP) off, home position set error (ZSE) turns on, and home position return is not completed.
Also, when position command exceeds 32 bit or motor exceeds ±32767 revolutions when moving from the home position in an absolute position detection system, the current command position cannot be normally restored at power supply on. Use absolute position detection system within ±32767 revolutions and with position commands within 32 bit.



(1) Axis data command/status bit

Command bit

| Address | Bit | Symbol | Signal name | When in auxiliary drive |
|---|---|---|---|---|
| 100A | 0 | | Reserved | |
| | 1 | | | |
| | 2 | | | |
| | 3 | | | |
| | 4 | ZSC | Home position set command | |
| | 5 | | Reserved | |
| | 6 | | | |
| | 7 | | | |

Status Bit

| Address | Bit | Symbol | Signal name | When in auxiliary drive |
|---|---|---|---|---|
| 0451 | 0 | | Reserved | |
| | 1 | | | |
| | 2 | | | |
| | 3 | | | |
| | 4 | ZSF | Home position set complete | |
| | 5 | ZSE | Home position set error | |
| | 6 | | Reserved | |
| | 7 | | | |

Note. The addresses above are the addresses for the first axis. For the second axis and after, increase by C0h for each axis.

(a) Details on command bit

| Abbreviation | Signal name | Function details |
|---|---|---|
| ZSC | Home position set command | [Function]<br>Commands home position set.<br>[Operation]<br>When home position set command (ZSC) is turned on, the current position is set as home position.<br>This is used when absolute position detection system is valid. |

(b) Details on status bit

| Abbreviation | Signal name | Function details |
|---|---|---|
| ZSF | Home position set complete | [Function]<br>Notifies the home position set is complete.<br>[Operation]<br><Conditions for turning on><br>• Home position set is completed.<br><Conditions for turning off><br>• Home position set command (ZSC) is turned off. |
| ZSE | Home position set error | [Function]<br>Notifies the home position set failed.<br>[Operation]<br><Conditions for turning on><br>• During an operation alarm.<br>• During servo off (including servo alarm).<br>• During test mode.<br>• In-position signal is off.<br><Conditions for turning off><br>• Home position set command (ZSC) is turned off. |

## 9.11 Coordinate management

This section shows an example of how to approach coordination management.

### 9.11.1 Incremental system

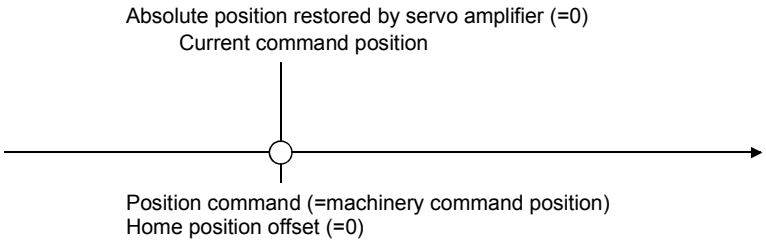
When using servo amplifiers with incremental system setting, the current command position (position command) when SSCNET connection is restored is 0. Afterwards, a coordinate system value for a position of 0 when the SSCNET is connected needs to be used for the position command that the user program applies to position board until connecting to SSCNET again. In many cases, the actual home position of the machine and the home position of the position command (position when SSCNET is connected) are different, therefore, the position command is calculated using the machinery command position and home position offset with the following formula.

| Position command = Machinery command position + Home position offset |
|---|

(1) When connected to SSCNET

Because the current command position (position command) when SSCNET connection is restored is 0, set home position offset to 0.

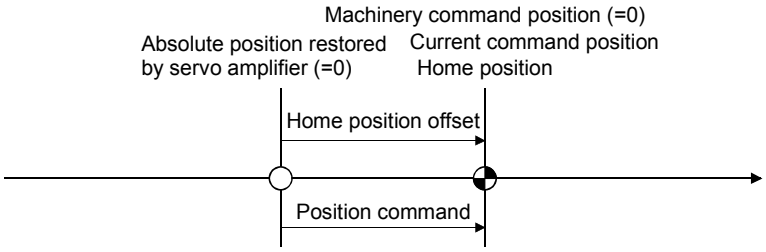
Until home position is determined, machinery command position is undefined. Use the position that is referred to when connected to SSCNET (=0) as the machinery command position.




(2) Home position return

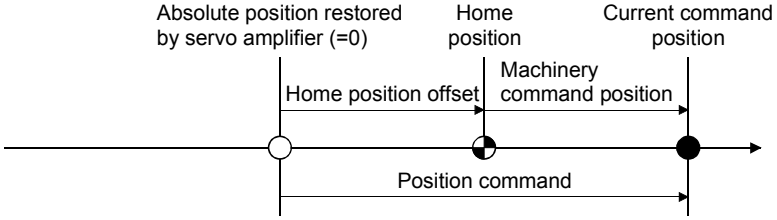
When home position return is required, move to home position on the user program side. The home position of the position command (distance from position when connected to SSCNET to home position) is the home position offset after home position return.

In an incremental system, home position set for position board is not required.



(3) After home position return

Calculate the position command (=machinery command position + home position offset) by using the home position offset determined at home position return.



### 9.11.2 Absolute position system

When using servo amplifiers with absolute position system setting, the absolute position restored when connected to SSCNET is a position calculated from the "home position coordinates", "home position within 1 revolution", and "home position multiple revolution data" set to the parameters. Afterwards, a coordinate system value for when the SSCNET is connected needs to be used for the position command that the user program applies to position board until connecting to SSCNET again.

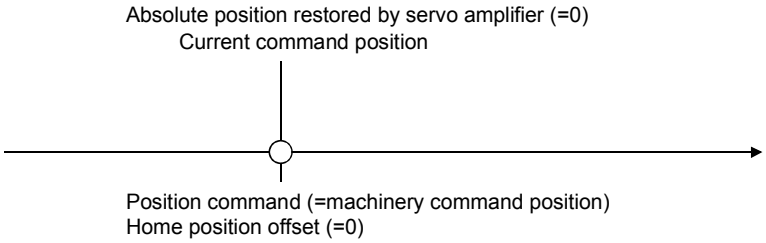
Similar to an incremental system, the coordinate system does not change after home position return operation (after home position set). As a result, the actual home position of the machine and the home position of the position command (position when SSCNET is connected) is different, therefore, the position command is calculated using the machinery command position and home position offset with the following formula.

| Position command = Machinery command position + Home position offset |
|---|

(1) When connected to SSCNET (home position is not determined)

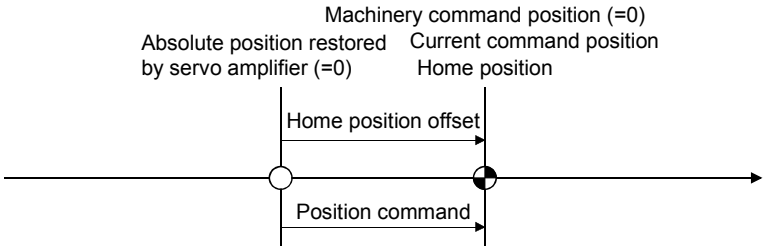
Because the current command position (position command) when SSCNET connection is restored is 0, set home position offset to 0.

Until home position is determined, machinery command position is undefined. Use the position that is referred to when connected to SSCNET (=0) as the machinery command position.



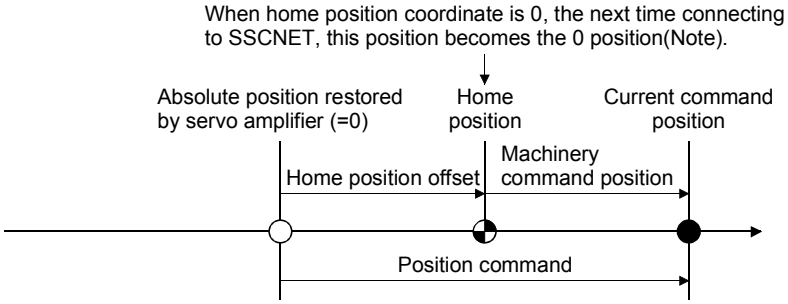

(2) Home position return

Move to home position on the user program side, execute home position set, and determine the home position. The home position of the position command (distance from position when connected to SSCNET to home position) is the home position offset after home position return.



(3) After home position return

Position board also operates with the same coordinate system as when connected to SSCNET after home position return. As a result, the machinery command position and position command deviate by the difference between the new coordinate system and the coordinate system when connected to SSCNET. Set the amount of deviation to the home position offset.



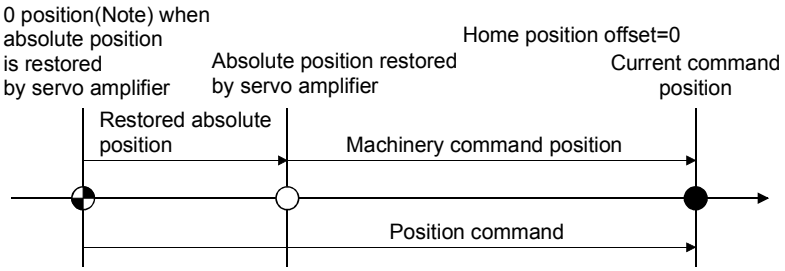

Note. 0 position is the position in the coordinate system where machinery command position is 0 when restoring absolute position, or after home position return. (When the home position coordinate is 0, this is the position after performing home position return)

Except for when home position coordinate is 0, the formula for calculating home position offset is as follows.

| Home position offset = Position command at home position return – Home position coordinate |
|---|

(4) After restoring absolute position

After restoring the home position, the machinery command position and position command are equivalent, thus set home position offset to 0.




Note. 0 position is the position in the coordinate system where machinery command position is 0 when restoring absolute position, or after home position return. (When the home position coordinate is 0, this is the position after performing home position return)

## 9.12 Precautions

When performing interface mode the following precautions apply.

(1) For the setting value of the position command buffer, ensure that the difference between the previous command value and the current command value is no more than 20000000. When the difference between the previous command value and the current command value exceeds 20000000, command data error (operation alarm A7, detail No.03) occurs, followed by an immediate stop.

(2) If a value outside of the range is input to the speed command buffer, command data error (operation alarm A7, detail No.01) occurs. The speed command value becomes 0[0.01r/min], followed by an immediate stop.

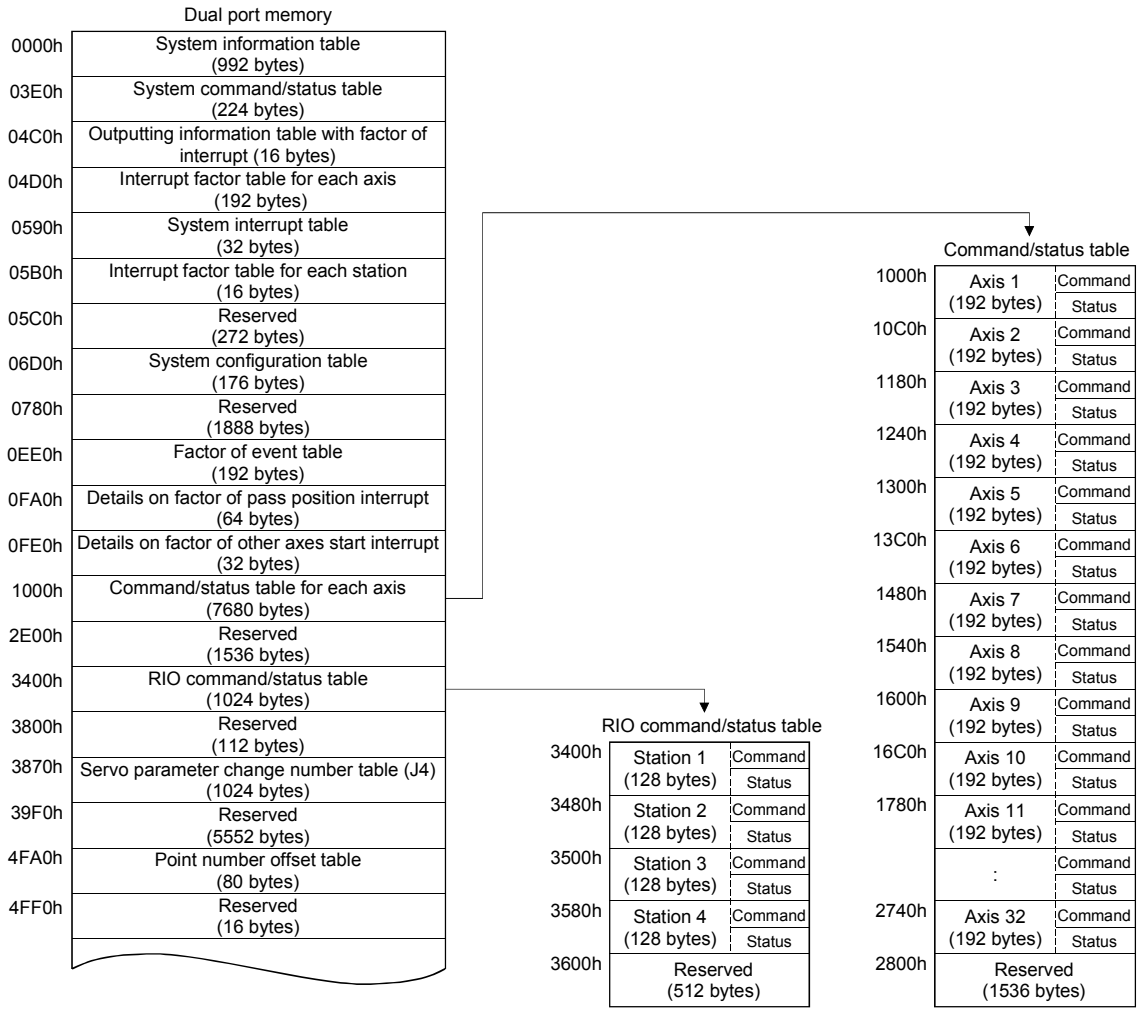
(3) If a value outside of the range is input to the torque command buffer, command data error (operation alarm A7, detail No.02) occurs. The torque command value becomes the value before the change.

# MEMO

# 10. TABLE MAP

## 10.1 Table list

> **POINT**
>
> - Do not write to reserved areas.
> - The first number in the point table for each axis can be designated using point number offset.



Dual port memory

| | |
|---|---|
| 5000h | Point table/position command buffer (10240 bytes) |
| 7800h | Speed command buffer (5120 bytes) |
| 8C00h | Torque command buffer (5120 bytes) |
| A000h | High speed monitor table (1280 bytes) |
| A500h | Reserved (320 bytes) |
| A640h | Pass position interrupt table (512 bytes) |
| A840h | Continuous operation to torque control data table (1536 bytes) |
| AE40h | Reserved (448 bytes) |
| B000h | Digital I/O table (256 bytes) |
| B100h | Reserved (1008 bytes) |
| B4F0h | Mark detection command/status data table (1536 bytes) |
| BAF0h | Mark detection edge data table (64 bytes) |
| BB30h | Mark detection position data table (256 bytes) |
| BC30h | Alarm history table (256 bytes) |
| BD30h | Reserved (112 bytes) |
| BDA0h | Sampling data table (96 bytes) |
| BE00h | Sampling data read table (4224 bytes) |
| CE80h | Reserved (1408 bytes) |
| D400h | Transient transmit command/status table (1792 bytes) |
| DB00h | I/O device table (1024 bytes) |
| DF00h | Log data table (256 bytes) |
| E000h | Reserved (128 bytes) |
| E080h | Other axes start command/status table (128 bytes) |
| E100h | Other axes start data table (3328 bytes) |
| EE00h | Reserved (384 bytes) |
| EF80h | Dual port memory exclusive control table (16 bytes) |
| EF90h<br>EFFFh | Reserved (4208 bytes) |

Point table/
position command buffer

| | |
|---|---|
| 5000h (0000h) | Axis 1 (256 bytes) |
| 5100h (0008h) | Axis 2 (256 bytes) |
| 5200h (0010h) | Axis 3 (256 bytes) |
| 5300h (0018h) | Axis 4 (256 bytes) |
| 5400h (0020h) | Axis 5 (256 bytes) |
| 5500h (0028h) | Axis 6 (256 bytes) |
| 5600h (0030h) | Axis 7 (256 bytes) |
| 5700h (0038h) | Axis 8 (256 bytes) |
| 5800h (0040h) | Axis 9 (256 bytes) |
| 5900h (0048h) | Axis 10 (256 bytes) |
| 5A00h (0050h) | Axis 11 (256 bytes) |
| | : |
| 6F00h (00F8h) | Axis 32 (256 bytes) |
| 7000h (0100h) | Reserved (2048 bytes) |

Point number offset

| | |
|---|---|
| 20000h<br>2000Fh | Module information (Note) (16 bytes) |

Note. Refer to Section 1.5.3 for the module information.

## 10.2 System information

| Address | Content | |
|---|---|---|
| 0000 | CH number | |
| 0001 | | |
| 0002 | Number of lines | |
| 0003 | | |
| 0004 | Control cycle status | 0001h: 0.88ms<br>0002h: 0.44ms<br>0003h: 0.22ms |
| 0005 | | |
| 0006 | Reserved | |
| 0007 | | |
| 0008 | SSCNET communication method | 0: Not connected<br>2: SSCNET Ⅲ/H |
| 0009 | | |
| 000A | Reserved | |
| 000B | | |
| 000C | | |
| 000D | | |
| 000E | | |
| 000F | | |
| 0010 | | |
| 0011 | | |
| 0012 | | |
| 0013 | | |
| 0014 | Operation cycle current time | |
| 0015 | | |
| 0016 | Operation cycle maximum time | |
| 0017 | | |
| 0018 | Operation cycle over time | |
| 0019 | | |
| 001A | Reserved | |
| 001B | | |
| 001C | Reserved | |
| 001D | | |
| 001E | | |
| 001F | | |
| 0020 | | |
| 0021 | | |
| 0022 | | |
| 0023 | | |
| 0024 | | |
| 0025 | | |
| 0026 | | |
| 0027 | | |
| 0028 | | |
| 0029 | | |
| 002A | | |
| 002B | | |
| 002C | | |
| 002D | | |
| 002E | | |
| 002F | | |

| Address | Content |
|---|---|
| 0030 | System program software version |
| 0031 | |
| 0032 | |
| 0033 | |
| 0034 | |
| 0035 | |
| 0036 | |
| 0037 | |
| 0038 | |
| 0039 | |
| 003A | |
| 003B | |
| 003C | |
| 003D | |
| 003E | |
| 003F | |
| 0040 | Reserved |
| 0041 | |
| 0042 | |
| 0043 | |
| 0044 | |
| 0045 | |
| 0046 | |
| 0047 | |
| 0048 | |
| 0049 | |
| 004A | |
| 004B | |
| 004C | |
| 004D | |
| 004E | |
| 004F | |
| 0050 | |
| 0051 | |
| 0052 | |
| 0053 | |
| 0054 | |
| 0055 | |
| 0056 | |
| 0057 | |
| 0058 | |
| 0059 | |
| 005A | |
| 005B | |
| 005C | |
| 005D | |
| 005E | |
| 005F | |

| Address | Content |
|---|---|
| 0060 | Servo amplifier software version (Axis 1) |
| 0061 | |
| 0062 | |
| 0063 | |
| 0064 | |
| 0065 | |
| 0066 | |
| 0067 | |
| 0068 | |
| 0069 | |
| 006A | |
| 006B | |
| 006C | |
| 006D | |
| 006E | |
| 006F | |
| 0070 | Servo amplifier software version (Axis 2) |
| : | |
| 007F | |
| 0080 | Servo amplifier software version (Axis 3) |
| : | |
| 008F | |
| 0090 | Servo amplifier software version (Axis 4) |
| : | |
| 009F | |
| 00A0 | Servo amplifier software version (Axis 5) |
| : | |
| 00AF | |
| 00B0 | Servo amplifier software version (Axis 6) |
| : | |
| 00BF | |
| 00C0 | Servo amplifier software version (Axis 7) |
| : | |
| 00CF | |
| 00D0 | Servo amplifier software version (Axis 8) |
| : | |
| 00DF | |
| 00E0 | Servo amplifier software version (Axis 9) |
| : | |
| 00EF | |

| Address | Content |
|---|---|
| 00F0 | Servo amplifier software version (Axis 10) |
| : | |
| 00FF | |
| 0100 | Servo amplifier software version (Axis 11) |
| : | |
| 010F | |
| 0110 | Servo amplifier software version (Axis 12) |
| : | |
| 011F | |
| 0120 | : |
| : | |
| 024F | |
| 0250 | Servo amplifier software version (Axis 32) |
| : | |
| 025F | |
| 0260 | Reserved |
| : | |
| 03DF | |

## 10.3 System command/status table

### (1) System commands

| Address | Content |
|---|---|
| 03E0 | Command bit |
| 03E1 | |
| 03E2 | |
| 03E3 | |
| 03E4 | |
| 03E5 | |
| 03E6 | |
| 03E7 | |
| 03E8 | |
| 03E9 | |
| 03EA | |
| 03EB | |
| 03EC | |
| 03ED | |
| 03EE | |
| 03EF | |
| 03F0 | |
| 03F1 | |
| 03F2 | |
| 03F3 | |
| 03F4 | |
| 03F5 | |
| 03F6 | |
| 03F7 | |
| 03F8 | |
| 03F9 | |
| 03FA | |
| 03FB | |
| 03FC | |
| 03FD | |
| 03FE | |
| 03FF | |
| 0400 | System command code |
| 0401 | |
| 0402 | Watchdog check counter |
| 0403 | |
| 0404 | Watchdog timer start counter |
| 0405 | |
| 0406 | Reboot ID |
| 0407 | |
| 0408 | Flash ROM transfer ID (Flash ROM initialization ID) |
| 0409 | |
| 040A | Reserved |
| 040B | |
| 040C | |
| 040D | |
| 040E | |
| 040F | |

| Address | Content |
|---|---|
| 0410 | Monitor number 1 |
| 0411 | |
| 0412 | Monitor number 2 |
| 0413 | |
| 0414 | Reserved |
| 0415 | |
| 0416 | |
| 0417 | |
| 0418 | Parameter write number 1 |
| 0419 | |
| 041A | Parameter write data 1 |
| 041B | |
| 041C | Parameter write number 2 |
| 041D | |
| 041E | Parameter write data 2 |
| 041F | |
| 0420 | Parameter read number 1 |
| 0421 | |
| 0422 | Reserved |
| 0423 | |
| 0424 | Parameter read number 2 |
| 0425 | |
| 0426 | Reserved |
| 0427 | |
| 0428 | Log data read page number |
| 0429 | |
| 042A | Reserved |
| 042B | |
| 042C | |
| 042D | |
| 042E | |
| 042F | |
| 0430 | |
| 0431 | |
| 0432 | |
| 0433 | |
| 0434 | Disconnection axis No. |
| 0435 | |
| 0436 | Reserved |
| 0437 | |
| 0438 | |
| : | |
| 0442 | |
| 0443 | |
| 0444 | Alarm history read page number |
| 0445 | |
| 0446 | Alarm history initialization ID |
| 0447 | |

| Address | Content |
|---|---|
| 0448 | System startup time |
| 0449 | |
| 044A | |
| 044B | |
| 044C | |
| 044D | |
| 044E | |
| 044F | |

(a) System command code

| System command code | Content |
|---|---|
| 0000 | Initial value |
| 0003 | Parameter initialization |
| 0004 | Flash ROM parameter reading |
| 000A | Start system startup |

(b) Reboot ID

| Reboot ID | Remarks |
|---|---|
| 1EA5 | Set when rebooting software. |

(c) Flash ROM transfer ID (Flash ROM initialization ID)

| Flash ROM transfer ID (Flash ROM initialization ID) | Remarks |
|---|---|
| A51E | Set when transferring data to flash ROM. |
| A55A | Set when initializing flash ROM. |

(2) System status

| Address | Content |
|---|---|
| 0450 | Status bit |
| 0451 | |
| 0452 | |
| 0453 | |
| 0454 | |
| 0455 | |
| 0456 | |
| 0457 | |
| 0458 | |
| 0459 | |
| 045A | |
| 045B | |
| 045C | |
| 045D | |
| 045E | |
| 045F | |
| 0460 | |
| 0461 | |
| 0462 | |
| 0463 | |
| 0464 | |
| 0465 | |
| 0466 | |
| 0467 | |
| 0468 | |
| 0469 | |
| 046A | |
| 046B | |
| 046C | |
| 046D | |
| 046E | |
| 046F | |
| 0470 | System status code |
| 0471 | |
| 0472 | Watchdog time |
| 0473 | |
| 0474 | System alarm number |
| 0475 | |
| 0476 | Specific system alarm number |
| 0477 | |
| 0478 | Command buffer read error counter |
| 0479 | |
| 047A | Reserved |
| 047B | |
| 047C | |
| 047D | |
| 047E | |
| 047F | |

| Address | Content |
|---|---|
| 0480 | Monitor number 1 |
| 0481 | |
| 0482 | Monitor number 2 |
| 0483 | |
| 0484 | Monitor data 1 |
| 0485 | |
| 0486 | Monitor data 2 |
| 0487 | |
| 0488 | Parameter write number 1 |
| 0489 | |
| 048A | Parameter write data 1 |
| 048B | |
| 048C | Parameter write number 2 |
| 048D | |
| 048E | Parameter write data 2 |
| 048F | |
| 0490 | Parameter read number 1 |
| 0491 | |
| 0492 | Parameter read data 1 |
| 0493 | |
| 0494 | Parameter read number 2 |
| 0495 | |
| 0496 | Parameter read data 2 |
| 0497 | |
| 0498 | Log data read page number |
| 0499 | |
| 049A | Number of valid log data events |
| 049B | |
| 049C | Reserved |
| 049D | |
| 049E | |
| 049F | |
| 04A0 | |
| 04A1 | |
| 04A2 | |
| 04A3 | |
| 04A4 | Error code of reconnection/disconnection |
| 04A5 | |
| 04A6 | Reserved |
| : | |
| 04B3 | |
| 04B4 | Alarm history read page number |
| 04B5 | |
| 04B6 | Number of valid alarm history events |
| 04B7 | |
| 04B8 | Reserved |
| : | |
| 04BF | |

(a) System status code

| System status code | Content |
|---|---|
| 0000 | During system preparation |
| 0001 | System preparation completion |
| 0003 | Parameter initialization completion |
| 0004 | Flash ROM parameter read completion |
| 0005 | Flash ROM parameter read error |
| 0009 | Waiting for SSCNET response |
| 000A | During system running |
| 000F | Rebooting |
| E □□□ | System error |

Note. Notification items when a system error (E □□□ to) occurs.

- Forced stop is executed for servo amplifier. However, depending on the system status, there are cases where forced stop is not executed.
- System errors (E400h to) are SSCNET communication errors. Confirm the status of the servo amplifiers as well as the SSCNETⅢ cable. For details, refer to Section 13.6.

(b) Error code of reconnection/disconnection

| Error code of reconnection/disconnection | Content |
|---|---|
| 0000 | No error |
| 0001 | Disconnected axis specification error |
| 0002 | Reconnected axis No. duplication error |
| 0003 | Reconnected axis type code error |
| 0004 | Reconnection error during communication error |
| 0006 | Communication cycle error |

(3) Command bit

For each bit, 0 stands for invalid and 1 stands for valid.

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 03E0 | 0 | ITE | Interrupt processing complete |
| | 1 | ITS | Interrupt output valid |
| | 2 | | Reserved |
| | 3 | | |
| | 4 | HMA | During user program memory access |
| | 5 | | Reserved |
| | 6 | | |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 03E1 | 0 | SMPS | Sampling start |
| | 1 | | Reserved |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 03E2 | 0 | SEMI | Software forced stop (Note) |
| | 1 | | Reserved |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 03E3 | 0 | | Reserved |
| | 1 | | |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 03E4 | 0 | ITFE | Interrupt processing high speed complete |
| | 1 | | Reserved |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 03E5 | 0 | | Reserved |
| | 1 | | |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 03E6 | 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 | Bit | Symbol | Signal name |
|---|---|---|---|
| 03E7 | 0 | | Reserved |
| | 1 | | |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

Note. Software forced stop is a normally-open contact (an external forced stop is a normally-closed contact). When the signal is turned on, the status becomes forced stop status. This is different than an external forced stop, in that it is performed through software processing.

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 03E8 | 0 | RBR | Reboot preparation |
| | 1 | RBS | Execution of reboot |
| | 2 | CRST | System alarm reset |
| | 3 | | Reserved |
| | 4 | SMON | Monitor command |
| | 5 | SMONR | Monitor latch command |
| | 6 | | Reserved |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 03E9 | 0 | | Reserved |
| | 1 | | |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 03EA | 0 | LOGC | Log command |
| | 1 | LOGR | Reading of log data command |
| | 2 | | Reserved |
| | 3 | LOGI | Log data initialization command |
| | 4 | | Reserved |
| | 5 | OCMC | Operation cycle monitor clear |
| | 6 | | Reserved |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 03EB | 0 | RCC | Reconnection command |
| | 1 | | Reserved |
| | 2 | | |
| | 3 | CCC | Disconnection command |
| | 4 | | Reserved |
| | 5 | | |
| | 6 | | |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 03EC | 0 | | Reserved |
| | 1 | | |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 03ED | 0 | | Reserved |
| | 1 | | |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 03EE | 0 | | Reserved |
| | 1 | | |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 03EF | 0 | | Reserved |
| | 1 | | |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 03F0 | 0 | SPWRT | Parameter write command |
| | 1 | | Reserved |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 03F1 | 0 | SPRD | Parameter read command |
| | 1 | | Reserved |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 03F2 | 0 | SMPSW | Sampling setting write command |
| | 1 | | Reserved |
| | 2 | | |
| | 3 | | |
| | 4 | SMPSR | Sampling setting read command |
| | 5 | | Reserved |
| | 6 | | |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 03F3 | 0 | | Reserved |
| | 1 | | |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 03F4 | 0 | | Reserved |
| | 1 | | |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 03F5 | 0 | | Reserved |
| | 1 | | |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 03F6 | 0 | FTR | Flash ROM transfer preparation |
| | 1 | FTS | Flash ROM transfer execution |
| | 2 | | Reserved |
| | 3 | | |
| | 4 | FIR | Flash ROM initialization preparation |
| | 5 | FIS | Flash ROM initialization execution |
| | 6 | | Reserved |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 03F7 | 0 | ALHR | Alarm history read command |
| | 1 | | Reserved |
| | 2 | ALHI | Alarm history initialization command |
| | 3 | | Reserved |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 03F8 | 0 | | Reserved |
| | 1 | | |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 03F9 | 0 | | Reserved |
| | 1 | | |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 03FA | 0 | | Reserved |
| | 1 | | |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 03FB | 0 | | Reserved |
| | 1 | | |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 03FC | 0 | | Reserved |
| | 1 | | |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 03FD | 0 | | Reserved |
| | 1 | | |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 03FE | 0 | | Reserved |
| | 1 | | |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 03FF | 0 | | Reserved |
| | 1 | | |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

(4) Status bit

For each bit, 0 stands for invalid and 1 stands for valid.

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 0450 | 0 | ITO | Outputting with factor of interrupt |
| | 1 | IITO | During interface mode interrupt valid |
| | 2 | EVDO | Event detection enabled |
| | 3 | HRIF | During highly response I/F valid |
| | 4 | BMA | During system program memory access |
| | 5 | PRINF | Continuous operation to torque control compatible information |
| | 6 | | Reserved |
| | 7 | IFMO | In interface mode |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 0451 | 0 | SMPW | Waiting for sampling trigger |
| | 1 | SMPO | Sampling is being performed |
| | 2 | SMPF | Sampling is complete |
| | 3 | SMPE | Sampling error |
| | 4 | | Reserved |
| | 5 | AHINF | Alarm history information |
| | 6 | | Reserved |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 0452 | 0 | EMIO | During forced stop |
| | 1 | | Reserved |
| | 2 | TSTO | In test mode (Note) |
| | 3 | | Reserved |
| | 4 | | |
| | 5 | | |
| | 6 | EMID | External forced stop disabled |
| | 7 | | Reserved |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 0453 | 0 | | Reserved |
| | 1 | | |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 0454 | 0 | | Reserved |
| | 1 | | |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 0455 | 0 | | Reserved |
| | 1 | | |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 0456 | 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 | Bit | Symbol | Signal name |
|---|---|---|---|
| 0457 | 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) |

Note. If test mode is selected from MR Configurator2, status becomes test mode in operation (TSTO). The following items concerning control exist during test mode.

- Operation from the position board (such as automatic operation) can not be performed.
- In order to perform operations using the position board, the system must be restarted.

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 0458 | 0 | RBOK | Reboot preparation complete |
| | 1 | RBNG | Reboot preparation error |
| | 2 | CALM | Current system alarm |
| | 3 | | Reserved |
| | 4 | SMOUT | Monitor output |
| | 5 | SMRCH | Monitor latch |
| | 6 | SMER1 | Monitor number error 1 |
| | 7 | SMER2 | Monitor number error 2 |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 0459 | 0 | | Reserved |
| | 1 | | |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 045A | 0 | LOGO | Log operation being performed |
| | 1 | LOGRF | Reading of log data complete |
| | 2 | LOGRE | Reading of log data error |
| | 3 | LOGIF | Log data initialization is complete |
| | 4 | LOGIE | Log data initialization error |
| | 5 | OCMCO | Operation cycle monitor clear |
| | 6 | OCME | Operation cycle alarm |
| | 7 | OCMW | Operation cycle warning |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 045B | 0 | RCO | During reconnection processing |
| | 1 | RCF | Reconnection complete |
| | 2 | RCE | Reconnection error |
| | 3 | CCO | During disconnection processing |
| | 4 | CCF | Disconnection complete |
| | 5 | CCE | Disconnection error |
| | 6 | | Reserved |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 045C | 0 | | Reserved |
| | 1 | | |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 045D | 0 | | Reserved |
| | 1 | | |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 045E | 0 | | Reserved |
| | 1 | | |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 045F | 0 | | Reserved |
| | 1 | | |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 0460 | 0 | SPWFIN1 | Parameter write complete 1 |
| | 1 | SPWEN1 | Parameter number error 1 |
| | 2 | SPWED1 | Parameter data out of bounds 1 |
| | 3 | | Reserved |
| | 4 | SPWFIN2 | Parameter write complete 2 |
| | 5 | SPWEN2 | Parameter number error 2 |
| | 6 | SPWED2 | Parameter data out of bounds 2 |
| | 7 | | Reserved |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 0461 | 0 | SPRFIN1 | Parameter read complete 1 |
| | 1 | SPREN1 | Parameter number error 1 |
| | 2 | SPRFIN2 | Parameter read complete 2 |
| | 3 | SPREN2 | Parameter number error 2 |
| | 4 | | Reserved |
| | 5 | | |
| | 6 | | |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 0462 | 0 | SWFIN | Sampling setting write complete |
| | 1 | SWEN | Sampling setting number error |
| | 2 | SWED | Sampling setting data out of bounds |
| | 3 | | Reserved |
| | 4 | SRFIN | Sampling setting read complete |
| | 5 | SREN | Sampling setting number error |
| | 6 | | Reserved |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 0463 | 0 | | Reserved |
| | 1 | | |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 0464 | 0 | | Reserved |
| | 1 | | |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 0465 | 0 | | Reserved |
| | 1 | | |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 0466 | 0 | FROK | Flash ROM transfer preparation complete |
| | 1 | FRNG | Flash ROM transfer preparation error |
| | 2 | FSOK | Flash ROM transfer complete |
| | 3 | FSNG | Flash ROM transfer error |
| | 4 | FIROK | Flash ROM initialization preparation complete |
| | 5 | FIRNG | Flash ROM initialization preparation error |
| | 6 | FIOK | Flash ROM initialization complete |
| | 7 | FING | Flash ROM initialization error |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 0467 | 0 | ALHRF | Alarm history read complete |
| | 1 | ALHRE | Alarm history read error |
| | 2 | ALHIF | Alarm history initialization complete |
| | 3 | ALHIE | Alarm history initialization error |
| | 4 | | Reserved |
| | 5 | | |
| | 6 | | |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 0468 | 0 | | Reserved |
| | 1 | | |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 0469 | 0 | | Reserved |
| | 1 | | |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 046A | 0 | | Reserved |
| | 1 | | |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 046B | 0 | | Reserved |
| | 1 | | |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 046C | 0 | | Reserved |
| | 1 | | |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 046D | 0 | | Reserved |
| | 1 | | |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 046E | 0 | | Reserved |
| | 1 | | |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 046F | 0 | | Reserved |
| | 1 | | |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

## 10.4 Factor of interrupt

(1) Information of outputting with factor of interrupt

When an interrupt occurs, the bit corresponding to the axis No. or system which is the factor of the interrupt turns on.

| Address | Content | Remarks |
|---|---|---|
| 04C0 | Outputting with factor of axis interrupt 1 | Axis 1 (bit 0) to axis 32 (bit 31) |
| 04C1 | | |
| 04C2 | | |
| 04C3 | | |
| 04C4 | Reserved | |
| 04C5 | | |
| 04C6 | | |
| 04C7 | | |
| 04C8 | Outputting with factor of station interrupt | Station 1 (bit0) to station 4 (bit3) |
| 04C9 | Reserved | |
| 04CA | Outputting with factor of system interrupt | System (bit 0) |
| 04CB | Reserved | |
| 04CC | | |
| 04CD | | |
| 04CE | | |
| 04CF | | |

(2) Factor of axis interrupt

(a) Factor of axis interrupt

| Address | Content |
|---|---|
| 04D0 | Factor of interrupt Axis 1 |
| 04D1 | |
| 04D2 | |
| 04D3 | |
| 04D4 | Factor of interrupt Axis 2 |
| 04D5 | |
| 04D6 | |
| 04D7 | |
| 04D8 | Factor of interrupt Axis 3 |
| 04D9 | |
| 04DA | |
| 04DB | |
| 04DC | Factor of interrupt Axis 4 |
| 04DD | |
| 04DE | |
| 04DF | |
| 04E0 | Factor of interrupt Axis 5 |
| 04E1 | |
| 04E2 | |
| 04E3 | |
| 04E4 | Factor of interrupt Axis 6 |
| 04E5 | |
| 04E6 | |
| 04E7 | |
| 04E8 | Factor of interrupt Axis 7 |
| 04E9 | |
| 04EA | |
| 04EB | |
| 04EC | Factor of interrupt Axis 8 |
| 04ED | |
| 04EE | |
| 04EF | |
| 04F0 | Factor of interrupt Axis 9 |
| 04F1 | |
| 04F2 | |
| 04F3 | |
| 04F4 | Factor of interrupt Axis 10 |
| 04F5 | |
| 04F6 | |
| 04F7 | |
| 04F8 | Factor of interrupt Axis 11 |
| 04F9 | |
| 04FA | |
| 04FB | |
| 04FC | Factor of interrupt Axis 12 |
| 04FD | |
| 04FE | |
| 04FF | |

| Address | Content |
|---|---|
| 0500 | Factor of interrupt Axis 13 |
| 0501 | |
| 0502 | |
| 0503 | |
| 0504 | Factor of interrupt Axis 14 |
| 0505 | |
| 0506 | |
| 0507 | |
| 0508 | : |
| : | |
| 054B | |
| 054C | Factor of interrupt Axis 32 |
| 054D | |
| 054E | |
| 054F | |
| 0550 | Reserved |
| : | |
| 058F | |

(b) Details on factor of interrupt on axis n

The addresses in the table are the addresses for the axis 1. For the axis 2 and above, add +04h for each axis.

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 04D0 to 04D3 | 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 | Servo alarm (interrupt) |
| | 6 | iSWRN | Servo 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 | iGAINO | During gain switching (interrupt) |
| | 17 | iFCLSO | Fully closed loop control changing (interrupt) |
| | 18 | iTLSO | Selecting torque limit (interrupt) |
| | 19 | iSPC | During PID control (interrupt) |
| | 20 | | Reserved |
| | 21 | iMAK1 | Mark detection 1 (interrupt) |
| | 22 | iMAK2 | Mark detection 2 (interrupt) |
| | 23 | iPRSMO | During continuous operation to torque control (interrupt) |
| | 24 | iIWT | Interference check standby (interrupt) |
| | 25 | iSINP | Servo amplifier in-position (interrupt) |
| | 26 | | Reserved |
| | 27 | | |
| | 28 | | |
| | 29 | | |
| | 30 | | |
| | 31 | | |

Note. OFF: No factor of interrupt exists.
ON: A factor of interrupt exists.

(3) System interrupt factors

(a) System interrupt factors

| Address | Content |
|---|---|
| 0590 | System interrupt factors |
| 0591 | |
| 0592 | Reserved |
| 0593 | |
| 0594 | Factor of other axes start interrupt |
| 0595 | |
| 0596 | |
| 0597 | |
| 0598 | Factor of pass position interrupt |
| 0599 | |
| 059A | |
| 059B | |
| 059C | |
| 059D | |
| 059E | |
| 059F | |
| 05A0 | Reserved |
| : | |
| 05AF | |

(b) Details on factor of system interrupt

| Address | Bit | (Note) Symbol | Signal name |
|---|---|---|---|
| 0590 to 0591 | 0 | iSYSE | System error (interrupt) |
| | 1 | iCALM | System alarm (interrupt) |
| | 2 | iEMIO | During forced stop (interrupt) |
| | 3 | | Reserved |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | iOCME | Operation cycle alarm (interrupt) |
| | 8 | iOASF | Outputting with factor of other axes start interrupt (interrupt) |
| | 9 | iPPI | Outputting with factor of pass position interrupt (interrupt) |
| | 10 | | Reserved |
| | 11 | | |
| | 12 | | |
| | 13 | | |
| | 14 | | |
| | 15 | | |

Note. OFF: No factor of interrupt exists.
ON: A factor of interrupt exists.

(c) Factor of other axes start interrupt

When the outputting with factor of other axes start interrupt (iOASF) is on, the bit corresponding to other axes start data No. (1 to 32) turns on.

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 0594 | 0 | iOAS1 | Other axes start data 1 (interrupt) |
| to | 1 | iOAS2 | Other axes start data 2 (interrupt) |
| 0597 | 2 | iOAS3 | Other axes start data 3 (interrupt) |
| | 3 | iOAS4 | Other axes start data 4 (interrupt) |
| | 4 | iOAS5 | Other axes start data 5 (interrupt) |
| | 5 | iOAS6 | Other axes start data 6 (interrupt) |
| | 6 | iOAS7 | Other axes start data 7 (interrupt) |
| | 7 | iOAS8 | Other axes start data 8 (interrupt) |
| | 8 | iOAS9 | Other axes start data 9 (interrupt) |
| | 9 | iOAS10 | Other axes start data 10 (interrupt) |
| | 10 | iOAS11 | Other axes start data 11 (interrupt) |
| | 11 | iOAS12 | Other axes start data 12 (interrupt) |
| | 12 | iOAS13 | Other axes start data 13 (interrupt) |
| | 13 | iOAS14 | Other axes start data 14 (interrupt) |
| | 14 | iOAS15 | Other axes start data 15 (interrupt) |
| | 15 | iOAS16 | Other axes start data 16 (interrupt) |
| | 16 | iOAS17 | Other axes start data 17 (interrupt) |
| | 17 | iOAS18 | Other axes start data 18 (interrupt) |
| | 18 | iOAS19 | Other axes start data 19 (interrupt) |
| | 19 | iOAS20 | Other axes start data 20 (interrupt) |
| | 20 | iOAS21 | Other axes start data 21 (interrupt) |
| | 21 | iOAS22 | Other axes start data 22 (interrupt) |
| | 22 | iOAS23 | Other axes start data 23 (interrupt) |
| | 23 | iOAS24 | Other axes start data 24 (interrupt) |
| | 24 | iOAS25 | Other axes start data 25 (interrupt) |
| | 25 | iOAS26 | Other axes start data 26 (interrupt) |
| | 26 | iOAS27 | Other axes start data 27 (interrupt) |
| | 27 | iOAS28 | Other axes start data 28 (interrupt) |
| | 28 | iOAS29 | Other axes start data 29 (interrupt) |
| | 29 | iOAS30 | Other axes start data 30 (interrupt) |
| | 30 | iOAS31 | Other axes start data 31 (interrupt) |
| | 31 | iOAS32 | Other axes start data 32 (interrupt) |

(d) 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. (1 to 32) turns on.

Details on factor of other axes start interrupt

| Address | Content |
|---|---|
| 0FE0 | Details on factor of other axes start interrupt 1 |
| 0FE1 | Details on factor of other axes start interrupt 2 |
| 0FE2 | Details on factor of other axes start interrupt 3 |
| 0FE3 | Details on factor of other axes start interrupt 4 |
| 0FE4 | Details on factor of other axes start interrupt 5 |
| 0FE5 | Details on factor of other axes start interrupt 6 |
| 0FE6 | Details on factor of other axes start interrupt 7 |
| 0FE7 | Details on factor of other axes start interrupt 8 |
| 0FE8 | Details on factor of other axes start interrupt 9 |
| 0FE9 | Details on factor of other axes start interrupt 10 |
| 0FEA | Details on factor of other axes start interrupt 11 |
| 0FEB | Details on factor of other axes start interrupt 12 |
| 0FEC | Details on factor of other axes start interrupt 13 |
| 0FED | Details on factor of other axes start interrupt 14 |
| 0FEE | Details on factor of other axes start interrupt 15 |
| 0FEF | Details on factor of other axes start interrupt 16 |

| Address | Content |
|---|---|
| 0FF0 | Details on factor of other axes start interrupt 17 |
| 0FF1 | Details on factor of other axes start interrupt 18 |
| 0FF2 | Details on factor of other axes start interrupt 19 |
| 0FF3 | Details on factor of other axes start interrupt 20 |
| 0FF4 | Details on factor of other axes start interrupt 21 |
| 0FF5 | Details on factor of other axes start interrupt 22 |
| 0FF6 | Details on factor of other axes start interrupt 23 |
| 0FF7 | Details on factor of other axes start interrupt 24 |
| 0FF8 | Details on factor of other axes start interrupt 25 |
| 0FF9 | Details on factor of other axes start interrupt 26 |
| 0FFA | Details on factor of other axes start interrupt 27 |
| 0FFB | Details on factor of other axes start interrupt 28 |
| 0FFC | Details on factor of other axes start interrupt 29 |
| 0FFD | Details on factor of other axes start interrupt 30 |
| 0FFE | Details on factor of other axes start interrupt 31 |
| 0FFF | Details on factor of other axes start interrupt 32 |

Details on factor of other axes start interrupt□

| Address | Bit | Abbreviation | Signal name |
|---|---|---|---|
| 0FE0 | 0 | iOSOP□ | Other axes start notice□ (interrupt) |
| | 1 | iOSFIN□ | Other axes start complete□ (interrupt) |
| | 2 | iOSERR□ | Other axes start incomplete□ (interrupt) |
| | 3 | | Reserved |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

Note 1. The addresses in the table above are the addresses for the other axes start status table 1. For the other axes status table 2 and above, increase in units of 1h for each axis.

2. □ : Other axes start No.

(e) Factor of pass position interrupt

When the outputting with factor of pass position interrupt (iPPI) is on, the bit corresponding to the pass position condition number of the factor of the pass position interrupt turns on.

| Address | Bit | Abbreviation | Signal name |
|---|---|---|---|
| 0598 to 059B | 0 | iPPI1 | Pass position condition 1 (interrupt) |
| | 1 | iPPI2 | Pass position condition 2 (interrupt) |
| | 2 | iPPI3 | Pass position condition 3 (interrupt) |
| | 3 | iPPI4 | Pass position condition 4 (interrupt) |
| | 4 | iPPI5 | Pass position condition 5 (interrupt) |
| | 5 | iPPI6 | Pass position condition 6 (interrupt) |
| | 6 | iPPI7 | Pass position condition 7 (interrupt) |
| | 7 | iPPI8 | Pass position condition 8 (interrupt) |
| | 8 | iPPI9 | Pass position condition 9 (interrupt) |
| | 9 | iPPI10 | Pass position condition 10 (interrupt) |
| | 10 | iPPI11 | Pass position condition 11 (interrupt) |
| | 11 | iPPI12 | Pass position condition 12 (interrupt) |
| | 12 | iPPI13 | Pass position condition 13 (interrupt) |
| | 13 | iPPI14 | Pass position condition 14 (interrupt) |
| | 14 | iPPI15 | Pass position condition 15 (interrupt) |
| | 15 | iPPI16 | Pass position condition 16 (interrupt) |
| | 16 | iPPI17 | Pass position condition 17 (interrupt) |
| | 17 | iPPI18 | Pass position condition 18 (interrupt) |
| | 18 | iPPI19 | Pass position condition 19 (interrupt) |
| | 19 | iPPI20 | Pass position condition 20 (interrupt) |
| | 20 | iPPI21 | Pass position condition 21 (interrupt) |
| | 21 | iPPI22 | Pass position condition 22 (interrupt) |
| | 22 | iPPI23 | Pass position condition 23 (interrupt) |
| | 23 | iPPI24 | Pass position condition 24 (interrupt) |
| | 24 | iPPI25 | Pass position condition 25 (interrupt) |
| | 25 | iPPI26 | Pass position condition 26 (interrupt) |
| | 26 | iPPI27 | Pass position condition 27 (interrupt) |
| | 27 | iPPI28 | Pass position condition 28 (interrupt) |
| | 28 | iPPI29 | Pass position condition 29 (interrupt) |
| | 29 | iPPI30 | Pass position condition 30 (interrupt) |
| | 30 | iPPI31 | Pass position condition 31 (interrupt) |
| | 31 | iPPI32 | Pass position condition 32 (interrupt) |

| Address | Bit | Abbreviation | Signal name |
|---|---|---|---|
| 059C to 059F | 0 | iPPI33 | Pass position condition 33 (interrupt) |
| | 1 | iPPI34 | Pass position condition 34 (interrupt) |
| | 2 | iPPI35 | Pass position condition 35 (interrupt) |
| | 3 | iPPI36 | Pass position condition 36 (interrupt) |
| | 4 | iPPI37 | Pass position condition 37 (interrupt) |
| | 5 | iPPI38 | Pass position condition 38 (interrupt) |
| | 6 | iPPI39 | Pass position condition 39 (interrupt) |
| | 7 | iPPI40 | Pass position condition 40 (interrupt) |
| | 8 | iPPI41 | Pass position condition 41 (interrupt) |
| | 9 | iPPI42 | Pass position condition 42 (interrupt) |
| | 10 | iPPI43 | Pass position condition 43 (interrupt) |
| | 11 | iPPI44 | Pass position condition 44 (interrupt) |
| | 12 | iPPI45 | Pass position condition 45 (interrupt) |
| | 13 | iPPI46 | Pass position condition 46 (interrupt) |
| | 14 | iPPI47 | Pass position condition 47 (interrupt) |
| | 15 | iPPI48 | Pass position condition 48 (interrupt) |
| | 16 | iPPI49 | Pass position condition 49 (interrupt) |
| | 17 | iPPI50 | Pass position condition 50 (interrupt) |
| | 18 | iPPI51 | Pass position condition 51 (interrupt) |
| | 19 | iPPI52 | Pass position condition 52 (interrupt) |
| | 20 | iPPI53 | Pass position condition 53 (interrupt) |
| | 21 | iPPI54 | Pass position condition 54 (interrupt) |
| | 22 | iPPI55 | Pass position condition 55 (interrupt) |
| | 23 | iPPI56 | Pass position condition 56 (interrupt) |
| | 24 | iPPI57 | Pass position condition 57 (interrupt) |
| | 25 | iPPI58 | Pass position condition 58 (interrupt) |
| | 26 | iPPI59 | Pass position condition 59 (interrupt) |
| | 27 | iPPI60 | Pass position condition 60 (interrupt) |
| | 28 | iPPI61 | Pass position condition 61 (interrupt) |
| | 29 | iPPI62 | Pass position condition 62 (interrupt) |
| | 30 | iPPI63 | Pass position condition 63 (interrupt) |
| | 31 | iPPI64 | Pass position condition 64 (interrupt) |

(f) 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 number (1 to 64) turns on.

| Address | Content | |
|---|---|---|
| 0FA0 | Details on factor of pass position interrupt (64 bytes) | Details on factor of pass position interrupt 1 |
| 0FA1 | | Details on factor of pass position interrupt 2 |
| 0FA2 | | Details on factor of pass position interrupt 3 |
| 0FA3 | | Details on factor of pass position interrupt 4 |
| : | | : |
| 0FDF | | Details on factor of pass position interrupt 64 |

Details on factor of pass position interrupt□

| Address | Bit | Abbreviation | Signal name |
|---|---|---|---|
| 0FA0 | 0 | iPPIF□ | Pass position interrupt complete□ (interrupt) |
| | 1 | iPPIE□ | Pass position interrupt incomplete□ (interrupt) |
| | 2 | | Reserved |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

Note 1. The address above is for the pass position condition number 1.
For the pass position condition number 2 and above, increase in units of 01h for each number.

2. □ indicates the pass position condition number (1 to 64).

(4) Station interrupt factors

(a) Station interrupt factors

| Address | Content |
|---|---|
| 05B0 | Station interrupt factor station 1 |
| 05B1 | |
| 05B2 | Station interrupt factor station 2 |
| 05B3 | |
| 05B4 | Station interrupt factor station 3 |
| 05B5 | |
| 05B6 | Station interrupt factor station 4 |
| 05B7 | |
| 05B8 | Reserved |
| 05B9 | |
| 05BA | |
| 05BB | |
| 05BC | |
| 05BD | |
| 05BE | |
| 05BF | |

(b) Details on station n interrupt factors

The addresses in the table are the addresses for the axis 1. For the axis 2 and above, increase in units of 02h for each axis.

| Address | Bit | (Note) Abbreviation | Signal name |
|---|---|---|---|
| 05B0 to 05B1 | 0 | | Reserved |
| | 1 | | |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | iRUALM | RIO module alarm (interrupt) |
| | 6 | iRUWRN | RIO module warning (interrupt) |
| | 7 | | Reserved |
| | 8 | | |
| | 9 | | |
| | 10 | | |
| | 11 | | |
| | 12 | | |
| | 13 | iRCALM | RIO control alarm (interrupt) |
| | 14 | | Reserved |
| | 15 | | |

Note. OFF: No factor of interrupt exists.
ON: A factor of interrupt exists.

## 10.5 Factor of event

### (1) Factor of axis event

#### (a) Factor of axis event

| Address | Content |
|---|---|
| 0EE0 | Factor of event Axis 1 |
| 0EE1 | |
| 0EE2 | |
| 0EE3 | |
| 0EE4 | Factor of event Axis 2 |
| 0EE5 | |
| 0EE6 | |
| 0EE7 | |
| 0EE8 | Factor of event Axis 3 |
| 0EE9 | |
| 0EEA | |
| 0EEB | |
| 0EEC | Factor of event Axis 4 |
| 0EED | |
| 0EEE | |
| 0EEF | |
| 0EF0 | Factor of event Axis 5 |
| 0EF1 | |
| 0EF2 | |
| 0EF3 | |
| 0EF4 | Factor of event Axis 6 |
| 0EF5 | |
| 0EF6 | |
| 0EF7 | |
| 0EF8 | Factor of event Axis 7 |
| 0EF9 | |
| 0EFA | |
| 0EFB | |
| 0EFC | Factor of event Axis 8 |
| 0EFD | |
| 0EFE | |
| 0EFF | |
| 0F00 | Factor of event Axis 9 |
| 0F01 | |
| 0F02 | |
| 0F03 | |
| 0F04 | Factor of event Axis 10 |
| 0F05 | |
| 0F06 | |
| 0F07 | |
| 0F08 | Factor of event Axis 11 |
| 0F09 | |
| 0F0A | |
| 0F0B | |

| Address | Content |
|---|---|
| 0F0C | Factor of event Axis 12 |
| 0F0D | |
| 0F0E | |
| 0F0F | |
| 0F10 | Factor of event Axis 13 |
| 0F11 | |
| 0F12 | |
| 0F13 | |
| 0F14 | Factor of event Axis 14 |
| 0F15 | |
| 0F16 | |
| 0F17 | |
| 0F18 | : |
| : | |
| 0F5B | |
| 0F5C | Factor of event Axis 32 |
| 0F5D | |
| 0F5E | |
| 0F5F | |
| 0F60 | Reserved |
| : | |
| 0F9F | |

:

(b) Details on factor of event on axis n

The addresses in the table are the addresses for the axis 1. For the axis 2 and above, increase in units of 04h for each axis.

| Address | Bit | (Note) Abbreviation | Signal name |
|---|---|---|---|
| 0EE0 to 0EE3 | 0 | iRDYON | Servo ready (ON edge) |
| | 1 | iINPON | In-position (ON edge) |
| | 2 | iZSPON | Zero speed (ON edge) |
| | 3 | iTLCON | Torque limit effective (ON edge) |
| | 4 | iSALMON | Servo alarm (ON edge) |
| | 5 | iSWRNON | Servo warning (ON edge) |
| | 6 | iABSEON | Absolute position erased (ON edge) |
| | 7 | iOALMON | Operation alarm (ON edge) |
| | 8 | iMAK1ON | Mark detection 1 (ON edge) |
| | 9 | iMAK2ON | Mark detection 2 (ON edge) |
| | 10 | | Reserved |
| | 11 | | |
| | 12 | | |
| | 13 | iLSPON | + side limit switch (ON edge) |
| | 14 | iLSNON | - side limit switch (ON edge) |
| | 15 | iDOGON | Proximity dog (ON edge) |
| | 16 | iRDYOF | Servo ready (OFF edge) |
| | 17 | iINPOF | In-position (OFF edge) |
| | 18 | iZSPOF | Zero speed (OFF edge) |
| | 19 | iTLCOF | Torque limit effective (OFF edge) |
| | 20 | iSALMOF | Servo alarm (OFF edge) |
| | 21 | iSWRNOF | Servo warning (OFF edge) |
| | 22 | iABSEOF | Absolute position erased (OFF edge) |
| | 23 | iOALMOF | Operation alarm (OFF edge) |
| | 24 | iMAK1OF | Mark detection 1 (OFF edge) |
| | 25 | iMAK2OF | Mark detection 2 (OFF edge) |
| | 26 | | Reserved |
| | 27 | | |
| | 28 | | |
| | 29 | iLSPOF | + side limit switch (OFF edge) |
| | 30 | iLSNOF | - side limit switch (OFF edge) |
| | 31 | iDOGOF | Proximity dog (OFF edge) |

Note. OFF: No factor of event exists.
ON: A factor of event exists.

## 10.6 System configuration information table

### (1) System configuration information table

| Address | Content | Remarks |
|---|---|---|
| 06D0 | Reserved<br>(16 bytes) | |
| 06E0 | Controlling axis information (lower)<br>(4 bytes) | The bit corresponding to the axis which is currently controllable (SSCNET communicating axis or amplifier-less axis) turns on.<br>The bit is the axis 1 (bit 0) to the axis 32 (bit 31). |
| 06E4 | Controlling axis information (upper)<br>(4 bytes) | Fixed to 0. |
| 06E8 | Controlling station information<br>(2 bytes) | The bit corresponding to the station which is currently controllable (SSCNET communicating station or the remote I/O disconnect station) turns on.<br>The bit is the station 1 (bit 0) to the station 4 (bit3). |
| 06EA | Reserved<br>(142 bytes) | |
| 0778 | Time synchronization information<br>(8 bytes) | Set the time when starting up system, or reconnecting.<br>When the set value is 0, the time is 0000hrs on January 1st, 2000. |

#### (a) Details on time synchronization information

| Address | Content |
|---|---|
| 0778 | Year |
| 0779 | |
| 077A | Month |
| 007B | Date |
| 077C | Hour |
| 077D | Minute |
| 077E | Seconds |
| 077F | Day<br>0: Sunday<br>1: Monday<br>2: Tuesday<br>3: Wednesday<br>4: Thursday<br>5: Friday<br>6: Saturday |

## 10.7 Axis data

### 10.7.1 Axis data command table

(1) Table list

The addresses in the table are the addresses for the axis 1. For the axis 2 and above, increase in units of C0 for each axis.

The column in the table for when tandem drive (synchronous) is being used is for axis data classification for when using tandem drive.

Master : The data only valid for the master axis (refer to Section 8.3)

Each axis: The data valid for both the master axis and slave axis (refer to Section 8.3)

| Address | Content | Tandem drive when in (synchronous) |
|---|---|---|
| 1000 | Command bit | Refer to (2) of this section |
| 1001 | | |
| 1002 | | |
| 1003 | | |
| 1004 | | |
| 1005 | | |
| 1006 | | |
| 1007 | | |
| 1008 | | |
| 1009 | | |
| 100A | | |
| 100B | | |
| 100C | | |
| 100D | | |
| 100E | | |
| 100F | | |
| 1010 | | |
| 1011 | | |
| 1012 | | |
| 1013 | | |
| 1014 | | |
| 1015 | | |
| 1016 | | |
| 1017 | | |
| 1018 | | |
| 1019 | | |
| 101A | | |
| 101B | | |
| 101C | | |
| 101D | | |
| 101E | | |
| 101F | | |

| Address | Content | Tandem drive when in (synchronous) |
|---|---|---|
| 1020 | Manual feed speed (Note) | Master |
| 1021 | | |
| 1022 | | |
| 1023 | | |
| 1024 | Manual feed acceleration time constant | Master |
| 1025 | | |
| 1026 | Manual feed deceleration time constant | Master |
| 1027 | | |
| 1028 | Incremental feed movement amount | Master |
| 1029 | | |
| 102A | | |
| 102B | | |
| 102C | Start point No. | Master |
| 102D | | |
| 102E | End point No. | Master |
| 102F | | |
| 1030 | Latest position command buffer number | |
| 1031 | | |
| 1032 | Control mode command | |
| 1033 | | |
| 1034 | Pass position condition start number | Each axis |
| 1035 | | |
| 1036 | Pass position condition end number | Each axis |
| 1037 | | |
| 1038 | Reserved | |
| 1039 | | |
| 103A | Latest command point No. | Master |
| 103B | | |
| 103C | Reserved | |
| 103D | | |
| 103E | | |
| 103F | | |

Note. The manual feed speed is the moving speed for manual operation (JOG operation as well as incremental feed).

| Address | Content | Tandem drive when in (synchronous) |
|---|---|---|
| 1040 | Monitor number 1 | Each axis |
| 1041 | | |
| 1042 | Monitor number 2 | Each axis |
| 1043 | | |
| 1044 | Monitor number 3 | Each axis |
| 1045 | | |
| 1046 | Monitor number 4 | Each axis |
| 1047 | | |
| 1048 | Torque control speed limit value | |
| 1049 | | |
| 104A | | |
| 104B | | |
| 104C | Reserved | |
| 104D | | |
| 104E | | |
| 104F | | |

| Address | Content | Tandem drive when in (synchronous) |
|---|---|---|
| 1050 | Parameter write number 1 | Each axis |
| 1051 | | |
| 1052 | Parameter write data 1 | Each axis |
| 1053 | | |
| 1054 | Parameter write number 2 | Each axis |
| 1055 | | |
| 1056 | Parameter write data 2 | Each axis |
| 1057 | | |
| 1058 | Parameter read number 1 | Each axis |
| 1059 | | |
| 105A | Reserved | |
| 105B | | |
| 105C | Parameter read number 2 | Each axis |
| 105D | | |
| 105E | Reserved | |
| 105F | | |

(2) Command bit

The addresses in the table are the addresses for the axis 1. For the axis 2 and above, increase in units of C0h for each axis.

The column in the table for when tandem drive is being used is for axis data classification for when using tandem drive synchronous mode.

Master : The data only valid for the master axis (refer to Section 8.3)
Each axis : The data valid for both the master axis and slave axis (refer to Section 8.3)
Special : Refer to Section 8.5 for details.
Not supported : The data not supported by tandem drive.

| Address | Bit | Symbol | Signal name | When tandem drive is being used |
|---|---|---|---|---|
| 1000 | 0 | SON | Servo on | Special |
| | 1 | | Reserved | |
| | 2 | | | |
| | 3 | | | |
| | 4 | TL | Torque limit | Each axis |
| | 5 | SRST | Servo alarm reset | Each axis |
| | 6 | | Reserved | |
| | 7 | | | |

| Address | Bit | Symbol | Signal name | When tandem drive is being used |
|---|---|---|---|---|
| 1001 | 0 | ST | Start operation | Master |
| | 1 | DIR | Movement direction | Master |
| | 2 | STP | Stop operation | Master |
| | 3 | RSTP | Rapid stop | Master |
| | 4 | | Reserved | |
| | 5 | ORST | Operation alarm reset | Master |
| | 6 | | Reserved | |
| | 7 | | | |

| Address | Bit | Symbol | Signal name | When tandem drive is being used |
|---|---|---|---|---|
| 1002 | 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 | | Reserved | |
| | 5 | LIP | Linear interpolation mode | Master |
| | 6 | DST | Home position reset mode | Master |
| | 7 | | Reserved | |

| Address | Bit | Symbol | Signal name | When tandem drive is being used |
|---|---|---|---|---|
| 1003 | 0 | | Reserved | |
| | 1 | | | |
| | 2 | | | |
| | 3 | | | |
| | 4 | | | |
| | 5 | | | |
| | 6 | | | |
| | 7 | | | |

| Address | Bit | Symbol | Signal name | When tandem drive is being used |
|---|---|---|---|---|
| 1004 | 0 | ITL | Interlock | Master |
| | 1 | RMONR | High speed monitor latch command | Each axis |
| | 2 | | Reserved | |
| | 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 | | Reserved | |

| Address | Bit | Symbol | Signal name | When tandem drive is being used |
|---|---|---|---|---|
| 1005 | 0 | SCHG | Change speed | Master |
| | 1 | TACHG | Change acceleration time constant | Master |
| | 2 | TDCHG | Change deceleration time constant | Master |
| | 3 | PCHG | Position change | Master |
| | 4 | | Reserved | |
| | 5 | | | |
| | 6 | | | |
| | 7 | | | |

| Address | Bit | Symbol | Signal name | When tandem drive is being used |
|---|---|---|---|---|
| 1006 | 0 | FST | Fast start operation | Master |
| | 1 | | Reserved | |
| | 2 | | | |
| | 3 | | | |
| | 4 | | | |
| | 5 | | | |
| | 6 | | | |
| | 7 | | | |

| Address | Bit | Symbol | Signal name | When tandem drive is being used |
|---|---|---|---|---|
| 1007 | 0 | PPISTP | Pass position interrupt cancel | Master |
| | 1 | | Reserved | |
| | 2 | | | |
| | 3 | | | |
| | 4 | | | |
| | 5 | | | |
| | 6 | | | |
| | 7 | | | |

| Address | Bit | Symbol | Signal name | When tandem drive is being used |
|---|---|---|---|---|
| 1008 | 0 | GAIN | Gain changing command | Each axis |
| | 1 | FCLS | Fully closed loop control change command | Each axis |
| | 2 | | Reserved | |
| | 3 | CPC | PID control command | Each axis |
| | 4 | | Reserved | |
| | 5 | | | |
| | 6 | | | |
| | 7 | | | |

| Address | Bit | Symbol | Signal name | When tandem drive is being used |
|---|---|---|---|---|
| 1009 | 0 | | Reserved | |
| | 1 | | | |
| | 2 | | | |
| | 3 | | | |
| | 4 | | | |
| | 5 | | | |
| | 6 | | | |
| | 7 | | | |

| Address | Bit | Symbol | Signal name | When tandem drive is being used |
|---|---|---|---|---|
| 100A | 0 | | Reserved | |
| | 1 | | | |
| | 2 | | | |
| | 3 | | | |
| | 4 | ZSC | Home position set command | |
| | 5 | | Reserved | |
| | 6 | | | |
| | 7 | | | |

| Address | Bit | Symbol | Signal name | When tandem drive is being used |
|---|---|---|---|---|
| 100B | 0 | | Reserved | |
| | 1 | MKC1 | Mark detection clear command 1 | Each axis |
| | 2 | MKD1 | Mark detection disable command 1 | Each axis |
| | 3 | MKSEN1 | Mark detection setting enable command 1 | Each axis |
| | 4 | | Reserved | |
| | 5 | MKC2 | Mark detection clear command 2 | Each axis |
| | 6 | MKD2 | Mark detection disable command 2 | Each axis |
| | 7 | MKSEN2 | Mark detection setting enable command 2 | Each axis |

| Address | Bit | Symbol | Signal name | When tandem drive is being used |
|---|---|---|---|---|
| 100C | 0 | | Reserved | |
| | 1 | | | |
| | 2 | | | |
| | 3 | | | |
| | 4 | CTLMC | Control mode switch command | Not supported |
| | 5 | | Reserved | |
| | 6 | | | |
| | 7 | | | |

| Address | Bit | Symbol | Signal name | When tandem drive is being used |
|---|---|---|---|---|
| 100D | 0 | | Reserved | |
| | 1 | | | |
| | 2 | | | |
| | 3 | | | |
| | 4 | | | |
| | 5 | | | |
| | 6 | | | |
| | 7 | | | |

| Address | Bit | Symbol | Signal name | When tandem drive is being used |
|---|---|---|---|---|
| 100E | 0 | | Reserved | |
| | 1 | | | |
| | 2 | | | |
| | 3 | | | |
| | 4 | | | |
| | 5 | | | |
| | 6 | | | |
| | 7 | | | |

| Address | Bit | Symbol | Signal name | When tandem drive is being used |
|---|---|---|---|---|
| 100F | 0 | | Reserved | |
| | 1 | | | |
| | 2 | | | |
| | 3 | | | |
| | 4 | | | |
| | 5 | | | |
| | 6 | | | |
| | 7 | | | |

| Address | Bit | Symbol | Signal name | When tandem drive is being used |
|---|---|---|---|---|
| 1010 | 0 | MON | Monitor command | Each axis |
| | 1 | MONR | Monitor latch command | Each axis |
| | 2 | | Reserved | |
| | 3 | | | |
| | 4 | | | |
| | 5 | | | |
| | 6 | | | |
| | 7 | | | |

| Address | Bit | Symbol | Signal name | When tandem drive is being used |
|---|---|---|---|---|
| 1011 | 0 | | Reserved | |
| | 1 | | | |
| | 2 | | | |
| | 3 | | | |
| | 4 | | | |
| | 5 | | | |
| | 6 | | | |
| | 7 | | | |

| Address | Bit | Symbol | Signal name | When tandem drive is being used |
|---|---|---|---|---|
| 1012 | 0 | | Reserved | |
| | 1 | | | |
| | 2 | | | |
| | 3 | | | |
| | 4 | | | |
| | 5 | | | |
| | 6 | | | |
| | 7 | | | |

| Address | Bit | Symbol | Signal name | When tandem drive is being used |
|---|---|---|---|---|
| 1013 | 0 | | Reserved | |
| | 1 | | | |
| | 2 | | | |
| | 3 | | | |
| | 4 | | | |
| | 5 | | | |
| | 6 | | | |
| | 7 | | | |

| Address | Bit | Symbol | Signal name | When tandem drive is being used |
|---|---|---|---|---|
| 1014 | 0 | PWRT | Parameter write command | |
| | 1 | | Reserved | |
| | 2 | | | |
| | 3 | | | |
| | 4 | | | |
| | 5 | | | |
| | 6 | | | |
| | 7 | PSF | Servo parameter read complete | |

| Address | Bit | Symbol | Signal name | When tandem drive is being used |
|---|---|---|---|---|
| 1015 | 0 | PRD | Parameter read command | Each axis |
| | 1 | | Reserved | |
| | 2 | | | |
| | 3 | | | |
| | 4 | | | |
| | 5 | | | |
| | 6 | | | |
| | 7 | | | |

| Address | Bit | Symbol | Signal name | When tandem drive is being used |
|---|---|---|---|---|
| 1016 | 0 | | Reserved | |
| | 1 | | | |
| | 2 | | | |
| | 3 | | | |
| | 4 | | | |
| | 5 | | | |
| | 6 | | | |
| | 7 | | | |

| Address | Bit | Symbol | Signal name | When tandem drive is being used |
|---|---|---|---|---|
| 1017 | 0 | | Reserved | |
| | 1 | | | |
| | 2 | | | |
| | 3 | | | |
| | 4 | | | |
| | 5 | | | |
| | 6 | | | |
| | 7 | | | |

| Address | Bit | Symbol | Signal name | When tandem drive is being used |
|---|---|---|---|---|
| 1018 | 0 | | Reserved | |
| | 1 | | | |
| | 2 | | | |
| | 3 | | | |
| | 4 | | | |
| | 5 | | | |
| | 6 | | | |
| | 7 | | | |

| Address | Bit | Symbol | Signal name | When tandem drive is being used |
|---|---|---|---|---|
| 1019 | 0 | | Reserved | |
| | 1 | | | |
| | 2 | | | |
| | 3 | | | |
| | 4 | | | |
| | 5 | | | |
| | 6 | | | |
| | 7 | | | |

| Address | Bit | Symbol | Signal name | When tandem drive is being used |
|---|---|---|---|---|
| 101A | 0 | | Reserved | |
| | 1 | | | |
| | 2 | | | |
| | 3 | | | |
| | 4 | | | |
| | 5 | | | |
| | 6 | | | |
| | 7 | | | |

| Address | Bit | Symbol | Signal name | When tandem drive is being used |
|---|---|---|---|---|
| 101B | 0 | | Reserved | |
| | 1 | | | |
| | 2 | | | |
| | 3 | | | |
| | 4 | | | |
| | 5 | | | |
| | 6 | | | |
| | 7 | | | |

| Address | Bit | Symbol | Signal name | When tandem drive is being used |
|---|---|---|---|---|
| 101C | 0 | | Reserved | |
| | 1 | | | |
| | 2 | | | |
| | 3 | | | |
| | 4 | | | |
| | 5 | | | |
| | 6 | | | |
| | 7 | | | |

| Address | Bit | Symbol | Signal name | When tandem drive is being used |
|---|---|---|---|---|
| 101D | 0 | | Reserved | |
| | 1 | | | |
| | 2 | | | |
| | 3 | | | |
| | 4 | | | |
| | 5 | | | |
| | 6 | | | |
| | 7 | | | |

| Address | Bit | Symbol | Signal name | When tandem drive is being used |
|---|---|---|---|---|
| 101E | 0 | | Reserved | |
| | 1 | | | |
| | 2 | | | |
| | 3 | | | |
| | 4 | | | |
| | 5 | | | |
| | 6 | | | |
| | 7 | | | |

| Address | Bit | Symbol | Signal name | When tandem drive is being used |
|---|---|---|---|---|
| 101F | 0 | | Reserved | |
| | 1 | | | |
| | 2 | | | |
| | 3 | | | |
| | 4 | | | |
| | 5 | | | |
| | 6 | | | |
| | 7 | | | |

### 10.7.2 Axis data status table

(1) Table list

The addresses in the table are the addresses for the first axis. For the axis 2 and above, increase in units of C0h for each axis.

The column in the table for when tandem drive (synchronous) is being used is for axis data classification for when using tandem drive.

Master : The data only valid for the master axis (refer to Section 8.3)

Each axis: The data valid for both the master axis and slave axis (refer to Section 8.3)

| Address | Content | When in parallel drive (synchronous) |
|---|---|---|
| 1060 | Status bit | Refer to (2) of this section |
| 1061 | | |
| 1062 | | |
| 1063 | | |
| 1064 | | |
| 1065 | | |
| 1066 | | |
| 1067 | | |
| 1068 | | |
| 1069 | | |
| 106A | | |
| 106B | | |
| 106C | | |
| 106D | | |
| 106E | | |
| 106F | | |
| 1070 | | |
| 1071 | | |
| 1072 | | |
| 1073 | | |
| 1074 | | |
| 1075 | | |
| 1076 | | |
| 1077 | | |
| 1078 | | |
| 1079 | | |
| 107A | | |
| 107B | | |
| 107C | | |
| 107D | | |
| 107E | | |
| 107F | | |

| Address | Content | When in parallel drive (synchronous) |
|---|---|---|
| 1080 | Operation alarm number | Master |
| 1081 | | |
| 1082 | Specific operation alarm number | Master |
| 1083 | | |
| 1084 | Servo alarm number | Each axis |
| 1085 | | |
| 1086 | Specific servo alarm number | Each axis |
| 1087 | | |
| 1088 | Reserved | |
| 1089 | | |
| 108A | | |
| 108B | | |
| 108C | Operation point No. | Master |
| 108D | | |
| 108E | Maximum position command buffer number | |
| 108F | | |
| 1090 | Transmit position command buffer number | |
| 1091 | | |
| 1092 | Control mode status | |
| 1093 | | |
| 1094 | Executing pass position condition number | Master |
| 1095 | | |
| 1096 | Reserved | |
| 1097 | | |
| 1098 | | |
| 1099 | | |
| 109A | | |
| 109B | | |
| 109C | | |
| 109D | | |
| 109E | | |
| 109F | | |

| Address | Content | When in parallel drive (synchronous) |
|---|---|---|
| 10A0 | Monitor number 1 | Each axis |
| 10A1 | | |
| 10A2 | Monitor number 2 | Each axis |
| 10A3 | | |
| 10A4 | Monitor number 3 | Each axis |
| 10A5 | | |
| 10A6 | Monitor number 4 | Each axis |
| 10A7 | | |
| 10A8 | Monitor data 1 | Each axis |
| 10A9 | | |
| 10AA | Monitor data 2 | Each axis |
| 10AB | | |
| 10AC | Monitor data 3 | Each axis |
| 10AD | | |
| 10AE | Monitor data 4 | Each axis |
| 10AF | | |

| Address | Content | When in parallel drive (synchronous) |
|---|---|---|
| 10B0 | Parameter write number 1 | Each axis |
| 10B1 | | |
| 10B2 | Parameter write data 1 | Each axis |
| 10B3 | | |
| 10B4 | Parameter write number 2 | Each axis |
| 10B5 | | |
| 10B6 | Parameter write data 2 | Each axis |
| 10B7 | | |
| 10B8 | Parameter read number 1 | Each axis |
| 10B9 | | |
| 10BA | Parameter read data 1 | Each axis |
| 10BB | | |
| 10BC | Parameter read number 2 | Each axis |
| 10BD | | |
| 10BE | Parameter read data 2 | Each axis |
| 10BF | | |

(2) Status bit

For each bit, 0 stands for invalid and 1 stands for valid.

The column in the table for when tandem drive is being used is for axis data classification for when using tandem drive synchronous mode.

Master : The data only valid for the master axis (refer to Section 8.3)

Each axis : The data valid for both the master axis and slave axis (refer to Section 8.3)

Not supported : The data not supported by tandem drive

| Address | Bit | Symbol | Signal name | When tandem drive is being used |
|---|---|---|---|---|
| 1060 | 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 | Servo alarm | Each axis |
| | 6 | SWRN | Servo warning | Each axis |
| | 7 | ABSE | Absolute position erased | Each axis |

| Address | Bit | Symbol | Signal name | When tandem drive is being used |
|---|---|---|---|---|
| 1061 | 0 | OP | During operation | Master |
| | 1 | CPO | Rough match | Master |
| | 2 | PF | Positioning complete | Master |
| | 3 | ZP | Home position return complete | Master |
| | 4 | SMZ | During smoothing of stopping | Master |
| | 5 | OALM | Operation alarm | Master |
| | 6 | OPF | Completion of operation | Master |
| | 7 | PSW | Position switch | Each axis |

| Address | Bit | Symbol | Signal name | When tandem drive is being used |
|---|---|---|---|---|
| 1062 | 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 | | Reserved | |
| | 5 | LIPO | In linear interpolation mode | Master |
| | 6 | DSTO | In home position reset mode | Master |
| | 7 | | Reserved | |

| Address | Bit | Symbol | Signal name | When tandem drive is being used |
|---|---|---|---|---|
| 1063 | 0 | | Reserved | |
| | 1 | | | |
| | 2 | | | |
| | 3 | | | |
| | 4 | | | |
| | 5 | | | |
| | 6 | | | |
| | 7 | | | |

| Address | Bit | Symbol | Signal name | When tandem drive is being used |
|---|---|---|---|---|
| 1064 | 0 | ISTP | Interlock stop | Master |
| | 1 | RMRCH | High speed monitor is latched | Each axis |
| | 2 | POV | Stop position over-round | Master |
| | 3 | STO | Start up acceptance complete | Master |
| | 4 | | Reserved | |
| | 5 | | | |
| | 6 | ZREQ | Home position return request | Master |
| | 7 | | Reserved | |

| Address | Bit | Symbol | Signal name | When tandem drive is being used |
|---|---|---|---|---|
| 1065 | 0 | SCF | Completion of preparation for changing speed | Master |
| | 1 | TACF | Completion of preparation for changing acceleration time constant | Master |
| | 2 | TDCF | Completion of preparation for changing deceleration time constant | Master |
| | 3 | PCF | Completion of preparation for changing position | 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 | Bit | Symbol | Signal name | When tandem drive is being used |
|---|---|---|---|---|
| 1066 | 0 | | Reserved | |
| | 1 | | | |
| | 2 | | | |
| | 3 | | | |
| | 4 | | | |
| | 5 | | | |
| | 6 | | | |
| | 7 | | | |

| Address | Bit | Symbol | Signal name | When tandem drive is being used |
|---|---|---|---|---|
| 1067 | 0 | PPIOP | Pass position interrupt | Master |
| | 1 | PPIFIN | Pass position interrupt complete | Master |
| | 2 | PPIERR | Pass position interrupt incomplete | Master |
| | 3 | | Reserved | |
| | 4 | | | |
| | 5 | | | |
| | 6 | | | |
| | 7 | AUTLO | In point table loop | Master |

| Address | Bit | Symbol | Signal name | When tandem drive is being used |
|---|---|---|---|---|
| 1068 | 0 | GAINO | During gain switching | Each axis |
| | 1 | FCLSO | Fully closed loop control changing | Each axis |
| | 2 | TLSO | Selecting torque limit | Each axis |
| | 3 | SPC | During PID control | Each axis |
| | 4 | | Reserved | |
| | 5 | | | |
| | 6 | | | |
| | 7 | PRSMO | During continuous operation to torque control | Not supported |

| Address | Bit | Symbol | Signal name | When tandem drive is being used |
|---|---|---|---|---|
| 1069 | 0 | IWT | Interference check standby | Each axis |
| | 1 | SINP | Servo amplifier in-position | Each axis |
| | 2 | | Reserved | |
| | 3 | | | |
| | 4 | | | |
| | 5 | | | |
| | 6 | | | |
| | 7 | | | |

| Address | Bit | Symbol | Signal name | When tandem drive is being used |
|---|---|---|---|---|
| 106A | 0 | | Reserved | |
| | 1 | | | |
| | 2 | | | |
| | 3 | | | |
| | 4 | ZSF | Home position set complete | Not supported |
| | 5 | ZSE | Home position set error | Not supported |
| | 6 | | Reserved | |
| | 7 | | | |

| Address | Bit | Symbol | Signal name | When tandem drive is being used |
|---|---|---|---|---|
| 106B | 0 | MKIF1 | Mark detection compatible information 1 | Each axis |
| | 1 | MKCF1 | Mark detection clear complete 1 | Each axis |
| | 2 | MKDO1 | Mark detection disabled 1 | Each axis |
| | 3 | MKSEF1 | Mark detection setting enable complete 1 | Each axis |
| | 4 | MKIF2 | Mark detection compatible information 2 | Each axis |
| | 5 | MKCF2 | Mark detection clear complete 2 | Each axis |
| | 6 | MKDO2 | Mark detection disabled 2 | Each axis |
| | 7 | MKSEF2 | Mark detection setting enable complete 2 | Each axis |

| Address | Bit | Symbol | Signal name | When tandem drive is being used |
|---|---|---|---|---|
| 106C | 0 | | Reserved | |
| | 1 | | | |
| | 2 | | | |
| | 3 | | | |
| | 4 | CTLMCF | Control mode switch complete | Not supported |
| | 5 | CTLMCE | Control mode switch error | Not supported |
| | 6 | | Reserved | |
| | 7 | | | |

| Address | Bit | Symbol | Signal name | When tandem drive is being used |
|---|---|---|---|---|
| 106D | 0 | | Reserved | |
| | 1 | | | |
| | 2 | | | |
| | 3 | | | |
| | 4 | | | |
| | 5 | | | |
| | 6 | | | |
| | 7 | | | |

| Address | Bit | Symbol | Signal name | When tandem drive is being used |
|---|---|---|---|---|
| 106E | 0 | | Reserved | |
| | 1 | | | |
| | 2 | | | |
| | 3 | | | |
| | 4 | | | |
| | 5 | | | |
| | 6 | | | |
| | 7 | | | |

| Address | Bit | Symbol | Signal name | When tandem drive is being used |
|---|---|---|---|---|
| 106F | 0 | | Reserved | |
| | 1 | | | |
| | 2 | | | |
| | 3 | | | |
| | 4 | | | |
| | 5 | | | |
| | 6 | | | |
| | 7 | | | |

| Address | Bit | Symbol | Signal name | When tandem drive is being used |
|---|---|---|---|---|
| 1070 | 0 | MOUT | Monitor output | Each axis |
| | 1 | MRCH | Monitor latch | Each axis |
| | 2 | MER1 | Monitor number error 1 | Each axis |
| | 3 | MER2 | Monitor number error 2 | Each axis |
| | 4 | MER3 | Monitor number error 3 | Each axis |
| | 5 | MER4 | Monitor number error 4 | Each axis |
| | 6 | MESV | Servo amplifier is not connected | Each axis |
| | 7 | | Reserved | |

| Address | Bit | Symbol | Signal name | When tandem drive is being used |
|---|---|---|---|---|
| 1071 | 0 | | Reserved | |
| | 1 | | | |
| | 2 | | | |
| | 3 | | | |
| | 4 | | | |
| | 5 | | | |
| | 6 | | | |
| | 7 | | | |

| Address | Bit | Symbol | Signal name | When tandem drive is being used |
|---|---|---|---|---|
| 1072 | 0 | | Reserved | |
| | 1 | | | |
| | 2 | | | |
| | 3 | | | |
| | 4 | | | |
| | 5 | | | |
| | 6 | | | |
| | 7 | | | |

| Address | Bit | Symbol | Signal name | When tandem drive is being used |
|---|---|---|---|---|
| 1073 | 0 | | Reserved | |
| | 1 | | | |
| | 2 | | | |
| | 3 | | | |
| | 4 | | | |
| | 5 | | | |
| | 6 | | | |
| | 7 | | | |

| Address | Bit | Symbol | Signal name | When tandem drive is being used |
|---|---|---|---|---|
| 1074 | 0 | PWFIN1 | Parameter write complete 1 | Each axis |
| | 1 | PWEN1 | Parameter number error 1 | Each axis |
| | 2 | PWED1 | Parameter data out of bounds 1 | Each axis |
| | 3 | | Reserved | |
| | 4 | PWFIN2 | Parameter write complete 2 | Each axis |
| | 5 | PWEN2 | Parameter number error 2 | Each axis |
| | 6 | PWED2 | Parameter data out of bounds 2 | Each axis |
| | 7 | PSCHG | Changes to servo parameters exist | Each axis |

| Address | Bit | Symbol | Signal name | When tandem drive is being used |
|---|---|---|---|---|
| 1075 | 0 | PRFIN1 | Parameter read complete 1 | Each axis |
| | 1 | PREN1 | Parameter number error 1 | Each axis |
| | 2 | PRFIN2 | Parameter read complete 2 | Each axis |
| | 3 | PREN2 | Parameter number error 2 | Each axis |
| | 4 | | Reserved | |
| | 5 | | | |
| | 6 | | | |
| | 7 | | | |

| Address | Bit | Symbol | Signal name | When tandem drive is being used |
|---|---|---|---|---|
| 1076 | 0 | | Reserved | |
| | 1 | | | |
| | 2 | | | |
| | 3 | | | |
| | 4 | | | |
| | 5 | | | |
| | 6 | | | |
| | 7 | | | |

| Address | Bit | Symbol | Signal name | When tandem drive is being used |
|---|---|---|---|---|
| 1077 | 0 | | Reserved | |
| | 1 | | | |
| | 2 | | | |
| | 3 | | | |
| | 4 | | | |
| | 5 | | | |
| | 6 | | | |
| | 7 | | | |

| Address | Bit | Symbol | Signal name | When tandem drive is being used |
|---|---|---|---|---|
| 1078 | 0 | | Reserved | |
| | 1 | | | |
| | 2 | | | |
| | 3 | | | |
| | 4 | | | |
| | 5 | | | |
| | 6 | | | |
| | 7 | | | |

| Address | Bit | Symbol | Signal name | When tandem drive is being used |
|---|---|---|---|---|
| 1079 | 0 | | Reserved | |
| | 1 | | | |
| | 2 | | | |
| | 3 | | | |
| | 4 | | | |
| | 5 | | | |
| | 6 | | | |
| | 7 | | | |

| Address | Bit | Symbol | Signal name | When tandem drive is being used |
|---|---|---|---|---|
| 107A | 0 | | Reserved | |
| | 1 | | | |
| | 2 | | | |
| | 3 | | | |
| | 4 | | | |
| | 5 | | | |
| | 6 | | | |
| | 7 | | | |

| Address | Bit | Symbol | Signal name | When tandem drive is being used |
|---|---|---|---|---|
| 107B | 0 | | Reserved | |
| | 1 | | | |
| | 2 | | | |
| | 3 | | | |
| | 4 | | | |
| | 5 | | | |
| | 6 | | | |
| | 7 | | | |

| Address | Bit | Symbol | Signal name | When tandem drive is being used |
|---|---|---|---|---|
| 107C | 0 | | Reserved | |
| | 1 | | | |
| | 2 | | | |
| | 3 | | | |
| | 4 | | | |
| | 5 | | | |
| | 6 | | | |
| | 7 | | | |

| Address | Bit | Symbol | Signal name | When tandem drive is being used |
|---|---|---|---|---|
| 107D | 0 | | Reserved | |
| | 1 | | | |
| | 2 | | | |
| | 3 | | | |
| | 4 | | | |
| | 5 | | | |
| | 6 | | | |
| | 7 | | | |

| Address | Bit | Symbol | Signal name | When tandem drive is being used |
|---|---|---|---|---|
| 107E | 0 | | Reserved | |
| | 1 | | | |
| | 2 | | | |
| | 3 | | | |
| | 4 | | | |
| | 5 | | | |
| | 6 | | | |
| | 7 | | | |

| Address | Bit | Symbol | Signal name | When tandem drive is being used |
|---|---|---|---|---|
| 107F | 0 | | Reserved | |
| | 1 | | | |
| | 2 | | | |
| | 3 | | | |
| | 4 | | | |
| | 5 | | | |
| | 6 | | | |
| | 7 | | | |

## 10.8 Remote I/O data

### 10.8.1 RIO data command table

(1) Table list

The addresses in the table are the addresses for the station 1. For the station 2 and above, increase in units of 80 for each station.

| Address | Content |
|---|---|
| 3400 | Command bit |
| 3401 | |
| 3402 | |
| 3403 | |
| 3404 | |
| 3405 | |
| 3406 | |
| 3407 | |
| 3408 | |
| 3409 | |
| 340A | |
| 340B | |
| 340C | |
| 340D | |
| 340E | |
| 340F | |
| 3410 | Reserved |
| 3411 | |
| 3412 | |
| 3413 | |
| 3414 | |
| 3415 | |
| 3416 | |
| 3417 | |
| 3418 | |
| 3419 | |
| 341A | |
| 341B | |
| 341C | |
| 341D | |
| 341E | |
| 341F | |

| Address | Content |
|---|---|
| 3420 | Monitor number 1 |
| 3421 | |
| 3422 | Monitor number 2 |
| 3423 | |
| 3424 | Monitor number 3 |
| 3425 | |
| 3426 | Monitor number 4 |
| 3427 | |
| 3428 | Reserved |
| 3429 | |
| 342A | |
| 342B | |
| 342C | |
| 342D | |
| 342E | |
| 342F | |
| 3430 | Parameter write number 1 |
| 3431 | |
| 3432 | Parameter write data 1 |
| 3433 | |
| 3434 | Parameter write number 2 |
| 3435 | |
| 3436 | Parameter write data 2 |
| 3437 | |
| 3438 | Parameter read number 1 |
| 3439 | |
| 343A | Reserved |
| 343B | |
| 343C | Parameter read number 2 |
| 343D | |
| 343E | Reserved |
| 343F | |

(2) Command bit

For each bit, 0 stands for invalid and 1 stands for valid.

The addresses in the table are the addresses for the station 1. For the station 2 and above, increase in units of 80 for each station.

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 3400 | 0 | | Reserved |
| | 1 | | |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | RURST | RIO module alarm reset |
| | 6 | | Reserved |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 3401 | 0 | | Reserved |
| | 1 | | |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | RCRST | RIO control alarm reset |
| | 6 | | Reserved |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 3402 | 0 | | Reserved |
| | 1 | | |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 3403 | 0 | | Reserved |
| | 1 | | |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 3404 | 0 | MON | Monitor command |
| | 1 | MONR | Monitor latch command |
| | 2 | | Reserved |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 3405 | 0 | | Reserved |
| | 1 | | |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 3406 | 0 | PWRT | Parameter write command |
| | 1 | | Reserved |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 3407 | 0 | PRD | Parameter read command |
| | 1 | | Reserved |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 3408 | 0 | | Reserved |
| | 1 | | |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 3409 | 0 | | Reserved |
| | 1 | | |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 340A | 0 | | Reserved |
| | 1 | | |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 340B | 0 | | Reserved |
| | 1 | | |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 340C | 0 | | Reserved |
| | 1 | | |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 340D | 0 | | Reserved |
| | 1 | | |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 340E | 0 | | Reserved |
| | 1 | | |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 340F | 0 | | Reserved |
| | 1 | | |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

### 10.8.2 RIO data status table

(1) Table list

The addresses in the table are the addresses for the station 1. For the station 2 and above, increase in units of 80 for each station.

| Address | Content |
|---|---|
| 3440 | Status bit |
| 3441 | |
| 3442 | |
| 3443 | |
| 3444 | |
| 3445 | |
| 3446 | |
| 3447 | |
| 3448 | |
| 3449 | |
| 344A | |
| 344B | |
| 344C | |
| 344D | |
| 344E | |
| 344F | |
| 3450 | RIO control alarm No. |
| 3451 | |
| 3452 | Detail RIO control alarm No. |
| 3453 | |
| 3454 | RIO module alarm No. |
| 3455 | |
| 3456 | Detail RIO module alarm No. |
| 3457 | |
| 3458 | Reserved |
| 3459 | |
| 345A | |
| 345B | |
| 345C | |
| 345D | |
| 345E | |
| 345F | |

| Address | Content |
|---|---|
| 3460 | Monitor number 1 |
| 3461 | |
| 3462 | Monitor number 2 |
| 3463 | |
| 3464 | Monitor number 3 |
| 3465 | |
| 3466 | Monitor number 4 |
| 3467 | |
| 3468 | Monitor data 1 |
| 3469 | |
| 346A | Monitor data 2 |
| 346B | |
| 346C | Monitor data 3 |
| 346D | |
| 346E | Monitor data 4 |
| 346F | |
| 3470 | Parameter write number 1 |
| 3471 | |
| 3472 | Parameter write data 1 |
| 3473 | |
| 3474 | Parameter write number 2 |
| 3475 | |
| 3476 | Parameter write data 2 |
| 3477 | |
| 3478 | Parameter read number 1 |
| 3479 | |
| 347A | Parameter read data 1 |
| 347B | |
| 347C | Parameter read number 2 |
| 347D | |
| 347E | Parameter read data 2 |
| 347F | |

(2) Status bit

For each bit, 0 stands for invalid and 1 stands for valid.

The addresses in the table are the addresses for the station 1. For the station 2 and above, increase in units of 80 for each station.

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 3440 | 0 | RURDY | Receiving controller ready on |
| | 1 | RUA | Outputting DO |
| | 2 | | Reserved |
| | 3 | | |
| | 4 | | |
| | 5 | RUALM | RIO module alarm |
| | 6 | RUWRN | RIO module warning |
| | 7 | | Reserved |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 3441 | 0 | | Reserved |
| | 1 | | |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | RCALM | RIO control alarm |
| | 6 | | Reserved |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 3442 | 0 | | Reserved |
| | 1 | | |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 3443 | 0 | | Reserved |
| | 1 | | |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 3444 | 0 | MOUT | Monitor output |
| | 1 | MRCH | Monitor latch |
| | 2 | MER1 | Monitor number error 1 |
| | 3 | MER2 | Monitor number error 2 |
| | 4 | MER3 | Monitor number error 3 |
| | 5 | MER4 | Monitor number error 4 |
| | 6 | MERIO | RIO module is not connected |
| | 7 | | Reserved |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 3445 | 0 | | Reserved |
| | 1 | | |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 3446 | 0 | PWFIN1 | Parameter write complete 1 |
| | 1 | PWEN1 | Parameter number error 1 |
| | 2 | PWED1 | Parameter data out of bounds 1 |
| | 3 | | Reserved |
| | 4 | PWFIN2 | Parameter write complete 2 |
| | 5 | PWEN2 | Parameter number error 2 |
| | 6 | PWED2 | Parameter data out of bounds 2 |
| | 7 | | Reserved |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 3447 | 0 | PRFIN1 | Parameter read complete 1 |
| | 1 | PREN1 | Parameter number error 1 |
| | 2 | PRFIN2 | Parameter read complete 2 |
| | 3 | PREN2 | Parameter number error 2 |
| | 4 | | Reserved |
| | 5 | | |
| | 6 | | |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 3448 | 0 | | Reserved |
| | 1 | | |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 3449 | 0 | | Reserved |
| | 1 | | |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 344A | 0 | | Reserved |
| | 1 | | |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 344B | 0 | | Reserved |
| | 1 | | |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 344C | 0 | | Reserved |
| | 1 | | |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 344D | 0 | | Reserved |
| | 1 | | |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 344E | 0 | | Reserved |
| | 1 | | |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

| Address | Bit | Symbol | Signal name |
|---|---|---|---|
| 344F | 0 | | Reserved |
| | 1 | | |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |

## 10.9 Servo parameter change number

When parameter settings within the servo amplifier are changed using the auto tuning function or parameter changes using MR Configurator2 (set up software), the bit corresponding to the servo parameter number that was changed is turned on to notify concerning which parameter number was changed (in units of 16). To identify the changed parameter, check the servo parameter change number (monitor No.0590 to 05B7) corresponding to the bit which is turned on. Refer to Section 7.2 for more information.

(1) Servo parameter change number (SSCNETⅢ/H)

| Address | Content |
|---|---|
| 3870 | Servo parameter change number 1□□□ Axis 1 |
| 3871 | |
| 3872 | |
| 3873 | |
| 3874 | |
| 3875 | |
| 3876 | |
| 3877 | |
| 3878 | Servo parameter change number 1□□□ Axis 2 |
| 3879 | |
| 387A | |
| 387B | |
| 387C | |
| 387D | |
| 387E | |
| 387F | |
| 3880 | Servo parameter change number 1□□□ Axis 3 |
| 3881 | |
| 3882 | |
| 3883 | |
| 3884 | |
| 3885 | |
| 3886 | |
| 3887 | |
| 3888 | Servo parameter change number 1□□□ Axis 4 |
| 3889 | |
| 388A | |
| 388B | |
| 388C | |
| 388D | |
| 388E | |
| 388F | |
| 3890 | Servo parameter change number 1□□□ Axis 5 |
| 3891 | |
| 3892 | |
| 3893 | |
| 3894 | |
| 3895 | |
| 3896 | |
| 3897 | |

| Address | Content |
|---|---|
| 3898 | Servo parameter change number 1□□□ Axis 6 |
| 3899 | |
| 389A | |
| 389B | |
| 389C | |
| 389D | |
| 389E | |
| 389F | |
| 38A0 | Servo parameter change number 1□□□ Axis 7 |
| 38A1 | |
| 38A2 | |
| 38A3 | |
| 38A4 | |
| 38A5 | |
| 38A6 | |
| 38A7 | |
| 38A8 | Servo parameter change number 1□□□ Axis 8 |
| 38A9 | |
| 38AA | |
| 38AB | |
| 38AC | |
| 38AD | |
| 38AE | |
| 38AF | |
| 38B0 | Servo parameter change number 1□□□ Axis 9 |
| 38B1 | |
| 38B2 | |
| 38B3 | |
| 38B4 | |
| 38B5 | |
| 38B6 | |
| 38B7 | |
| 38B8 | Servo parameter change number 1□□□ Axis 10 |
| 38B9 | |
| 38BA | |
| 38BB | |
| 38BC | |
| 38BD | |
| 38BE | |
| 38BF | |

| Address | Content |
|---|---|
| 38C0 | Servo parameter change number 1□□□ Axis 11 |
| 38C1 | |
| 38C2 | |
| 38C3 | |
| 38C4 | |
| 38C5 | |
| 38C6 | |
| 38C7 | |
| 38C8 | Servo parameter change number 1□□□ Axis 12 |
| 38C9 | |
| 38CA | |
| 38CB | |
| 38CC | |
| 38CD | |
| 38CE | |
| 38CF | |
| 38D0 | Servo parameter change number 1□□□ Axis 13 |
| 38D1 | |
| 38D2 | |
| 38D3 | |
| 38D4 | |
| 38D5 | |
| 38D6 | |
| 38D7 | |
| 38D8 | Servo parameter change number 1□□□ Axis 14 |
| 38D9 | |
| 38DA | |
| 38DB | |
| 38DC | |
| 38DD | |
| 38DE | |
| 38DF | |
| 38E0 | Servo parameter change number 1□□□ Axis 15 |
| 38E1 | |
| 38E2 | |
| 38E3 | |
| 38E4 | |
| 38E5 | |
| 38E6 | |
| 38E7 | |
| 38E8 | Servo parameter change number 1□□□ Axis 16 |
| 38E9 | |
| 38EA | |
| 38EB | |
| 38EC | |
| 38ED | |
| 38EE | |
| 38EF | |

| Address | Content |
|---|---|
| 38F0 | Servo parameter change number 1□□□ Axis 17 |
| 38F1 | |
| 38F2 | |
| 38F3 | |
| 38F4 | |
| 38F5 | |
| 38F6 | |
| 38F7 | |
| 38F8 | Servo parameter change number 1□□□ Axis 18 |
| 38F9 | |
| 38FA | |
| 38FB | |
| 38FC | |
| 38FD | |
| 38FE | |
| 38FF | |
| : | : |
| 3968 | Servo parameter change number 1□□□ Axis 32 |
| 3969 | |
| 396A | |
| 396B | |
| 396C | |
| 396D | |
| 396E | |
| 396F | |
| 3970 | Reserved |
| : | |
| 39EF | |

(2) Details on servo amplifier change number on axis n (SSCNETⅢ/H)

| Address | Name | Abbreviation | Remarks |
|---|---|---|---|
| 3870<br>3871 | Servo parameter change number 11□□ | PSN11 | bit0: Parameter No.1100 to 111F<br>to<br>bit15: Parameter No.11F0 to 11FF |
| 3872<br>3873 | Servo parameter change number 12□□ | PSN12 | bit0: Parameter No.1200 to 121F<br>to<br>bit15: Parameter No.12F0 to 12FF |
| 3874<br>3875 | Servo parameter change number 13□□ | PSN13 | bit0: Parameter No.1300 to 131F<br>to<br>bit7: Parameter No.1370 to 137F |
| 3876<br>3877 | Reserved | | |

Note. The address in the table is the address for the axis 1. For the axis 2 and above, increase in units of 8h for each axis.

## 10.10 Transient transmit command/status table

### (1) Transient transmit command table

| Address | Content |
|---|---|
| D400 | Command transmission request |
| D401 | |
| D402 | Transient command |
| D403 | |
| D404 | Request data 1 |
| D405 | |
| D406 | Request data 2 |
| D407 | |
| D408 | Request data 3 |
| D409 | |
| D40A | Request data 4 |
| D40B | |
| D40C | Reserved |
| D40D | |
| D40E | |
| D40F | |

Note 1. The addresses above are the addresses for the first axis. For the second axis and after, increase by 20h for each axis.
Note 2. The start address for the first station is DA00h. For the second station and after, increase by 20h for each station.

### (2) Transient transmit status table

| Address | Content |
|---|---|
| D410 | Transient status |
| D411 | |
| D412 | Reserved |
| D413 | |
| D414 | Response data 1 |
| D415 | |
| D416 | Response data 2 |
| D417 | |
| D418 | Response data 3 |
| D419 | |
| D41A | Response data 4 |
| D41B | |
| D41C | Reserved |
| D41D | |
| D41E | |
| D41F | |

Note 1. The addresses above are the addresses for the first axis. For the second axis and after, increase by 20h for each axis.
Note 2. The start address for the first station is DA10h. For the second station and after, increase by 20h for each station.

## 10.11 Point number offset

The first number in the point table for each axis can be designated using point number offset.
The amount of offset from the first point in the point table is set by the point number for the point number 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 = 5000h + 20h × point number offset

When the point number offset of the axis 2 is 0020h, the dual port memory address calculates to.

5000h + 20h × 0020h = 5400h

Set the point table for the axis 2 from 5400h.

| Address | Content | Initial Value |
|---|---|---|
| 4FA0 | Axis 1 point number offset | 0000h |
| 4FA1 | | |
| 4FA2 | Axis 2 point number offset | 0008h |
| 4FA3 | | |
| 4FA4 | Axis 3 point number offset | 0010h |
| 4FA5 | | |
| 4FA6 | Axis 4 point number offset | 0018h |
| 4FA7 | | |
| 4FA8 | Axis 5 point number offset | 0020h |
| 4FA9 | | |
| 4FAA | Axis 6 point number offset | 0028h |
| 4FAB | | |
| 4FAC | Axis 7 point number offset | 0030h |
| 4FAD | | |
| 4FAE | Axis 8 point number offset | 0038h |
| 4FAF | | |
| 4FB0 | Axis 9 point number offset | 0040h |
| 4FB1 | | |
| 4FB2 | Axis 10 point number offset | 0048h |
| 4FB3 | | |
| 4FB4 | Axis 11 point number offset | 0050h |
| 4FB5 | | |

| Address | Content | Initial Value |
|---|---|---|
| 4FB6 | Axis 12 point number offset | 0058h |
| 4FB7 | | |
| 4FB8 | Axis 13 point number offset | 0060h |
| 4FB9 | | |
| 4FBA | Axis 14 point number offset | 0068h |
| 4FBB | | |
| 4FBC | Axis 15 point number offset | 0070h |
| 4FBD | | |
| 4FBE | Axis 16 point number offset | 0078h |
| 4FBF | | |
| 4FC0 | Axis 17 point number offset | 0080h |
| 4FC1 | | |
| 4FC2 | Axis 18 point number offset | 0088h |
| 4FC3 | | |
| : | : | : |
| 4FDE | Axis 32 point number offset | 0098h |
| 4FDF | | |
| 4FE0 | Reserved | |
| : | | |
| 4FEF | | |

## 10.12 Command buffers

### (1) Position command buffer

| Address | Content |
|---|---|
| 5000 | Position command buffer 0 (pulse) |
| 5001 | |
| 5002 | |
| 5003 | |
| 5004 | Position command buffer 1 (pulse) |
| 5005 | |
| 5006 | |
| 5007 | |
| 5008 | Position command buffer 2 (pulse) |
| 5009 | |
| 500A | |
| 500B | |
| 500C | Position command buffer 3 (pulse) |
| 500D | |
| 500E | |
| 500F | |
| 5010 | Position command buffer 4 (pulse) |
| 5011 | |
| 5012 | |
| 5013 | |
| 5014 | Position command buffer 5 (pulse) |
| 5015 | |
| 5016 | |
| 5017 | |
| 5018 | Position command buffer 6 (pulse) |
| 5009 | |
| 501A | |
| 501B | |
| 501C | Position command buffer 7 (pulse) |
| 501D | |
| 501E | |
| 501F | |
| 5020 | Position command buffer 8 (pulse) |
| 5021 | |
| 5022 | |
| 5023 | |
| 5024 | Position command buffer 9 (pulse) |
| 5025 | |
| 5026 | |
| 5027 | |
| 5028 | Position command buffer 10 (pulse) |
| 5029 | |
| 502A | |
| 502B | |

| Address | Content |
|---|---|
| 502C | Position command buffer 11 (pulse) |
| 502D | |
| 502E | |
| 502F | |
| 5030 | Position command buffer 12 (pulse) |
| 5031 | |
| 5032 | |
| 5033 | |
| 5034 | Position command buffer 13 (pulse) |
| 5035 | |
| 5036 | |
| 5037 | |
| 5038 | Position command buffer 14 (pulse) |
| 5039 | |
| 503A | |
| 503B | |
| 503C | Position command buffer 15 (pulse) |
| 503D | |
| 503E | |
| 503F | |
| 5040 | Position command buffer 16 (pulse) |
| 5041 | |
| 5042 | |
| 5043 | |
| 5044 | : |
| : | |
| 50EF | |
| 50F0 | Position command buffer 60 (pulse) |
| 50F1 | |
| 50F2 | |
| 50F3 | |
| 50F4 | Position command buffer 61 (pulse) |
| 50F5 | |
| 50F6 | |
| 50F7 | |
| 50F8 | Position command buffer 62 (pulse) |
| 50F9 | |
| 50FA | |
| 50FB | |
| 50FC | Position command buffer 63 (pulse) |
| 50FD | |
| 50FE | |
| 50FF | |

Note. The addresses in the table are the addresses for the axis 1. For the axis 2 and above, increase the units of 100h for each axis.

(2) Speed command buffer

| Address | Content |
|---|---|
| 7800 | Speed command buffer 0 (0.01r/min) |
| 7801 | |
| 7802 | |
| 7803 | |

Note 1. Setting range: -1000000000 (-10000000r/min) to 1000000000 (10000000r/min)
2. The addresses above are the addresses for the first axis.
For the second axis and after, increase by 80h for each axis.

(3) Torque command buffer

| Address | Content |
|---|---|
| 8C00 | Torque command buffer 0 (0.1%) (When parameter No.010D is 0, positive: CCW negative: CW) |
| 8C01 | |
| 8C02 | |
| 8C03 | |

Note 1. Setting range: -32768 (-3276.8%) to 32767 (3276.7%)
2. The addresses above are the addresses for the first axis.
For the second axis and after, increase by 80h for each axis.

## 10.13 Digital I/O table

### (1) Digital input table

| Address | Digital input area number | Digital input number | Symbol | Remarks |
|---|---|---|---|---|
| B000 | Digital input area 0<br>(2 bytes) | Digital input 0<br>to Digital input 15 | DI_000<br>to DI_00F | Notifies the status of the digital input signal.<br>The bits are DI_000 (bit0) to DI_00F (bit15). |
| B002 | Digital input area 1<br>(2 bytes) | Digital input 16<br>to Digital input 31 | DI_010<br>to DI_01F | Notifies the status of the digital input signal.<br>The bits are DI_010(bit0) to DI_01F(bit15). |
| B004 | Digital input area 2<br>(2 bytes) | Digital input 32<br>to Digital input 47 | DI_020<br>to DI_02F | Notifies the status of the digital input signal.<br>The bits are DI_020(bit0) to DI_02F(bit15). |
| B006 | Digital input area 3<br>(2 bytes) | Digital input 48<br>to Digital input 63 | DI_030<br>to DI_03F | Notifies the status of the digital input signal.<br>The bits are DI_030(bit0) to DI_03F(bit15). |
| B008 | Digital input area 4<br>(2 bytes) | Digital input 64<br>to Digital input 79 | DI_040<br>to DI_04F | Notifies the status of the digital input signal.<br>The bits are DI_040(bit0) to DI_04F(bit15). |
| B00A | Digital input area 5<br>(2 bytes) | Digital input 80<br>to Digital input 95 | DI_050<br>to DI_05F | Notifies the status of the digital input signal.<br>The bits are DI_050(bit0) to DI_05F(bit15). |
| B00C | Digital input area 6<br>(2 bytes) | Digital input 96<br>to Digital input 111 | DI_060<br>to DI_06F | Notifies the status of the digital input signal.<br>The bits are DI_060(bit0) to DI_06F(bit15). |
| B00E | Digital input area 7<br>(2 bytes) | Digital input 112<br>to Digital input 127 | DI_070<br>to DI_07F | Notifies the status of the digital input signal.<br>The bits are DI_070(bit0) to DI_07F(bit15). |
| : | : | : | : | : |
| B07E | Digital input area 63<br>(2 bytes) | Digital input 1008<br>to Digital input 1023 | DI_3F0<br>to DI_3FF | Notifies the status of the digital input signal.<br>The bits are DI_3F0(bit0) to DI_3FF(bit15). |

### (2) Digital output table

| Address | Digital input area number | Digital input number | Symbol | Remarks |
|---|---|---|---|---|
| B080 | Digital output area 0<br>(2 bytes) | Digital output 0<br>to Digital output 15 | DO_000<br>to DO_00F | Turns on/off the digital output signal.<br>The bits are DO_000(bit0) to DO_00F(bit15). |
| B082 | Digital output area 1<br>(2 bytes) | Digital output 16<br>to Digital output 31 | DO_010<br>to DO_01F | Turns on/off the digital output signal.<br>The bits are DO_010(bit0) to DO_01F(bit15). |
| B084 | Digital output area 2<br>(2 bytes) | Digital output 32<br>to Digital output 47 | DO_020<br>to DO_02F | Turns on/off the digital output signal.<br>The bits are DO_020(bit0) to DO_02F(bit15). |
| B086 | Digital output area 3<br>(2 bytes) | Digital output 48<br>to Digital output 63 | DO_030<br>to DO_03F | Turns on/off the digital output signal.<br>The bits are DO_030(bit0) to DO_03F(bit15). |
| B088 | Digital output area 4<br>(2 bytes) | Digital output 64<br>to Digital output 79 | DO_040<br>to DO_04F | Turns on/off the digital output signal.<br>The bits are DO_040(bit0) to DO_04F(bit15). |
| B08A | Digital output area 5<br>(2 bytes) | Digital output 80<br>to Digital output 95 | DO_050<br>to DO_05F | Turns on/off the digital output signal.<br>The bits are DO_050(bit0) to DO_05F(bit15). |
| B08C | Digital output area 6<br>(2 bytes) | Digital output 96<br>to Digital output 111 | DO_060<br>to DO_06F | Turns on/off the digital output signal.<br>The bits are DO_060(bit0) to DO_06F(bit15). |
| B08E | Digital output area 7<br>(2 bytes) | Digital output 112<br>to Digital output 127 | DO_070<br>to DO_07F | Turns on/off the digital output signal.<br>The bits are DO_070(bit0) to DO_07F(bit15). |
| : | : | : | : | : |
| B0FE | Digital output area 63<br>(2 bytes) | Digital output 1008<br>to Digital output 1023 | DO_3F0<br>to DO_3FF | Turns on/off the digital output signal.<br>The bits are DO_3F0(bit0) to DO_3FF(bit15). |

## 10.14 I/O device table

### (1) Input device table

| Address | Content |
|---|---|
| DB00 | Input word device 0 |
| DB01 | |
| DB02 | Input word device 1 |
| DB03 | |
| DB04 | Input word device 2 |
| DB05 | |
| DB06 | Input word device 3 |
| DB07 | |
| DB08 | Input word device 4 |
| DB09 | |
| DB0A | Input word device 5 |
| DB0B | |
| DB0C | Input word device 6 |
| DB0D | |
| DB0E | Input word device 7 |
| DB0F | |

| Address | Content |
|---|---|
| DB10 | Input word device 8 |
| DB11 | |
| DB12 | Input word device 9 |
| DB13 | |
| DB14 | Input word device 10 |
| DB15 | |
| DB16 | : |
| : | |
| DCF9 | |
| DCFA | Input word device 253 |
| DCFB | |
| DCFC | Input word device 254 |
| DCFD | |
| DCFE | Input word device 255 |
| DCFF | |

### (2) Output device table

| Address | Content |
|---|---|
| DD00 | Output word device 0 |
| DD01 | |
| DD02 | Output word device 1 |
| DD03 | |
| DD04 | Output word device 2 |
| DD05 | |
| DD06 | Output word device 3 |
| DD07 | |
| DD08 | Output word device 4 |
| DD09 | |
| DD0A | Output word device 5 |
| DD0B | |
| DD0C | Output word device 6 |
| DD0D | |
| DD0E | Output word device 7 |
| DD0F | |

| Address | Content |
|---|---|
| DD10 | Output word device 8 |
| DD11 | |
| DD12 | Output word device 9 |
| DD13 | |
| DD14 | Output word device 10 |
| DD15 | |
| DD16 | : |
| : | |
| DEF9 | |
| DEFA | Output word device 253 |
| DEFB | |
| DEFC | Output word device 254 |
| DEFD | |
| DEFE | Output word device 255 |
| DEFF | |

## 10.15 Mark detection command/status table

(1) Mark detection command table

The column in the table for when tandem drive is being used is for axis data classification for when using tandem drive synchronous mode.

Each axis: The data valid for both the master axis and slave axis (refer to Section 8.3)

| Address | Name | When in tandem drive |
|---|---|---|
| B4F0 | Read complete buffer number 1 | Each axis |
| B4F1 | Read complete buffer number 2 | Each axis |
| B4F2 | Reserved | |
| B4F3 | | |
| B4F4 | | |
| B4F5 | | |
| B4F6 | | |
| B4F7 | | |
| B4F8 | | |
| B4F9 | | |
| B4FA | | |
| B4FB | | |
| B4FC | | |
| B4FD | | |
| B4FE | | |
| B4FF | | |

Note. The addresses above are the addresses for the first axis.
For the second axis and after, increase by 20h for each axis.

(2) Mark detection status table

The column in the table for when tandem drive is being used is for axis data classification for when using tandem drive synchronous mode.

Each axis: The data valid for both the master axis and slave axis (refer to Section 8.3)

| Address | Name | When in tandem drive |
|---|---|---|
| B500 | Start data storage area 1 | Each axis |
| B501 | Number of continuous latch data storages 1 | Each axis |
| B502 | Number of mark detections counter 1 | Each axis |
| B503 | Mark detection mode 1 | Each axis |
| B504 | Start data storage area 2 | Each axis |
| B505 | Number of continuous latch data storages 2 | Each axis |
| B506 | Number of mark detections counter 2 | Each axis |
| B507 | Mark detection mode 2 | Each axis |
| B508 | Reserved | |
| B509 | | |
| B50A | | |
| B50B | | |
| B50C | | |
| B50D | | |
| B50E | | |
| B50F | | |

Note. The addresses above are the addresses for the first axis.
For the second axis and after, increase by 20h for each axis.

## 10.16 Mark detection data tables

(1) Mark detection edge data table

This data shows the detection edges for every positioning data of the mark detection positioning data table.
0: Not detected 1: OFF edge 2: ON edge

| Address | Content |
|---|---|
| BAF0 | Mark detection edge data 0 |
| BAF1 | Mark detection edge data 1 |
| BAF2 | Mark detection edge data 2 |
| BAF3 | Mark detection edge data 3 |
| BAF4 | Mark detection edge data 4 |
| BAF5 | Mark detection edge data 5 |
| BAF6 | Mark detection edge data 6 |
| BAF7 | Mark detection edge data 7 |

| Address | Content |
|---|---|
| BAF8 | Mark detection edge data 8 |
| BAF9 | Mark detection edge data 9 |
| BAFA | Mark detection edge data 10 |
| : | : |
| BB2C | Mark detection edge data 60 |
| BB2D | Mark detection edge data 61 |
| BB2E | Mark detection edge data 62 |
| BB2F | Mark detection edge data 63 |

(2) Mark detection positioning data table

| Address | Content |
|---|---|
| BB30 | Mark detection positioning data 0 |
| BB31 | |
| BB32 | |
| BB33 | |
| BB34 | Mark detection positioning data 1 |
| BB35 | |
| BB36 | |
| BB37 | |
| BB38 | Mark detection positioning data 2 |
| BB39 | |
| BB3A | |
| BB3B | |
| BB3C | Mark detection positioning data 3 |
| BB3D | |
| BB3E | |
| BB3F | |
| BB40 | Mark detection positioning data 4 |
| BB41 | |
| BB42 | |
| BB43 | |
| BB44 | Mark detection positioning data 5 |
| BB45 | |
| BB46 | |
| BB47 | |
| BB48 | Mark detection positioning data 6 |
| BB49 | |
| BB4A | |
| BB4B | |
| BB4C | Mark detection positioning data 7 |
| BB4D | |
| BB4E | |
| BB4F | |

| Address | Content |
|---|---|
| BB50 | Mark detection positioning data 8 |
| BB51 | |
| BB52 | |
| BB53 | |
| BB54 | Mark detection positioning data 9 |
| BB55 | |
| BB56 | |
| BB57 | |
| BB58 | Mark detection positioning data 10 |
| BB59 | |
| BB5A | |
| BB5B | |
| BB5C | : |
| : | |
| BC1F | |
| BC20 | Mark detection positioning data 60 |
| BC21 | |
| BC22 | |
| BC23 | |
| BC24 | Mark detection positioning data 61 |
| BC25 | |
| BC26 | |
| BC27 | |
| BC28 | Mark detection positioning data 62 |
| BC29 | |
| BC2A | |
| BC2B | |
| BC2C | Mark detection positioning data 63 |
| BC2D | |
| BC2E | |
| BC2F | |

## 10.17 Continuous operation to torque control data table

| Address | Abbreviation | Name | At manual switch selection |
|---|---|---|---|
| A840 | PRCPS | Continuous operation to torque control switching position (4 bytes) | Invalid |
| A841 | | | |
| A842 | | | |
| A843 | | | |
| A844 | PRLMPS | Press limit position (4 bytes) | Valid |
| A845 | | | |
| A846 | | | |
| A847 | | | |
| A848 | PRCTSP | Continuous operation to torque control speed limit value (4 bytes) | Valid |
| A849 | | | |
| A84A | | | |
| A84B | | | |
| A84C | PRTGTR | Target torque (2 bytes) | Valid |
| A84D | | | |
| A84E | PRTM | Press time (2 bytes) | Invalid |
| A84E | | | |
| A850 | PRTRW | Torque settle width (2 bytes) | Valid |
| A851 | | | |
| A852 | PRWTM | Torque settle waiting time (2 bytes) | Valid |
| A853 | | | |
| A854 | PRCA | Continuous operation to torque control acceleration time constant (2 bytes) | Valid |
| A855 | | | |
| A856 | PRCD | Continuous operation to torque control deceleration time constant (2 bytes) | Valid |
| A857 | | | |
| A858 | PRCOP | Continuous operation to torque control operating conditions (2 bytes) | Valid |
| A859 | | | |
| A85A | | Reserved | |
| A85B | | | |
| A85C | | | |
| A85D | | | |
| A85E | | | |
| A85F | | | |

Note. The addresses above are the addresses for the first axis. For the second axis and after, increase by 20h for each axis.

# MEMO

# 11. PARAMETERS



Concerning the parameters for which the parameter name shows that it is set by manufacturer, do not use other than the default values. If erroneous values are set, unexpected movement can occur.
The parameters are classified as is shown below.

| Classification | | (Note) Parameter No. | Remarks |
|---|---|---|---|
| System parameters | | No. 0001 to 007F | |
| Servo amplifier | Servo parameters | No. 1100 to 1380 | Each axis |
| | Control parameters | No. 0200 to 02FF | Each axis |
| SSCNETⅢ/H head module | RIO module parameters | | Each station |
| | RIO control parameters | No. 0200 to 023F | Each station |

Note. Parameter numbers are given in hexadecimal.

## 11.1 System parameters

**POINT**

- The settings for the parameters with a * mark at the front of the abbreviation are validated when the system is restarted.

| Parameter No. | Symbol | Name | Initial Value | Units | Setting range | Function |
|---|---|---|---|---|---|---|
| 0001 | *SYSOP1 | System option 1 | 0000h | | 0000h to 0002h | 0 \| \| 0 \|<br>Set the control cycle<br>0: 0.88ms<br>1: 0.44ms<br>2: 0.22ms<br>SSCNET communication method<br>Set the SSCNET communication method.<br>0: SSCNETⅢ /H<br>(Note) SSCNET communication method is shared in lines 1 and 2. |
| 0002 | *SYSOP2 | System option 2 | 0000h | | 0000h to 1101h | \| \| 0 \|<br>Axis/station No. assignment<br>Set 1 when validating axis/station No. assignment. When axis/station No. assignment is invalid, axis/station No. is automatically assigned.<br>0: Invalid<br>1: Valid<br>Consistency check selection at system startup<br>Set whether to perform consistency check for controlled axes setting at system startup.<br>0: Valid<br>1: Invalid<br>Control mode selection<br>Set the control mode.<br>0: Standard mode<br>1: Interface mode |
| 0003 | | For manufacturer setting | 0 | | | |
| 0004 | SITM | System interrupt conditions | 0000h | | 0000h to FFFFh | Set the interrupt conditions for the system. |
| 0005 | | For manufacturer setting | 0 | | | |
| 0006 | | | 0 | | | |
| 0007 | | | 0 | | | |
| 0008 | | | 0 | | | |
| 0009 | | | 0 | | | |
| 000A | | | 0 | | | |
| 000B | | | 0 | | | |
| 000C | | | 0 | | | |
| 000D | | | 0 | | | |
| 000E | *EMID | External forced stop disabled | 0000h | | 0000h to FFFFh | Disable the forced stop by EMI signal.<br>5AE1h : Forced stop disabled<br>Other than 5AE1h: Forced stop enabled |

| Parameter No. | Symbol | Name | Initial Value | Units | Setting range | Function |
|---|---|---|---|---|---|---|
| 000F | *IFM0 | Interface mode option | 0000h | | 0000h to 0F0Fh | 0 \| \| 0 \|<br>Interrupt output cycle<br>When interrupt by interface mode is valid, set the cycle for which the interrupt is output.<br>Interrupt output cycle:<br>Control cycle×(setting value+1)<br>Example: When interrupt output cycle is set to 1 and control cycle is 0.88ms, interrupt is output approximately every 1.77ms.<br>Command data update cycle<br>Set the cycle for which position command is updated in interface mode.<br>Command data update cycle:<br>Control cycle×(setting value+1)<br>Example: When command data update cycle is set to 2 and control cycle is 0.88ms, position command is updated approximately every 2.66ms. |
| 0010<br>:<br>003F | | For manufacturer setting | 0<br>:<br>0 | | | |
| 0040 | LGS1 | Log acquiring selection 1 (Note) | 0000h | | 0000h to 0001h | Set whether to acquire the log of the system when the log function is used.<br>System (bit 0)<br>0: Not acquire 1: Acquire |
| 0041 | LGS2 | Log acquiring selection 2 (Note) | 0000h | | 0000h to FFFFh | Set the axis No. for which the log is to be acquired.<br>Axis 1 (bit 0) to axis 16 (bit 15)<br>0: Not acquire 1: Acquire |
| 0042 | LGS3 | Log acquiring selection 3 (Note) | 0000h | | 0000h to FFFFh | Set the axis No. for which the log is to be acquired.<br>Axis 17 (bit 0) to axis 32 (bit 15)<br>0: Not acquire 1: Acquire |
| 0043<br>0044<br>0045<br>0046<br>0047<br>0048<br>0049 | | For manufacturer setting | 0000h<br>0000h<br>0<br>0<br>0000h<br>0<br>0 | | | |
| 004A | *IOTBL | I/O table | 0000h | | 0000h to 0001h | 0 0 0 \|<br>I/O table selection<br>Set the I/O table to be used.<br>0: Use digital I/O table<br>1: Use I/O device table |
| 004B<br>:<br>007F | | For manufacturer setting | 0<br>:<br>0 | | | |

Note. When all the system parameters of the log acquiring selection (parameters No. 0040 to 0043) are set to 0000h (initial value), log for all axes and systems will be acquired.

## 11.2 Servo parameters

### 11.2.1 Servo amplifier MR-J4(W□)-□B

The parameters described in this section are for using the servo amplifier MR-J4(W□)-□B. For details, refer to the Servo Amplifier Instruction Manual on your servo amplifier.

POINT

- The parameters with a * mark in front of the parameter abbreviation become valid according to the following conditions.
  - *: The setting value for the system startup or the SSCNET reconnection is valid. The parameter change after the system startup is invalid.
  - **: The setting value for the system startup or the SSCNET reconnection is valid. However, after the system startup, turn off the power supply of the servo amplifier once, and it is necessary to turn on it again. The parameter change after the system startup is invalid.

(1) Menu A) Basic settings

| Parameter No. | MR-J4-B Parameter No. | Symbol | Name | Initial Value | Units |
|---|---|---|---|---|---|
| 1100 | PA01 | **STY | Operation mode | 1000h | |
| 1101 | PA02 | **REG | Regenerative option | 0000h | |
| 1102 | PA03 | *ABS | Absolute position detection system | 0000h | |
| 1103 | PA04 | *AOP1 | Function selection A-1 | 2000h | |
| 1104 | PA05 | | For manufacturer setting | 10000 | |
| 1105 | PA06 | | | 1 | |
| 1106 | PA07 | | | 1 | |
| 1107 | PA08 | ATU | Auto tuning mode | 0001h | |
| 1108 | PA09 | RSP | Auto tuning response | 16 | |
| 1109 | PA10 | INP | In-position range | 1600 | pulse |
| 110A | PA11 | | For manufacturer setting | 10000 | |
| 110B | PA12 | | | 10000 | |
| 110C | PA13 | | | 0000h | |
| 110D | PA14 | *POL | Rotation direction selection/travel direction selection | 0 | |
| 110E | PA15 | *ENR | Encoder output pulses | 4000 | pulse/rev |
| 110F | PA16 | *ENR2 | Encoder output pulses 2 | 1 | |
| 1110 | PA17 | **MSR | Servo motor series setting | 0000h | |
| 1111 | PA18 | **MTY | Servo motor type setting | 0000h | |
| 1112 | PA19 | *BLK | Parameter writing inhibit | 00ABh | |
| 1113 | PA20 | *TDS | Tough drive setting | 0000h | |
| 1114 | PA21 | *AOP3 | Function selection A-3 | 0001h | |
| 1115 | PA22 | **PCS | Position control composition selection | 0000h | |
| 1116 | PA23 | DRAT | Drive recorder arbitrary alarm trigger setting | 0000h | |
| 1117 | PA24 | AOP4 | Function selection A-4 | 0000h | |
| 1118 | PA25 | OTHOV | One-touch tuning - Overshoot permissible level | 0000h | % |
| 1119 | PA26 | *AOP5 | Function selection A-5 (Note) | 0000h | |
| 111A | PA27 | | For manufacturer setting | 0000h | |
| 111B | PA28 | | | 0000h | |
| 111C | PA29 | | | 0000h | |
| 111D | PA30 | | | 0000h | |
| 111E | PA31 | | | 0000h | |
| 111F | PA32 | | | 0000h | |
| 1120 | PA33 | | | 0000h | |
| : | : | | | : | |
| 113F | PA64 | | | 0000h | |

Note. MR-J4-□B use.

(2) Menu B) Gain filter settings

| Parameter No. | MR-J4-B Parameter No. | Symbol | Name | Initial Value | Units |
|---|---|---|---|---|---|
| 1140 | PB01 | FILT | Adaptive tuning mode (adaptive filter Ⅱ) | 0000h | |
| 1141 | PB02 | VRFT | Vibration suppression control tuning mode (advanced vibration suppression control Ⅱ) | 0000h | |
| 1142 | PB03 | TFBGN | Torque feedback loop gain | 18000 | rad/s |
| 1143 | PB04 | FFC | Feed forward gain | 0 | % |
| 1144 | PB05 | | For manufacturer setting | 500 | |
| 1145 | PB06 | GD2 | Load to motor inertia ratio/load to motor mass ratio | 700 | 0.01 times |
| 1146 | PB07 | PG1 | Model loop gain | 150 | 0.1 rad/s |
| 1147 | PB08 | PG2 | Position loop gain | 370 | 0.1 rad/s |
| 1148 | PB09 | VG2 | Speed loop gain | 823 | rad/s |
| 1149 | PB10 | VIC | Speed integral compensation | 337 | 0.1ms |
| 114A | PB11 | VDC | Speed differential compensation | 980 | |
| 114B | PB12 | OVA | Overshoot amount compensation | 0 | % |
| 114C | PB13 | NH1 | Machine resonance suppression filter 1 | 4500 | Hz |
| 114D | PB14 | NHQ1 | Notch shape selection 1 | 0000h | |
| 114E | PB15 | NH2 | Machine resonance suppression filter 2 | 4500 | Hz |
| 114F | PB16 | NHQ2 | Notch shape selection 2 | 0000h | |
| 1150 | PB17 | NHF | Shaft resonance suppression filter | 0000h | |
| 1151 | PB18 | LPF | Low-pass filter setting | 3141 | rad/s |
| 1152 | PB19 | VRF11 | Vibration suppression control 1 - Vibration frequency | 1000 | 0.1Hz |
| 1153 | PB20 | VRF12 | Vibration suppression control 1 - Resonance frequency | 1000 | 0.1Hz |
| 1154 | PB21 | VRF13 | Vibration suppression control 1 - Vibration frequency damping | 0 | 0.1 |
| 1155 | PB22 | VRF14 | Vibration suppression control 1 - Resonance frequency damping | 0 | 0.1 |
| 1156 | PB23 | VFBF | Low-pass filter selection | 0000h | |
| 1157 | PB24 | *MVS | Slight vibration suppression control | 0000h | |
| 1158 | PB25 | *BOP1 | Function selection B-1 | 0000h | |
| 1159 | PB26 | *CDP | Gain switching function | 0000h | |
| 115A | PB27 | CDL | Gain switching condition | 10 | kpps<br>pulse<br>r/min |
| 115B | PB28 | CDT | Gain switching time constant | 1 | ms |
| 115C | PB29 | GD2B | Load to motor inertia ratio/load to motor mass ratio after gain switching | 700 | 0.01 times |
| 115D | PB30 | PG2B | Position loop gain after gain switching | 0 | 0.1 rad/s |
| 115E | PB31 | VG2B | Speed loop gain after gain switching | 0 | rad/s |
| 115F | PB32 | VICB | Speed integral compensation after gain switching | 0 | 0.1ms |

| Parameter No. | MR-J4-B Parameter No. | Symbol | Name | Initial Value | Units |
|---|---|---|---|---|---|
| 1160 | PB33 | VRF11B | Vibration suppression control 1 - Vibration frequency after gain switching | 0 | 0.1Hz |
| 1161 | PB34 | VRF12B | Vibration suppression control 1 - Resonance frequency after gain switching | 0 | 0.1Hz |
| 1162 | PB35 | VRF13B | Vibration suppression control 1- Vibration frequency damping after gain switching | 0 | 0.01 |
| 1163 | PB36 | VRF14B | Vibration suppression control 1- Resonance frequency damping after gain switching | 0 | 0.01 |
| 1164 | PB37 | | For manufacturer setting | 1600 | |
| 1165 | PB38 | | | 0 | |
| 1166 | PB39 | | | 0 | |
| 1167 | PB40 | | | 0 | |
| 1168 | PB41 | | | 0 | |
| 1169 | PB42 | | | 0 | |
| 116A | PB43 | | | 0000h | |
| 116B | PB44 | | | 0 | |
| 116C | PB45 | CNHF | Command notch filter | 0000h | |
| 116D | PB46 | NH3 | Machine resonance suppression filter 3 | 4500 | Hz |
| 116E | PB47 | NHQ3 | Notch shape selection 3 | 0000h | |
| 116F | PB48 | NH4 | Machine resonance suppression filter 4 | 4500 | Hz |
| 1170 | PB49 | NHQ4 | Notch shape selection 4 | 0000h | |
| 1171 | PB50 | NH5 | Machine resonance suppression filter 5 | 4500 | Hz |
| 1172 | PB51 | NHQ5 | Notch shape selection 5 | 0000h | |
| 1173 | PB52 | VRF21 | Vibration suppression control 2 - Vibration frequency | 1000 | 0.1Hz |
| 1174 | PB53 | VRF22 | Vibration suppression control 2 - Resonance frequency | 1000 | 0.1Hz |
| 1175 | PB54 | VRF23 | Vibration suppression control 2 - Vibration frequency damping | 0 | 0.01 |
| 1176 | PB55 | VRF24 | Vibration suppression control 2 - Resonance frequency damping | 0 | 0.01 |
| 1177 | PB56 | VRF21B | Vibration suppression control 2 - Vibration frequency after gain switching | 0 | 0.1Hz |
| 1178 | PB57 | VRF22B | Vibration suppression control 2 - Resonance frequency after gain switching | 0 | 0.1Hz |
| 1179 | PB58 | VRF23B | Vibration suppression control 2 - Vibration frequency damping after gain switching | 0 | 0.01 |
| 117A | PB59 | VRF24B | Vibration suppression control 2 - Resonance frequency damping after gain switching | 0 | 0.01 |
| 117B | PB60 | PG1B | Model loop gain after gain switching | 0 | 0.1rad/s |
| 117C | PB61 | | For manufacturer setting | 0 | |
| 117D | PB62 | | | 0000h | |
| 117E | PB63 | | | 0000h | |
| 117F | PB64 | | | 0000h | |

(3) Menu C) Expansion settings 1

| Parameter No. | MR-J4-B Parameter No. | Symbol | Name | Initial Value | Units |
|---|---|---|---|---|---|
| 1180 | PC01 | ERZ | Error excessive alarm level | 0 | rev or mm |
| 1181 | PC02 | MBR | Electromagnetic brake sequence output | 0 | ms |
| 1182 | PC03 | *ENRS | Encoder output pulse selection | 0000h | |
| 1183 | PC04 | **COP1 | Function selection C-1 | 0000h | |
| 1184 | PC05 | **COP2 | Function selection C-2 | 0000h | |
| 1185 | PC06 | *COP3 | Function selection C-3 | 0000h | |
| 1186 | PC07 | ZSP | Zero speed | 50 | r/min or mm/s |
| 1187 | PC08 | OSL | Overspeed alarm detection level | 0 | r/min or mm/s |
| 1188 | PC09 | MOD1 | Analog monitor 1 output | 0000h | |
| 1189 | PC10 | MOD2 | Analog monitor 2 output | 0001h | |
| 118A | PC11 | MO1 | Analog monitor 1 offset | 0 | mV |
| 118B | PC12 | MO2 | Analog monitor 2 offset | 0 | mV |
| 118C | PC13 | MOSDL | Analog monitor - Feedback position output standard data - Low | 0 | pulse |
| 118D | PC14 | MOSDH | Analog monitor - Feedback position output standard data - High | 0 | 10000 pulses |
| 118E | PC15 | | For manufacturer setting | 0 | |
| 118F | PC16 | | | 0000h | |
| 1190 | PC17 | **COP4 | Function selection C-4 | 0000h | |
| 1191 | PC18 | *COP5 | Function selection C-5 | 0000h (Note 1) | |
| 1192 | PC19 | | For manufacturer setting | 0000h | |
| 1193 | PC20 | *COP7 | Function selection C-7 | 0000h | |
| 1194 | PC21 | *BPS | Alarm history clear | 0000h | |
| 1195 | PC22 | | For manufacturer setting | 0 | |
| 1196 | PC23 | | | 0000h | |
| 1197 | PC24 | RSBR | Forced stop deceleration time constant | 100 | ms |
| 1198 | PC25 | | For manufacturer setting | 0 | |
| 1199 | PC26 | **COP8 | Function selection C-8 (Note 2) | 0000h | |
| 119A | PC27 | **COP9 | Function selection C-9 | 0000h | |
| 119B | PC28 | | For manufacturer setting | 0000h | |
| 119C | PC29 | *COPB | Function selection C-B | 0000h | |
| 119D | PC30 | | For manufacturer setting | 0 | |
| 119E | PC31 | RSUP1 | Vertical axis freefall prevention compensation amount | 0 | 0.0001rev or 0.01mm |
| 119F | PC32 | | For manufacturer setting | 0000h | |

Note. 1. For position board, the initial value is "1000h".
2. MR-J4-□B use.

| Parameter No. | MR-J4-B Parameter No. | Symbol | Name | Initial Value | Units |
|---|---|---|---|---|---|
| 11A0 | PC33 | | For manufacturer setting | 0 | |
| 11A1 | PC34 | | | 100 | |
| 11A2 | PC35 | | | 0000h | |
| 11A3 | PC36 | | | 0000h | |
| 11A4 | PC37 | | | 0000h | |
| 11A5 | PC38 | ERW | Error excessive warning level (Note 3) | 0 | rev/mm |
| 11A6 | PC39 | | For manufacturer setting | 0000h | |
| 11A7 | PC40 | | | 0000h | |
| 11A8 | PC41 | | | 0000h | |
| 11A9 | PC42 | | | 0000h | |
| 11AA | PC43 | | | 0000h | |
| 11AB | PC44 | | | 0000h | |
| 11AC | PC45 | | | 0000h | |
| 11AD | PC46 | | | 0000h | |
| 11AE | PC47 | | | 0000h | |
| 11AF | PC48 | | | 0000h | |
| 11B0 | PC49 | | | 0000h | |
| 11B1 | PC50 | | | 0000h | |
| 11B2 | PC51 | | | 0000h | |
| 11B3 | PC52 | | | 0000h | |
| 11B4 | PC53 | | | 0000h | |
| 11B5 | PC54 | | | 0000h | |
| 11B6 | PC55 | | | 0000h | |
| 11B7 | PC56 | | | 0000h | |
| 11B8 | PC57 | | | 0000h | |
| 11B9 | PC58 | | | 0000h | |
| 11BA | PC59 | | | 0000h | |
| 11BB | PC60 | | | 0000h | |
| 11BC | PC61 | | | 0000h | |
| 11BD | PC62 | | | 0000h | |
| 11BE | PC63 | | | 0000h | |
| 11BF | PC64 | | | 0000h | |

Note. 3. MR-J4W□-□B use.

(4) Menu D) I/O settings

| Parameter No. | MR-J4-B Parameter No. | Symbol | Name | Initial Value | Units |
|---|---|---|---|---|---|
| 11C0 | PD01 | | For manufacturer setting | 0000h | |
| 11C1 | PD02 | *DIA2 | Input signal automatic on selection 2 | 0000h | |
| 11C2 | PD03 | | For manufacturer setting | 0020h | |
| 11C3 | PD04 | | | 0021h | |
| 11C4 | PD05 | | | 0022h | |
| 11C5 | PD06 | | | 0000h | |
| 11C6 | PD07 | *DO1 | Output device selection 1 | 0005h | |
| 11C7 | PD08 | *DO2 | Output device selection 2 | 0004h | |
| 11C8 | PD09 | *DO3 | Output device selection 3 | 0003h | |
| 11C9 | PD10 | | For manufacturer setting | 0000h | |
| 11CA | PD11 | *DIF | Input filter setting | 0004h | ms |
| 11CB | PD12 | *DOP1 | Function selection D-1 | 0000h | |
| 11CC | PD13 | *DOP2 | Function selection D-2 (Note) | 0000h | |
| 11CD | PD14 | *DOP3 | Function selection D-3 | 0000h | |
| 11CE | PD15 | | For manufacturer setting | 0000h | |
| 11CF | PD16 | | | 0000h | |
| 11D0 | PD17 | | | 0000h | |
| 11D1 | PD18 | | | 0000h | |
| 11D2 | PD19 | | | 0000h | |
| 11D3 | PD20 | | | 0 | |
| 11D4 | PD21 | | | 0 | |
| 11D5 | PD22 | | | 0 | |
| 11D6 | PD23 | | | 0 | |
| 11D7 | PD24 | | | 0000h | |
| 11D8 | PD25 | | | 0000h | |
| 11D9 | PD26 | | | 0000h | |
| 11DA | PD27 | | | 0000h | |
| 11DB | PD28 | | | 0000h | |
| 11DC | PD29 | | | 0000h | |
| 11DD | PD30 | | | 0 | |
| 11DE | PD31 | | | 0 | |
| 11DF | PD32 | | | 0 | |
| 11E0 | PD33 | | | 0000h | |
| 11E1 | PD34 | | | 0000h | |
| 11E2 | PD35 | | | 0000h | |
| 11E3 | PD36 | | | 0000h | |
| 11E4 | PD37 | | | 0000h | |
| 11E5 | PD38 | | | 0000h | |
| 11E6 | PD39 | | | 0000h | |
| 11E7 | PD40 | | | 0000h | |
| 11E8 | PD41 | | | 0000h | |
| 11E9 | PD42 | | | 0000h | |
| 11EA | PD43 | | | 0000h | |
| 11EB | PD44 | | | 0000h | |
| 11EC | PD45 | | | 0000h | |
| 11ED | PD46 | | | 0000h | |

Note. MR-J4-□B use.

| Parameter No. | MR-J4-B Parameter No. | Symbol | Name | Initial Value | Units |
|---|---|---|---|---|---|
| 11EE | PD47 | | For manufacturer setting | 0000h | |
| 11EF | PD48 | | | 0000h | |
| 11F0 | PD49 | | | 0000h | |
| : | : | | | : | |
| 11FF | PD64 | | | 0000h | |

(5) Menu E) Expansion settings 2

| Parameter No. | MR-J4-B Parameter No. | Symbol | Name | Initial Value | Units |
|---|---|---|---|---|---|
| 1200 | PE01 | **FCT1 | Fully closed loop function selection 1 | 0000h | |
| 1201 | PE02 | | For manufacturer setting | 0000h | |
| 1202 | PE03 | *FCT2 | Fully closed loop function selection 2 | 0003h | |
| 1203 | PE04 | **FBN | Fully closed loop control - Feedback pulse electronic gear 1 - Numerator | 1 | |
| 1204 | PE05 | **FBD | Fully closed loop control - Feedback pulse electronic gear 2 - Denominator | 1 | |
| 1205 | PE06 | BC1 | Fully closed loop control - Speed deviation error detection level | 400 | r/min |
| 1206 | PE07 | BC2 | Fully closed loop control - Position deviation error detection level | 100 | kpulse |
| 1207 | PE08 | DUF | Fully closed loop dual feedback filter | 10 | rad/s |
| 1208 | PE09 | | For manufacturer setting | 0000h | |
| 1209 | PE10 | FCT3 | Fully closed loop function selection 3 | 0000h | |
| 120A | PE11 | | For manufacturer setting | 0 | |
| 120B | PE12 | | | 0 | |
| 120C | PE13 | | | 0000h | |
| 120D | PE14 | | | 0111h | |
| 120E | PE15 | | | 20 | |
| 120F | PE16 | | | 0000h | |
| 1210 | PE17 | | | 0000h | |
| 1211 | PE18 | | | 0000h | |
| 1212 | PE19 | | | 0000h | |
| 1213 | PE20 | | | 0000h | |
| 1214 | PE21 | | | 0000h | |
| 1215 | PE22 | | | 0000h | |
| 1216 | PE23 | | | 0000h | |
| 1217 | PE24 | | | 0000h | |
| 1218 | PE25 | | | 0000h | |
| 1219 | PE26 | | | 0000h | |
| 121A | PE27 | | | 0000h | |
| 121B | PE28 | | | 0000h | |
| 121C | PE29 | | | 0000h | |
| 121D | PE30 | | | 0000h | |
| 121E | PE31 | | | 0000h | |
| 121F | PE32 | | | 0000h | |

| Parameter No. | MR-J4-B Parameter No. | Symbol | Name | Initial Value | Units |
|---|---|---|---|---|---|
| 1220 | PE33 | | For manufacturer setting | 0000h | |
| 1221 | PE34 | **FBN2 | Fully closed loop control - Feedback pulse electronic gear 2 - Numerator | 1 | |
| 1222 | PE35 | **FBD2 | Fully closed loop control - Feedback pulse electronic gear 2 - Denominator | 1 | |
| 1223 | PE36 | | For manufacturer setting | 0 | |
| 1224 | PE37 | | | 0 | |
| 1225 | PE38 | | | 0 | |
| 1226 | PE39 | | | 20 | |
| 1227 | PE40 | | | 0000h | |
| 1228 | PE41 | EOP3 | Function selection E-3 | 0000h | |
| 1229 | PE42 | | For manufacturer setting | 0 | |
| 122A | PE43 | | | 0 | |
| 122B | PE44 | LMCP | Lost motion compensation positive-side compensation value selection (Note) | 0 | 0.01% |
| 122C | PE45 | LMCN | Lost motion compensation negative-side compensation value selection (Note) | 0 | 0.01% |
| 122D | PE46 | LMFLT | Lost motion filter setting (Note) | 0 | 0.1ms |
| 122E | PE47 | TOF | Torque offset | 0 | 0.01% |
| 122F | PE48 | *LMOP | Lost motion compensation function selection (Note) | 0000h | |
| 1230 | PE49 | LMCD | Lost motion compensation timing (Note) | 0 | 0.1ms |
| 1231 | PE50 | LMCT | Lost motion compensation non-sensitive band (Note) | 0 | pulse/kpulse |
| 1232 | PE51 | | For manufacturer setting | 0000h | |
| 1233 | PE52 | | | 0000h | |
| 1234 | PE53 | | | 0000h | |
| 1235 | PE54 | | | 0000h | |
| 1236 | PE55 | | | 0000h | |
| 1237 | PE56 | | | 0000h | |
| 1238 | PE57 | | | 0000h | |
| 1239 | PE58 | | | 0000h | |
| 123A | PE59 | | | 0000h | |
| 123B | PE60 | | | 0000h | |
| 123C | PE61 | | | 0 | |
| 123D | PE62 | | | 0 | |
| 123E | PE63 | | | 0 | |
| 123F | PE64 | | | 0 | |

Note. MR-J4-□B use.

(6) Menu F) Expansion settings 3

| Parameter No. | MR-J4-B Parameter No. | Symbol | Name | Initial Value | Units |
|---|---|---|---|---|---|
| 1240 | PF01 | | For manufacturer setting | 0000h | |
| 1241 | PF02 | *FOP2 | Function selection F-2 (Note) | 0000h | |
| 1242 | PF03 | | For manufacturer setting | 0000h | |
| 1243 | PF04 | | | 0 | |
| 1244 | PF05 | | | 0000h | |
| 1245 | PF06 | *FOP5 | Function selection F-5 | 0000h | |
| 1246 | PF07 | | For manufacturer setting | 0000h | |
| 1247 | PF08 | | | 0000h | |
| 1248 | PF09 | | | 0 | |
| 1249 | PF10 | | | 0 | |
| 124A | PF11 | | | 0 | |
| 124B | PF12 | DBT | Electronic dynamic brake operating time | 2000 | ms |
| 124C | PF13 | | For manufacturer setting | 0000h | |
| 124D | PF14 | | | 10 | |
| 124E | PF15 | | | 0000h | |
| 124F | PF16 | | | 0000h | |
| 1250 | PF17 | | | 0000h | |
| 1251 | PF18 | | | 0000h | |
| 1252 | PF19 | | | 0000h | |
| 1253 | PF20 | | | 0000h | |
| 1254 | PF21 | DRT | Drive recorder switching time setting | 0 | s |
| 1255 | PF22 | | For manufacturer setting | 200 | |
| 1256 | PF23 | OSCL1 | Vibration tough drive - Oscillation detection level | 50 | % |
| 1257 | PF24 | *OSCL2 | Vibration tough drive function selection | 0000h | |
| 1258 | PF25 | CVAT | SEMI-F47 function instantaneous power failure detection time (instantaneous power failure tough drive - detection time) | 200 | ms |
| 1259 | PF26 | | For manufacturer setting | 0 | |
| 125A | PF27 | | | 0 | ℃ |
| 125B | PF28 | | | 0 | |
| 125C | PF29 | | | 0000h | |
| 125D | PF30 | | | 0 | |
| 125E | PF31 | FRIC | Machine diagnosis function - Friction judgement speed | 0 | r/min or mm/s |
| 125F | PF32 | | For manufacturer setting | 50 | |

Note. MR-J4W□-□B use.

| Parameter No. | MR-J4-B Parameter No. | Symbol | Name | Initial Value | Units |
|---|---|---|---|---|---|
| 1260 | PF33 | | For manufacturer setting | 0000h | |
| 1261 | PF34 | | | 0000h | |
| 1262 | PF35 | | | 0000h | |
| 1263 | PF36 | | | 0000h | |
| 1264 | PF37 | | | 0000h | |
| 1265 | PF38 | | | 0000h | |
| 1266 | PF39 | | | 0000h | |
| 1267 | PF40 | | | 0000h | |
| 1268 | PF41 | | | 0000h | |
| 1269 | PF42 | | | 0000h | |
| 126A | PF43 | | | 0000h | |
| 126B | PF44 | | | 0000h | |
| 126C | PF45 | | | 0000h | |
| 126D | PF46 | | | 0000h | |
| 126E | PF47 | | | 0000h | |
| 126F | PF48 | | | 0000h | |
| 1270 | PF49 | | | 0000h | |
| : | : | | | : | |
| 127F | PF64 | | | 0000h | |

(7) Menu O) Option setting

| Parameter No. | MR-J4-B Parameter No. | Symbol | Name | Initial Value | Units |
|---|---|---|---|---|---|
| 1280 | Po01 | | For manufacturer setting | 0000h | |
| 1281 | Po02 | | | 0000h | |
| 1282 | Po03 | | | 0000h | |
| 1283 | Po04 | | | 0000h | |
| 1284 | Po05 | | | 0000h | |
| 1285 | Po06 | | | 0 | |
| 1286 | Po07 | | | 0 | |
| 1287 | Po08 | | | 0 | |
| 1288 | Po09 | | | 0 | |
| 1289 | Po10 | | | 0000h | |
| 128A | Po11 | | | 0000h | |
| 128B | Po12 | | | 0000h | |
| 128C | Po13 | | | 0000h | |
| 128D | Po14 | | | 0000h | |
| 128E | Po15 | | | 0000h | |
| 128F | Po16 | | | 0000h | |
| 1290 | Po17 | | | 0000h | |
| 1291 | Po18 | | | 0000h | |
| 1292 | Po19 | | | 0000h | |
| 1293 | Po20 | | | 0000h | |
| 1294 | Po21 | | | 0000h | |
| 1295 | Po22 | | | 0000h | |
| 1296 | Po23 | | | 0000h | |
| 1297 | Po24 | | | 0000h | |
| 1298 | Po25 | | | 0000h | |
| 1299 | Po26 | | | 0000h | |
| 129A | Po27 | | | 0000h | |
| 129B | Po28 | | | 0000h | |
| 129C | Po29 | | | 0000h | |
| 129D | Po30 | | | 0000h | |
| 129E | Po31 | | | 0000h | |
| 129F | Po32 | | | 0000h | |
| 12A0 | Po33 | | | 0000h | |
| : | : | | | : | |
| 12BF | Po64 | | | 0000h | |

(8) Menu S) Special settings

| Parameter No. | MR-J4-B Parameter No. | Symbol | Name | Initial Value | Units |
|---|---|---|---|---|---|
| 12C0 | PS01 | | For manufacturer setting | 0000h | |
| 12C1 | PS02 | | | 0000h | |
| 12C2 | PS03 | | | 0000h | |
| 12C3 | PS04 | | | 0000h | |
| 12C4 | PS05 | | | 0000h | |
| 12C5 | PS06 | | | 0000h | |
| 12C6 | PS07 | | | 0000h | |
| 12C7 | PS08 | | | 0000h | |
| 12C8 | PS09 | | | 0000h | |
| 12C9 | PS10 | | | 0000h | |
| 12CA | PS11 | | | 0000h | |
| 12CB | PS12 | | | 0000h | |
| 12CC | PS13 | | | 0000h | |
| 12CD | PS14 | | | 0000h | |
| 12CE | PS15 | | | 0000h | |
| 12CF | PS16 | | | 0000h | |
| 12D0 | PS17 | | | 0000h | |
| 12D1 | PS18 | | | 0000h | |
| 12D2 | PS19 | | | 0000h | |
| 12D3 | PS20 | | | 0000h | |
| 12D4 | PS21 | | | 0000h | |
| 12D5 | PS22 | | | 0000h | |
| 12D6 | PS23 | | | 0000h | |
| 12D7 | PS24 | | | 0000h | |
| 12D8 | PS25 | | | 0000h | |
| 12D9 | PS26 | | | 0000h | |
| 12DA | PS27 | | | 0000h | |
| 12DB | PS28 | | | 0000h | |
| 12DC | PS29 | | | 0000h | |
| 12DD | PS30 | | | 0000h | |
| 12DE | PS31 | | | 0000h | |
| 12DF | PS32 | | | 0000h | |
| 12E0 | PS33 | | | 0000h | |
| : | : | | | : | |
| 12FF | PS64 | | | 0000h | |

(9) Menu L) Linear servo motor/DD motor settings

| Parameter No. | MR-J4-B Parameter No. | Symbol | Name | Initial Value | Units |
|---|---|---|---|---|---|
| 1300 | PL01 | **LIT1 | Linear servo motor/DD motor function selection 1 | 0301h | |
| 1301 | PL02 | **LIM | Linear encoder resolution - Numerator | 1000 | μm |
| 1302 | PL03 | **LID | Linear encoder resolution - Denominator | 1000 | μm |
| 1303 | PL04 | *LIT2 | Linear servo motor/DD motor function selection 2 | 0003h | |
| 1304 | PL05 | LB1 | Position deviation error detection level | 0 | mm<br>0.01rev |
| 1305 | PL06 | LB2 | Speed deviation error detection level | 0 | r/min<br>mm/s |
| 1306 | PL07 | LB3 | Torque/thrust deviation error detection level | 100 | % |
| 1307 | PL08 | *LIT3 | Linear servo motor/DD motor function selection 3 | 0010h | |
| 1308 | PL09 | LPWM | Magnetic pole detection voltage level | 30 | % |
| 1309 | PL10 | | For manufacturer setting | 5 | |
| 130A | PL11 | | | 100 | |
| 130B | PL12 | | | 500 | |
| 130C | PL13 | | | 0000h | |
| 130D | PL14 | | | 0 | |
| 130E | PL15 | | | 20 | |
| 130F | PL16 | | | 0 | |
| 1310 | PL17 | LTSTS | Magnetic pole detection - Minute position detection method - Function selection | 0000h | |
| 1311 | PL18 | IDLV | Magnetic pole detection - Minute position detection method - Identification signal amplitude | 0 | % |
| 1312 | PL19 | | For manufacturer setting | 0 | |
| 1313 | PL20 | | | 0 | |
| 1314 | PL21 | | | 0 | |
| 1315 | PL22 | | | 0 | |
| 1316 | PL23 | | | 0000h | |
| 1317 | PL24 | | | 0 | |
| 1318 | PL25 | | | 0000h | |
| 1319 | PL26 | | | 0000h | |
| 131A | PL27 | | | 0000h | |
| 131B | PL28 | | | 0000h | |
| 131C | PL29 | | | 0000h | |
| 131D | PL30 | | | 0000h | |
| 131E | PL31 | | | 0000h | |
| 131F | PL32 | | | 0000h | |

| Parameter No. | MR-J4-B Parameter No. | Symbol | Name | Initial Value | Units |
|---|---|---|---|---|---|
| 1320 | PL33 | | For manufacturer setting | 0000h | |
| 1321 | PL34 | | | 0000h | |
| 1322 | PL35 | | | 0000h | |
| 1323 | PL36 | | | 0000h | |
| 1324 | PL37 | | | 0000h | |
| 1325 | PL38 | | | 0000h | |
| 1326 | PL39 | | | 0000h | |
| 1327 | PL40 | | | 0000h | |
| 1328 | PL41 | | | 0000h | |
| 1329 | PL42 | | | 0000h | |
| 132A | PL43 | | | 0000h | |
| 132B | PL44 | | | 0000h | |
| 132C | PL45 | | | 0000h | |
| 132D | PL46 | | | 0000h | |
| 132E | PL47 | | | 0000h | |
| 132F | PL48 | | | 0000h | |
| 1330 | PL49 | | | 0000h | |
| : | : | | | : | |
| 133F | PL64 | | | 0000h | |

(10) Menu T) Parameter for manufacturer setting

| Parameter No. | MR-J4-B Parameter No. | Symbol | Name | Initial Value | Units |
|---|---|---|---|---|---|
| 1340 | PT01 | | For manufacturer setting | 0000h | |
| 1341 | PT02 | | | 0000h | |
| 1342 | PT03 | | | 0001h | |
| 1343 | PT04 | | | 500 | |
| 1344 | PT05 | | | 10 | |
| 1345 | PT06 | | | 100 | |
| 1346 | PT07 | | | 100 | |
| 1347 | PT08 | | | 0000h | |
| 1348 | PT09 | | | 0000h | |
| 1349 | PT10 | | | 0000h | |
| 134A | PT11 | | | 0000h | |
| 134B | PT12 | | | 0400h | |
| 134C | PT13 | | | 0000h | |
| 134D | PT14 | | | 0000h | |
| 134E | PT15 | | | 100 | |
| 134F | PT16 | | | 100 | |
| 1350 | PT17 | | | 100 | |
| 1351 | PT18 | | | 0 | |
| 1352 | PT19 | | | 0 | |
| 1353 | PT20 | | | 0000h | |
| 1354 | PT21 | | | 0000h | |
| 1355 | PT22 | | | 0000h | |
| 1356 | PT23 | | | 100 | |
| 1357 | PT24 | | | 150 | |
| 1358 | PT25 | | | 20 | |
| 1359 | PT26 | | | 0000h | |
| 135A | PT27 | | | 0000h | |
| 135B | PT28 | | | 0000h | |
| 135C | PT29 | | | 0000h | |
| 135D | PT30 | | | 0000h | |
| 135E | PT31 | | | 0000h | |
| 135F | PT32 | | | 0000h | |
| 1360 | PT33 | | | 0000h | |
| 1361 | PT34 | | | 0000h | |
| 1362 | PT35 | | | 0000h | |
| 1363 | PT36 | | | 0000h | |
| 1364 | PT37 | | | 0000h | |
| 1365 | PT38 | | | 0000h | |
| 1366 | PT39 | | | 0000h | |
| 1367 | PT40 | | | 0000h | |
| 1368 | PT41 | | | 0000h | |
| 1369 | PT42 | | | 0000h | |
| 136A | PT43 | | | 0000h | |
| 136B | PT44 | | | 0000h | |
| 136C | PT45 | | | 0000h | |
| 136D | PT46 | | | 0000h | |

| Parameter No. | MR-J4-B Parameter No. | Symbol | Name | Initial Value | Units |
|---|---|---|---|---|---|
| 136E | PT47 | | For manufacturer setting | 0000h | |
| 136F | PT48 | | | 0000h | |
| 1370 | PT49 | | | 0000h | |
| : | : | | | : | |
| 137F | PTL64 | | | 0000h | |

## 11.3 Control parameters

POINT

- The settings for the parameters with a * mark at the front of the abbreviation are activated when the system is restarted.
- The column in the table for when tandem drive is being used is for control parameter setting classification of the axis for which the tandem drive is performed. Master shows where only the master value are valid, Same value shows both the master/slave axes is set to the same value, and Each axis shows where master/slave axis can be set separately.
  Refer to "Chapter 8 TANDEM DRIVE" concerning details for the classification.

| Parameter No. | Symbol | Name | Initial Value | Units | Setting range | Function | When tandem drive is being used |
|---|---|---|---|---|---|---|---|
| 0200 | *OPC1 | Control option 1 | 0001h | | 0000h to 2111h | Control Axis<br>Set to 1 for implementing control of servo amplifier<br>0: Not controlled<br>1: Controlled<br>Amplifier-less axis function<br>Set to 1 when servo amplifier communication is not implemented. When set to 1 together with the control axis, it is possible to run without a servo amplifier (simulate).<br>0: Invalid<br>1: Valid<br>No home position<br>If the position when power is turned on is to be defined as home position set to 1. If home position return is performed, the current position after executing home position return is the home position.<br>0: Invalid<br>1: Valid<br>Speed units<br>Set the units for the speed command<br>0: Position command units/min<br>1: Position command units/sec<br>2: r/min<br>(Note) Always set the same value for the master axis and slave axis when tandem drive is being used. | Same value |

| Parameter No. | Symbol | Name | Initial Value | Units | Setting range | Function | When tandem drive is being used |
|---|---|---|---|---|---|---|---|
| 0201 | OPC2 | Control option 2 | 0000h | | 0000h to 0121h | 0 □ □ □<br>Position switch judgement conditions<br>Set the position switch judgement conditions<br>0: Current command position<br>1: Current feedback position<br>Continuous operation position over-bound processing<br>Defines processing for when the stop position exceeds the command position during operation.<br>0: Alarm<br>1: Return to command position<br>2: Stop firmly at command position<br>Change of position over-bound processing<br>Set processing for when the stop position exceeds the command position during position change.<br>0: Alarm<br>1: Return to command position | Master |
| 0202 | *OPC3 | Control option 3 | 0001h | | 0000h to 0001h | 0 0 0 □<br>Interlock signal polarity<br>Set the polarity of the Interlock signal.<br>0: B-contact<br>1: A-contact | Master |
| 0203 | *AXALC | Axis No. assignment | 0000h | | 0000h to 011Fh | 0 □ □ □<br>Servo amplifier axis No.<br>Set the servo amplifier axis No. to be assigned to the axis Nos. on the position board. (Note 1, 2 and 3)<br>00h: No axis No. assignment<br>01h to 14h: Axis No.<br>Example) 0Ah: Axis No. 10<br>Servo amplifier line No.<br>Set the servo amplifier line No. to be assigned to the axis Nos. on the position board.<br>0 to 1: Line No.-1 | Each axis |
| 0204 | ITM1 | Interrupt condition 1 | 0000h | | 0000h to FFFFh | Set interrupt condition 1. | Each axis |

| Parameter No. | Symbol | Name | Initial Value | Units | Setting range | Function | When tandem drive is being used |
|---|---|---|---|---|---|---|---|
| 0205 | ITM2 | Interrupt condition 2 | 0000h | | 0000h to FFFFh | Set interrupt condition 2. | Each axis |
| 0206 | *OPC4 | Control option 4 | 0000h | | 0000h to 0001h | 0 0 0 □<br>Predwell setting range<br>Set the setting range of predwell.<br>0: 0 to 3000ms<br>1: 0 to 65535ms | Master |
| 0207 | | For manufacturer setting | 0 | | | | |
| 0208 | *BKC | Backlash compensation amount | 0000h | pulse | 0 to 65535 | Setting for performing compensation of machine backlash. | Same value |
| 0209 | | For manufacturer setting | 0 | | | | |
| 020A | *CMXL | Electronic gear numerator (lower) | 0001h | | 1 to 5242879 (32 bit) | Set the numerator for electronic gears. | Master |
| 020B | *CMXH | Electronic gear numerator (upper) | 0000h | | | | |
| 020C | *CDVL | Electronic gear denominator (lower) | 0001h | | 1 to 589823 (32 bit) | Set the denominator for electronic gears. | Master |
| 020D | *CDVH | Electronic gear denominator (upper) | 0000h | | | | |
| 020E | SUML | Speed units multiplication factor (lower) | 2000h | | 1 to 32768 (32 bit) | Set the multiplication factor for the speed command. | Master |
| 020F | SUMH | Speed units multiplication factor (upper) | 0000h | | | | |
| 0210 | TLP | Forward rotation torque limit value | 3000 | 0.1% | 0 to 32767 | Set for limiting torque generated in the CW direction when the servo motor is exerting in the CCW direction. | Master |
| 0211 | TLN | Reverse rotation torque limit value | 3000 | 0.1% | 0 to 32767 | Set for limiting torque generated in the CCW direction when the servo motor is exerting in the CW direction. | Master |

| Parameter No. | Symbol | Name | Initial Value | Units | Setting range | Function | When tandem drive is being used |
|---|---|---|---|---|---|---|---|
| 0212 | | For manufacturer setting | 0 | | | | |
| 0213 | *GIOO | General I/O option | 0000h | | 0000h to 0011h | 0 0 ☐ ☐<br>Servo amplifier general input setting<br>Set whether to use the general input of the servo amplifier.<br>0: Not used<br>1: Used<br>Note: When the general input is used, the limit switch signal and the dog signal cannot be input from the servo amplifier. Set other than "Driver input" to the sensor input method (parameter No.0219).<br>Servo amplifier general output setting<br>Set whether to use the general output of the servo amplifier.<br>0: Not used<br>1: Used | Each axis |

| Parameter No. | Symbol | Name | Initial Value | Units | Setting range | Function | When tandem drive is being used |
|---|---|---|---|---|---|---|---|
| 0214 | *GDNA | General I/O number assignment | 0000h | | 0000h to FFFFh | Set assignment of the general I/O number.<br>The setting target differs depending on the I/O table (parameter No.004A) setting.<br>[When using a digital I/O table]<br>General input assignment<br>Specify the first digital input area number to assign the general input.<br>00h to 3Fh: Digital input area 0 to 63<br>Example: When the digital input area number 1 is specified, assign 16 points of DI_010 to DI_01F. However, DI_013 to DI_01F are unavailable.<br>General output assignment<br>Specify the first digital output area number to assign the general output.<br>00h to 3Fh: Digital output area 0 to 63<br>Example: When the digital output area number 2 is specified, 16 points are assigned from DO_020 to DO_02F. However, DO_023 to DO_02F are unavailable.<br>[When using a I/O device table]<br>General input assignment<br>Specify the first input word device number that corresponds with the input bit device number to assign the general input.<br>00h to FFh: Input word device number 0 to FF<br>Example: When the input word device number 01 is specified, 16 points are assigned from DVI_010 to DVI_01F. However, DVI_013 to DVI_01F are unavailable.<br>General output assignment<br>Specify the first output word device number that corresponds with the output bit device number to assign the general input.<br>00h to FFh: Output word device number 00 to FF<br>Example: When the output word device number 2 is specified, 16 points are assigned from DVO_020 to DVO_02F. However, DVO_023 to DVI_02F are unavailable. | Each axis |

| Parameter No. | Symbol | Name | Initial Value | Units | Setting range | Function | When tandem drive is being used |
|---|---|---|---|---|---|---|---|
| 0215 | | For manufacturer setting | 0000h | | | | |
| 0216 | | | 0000h | | | | |
| 0217 | | | 0000h | | | | |
| 0218 | | | 0 | | | | |
| 0219 | *SOP | Sensor input options | 0000h | | 0000h to 0304h | 0 \| \| 0 \| \|<br>Sensor input method<br>0: Unavailable<br>1: Driver input<br>2: Digital or input device input<br>3: Not connected (does not detect LSP, LSN, DOG)<br>4: Dual port memory input<br>Limit switch signal selection<br>0: LSP/LSN are valid<br>1: LSP is valid, LSN is invalid<br>2: LSP is invalid, LSN is valid<br>3: LSP/LSN are invalid | Each axis |
| 021A | *SLSP | Sensor signal (LSP) connection specification | 0000h | | 0000 to FFF1h | The setting target differs depending on the I/O table (parameter No.004A) setting.<br>[When using a digital I/O table]<br>\| \| \| \|<br>Digital input assignment<br>Set valid/invalid for the digital input assignment where LSP is connected.<br>0: Not assigned<br>1: Assigned<br>Digital input number assignment<br>Set the digital input number where LSP is connected.<br>000h to 3FFh: DI_000 to DI_3FF<br>[When using a I/O device table]<br>\| \| \| \|<br>Input device assignment<br>Set valid/invalid for the input device assignment where LSP is connected.<br>0: Not assigned<br>1: Assigned<br>Input device number assignment<br>Set the input device number where LSP is connected.<br>000h to FFFh: DVI_000 to DVI_3FF | Each axis |

| Parameter No. | Symbol | Name | Initial Value | Units | Setting range | Function | When tandem drive is being used |
|---|---|---|---|---|---|---|---|
| 021B | *SLSN | Sensor signal (LSN) connection specification | 0000h | | 0000 to FFF1h | The setting target differs depending on the I/O table (parameter No.004A) setting.<br>[When using a digital I/O table]<br>Digital input assignment<br>Set valid/invalid for the digital input assignment where LSN is connected.<br>0: Not assigned<br>1: Assigned<br>Digital input number assignment<br>Set the digital input number where LSN is connected.<br>000h to 3FFh: DI_000 to DI_3FF<br>[When using a I/O device table]<br>Input device assignment<br>Set valid/invalid for the input device assignment where LSN is connected.<br>0: Not assigned<br>1: Assigned<br>Input device number assignment<br>Set the input device number where LSN is connected.<br>000h to FFFh: DVI_000 to DVI_3FF | Each axis |

| Parameter No. | Symbol | Name | Initial Value | Units | Setting range | Function | When tandem drive is being used |
|---|---|---|---|---|---|---|---|
| 021C | *SDOG | Sensor signal (DOG) connection specification | 0000h | | 0000 to FFF1h | The setting target differs depending on the I/O table (parameter No.004A) setting.<br>[When using a digital I/O table]<br>□□□□<br>└ Digital input assignment<br>Set valid/invalid for the digital input assignment where DOG is connected.<br>0: Not assigned<br>1: Assigned<br>└ Digital input number assignment<br>Set the digital input number where DOG is connected.<br>000h to 3FFh: DI_000 to DI_3FF<br>[When using a I/O device table]<br>□□□□<br>└ Input device assignment<br>Set valid/invalid for the input device assignment where DOG is connected.<br>0: Not assigned<br>1: Assigned<br>└ Input device number assignment<br>Set the input device number where DOG is connected.<br>000h to FFFh: DVI_000 to DVI_3FF | Each axis |
| 021D | *VEND | Vendor ID | 0000h | | 0000h to FFFFh | Set the vendor ID. (SSCNETⅢ/H communication)<br>0000h: Mitsubishi Electric | Same value |
| 021E | *CODE | Type code | 0100h | | 0000h to FFFFh | Sets the type code.<br>1000h: MR-J4(W□)-□B<br>1200h: MR-JE-□B | Same value |
| 021F | | For manufacturer setting | 0 | | | | |
| 0220 | OPS | Speed options | 0000h | | 0000h to 0002h | 0 0 0 □<br>└ Acceleration/deceleration method<br>Set the type of acceleration/deceleration<br>0: Linear acceleration/deceleration<br>1: Smoothing filter<br>2: Start up speed active | Master |

| Parameter No. | Symbol | Name | Initial Value | Units | Setting range | Function | When tandem drive is being used |
|---|---|---|---|---|---|---|---|
| 0221 | SRATE | S-curve ratio | 0 | % | 0 to 100 | Set the S-curve ratio of the S-curve acceleration/deceleration (Sine acceleration/deceleration).<br>0: S-curve acceleration/deceleration invalid<br>1 to 100: S-curve acceleration/deceleration<br>(Note 1) S-curve acceleration/deceleration is performed for the acceleration/deceleration selected in acceleration/deceleration method (parameter No.0220).<br>(Note 2) The S-curve ratio set by this parameter is used in JOG operation, incremental feed operation and home position return. For automatic operation and linear interpolation operation, set the S-curve ratio in the point table. | Master |
| 0222 | SPLL | Speed limit value (lower) | 0BB8h | Speed units | 0000h to FFFFh | Set the value for the moving speed limit. | Master |
| 0223 | SPLH | Speed limit value (upper) | 0000h | | 0000h to 7FFFh | | |
| 0224 | LSPL | Start up speed (lower) | 0000h | Speed Units | 0000h to FFFFh | Set the start up speed | Master |
| 0225 | LSPH | Start up speed (upper) | 0000h | | 0000h to 7FFFh | | |
| 0226 | STC | Smoothing time constant | 0 | ms | 0 to 100 | Sets 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 operation rapid stop or limit switch is input. | Master |
| 0228 | SLPL | Software limit Upper limit (lower) | 0000h | Command Units | 0000h to FFFFh | Set the + side of the software limit. | Master |
| 0229 | SLPH | Software limit Upper limit (upper) | 0000h | | 0000h to FFFFh | | |
| 022A | SLNL | Software limit Lower limit (lower) | 0000h | Command Units | 0000h to FFFFh | Set the − side of the software limit. | Master |
| 022B | SLNH | Software limit Lower limit (upper) | 0000h | | 0000h to FFFFh | | |
| 022C | PSPL | Position switch Upper limit (lower) | 0000h | Command Units | 0000h to FFFFh | Set the + end position for turning on the position switch. | Master |
| 022D | PSPH | Position switch Upper limit (upper) | 0000h | | 0000h to FFFFh | | Master |
| 022E | PSNL | Position switch Lower limit (lower) | 0000h | Command Units | 0000h to FFFFh | Set the − end position for turning on the position switch. | Master |
| 022F | PSNH | Position switch Lower limit (upper) | 0000h | | 0000h to FFFFh | | Master |

| Parameter No. | Symbol | Name | Initial Value | Units | Setting range | Function | When tandem drive is being used |
|---|---|---|---|---|---|---|---|
| 0230 | CRPL | Rough match output limits (lower) | 0000h | Command Units | 0000h to FFFFh | Set the remaining distance limits for outputting a command for rough matching. | Master |
| 0231 | CRPH | Rough match output limits (upper) | 0000h | | 0000h to 7FFFh | | |
| 0232 | | For manufacturer setting | 0 | | | | |
| 0233 | | | 0 | | | | |
| 0234 | | | 0 | | | | |
| 0235 | | | 0 | | | | |
| 0236 | | | 0 | | | | |
| 0237 | | | 0 | | | | |
| 0238 | | | 0 | | | | |
| 0239 | | | 0 | | | | |
| 023A | | | 0 | | | | |
| 023B | | | 0 | | | | |
| 023C | | | 0 | | | | |
| 023D | | | 0 | | | | |
| 023E | | | 0 | | | | |
| 023F | *IFBN | Interface mode maximum buffer number | 0 | | 0 to 63 | Set the maximum value for buffer number used during interface mode.<br>Set value + 1 is the number of buffers.<br>Note. When controlling with interrupt output invalid in interface mode, maximum value of 1 or more must be set. | |

| Parameter No. | Symbol | Name | Initial Value | Units | Setting range | Function | When tandem drive is being used |
|---|---|---|---|---|---|---|---|
| 0240 | *OPZ1 | Home position return Option 1 | 0000h | | 0000h to 112Dh | Home position return method (Note 1), (Note 2)<br>Set the method for home position return.<br>0: Dog method<br>2: Data set method<br>3: Stopper method<br>4: Dog cradle method<br>5: Limit switch combined method<br>6: Scale home position signal detectionmethod<br>7: Limit switch front end method<br>8: Dog front end method<br>C: Z-phase detection method<br>D: Scale home position signal detection method 2<br>Home position return direction<br>Set the home position return direction with respect to the proximity dog.<br>Or the movement direction for creep speed movement.<br>0: - direction<br>1: + direction<br>2: Shortcut direction (Note 1)<br>Proximity dog input polarity<br>Set the input polarity for the proximity dog<br>0: Normally closed contact<br>1: Normally open contact<br>Home position signal re-search (Note 2)<br>Set "1" when using an incremental encoder or incremental linear scale.<br>0: Do not search again<br>1: Master searching again<br>Note 1. Shortcut direction is available only by Z-phase detection method.<br>2. Can be changed while system is running. (Software version A5 or later) | Master |
| 0241 | *OPZ2 | Home position return Option 2 | 0000h | | 0000h to 0011h | 0 0<br>Absolute position data<br>Set the validity/invalidity of restoring the absolute position.<br>0: Invalid (The position at system startup is defined to be 0. Home position return must be executed prior to performing automatic operation or linear interpolation operation.)<br>1: Valid (absolute position is set at startup based on the home position multiple revolution data and the home position within 1 revolution position.)<br>Change of absolute position data on home position reset<br>If 1 is set, the home position multiple revolution data and home position within 1 revolution position are renewed when the home position is reset.<br>0: Invalid<br>1: Valid | Master |

| Parameter No. | Symbol | Name | Initial Value | Units | Setting range | Function | When tandem drive is being used |
|---|---|---|---|---|---|---|---|
| 0242 | ZSPL | Home position return speed (lower) | 00C8h | Speed Units | 0000h to FFFFh | Set the moving speed for home position return. | Master |
| 0243 | ZSPH | Home position return speed (upper) | 0000h | | 0000h to 7FFFh | | |
| 0244 | ZTCA | Home position return acceleration time constant | 100 | ms | 0 to 20000 | Set the acceleration time constant for home position return. | Master |
| 0245 | ZTCD | Home position return deceleration time constant | 100 | ms | 0 to 20000 | Set the deceleration time constant for home position return. | Master |
| 0246 | ZPSL | Home position coordinates (lower) | 0000h | Command Units | 0000h to FFFFh | Set the home position coordinates (position after completing home position return). | Master |
| 0247 | ZPSH | Home position coordinates (upper) | 0000h | | 0000h to FFFFh | | |
| 0248 | ZSTL | Amount of home position shift (lower) | 0000h | Command Units | 0000h to FFFFh | Set the amount of shift from the Z-phase pulse detection position of the detector. | Master |
| 0249 | ZSTH | Amount of home position shift (upper) | 0000h | | 0000h to FFFFh | | |
| 024A | ZLL | Home position search limit (lower) | 0000h | Command Units | 0000h to FFFFh | Set a limit on the movement amount when searching for the home position. | Master |
| 024B | ZLH | Home position search limit (upper) | 0000h | | 0000h to 7FFFh | | |
| 024C | CRF | Creep speed | 0014h | Speed Units | 0000h to 7FFFh | Set the creep speed after detecting the proximity dog. | Master |
| 024D | *LS0 | Home position multiple revolution data | 0000h | rev | 0000h to FFFFh | Set the home position multiple revolution data. (Only using with the absolute position detection system.) | Each axis |
| 024E | *CY0L | Home position within 1 revolution position (lower) | 0000h | pulse | 0000h to FFFFh | Set the within 1 revolution home position. (Only using with the absolute position detection system.) | Each axis |
| 024F | *CY0H | Home position within 1 revolution position (upper) | 0000h | | 0000h to FFFFh | | |

| Parameter No. | Symbol | Name | Initial Value | Units | Setting range | Function | When tandem drive is being used |
|---|---|---|---|---|---|---|---|
| 0250 | ZPML | Z-phase mask amount (lower) | 0000h | Command Units | 0000h to FFFFh | Set the reference encoder Z-phase mask amount when the home position return method is set to the Z-phase detection method. | Master |
| 0251 | ZPMH | Z-phase mask amount (upper) | 0000h | | 0000h to 7FFFh | | |
| 0252 | | For manufacturer setting | 0 | | | | |
| 0253 | | | 0 | | | | |
| 0254 | | | 0 | | | | |
| 0255 | | | 0 | | | | |
| 0256 | | | 0 | | | | |
| 0257 | | | 0 | | | | |
| 0258 | | | 0 | | | | |
| 0259 | | | 0 | | | | |
| 025A | | | 0 | | | | |
| 025B | | | 0 | | | | |
| 025C | | | 0 | | | | |
| 025D | | | 0 | | | | |
| 025E | | | 0 | | | | |
| 025F | | | 0 | | | | |
| 0260 | *LGRP | Linear interpolation group | 0000h | | 0000h to 0008h | 0 0 0 □<br>Group number<br>Set the group number for the linear interpolation group.<br>0: Invalid<br>1 to 8: Group number | Master |
| 0261 | LOP | Linear interpolation options | 0000h | | 0000h to 0002h | 0 0 0 □<br>Excessive speed processing<br>0: Speed clamp<br>1: Alarm and stop<br>2: No processing | Master |
| 0262 | LSLL | Linear interpolation speed limit value (lower) | 0BB8h | Speed Units | 0000h to FFFFh | Set the limit for linear interpolation speed. | Master |
| 0263 | LSLH | Linear interpolation speed limit value (upper) | 0000h | | 0000h to 7FFFh | | |
| 0264 | *TGRP | Tandem drive group | 0 | | 0000h to 0008h | 0 0 0 □<br>Group number<br>Set the group number for the tandem drive group.<br>0: Invalid<br>1 to 8: Group number | Same value |

| Parameter No. | Symbol | Name | Initial Value | Units | Setting range | Function | When tandem drive is being used |
|---|---|---|---|---|---|---|---|
| 0265 | TOP | Tandem drive options | 0000h | | 0000h to 1011h | [ ][0][ ][ ]<br>Method of to home position return<br>Set the operation method when the scale home position signal detection method is used for return to home position.<br>0: Normal mode<br>1: Adjustment mode<br>Synchronization setting<br>Set the validity/invalidity of synchronization for turning servo on.<br>0: Valid<br>1: Invalid<br>Compensation of home position return deviation<br>Set the validity/invalidity of deviation compensation for home position return.<br>0: Deviation compensation invalid<br>1: Deviation compensation valid<br>(Note) In home position return using a scale home positon signal detection method, the deviation compensation becomes valid regardless of this setting. | Master |
| 0266 | *TEV | Tandem drive synchronous alignment valid width | 10000 | Command Units | 0 to 32767 | Set the valid width for performing compensation of the deviation between the master axis and 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 compensation of the deviation between the master axis and 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 deviation between the master axis and the slave axis.<br>(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 excessive deviation width, synchronization speed, and synchronization valid width for tandem drive axes. | Master |
| 026A | *TED | Late starting of tandem drive excessive deviation detection | 50 | ms | 0 to 500 | Set the delay time for from completion of synchronization for turning servo on until detection of excessive deviation is started. | Master |
| 026B | *TOFL | Valid width of tandem drive deviation compensation | 10000 | Command Units | 0 to 32767 | Set the permissible width for performing compensation of the deviation between the master axis and slave axis when home position return is performed while in tandem drive axes mode. (0: The check with the valid width of deviation compensation is invalid.) | Master |

| Parameter No. | Symbol | Name | Initial Value | Units | Setting range | Function | When tandem drive is being used |
|---|---|---|---|---|---|---|---|
| 026C | TZOFL | Tandem drive home position signal offset (lower) | 0000h | Command Units | 0000h to FFFFh | Set the amount of offset for the home position signal position while in tandem drive axes mode.<br>(Used when performing home position return using the scale home position signal detection method.) | Master |
| 026D | TZOFH | Tandem drive home position signal offset (upper) | 0000h | | 0000h to FFFFh | | |
| 026E | *TOFS | Tandem drive deviation compensation units multiplication | 0 | | 0 to 32767 | Set the multiplication for valid width of tandem drive deviation compensation.<br>(Note) When the setting value is 0, the multiplication is 1 times. | Master |
| 026F | | For manufacturer setting | 0 | | | | |
| 0270 | | | 0 | | | | |
| 0271 | | | 0 | | | | |
| 0272 | | | 0 | | | | |
| 0273 | | | 0 | | | | |
| 0274 | | | 0 | | | | |
| 0275 | | | 0 | | | | |
| 0276 | | | 0 | | | | |
| 0277 | | | 0 | | | | |
| 0278 | | | 0 | | | | |
| 0279 | | | 0 | | | | |
| 027A | | | 0 | | | | |
| 027B | | | 0 | | | | |
| 027C | | | 0 | | | | |
| 027D | | | 0 | | | | |
| 027E | | | 0 | | | | |
| 027F | | | 0 | | | | |
| 0280 | | | 0 | | | | |
| 0281 | *IOP | Interference check Options | 0000h | | 0000h to 1FF1h | □□□□<br>Interference check<br>Set validity/invalidity of interference check.<br>0: Invalid<br>1: Valid<br>Interference check axis<br>Set the opposing axis for performing interference check.<br>00h to 1Fh: Interference check axis−1<br>Example: 0: axis No. 1<br>Interference check coordinate direction<br>Set the direction of the coordinate system for the axis from the perspective of the standard coordinate system.<br>0: Same direction<br>1: Opposite direction | Master |

| Parameter No. | Symbol | Name | Initial Value | Units | Setting range | Function | When tandem drive is being used |
|---|---|---|---|---|---|---|---|
| 0282 | *IOP2 | Interference check Options 2 | 0000h | | 0000h to 0011h | 0 0 ☐ ☐<br>Interference check direction<br>Set the direction for which interference check is performed.<br>0: +direction of coordinate system for the axis<br>1: −direction of coordinate system for the axis<br>Interference check standby<br>Set validity/invalidity of interference check standby.<br>0: Invalid<br>1: Valid | Master |
| 0283 | | For manufacturer setting | 0 | | | | |
| 0284 | IOFL | Interference check Offset (lower) | 0000h | Command Units | 0000h to FFFFh | Set the position on the home position standard coordinate system. | Master |
| 0285 | IOFH | Interference check Offset (upper) | 0000h | | 0000h to FFFFh | | |
| 0286 | IWL | Interference check width (lower) | 0000h | Command Units | 0000h to FFFFh | Set the width from the interference check axis target position of the area where interference check is performed. | Master |
| 0287 | IWH | Interference check width (upper) | 0000h | | 0000h to 7FFFh | | |
| 0288 | | For manufacturer setting | 0 | | | | |
| 0289 | | | 0 | | | | |
| 028A | | | 0 | | | | |
| 028B | | | 0 | | | | |
| 028C | | | 0 | | | | |
| 028D | | | 0 | | | | |
| 028E | | | 0 | | | | |
| 028F | | | 0 | | | | |
| : | | | : | | | | |
| 02AF | | | 0 | | | | |
| 02B0 | *MKOP1 | Mark detection option 1 | 0000h | | 0000h to 3F23h | ☐☐☐☐<br>Mark detection signal number specification 1<br>Set the mark detection signal number to be used.<br>0 : Invalid<br>1 to 3: Mark detection signal number (DI1 to DI3)<br>Mark detection mode<br>Set the mark detection mode<br>0: Continuous detection<br>1: Specified number of detection<br>2: Ring buffer<br>Number of continuous latch data storages (Note)<br>Set the number of data that can be latched continuously.<br>00h to 3Fh: Number of continuous latch data storages-1<br>Note. Up to 64 can be set in the whole system. | Each axis |

| Parameter No. | Symbol | Name | Initial Value | Units | Setting range | Function | When tandem drive is being used |
|---|---|---|---|---|---|---|---|
| 02B1 | MKDS1 | Mark detection data setting 1 | 0000h | | 0000h to 0111h | 0 ☐ ☐ ☐<br>ON edge detection setting<br>Set enable/disable for detection at ON edge.<br>0: Disable<br>1: Enable<br>OFF edge detection setting<br>Set enable/disable for detection at OFF edge.<br>0: Disable<br>1: Enable<br>Mark detection data type<br>Set the type of data to be stored as mark detection data.<br>0: Current feedback position [command units]<br>1: Current feedback position [pulse] | Each axis |
| 02B2 | *MKOP2 | Mark detection option 2 | 0000h | | 0000h to 3F23h | Same as mark detection option 1. | Each axis |
| 02B3 | MKDS2 | Mark detection data setting 2 | 0000h | | 0000h to 0111h | Same as mark detection data setting 1. | Each axis |
| 02B4 | MKNL1 | Latch data range lower limit 1 (lower) | 0000h | | 0000h to FFFFh | Specify the range (lower limit) of data to be latched at detection of the mark detection signal of mark detection signal number specification 1.<br>(Note1), (Note 2) | Each axis |
| 02B5 | MKNH1 | Latch data range lower limit 1 (upper) | 0000h | | 0000h to FFFFh | | Each axis |
| 02B6 | MKXL1 | Latch data range upper limit 1 (lower) | 0000h | | 0000h to FFFFh | Specify the range (upper limit) of data to be latched at detection of the mark detection signal of mark detection signal number specification 1.<br>(Note1), (Note 2) | Each axis |
| 02B7 | MKXH1 | Latch data range upper limit 1 (upper) | 0000h | | 0000h to FFFFh | | Each axis |
| 02B8 | MKNL2 | Latch data range lower limit 2 (lower) | 0000h | | 0000h to FFFFh | Same as latch data range lower limit 1. | Each axis |
| 02B9 | MKNH2 | Latch data range lower limit 2 (upper) | 0000h | | 0000h to FFFFh | | Each axis |
| 02BA | MKXL2 | Latch data range upper limit 2 (lower) | 0000h | | 0000h to FFFFh | Same as latch data range upper limit 1. | Each axis |
| 02BB | MKXH2 | Latch data range upper limit 2 (upper) | 0000h | | 0000h to FFFFh | | Each axis |
| 02BC | | For manufacturer setting | 0 | | | | |
| 02BD | | | 0 | | | | |
| 02BE | | | 0 | | | | |
| 02BF | | | 0 | | | | |
| : | | | : | | | | |
| 02FF | | | 0 | | | | |

Note 1. When changed while system is running, changes are enabled when a mark detection settings enable command is input.
2. The set units are regarded as command units, or pulse units (the unit set in mark detection data type (parameter No.02B1)).

## 11.4 RIO module parameters

Refer to "MELSEC-L SSCNETⅢ/H Head Module User's Manual" for the RIO module parameters of the SSCNETⅢ/H head module.

## 11.5 RIO control parameters

| Parameter No. | Abbreviation | Name | Initial value | Units | Setting range | Function |
|---|---|---|---|---|---|---|
| 0200 | *OPC1 | Control option 1 | 0000h | | 0000h to 0011h | 0 0 ☐ ☐<br>Control station<br>Set to 1 for implementing control of a remote I/O module.<br>0: Not controlled<br>1: Controllled<br>Remote I/O disconnect<br>Set to 1 when remote I/O communication is not implemented.<br>When set to 1 together with the control station, it is possible to run without a remote I/O (simulate).<br>0: Invalid<br>1: Valid |
| 0201 | OPC2 | Control option 2 | 0000h | | 0000h to 0001h | 0 0 0 ☐<br>RI control at communication error<br>Set input device control at communication error(system error E401 to E407)<br>0: All points OFF<br>1: Maintain status |
| 0202 | *UTALC | Station No. assignment | 0000h | | 0000h to 011Fh | 0 ☐ ☐ ☐<br>Remote I/O station No.<br>Set the remote I/O station No. to be assigned to the station No. on the position board.<br>00h : No station No. assignment<br>15h to 18h : Station No.<br>Example) 16h: Remote I/O No. 22<br>Remote I/O line No.<br>Set the remote I/O line No. to be assigned to the station No.on the position board<br>0 to 1: Line No. - 1 |
| 0203 | ITM | Interrupt condition | 0000h | | 0000h to FFFFh | Set interrupt condition. |
| 0204 | | For manufacturer setting | 0 | | | |
| 0205 | | | 0 | | | |
| 0206 | | | 0 | | | |
| 0207 | | | 0 | | | |
| 0208 | | | 0 | | | |
| 0209 | | | 0 | | | |
| 020A | | | 0 | | | |
| 020B | | | 0 | | | |
| 020C | | | 0 | | | |
| 020D | | | 0 | | | |
| 020E | | | 0 | | | |
| 020F | | | 0 | | | |

| Parameter No. | Abbreviation | Name | Initial value | Units | Setting range | Function |
|---|---|---|---|---|---|---|
| 0210 | *BDIO | Input bit device points | 0000h | | 0000h to 0200h | Set the points used for input bit device.<br>0000h to 0200h: 0 to 512<br>Note. Only a multiple of 16 can be selected. |
| 0211 | *BDINA | Input bit device start number | 0000h | | 0000h to 0FF0h | Set the start of the input bit device number assigned to RX.<br>0000h to 0FF0h: 0 to 4080<br>Note. Only a multiple of 16 can be selected.<br>Example: When the input points are 64, and input bit device 020 is specified as the start, assign the 64 points of DVI_020 to DVI_05F. |
| 0212 | *WDIO | Input word device points | 0000h | | 0000h to 0020h | Set the points used for input word device.<br>0000h to 0020h: 0 to 32<br>Note. The size used is 1 word × set value. |
| 0213 | *WDINA | Input word device start number | 0000h | | 0000h to 00FFh | Set the start of the input word device number assigned to RWr.<br>0000h to 00FFh: 0 to 255<br>Example: When the input points are 2, and input word device 06 is specified as the start, assign input word devices 06 to 07. |
| 0214 | *BDOO | Output bit device points | 0000h | | 0000h to 0200h | Set the points used for output bit device.<br>0000h to 0200h: 0 to 512<br>Note. Only a multiple of 16 can be selected. |
| 0215 | *BDONA | Output bit device start number | 0000h | | 0000h to 0FF0h | Set the start of the output bit device number assigned to RY.<br>0000h to 0FF0h: 0 to 4080<br>Note. Only a multiple of 16 can be selected.<br>Example: When the output points are 64, and output bit device 040 is specified as the start, assign the 64 points of DV0_040 to DVO_07F. |
| 0216 | *WDOO | Output word device points | 0000h | | 0000h to 0020h | Set the points used for output word device.<br>0000h to 0020h: 0 to 32<br>Note. The size used is 1 word × set value. |
| 0217 | *WDONA | Output word device start number | 0000h | | 0000h to 00FFh | Set the start of the output word device number assigned to RWw.<br>0000h to 00FFh: 0 to 255<br>Example: When the output points are 2, and output word device 08 is specified as the start, assign output word devices 08 to 09. |
| 0218 | | For manufacturer setting | 0 | | | |
| 0219 | | | 0 | | | |
| 021A | | | 0 | | | |
| 021B | | | 0 | | | |
| 021C | | | 0 | | | |
| 021D | *VEND | Vendor ID | 0000h | | 0000h to FFFFh | Set the vendor ID.<br>0000h: Mitsubishi Electric |
| 021E | *CODE | Type code | 3000h | | 0000h to FFFFh | Set the type code.<br>3000h: SSCNETⅢ/H head module |
| 021F | | For manufacturer setting | 0 | | | |

Note. When a value other than a multiple of 16 is set to parameters where only a multiple of 16 can be set, a parameter error (RIO control alarm 37, detail 01) occurs at system startup.

| Parameter No. | Abbreviation | Name | Initial value | Units | Setting range | Function |
|---|---|---|---|---|---|---|
| 0220 | | For manufacturer setting | 0 | | | |
| 0221 | | | 0 | | | |
| 0222 | | | 0 | | | |
| 0223 | | | 0 | | | |
| 0224 | | | 0 | | | |
| 0225 | | | 0 | | | |
| 0226 | | | 0 | | | |
| 0227 | | | 0 | | | |
| 0228 | | | 0 | | | |
| 0229 | | | 0 | | | |
| 022A | | | 0 | | | |
| 022B | | | 0 | | | |
| 022C | | | 0 | | | |
| 022D | | | 0 | | | |
| 022E | | | 0 | | | |
| 022F | | | 0 | | | |
| 0230 | | | 0 | | | |
| 0231 | | | 0 | | | |
| 0232 | | | 0 | | | |
| 0233 | | | 0 | | | |
| 0234 | | | 0 | | | |
| 0235 | | | 0 | | | |
| 0236 | | | 0 | | | |
| 0237 | | | 0 | | | |
| 0238 | | | 0 | | | |
| 0239 | | | 0 | | | |
| 023A | | | 0 | | | |
| 023B | | | 0 | | | |
| 023C | | | 0 | | | |
| 023D | | | 0 | | | |
| 023E | | | 0 | | | |
| 023F | | | 0 | | | |

# 12. MONITOR NUMBER

## 12.1 Servo information (1)

| Monitor No. | Content | Units | Remarks |
|---|---|---|---|
| 0100 | Unit type name | | Hexadecimal ASCII character string (2 Characters per monitor number) |
| 0101 | | | |
| 0102 | | | |
| 0103 | | | |
| 0104 | | | |
| 0105 | | | |
| 0106 | | | |
| 0107 | | | |
| 0108 | Software number | | Hexadecimal ASCII character string (2 Characters per monitor number) |
| 0109 | | | |
| 010A | | | |
| 010B | | | |
| 010C | | | |
| 010D | | | |
| 010E | | | |
| 010F | | | |
| 0110 | Type code | | 1000h: MR-J4(W□)-□B<br>1200h: MR-JE-□B |
| 0111 | Vendor ID | | 0000h: Mitsubishi Electric |
| 0112 | Motor rated revolution speed | r/min | |
| 0113 | Motor rated current | 0.1% | |
| 0114 | Motor maximum revolution speed | r/min | |
| 0115 | Motor maximum torque | 0.1% | |
| 0116 | Number of encoder pulses per revolution (lower) | pulse | |
| 0117 | Number of encoder pulses per revolution (upper) | | |
| 0118 | Reserved | | |
| 0119 | Initial within 1 revolution position (lower) | pulse | |
| 011A | Initial within 1 revolution position (upper) | | |
| 011B | Initial multiple revolution data | rev | |
| 011C | Reserved | | |
| 011D | | | |
| 011E | | | |
| 011F | | | |
| 0120 | Motor permissible pulse rate (lower) | kpps | Pulse rate of operation at the motor maximum revolution speed. |
| 0121 | Motor permissible pulse rate (upper) | | |
| 0122 | Maximum output pulse rate (lower) | kpps | Maximum pulse rate that can be output by the position board. |
| 0123 | Maximum output pulse rate (upper) | | |
| 0124 | Reserved | | |
| 0125 | | | |
| 0126 | | | |

| Monitor No. | Content | Units | Remarks |
|---|---|---|---|
| 0127 | Station No. in order of connection | | Station No. in order of connection on line<br>Indicates the place where the station is connected from the position board.<br>Axes and stations are both included in the connection order.<br>Line No.<br>0: Line 1<br>1: Line 2<br>Example. Monitor value for the axis connected fifth on line 2: 1005h |
| 0128 | Reserved | | |
| 0129 | | | |
| 012A | | | |
| 012B | | | |
| 012C | | | |
| 012D | | | |
| 012E | | | |
| 012F | | | |

## 12.2 Servo information (2)

| Monitor No. | Content | Units | Remarks |
|---|---|---|---|
| 0200 | Position feedback (lower) | pulse | |
| 0201 | Position feedback (upper) | | |
| 0202 | Reserved | | |
| 0203 | | | |
| 0204 | Position droop (lower) | pulse | |
| 0205 | Position droop (upper) | | |
| 0206 | Reserved | | |
| 0207 | | | |
| 0208 | Speed feedback (lower) | 0.01r/min | |
| 0209 | Speed feedback (upper) | | |
| 020A | Electrical current command | 0.1% | |
| 020B | Electrical current feedback | 0.1% | |
| 020C | Reserved | | |
| 020D | | | |
| 020E | Detector within 1 revolution position (lower) | pulse | |
| 020F | Detector within 1 revolution position (upper) | | |
| 0210 | Home position within 1 revolution position (lower) | pulse | |
| 0211 | Home position within 1 revolution position (upper) | | |
| 0212 | ZCT (lower) | pulse | |
| 0213 | ZCT (upper) | | |
| 0214 | Multiple revolution counter | rev | |
| 0215 | Home position multiple revolution data | rev | |
| 0216 | Speed command (lower) | 0.01r/min | 0.01mm/s for linear servo motor |
| 0217 | Speed command (upper) | | |
| 0218 | Reserved | | |
| 0219 | | | |
| 021A | | | |
| 021B | | | |
| 021C | | | |
| 021D | | | |
| 021E | | | |
| 021F | | | |

| Monitor No. | Content | Units | Remarks |
|---|---|---|---|
| 0220 | Reserved | | |
| 0221 | | | |
| 0222 | | | |
| 0223 | | | |
| 0224 | | | |
| 0225 | | | |
| 0226 | | | |
| 0227 | | | |
| 0228 | | | |
| 0229 | | | |
| 022A | | | |
| 022B | | | |
| 022C | | | |
| 022D | | | |
| 022E | | | |
| 022F | | | |
| 0230 | | | |
| 0231 | | | |
| 0232 | | | |
| 0233 | | | |
| 0234 | | | |
| 0235 | | | |
| 0236 | | | |
| 0237 | | | |
| 0238 | | | |
| 0239 | | | |
| 023A | | | |
| 023B | | | |
| 023C | | | |
| 023D | | | |
| 023E | | | |
| 023F | | | |

| Monitor No. | Content | Units | Remarks |
|---|---|---|---|
| 0240 | Selected droop pulse (lower) | pulse | Select in the parameter when using the fully closed loop control (motor side/load side/motor side - load side) |
| 0241 | Selected droop pulse (upper) | | |
| 0242 | Reserved | | |
| 0243 | | | |
| 0244 | Selected cumulative feed pulses (lower) | pulse | Select in the parameter when using the fully closed loop control (motor side/load side) |
| 0245 | Selected cumulative feed pulses (upper) | | |
| 0246 | Load side encoder information data 1 (lower) | pulse | When using the linear servo/fully closed loop control |
| 0247 | Load side encoder information data 1 (upper) | | |
| 0248 | Load side encoder information data 2 (lower) | pulse | When using the linear servo/fully closed loop control |
| 0249 | Load side encoder information data 2 (upper) | | |
| 024A | Speed feedback (lower) | 0.01mm/s | When using a linear servo |
| 024B | Speed feedback (upper) | | |
| 024C | Voltage of generating line | V | |
| 024D | Regenerative load factor | % | |
| 024E | Effective load factor | % | |
| 024F | Peak load factor | % | |
| 0250 | Estimated load inertial ratio | 0.1 times | |
| 0251 | Position gain (model position gain) | rad/s | |
| 0252 | Motor thermistor temperature | ℃ | When using a motor with thermistor attached. |
| 0253 | Reserved | | |
| 0254 | | | |
| 0255 | | | |
| 0256 | | | |
| 0257 | | | |
| 0258 | | | |
| 0259 | | | |
| 025A | | | |
| 025B | | | |
| 025C | | | |
| 025D | | | |
| 025E | | | |
| 025F | | | |
| 0260 | | | |
| 0261 | Alarm/warning number | | |
| 0262 | Alarm detailed bits | | |
| 0263 | Reserved | | |
| 0264 | Alarm status AL-1 □ | | □ is 0 (bit 0) to F (bit 15)<br>Bit corresponding to alarm number is turned on.<br>Review the alarms when multiple alarms occurs simultaneously etc. |
| 0265 | Alarm status AL-2 □ | | |
| 0266 | Alarm status AL-3 □ | | |
| 0267 | Alarm status AL-4 □ | | |
| 0268 | Alarm status AL-5 □ | | |
| 0269 | Alarm status AL-6 □ | | |
| 026A | Alarm status AL-7 □ | | |
| 026B | Alarm status AL-8 □ | | |
| 026C | Alarm status AL-9 □ | | |
| 026D | Alarm status AL-E □ | | |
| 026E | Alarm status AL-F □ | | |
| 026F | Alarm status AL-A □ | | |

| Monitor No. | Content | Units | Remarks |
|---|---|---|---|
| 0270 | Reserved | | |
| 0271 | | | |
| 0272 | | | |
| 0273 | | | |
| 0274 | | | |
| 0275 | | | |
| 0276 | | | |
| 0277 | | | |
| 0278 | | | |
| 0279 | | | |
| 027A | | | |
| 027B | | | |
| 027C | | | |
| 027D | | | |
| 027E | | | |
| 027F | | | |
| 0280 | | | |
| 0281 | | | |
| 0282 | | | |
| 0283 | | | |
| 0284 | | | |
| 0285 | | | |
| 0286 | | | |
| 0287 | | | |
| 0288 | | | |
| 0289 | | | |
| 028A | | | |
| 028B | | | |
| 028C | | | |
| 028D | | | |
| 028E | | | |
| 028F | | | |
| 0290 | | | |
| 0291 | | | |
| 0292 | | | |
| 0293 | | | |
| 0294 | | | |
| 0295 | | | |
| 0296 | | | |
| 0297 | | | |
| 0298 | | | |
| 0299 | | | |
| 029A | | | |
| 029B | | | |
| 029C | | | |
| 029D | | | |
| 029E | | | |
| 029F | | | |

| Monitor No. | Content | Units | Remarks |
|---|---|---|---|
| 02A0 | Module power consumption | W | |
| 02A1 | Reserved | | |
| 02A2 | Module cumulative power consumption (lower) | Wh | |
| 02A3 | Module cumulative power consumption (upper) | | |
| 02A4 | Reserved | | |
| 02A5 | | | |
| 02A6 | | | |
| 02A7 | | | |
| 02A8 | Torques corresponding to disturbance | 0.1% | Thrust corresponding to disturbance when using the linear |
| 02A9 | Instantaneous torque | 0.1% | Instantaneous thrust when using the linear |
| 02AA | Overload alarm margin | 0.1% | |
| 02AB | Error excessive alarm margin | 16pulse | |
| 02AC | Settle time | ms | |
| 02AD | Overshoot amount | pulse | |
| 02AE | Motor side/load side position deviation (lower) | pulse | When using the fully closed loop control |
| 02AF | Motor side/load side position deviation (upper) | | |
| 02B0 | Motor side/load side speed deviation (lower) | 0.01r/min | When using the fully closed loop control |
| 02B1 | Motor side/load side speed deviation (upper) | | |
| 02B2 | Reserved | | |
| 02B3 | | | |
| 02B4 | | | |
| 02B5 | | | |
| 02B6 | | | |
| 02B7 | | | |
| 02B8 | | | |
| 02B9 | | | |
| 02BA | | | |
| 02BB | | | |
| 02BC | | | |
| 02BD | | | |
| 02BE | | | |
| 02BF | | | |
| 02C0 | | | |
| 02C1 | | | |
| 02C2 | | | |
| 02C3 | | | |
| 02C4 | | | |
| 02C5 | | | |
| 02C6 | | | |
| 02C7 | | | |
| 02C8 | | | |
| 02C9 | | | |
| 02CA | | | |
| 02CB | | | |
| 02CC | | | |
| 02CD | | | |
| 02CE | | | |
| 02CF | | | |

## 12.3 RIO information

| Monitor No. | Content | Units | Remarks |
|---|---|---|---|
| 0100 | Reserved | | |
| 0101 | | | |
| 0102 | | | |
| 0103 | | | |
| 0104 | | | |
| 0105 | | | |
| 0106 | | | |
| 0107 | | | |
| 0108 | | | |
| 0109 | | | |
| 010A | | | |
| 010B | | | |
| 010C | | | |
| 010D | | | |
| 010E | | | |
| 010F | | | |
| 0110 | Type code | | 3000h: SSCNETⅢ/H head module |
| 0111 | Vendor ID | | 0000h: Mitsubishi Electric |
| 0112 | Reserved | | |
| 0113 | | | |
| 0114 | | | |
| 0115 | | | |
| 0116 | | | |
| 0117 | | | |
| 0118 | | | |
| 0119 | | | |
| 011A | | | |
| 011B | | | |
| 011C | | | |
| 011D | | | |
| 011E | | | |
| 011F | | | |
| 0120 | | | |
| 0121 | | | |
| 0122 | | | |
| 0123 | | | |
| 0124 | | | |
| 0125 | | | |
| 0126 | | | |
| 0127 | Station No. in order of connection | | Station No. in order of connection on line<br>Indicates the place where the station is connected from the position board.<br>Axes and stations are both included in the connection order.<br>Line No.<br>0: Line 1<br>1: Line 2<br>Example. Monitor value for the axis connected fifth on line 2: 1005h |

| Monitor No. | Content | Units | Remarks |
|---|---|---|---|
| 0128 | Reserved | | |
| 0129 | | | |
| 012A | | | |
| 012B | | | |
| 012C | | | |
| 012D | | | |
| 012E | | | |
| 012F | | | |

## 12.4 Operation information

| Monitor No. | Content | Units | Remarks |
|---|---|---|---|
| 0300 | Current command position (lower) | Command units | Current command position prior to electronic gear processing |
| 0301 | Current command position (upper) | | |
| 0302 | Current feedback position (lower) | Command units | Current feedback position prior to electronic gear processing |
| 0303 | Current feedback position (upper) | | |
| 0304 | Moving speed (lower) | Speed units | Current speed output to servo amplifier |
| 0305 | Moving speed (upper) | | |
| 0306 | Remaining distance to move (lower) | Command units | Distance from current command position to end point when in automatic operation |
| 0307 | Remaining distance to move (upper) | | |
| 0308 | Grid size (lower) | pulse | Distance from standard position of return to home position (end of dog etc.) to the Z-phase<br>For the home position return method which does not use the Z-phase, 0 is displayed. |
| 0309 | Grid size (upper) | | |
| 030A | Operation point No. | | Value equal to operation point number + 1 is displayed.<br>0 is displayed while stopped. |
| 030B | Remaining dwell time | ms | |
| 030C | Reserved | | |
| 030D | | | |
| 030E | | | |
| 030F | | | |
| 0310 | Current command position (lower) | pulse | Current command position after electronic gear processing |
| 0311 | Current command position (upper) | | |
| 0312 | Current feedback position (lower) | pulse | Current feedback position after electronic gear processing |
| 0313 | Current feedback position (upper) | | |
| 0314 | F Δ T (lower) | pulse | Movement amount per control cycle |
| 0315 | F Δ T (upper) | | |
| 0316 | Feedback moving speed (lower) | Speed units | The feedback speed converted from the difference of the current feedback position (after electronic gear processing) |
| 0317 | Feedback moving speed (upper) | | |
| 0318 | Reserved | | |
| 0319 | | | |
| 031A | | | |
| 031B | | | |
| 031C | | | |
| 031D | | | |
| 031E | | | |
| 031F | | | |
| 0320 | External signal status | | bit0: LSP - bit1: LSN - bit2: DOG (Note) |
| 0321 | Reserved | | |
| 0322 | | | |
| 0323 | | | |
| 0324 | Speed command (lower) | 0.01r/min | Notifies the speed command during speed control. |
| 0325 | Speed command (upper) | 0.01r/min | |
| 0326 | Torque command | 0.1% | Notifies the torque command during torque control. |
| 0327 | Reserved | | |
| 0328 | | | |
| 0329 | | | |
| 032A | | | |
| 032B | | | |
| 032C | | | |
| 032D | | | |
| 032E | | | |
| 032F | | | |

Note. 0: I/O input signal OFF, 1: I/O input signal ON is indicated.

| Monitor No. | Content | Units | Remarks |
|---|---|---|---|
| 0330 | Control parameter error number<br>No. 0200 to 020F | | Bit corresponding to parameter number is turned on.<br>bit is No. 0200 (bit 0) to 020F (bit 15). |
| 0331 | Control parameter error number<br>No. 0210 to 021F | | Bit corresponding to parameter number is turned on.<br>bit is No. 0210 (bit 0) to 021F (bit 15). |
| 0332 | Control parameter error number<br>No. 0220 to 022F | | Bit corresponding to parameter number is turned on.<br>bit is No. 0220 (bit 0) to 022F (bit 15). |
| 0333 | Control parameter error number<br>No. 0230 to 023F | | Bit corresponding to parameter number is turned on.<br>bit is No. 0230 (bit 0) to 023F (bit 15). |
| 0334 | Control parameter error number<br>No. 0240 to 024F | | Bit corresponding to parameter number is turned on.<br>bit is No. 0240 (bit 0) to 024F (bit 15). |
| 0335 | Control parameter error number<br>No. 0250 to 025F | | Bit corresponding to parameter number is turned on.<br>bit is No. 0250 (bit 0) to 025F (bit 15). |
| 0336 | Control parameter error number<br>No. 0260 to 026F | | Bit corresponding to parameter number is turned on.<br>bit is No. 0260 (bit 0) to 026F (bit 15). |
| 0337 | Control parameter error number<br>No. 0270 to 027F | | Bit corresponding to parameter number is turned on.<br>bit is No. 0270 (bit 0) to 027F (bit 15). |
| 0338 | Control parameter error number<br>No. 0280 to 028F | | Bit corresponding to parameter number is turned on.<br>bit is No. 0280 (bit 0) to 028F (bit 15). |
| 0339 | Control parameter error number<br>No. 0290 to 029F | | Bit corresponding to parameter number is turned on.<br>bit is No. 0290 (bit 0) to 029F (bit 15). |
| 033A | Control parameter error number<br>No. 02A0 to 02AF | | Bit corresponding to parameter number is turned on.<br>bit is No. 02A0 (bit 0) to 02AF (bit 15). |
| 033B | Control parameter error number<br>No. 02B0 to 02BF | | Bit corresponding to parameter number is turned on.<br>bit is No. 02B0 (bit 0) to 02BF (bit 15). |
| 033C | Control parameter error number<br>No. 02C0 to 02CF | | Bit corresponding to parameter number is turned on.<br>bit is No. 02C0 (bit 0) to 02CF (bit 15). |
| 033D | Control parameter error number<br>No. 02D0 to 02DF | | Bit corresponding to parameter number is turned on.<br>bit is No. 02D0 (bit 0) to 02DF (bit 15). |
| 033E | Control parameter error number<br>No. 02E0 to 02EF | | Bit corresponding to parameter number is turned on.<br>bit is No. 02E0 (bit 0) to 02EF (bit 15). |
| 033F | Control parameter error number<br>No. 02F0 to 02FF | | Bit corresponding to parameter number is turned on.<br>bit is No. 02F0 (bit 0) to 02FF (bit 15). |
| 0340 | Reserved | | |
| 0341 | | | |
| 0342 | | | |
| 0343 | | | |
| 0344 | | | |
| 0345 | | | |
| 0346 | | | |
| 0347 | | | |
| 0348 | | | |
| 0349 | | | |
| 034A | | | |
| 034B | | | |
| 034C | | | |
| 034D | | | |
| 034E | | | |
| 034F | | | |
| : | | | |
| 037F | | | |

| Monitor No. | Content | Units | Remarks |
|---|---|---|---|
| 0380 | Axis data command bit 1 | | Use these when sampling the axis data command bit. For details, refer to Section 7.12.7. |
| 0381 | Axis data command bit 2 | | |
| 0382 | Axis data command bit 3 | | |
| 0383 | Axis data command bit 4 | | |
| 0384 | Axis data command bit 5 | | |
| 0385 | Axis data command bit 6 | | |
| 0386 | Axis data command bit 7 | | |
| 0387 | Axis data command bit 8 | | |
| 0388 | Reserved | | |
| 0389 | | | |
| 038A | | | |
| 038B | | | |
| 038C | | | |
| 038D | | | |
| 038E | | | |
| 038F | | | |
| 0390 | | | |
| : | | | |
| 039F | | | |
| 03A0 | Axis data status bit 1 | | Use these when sampling the axis data status bit. For details, refer to Section 7.12.7. |
| 03A1 | Axis data status bit 2 | | |
| 03A2 | Axis data status bit 3 | | |
| 03A3 | Axis data status bit 4 | | |
| 03A4 | Axis data status bit 5 | | |
| 03A5 | Axis data status bit 6 | | |
| 03A6 | Axis data status bit 7 | | |
| 03A7 | Axis data status bit 8 | | |
| 03A8 | Reserved | | |
| 03A9 | | | |
| 03AA | | | |
| 03AB | | | |
| 03AC | | | |
| 03AD | | | |
| 03AE | | | |
| 03AF | | | |
| 03B0 | | | |
| : | | | |
| 03BF | | | |

## 12.5 Operation information (double word)

| Monitor No. | Content | Units | Remarks |
|---|---|---|---|
| 1300 | Current command position | Command units | Command position prior to electronic gear processing |
| 1302 | Current feedback position | Command units | Current feedback position prior to electronic gear processing |
| 1304 | Moving speed | Speed units | Command speed output to servo amplifier |
| 1306 | Remaining distance to move | Command units | Distance from current command position to end point when in automatic operation |
| 1308 | Grid size | pulse | Distance from standard position of return to home position (end of dog etc.) to the Z-phase.<br>For the home position return method which does not use the Z-phase, 0 is displayed. |
| 130A | Reserved | | |
| 130C | | | |
| 130E | | | |
| 1310 | Current command position | pulse | Command position after electronic gear processing |
| 1312 | Current feedback position | pulse | Current feedback position after electronic gear processing |
| 1314 | F Δ T | pulse | Movement amount per control cycle |
| 1316 | Feedback moving speed | Speed units | The feedback speed converted from the difference of the current feedback position (after electronic gear processing) |
| 1318 | Reserved | | |
| 131A | | | |
| 131C | | | |
| 131E | | | |
| 1320 | | | |
| 1322 | | | |
| 1324 | Speed command | 0.01r/min | Notifies the speed command during speed control. |
| 1326 | Reserved | | |
| 1328 | | | |
| 132A | | | |
| 132C | | | |
| 132E | | | |
| 1330 | | | |
| 1332 | | | |
| 1334 | | | |
| 1336 | | | |
| 1338 | | | |
| 133A | | | |
| 133C | | | |
| 133E | | | |
| 1340 | | | |
| 1342 | | | |
| 1344 | | | |
| 1346 | | | |
| 1348 | | | |
| 134A | | | |
| 134C | | | |
| 134E | | | |

## 12.6 RIO control information

| Monitor No. | Content | Units | Remarks |
|---|---|---|---|
| 0300 | Reserved | | |
| 0301 | | | |
| 0302 | | | |
| 0303 | | | |
| 0304 | | | |
| 0305 | | | |
| 0306 | | | |
| 0307 | | | |
| 0308 | | | |
| 0309 | | | |
| 030A | | | |
| 030B | | | |
| 030C | | | |
| 030D | | | |
| 030E | | | |
| 030F | | | |
| 0310 | | | |
| 0311 | | | |
| 0312 | | | |
| 0313 | | | |
| 0314 | | | |
| 0315 | | | |
| 0316 | | | |
| 0317 | | | |
| 0318 | | | |
| 0319 | | | |
| 031A | | | |
| 031B | | | |
| 031C | | | |
| 031D | | | |
| 031E | | | |
| 031F | | | |
| 0320 | | | |
| 0321 | | | |
| 0322 | | | |
| 0323 | | | |
| 0324 | | | |
| 0325 | | | |
| 0326 | | | |
| 0327 | | | |
| 0328 | | | |
| 0329 | | | |
| 032A | | | |
| 032B | | | |
| 032C | | | |
| 032D | | | |
| 032E | | | |
| 032F | | | |

| Monitor No. | Content | Units | Remarks |
|---|---|---|---|
| 0330 | RIO control parameter error number No. 0200 to 020F | | Bit corresponding to parameter error number is turned on. bit is No. 0200 (bit 0) to 020F (bit 15). |
| 0331 | RIO control parameter error number No. 0210 to 021F | | Bit corresponding to parameter error number is turned on. bit is No. 0210 (bit 0) to 021F (bit 15). |
| 0332 | RIO control parameter error number No. 0220 to 022F | | Bit corresponding to parameter error number is turned on. bit is No. 0220 (bit 0) to 022F (bit 15). |
| 0333 | RIO control parameter error number No. 0230 to 023F | | Bit corresponding to parameter error number is turned on. bit is No. 0230 (bit 0) to 023F (bit 15). |
| 0334 | Reserved | | |
| 0335 | | | |
| 0336 | | | |
| 0337 | | | |
| 0338 | | | |
| 0339 | | | |
| 033A | | | |
| 033B | | | |
| 033C | | | |
| 033D | | | |
| 033E | | | |
| 033F | | | |

Note. Information concerning parameter error (RIO control alarm 37, detail 01) that has occurred at system startup can be monitored.

## 12.7 System information

| Monitor No. | Content | Units | Remarks |
|---|---|---|---|
| 0400 | Reserved | | |
| 0401 | Cause of forced stop (Note) | | bit 0: External forced stop<br>bit 1: Software forced stop<br>bit 2: User watchdog<br>bit 3: Communication error<br>bit 4: An axis that has not been mounted exists<br>bit 5: During reboot preparation<br>bit 6: System error E5□□ occurrence |
| 0402 | Reserved | | |
| 0403 | | | |
| 0404 | | | |
| 0405 | | | |
| 0406 | | | |
| 0407 | | | |
| 0408 | | | |
| 0409 | | | |
| 040A | Parameter backup times | Times | Displays the times of write accesses to flash ROM by the parameter backups after system preparation is completed. |
| 040B | Reserved | | |
| 040C | | | |
| 040D | | | |
| 040E | | | |
| 040F | | | |
| 0410 | System parameter error number No. 0001 to 000F | | Bit corresponding to parameter number is turned on. bit is No. 0001 (bit 1) to 000F (bit 15). |
| 0411 | System parameter error number No. 0010 to 001F | | Bit corresponding to parameter number is turned on. bit is No. 0010 (bit 0) to 001F (bit 15). |
| 0412 | System parameter error number No. 0020 to 002F | | Bit corresponding to parameter number is turned on. bit is No. 0020 (bit 0) to 002F (bit 15). |
| 0413 | System parameter error number No. 0030 to 003F | | Bit corresponding to parameter number is turned on. bit is No. 0030 (bit 0) to 003F (bit 15). |
| 0414 | System parameter error number No. 0040 to 004F | | Bit corresponding to parameter number is turned on. bit is No. 0040 (bit 0) to 004F (bit 15). |
| 0415 | System parameter error number No. 0050 to 005F | | Bit corresponding to parameter number is turned on. bit is No. 0050 (bit 0) to 005F (bit 15). |
| 0416 | System parameter error number No. 0060 to 006F | | Bit corresponding to parameter number is turned on. bit is No. 0060 (bit 0) to 006F (bit 15). |
| 0417 | System parameter error number No. 0070 to 007F | | Bit corresponding to parameter number is turned on. bit is No. 0070 (bit 0) to 007F (bit 15). |
| 0418 | Reserved | | |
| : | | | |
| 047F | | | |

Note. The bit for the corresponding forced stop factor is turned on.

| Monitor No. | Content | Units | Remarks |
|---|---|---|---|
| 0480 | Information concerning axis that is not mounted 1<br>(For driver) | | When system error E400: "An axis that has not been mounted exists" is set, this bit is turned on.<br>Axis 1 (bit 0) to axis 16 (bit 15) |
| 0481 | Information concerning axis that is not mounted 2<br>(For driver) | | When system error E400: "An axis that has not been mounted exists" is set, this bit is turned on.<br>Axis 17 (bit 0) to axis 32 (bit 15) |
| 0482<br>0483 | Reserved | | |
| 0484 | Type code erroneous axis information 1<br>(For driver) | | When system error E405: Driver type code error is set, this bit is turned on.<br>Axis 1 (bit 0) to axis 16 (bit 15) |
| 0485 | Type code erroneous axis information 2<br>(For driver) | | When system error E405: Driver type code error is set, this bit is turned on.<br>Axis 17 (bit 0) to axis 32 (bit 15) |
| 0486<br>0487 | Reserved | | |
| 0488 | Electronic gear setting error axis information 1 | | When an electronic gear setting error (system error E500) is set, this bit is turned on.<br>Axis 1 (bit 0) to axis 16 (bit 15) |
| 0489 | Electronic gear setting error axis information 2 | | When an electronic gear setting error (system error E500) is set, this bit is turned on.<br>Axis 17 (bit 0) axis 32 (bit 15) |
| 048A<br>:<br>04BF | Reserved | | |
| 04C0 | Information concerning station that is not mounted<br>(For module) | | When system error E400: "An axis that has not been mounted exists" is set, this bit is turned on.<br>Station 1 (bit 0) to station 4 (bit 3) |
| 04C1 | Type code erroneous station information<br>(For module) | | When system error E405: Driver type code error is set, this bit is turned on.<br>Station 1 (bit 0) to station 4 (bit 3) |
| 04C2<br>:<br>04BF | Reserved | | |

## 12.8 Servo parameter information

| Monitor No. | Content | Units | Remarks |
|---|---|---|---|
| 0500<br>:<br>050F | Reserved | | |
| 0510 | Servo parameter error number (Note)<br>No. 1100 to 110F | | Bit corresponding to parameter number is turned on.<br>bit is No. 1100 (bit 0) to 110F (bit 15). |
| 0511 | Servo parameter error number (Note)<br>No. 1110 to 111F | | Bit corresponding to parameter number is turned on.<br>bit is No. 1110 (bit 0) to 111F (bit 15). |
| 0512 | Servo parameter error number (Note)<br>No. 1120 to 112F | | Bit corresponding to parameter number is turned on.<br>bit is No. 1120 (bit 0) to 112F (bit 15). |
| 0513 | Servo parameter error number (Note)<br>No. 1130 to 113F | | Bit corresponding to parameter number is turned on.<br>bit is No. 1130 (bit 0) to 113F (bit 15). |
| 0514 | Servo parameter error number (Note)<br>No. 1140 to 114F | | Bit corresponding to parameter number is turned on.<br>bit is No. 1140 (bit 0) to 114F (bit 15). |
| 0515 | Servo parameter error number (Note)<br>No. 1150 to 115F | | Bit corresponding to parameter number is turned on.<br>bit is No. 1150 (bit 0) to 115F (bit 15). |
| 0516 | Servo parameter error number (Note)<br>No. 1160 to 116F | | Bit corresponding to parameter number is turned on.<br>bit is No. 1160 (bit 0) to 116F (bit 15). |
| 0517 | Servo parameter error number (Note)<br>No. 1170 to 117F | | Bit corresponding to parameter number is turned on.<br>bit is No. 1170 (bit 0) to 117F (bit 15). |
| 0518 | Servo parameter error number (Note)<br>No. 1180 to 118F | | Bit corresponding to parameter number is turned on.<br>bit is No. 1180 (bit 0) to 118F (bit 15). |
| 0519 | Servo parameter error number (Note)<br>No. 1190 to 119F | | Bit corresponding to parameter number is turned on.<br>bit is No. 1190 (bit 0) to 119F (bit 15). |
| 051A | Servo parameter error number (Note)<br>No. 11A0 to 11AF | | Bit corresponding to parameter number is turned on.<br>bit is No. 11A0 (bit 0) to 11AF (bit 15). |
| 051B | Servo parameter error number (Note)<br>No. 11B0 to 11BF | | Bit corresponding to parameter number is turned on.<br>bit is No. 11B0 (bit 0) to 11BF (bit 15). |
| 051C | Servo parameter error number (Note)<br>No. 11C0 to 11CF | | Bit corresponding to parameter number is turned on.<br>bit is No. 11C0 (bit 0) to 11CF (bit 15). |
| 051D | Servo parameter error number (Note)<br>No. 11D0 to 11DF | | Bit corresponding to parameter number is turned on.<br>bit is No. 11D0 (bit 0) to 11DF (bit 15). |
| 051E | Servo parameter error number (Note)<br>No. 11E0 to 11EF | | Bit corresponding to parameter number is turned on.<br>bit is No. 11E0 (bit 0) to 11EF (bit 15). |
| 051F | Servo parameter error number (Note)<br>No. 11F0 to 11FF | | Bit corresponding to parameter number is turned on.<br>bit is No. 11F0 (bit 0) to 11FF (bit 15). |

Note. Information concerning parameter error (servo alarm 37) that has occurred at system startup can be monitored. If a parameter warning (servo alarm E4) occurs while system is running, it is not reflected in this information.

| Monitor No. | Content | Units | Remarks |
|---|---|---|---|
| 0520 | Servo parameter error number (Note)<br>No. 1200 to 120F | | Bit corresponding to parameter number is turned on.<br>bit is No. 1200 (bit 0) to 120F (bit 15). |
| 0521 | Servo parameter error number (Note)<br>No. 1210 to 121F | | Bit corresponding to parameter number is turned on.<br>bit is No. 1210 (bit 0) to 121F (bit 15). |
| 0522 | Servo parameter error number (Note)<br>No. 1220 to 122F | | Bit corresponding to parameter number is turned on.<br>bit is No. 1220 (bit 0) to 122F (bit 15). |
| 0523 | Servo parameter error number (Note)<br>No. 1230 to 123F | | Bit corresponding to parameter number is turned on.<br>bit is No. 1230 (bit 0) to 123F (bit 15). |
| 0524 | Servo parameter error number (Note)<br>No. 1240 to 124F | | Bit corresponding to parameter number is turned on.<br>bit is No. 1240 (bit 0) to 124F (bit 15). |
| 0525 | Servo parameter error number (Note)<br>No. 1250 to 125F | | Bit corresponding to parameter number is turned on.<br>bit is No. 1250 (bit 0) to 125F (bit 15). |
| 0526 | Servo parameter error number (Note)<br>No. 1260 to 126F | | Bit corresponding to parameter number is turned on.<br>bit is No. 1260 (bit 0) to 126F (bit 15). |
| 0527 | Servo parameter error number (Note)<br>No. 1270 to 127F | | Bit corresponding to parameter number is turned on.<br>bit is No. 1270 (bit 0) to 127F (bit 15). |
| 0528 | Servo parameter error number (Note)<br>No. 1280 to 128F | | Bit corresponding to parameter number is turned on.<br>bit is No. 1280 (bit 0) to 128F (bit 15). |
| 0529 | Servo parameter error number (Note)<br>No. 1290 to 129F | | Bit corresponding to parameter number is turned on.<br>bit is No. 1290 (bit 0) to 129F (bit 15). |
| 052A | Servo parameter error number (Note)<br>No. 12A0 to 12AF | | Bit corresponding to parameter number is turned on.<br>bit is No. 12A0 (bit 0) to 12AF (bit 15). |
| 052B | Servo parameter error number (Note)<br>No. 12B0 to 12BF | | Bit corresponding to parameter number is turned on.<br>bit is No. 12B0 (bit 0) to 12BF (bit 15). |
| 052C | Servo parameter error number (Note)<br>No. 12C0 to 12CF | | Bit corresponding to parameter number is turned on.<br>bit is No. 12C0 (bit 0) to 12CF (bit 15). |
| 052D | Servo parameter error number (Note)<br>No. 12D0 to 12DF | | Bit corresponding to parameter number is turned on.<br>bit is No. 12D0 (bit 0) to 12DF (bit 15). |
| 052E | Servo parameter error number (Note)<br>No. 12E0 to 12EF | | Bit corresponding to parameter number is turned on.<br>bit is No. 12E0 (bit 0) to 12EF (bit 15). |
| 052F | Servo parameter error number (Note)<br>No. 12F0 to 12FF | | Bit corresponding to parameter number is turned on.<br>bit is No. 12F0 (bit 0) to 12FF (bit 15). |

Note. Information concerning parameter error (servo alarm 37) that has occurred at system startup can be monitored. If a parameter warning (servo alarm E4) occurs while system is running, it is not reflected in this information.

| Monitor No. | Content | Units | Remarks |
|---|---|---|---|
| 0530 | Servo parameter error number (Note)<br>No. 1300 to 130F | | Bit corresponding to parameter number is turned on.<br>bit is No. 1300 (bit 0) to 130F (bit 15). |
| 0531 | Servo parameter error number (Note)<br>No. 1310 to 131F | | Bit corresponding to parameter number is turned on.<br>bit is No. 1310 (bit 0) to 131F (bit 15). |
| 0532 | Servo parameter error number (Note)<br>No. 1320 to 132F | | Bit corresponding to parameter number is turned on.<br>bit is No. 1320 (bit 0) to 132F (bit 15). |
| 0533 | Servo parameter error number (Note)<br>No. 1330 to 133F | | Bit corresponding to parameter number is turned on.<br>bit is No. 1330 (bit 0) to 133F (bit 15). |
| 0534 | Servo parameter error number (Note)<br>No. 1340 to 134F | | Bit corresponding to parameter number is turned on.<br>bit is No. 1340 (bit 0) to 134F (bit 15). |
| 0535 | Servo parameter error number (Note)<br>No. 1350 to 135F | | Bit corresponding to parameter number is turned on.<br>bit is No. 1350 (bit 0) to 135F (bit 15). |
| 0536 | Servo parameter error number (Note)<br>No. 1360 to 136F | | Bit corresponding to parameter number is turned on.<br>bit is No. 1360 (bit 0) to 136F (bit 15). |
| 0537 | Servo parameter error number (Note)<br>No. 1370 to 137F | | Bit corresponding to parameter number is turned on.<br>bit is No. 1370 (bit 0) to 137F (bit 15). |
| 0538<br>:<br>054F | Reserved | | |

Note. Information concerning parameter error (servo alarm 37) that has occurred at system startup can be monitored. If a parameter warning (servo alarm E4) occurs while system is running, it is not reflected in this information.

| Monitor No. | Content | Units | Remarks |
|---|---|---|---|
| 0580<br>:<br>058F | Reserved | | |
| 0590 | Servo parameter change number<br>No. 1100 to 110F | | Bit corresponding to parameter number is turned on.<br>bit is No. 1100 (bit 0) to 110F (bit 15). |
| 0591 | Servo parameter change number<br>No. 1110 to 111F | | Bit corresponding to parameter number is turned on.<br>bit is No. 1110 (bit 0) to 111F (bit 15). |
| 0592 | Servo parameter change number<br>No. 1120 to 112F | | Bit corresponding to parameter number is turned on.<br>bit is No. 1120 (bit 0) to 112F (bit 15). |
| 0593 | Servo parameter change number<br>No. 1130 to 113F | | Bit corresponding to parameter number is turned on.<br>bit is No. 1130 (bit 0) to 113F (bit 15). |
| 0594 | Servo parameter change number<br>No. 1140 to 114F | | Bit corresponding to parameter number is turned on.<br>bit is No. 1140 (bit 0) to 114F (bit 15). |
| 0595 | Servo parameter change number<br>No. 1150 to 115F | | Bit corresponding to parameter number is turned on.<br>bit is No. 1150 (bit 0) to 115F (bit 15). |
| 0596 | Servo parameter change number<br>No. 1160 to 116F | | Bit corresponding to parameter number is turned on.<br>bit is No. 1160 (bit 0) to 116F (bit 15). |
| 0597 | Servo parameter change number<br>No. 1170 to 117F | | Bit corresponding to parameter number is turned on.<br>bit is No. 1170 (bit 0) to 117F (bit 15). |
| 0598 | Servo parameter change number<br>No. 1180 to 118F | | Bit corresponding to parameter number is turned on.<br>bit is No. 1180 (bit 0) to 118F (bit 15). |
| 0599 | Servo parameter change number<br>No. 1190 to 119F | | Bit corresponding to parameter number is turned on.<br>bit is No. 1190 (bit 0) to 119F (bit 15). |
| 059A | Servo parameter change number<br>No. 11A0 to 11AF | | Bit corresponding to parameter number is turned on.<br>bit is No. 11A0 (bit 0) to 11AF (bit 15). |
| 059B | Servo parameter change number<br>No. 11B0 to 11BF | | Bit corresponding to parameter number is turned on.<br>bit is No. 11B0 (bit 0) to 11BF (bit 15). |
| 059C | Servo parameter change number<br>No. 11C0 to 11CF | | Bit corresponding to parameter number is turned on.<br>bit is No. 11C0 (bit 0) to 11CF (bit 15). |
| 059D | Servo parameter change number<br>No. 11D0 to 11DF | | Bit corresponding to parameter number is turned on.<br>bit is No. 11D0 (bit 0) to 11DF (bit 15). |
| 059E | Servo parameter change number<br>No. 11E0 to 11EF | | Bit corresponding to parameter number is turned on.<br>bit is No. 11E0 (bit 0) to 11EF (bit 15). |
| 059F | Servo parameter change number<br>No. 11F0 to 11FF | | Bit corresponding to parameter number is turned on.<br>bit is No. 11F0 (bit 0) to 11FF (bit 15). |

| Monitor No. | Content | Units | Remarks |
|---|---|---|---|
| 05A0 | Servo parameter change number<br>No. 1200 to 120F | | Bit corresponding to parameter number is turned on.<br>bit is No. 1200 (bit 0) to 120F (bit 15). |
| 05A1 | Servo parameter change number<br>No. 1210 to 121F | | Bit corresponding to parameter number is turned on.<br>bit is No. 1210 (bit 0) to 121F (bit 15). |
| 05A2 | Servo parameter change number<br>No. 1220 to 122F | | Bit corresponding to parameter number is turned on.<br>bit is No. 1220 (bit 0) to 122F (bit 15). |
| 05A3 | Servo parameter change number<br>No. 1230 to 123F | | Bit corresponding to parameter number is turned on.<br>bit is No. 1230 (bit 0) to 123F (bit 15). |
| 05A4 | Servo parameter change number<br>No. 1240 to 124F | | Bit corresponding to parameter number is turned on.<br>bit is No. 1240 (bit 0) to 124F (bit 15). |
| 05A5 | Servo parameter change number<br>No. 1250 to 125F | | Bit corresponding to parameter number is turned on.<br>bit is No. 1250 (bit 0) to 125F (bit 15). |
| 05A6 | Servo parameter change number<br>No. 1260 to 126F | | Bit corresponding to parameter number is turned on.<br>bit is No. 1260 (bit 0) to 126F (bit 15). |
| 05A7 | Servo parameter change number<br>No. 1270 to 127F | | Bit corresponding to parameter number is turned on.<br>bit is No. 1270 (bit 0) to 127F (bit 15). |
| 05A8 | Servo parameter change number<br>No. 1280 to 128F | | Bit corresponding to parameter number is turned on.<br>bit is No. 1280 (bit 0) to 128F (bit 15). |
| 05A9 | Servo parameter change number<br>No. 1290 to 129F | | Bit corresponding to parameter number is turned on.<br>bit is No. 1290 (bit 0) to 129F (bit 15). |
| 05AA | Servo parameter change number<br>No. 12A0 to 12AF | | Bit corresponding to parameter number is turned on.<br>bit is No. 12A0 (bit 0) to 12AF (bit 15). |
| 05AB | Servo parameter change number<br>No. 12B0 to 12BF | | Bit corresponding to parameter number is turned on.<br>bit is No. 12B0 (bit 0) to 12BF (bit 15). |
| 05AC | Servo parameter change number<br>No. 12C0 to 12CF | | Bit corresponding to parameter number is turned on.<br>bit is No. 12C0 (bit 0) to 12CF (bit 15). |
| 05AD | Servo parameter change number<br>No. 12D0 to 12DF | | Bit corresponding to parameter number is turned on.<br>bit is No. 12D0 (bit 0) to 12DF (bit 15). |
| 05AE | Servo parameter change number<br>No. 12E0 to 12EF | | Bit corresponding to parameter number is turned on.<br>bit is No. 12E0 (bit 0) to 12EF (bit 15). |
| 05AF | Servo parameter change number<br>No. 12F0 to 12FF | | Bit corresponding to parameter number is turned on.<br>bit is No. 12F0 (bit 0) to 12FF (bit 15). |

| Monitor No. | Content | Units | Remarks |
|---|---|---|---|
| 05B0 | Servo parameter change number<br>No. 1300 to 130F | | Bit corresponding to parameter number is turned on.<br>bit is No. 1300 (bit 0) to 130F (bit 15). |
| 05B1 | Servo parameter change number<br>No. 1310 to 131F | | Bit corresponding to parameter number is turned on.<br>bit is No. 1310 (bit 0) to 131F (bit 15). |
| 05B2 | Servo parameter change number<br>No. 1320 to 132F | | Bit corresponding to parameter number is turned on.<br>bit is No. 1320 (bit 0) to 132F (bit 15). |
| 05B3 | Servo parameter change number<br>No. 1330 to 133F | | Bit corresponding to parameter number is turned on.<br>bit is No. 1330 (bit 0) to 133F (bit 15). |
| 05B4 | Servo parameter change number<br>No. 1340 to 134F | | Bit corresponding to parameter number is turned on.<br>bit is No. 1340 (bit 0) to 134F (bit 15). |
| 05B5 | Servo parameter change number<br>No. 1350 to 135F | | Bit corresponding to parameter number is turned on.<br>bit is No. 1350 (bit 0) to 135F (bit 15). |
| 05B6 | Servo parameter change number<br>No. 1360 to 136F | | Bit corresponding to parameter number is turned on.<br>bit is No. 1360 (bit 0) to 136F (bit 15). |
| 05B7 | Servo parameter change number<br>No. 1370 to 137F | | Bit corresponding to parameter number is turned on.<br>bit is No. 1370 (bit 0) to 137F (bit 15). |
| 05B8 | Reserved | | |
| : | | | |
| 05CF | | | |

# MEMO

# 13. ALARM NUMBER

The position board can raise the following four alarms: system alarm, servo alarm, operation alarm, and system error. The alarm numbers are represented in hexadecimal numbers.

API LIBRARY

- Use the sscGetAlarm/sscResetAlarm functions to get/reset the alarm number. Specify the following in the argument for the alarm type.
  - System alarm : SSC_ALARM_SYSTEM
  - Servo alarm : SSC_ALARM_SERVO
  - Operation alarm: SSC_ALARM_OPERATION



## 13.1 System alarm

| Alarm No. | Content | Detail No. | Cause of occurrence | Procedure |
|---|---|---|---|---|
| 35 | Operation cycle alarm | 01 | An operation cycle alarm occurred. | Reexamine the following.<br>(1) Make the control cycle setting longer. (Example. When control cycle is 0.44ms, change to 0.88ms)<br>(2) Decrease the number of control axes.<br>(3) Reexamine the operation pattern so that the timing of the operation startup of each axis does not overlap. |
| 36 | Number of write accesses to flash ROM error | 01 | The number of write accesses to flash ROM by parameter backups exceeds 100,000 times. | Data cannot be written to the flash ROM because the flash ROM is expected to reach its service life. |
| | | 03 | The number of write accesses to flash ROM by parameter backups exceeds 25 times after system preparation completion. | Check for unnecessary parameter backups. To perform the parameter backup again, reset the system alarm. |
| 37 (Note) | Parameter error | 01 | Parameter setting is erroneous. | Set the setting to a correct value within the parameter limits. |
| 3B (Note) | Mark detection setting error | 01 | When mark detection is enabled, the total number of continuous latch data storages (parameter No.02B0, No.02B2) for the whole system exceeds 64. | Set the total number of continuous latch data storages (parameter No.02B0, No.02B2) for the whole system to within 64. |

Note. The system alarm cannot be reset.

## 13.2 Servo alarm

(1) MR-J4(W□)-□B

The servo alarms of MR-J4(W□)-□B are shown in the following table. For details, refer to the Servo Amplifier Instruction Manual for MR-J4(W□)-□B.

Alarm

| Alarm No. | Name |
|---|---|
| 10 | Undervoltage |
| 11 | Switch setting error |
| 12 | Memory error 1 (RAM) |
| 13 | Clock error |
| 14 | Control processing error |
| 15 | Memory error 2 (EEP-ROM) |
| 16 | Encoder initial communication error 1 |
| 17 | Board error |
| 19 | Memory error 3 (FLASH-ROM) |
| 1A | Servo motor combination error |
| 1E | Encoder initial communication error 2 |
| 1F | Encoder initial communication error 3 |
| 20 | Encoder normal communication error 1 |
| 21 | Encoder normal communication error 2 |
| 24 | Main circuit error |
| 25 | Absolute position erased |
| 27 | Initial magnetic pole detection error |
| 28 | Linear encoder error 2 |
| 2A | Linear encoder error 1 |
| 2B | Encoder counter error |
| 30 | Regenerative error |
| 31 | Overspeed |
| 32 | Overcurrent |
| 33 | Overvoltage |
| 34 | SSCNET receive error 1 |
| 35 | Command frequency alarm |
| 36 | SSCNET receive error 2 |
| 37 | Parameter error |
| 3A | Inrush current suppression circuit error |
| 3D | Parameter setting error for driver communication |
| 3E | Operation mode error |
| 42 | Servo control error |
| 45 | Main circuit device overheat |
| 46 | Servo motor overheat |
| 47 | Cooling fan alarm |
| 50 | Overload 1 |
| 51 | Overload 2 |

| Alarm No. | Name |
|---|---|
| 52 | Error excessive |
| 54 | Oscillation detection |
| 56 | Forced stop error |
| 63 | STO timing error |
| 70 | Load-side encoder initial communication error 1 |
| 71 | Load-side encoder normal communication error 1 |
| 72 | Load-side encoder normal communication error 2 |
| 82 | Master-slave operation error 1 |
| 8A | USB communication timeout |
| 8E | USB communication error |
| 888 | Watchdog |

Warning

| Alarm No. | Name |
|---|---|
| 91 | Servo amplifier overheat warning |
| 92 | Open battery cable warning |
| 95 | STO warning |
| 96 | Home position setting error |
| 9F | Battery warning |
| E0 | Excessive regeneration warning |
| E1 | Overload warning 1 |
| E2 | Servo motor overheat warning |
| E3 | Absolute position counter warning |
| E4 | Parameter warning |
| E6 | Servo forced stop warning |
| E7 | Controller forced stop warning |
| E8 | Cooling fan speed reduction warning |
| E9 | Main circuit off warning |
| EB | Other axes error warning |
| EC | Overload warning 2 |
| ED | Output watt excess warning |
| F0 | Tough drive warning |
| F2 | Drive recorder – Miswriting warning |
| F3 | Oscillation detection warning |

Note. For the specific servo alarm numbers,
refer to the specifications of MR-J4(W□)-□ B.

## 13.3 RIO module alarm

Refer to "MELSEC-L SSCNETⅢ/H Head Module User's Manual" for RIO module alarms.

## 13.4 Operation alarm

| Alarm No. | Content | Detail No. | Cause of occurrence | Procedure |
|---|---|---|---|---|
| 10 | Stop command on | 01 | The stop operation signal (STP) is on. | Turn off the stop operation signal (STP). |
| | | 02 | The rapid stop signal (RSTP) is on. | Turn off the rapid stop signal (RSTP). |
| 12 | During forced stop | 01 | An forced stop is present. | Cancel the forced stop. |
| 13 | Interlock is on | 01 | An Interlock is present. | Cancel the interlock. |
| 16 | Group error | 01 | 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. |
| 1A | In test mode | 01 | Currently in test mode. | If test mode was selected using MR Configurator2 (set up software), operation (automatic operation etc.) can not be performed using the position board. For performing operations using the position board, perform a restart. |
| 20 | Operation mode error | 01 | Operation modes overlap. | Set up the operation modes correctly. |
| | | 02 | Operation modes are not set up. | |
| 21 | Command speed zero | 01 | The command speed is zero or less. | Set the command speed to 1 or more.<br>Note. Depending on parameter settings, a setting of 1 or more may be treated as 0 by internal calculations. |
| | | 02 | The speed limit is zero or less. | Set the speed limit to 1 or more. |
| 22 | Point number error | 01 | The start point No. or end point No. is a negative value. | Set up the point numbers correctly. |
| | | 02 | Start point No. is greater than end point No. | |
| | | 03 | Start point No. or end point No. exceeds the point table area of the dual port memory. | Set up the point numbers and point number offset correctly. |
| 23 | Mode change during operation | 01 | Operation mode was changed during operation. | Do not attempt to change operation modes during operation. |
| 24 | Position exceeded during positioning | 01 | 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. |
| 25 | Point table Setting error | 01 | The position command system setting is erroneous. | Set up the position command system correctly. |
| | | 02 | The deceleration check system setting is erroneous. | Set up the deceleration check system correctly. |
| | | 06 | The S-curve ratio setting is erroneous. | Set up the S-curve ratio correctly. |
| | | 07 | The speed switching point specification setting is erroneous. | Set up the help command correctly. |
| | | 08 | The point data setting of the next point is erroneous.<br>* Only when "1: Before point switching" is set in the speed switching point specification | Reexamine the setting value of the next point in the point table. |
| | | 09 | The other axes start specification setting is erroneous. | Set up the other axes start specification correctly. |
| | | 0A | The predwell setting is erroneous. | Set up the predwell correctly. |
| | | 0C | The setting of pass position interrupt specification is erroneous. | Set only the start point for the pass position interrupt specification. |
| 26 | Incremental feed movement amount error | 01 | The setting for incremental feed movement amount is a negative number. | Set the incremental feed movement amount using natural numbers including 0. Movement direction is designated by the movement direction signal (DIR). |
| 2D | Latest command buffer number setting error | 01 | A value outside of range is set to the latest buffer number. | Set a value inside the range to the latest buffer number. |

| Alarm No. | Content | Detail No. | Cause of occurrence | Procedure |
|---|---|---|---|---|
| 2E | Control mode switch error | 01 | Control mode was changed during operation. | When changing from position control mode to speed control mode/torque control mode, or changing from speed control mode/torque control mode to position control mode, perform the control mode change while stopped. |
| | | 02 | A control mode outside of setting range was set. | Reexamine the value of the control mode command. |
| | | 03 (Note) | Without the control mode changing, a time out occurred. | (1) 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.<br>(2) An error occurred in communication processing between the position board and the servo amplifier. Make contact with and explain the failure symptoms to an agency or branch office. |
| | | 04 | During standard mode, a switch command to a control mode that cannot be switched to was input. | Reexamine the value of the control mode command. (a value that is not speed control mode, torque control mode, or outside of range) |
| 2F | Torque control setting error | 01 | A value outside of range is set to the torque control speed limit value. | Reexamine the value of the torque control speed limit value. |
| 37 (Note) | Parameter error | 01 | Parameter setting is erroneous. | Set the setting to correct value within the parameter limits. |
| 38 (Note) | System setting error | 01 | The setting for the control axis exceeds the maximum number of control axes. | Reexamine the structure of the system. |
| | | 02 | When Axis No. assignment is valid, the servo amplifier axis No. (parameter No.0203) is set to 0. | Set the axis No. to the servo amplifier axis No. (parameter No.0203). |
| | | 03 | When Axis No. assignment is valid, the setting value of the servo amplifier axis No. (parameter No.0203) is out of range of the valid axis No. | Set the axis No. within the valid range to the servo amplifier axis No. (parameter No.0203). |
| | | 04 | When Axis No. assignment is valid, the setting value of the servo amplifier axis No. (parameter No.0203) is the same as other axes. | Reexamine of the setting of the servo amplifier axis No. (parameter No.0203). |
| 39 (Note) | I/O No. assignment setting error | 01 | The general input number assigned to the digital input table or input device table is the same as the setting for other servo amplifiers/remote I/O modules. Or, the assignment exceeds its allowable range. | Reexamine the general I/O number assignment setting (parameter No.0214) for the servo amplifier. |
| | | 02 | The general output number assigned to the digital output table or output device table is the same as the setting for other servo amplifiers/remote I/O modules. Or, the assignment exceeds its allowable range. | Reexamine the general I/O number assignment setting (parameter No.0214) for the servo amplifier. |
| 3B (Note) | Mark detection setting error | 01 | Mark detection was enabled in a communication mode that is not compatible. | Use mark detection in a SSCNETⅢ/H system. |
| | | 02 | Mark detection function is set to enabled for an axis that does not support mark detection function. | (1) Change the servo amplifier being used to an axis with a mark detection signal function.<br>(2) Disable the mark detection settings. |
| | | 03 | When the mark detection mode is ring buffer, the number of continuous latch storages was set to 0. | Reexamine the value of number of continuous latch data storages (parameter No.02B0, No.02B2). |
| | | 04 | Mark detection function was set to enabled for an axis that is set to get sensor input from driver. | (1) Reexamine the setting of sensor input option (parameter No.0219).<br>(2) Disable the mark detection settings. |

Note. The operation alarm cannot be reset.

| Alarm No. | Content | Detail No. | Cause of occurrence | Procedure |
|---|---|---|---|---|
| 40 | Linear interpolation start up error | 01 | Axes that have been set to something besides linear interpolation mode (LIP) are included in the same group. | Designate all of the axes in the group as linear interpolation mode (LIP). |
| | | 02 | There are 5 or more axes in the group formation. | Set the group formation to a maximum of 4 axes. |
| | | 03 | Start operation was performed for linear interpolation with the invalid linear interpolation group number. | Reexamine the linear interpolation group (parameter No.0260). Refer to Section 5.4 linear interpolation for further details concerning valid group number. |
| | | 04 | The number of points defined for axes in the group is different. | Set the same number of points for all axes. |
| | | 05 | The speed unit for the primary axis (parameter No.0200) is defined to be r/min. | Change the speed units. |
| 41 | Linear interpolation point data error | 01 | The movement amount in the group exceeds the maximum value "999999999". | Set it to the correct data. |
| | | 02 | With excessive speed processing (parameter No.0261) set to "1: alarm stop", the group formation axis exceeds the speed limit. | Reexamine feed speed and speed limit values. |
| 42 | Can't start linear interpolation auxiliary axis error | 01 | The auxiliary axis is in operation. | Perform start operation for linear interpolation after making sure all axes in the group are stopped. |
| | | 02 | The auxiliary axis has an alarm set. | Remove the cause for the alarm on the auxiliary axis. |
| 43 | Interference check axis setting error | 01 | The axis is set up as the interference check axis. | Set it to the correct data. |
| | | 02 | The axis in the same linear interpolation group as the axis is set up as the interference check axis. | |
| 44 | Command error in interference area | 01 | Commanded to move into interference area. | Perform a commanded to move out of the interference area. |
| 45 | Entering interference area error | 01 | Entered interference area during operation. | (1) Confirm that the parameter settings related to interference check are correct.<br>(2) Change the operation pattern so that the interference area is not entered. |
| 4D | Other axes start setting error | 01 | The start condition setting is erroneous. | Set correct data. |
| | | 02 | The operation setting is erroneous. | |
| 50 | Tandem drive mode change error | 01 | Drive mode change was attempted while tandem drive axis mode toggling was prohibited. | Only attempt to change drive mode when change conditions are satisfied.<br>Refer to Section 8.1.3. |
| 51 | While in tandem drive non-synchronous mode | 01 | Home position return, automatic operation, or linear interpolation operation was attempted while in non-synchronous micro adjustment mode of tandem drive axes. | Perform home position return, automatic operation as well as linear interpolation operation while in synchronous mode. |
| 52 | Tandem drive axis setting error | 01 | A home position return method other than dog method, dog cradle method, data set method, scale home position signal detection method, or dog front end method was attempted for home position return while in tandem drive axis mode. | Set the home position return option 1 to one of the return to home position methods listed to the left. |
| | | 02 | 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. |
| 53 | Tandem drive excessive deviation | 01 | 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. |
| 54 | Tandem drive synchronous alignment valid width error | 01 | 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. |
| 55 | Tandem drive while performing synchronization | 01 | 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. |

| Alarm No. | Content | Detail No. | Cause of occurrence | Procedure |
|---|---|---|---|---|
| 56 | Tandem drive slave axis error | 01 | There is a servo alarm for the parallel drive slave axis (including servo warning E6, E7, E9). | Cancel the servo alarm. For details, refer to the Servo Amplifier Instruction Manual on your servo amplifier. |
| | | 02 | A communication error or a power outage on the servo amplifier occurred. | Confirm that the connection to the servo amplifier is intact. Refer to Section 13.6 for details concerning communication errors. |
| | | 03 | The tandem drive slave axis entered servo ready off mode. | |
| 57 | Exceeding of valid width of tandem drive deviation compensation error | 01 | The deviation between the master axis and the slave axis exceeded the valid width when home position return was performed while in tandem drive mode. | (1) Adjust the mechanical deviation between the master axis and the slave axis so that it is within the valid width.<br>(2) Set the tandem drive home position signal offset (parameter No.026C, 026D) to a correct value. |
| 58 | Tandem drive synchronous alignment error | 01 | When a stop command is input during calculation error correction performed for turning on the servo, while in tandem drive synchronous mode. | To correct the error between the master axis and the slave axis, turn the servo off and then on to perform synchronization again. |
| | | 02 | In tandem drive synchronous mode, the start operation is performed without completion of synchronization. | |
| 5B | Using other axes start data | 01 | Other axes start data is being used (the other axes start notice signal (OSOP□) is on). | Check the other axes start data is not being used (the other axes start notice signal (OSOP□) is off). |
| 5C | Pass position interrupt error | 01 | 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. |
| | | 02 | 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. |
| | | 03 | 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. |
| | | 04 | The setting of the pass interrupt condition is out of range. | Check the pass interrupt condition setting. |
| | | 05 | The specified pass interrupt condition is used for other axes. | Do not overlap the pass interrupt condition numbers for each axis. |
| | | 06 | The operation is started during the pass position output interrupt. | Do not start the operation until the pass position output interruption is completed. |
| | | 07 | 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). |

| Alarm No. | Content | Detail No. | Cause of occurrence | Procedure |
|---|---|---|---|---|
| 5D | Continuous operation to torque control error | 01 | Continuous operation to torque control valid was specified to a tandem drive axis. | Specify continuous operation to torque control invalid to the tandem drive axis. |
| | | 02 | When operating at a continuous operation to torque control point, the operation was completed without conducting a switch to continuous operation to torque control. | (1) For automatic switch, reexamine the setting of the continuous operation to torque control switching position.<br>(2) For manual switch, conduct a switch to continuous operation to torque control mode before position control mode operation is completed. |
| | | 03 | The press limit position was reached. | Reexamine the positions of the pressing position in continuous operation to torque control and the press limit position. |
| | | 04 | Interlock command (ITL) turned ON during the operation of a point set to continuous operation to torque control valid. | Do not input an interlock command during the operation of a continuous operation to torque control point. |
| | | 05 | The travel direction and press limit position were incorrect. | (1) Reexamine the set values of the point table.<br>(2) Travel in the opposite direction, and start operation before the press limit position. |
| | | 06 | A continuous operation to torque control point was specified for a connected module that does not support continuous operation to torque control. | (1) Reexamine the set values of the point table.<br>(2) Use a servo amplifier that supports continuous operation to torque control mode. |
| | | 07 | The control mode switch command (CTLMC) turned ON during movement in continuous operation to torque control mode (before reaching target torque). | Turn ON control mode switch command after completion of continuous operation to torque control. (Switch to position control mode) |
| | | 08 | The press limit position was set to a position before the position data of the point table. | Set the press limit position to a position after the position data of the point table. |
| | | 09 | The software limit was set to a position before the press limit position. | Set the press limit position to a position before the software limit. |
| | | 0A | Continuous operation to torque control valid was specified to a linear interpolation axis. | Specify continuous operation to torque control invalid to a linear interpolation axis. |
| | | 0B | Continuous operation to torque control was specified as valid for a point where travel amount is 0. | Set the required travel amount in order to conduct continuous operation to torque control. |
| 5E | Continuous operation to torque control setting error | 01 | Continuous operation to torque control speed limit value is outside of range. | Reexamine the setting of the continuous operation to torque control speed limit value. |
| | | 02 | Target torque is outside of range. | Reexamine the setting of the target torque. |
| | | 03 | Continuous operation to torque control acceleration time constant is outside of range. | Reexamine the setting of continuous operation to torque control acceleration time constant. |
| | | 04 | Continuous operation to torque control deceleration time constant is outside of range. | Reexamine the setting of continuous operation to torque control deceleration time constant. |
| | | 05 | Continuous operation to torque control operating conditions is out of range. | Reexamine the setting of continuous operation to torque control operating conditions. |
| 5F | Point table loop error | 01 | 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. |
| | | 02 | 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. |
| | | 03 | 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. |
| | | 04 | The next point for a point that specifies continuous operation has not been updated. | (1) 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.<br>(2) Increase the updating speed so that update is complete at the time of operation start for the next point.<br>(3) After updating the point table, set the latest command point No. |
| | | 05 | Loop end point was specified while not in point table loop. | Specify loop end point while using point table loop method. |

| Alarm No. | Content | Detail No. | Cause of occurrence | Procedure |
|---|---|---|---|---|
| 90 | Home position return not complete | 01 | Automatic operation, linear interpolation operation, or home position reset were performed without executing return to home position. | Execute home position return. Or validate no home position (parameter No.0200). |
| 91 | Z-phase not passed | 01 | The Z-phase has not been passed. | Turn the motor more than 1 revolution in the + / − direction and then perform home position return. |
| 92 | The proximity dog is short | 01 | When using dog method home position return, after the dog turned on and decelerating to a stop, the position is not above the dog. | Lengthen the proximity dog. Or in order to stop on top of the dog, reduce the home position return speed. |
| 94 | Home position return direction error | 01 | The home position return direction and stopper method direction are opposite when using a stopper method for return to home position. | Set the home position return direction to be the same as the push direction. |
| 95 | Not limiting torque | 01 | "Torque limit effective" has not been turned on when stopper method is being used for return to home position. | Perform push, and after torque limitation effective state, perform start operation for home position return. |
| 96 | Home position setting error | 01 | Home position setting was performed prior to motor being stabilized. | Adjust the servo so that it stabilizes quickly upon stopping at the home position. |
| 97 | Home position stop error | 01 | Upon stopping at home position, even after 1800 ms passed, in-position was not achieved. | (1) Reduce home position return speed and creep speed.<br>(2) Lengthen the home position return time constant.<br>(3) Broaden the in-position boundaries.<br>(4) Confirm that it is not contacting the machine when return to home position is being performed. |
| 98 | Home position search limit error | 01 | The movement amount moved to detect the home position signal or dog signal while performing return to home position exceeded the home position search limit (parameter No.024A, 024B) | Confirm the input status of the dog signal etc. |
| 9C | Z-phase mask amount setting error | 01 | The value calculated by Z-phase mask amount × electronic gear numerator (CMX) ÷ electronic gear denominator (CDV) exceeds 32 bits. | Reexamine the setting value of the Z-phase mask amount. |
| | | | The Z-phase mask amount + the travel distance to the Z-phase exceeds 32 bits. | |
| 9D | Home position return parameter setting error | 01 | For a home position return method that requires the Z-phase being passed, "Not need to pass motor Z phase after the power supply is switched on" is set. | Reexamine the home position return method (parameter No.0240) or the home position setting condition selection (parameter No.1190). |
| | | 02 | In the Z-phase detection method home position return, "Search again" is set in the setting of the home position signal re-search. | Set "Do not search again" to the home position signal re-search (parameter No.0240). |
| | | 03 | In the home position return using other than a Z-phase detection method, a shortcut direction is set as the home position return direction. | Set the − or + direction to the home position return direction (parameter No.0240). |
| | | 04 | The setting for home position return method (parameter No.0240) is incorrect. | Reexamine the setting of home position return method (parameter No.0240). |
| A0 | Limit switch | 01 | 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. |
| | | 02 | 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. |
| A1 | Out of software limit boundaries | 01 | Position outside of software limit boundaries is being designated. | Set the movement command to within the software limit boundaries. |
| A2 | Reached software limit | 01 | The software limit has been reached. | Using JOG operation etc. move in the opposite direction to return to within the software limit boundaries. |
| A4 | Software limit Parameter error | 01 | 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. |

| Alarm No. | Content | Detail No. | Cause of occurrence | Procedure |
|---|---|---|---|---|
| A5 | Position switch parameter error | 01 | 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. |
| A6 | Mark detection write/read error | 01 | During mark detection, it is not possible to write to the target buffer. | The reading speed of the host controller for a mark detection occurrence is too slow. Perform the following.<br>(1) Increase the number of continuous latch data storages (parameter No.02B0, No.02B2) for the applicable mark sensor.<br>(2) Increase the reading speed. |
| | | 02 | After the input of a value to the read complete buffer number that exceeds the mark detection count, a mark sensor was detected. | Reexamine the input value for the read complete buffer number. |
| A7 | Command data error | 01 | A value outside of range was input to the speed command buffer. | Reexamine the speed command data. |
| | | 02 | A value outside of range was input to the torque command buffer. | Reexamine the torque command data. |
| | | 03 | Position command data that exceeds the allowable difference between the position command data of the previous command data update cycle was input. | Reexamine the position command data. |
| B0 | Servo is not controllable | 01 | Axis is not a control axis. | Validate control axes (parameter No.0200). |
| | | 02 | A communication error or a power outage on the servo amplifier occurred. | Confirm that the connection to the servo amplifier is intact. Refer to Section 13.6 for further details concerning communication errors. |
| | | 03 | A servo alarm was set and servo ready off mode was entered. | Cancel the servo alarm. For details, refer to the Servo Amplifier Instruction Manual on your servo amplifier. |
| | | | The main circuit is in off status. | Turn on the main circuit. |
| B1 | Servo alarm occurrence | 01 | A servo alarm occurs (including servo warning E6, E7, E9). | Cancel the servo alarm. For details, refer to the Servo Amplifier Instruction Manual on your servo amplifier. |
| B2 | Servo is off | 01 | Servo is in off status. | Turn on the servo. |
| B3 | Servo off command | 01 | Servo on signal (SON) was turned off during operation. | Turn on the servo. |

## 13.5 RIO control alarm

| Alarm No. | Content | Detail No. | Cause of occurrence | Procedure |
|---|---|---|---|---|
| 37 (Note) | Parameter error | 01 | Parameter setting is erroneous. | Set the setting to correct value within the parameter limits. |
| 38 (Note) | System setting error | 01 | The setting for the control station exceeds the maximum number of control stations. | Reexamine the structure of the system. |
| | | 02 | When station No. assignment is valid, the remote I/O module station No. (parameter No.0202) is set to 0. | Set the station No. to the remote I/O module station No. (parameter No.0202). |
| | | 03 | When station No. assignment is valid, the setting value of the remote I/O module station No. (parameter No.0202) is out of range of the valid station No. | Set the station No. within the valid range to remote I/O module station No. (parameter No.0202). |
| | | 04 | When station No. assignment is valid, the setting value of remote I/O module station No. (parameter No.0202) is the same as other stations. | Reexamine the setting of the remote I/O module station No. (parameter No.0202). |
| | | 05 | The used points were set to an input table that is not being used. | Review the settings for I/O table selection (parameter No.004A), input bit device points (parameter No.0210) and input word device points (parameter No.0212) for remote I/O module |
| | | 06 | The used points were set to an output table that is not being used. | Review the settings for I/O table selection (parameter No.004A), output bit device points (parameter No.0214) and output word device points (parameter No.0216) for remote I/O module |
| 39 (Note) | I/O No. assignment setting error | 01 | The number assigned to the digital input table or input device table is the same as the setting for other servo amplifiers/remote I/O modules. Or, the assignment exceeds its allowable range. | Reexamine the input bit device start No. (parameter No.0211), and input word device start No. (parameter No.0213) for the remote I/O module. |
| | | 02 | The number assigned to the digital output table or output device table is the same as the setting for other servo amplifiers/remote I/O modules. Or, the assignment exceeds its allowable range. | Reexamine the output bit device start No. (parameter No.0215), and output word device start No. (parameter No.0217) for the remote I/O module. |

Note. The RIO control alarm cannot be reset.

## 13.6 System error

The error code for system errors can be confirmed using system status codes (address 01D0). When the status code is E □ □ □ h, this corresponds to a system error.

| Error code | Content | Cause of occurrence | Procedure |
|---|---|---|---|
| E001 | ROM error | Component failure inside position board. | Replace the position board. |
| E002 | RAM error 1 | | |
| E003 | Dual port memory error | Component (dual port memory) failure inside position board. (Note 1) | If the conditions described in (Note 1) are not applicable, replace the position board. |
| E004 | RAM error 2 | Component error inside position board. | Replace the position board. |
| E006 | SSCNET communication IC error 1 | | |
| E007 | SSCNET communication IC error 2 | | |
| E008 | Board error | | |
| E1 □ □ | CPU error | | |
| E200 | Interrupt error | | |
| E301 | Watchdog error (Note 2) | | |
| E302 | DC FAIL | The + 5VDC being supplied to the position board was reduced. | Check the + 5VDC of the bus connected to the position board. |
| E400 | An axis that has not been mounted exists | The control option 1 (parameter No.0200) control axis (■■■□) setting and the servo amplifier connection status are different. | Check the following details.<br>(1) That the control option 1 setting and the servo amplifier connection status, setting (rotary switch) match.<br>(2) Power supply status to servo amplifier.<br>(3) SSCNETⅢ cable connection status.<br>(4) For disconnection of SSCNETⅢ cable. |
| | | Communication was cut off by power outage of servo amplifier etc. | Check the following details.<br>(1) Power supply status to servo amplifier.<br>(2) SSCNETⅢ cable connection status.<br>(3) For disconnection of SSCNETⅢ cable.<br>Turn on the control power supplies for the communication route servo amplifiers. |
| | | The disconnection command is sent to the second or later axis in the module of the multi-axis amplifier. | Make sure the all axes in the module of the multi-axis amplifier are simultaneously disconnected. |
| E401 | CRC error | SSCNET communication error | Check the following details.<br>(1) SSCNETⅢ cable connection status.<br>(2) For disconnection of SSCNETⅢ cable. |
| E403 | Data ID error | | |
| E405 | Driver type code error | Type code (parameter No.021E) is different from actual drivers. | Check the respective parameters. |
| | | The vendor ID (parameter No.021D) is different from the actual driver. | Check the respective parameters. |
| E407 | SSCNET time out | No response from the servo amplifier and a communication time out occurred. | An error occurred in communication processing between the position board and the servo amplifier. Make contact with and explain the failure symptoms to an agency or branch office. |

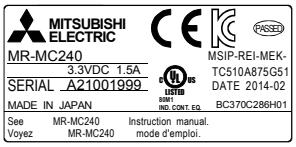
Note. 1. There are cases where this occurs when data is written to the dual port memory from the host controller prior to system status code becoming "system preparation completion" after turning on the power for the position board (or after reboot).
2. Not user watchdog. Watchdog error on the position board side.

| Error code | Content | Cause of occurrence | Procedure |
|---|---|---|---|
| E40B | Uncontrollable driver | The position board failed to shift to the status where the driver is controllable since an error occurred in initial communication between the position board and the servo amplifier. | Check the following details.<br>(1) The setting value of the control option 1 should correspond to the servo amplifier connection status.<br>(2) The setting of multi-axis amplifier and the control option 1 or axis/station No. assignment should correspond. |
| E40E | Communication cycle error | A servo amplifier that does not support the set communication cycle is connected. | Check that all servo amplifiers support the set control cycle (communication cycle.) |
| E500 | Electronic gear setting error | A value out of the setting range was input. | Check the following details.<br>(1) The settings of the electronic gear numerator (CMX) and the electronic gear denominator (CDV) are within the setting range.<br>(2) The settings of the electronic gears (CMX/CDV) are within the setting range. |
| E503 | Exclusive control error | The invalid value is set to the exclusive control data area. | Reexamine the setting process for the exclusive control data. |
| E510 | I/O No. assignment error | The digital I/O table or I/O table assignment is erroneous. | Check the axis or station in which the I/O No. assignment setting error (Operation alarm No. 39, RIO control alarm 39) is occurring and reexamine the setting. |
| E511 | I/O table select error | The used points were set to an I/O table that is not being used. | Check the station in which the system setting error (RIO control alarm 38) is occurring and reexamine the setting. |
| E5E0 | SSCNET communication system error | An error occurred in initial communication with the servo amplifier. | An error occurred in initial communication between the position board and the servo amplifier. Make contact with and explain the failure symptoms to an agency or branch office. |
| E5E1 | SSCNET communication system error 2 | | |
| EF01 | System command code error | An erroneous system command code was set. | Do not set any values other than those listed in Section 10.3. |

# MEMO

# 14. EMC AND LOW VOLTAGE DIRECTIVES

Compliance to the EMC Directive, which is one of the EU Directives, has been a legal obligation for the products sold in European countries since 1996 as well as the Low Voltage Directive since 1997.
Manufacturers who recognize their products are compliant to the EMC and Low Voltage Directives are required to declare that print a "CE mark" on their products.




(1) Authorized representative in Europe
Authorized representative in Europe is shown below.
Name : Mitsubishi Electric Europe B.V.
Address : Gothaer strase 8, 40880 Ratingen, Germany



## 14.1 Requirements for compliance 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)". Section 14.1.1 through Section 14.1.3 summarize the precautions on compliance with the EMC Directive of the machinery constructed with the position 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 will comply with above-mentioned directive. The method and judgement for complying with the EMC Directive must be determined by the person who construct the entire machinery.

### 14.1.1 Standards relevant to the EMC directive

For all test items, the test has been done with a position board installed in a computer that is compatible to CE mark.
The test does not cover USB because only the test tool "MRZJW3-MC2-UTL" (sold separately) uses it.

The standards relevant to the EMC Directive are listed in table below.

| Certification | Test item | Test details | Standard value |
|---|---|---|---|
| EN61000-6-4:2007+A1:2011 | CISPR16-2-3, CISPR22<br>Radiated emission<br>(Note 1) | Radio waves from the product are measured. | 30M-230MHz QP (Note 2) : 40dBμV/m<br>(10m (32.81ft.) in measurement range)<br>230M-1000MHz QP: 47dBμV/m<br>(10m (32.81ft.) in measurement range)<br>1GHz-2GHz QP: 76dBμV/m<br>(3m (9.84ft.) in measurement range)<br>AV: 56dBμV/m<br>(3m (9.84ft.) in measurement range) |
| | CISPR16-2-1<br>CISPR16-1-2<br>Conducted emission | Noise from the product to the power line is measured. | AC power line<br>0.15M-0.5MHz QP : 79dBμV<br>AV (Note 3) : 66dBμV<br>0.5M-30MHz QP : 73dBμV<br>AV : 60dBμV |
| EN61000-6-2:2005 | EN61000-4-2<br>Electrostatic discharge immunity | Immunity test in which electrostatic discharge is applied to the product. | 8kV: 10 times at 1 second interval, Air discharge<br>4kV: 10 times at 1 second interval, Contact discharge |
| | EN61000-4-3<br>Radiated immunity<br>(Note 1) | Immunity test in which electric fields are radiated to the product. | 80%AM modulation @1kHz,<br>80-1000MHz 10V/m,<br>1400M-2000MHz 3V/m,<br>2000M-2700MHz 1V/m |
| | EN61000-4-4<br>Electrical fast transient/ burst (EFT/B) immunity | Immunity test in which burst noise is applied to the power cable and signal line. | AC power line : ±2kV/5kHz<br>DC power line : ±2kV/5kHz<br>I/O, communication line : ±1kV/5kHz |
| | EN61000-4-5<br>Surge immunity | Immunity test in which surge is applied to the power line and signal line. | AC power line<br>Common mode: ±2.0kV<br>Differential mode: ±1.0kV<br>DC power line<br>Common mode: ±0.5kV<br>Differential mode: ±0.5kV<br>I/O, communication line<br>Common mode: ±1kV |
| | EN61000-4-6<br>Conducted immunity | Immunity test in which high frequency noise is applied to the power line and signal line. | 0.15-80MHz,<br>80%AM modulation @1kHz, 10Vrms |
| | EN61000-4-11<br>Voltage dip and short interruptions immunity | Immunity test in which short interruptions are applied to the power supply voltage. | 0% of rated voltage, 1cycle<br>Start at zero cross<br>0% of rated voltage, 250/300cycle<br>(50Hz/60Hz)<br>40% of rated voltage, 10/12cycle<br>(50Hz/60Hz)<br>70% of rated voltage, 25/30cycle<br>(50Hz/60Hz) |

Note 1. This product is an open type device (a device designed to be housed inside other equipment) and must be installed inside a conductive control panel. The corresponding test has been done with the programmable controller installed inside a control panel.
2. QP: Quasi-peak value
3. AV: Average value

### 14.1.2 Installation instructions for EMC directive

(1) Installation

Installing inside a control panel not only ensures safety but also ensures effective shielding of position board-generated electromagnetic noise.

(a) Control panel

1) Use a conductive control panel.
2) When attaching the control panel's top plate or base plate, expose bare metal surface and weld so that good surface contact can be made between the panel and plate.
3) To ensure good electrical contact with the control panel, mask the paint on the installation bolts of the inner plate in the control panel so that contact between surfaces can be ensured over the widest possible area.
4) Ground the control panel with a thick wire so that a low impedance connection to ground can be ensured even at high frequencies.
5) Holes made in the control panel must be 10cm (3.94inch) diameter or less. If the holes are 10cm (3.94 inch) or larger, radio frequency noise may be emitted. In addition, because radio waves leak through a clearance between the control panel door and the main unit, reduce the clearance as much as practicable. The leakage of radio waves can be suppressed by the direct application of an EMI gasket on the paint surface.

(2) Connection of power line and ground wire

Ground wire and power supply cable for the host controller must be connected as described below.

(a) Provide a grounding point near the FG terminal. Ground the FG terminals (Frame Ground) with the thickest and shortest wire possible. (The wire length must be 30cm (11.81inch) or shorter.) The FG terminals function is to pass the noise generated in the position board to the ground, so the ground wire ensures a low impedance as possible.
Because the wire does the role to transfer the noise, the wire itself carries a large noise content and thus short wiring means that the wire is prevented from acting as an antenna.

(b) Twist the ground wire drawn out from grounding point with the power line. By twisting the power line with ground wire, it can transfer the noise more from power line to the ground. However, if the noise filter is attached to the power line, it might be unnecessary to twist with the ground wire.

(3) Forced stop input cable

The forced stop input cable length must be within 30m (98.43ft.).

(4) Cables

The cables extracted from the control panel contain a high frequency noise component. On the outside of the control panel, therefore, they serve as antennas to emit noise. To prevent noise emission, use shielded cables for the cables extracted to the outside of the control panel.

The use of a shielded cable also increases noise resistance.

(a) Grounding of shield section of shield cable

1) When the grounded cables and the not yet grounded cables are bundled in grounding point of shielded cable back, the cables might be induced to electromagnetic and generated high frequency noise outside of the control panel.
2) Ground the exposed shield section to spacious area on the control panel. A clamp can be used as shown in Figure 14.2.
   In this case, mask the inner wall surface when coating the control panel, and contact the exposed shield section with the clamp at the exposed bare metal surface.

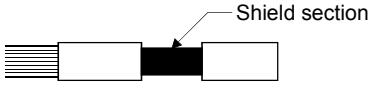



Figure 14.1 Part to be exposed

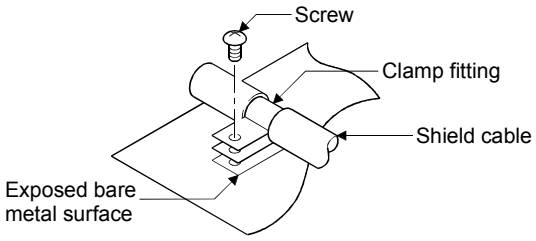



Figure 14.2 Shield grounding (Correct example)

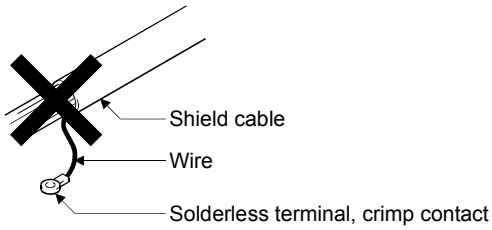



Figure 14.3 Shield grounding (Incorrect example)

Note. The method of grounding with a vinyl-coated wire soldered onto the shielded section of the shielded cable as in shown Figure 14.3 is not recommended. Doing so will raise the high frequency impedance, resulting in loss of the shielding effect.

(5) Precautions relevant to the electrostatic discharge

Before touching the position board, always touch grounded metal, etc. to discharge static electricity from human body. Failure to do so may cause the position board to fail or malfunction.

Do not directly touch the conductive parts of position board and electronic components. Touching them could cause an operation failure or damage the position board.

### 14.1.3 Parts of measure against noise

(1) Ferrite core

A ferrite core has the effect of reducing noise in the 30MHz to 100MHz band.

It is not required to fit ferrite cores to cables, but it is recommended to fit ferrite cores if shield cables pulled out of the enclosure do not provide sufficient shielding effects.

Note that the ferrite cores must be fitted to the cables in the position immediately before they are pulled out of the enclosure. If the fitting position is improper, the ferrite core will not produce any effect.

• Ferrite core (Recommended product)

| Manufacturer | Model name |
|---|---|
| TDK | ZCAT3035-1330 |

(2) Noise filter (power supply line filter)

A noise filter is a component which has an effect on conducted noise.

The attachment of the noise filter to the power supply line of the servo amplifier and system's power supply is effective for the reducing noise.

(The noise filter has the effect of reducing conducted noise of 10 MHz or less.)

• Recommended noise filters

| Manufacturer | Model name | Rated current (A) | Rated voltage (V) |
|---|---|---|---|
| SCHAFFNER | FN343-3/01 | 3 | 250 |
| | FN660-6/06 | 6 | |
| TDK | ZHC2203-11 | 3 | |

The precautions required when installing a noise filter are described below.

(a) Do not bundle the wires on the input side and output side of the noise filter. When bundled, the output side noise will be induced into the input side wires from which the noise was filtered.

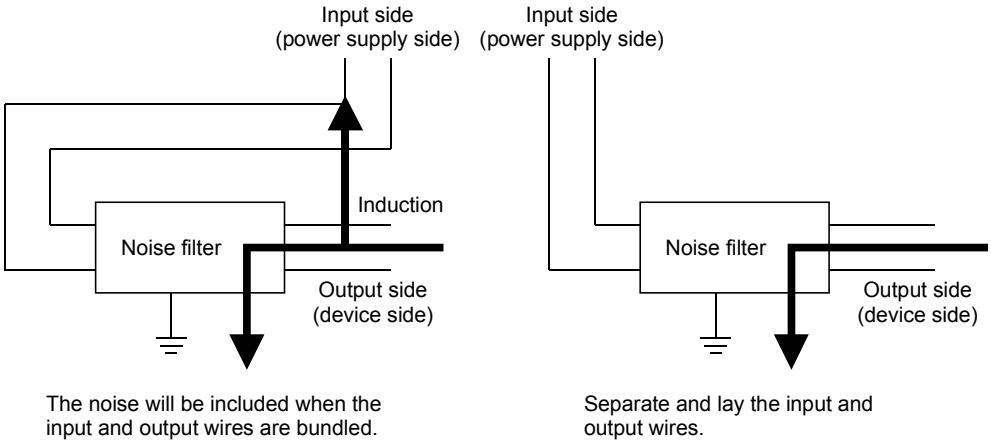



Figure 14.4 Precautions on noise filter

(b) Ground the noise filter grounding terminal to the control panel with the shortest wire possible (approx. 10cm (3.94 inch)).

## 14.2 Requirements for compliance with the low voltage directive

This board does not use the power supply of 50VAC to 1000VAC and 75VDC to 1500VDC, so it is a product outside the object range of Low Voltage Directive.

# APPENDIX

## App. 1 Supplementary explanation for the use of linear servo system

### App. 1.1 Position board

The software versions of the position board that can set up the linear servo system are as follows.

| Position board | Software version |
|---|---|
| MR-MC2□□ | A0 or later |

### App. 1.2 Position board utility software

The Position Board Utility2 versions supporting position board are as follows.

| Position board utility software | Software version |
|---|---|
| MRZJW3-MC2-UTL | Ver. 1.50 or later |

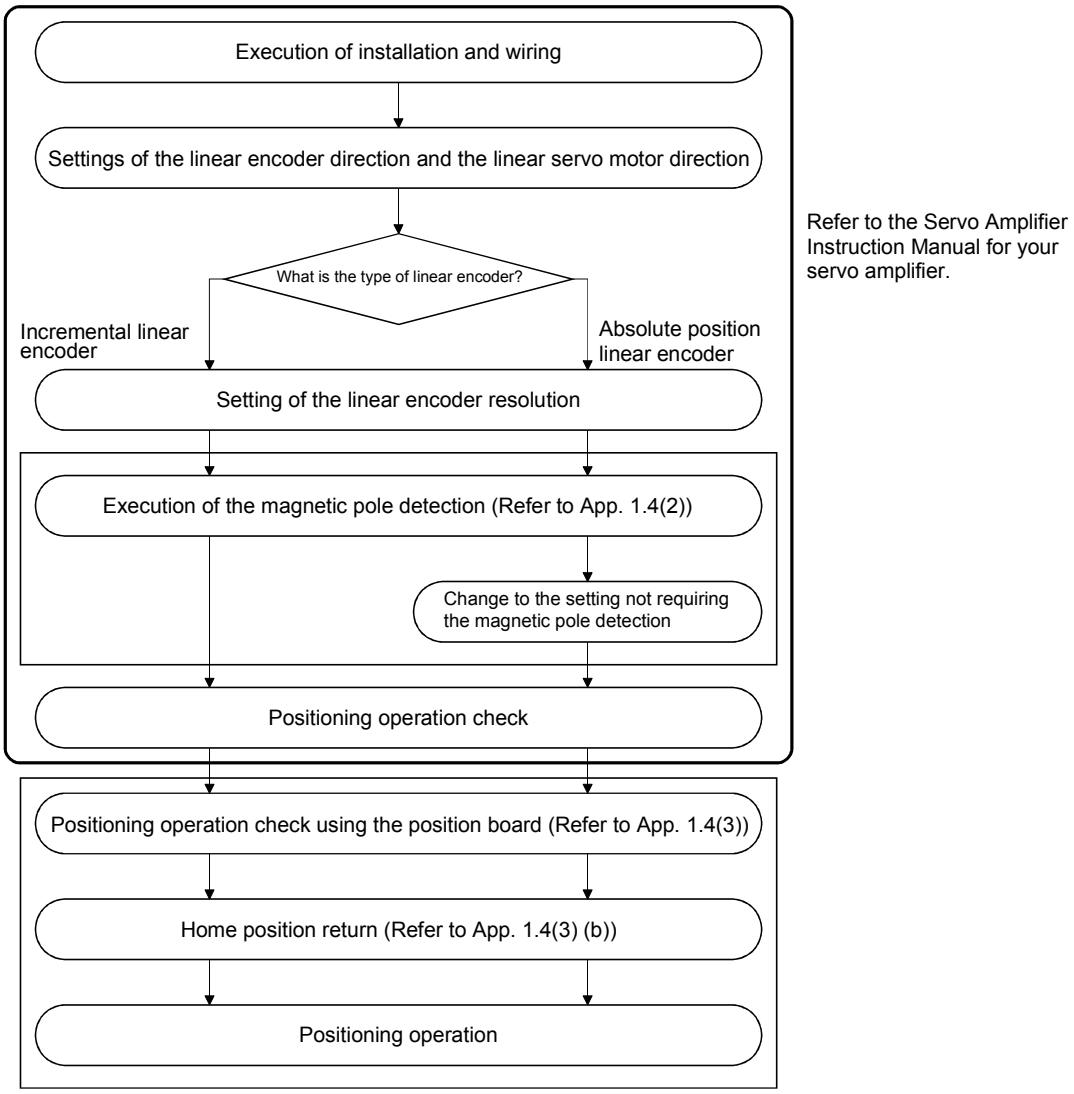
### App. 1.3 Servo amplifier

The servo amplifier MR-J4(W□)-□B can set linear servo system with the position board.
For detailed specifications of the servo amplifier, refer to the Servo Amplifier Instruction Manual for your servo amplifier.

App. 1.4 Operations and functions of the linear servo system

(1) Startup procedure

Linear servo system startup procedures are as follows.



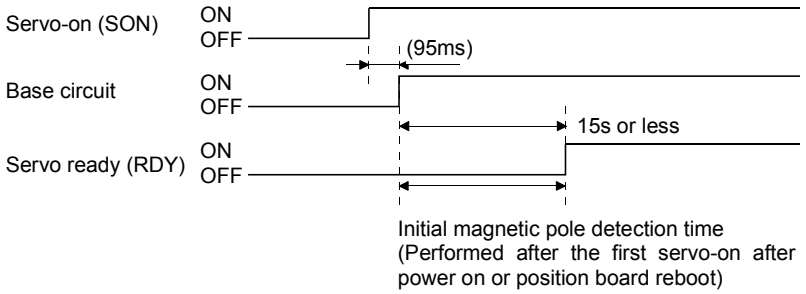
(2) Magnetic pole detection

For magnetic pole detection methods, refer to the Servo Amplifier Instruction Manual for your servo amplifier.

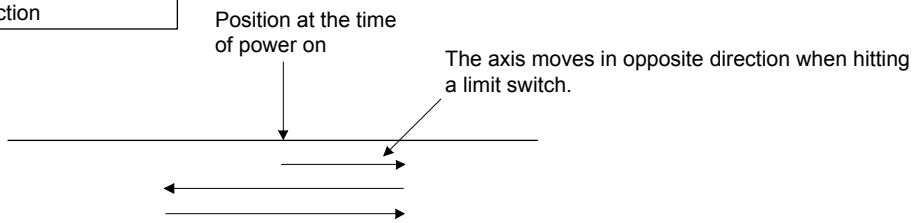
When an incremental scale is used, magnetic pole detection is performed at every power on. The magnetic pole detection is started when the first servo-on command following power on is received. Completion of the magnetic pole detection turns the servo on.

(a) For a single axis

Timing chart

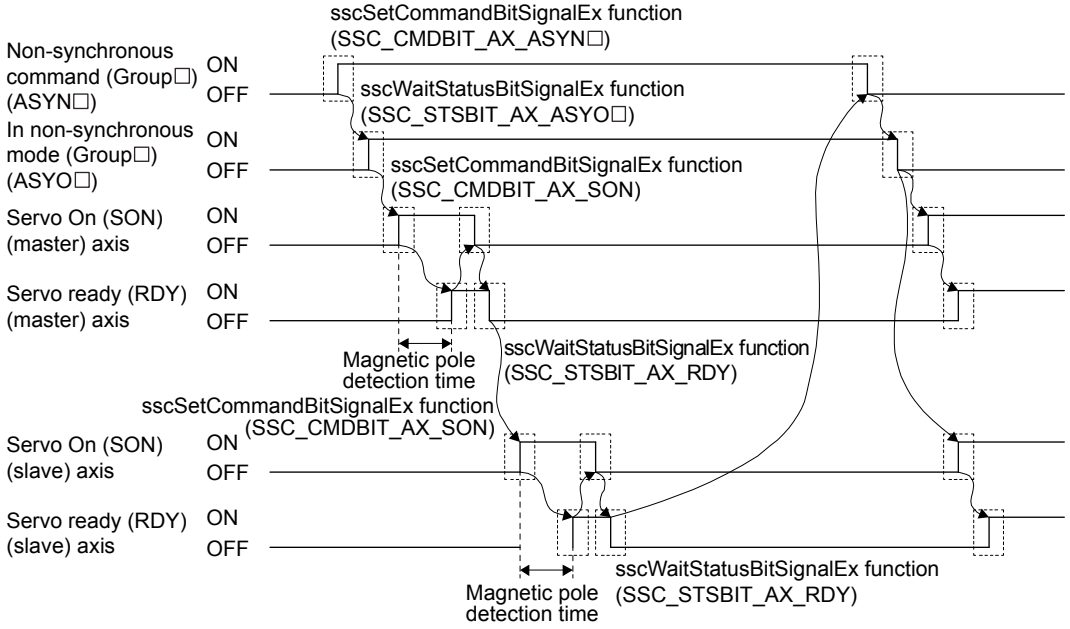



Axis movement in magnetic pole detection



(b) For tandem drive axes

For tandem drive axes, perform magnetic pole detection for the master axis, and then for the slave axis in the non-synchronous micro adjustment mode. Make sure the axis where magnetic pole detection is not performed is servo off (free).




Note 1. As shown on the timing chart above, during magnetic pole detection operation, it takes up to 15s from servo-on (SON) signal turning on to servo ready (RDY) signal turning on. Before using the API library, set 15s or more to the time-out period in sscWaitStatusBitSignalEx function, and wait until the servo on.

2. Establish the machine configuration using a limit switch. Collision may be caused between components without a limit switch.
3. In initial magnetic pole adjustment, a controlled object may move in the forward direction or reverse direction.
4. For tandem drive axes, do not turn servo on simultaneously for both the master and slave axes.
5. Magnetic pole detection time is the operating time when the stroke limit signal (FLS/RLS) is on.
6. When switching between non-synchronous mode/synchronous mode, check that all of the following conditions are satisfied.
   - The in-position signal (INP) is ON for both the master axis and slave axis.
   - No operation alarm has occurred for both the master axis and slave axis.

(3) Operation from the position board

Positioning operation using the position board is basically the same as operation for using a rotary servo motor.

However, some parameters, home position return operation, and monitor No. vary from when using a rotary servo motor. Details are as follows.

(a) Parameter

When using the linear servo system, set the parameters shown on the table below.

For other servo parameters, control parameters, and system parameters, set them as equivalent to using standard control mode (operation mode).

1) Servo parameters

For details on each parameter, refer to the Servo Amplifier Instruction Manual for your servo amplifier.

<MR-J4(W□)-□B>

| Parameter No. | MR-J4-B Parameter No. | (Note) Abbreviation | Name |
|---|---|---|---|
| 1100 | PA01 | **STY | Operation mode |
| 1110 | PA17 | **MSR | Servo motor series setting |
| 1111 | PA18 | **MTY | Servo motor type setting |
| 1180 | PC01 | ERZ | Error excessive alarm level |
| 1182 | PC03 | *ENRS | Encoder output pulse selection |
| 119A | PC27 | **COP9 | Function selection C-9 |
| 1300 | PL01 | **LIT1 | Linear servo motor/DD motor function selection 1 |
| 1301 | PL02 | **LIM | Linear encoder resolution setting Numerator |
| 1302 | PL03 | **LID | Linear encoder resolution setting Denominator |
| 1303 | PL04 | *LIT2 | Linear servo motor/DD motor function selection 2 |
| 1304 | PL05 | LB1 | Position deviation error detection level |
| 1305 | PL06 | LB2 | Speed deviation error detection level |
| 1306 | PL07 | LB3 | Torque/thrust deviation error detection level |
| 1307 | PL08 | *LIT3 | Linear servo motor/DD motor function selection 3 |
| 1308 | PL09 | LPWM | Magnetic pole detection voltage level |
| 1310 | PL17 | LTSTS | Magnetic pole detection - Minute position detection method - Function selection |
| 1311 | PL18 | IDLV | Magnetic pole detection - Minute position detection method - Identification signal amplitude |

Note. Parameters with asterisk (*) before abbreviation will be valid under the following conditions.

*: After setting, turn off the power supply and then on again, or reset controller.

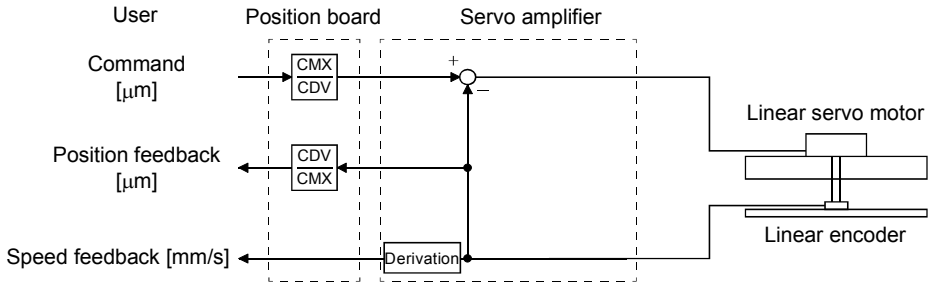
**: After setting, turn off the power supply and then on again.

2) Control parameters

| Parameter No. | (Note 1) Abbreviation | Name | Initial value | Unit | Setting range | Function |
|---|---|---|---|---|---|---|
| 0200 | *OPC1 | Control option 1 | 0001h | | 0000h to 2111h | □ 0 0 0<br>Speed unit (Note 3)<br>Set the speed command unit.<br>0: Position command unit / min<br>1: Position command unit / s |
| 020A | *CMXL | Electronic gear numerator (lower) | 0001h | | 1 to 5242879 (32 bit) (Note2) | Set the numerator of the electronic gear.<br>(For setting methods, refer to 3).) |
| 020B | *CMXH | Electronic gear numerator (upper) | 0000h | | | |
| 020C | *CDVL | Electronic gear denominator (lower) | 0001h | | 1 to 589823 (32 bit) (Note2) | Set the denominator of the electronic gear.<br>(For setting methods, refer to 3).) |
| 020D | *CDVH | Electronic gear denominator (upper) | 0000h | | | |
| 021D | *VEND | Vendor ID | 0000h | | 0000h to FFFFh | Set the vendor ID.<br>0000h: Mitsubishi Electric |
| 021E | *CODE | Type code | 1000h | | 0000h to FFFFh | Set the type code.<br>1000h: MR-J4(W□)-□B servo amplifier |

Note 1. Settings for parameters with asterisk (*) before abbreviation will be valid at system startup.
2. For details on the setting range, refer to Section 6.1.1.
3. When using a linear servo amplifier, select [position command unit/min] or [position command unit/s] as the speed command unit. [r/min] cannot be used as the speed command unit.

3) Setting example of electronic gears




Conditions:

Command unit: μm
Linear encoder resolution: 0.05 μm

$$\frac{\text{Number of pulses (CMX) [pulse]}}{\text{Travel (CDV) [}\mu\text{m]}} = \frac{1}{0.05} = \frac{20}{1}$$

(b) Home position return operation

The home position return operation from the position board is basically the same as operation for using a rotary servo motor.

However, note the following.

1) When using the absolute position type linear scale, the scale home position signal detection method or the scale home position signal detection method 2 cannot be used.
   The other home position return methods are available and a home position return is performed to the reference home position created based on stop interval settings for the home position return.
2) When using the incremental linear scale, it is recommended to use the scale home position signal detection method or the scale home position signal detection method 2. In this case, the home position return is performed based on the home position signal (Z-phase). The reference home position which is created based on stop interval settings for the home position return is not used.

<Control parameter>

| Parameter No. | (Note 1) Abbreviation | Name | Initial value | Unit | Setting range | Function |
|---|---|---|---|---|---|---|
| 0240 | *OPZ1 | Home position return option 1 | 0000h | | 0000h to 112Dh | 0 0 0 □<br>Home position return method (Note)<br>Set the method for home position return.<br>0: Dog method<br>2: Data set method<br>3: Stopper method<br>4: Dog cradle method<br>5: Limit switch combined method<br>6: Scale home position signal detection method<br>7: Limit switch front end method<br>8: Dog front end method<br>C: Z-phase detection method<br>D: Scale home position signal detection method 2<br>Note. Can be changed while system is running. (Software version A5 or later) |

Note 1. *: Setting will be valid at system startup.

3) When using the incremental scale, the home position return using a Z-phase detection method cannot be used.
4) With the incremental scale, when using a home position return method other than the scale home position signal detection method or the scale home position signal detection method 2, "1□□□" (Search again) must be set for the parameter No.0240 (*OPZ1).
   In this case, the home position return is performed based on the home position return reference position which is created based on stop interval settings for the home position return and the home position signal (Z-phase).

<Control parameter>

| Parameter No. | (Note 1) Abbreviation | Name | Initial value | Unit | Setting range | Function |
|---|---|---|---|---|---|---|
| 0240 | *OPZ1 | Home position return option 1 | 0000h | | 0000h to 112Dh | □ 0 0 0<br>Home position signal additional search (Note)<br>Set "1" when using an incremental encoder or incremental linear scale.<br>0: Do not search again<br>1: Search again<br>Note. Can be changed while system is running. (Software version A5 or later) |

Note 1. *: Setting will be valid at system startup.

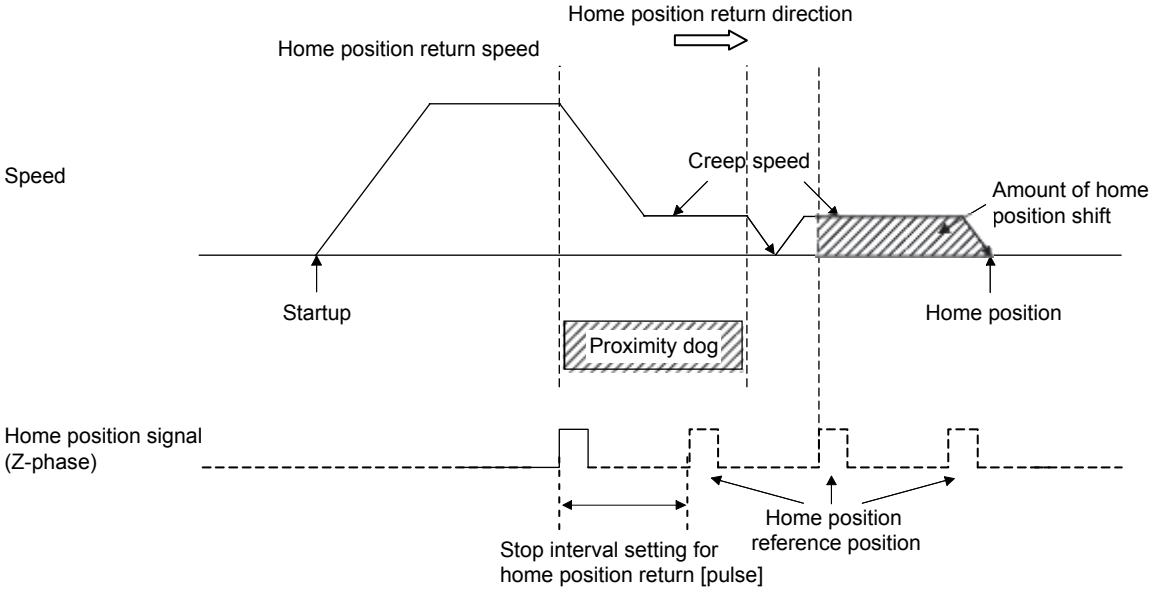
<Servo parameter (MR-J4(W□)-□B)>

| Parameter No. | MR-J4-B Parameter No. | (Note) Abbreviation | Name | Initial value | Unit | Setting range | Function |
|---|---|---|---|---|---|---|---|
| 1300 | PL01 | **LIT1 | Linear servo motor/direct drive motor function selection 1 | 0301h | | 0000h to 0605h | Stop interval setting for home position return |

| Setting value | Stop interval [pulse] |
|---|---|
| 0 | 8192 |
| 1 | 131072 |
| 2 | 262144 |
| 3 | 1048576 |
| 4 | 4194304 |
| 5 | 16777216 |
| 6 | 67108864 |

Note **: After setting, turn off the power supply and then on again to make the setting valid.

(Example) Home position return reference position for dog method home position return




Note 1. Adjust the position of the proximity dog sensor so that a stop position following the passed proximity dog is not near the reference home position. The reference home position may differ due to dispersion in the proximity dog signal detection, etc., which may prevent normal completion of the home position return.

2. When the reference home position is passed during deceleration after the proximity dog is passed, the reference home position that is the closest to the home position direction is defined as the home position.

For other precautions, refer to the Servo Amplifier Instruction Manual for your servo amplifier.

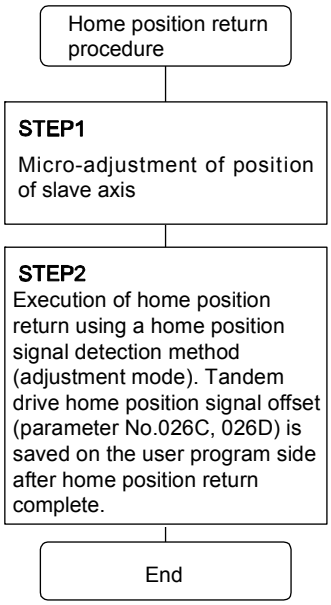
(c) Home position return process for tandem drive axes

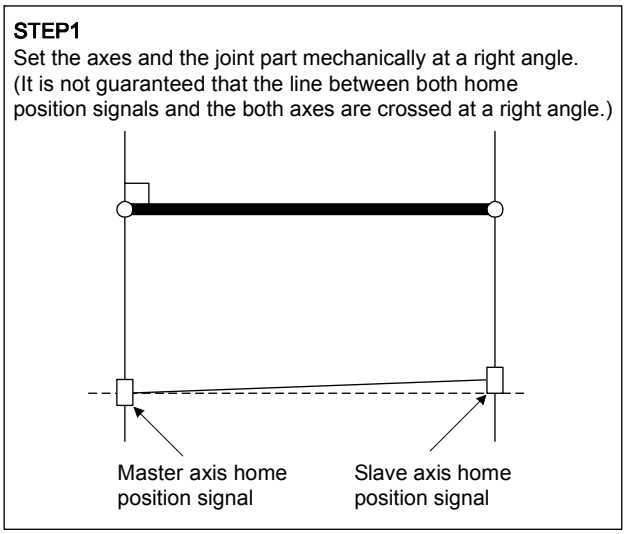
The following shows an example of the home position return for the tandem drive axes. In this example, the scale home position signal detection method is used as a home position method. The scale home position signal detection method has the adjustment mode and the normal mode, which can be selected in the tandem drive options (parameter No.0265).

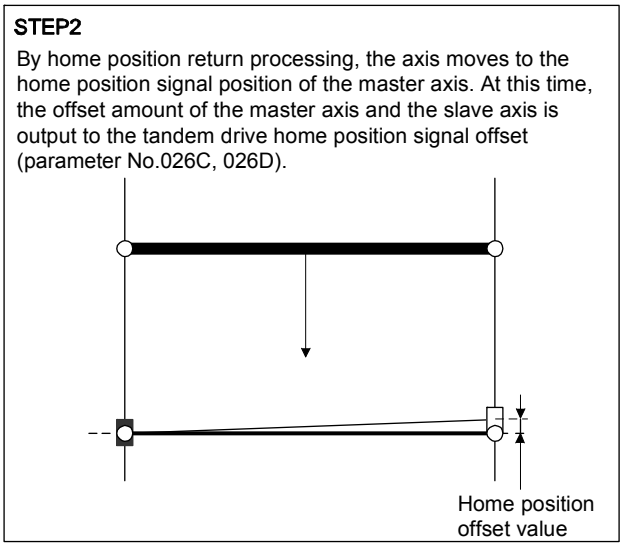
・Adjustment mode: This mode is used, for example, during adjustment at factory shipment, and is used to calculate the home position signal offset (amount of deviation in the position of the home position signal for the master axis and slave axis) on a linear scale.

・Normal mode: In this mode, the amount of deviation between the master axis and slave axis is detected and tweaking (compensation of deviation between master axis and slave axis) is performed. This movement sets the axis linking the master axis and slave axis mechanically at a right angle to the movement direction.

1) In adjustment mode



2) In normal mode

Home position return procedure

**STEP1**
Setting of the tandem drive home position signal offset (parameter No.026C, 026D) which has been set in the adjustment mode

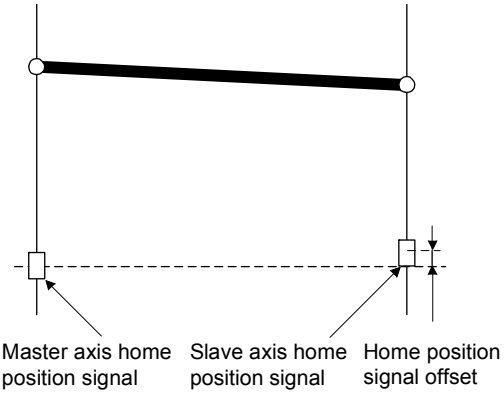
**STEP2**
Execution of home position return using a home position signal detection method (normal mode)

**STEP3**
Calculation of deviation amount from the target home position (compensation value) by camera, etc.

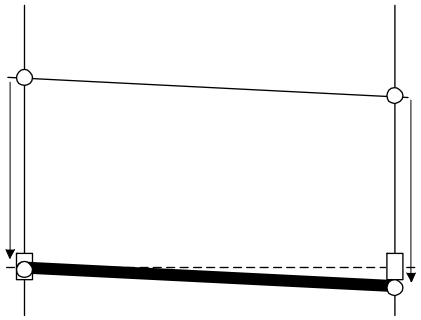
**STEP4**
Compensation of home position coordinate by home position reset function (Resetting of home position coordinate)

End

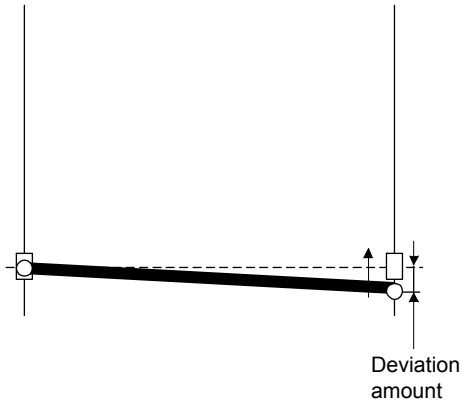
**STEP1**
It is not guaranteed that the axes and the joint part are connected at a right angle when the power is turned on.




**STEP2-1**
By home position return processing, the axis moves to the home position signal position of the master axis.



**STEP2-2**
By home position return processing, the deviation amount of the slave axis is compensated.



(d) Monitor

The following monitor numbers are added.

1) Servo information (2)

| Monitor No. | Description | Unit | Description |
|---|---|---|---|
| 0246 | Load side encoder information data 1 (lower) | | For incremental type linear encoder, displays the counter from power on. For absolute position type linear encoder, displays the absolute position data. |
| 0247 | Load side encoder information data 1 (upper) | | |
| 0248 | Load side encoder information data 2 (lower) | | For incremental type linear encoder, displays the distance (No. of pulses) from reference mark (Z-phase). For absolute position type linear encoder, displays "00000000". |
| 0249 | Load side encoder information data 2 (upper) | | |
| 024A | Speed feedback (lower) | 0.01mm/s | Displays motor speed in units of 0.01mm/s. |
| 024B | Speed feedback (upper) | | |

For the following monitor numbers, the monitor data details vary from those of a rotary servo motor.

2) Servo information (1)

| Monitor No. | Description | Unit | Description |
|---|---|---|---|
| 0112 | Motor rated revolution speed | r/min | Displays the value calculated in the equations shown below. Motor rated speed [m/s] × 1000 × 1000 × 60 / Scale resolution [μm/pulse] / Stop interval at home position return [pulse] |
| 0114 | Motor maximum revolution speed | r/min | Displays the value calculated in the equations shown below. Motor rated speed [m/s] × 1000 × 1000 × 60 / Scale resolution [μm/pulse] / Stop interval at home position return [pulse] |
| 0116 | Number of encoder pulses per revolution (lower) | pulse | Displays the stop interval during home position return set in parameter No.1300 (**LIT1). |
| 0117 | Number of encoder pulses per revolution (upper) | | |
| 0119 | Initial within 1 revolution position (lower) | pulse | Displays the within one-revolution position (Note 1) at the time of power-on. |
| 011A | Initial within 1 revolution position (upper) | | |
| 011B | Initial multiple revolution data | rev | Displays the multi-revolution data (Note 2) at the time of power-on. |

3) Servo information (2)

| Monitor No. | Description | Unit | Description |
|---|---|---|---|
| 0208 | Speed feedback (lower) | 0.01mm/s | Displays motor speed in units of 0.01mm/s. |
| 0209 | Speed feedback (upper) | | |
| 020E | Detector within 1 revolution position (lower) | pulse | Displays the current position within one-revolution. (Note 1) |
| 020F | Detector within 1 revolution position (upper) | | |
| 0210 | Home position within 1 revolution position (lower) | pulse | Displays the home position within one-revolution. (Note 1) |
| 0211 | Home position within 1 revolution position (upper) | | |
| 0214 | Multiple revolution counter | rev | Displays the current multiple revolution counter. (Note 2) |
| 0215 | Home position multiple revolution data | rev | Displays the home position multi-revolution data. (Note 2) |

Note. 1. Incremental linear encoder : Setting the position at the time of power on as 0, the position normalized by the stop interval during home position.

Absolute position linear encoder : Setting the linear encoder home position (absolute position data = 0), the position normalized by the stop interval during home position.

2. Incremental linear encoder : Setting the position at the time of power on as 0, the counter that counts up or down by the stop interval during home position return.

Absolute position linear encoder : Setting the linear encoder home position (absolute position data = 0), the counter that counts up or down by the stop interval during home position return.

(e) Command units

When using speed control mode in interface mode, the conversion of data in units of 0.01r/min is required. The formula for conversion is as follows.

$$\text{Speed command [0.01r/min]} = \frac{\text{Speed command[m/s]}\times1000\times1000\times60\times100}{\text{Linear encoder resolution[μm/pulse]}\times\text{Stop interval setting for home position return[pulse]}}$$

$$\text{Linear encoder resolution [μm/pulse]} = \frac{\text{Linear encoder resolution setting Numerator (Parameter No.1301)}}{\text{Linear encoder resolution setting Denominator (Parameter No.1302)]}}$$

## App. 2 Supplementary explanation for the use of fully closed loop system

### App. 2.1 Position board

The software versions of the position board that can set up the fully closed loop system are as follows.

| Position board | Software version |
|---|---|
| MR-MC2□□ | A0 or later |

### App. 2.2 Position board utility software

The Position Board Utility2 versions supporting position board are as follows.

| Position board utility software | Software version |
|---|---|
| MRZJW3-MC2-UTL | Ver. 1.50 or later |

### App. 2.3 Servo amplifier

The software versions of the servo amplifier that can set up the fully closed loop system with the position board are as follows.

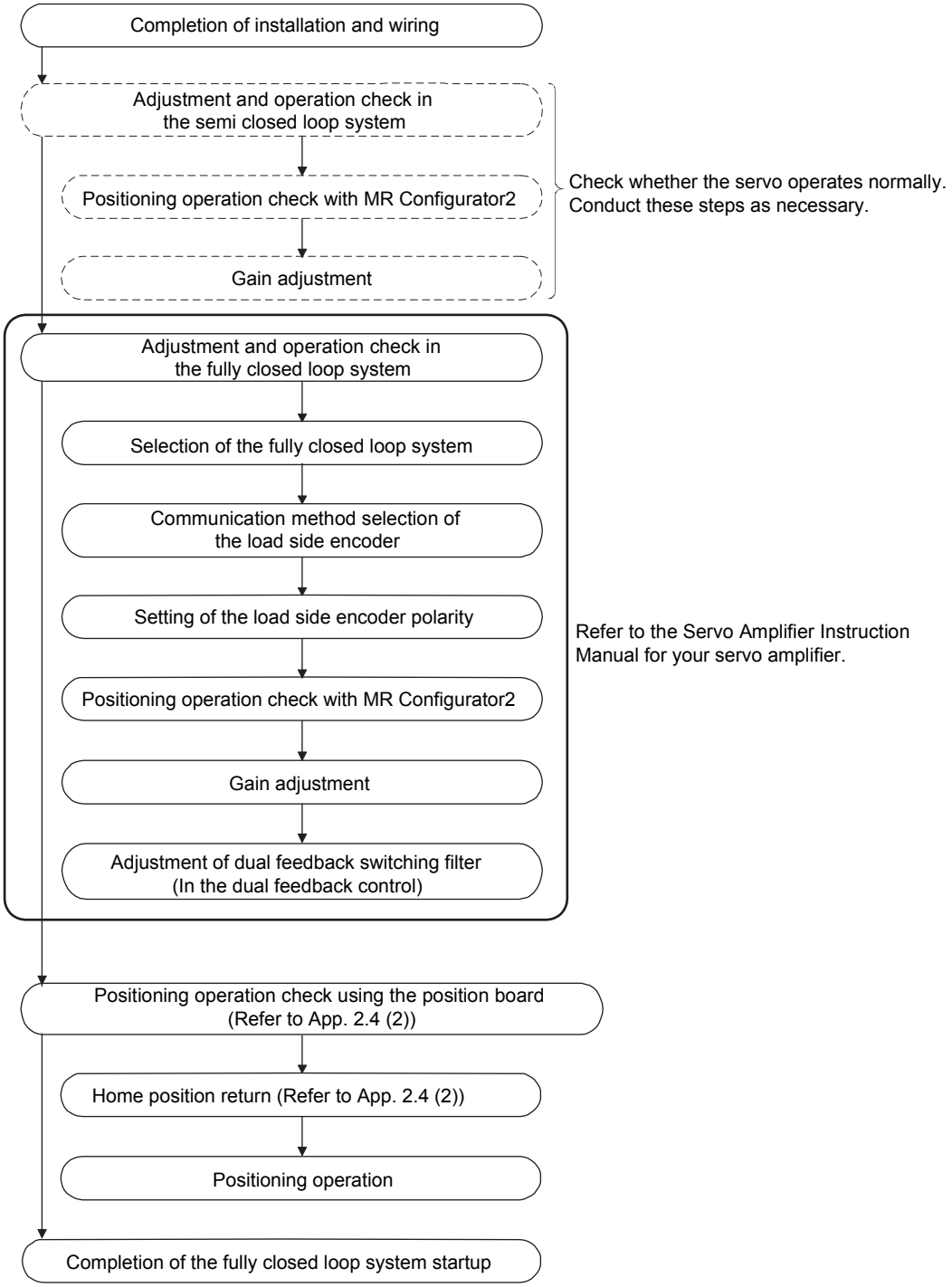
| Servo amplifier | Software version |
|---|---|
| MR-J4(W□)-□B | A3 or later |

For detailed specifications of the servo amplifier, refer to the Servo Amplifier Instruction Manual for your servo amplifier.

App. 2.4 Operations and functions of the fully closed loop control

(1) Startup procedure

The fully closed loop system startup procedures are as follows.



(2) Operation from the position board

Positioning operation using the position board is basically the same as operation for using a rotary servo motor.

However, some parameters, home position return operation, command/status bit, and monitor No. vary from when using a rotary servo motor. Details are as follows.

(a) Parameters

When using the fully closed loop system, set the parameters shown on the table below.

For other servo parameters, control parameters, and system parameters, set them as equivalent to using a rotary servo motor.

1) Servo parameters

For details on each parameter, refer to the Servo Amplifier Instruction Manual for your servo amplifier.

<MR-J4(W□)-□B>

| Parameter No. | MR-J4-B Parameter No. | Abbreviation (Note) | Name |
|---|---|---|---|
| 1100 | PA01 | **STY | Operation mode |
| 1190 | PC17 | **COP4 | Function selection C-4 |
| 119A | PC27 | **COP9 | Function selection C-9 |
| 1200 | PE01 | **FCT1 | Fully closed loop function selection 1 |
| 1202 | PE03 | *FCT2 | Fully closed loop function selection 2 |
| 1203 | PE04 | **FBN | Fully closed loop control feedback pulse electronic gear numerator 1 |
| 1204 | PE05 | **FBD | Fully closed loop control feedback pulse electronic gear denominator 1 |
| 1205 | PE06 | BC1 | Fully closed loop control speed deviation error detection level |
| 1206 | PE07 | BC2 | Fully closed loop control position deviation error detection level |
| 1207 | PE08 | DUF | Fully closed loop dual feedback filter |
| 1209 | PE10 | FCT3 | Fully closed loop function selection 3 |
| 1221 | PE34 | **FBN2 | Fully closed loop control feedback pulse electronic gear numerator 2 |
| 1222 | PE35 | **FBD2 | Fully closed loop control feedback pulse electronic gear denominator 2 |

Note. Parameters with asterisk (*) before abbreviation will be valid under the following conditions.

*: After setting, turn off the power supply and then on again, or reset controller.

**: After setting, turn off the power supply and then on again.

2) Control parameters

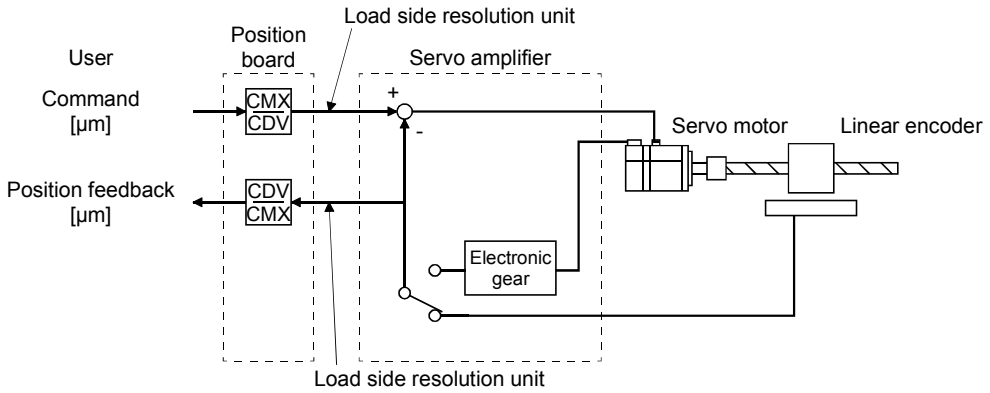
| Parameter No. | Abbreviation (Note 1) | Name | Initial value | Unit | Setting range | Function |
|---|---|---|---|---|---|---|
| 020A | *CMXL | Electronic gear numerator (lower) | 0001h | | 1 to 5242879 (32 bit) (Note2) | Set the numerator of the electronic gear. (For setting methods, refer to App. 2.4(2)(a)3.) |
| 020B | *CMXH | Electronic gear numerator (upper) | 0000h | | | |
| 020C | *CDVL | Electronic gear denominator (lower) | 0001h | | 1 to 589823 (32 bit) (Note2) | Set the denominator of the electronic gear. (For setting methods, refer to App. 2.4(2)(a)3).) |
| 020D | *CDVH | Electronic gear denominator (upper) | 0000h | | | |
| 021D | *VEND | Vendor ID | 0000h | | 0000h to FFFFh | Set the vendor ID. 0000h: Mitsubishi Electric |
| 021E | *CODE | Type code | 1000h | | 0000h to FFFFh | Set the type code. 1000h: MR-J4(W□)-□B servo amplifier |

Note 1. Settings for parameters with asterisk (*) before abbreviation will be valid at system startup.

2. The setting range differs depending on the setting of speed units (parameter No.0200). For details on the setting range, refer to Section 6.1.1.

3) Setting example of electronic gears

For the electronic gear numerator (CMX), set the number of linear encoder pulses (= load side resolution unit) per revolution of the servo motor, not the number of pulses per revolution of the servo motor.




Conditions:

Command unit: μm

Ball screw lead: 20 mm

Linear encoder resolution: 0.05 μm

Ball screw lead / Linear encoder resolution = 20 mm / 0.05 μm = 400000 pulses

$$\frac{\text{Number of pulses per revolution [pulse] (CMX)}}{\text{Travel distance per revolution [μm] (CDV)}} = \frac{400000\ \text{pulses}}{20\ \text{mm}} = \frac{400000}{20000} = \frac{20}{1}$$

(b) Home position return operation

The home position return operation from the position board is basically the same as operation for using a rotary servo motor.

However, when using the incremental linear scale, it is recommended to use the scale home position signal detection method or the scale home position signal detection method 2. In this case, the home position return is performed based on the home position signal (Z-phase). The reference home position which is created based on the number of encoder pulses per revolution of the servo motor is not used.

<Control parameter>

| Parameter No. | Abbreviation (Note 1) | Name | Initial value | Unit | Setting range | Function |
|---|---|---|---|---|---|---|
| 0240 | *OPZ1 | Home position return option 1 | 0000h | | 0000h to 112Dh | 0 0 0 □<br>Home position return method (Note)<br>Set the method for home position return.<br>0: Dog method<br>2: Data set method<br>3: Stopper method<br>4: Dog cradle method<br>5: Limit switch combined method<br>6: Scale home position signal detection method<br>7: Limit switch front end method<br>8: Dog front end method<br>C: Z-phase detection method<br>D: Scale home position signal detection method 2<br>Note. Can be changed while system is running. (Software version A5 or later) |

Note 1. *: Setting will be valid at system startup.

The home position return using a Z-phase detection method cannot be used.

When using a home position return method other than the scale home position signal detection method or the scale home position signal detection method 2, "1□□□" (Search again) must be set for the parameter No.0240 (*OPZ1).

<Control parameter>

| Parameter No. | Abbreviation (Note 1) | Name | Initial value | Unit | Setting range | Function |
|---|---|---|---|---|---|---|
| 0240 | *OPZ1 | Home position return option 1 | 0000h | | 0000h to 112Dh | □ 0 0 0<br>Home position signal additional search (Note)<br>Set "1" when using an incremental encoder or incremental linear scale.<br>0: Do not search again<br>1: Search again<br>Note. Can be changed while system is running. (Software version A5 or later) |

Note 1. *: Setting will be valid at system startup.

For other precautions, refer to the Servo Amplifier Instruction Manual for your servo amplifier.

(c) Bit information

The following bit (in the thick frame) is used to switch between the semi closed loop control and fully closed loop control.

The switching between the semi closed loop control and fully closed loop control is set with the parameter No.1200 (MR-J4(W□)-□B parameter No.PE01).

1) Command bit

| Address | Bit | Symbol | Signal name | When tandem drive is being used | Description |
|---|---|---|---|---|---|
| 0308 | 0 | GAIN | Gain changing command | Each axis | |
| | 1 | CLD | Fully closed loop control change command | Each axis | 0: Semi closed loop control<br>1: Dual feedback control<br>(Fully closed loop control) |
| | 2 | | Reserved | | |
| | 3 | CPC | PID control command | Each axis | |
| | 4 | | Reserved | | |
| | 5 | | | | |
| | 6 | | | | |
| | 7 | | | | |

2) Status bit

| Address | Bit | Symbol | Signal name | When tandem drive is being used | Description |
|---|---|---|---|---|---|
| 0348 | 0 | GAIN | During gain switching | Each axis | |
| | 1 | CLDO | Fully closed loop control changing | Each axis | 0: During semi closed loop control<br>1: During dual feedback control<br>(During fully closed loop control) |
| | 2 | TLSO | Selecting torque limit | Each axis | |
| | 3 | SPC | During PID control | Each axis | |
| | 4 | | Reserved | | |
| | 5 | | | | |
| | 6 | | | | |
| | 7 | | | | |

(d) Monitor

The following monitor numbers are added.

1) Servo information (2)

| Monitor No. | Description | Unit | Description |
|---|---|---|---|
| 0240 | Selected droop pulse (lower) | pulse | The data set to the second digit from the upper of the parameter No.1209 (MR-J4(W□)-□B parameter No.PE10) is output. |
| 0241 | Selected droop pulse (upper) | | |
| 0244 | Selected cumulative feed pulses (lower) | pulse | The data set to the first digit from the upper of the parameter No.1209 (MR-J4(W□)-□B parameter No.PE10) is output. |
| 0245 | Selected cumulative feed pulses (upper) | | |
| 0246 | Load side encoder information data 1 (lower) | | For incremental type linear encoder, displays the counter from power on. For absolute position type linear encoder, displays the absolute position data. |
| 0247 | Load side encoder information data 1 (upper) | | |
| 0248 | Load side encoder information data 2 (lower) | | For incremental type linear encoder, displays the distance (No. of pulses) from reference mark (Z-phase).<br>For absolute position type linear encoder, displays "00000000". |
| 0249 | Load side encoder information data 2 (upper) | | |

For the following monitor numbers, the monitor data details vary from those of a rotary servo motor.

2) Servo information (1)

| Monitor No. | Description | Unit | Description (upper: data, lower: unit) (Note 1) | | |
|---|---|---|---|---|---|
| | | | Semi closed loop system (Note 2) | Fully closed loop system (Note 2) | |
| | | | | Semi closed loop control (Note 2) | Fully closed loop control (Note 2) |
| 0112 | Motor rated revolution speed | r/min | Motor side<br>Motor unit | Motor side<br>Motor unit | Motor side<br>Motor unit |
| 0114 | Motor maximum revolution speed | r/min | Motor side<br>Motor unit | Motor side<br>Motor unit | Motor side<br>Motor unit |
| 0116 | Number of encoder pulses per revolution (lower) | pulse | Motor side<br>Motor unit | Load side<br>Machine unit | Load side<br>Machine unit |
| 0117 | Number of encoder pulses per revolution (upper) | | | | |
| 0119 | Initial within 1 revolution position (lower) | pulse | Motor side<br>Motor unit | Motor side<br>Machine unit | Load side<br>Machine unit |
| 011A | Initial within 1 revolution position (upper) | | | | |
| 011B | Initial multiple revolution data | rev | Motor side<br>Motor unit | Motor side<br>Machine unit | Load side<br>Machine unit |

Note 1. Data : Motor side → Data from the servo motor encoder
Load side → Data from the load side encoder
Unit : Motor unit → Motor side encoder resolution unit
Machine unit → Load side encoder resolution unit

Note 2. For the definitions of the semi closed loop system, the fully closed loop system, the semi closed loop control, and the fully closed loop control, refer to the Servo Amplifier Instruction Manual for your servo amplifier.

3) Servo information (2)

| Monitor No. | Description | Unit | Description (upper: data, lower: unit) (Note 1) | | |
|---|---|---|---|---|---|
| | | | Semi closed loop system (Note 2) | Fully closed loop system (Note 2) | |
| | | | | Semi closed loop control (Note 2) | Fully closed loop control (Note 2) |
| 0200 | Position feedback (lower) | pulse | Motor side<br>Motor unit | Motor side<br>Machine unit | Load side<br>Machine unit |
| 0201 | Position feedback (upper) | | | | |
| 0204 | Position droop (lower) | pulse | Motor side<br>Motor unit | Motor side<br>Machine unit | Load side<br>Machine unit |
| 0205 | Position droop (upper) | | | | |
| 0208 | Speed feedback (lower) | 0.01r/min | Motor side<br>Motor unit | Motor side<br>Motor unit | Motor side<br>Motor unit |
| 0209 | Speed feedback (upper) | | | | |
| 020E | Detector within 1 revolution position (lower) | pulse | Motor side<br>Motor unit | Motor side<br>Machine unit | Load side<br>Machine unit |
| 020F | Detector within 1 revolution position (upper) | | | | |
| 0210 | Home position within 1 revolution position (lower) | pulse | Motor side<br>Motor unit | Motor side<br>Machine unit | Load side<br>Machine unit |
| 0211 | Home position within 1 revolution position (upper) | | | | |
| 0212 | ZCT (lower) | pulse | Motor side<br>Motor unit | Motor side<br>Machine unit | Load side<br>Machine unit |
| 0213 | ZCT (upper) | | | | |
| 0214 | Multiple revolution counter | rev | Motor side<br>Motor unit | Motor side<br>Machine unit | Load side<br>Machine unit |
| 0215 | Home position multiple revolution data | rev | Motor side<br>Motor unit | Motor side<br>Machine unit | Load side<br>Machine unit |

Note 1. Data : Motor side → Data from the servo motor encoder
Load side → Data from the load side encoder
Unit : Motor unit → Motor side encoder resolution unit
Machine unit → Load side encoder resolution unit

Note 2. For the definitions of the semi closed loop system, the fully closed loop system, the semi closed loop control, and the fully closed loop control, refer to the Servo Amplifier Instruction Manual for your servo amplifier.

4) Operation information

The contents of the following table are also applied to the corresponding monitor numbers of operation information (double word).

| Monitor No. | Description | Unit | Description (upper: data, lower: unit) (Note 1) | | |
|---|---|---|---|---|---|
| | | | Semi closed loop system (Note 2) | Fully closed loop system (Note 2) | |
| | | | | Semi closed loop control (Note 2) | Fully closed loop control (Note 2) |
| 0308 | Grid size (lower) | pulse | Motor side<br>Motor unit | Motor side<br>Machine unit | Load side<br>Machine unit |
| 0309 | Grid size (upper) | | | | |
| 0310 | Current command position (lower) | pulse | Motor side<br>Motor unit | Motor side<br>Machine unit | Load side<br>Machine unit |
| 0311 | Current command position (upper) | | | | |
| 0312 | Current feedback position (lower) | pulse | Motor side<br>Motor unit | Motor side<br>Machine unit | Load side<br>Machine unit |
| 0313 | Current feedback position (upper) | | | | |
| 0314 | F Δ T (lower) | pulse | Motor side<br>Motor unit | Motor side<br>Machine unit | Load side<br>Machine unit |
| 0315 | F Δ T (upper) | | | | |

Note 1. Data : Motor side → Data from the servo motor encoder
Load side → Data from the load side encoder
Unit : Motor unit → Motor side encoder resolution unit
Machine unit → Load side encoder resolution unit

Note 2. For the definitions of the semi closed loop system, the fully closed loop system, the semi closed loop control, and the fully closed loop control, refer to the Servo Amplifier Instruction Manual for your servo amplifier.

## App. 3 Supplementary explanation for the use of direct drive servo system

### App. 3.1 Position board

The software versions of the position board that can set up the direct drive servo system are as follows.

| Position board | Software version |
|---|---|
| MR-MC2□□ | A0 or later |

### App. 3.2 Position board utility software

The Position Board Utility2 versions supporting position board are as follows.

| Position board utility software | Software version |
|---|---|
| MRZJW3-MC2-UTL | Ver. 1.50 or later |

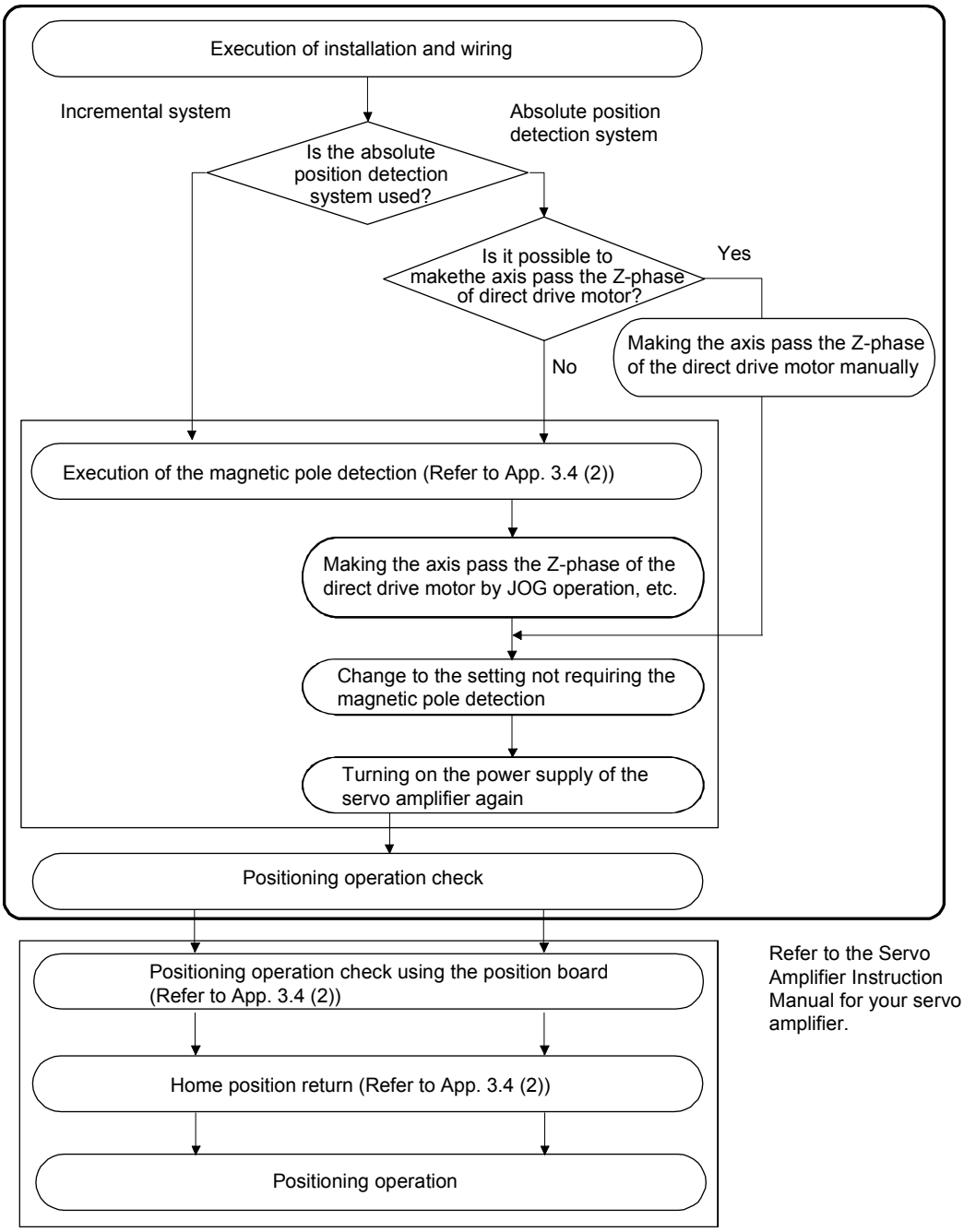
### App. 3.3 Servo amplifier

The servo amplifier MR-J4(W□)-□B can set the direct drive servo system with the position board.
For detailed specifications of the servo amplifier, refer to the Servo Amplifier Instruction Manual for your servo amplifier.

App. 3.4 Operations and functions of the direct drive servo system

(1) Startup procedure

The direct drive servo system startup procedures are as follows.



(2) Operation from the position board

Positioning operation using the position board is basically the same as operation for using a rotary servo motor.

However, some parameters, home position return operation, command/status bit, and monitor No. vary from when using a rotary servo motor. Details are as follows.

(a) Parameters

When using the direct drive system, set the parameters shown on the table below.

For other servo parameters, control parameters, and system parameters, set them as equivalent to using a rotary servo motor.

1) Servo parameters

For details on each parameter, refer to the Servo Amplifier Instruction Manual for your servo amplifier.

<MR-J4(W□)-□B>

| Parameter No. | MR-J4-B Parameter No. | (Note) Abbreviation | Name |
|---|---|---|---|
| 1100 | PA01 | **STY | Operation mode |
| 1180 | PC01 | ERZ | Error excessive alarm level |
| 1182 | PC03 | *ENRS | Encoder output pulse selection |
| 1300 | PL01 | **LIT1 | Linear servo motor/DD motor function selection 1 |
| 1303 | PL04 | *LIT2 | Linear servo motor/DD motor function selection 2 |
| 1304 | PL05 | LB1 | Position deviation error detection level |
| 1305 | PL06 | LB2 | Speed deviation error detection level |
| 1306 | PL07 | LB3 | Torque/thrust deviation error detection level |
| 1307 | PL08 | *LIT3 | Linear servo motor/DD motor function selection 3 |
| 1308 | PL09 | LPWM | Magnetic pole detection voltage level |
| 1310 | PL17 | LTSTS | Magnetic pole detection - Minute position detection method - Function selection |
| 1311 | PL18 | IDLV | Magnetic pole detection - Minute position detection method - Identification signal amplitude |

Note. Parameters with asterisk (*) before abbreviation will be valid under the following conditions.

*: After setting, turn off the power supply and then on again, or reset controller.

**: After setting, turn off the power supply and then on again.

2) Control parameters

| Parameter No. | (Note1) Abbreviation | Name | Initial value | Unit | Setting range | Function |
|---|---|---|---|---|---|---|
| 020A | *CMXL | Electronic gear numerator (lower) | 0001h | | 1 to 5242879 (32 bit) (Note2) | Set the numerator of the electronic gear. (For setting methods, refer to App. 3.4(2)(c).) |
| 020B | *CMXH | Electronic gear numerator (upper) | 0000h | | | |
| 020C | *CDVL | Electronic gear denominator (lower) | 0001h | | 1 to 589823 (32 bit) (Note2) | Set the denominator of the electronic gear. (For setting methods, refer to App. 3.4(2)(c).) |
| 020D | *CDVH | Electronic gear denominator (upper) | 0000h | | | |
| 021D | *VEND | Vendor ID | 0000h | | 0000h to FFFFh | Set the vendor ID. 0000h: Mitsubishi Electric |
| 021E | *CODE | Type code | 1000h | | 0000h to FFFFh | Set the type code. 1000h: MR-J4(W□)-□B servo amplifier |

Note1. Settings for parameters with asterisk (*) before abbreviation will be valid at system startup.

2. The setting range differs depending on the setting of speed units (parameter No.0200). Refer to Section 6.1.1.

(b) Home position return operation

The home position return operation from the position board is basically the same as operation for using a rotary servo motor.

When the home position return is performed using the position board, it is recommended to use the scale home position signal detection method 2. In this case, the home position return is performed based on the first home position signal (Z-phase) following start operation.

<Control parameter>

| Parameter No. | (Note 1) Abbreviation | Name | Initial value | Unit | Setting range | Function |
|---|---|---|---|---|---|---|
| 0240 | *OPZ1 | Home position return option 1 | 0000h | | 0000h to 112Dh | 0 0 0 □<br>Home position return method (Note)<br>Set the method for home position return.<br>0: Dog method<br>2: Data set method<br>3: Stopper method<br>4: Dog cradle method<br>5: Limit switch combined method<br>6: Scale home position signal detection method<br>7: Limit switch front end method<br>8: Dog front end method<br>C: Z-phase detection method<br>D: Scale home position signal detection method 2<br>Note. Can be changed while system is running. (Software version A5 or later) |

Note 1. *: Setting will be valid at system startup.

The home position return using a Z-phase detection method cannot be used.

When using a home position return method other than the scale home position signal detection method or the scale home position signal detection method 2, "1□□□" (Search again) must be set for the parameter No.0240 (*OPZ1).

<Control parameter>

| Parameter No. | (Note 1) Abbreviation | Name | Initial value | Unit | Setting range | Function |
|---|---|---|---|---|---|---|
| 0240 | *OPZ1 | Home position return option 1 | 0000h | | 0000h to 112Dh | □ 0 0 0<br>Home position signal additional search (Note)<br>Set "1" when using an incremental encoder or incremental linear scale.<br>0: Do not search again<br>1: Search again<br>Note. Can be changed while system is running. (Software version A5 or later) |

Note 1. *: Setting will be valid at system startup.

For other precautions, refer to the Servo Amplifier Instruction Manual for your servo amplifier.

(c) Position command unit

As "degree" cannot be used as a position command unit, note the following when using the axis as a degree axis.

| POINT |
|---|
| ・For positioning the automatic operation, etc., set "Relative position command" to the auxiliary command of the point table, and set the difference of the travel distance to the target position in the position data. Also, the rotating direction is determined by the code of the position data. Use the user program for shortcut control of a degree axis.<br>・The function to judge based on the current command position or the current feedback position such as the position switch, software limit, other axes start cannot be used. |

1) When the movement range is limited (-2147483648 to 2147483647)

For the electronic gear setting, set values so that conversion from travel distance per motor revolution to the number of encoder pulses per revolution does not produce a round value for electronic gear processing.

In this case, the travel distance per motor revolution can be converted to the number of encoder pulses per revolution by the following formula.

Example: When the position command unit is 0.001° and the travel distance per motor revolution is 360000 [0.001°]

$$\frac{\text{Electronic gear numerator}}{\text{Electronic gear denominator}} = \frac{\text{Number of encoder pulses per revolution [pulse]}}{\text{Travel distance per motor revolution [position command unit]}} = \frac{\text{Number of encoder pulses per revolution [pulse]}}{360000}$$

$$\text{Travel distance per motor revolution [position command unit]} \times \frac{\text{Electronic gear numerator}}{\text{Electronic gear denominator}} = \text{Number of encoder pulses per revolution [pulse]}$$

2) When using the unlimited length feed such as an unidirectional feed

When the travel distance per motor revolution is a power of two, the unlimited length feed can be used. As the monitor of a current command position is 4 bytes in size, unidirectional feed causes the overflow of current command position. Even though overflowed high-byte data is lost, the range of 4 bytes normally continues to be updated. And positioning control is not affected. (Position mismatch does not occur.)

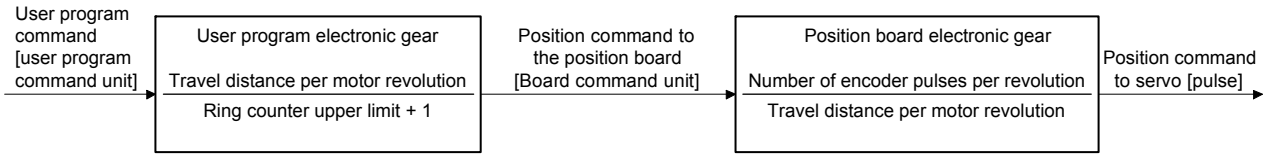
To control the axis as a degree axis, use the user program process to convert the current command position to the ring counter. As necessary, perform the same process for the current feedback position. The conversion process of the ring counter is as follows.

Example: When the command unit of the user program (user program command unit) is 0.001° and the range of the ring counter is 0 to 359999 [0.001°]

In this example, the travel distance per motor revolution is a power of two ($2^{20}$), and the unit is the position command unit of the position board (board command unit).

The user program uses the user program electronic gear for converting the user program command unit to the board command unit when the position command (position data, parameter, etc.) is set in the position board (hereinafter: board). Also, when the board current command position is referred, the user program uses the user program electronic gear for converting the board command unit to the user program command unit (ring counter) inversely.

The relationship of each command unit is as follows.




Note. Processed by user program.

(i) Conversion from the user program position command [user program command unit] to the position command to the board (position data) [board command unit]

$$\text{Position data} = \text{User program position command} \times \frac{\text{Travel distance per motor revolution}}{\text{Ring counter upper limit} + 1}$$

$$= \text{User program position command} \times \frac{2^{20}}{360000}$$

(ii) Inverse conversion from current command position [board command unit] to ring counter [user program command unit]

$$\text{Ring counter} = \{\text{Current command position \& (Travel distance per motor revolution} - 1)\} \times \frac{\text{Ring counter upper limit} + 1}{\text{Travel distance per motor revolution}}$$

$$= (\text{Current command position \& 0x000FFFFF}) \times \frac{360000}{2^{20}}$$

(d) Absolute position detection system

When the travel distance from the home position exceeds the value calculated from 32767 × (number of encoder pulses per revolution) due to a unidirectional feed, etc., the absolute position cannot be restored. To restore the absolute position, when turning off the power supply at a position out of the range where the absolute position is restorable, establish the home position again by the home position reset function or the home position return, and store the home position information (home position multiple revolution data and home position within 1 revolution position) to the user program side.

## App. 4 Supplementary explanation for the use of multiple-axis servo amplifier (MR-J4W□-□B)

### App. 4.1 Position board

The software versions of the position board that can be connected with a multiple-axis servo amplifier (MR-J4W□-□B) are as follows.

| Position board | Software version |
|---|---|
| MR-MC2□□ | A0 or later |

### App. 4.2 Position board utility software

The Position Board Utility2 versions supporting position board are as follows.

| Position board utility software | Software version |
|---|---|
| MRZJW3-MC2-UTL | Ver. 1.50 or later |

### App. 4.3 Servo amplifier

For detailed specifications of a multiple-axis servo amplifier (MR-J4W□-□B), refer to the Servo Amplifier Instruction Manual for your servo amplifier.

POINT

- When the control cycle is 0.22ms, MR-J4W3-□B cannot be used.
- The fully closed loop system can be used for the servo amplifier MR-J4(W□)-□B whose software version is A3 or later.

### App. 4.4 Operations and functions of the servo amplifier

(1) Startup procedure

With one multiple-axis servo amplifier (MR-J4W□-□B), a rotary servo motor, linear servo motor, fully closed loop system, and direct drive motor can be used in combination.
For the use of a rotary servo motor, refer to Section 4.1.
For the use of a linear servo motor, refer to App. 1. For the use of the fully closed loop system, refer to App. 2. For the use of the direct drive motor, refer to App. 3.

POINT

- For the all axes used with the multiple-axis servo amplifier (MR-J4W□-□B), always set "Controlled" to the control option 1 (parameter No.0200). When "Not controlled" is set, the system cannot start properly.
- For a multiple-axis servo amplifier (MR-J4W□-□B), the number of axis used can be changed using the control axis invalid switch (SW2). Deactivate unused axes.

(2) Operation from the position board

Positioning operation using the position board is basically the same as operation for using a rotary servo motor. For the use of a linear servo motor, refer to App. 1. For the use of the direct drive motor, refer to App. 3.

(a) Parameters

For servo parameters, control parameters, and system parameters, set them in the same way as the operation mode to be used (rotary motor, linear, fully closed loop system, and direct drive).

## App. 5 Supplementary explanation for the use of servo amplifier (MR-JE-□B)

### App. 5.1 Position board

The software versions of the position board that can use servo amplifier (MR-JE-□B) are as follows.

| Position board | Software version |
|---|---|
| MR-MC2□□ | A7 or later |

### App. 5.2 Position board utility software

The Position Board Utility2 versions supporting above position board are as follows.

| Position board utility software | Software version |
|---|---|
| MRZJW3-MC2-UTL | Ver. 1.70 or later |

### App. 5.3 Servo amplifier

For detailed specifications of a servo amplifier (MR-JE-□B), refer to the Servo Amplifier Instruction Manual for your servo amplifier.

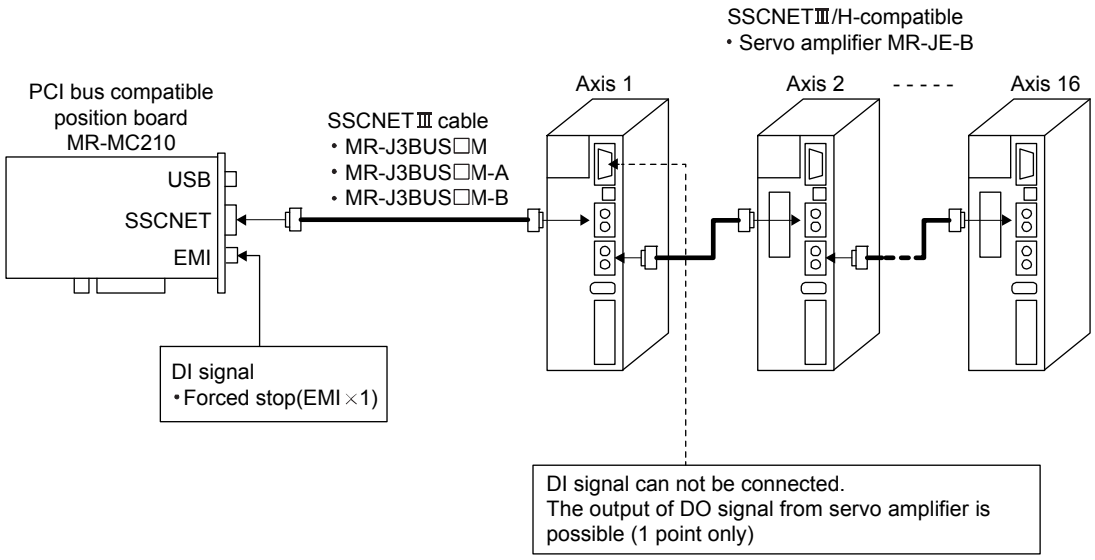
POINT

- Servo amplifier (MR-JE-□B) does not support SSCNETⅢ communication. Use the servo amplifier in a SSCNETⅢ/H system.
- Control cycle 0.22ms is not supported. When the system is start with the control cycle as 0.22ms and a servo amplifier (MR-JE-□B) connected, the system is on standby for start and a communication cycle error (system error E40E) occurs.
- Servo amplifier (MR-JE-□B) can connect up to 16 axes on 1 line with SSCNETⅢ/H. When using 17 axes or more, up to 20 axes can be controlled on 1 line by using MR-JE-□B together with MR-J4(W□)-□B.

App. 5.4 System configuration

App. 5.4.1 System configuration diagram

Example: For PCI bus compatible position board MR-MC210




POINT

- DI signals (LSP/LSN/DOG) cannot be input to servo amplifier (MR-JE-□B). When using sensor input, set a value other than "1: Driver input" to sensor input option (parameter No.0219). When inputting the sensor input from dual port (setting "4: Dual port memory input" to sensor input option), periodically updating the input status is necessary. Also, to take into consideration when the host controller is hangup, use together with the user watchdog function. Refer to Section 6.28 and Section 7.7 for details.

App. 5.5 Axis No. setting

App. 5.5.1 Servo amplifier setting

Axis No. of MR-JE-□B is set by the axis selection rotary switch (SW1) on the servo amplifier. Servo amplifier axis No. and rotary switch setting are correlated as shown on the table below. Set the axis No. of the servo amplifier so that it will not duplicate in the same line. If it is duplicated, the "An axis that has not been mounted exists" (system error E400) will occur at the time of system startup (system command code: 000Ah).

| Servo amplifier axis No. | Axis selection rotary switch | Servo amplifier display (3-digit, 7-segment indicator) |
|---|---|---|
| d1 | 0 | 01 |
| d2 | 1 | 02 |
| d3 | 2 | 03 |
| d4 | 3 | 04 |
| d5 | 4 | 05 |
| d6 | 5 | 06 |
| d7 | 6 | 07 |
| d8 | 7 | 08 |
| d9 | 8 | 09 |
| d10 | 9 | 10 |
| d11 | A | 11 |
| d12 | B | 12 |
| d13 | C | 13 |
| d14 | D | 14 |
| d15 | E | 15 |
| d16 | F | 16 |

App. 5.6 Parameter setting

App. 5.6.1 System option 1 setting

SSCNET communication method and control cycle is set by System option 1 (parameter No.0001).
SSCNET communication method is used for communication between a position board and connected units such as servo amplifiers and SSCNETⅢ/H method and SSCNETⅢ method are available. When using MR-JE-□B servo amplifiers, make sure to select the SSCNETⅢ/H method.
Control cycle is a cycle in which the position board conducts command import, position control, status output, and communication with servo amplifier. To set this cycle, use the control cycle (parameter No.0001). Servo amplifier (MR-JE-□B) does not support control cycle 0.22ms. When using servo amplifier (MR-JE-□B), make sure to select a control cycle other than 0.22ms.
The following shows the number of controllable axes according to the control cycle.

(1) For MR-MC210/MR-MC240

| Control cycle | Max. No. of axes connected | | Max. No. of axes connected for each line | Controllable axis No. |
|---|---|---|---|---|
| | Using MR-JE-□B only | Using together with MR-J4(W)-□B | | |
| 0.88ms | 16 axes | 20 axes | 20 axes (Note) | Axis 1 to 20 |
| 0.44ms | 16 axes | 16 axes | 16 axes | Axis 1 to 16 |

(2) For MR-MC211/MR-MC241

| Control cycle | Max. No. of axes connected | | Max. No. of axes connected for each line | Controllable axis No. |
|---|---|---|---|---|
| | Using MR-JE-□B only | Using together with MR-J4(W)-□B | | |
| 0.88ms | 32 axes | 32 axes | 20 axes (Note) | Axis 1 to 32 |
| 0.44ms | 16 axes | 16 axes | 16 axes | Axis 1 to 16 |

Note. When using 17 axes or more, use MR-JE-□B together with MR-J4(W□)-□B.

Control cycle settings are imported during system startup (system command code: 000Ah), and cannot be changed during system running (system command code: 000Ah).

(a) System parameters

| Parameter No. | Abbreviation | Name | Function |
|---|---|---|---|
| 0001 | *SYSOP1 | System option 1 | 0 [ ] 0 [ ]<br>Control cycle setting<br>0: 0.88ms<br>1: 0.44ms<br>2: 0.22ms (Not use)<br>Make sure to set a value other than "2: 0.22ms".<br>SSCNET communication method<br>Set the SSCNET communication method.<br>0: SSCNETⅢ/H<br>1: SSCNETⅢ (Not use)<br>Make sure to set "0: SSCNETⅢ/H".<br>Note. The SSCNET communication method is the same for line 1 and line 2. |

(b) SSCNET communication method

| Address | Name | Description |
|---|---|---|
| 0008 | SSCNET communication method | 1: SSCNETⅢ<br>2: SSCNETⅢ/H |
| 0009 | | |

App. 5.7 Axis No. assignment

With Axis No. assignment, the axis No. (on the position board) can be assigned by the axis No. on the servo amplifier. When using only servo amplifier (MR-JE-□B) and connecting 17 axes or more, the axis No. assignment function must be used to assign axes to line 2. Refer to Section 4.5.6 for details on axis No. assignment.

| POINT |
| --- |
| ・When using servo amplifier (MR-JE-□B), the 17th servo amplifier axis No. and after cannot be set on 1 line. |

App. 5.8 Sensor input option setting

External signal (sensor) is connected by setting sensor input options (parameter No.0219). The servo amplifier (MR-JE-□B) does not support servo amplifier general input. When using servo amplifier (MR-JE-□B), set a value other than "1: Driver input" to sensor input system. Refer to Section 4.5.7 for details on sensor input options setting.

| Parameter No. | Abbreviation | Name | Initial Value | Units | Setting range | Function |
|---|---|---|---|---|---|---|
| 0219 | *SOP | Sensor input options | 0000h | | 0000h to 0304h | 0 □ 0 □<br>Sensor input system<br>Set the input system of the sensor (LSP, LSN, DOG).<br>0: Not use<br>1: Driver input (prohibited)<br>2: Digital or input device input<br>3: Not connected (does not detect LSP, LSN, DOG)<br>4: Dual port memory input<br>Make sure to set a value other than "1: Driver input".<br>Limit switch signal selection<br>Set valid/invalid of limit switch.<br>0: LSP/LSN are valid<br>1: LSP is valid, LSN is invalid<br>2: LSP is invalid, LSN is valid<br>3: LSP/LSN are invalid |

POINT

- When "1: Driver input" is set in sensor input system, a parameter error (servo alarm 37) occurs for parameter No.11C2 to parameter No.11C4 (servo parameter PD03 to PD05).

App. 5.9 Vendor ID and type code setting

When using servo amplifier (MR-JE-□B) set 1200h to the type code.

(1) Control parameters

| Parameter No. | Abbreviation | Name | Function |
|---|---|---|---|
| 021D | *VEND | Vendor ID | Set the vendor ID.<br>0000h: Mitsubishi Electric |
| 021E | *CODE | Type code | Set the type code.<br>1200h: MR-JE-□B |

App. 5.10 Supported functions

Some functions and operation of the servo amplifier (MR-JE-□B) differ from those of the servo amplifier MR-J4(W□)-□B. This section mainly describes functions and operations different from those of the servo amplifier MR-J4(W□)-□B. For the specification items not described in this section, refer to the specifications of servo amplifier MR-J4(W□)-□B.

Supported function list

| Function type | Function | | Supported | Remarks |
|---|---|---|---|---|
| Operational functions | JOG operation | | ○ | |
| | Incremental feed | | ○ | |
| | Automatic operation | | ○ | |
| | Linear interpolation | | ○ | |
| | Home position return | | ○ | |
| | Home position reset function (data set function) | | ○ | |
| Application functions | Command units | Electronic gear | ○ | |
| | Speed units | Speed units | ○ | |
| | | Speed units multiplication factor | ○ | |
| | | Speed limit | ○ | |
| | Acceleration/deceleration | Linear acceleration/deceleration | ○ | |
| | | Smoothing filter | ○ | |
| | | Start up speed validity | ○ | |
| | | S-pattern acceleration/deceleration (Sine acceleration/deceleration) | ○ | |
| | Servo off | | ○ | |
| | Forced stop | | ○ | |
| | Stop operation | | ○ | |
| | Rapid stop | | ○ | |
| | Limit switch (stroke end) | | ○ | |
| | Software limit | | ○ | |
| | Interlock | | ○ | |
| | Rough match output | | ○ | |
| | Torque limit | | ○ | |
| | Command change | Speed change | ○ | |
| | | Change of time constants | ○ | |
| | | Position change | ○ | |
| | Backlash | | ○ | |
| | Position switch | | ○ | |
| | Completion of operation signal | | ○ | |
| | Interference check function | | ○ | |
| | Home position search limit | | ○ | |
| | Gain changing | | ○ | |
| | PI-PID switching | | ○ | |
| | Absolute position detection system | | ○ | |
| | Home position return request | | ○ | |
| | Other axes start | | ○ | |
| | High response I/F | | ○ | |
| | In-position signal | | ○ | |
| | Digital I/O | | ○ | |
| | I/O device | | ○ | |
| | Servo amplifier general I/O | | △ | General input cannot be used.<br>One point only can be used for general output. |
| | Dual port memory exclusive control | | ○ | |

| Function type | Function | Supported | Remarks |
|---|---|---|---|
| Application functions | Pass position interrupt | ○ | |
| | Mark detection | × | |
| | Continuous operation to torque control | ○ | |
| | SSCNETⅢ/H head module connection | ○ | |
| Auxiliary function | Reading/writing parameters | ○ | |
| | Changing parameters at the servo | ○ | |
| | Alarm and system error | ○ | |
| | Monitor function | ○ | |
| | High speed monitor function | ○ | |
| | Interrupt | ○ | |
| | User watchdog function | ○ | |
| | Software reboot function | ○ | |
| | Parameter backup | ○ | |
| | Test mode | ○ | |
| | Reconnect/disconnect function | ○ | If MR-JE-□B is reconnected in a system with a 0.22ms control cycle, reconnection error (RCE) turns ON, and reconnection/disconnection error code 0006h (communication cycle error) occurs. |
| | Sampling | ○ | |
| | Log | ○ | |
| | Operation cycle monitor function | ○ | |
| | Servo amplifier disconnect | ○ | Operate with the following motor specifications.<br>Number of encoder pulses per revolution: 131072[pulse]<br>Motor maximum revolution speed: 6000[r/min] |
| | Alarm history function | ○ | |
| | External forced stop disabled | ○ | |
| | Transient transmit | ○ | |
| | Hot line forced stop | ○ | |
| Tandem drive | Tandem drive | ○ | |
| Interface mode | Position control mode | ○ | |
| | Speed control mode | ○ | |
| | Torque control mode | ○ | |

Note. ○: Supported △: With restrictions ×: Unsupported

App. 5.10.1 Application functions

(1) Servo amplifier general I/O

For the specification of the servo amplifier general I/O, refer to the following table.

(a) Compatible servo amplifier

| Model | Remarks |
|---|---|
| Servo amplifier MR-JE-□B | Input: Not supported<br>Output: 1 point/axis |

(b) Destination connector

1) General input

Cannot be used.

2) General output

| Signal Name | Destination connector pin No. | Abbreviation |
|---|---|---|
| DI_□□0 | CN3-13 | MBR |
| DI_□□1 | — | — |
| DI_□□2 | — | — |

(c) Servo parameters

| Parameter No. | MR-JE-B Parameter No. | Abbreviation | Name | Setting value |
|---|---|---|---|---|
| 0176 | PD07 | *DO1 | Output device selection 1 | 0021h |

App. 5.10.2 Auxiliary function

(1) Hot line forced stop function

Refer to Section 7.19 for the hot line forced stop function.

App. 5.11 Table map

For the table map, refer to the table map of when servo amplifier (MR-J4(W□)-□B) is used.

App. 5.12 Parameters

Concerning the parameters for which the parameter name shows that it is set by manufacturer, do not use other than the default values. If erroneous values are set, unexpected operation can occur. For the specification items not described in this section, refer to the specifications of servo amplifier MR-J4(W□)-□B.

| Classification | Parameter No. (Note) | Remarks |
|---|---|---|
| System parameters | No. 0001 to 007F | |
| Servo parameters | No. 0100 to 01FF | Each axis |
| Control parameters | No. 0200 to 02FF | Each axis |

Note. Parameter numbers are given in hexadecimal.

App. 5.12.1 System parameters

For system parameters, only the additions and changes are listed.

POINT

- The settings for the parameters with a * mark at the front of the abbreviation are validated when the system is restarted.

| Parameter No. | Symbol | Name | Initial Value | Units | Setting range | Function |
|---|---|---|---|---|---|---|
| 0001 | *SYSOP1 | System option 1 | 0000h | | 0000h to 0102h | 0 □ 0 □<br>Control cycle setting<br>0: 0.88ms<br>1: 0.44ms<br>2: 0.22ms (Not use)<br>Make sure to set a value other than "2: 0.22ms".<br>SSCNET communication method<br>Set the SSCNET communication method.<br>0: SSCNETⅢ/H<br>1: SSCNETⅢ (Not use)<br>Make sure to set a value other than "0: SSCNETⅢ/H".<br>Note. The SSCNET communication method is the same for line 1 and line 2. |

App. 5.12.2 Servo parameters

When using servo amplifier MR-JE-□B, initial values for the following parameters are different to MR-J4(W□)-□B. Set the initial value to each parameter when using it. For details, refer to the Servo Amplifier Instruction Manual on your servo amplifier.

POINT

- The parameters with a * mark in front of the parameter abbreviation become valid according to the following conditions.
  - *: The setting value for the system startup or the SSCNET reconnection is valid. The parameter change after the system startup is invalid.
  - **: The setting value for the system startup or the SSCNET reconnection is valid. However, after the system startup, turn off the power supply of the servo amplifier once, and it is necessary to turn on it again. The parameter change after the system startup is invalid.

| Parameter No. | MR-JE-B Parameter No. | Symbol | Name | Initial Value | Units |
|---|---|---|---|---|---|
| 110E | PA15 | | For manufacturer setting | 0000h | |
| 110F | PA16 | | | 0000h | |
| 1112 | PA19 | *BLK | Parameter writing inhibit | 00AAh | |
| 1183 | PC04 | **COP1 | Function selection C-1 | 0020h | |
| 1189 | PC10 | | For manufacturer setting | 0000h | |
| 11C2 | PD03 | | For manufacturer setting | 0000h | |
| 11C3 | PD04 | | | 0000h | |
| 11C4 | PD05 | | | 0000h | |
| 11C7 | PD08 | | | 0000h | |
| 11C8 | PD09 | | | 0000h | |
| 1202 | PE03 | | For manufacturer setting | 0000h | |
| 1203 | PE04 | | | 0000h | |
| 1204 | PE05 | | | 0000h | |
| 1205 | PE06 | | | 0000h | |
| 1206 | PE07 | | | 0000h | |
| 1207 | PE08 | | | 0000h | |
| 1221 | PE34 | | | 0000h | |
| 1222 | PE35 | | | 0000h | |
| 1226 | PE39 | | | 0000h | |
| 1245 | PF06 | *FOP5 | Function selection F-5 | 0003h | |

App. 5.12.3 Control parameters

For control parameters, only the additions and changes are listed.

| Parameter No. | Symbol | Name | Initial value | Unit | Setting range | Function | When tandem drive is being used |
|---|---|---|---|---|---|---|---|
| 021E | *CODE | Type code | 1000h | | 0000h to FFFFh | Set the type code.<br>1200h: MR-JE-□B | Same value |

App. 5.13 Monitor

For the monitor, refer to the monitor list of when MR-J4(W□)-□B is used.

App. 5.14 System alarm

For the alarm No., only the additions and changes are listed.

App. 5.14.1 Servo alarm

The servo alarms of MR-JE-□B are shown in the following table. For details, refer to the Servo Amplifier Instruction Manual.

Alarm

| Alarm No. | Name |
|---|---|
| 10 | Undervoltage |
| 12 | Memory error 1 (RAM) |
| 13 | Clock error |
| 14 | Control processing error |
| 15 | Memory error 2 (EEP-ROM) |
| 16 | Encoder initial communication error 1 |
| 17 | Board error |
| 19 | Memory error 3 (FLASH-ROM) |
| 1A | Servo motor combination error |
| 1E | Encoder initial communication error 2 |
| 1F | Encoder initial communication error 3 |
| 20 | Encoder normal communication error 1 |
| 21 | Encoder normal communication error 2 |
| 24 | Main circuit error |
| 25 | Absolute position erased |
| 30 | Regenerative error |
| 31 | Overspeed |
| 32 | Overcurrent |
| 33 | Overvoltage |
| 34 | SSCNET receive error 1 |
| 35 | Command frequency alarm |
| 36 | SSCNET receive error 2 |
| 37 | Parameter error |
| 3E | Operation mode error |
| 45 | Main circuit device overheat |
| 46 | Servo motor overheat |
| 47 | Cooling fan alarm |
| 50 | Overload 1 |
| 51 | Overload 2 |
| 52 | Error excessive |
| 54 | Oscillation detection |
| 56 | Forced stop error |
| 8A | USB communication timeout |
| 8E | USB communication error |
| 888 | Watchdog |

Warning

| Alarm No. | Name |
|---|---|
| 91 | Servo amplifier overheat warning |
| 92 | Open battery cable warning |
| 96 | Home position setting error |
| 9B | Error excessive warning |
| 9F | Battery warning |
| E0 | Excessive regeneration warning |
| E1 | Overload warning 1 |
| E3 | Absolute position counter warning |
| E4 | Parameter warning |
| E6 | Servo forced stop warning |
| E7 | Controller forced stop warning |
| E8 | Cooling fan speed reduction warning |
| E9 | Main circuit off warning |
| EC | Overload warning 2 |
| ED | Output watt excess warning |
| F0 | Tough drive warning |
| F2 | Drive recorder – Miswriting warning |
| F3 | Oscillation detection warning |

Note. For the specific servo alarm numbers, refer to the specifications of MR-JE-□B.

App. 6 Supplementary explanation for the use of SSCNETⅢ compatible servo amplifier (MR-J3(W)-□B)

The SSCNETⅢ/H compatible position board can perform the positioning control with connecting our servo amplifier (MR-J3(W)-□B) when the SSCNET communication method is SSCNETⅢ.
In this section, the different point, comparing SSCNETⅢ/H with the servo amplifier MR-J4(W□)-□B, are mainly described.

App. 6.1 Position board

The software versions of the position board that can be used with the SSCNETⅢ compatible servo amplifier (MR-J3(W)-□B) is as follows.

| Position board | Software version |
|---|---|
| MR-MC2□□ | A0 or later |

App. 6.2 Position board utility software

The Position Board Utility2 versions supporting each position board listed above are as follows.

| Position board utility software | Software version |
|---|---|
| MRZJW3-MC2-UTL | Ver. 1.00 or later |

App. 6.3 Connectable units

The connectable units with the position board when the SSCNET communication method is SSCNETⅢ are shown below.

| Item | | MR-MC2□□ software version | Remarks |
|---|---|---|---|
| SSCNETⅢ compatible unit | Servo amplifier MR-J3-□B(S) | A0 or later | For how to use the unit, refer to this section. |
| | Linear servo amplifier MR-J3-□B-RJ004 | A0 or later | For how to use the units, refer to this section and App. 1 to 4. For servo parameters, refer to the Servo Amplifier Instruction Manual for your servo amplifier |
| | Fully closed control-compatible servo amplifier MR-J3-□B-RJ006 | A0 or later | |
| | 2-axis servo amplifier MR-J3W-□B | A0 or later | |
| | Direct drive servo amplifier MR-J3-□B-RJ080W | A0 or later | |
| SSCNETⅢ(/H) compatible unit | MR-J4(W□)-□B | A0 or later | Communication by SSCNETⅢ can only be used in J3 compatibility mode. This is supported in the MR-J4(W□)-□ B software version A5 or later.<br>Also refer to the restrictions when using J3 compatibility mode.<br>For how to use the unit, refer to the explanation of MR-J3 series. |

App. 6.4 System setting

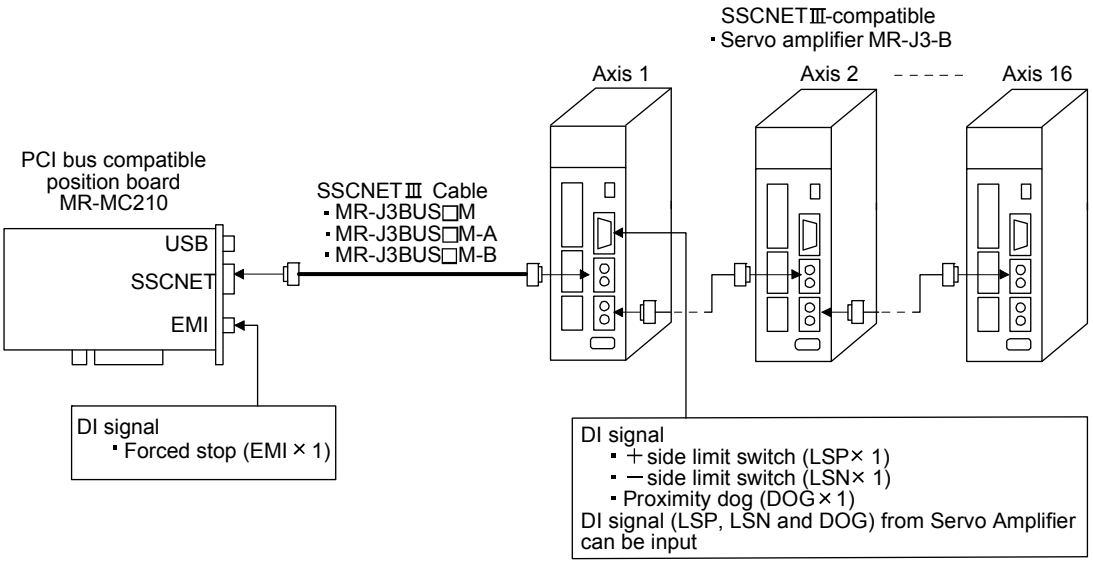
When the SSCNETⅢ, servo amplifiers of up to 32 axes can be controlled per SSCNET control channel (CH).

| Item | Content | | | | Remarks |
|---|---|---|---|---|---|
| | MR-MC210 | MR-MC211 | MR-MC240 | MR-MC241 | |
| Number of control axes | Max 16 | Max 32 | Max 16 | Max 32 | Up to 16 axes can be controlled per SSCNET line. |

App. 6.5 System configuration

App. 6.5.1 System configuration diagram

Example: For PCI bus compatible position board MR-MC210 (when using SSCNETⅢ)



App. 6.6 Axis No. setting

Axis No. is set by the axis selection rotary switch (Note). The axis No. and rotary switch No. are correlated as shown on the table below. Set the axis No. of the servo amplifier so that it will not duplicate in the same SSCNET line. If it is duplicated, the "An axis that has not been mounted exists" (system error E400) will occur at the time of system startup (system command code: 000Ah).

Note. The name and setting method of the axis selection rotary switch vary depending on the unit device to be used. For details, refer to the unit device specification for your unit.

App. 6.6.1 Servo amplifier setting

(1) MR-J3(W)-□B

Axis No. of MR-J3(W)-□B is set by the axis selection rotary switch (SW1) on the servo amplifier. Servo amplifier axis No. and rotary switch setting are correlated as shown on the table below. Set the axis No. of the servo amplifier so that it will not duplicate in the same line. If it is duplicated, the "An axis that has not been mounted exists" (system error E400) will occur at the time of system startup (system command code: 000Ah).

| Servo amplifier axis No. | Axis selection rotary switch | Servo amplifier display (3-digit, 7-segment indicator) |
|---|---|---|
| d1 | 0 | 01 |
| d2 | 1 | 02 |
| d3 | 2 | 03 |
| d4 | 3 | 04 |
| d5 | 4 | 05 |
| d6 | 5 | 06 |
| d7 | 6 | 07 |
| d8 | 7 | 08 |
| d9 | 8 | 09 |
| d10 | 9 | 10 |
| d11 | A | 11 |
| d12 | B | 12 |
| d13 | C | 13 |
| d14 | D | 14 |
| d15 | E | 15 |
| d16 | F | 16 |

POINT

- For each switch setting, refer to the Servo Amplifier Instruction Manual for your servo amplifier.
- If the "An axis that has not been mounted exists" (system error E400) occurred, the axis with wrong axis No. set can be confirmed with "information concerning axis that is not mounted" (monitor No.0480 to 0482).
- The servo amplifier axis No. and the axis No. to be managed on the position board are different. For details, refer to App. 6.9.

## App. 6.7 Parameter setting

### App. 6.7.1 System option 1 setting

SSCNET communication method and control cycle is set by System option 1 (parameter No.0001).
SSCNET communication method is used for communication between a position board and connected units such as servo amplifiers and SSCNETⅢ/H method and SSCNETⅢ method are available. When using MR-J3(W)-□B series servo amplifiers, make sure to select the SSCNETⅢ method.
Control cycle is a cycle in which the position board controls command import, position control, status output, and communication with servo amplifier. To set this cycle, use the control cycle (parameter No.0001). The number of controllable axes differs depending on the control cycle.

(1) For MR-MC210/MR-MC240

| Control cycle | Max. No. of axes connected | Max. No. of axes connected for each line | Controllable axis No. |
|---|---|---|---|
| 0.88ms | 16 axes | 16 axes | Axis 1 to 16 |
| 0.44ms | 8 axes | 8 axes | Axis 1 to 8 |

(2) For MR-MC211/MR-MC241

| Control cycle | Max. No. of axes connected | Max. No. of axes connected for each line | Controllable axis No. |
|---|---|---|---|
| 0.88ms | 32 axes | 16 axes | Axis 1 to 32 |
| 0.44ms | 16 axes | 8 axes | Axis 1 to 16 |

Note. Keep connections within the max. No. of axes connected. When the max. No. of axes connected are exceeded, system setting error (alarm No. 38, detail 01) will occur.

Control cycle settings are imported during system startup (system command code: 000Ah), and cannot be changed during system running (system command code: 000Ah).

(a) System parameters

| Parameter No. | Abbreviation | Name | Function |
|---|---|---|---|
| 0001 | *SYSOP1 | System option 1 | 0 ☐ 0 ☐<br>Control cycle setting<br>Set the control cycle<br>[When SSCNET communication method is 1: SSCNETⅢ]<br>0: 0.88ms<br>1: 0.44ms<br>SSCNET communication method<br>Set the SSCNET communication method.<br>0: SSCNETⅢ/H (Not use)<br>1: SSCNETⅢ<br>Make sure to set "1: SSCNETⅢ".<br>(Note) SSCNET communication method is shared in lines 1 and 2. |
| 0002 | *SYSOP2 | System option 2 | 0 ☐ 0 ☐<br>Axis No. assignment<br>Set 1 when validating axis No. assignment.<br>When axis No. assignment is invalid, axis No is automatically assigned.<br>0: Invalid<br>1: Valid<br>Consistency check selection at system startup<br>Set whether to perform consistency check for controlled axes setting at system startup.<br>0: Valid<br>1: Invalid |

(b) SSCNET communication method

| Address | Name | Description |
|---|---|---|
| 0008 | SSCNET communication method | 1: SSCNETⅢ |
| 0009 | | 2: SSCNETⅢ/H |

App. 6.8 Control option 1 setting

When controlling servo amplifier, set "1: control" for control axis of control option 1 (parameter No.0200). When the axis No. is set out of the controllable range, the corresponding axis will be system setting error (alarm No. 38) and cannot be controlled. If the servo amplifier set is in a state where communication cannot be made, such as not connected or control circuit power is off, the "An axis that has not been mounted exists" (system error E400) will occur at the time of system startup (system command code: 000Ah).

> POINT
>
> ・If the "An axis that has not been mounted exists" (system error E400) occurred, the axis with wrong No. set can be confirmed with "information concerning axis that is not mounted" (monitor No.0402).

Control axis settings are imported during system startup (system command code: 000Ah), and cannot be changed during system running (system status code: 000Ah).

(a) Control parameter

| Parameter No. | Abbreviation | Name | Initial value | Units | Setting range | Function |
|---|---|---|---|---|---|---|
| 0200 | *OPC1 | Control option 1 | 0000h | | 0000h to 2111h | Control axis<br>Set 1 when controlling servo amplifier.<br>0: Do not control<br>1: Control<br>Servo amplifier disconnect<br>Set 1 when not communicating with servo amplifier.<br>When setting 1 with control axis, operation without servo amplifier (simulation) is available.<br>0: Invalid<br>1: Valid<br>No home position<br>Set 1 when setting the position at the time of power on as the home position. After returning to home position, the home position will be the position where home position return is complete.<br>0: Invalid<br>1: Valid<br>Speed unit<br>Set the speed command unit.<br>0: Position command unit / min<br>1: Position command unit / s<br>2: r/min |

> POINT
>
> ・When the servo amplifier disconnect is valid, the position board simulates the operations of servo amplifier and operates as if it is connected. Operation can be checked without connecting the servo amplifier. When the setting is valid, the position board do not communicate with the servo amplifier.

App. 6.9 Axis No. assignment

With Axis No. assignment, the axis No. (on the position board) can be assigned by the axis No. on the servo amplifier.
When Axis No. assignment is invalid, correspondence between the axis No. on a position board and the axis No. on a servo amplifier is shown in the following table.

(1) When SSCNET communication method is SSCNETⅢ/H

| Servo amplifier axis No. | | Line 1 | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | d1 | d2 | d3 | d4 | d5 | d6 | d7 | d8 | d9 | d10 | d11 | d12 | d13 | d14 | d15 | d16 | d17 | d18 | d19 | d20 |
| Axis No. | 0.88ms | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | - | - | - | - |
| | 0.44ms | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | - | - | - | - | - | - | - | - | - | - | - | - |

| Servo amplifier axis No. | | Line 2 | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | d1 | d2 | d3 | d4 | d5 | d6 | d7 | d8 | d9 | d10 | d11 | d12 | d13 | d14 | d15 | d16 | d17 | d18 | d19 | d20 |
| Axis No. | 0.88ms | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | - | - | - | - |
| | 0.44ms | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | - | - | - | - | - | - | - | - | - | - | - | - |

When Axis No. assignment is valid, the axis Nos. 1 to 32 (on the position board) can be assigned by the servo amplifier axis Nos. d1 to d16 arbitrarily.
To assign the axis Nos., set the following parameters.

POINT

- To set servo amplifier axis Nos., use the axis No. assignment (parameter No.0203). Valid servo amplifier axis Nos. differ depending on the control cycle. Up to 16 axes can be set.

| Control cycle | SSCNETⅢ |
|---|---|
| 0.88ms | 1 to 16 |
| 0.44ms | 1 to 8 |

(a) System parameter

| Parameter No. | Abbreviation | Name | Function |
|---|---|---|---|
| 0002 | *SYSOP2 | System option 2 | 0 0 0 [ ]<br>Axis No. assignment selection<br>Set 1 when validating axis No. assignment.<br>When axis No. assignment is invalid, axis No is automatically assigned.<br>0: Invalid<br>1: Valid |

(b) Control parameter

| Parameter No. | Abbreviation | Name | Initial value | Units | Setting range | Function |
|---|---|---|---|---|---|---|
| 0203 | *AXALC | Axis No. assignment | 0000h | | 0000h to 011Fh | 0 □ □ □<br>Servo amplifier axis No.<br>Set the servo amplifier axis No. to be assigned to the axis Nos. on the position board. (Note 1, 2 and 3)<br>00h: No axis No. assignment<br>01h to 14h: Axis No.<br>Example) 0Ah: Axis No. 10<br>Servo amplifier line No.<br>Set the servo amplifier line No. to be assigned to the axis Nos. on the position board.<br>0 to 1: Line No.-1 |

Note 1. An axis No. out of the valid range causes the system setting error (alarm No. 38, detail 03).

2. Regardless of the control axis setting (parameter No.0200), set the axis No. so that the axis No. assignment is not duplicated. (Except for 00: No axis No. assignment) Duplicated axis Nos. cause the system setting error (alarm No. 38, detail 04).

3. When Control is set in the control axis setting (parameter No.0200), always set the axis Nos. (1 to 16). When 0 is set, system setting error (alarm No. 38, detail 02) will occur.

App. 6.10 Sensor input option setting

External signal (sensor) is connected by setting sensor input options (parameter No.0219). The following is for when 1 (driver input) is set in sensor input system. Refer to Section 4.5.7 for details on other sensor input option settings.

(1) When selecting the driver input

When 1 (driver input) is selected as the sensor destination, the sensor (LSP, LSN, DOG) status connected to the driver is imported via SSCNET.

(a) MR-J3-□B is used as a servo amplifier

| Signal Name | Destination connector pin No. | Abbreviation |
|---|---|---|
| LSP | CN3-2 | D11 |
| LSN | CN3-12 | D12 |
| DOG | CN3-19 | D13 |

(b) MR-J3W-□B is used as a servo amplifier

| Signal Name | Destination connector pin No. | | Abbreviation (□: A, B) |
|---|---|---|---|
| | A-axis | B-axis | |
| LSP | CN3-7 | CN3-20 | DI1-□ |
| LSN | CN3-8 | CN3-21 | DI2-□ |
| DOG | CN3-9 | CN3-22 | DI3-□ |

POINT

- For sensor connection to the driver, refer to the instruction manual of the driver.
- If communication error (system error E401 to E407) occurs, sensor (LSP, LSN, DOG) input status turns off.
- If communication error (system error 400) occurs, the input status of the corresponding axis turns off.

App. 6.11 Vendor ID and type code setting

Available functions, parameter settings and ranges will vary by servo amplifier type. At the time the communication with the servo amplifier has started, the position board will perform consistency check between type code of the servo amplifier connected and the parameter set. If a consistency check error occurs, driver type code error (system error E405) will be output, therefore set correct type code.

POINT

- If driver type code error (system error E405) occurred, the axis that has set an incorrect type code can be confirmed with "type code erroneous axis information" (monitor No.0484 to 0486).
- When the communication method is SSCNETⅢ, driver type code error (system error E405) due to the inconsistency of vendor IDs.

(a) Control parameters

| Parameter No. | Abbreviation | Name | Function |
|---|---|---|---|
| 021D | *VEND | Vendor ID | Set the vendor ID.<br>0000: Mitsubishi Electric<br>Note. Not used in SSCNETⅢ communication. |
| 021E | *CODE | Type code | Set the type code.<br>0100: MR-J3-B, MR-J3W-B (for rotary servo motor)<br>0101: MR-J3-BS, MR-J3-B-RJ006<br>0102: MR-J3-B-RJ004, MR-J3W-B (for linear servo motor)<br>0107: MR-J3-B-RJ080W<br>0180: MR-J3W-0303BN6 |

App. 6.12 System startup processing

The parameter settings and the system startup processing is the same as those of when the SSCNET communication method is SSCNETⅢ/H.

App. 6.13 Restrictions when using J3 compatibility mode

The restrictions when connecting SSCNETⅢ for position board and servo amplifier MR-J4(W□)-□B are shown in the following table.

| Position board SSCNET communication method | MR-J4(W□)-□B mode | Controller reset necessity (Note) | Details |
|---|---|---|---|
| SSCNETⅢ | Factory default | Necessary | The servo amplifier LED displays "rST".<br>The system status code is not system running (000Ah).<br>After system start up, if the system status code is not system running (000Ah) after 10 seconds, or a system error occurs, perform system startup procedure again after controller reset. |
| | J3 compatibility mode | Not necessary | The system status code becomes system running (000Ah) when all axes are connected normally. |
| | J4 mode | — (Cannot connect) | The system status code is not system running (000Ah).<br>Review the settings of the servo amplifier or position board. |
| SSCNETⅢ/H | Factory default | Not necessary | The system status code becomes system running (000Ah) when all axes are connected normally. |
| | J3 compatibility mode | — (Cannot connect) | The system status code is not system running (000Ah).<br>Review the settings of the servo amplifier or position board. |
| | J4 mode | Not necessary | The system status code becomes system running (000Ah) when all axes are connected normally. |

Note. To perform a controller reset, execute a software reboot of the position board, or turn the power supply of the position board OFF and ON again.

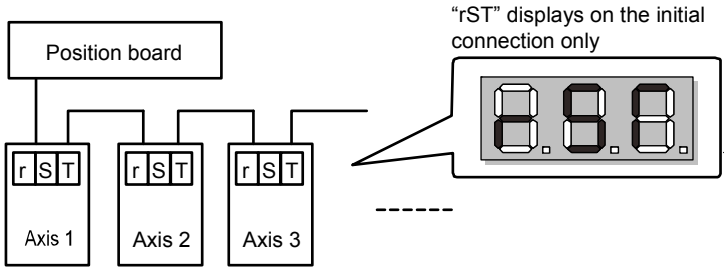
When position board SSCNET communication method is SSCNETⅢ and a factory default MR-J4(W□)-□B servo amplifier is connected by SSCNET, the servo amplifier switches to J3 compatibility mode and the LED displays "rST". In this state, executing a controller reset (software reboot, or turning the power supply of position board OFF and ON again) and performing system startup procedure again enables all axes to be connected.
When connecting by SSCNETⅢ from the next time onwards, a controller reset is not necessary. When a controller reset cannot be executed, use the "MR-J4(W)-B mode selection" attached to MR Configurator2 to manually switch the servo amplifier to J3 compatibility mode in advance.
For details on J3 compatibility mode, also refer to the MR-J4(W□)-□B Instruction Manual.

POINT

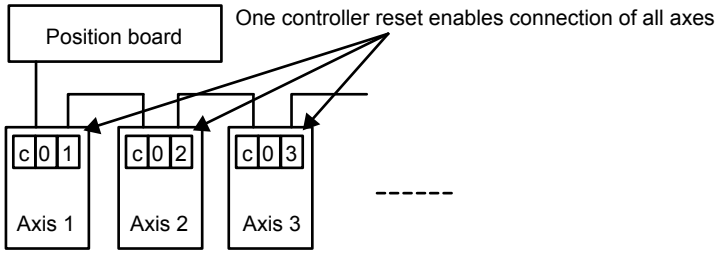
- Do not connect a factory default MR-J4(W□)-□B servo amplifier by SSCNET reconnect afterwards. If SSCNET is disconnected once, system error E4□□ occurs and all axes go into a forced stop state.

(1) When connecting factory default MR-J4(W□)-□B servo amplifier from the position board.

(a) Connecting the first time




(b) After performing system startup procedure again after controller reset.



App. 6.14 Supported functions

Some functions and operation of the servo amplifier MR-J3(W)-□B differ from those of the servo amplifier MR-J4(W□)-□B. This section mainly describes functions and operations different from those of the servo amplifier MR-J4(W□)-□B. For the specification items not described in this manual, refer to the specifications of servo amplifier MR-J4(W□)-□B.

Supported function list

| Function type | Function | | Supported | Remarks |
|---|---|---|---|---|
| Operational functions | JOG operation | | ○ | |
| | Incremental feed | | ○ | |
| | Automatic operation | | ○ | |
| | Linear interpolation | | ○ | |
| | Home position return | | ○ | |
| | Home position reset function (data set function) | | ○ | |
| Application functions | Command units | Electronic gear | ○ | |
| | Speed units | Speed units | ○ | |
| | | Speed units multiplication factor | ○ | |
| | | Speed limit | ○ | |
| | Acceleration/deceleration | Linear acceleration/deceleration | ○ | |
| | | Smoothing filter | ○ | |
| | | Start up speed validity | ○ | |
| | | S-pattern acceleration/deceleration (Sine acceleration/deceleration) | ○ | |
| | Servo off | | ○ | |
| | Forced stop | | ○ | |
| | Stop operation | | ○ | |
| | Rapid stop | | ○ | |
| | Limit switch (stroke end) | | ○ | |
| | Software limit | | ○ | |
| | Interlock | | ○ | |
| | Rough match output | | ○ | |
| | Torque limit | | ○ | |
| | Command change | Speed change | ○ | |
| | | Change of time constants | ○ | |
| | | Position change | ○ | |
| | Backlash | | ○ | |
| | Position switch | | ○ | |
| | Completion of operation signal | | ○ | |
| | Interference check function | | ○ | |
| | Home position search limit | | ○ | |
| | Gain changing | | ○ | The parameter No. to be used differs from those of MR-J4-B. For details, refer to App. 6.14.1(1). |
| | PI-PID switching | | ○ | The parameter No. to be used differs from those of MR-J4-B. For details, refer to App. 6.14.1(2). |
| | Absolute position detection system | | ○ | The parameter No. to be used differs from those of MR-J4-B. For details, refer to App. 6.14.1(3). |
| | Home position return request | | ○ | |
| | Other axes start | | ○ | |
| | High response I/F | | ○ | |
| | In-position signal | | ○ | |
| | Digital I/O | | ○ | |
| | I/O device | | ○ | |
| | Servo amplifier general I/O | | ○ | |
| | Dual port memory exclusive control | | ○ | |

| Function type | Function | Supported | Remarks |
|---|---|---|---|
| Application functions | Pass position interrupt | ○ | |
| | Mark detection | × | |
| | Continuous operation to torque control | ○ | For the servo amplifier, use a software version that supports continuous operation to torque control.<br>• MR-J3-□B: C7 or later<br>• MR-J3-□BS: C7 or later<br>Note. MR-J3W-□B is not supported. |
| | SSCNETⅢ/H head module connection | × | |
| Auxiliary function | Reading/writing parameters | ○ | Parameters No. 0100 to 01FF are used as servo parameters. |
| | Changing parameters at the servo | ○ | Parameters No. 0100 to 01FF are used as servo parameters. |
| | Alarm and system error | △ | The specific servo alarm number is always 0. |
| | Monitor function | △ | For MR-J3(W)-□B, some data cannot be monitored. For details, refer to App. 6.17. |
| | High speed monitor function | ○ | |
| | Interrupt | ○ | |
| | User watchdog function | ○ | |
| | Software reboot function | ○ | |
| | Parameter backup | ○ | |
| | Test mode | ○ | Even when SSCNETⅢ is used, servo amplifier can be adjusted using test operation function (JOG, test positioning, machine analyzer etc.) of the MR Configurator2 attached to the position board using a USB connection. |
| | Reconnect/disconnect function | ○ | When using the SSCNET disconnect function for the axes of a multiple-axis unit, make sure that all the axes in the unit are simultaneously disconnected. When the disconnection command is sent to the second axis or later in the same unit, "An axis that has not been mounted exists" (system error E400) occurs. |
| | Sampling | ○ | |
| | Log | ○ | |
| | Operation cycle monitor function | ○ | For software version A4 or later, when operation cycle alarm signal (OCME) is turned ON, an operation cycle alarm (system alarm 35, detail No.01) occurs. |
| | Servo amplifier disconnect | ○ | Operates in the following motor specifications.<br>Number of encoder pulses per revolution: 262144[pulse]<br>Maximum motor speed: 6000[r/min] |
| | Alarm history function | ○ | Supported by software version A3 or later |
| | External forced stop disabled | ○ | Supported by software version A5 or later |
| | Transient transmit | ○ | |
| Tandem drive | Tandem drive | ○ | Set the same values for the servo parameters of the tandem drive axes. However, the rotation direction selection (servo parameter No.010D) can be different values depending on mechanical specifications. |
| Interface mode | Position control mode | ○ | Supported by software version A3 or later |
| | Speed control mode | ○ | Supported by software version A4 or later |
| | Torque control mode | ○ | Supported by software version A4 or later |

Note. ○: Supported △: With restrictions ×: Unsupported

App. 6.14.1 Application functions

(1) Gain changing

For the usage of gain changing, which is the same as that of the servo amplifier MR-J4(W□)-□B, refer to Section 6.19. However, for the servo parameters to be used, refer to the following table.

Servo parameters (MR-J3(W)-□B)

| Parameter No. | MR-J3(W)-B Parameter No. | Symbol | Name | Setting |
|---|---|---|---|---|
| 0139 | PB26 | *CDP | Gain changing selection | 0001 (valid when command received from controller and when the input signal (CDP) is on) |
| 013A | PB27 | CDL | Gain changing condition | 0 |
| 013B | PB28 | CDT | Gain changing time constant | Arbitrary within setting range |
| 013C | PB29 | GD2B | Gain changing ratio of load inertia moment to servo motor inertia moment | Arbitrary within setting range |
| 013D | PB30 | PG2B | Gain changing position loop gain | Arbitrary within setting range |
| 013E | PB31 | VG2B | Gain changing speed loop gain | Arbitrary within setting range |
| 013F | PB32 | VICB | Gain changing speed integral compensation | Arbitrary within setting range |
| 0140 | PB33 | VRF1B | Gain changing vibration suppression control vibration frequency setting | Arbitrary within setting range |
| 0141 | PB34 | VRF2B | Gain changing vibration suppression control resonance frequency setting | Arbitrary within setting range |

POINT

- Refer to the Servo Amplifier Instruction Manual on your servo amplifier concerning details for the servo parameters.
- To use the gain switching function, first set the gain adjustment mode to a manual mode by changing an auto-tuning mode (parameter No.0107) to 3 (manual mode). If the gain adjustment mode is in an auto-tuning mode, the gain changing function cannot be used.

(2) PI-PID switching

For the usage of PI-PID switching, which is the same as that of the servo amplifier MR-J4(W□)-□B, refer to Section 6.20. However, for the servo parameters to be used, refer to the following table.

Servo parameter (MR-J3(W)-□B)

| Parameter No. | MR-J3(W)-B Parameter No. | Abbreviation | Name | Setting value |
|---|---|---|---|---|
| 0137 | PB24 | *MVS | Slight vibration suppression control selection | □□0□ (PI control is valid (can be switched to PID control by the command from the controller).) |

POINT

- Refer to the Servo Amplifier Instruction Manual on your servo amplifier concerning details for the servo parameters.
- To use the PI-PID switching function, first set the gain adjustment mode to a manual mode by changing an auto-tuning mode (parameter No.0107) to 3 (manual mode). If the gain adjustment mode is in an auto-tuning mode, the PI-PID switching function cannot be used.

(3) Absolute position detection system

For the usage of the absolute position detection system, which is the same as that of the servo amplifier MR-J4(W□)-□B, refer to Section 6.21. However, for the servo parameters to be used, refer to the following table.

Servo parameter (MR-J3(W)-□B)

| Parameter No. | MR-J3(W)-B Parameter No. | Abbreviation | Name | Setting value |
|---|---|---|---|---|
| 0102 | PA03 | *ABS | Absolute position detection system | □□□1 (Used in absolute position detection system) |

POINT

- Refer to the Servo Amplifier Instruction Manual on your servo amplifier concerning details for the servo parameters.
- When the rotation direction selection (parameter No.010D) is changed, the absolute position disappearance signal (ABSE) is turned on and the absolute position data of the home position return option 2 (parameter No.0241) is changed to 0 (invalid).

(4) In-position signal

For the specification of the in-position signal, which is the same as that of the servo amplifier MR-J4(W□)-□B, refer to Section 6.25. However, for the servo parameters to be used, refer to the following table.

Servo parameter (MR-J3(W)-□B)

| Parameter No. | MR-J3(W)-B Parameter No. | Abbreviation | Name | Initial Value | Unit |
|---|---|---|---|---|---|
| 0109 | PA10 | INP | In-position range | 100 | pulse |

(5) Servo amplifier general I/O

For the specification of the servo amplifier general I/O, which is the same as that of the servo amplifier MR-J4(W□)-□B, refer to Section 6.28. However, for the compatible servo amplifiers, refer to the following table.

(a) Compatible servo amplifier

| Model | Remarks |
|---|---|
| Servo amplifier MR-J3-□B | Input: 3 points/axis<br>Output: 3 points/axis |
| Servo amplifier MR-J3W-□B | Input: 3 points/axis<br>Output: 2 points/axis |

(b) Destination connector

1) Servo amplifier MR-J3-□B is used

・General input

| Signal Name | Destination connector pin No. | Abbreviation |
|---|---|---|
| DI_□□0 | CN3-2 | D11 |
| DI_□□1 | CN3-12 | D12 |
| DI_□□2 | CN3-19 | D13 |

・General output

| Signal Name | Destination connector pin No. | Abbreviation |
|---|---|---|
| DI_□□0 | CN3-13 | MBR |
| DI_□□1 | CN3-9 | INP |
| DI_□□2 | CN3-15 | ALM |

2) Servo amplifier MR-J3W-□B is used

・General input

| Signal Name | Destination connector pin No. | | Abbreviation (□: A, B) |
|---|---|---|---|
| | A-axis | B-axis | |
| DI_□□0 | CN3-7 | CN3-20 | DI1-□ |
| DI_□□1 | CN3-8 | CN3-21 | DI2-□ |
| DI_□□2 | CN3-9 | CN3-22 | DI3-□ |

・General output

| Signal Name | Destination connector pin No. | | Abbreviation (□: A, B) |
|---|---|---|---|
| | A-axis | B-axis | |
| DI_□□0 | CN3-12 | CN3-25 | MBR-□ |
| DI_□□1 | - | - | - |
| DI_□□2 | CN3-11 | CN3-24 | ALM -□ |

(c) Servo parameters

1) Servo amplifier MR-J3-□B is used

| Parameter No. | MR-J3-B Parameter No. | Abbreviation | Name | Setting value |
|---|---|---|---|---|
| 0176 | PD07 | *DO1 | Output device selection 1 | 0021h |
| 0177 | PD08 | *DO2 | Output device selection 2 | 0022h |
| 0178 | PD09 | *DO3 | Output device selection 3 | 0023h |

2) Servo amplifier MR-J3W-□B is used

| Parameter No. | MR-J3W-B Parameter No. | Abbreviation | Name | Setting value |
|---|---|---|---|---|
| 0176 | PD07 | *DO1 | Output device selection 1 | 0021h |
| 0178 | PD09 | *DO3 | Output device selection 3 | 0023h |

App. 6.14.2 Auxiliary function

(1) Reading/writing parameters

For the usage of the parameter read/write, which is the same as that of the servo amplifier MR-J4(W□)-□B, refer to Section 7.1.

However, servo parameters No.0100 to 01FF are used.

When the parameter error (servo alarm 37) has occurred at system startup, check the parameter No. on which the error has occurred in the servo parameter error number (monitor No.0500 to 0510). Then reboot software, set correct parameters, and restart the system.

POINT

- When SSCNET communication method is SSCNETⅢ, servo parameters No. 1100 to 1380 of MR-J4(W□)-□B cannot be written while system is running. Parameter number error (PWENn (n = 1 to 2)) turns on.
- When SSCNET communication method is SSCNET Ⅲ/H, servo parameters No. 0100 to 01FF of MR-J3(W)-□B cannot be written while system is running. Parameter number error (PWENn (n = 1 to 2)) turns on.
- When SSCNET communication method is SSCNETⅢ, servo parameters No. 1100 to 1380 of MR-J4(W□)-□B cannot be read while system is running. Parameter number error PRENn (n = 1 to 2)) turns on.
- When SSCNET communication method is SSCNETⅢ/H, servo parameters No. 0100 to 01FF of MR-J3(W)-□B cannot be read while system is running. Parameter number error PRENn (n = 1 to 2)) turns on.

(2) Changing parameters at the servo

For how to check parameter changes at the servo, which is the same as that of the servo amplifier MR-J4(W□)-□B, refer to Section 7.2.

However, to check changed servo parameter numbers, use servo parameter change number (monitor No.0580 to 058F) corresponding to the servo parameter change number 01 (PSN01) of the servo parameter change number table.

POINT

- The reasons that parameters are re-written on the servo amplifier are as follows.
  - When parameters are changed using MR Configurator2 (This includes execution of the machine analyzer and the gain search function.)
  - The parameter was automatically changed such as by the real time auto tuning function.
- Refer to the Servo Amplifier Instruction Manual on your servo amplifier concerning servo parameters that are automatically changed.

(3) Transient transmit

The interface is the same as that of the servo amplifier MR-J4(W□)-□B, refer to Section 7.18.

Compatible transient command list

| Data type | Transient command | Unit | Number of valid words (Note 1) | Remarks |
|---|---|---|---|---|
| Servo motor ID (SSCNETⅢ)/ Encoder ID | 0304 | — | 3 | (Note 2) |
| Encoder resolution | 0305 | [pulse] | 2 | |
| Servo amplifier recognition information (First 8 characters) | 0310 | [characters] | 4 | |
| Servo amplifier recognition information (Last 8 characters) | 0311 | [characters] | 4 | |
| Servo amplifier software number (First 8 characters) | 0312 | [characters] | 4 | |
| Servo amplifier software number (Last 8 characters) | 0313 | [characters] | 4 | |
| Power ON cumulative time | 0319 | [h] | 2 | |
| Inrush relay ON/OFF number | 031A | [times] | 2 | Returns the contactor ON count. |
| Read alarm history number | 0323 | [items] | 1 | |
| Alarm history/Detail #1, #2 | 0324 | — | 4 | (Note 2) |
| Alarm history/Detail #3, #4 | 0325 | — | 4 | |
| Alarm history/Detail #5, #6 | 0326 | — | 4 | |
| Alarm history/Detail/Occurrence time | 0328 | —/[h] | 4 | (Note 2) |
| Alarm occurrence time #1, #2 | 0329 | [h] | 4 | |
| Alarm occurrence time #3, #4 | 032A | [h] | 4 | |
| Alarm occurrence time #5 #6 | 032B | [h] | 4 | |
| Alarm history clear command | 0382 | — | 0 | (Note 2) |
| Home position [command unit] | 0408 | [pulse]/[rev] | 3 | (Note 2) |
| Main circuit bus voltage | 040A | [V] | 1 | |
| Regenerative load ratio | 040B | [%] | 1 | |
| Effective load ratio | 040C | [%] | 1 | |
| Peak load ratio | 040D | [%] | 1 | |
| Estimate inertia moment ratio | 040E | [× 0.1] | 1 | |
| Model loop gain | 040F | [rad/s] | 1 | |
| LED display | 0410 | [characters] | 2 | (Note 2) |
| Load-side encoder information 1 | 0416 | [pulse] | 2 | Fully closed control or synchronous encoder via servo amplifier use |
| Load-side encoder information 2 | 0417 | [pulse] | 2 | |
| Speed feedback | 0418 | [0.01mm/s] | 2 | Linear servo use |
| Servo motor thermistor temperature | 0419 | [°C] | 1 | Linear servo use |
| Optional transient command | — | — | 4 | Used when using an optional transient command. |

Note 1. Number of valid words for response data 1 to 4.

Note 2. Refer to Section 7.18.3 for details.

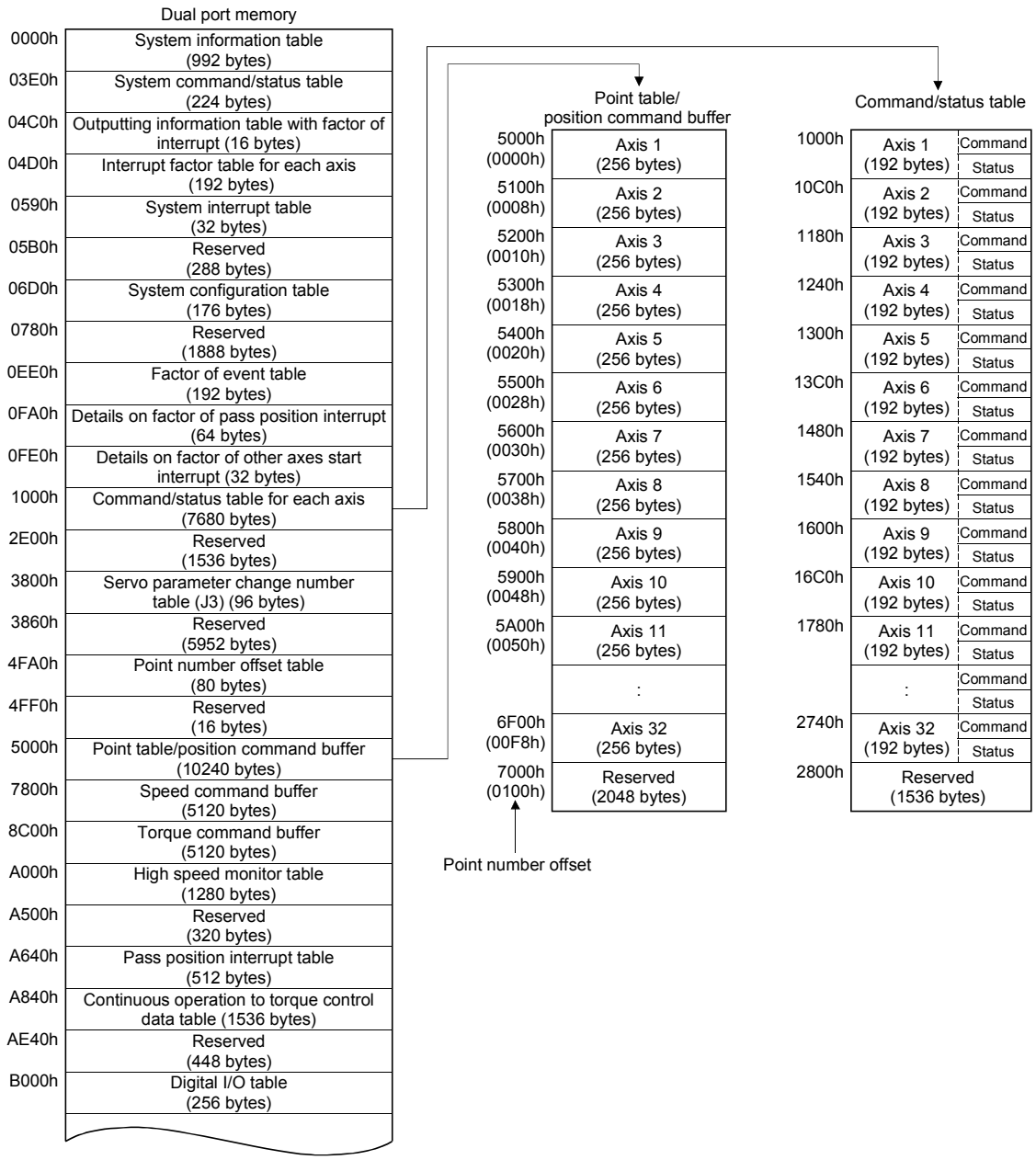
## App. 6.15 Table map

For the table map, only the additions and changes are listed. For items not described in this section, refer to the table map of when MR-J4(W□)-□B is used.

### App. 6.15.1 Table list

**POINT**

- Do not write to reserved areas.
- The first number in the point table for each axis can be designated using point number offset.



Dual port memory

| | |
|---|---|
| B100h | Reserved (2864 bytes) |
| BC30h | Alarm history table (256 bytes) |
| BD30h | Reserved (112 bytes) |
| BDA0h | Sampling data table (96 bytes) |
| BE00h | Sampling data read table (4224 bytes) |
| CE80h | Reserved (1408 bytes) |
| D400h | Transient transmit command/status table (1792 bytes) |
| DB00h | I/O device table (1024 bytes) |
| DF00h | Log data table (256 bytes) |
| E000h | Reserved (128 bytes) |
| E080h | Other axes start command/status table (128 bytes) |
| E100h | Other axes start data table (3328 bytes) |
| EE00h | Reserved (384 bytes) |
| EF80h | Dual port memory exclusive control table (16 bytes) |
| EF90h<br>EFFFh | Reserved (4208 bytes) |

| | |
|---|---|
| 20000h<br>2000Fh | Module information (Note) (16 bytes) |

Note. Refer to Section 1.5.3 for the module information.

App. 6.15.2 System information

| Address | Content | |
|---|---|---|
| 0000 | CH number | |
| 0001 | | |
| 0002 | Number of lines | |
| 0003 | | |
| 0004 | Control cycle status | 0001h: 0.88ms<br>0002h: 0.44ms<br>0003h: 0.22ms |
| 0005 | | |
| 0006 | Reserved | |
| 0007 | | |
| 0008 | SSCNET communication method | 1: SSCNETⅢ<br>2: SSCNETⅢ/H |
| 0009 | | |
| 000A | Reserved | |
| 000B | | |
| 000C | | |
| 000D | | |
| 000E | | |
| 000F | | |
| 0010 | | |
| 0011 | | |
| 0012 | | |
| 0013 | | |
| 0014 | Operation cycle current time | |
| 0015 | | |
| 0016 | Operation cycle maximum time | |
| 0017 | | |
| 0018 | Operation cycle over time | |
| 0019 | | |
| 001A | Reserved | |
| 001B | | |
| 001C | Reserved | |
| 001D | | |
| 001E | | |
| 001F | | |
| 0020 | | |
| 0021 | | |
| 0022 | | |
| 0023 | | |
| 0024 | | |
| 0025 | | |
| 0026 | | |
| 0027 | | |
| 0028 | | |
| 0029 | | |
| 002A | | |
| 002B | | |
| 002C | | |
| 002D | | |
| 002E | | |
| 002F | | |

| Address | Content |
|---|---|
| 0030 | System program Software version |
| 0031 | |
| 0032 | |
| 0033 | |
| 0034 | |
| 0035 | |
| 0036 | |
| 0037 | |
| 0038 | |
| 0039 | |
| 003A | |
| 003B | |
| 003C | |
| 003D | |
| 003E | |
| 003F | |
| 0040 | Reserved |
| 0041 | |
| 0042 | |
| 0043 | |
| 0044 | |
| 0045 | |
| 0046 | |
| 0047 | |
| 0048 | |
| 0049 | |
| 004A | |
| 004B | |
| 004C | |
| 004D | |
| 004E | |
| 004F | |
| 0050 | |
| 0051 | |
| 0052 | |
| 0053 | |
| 0054 | |
| 0055 | |
| 0056 | |
| 0057 | |
| 0058 | |
| 0059 | |
| 005A | |
| 005B | |
| 005C | |
| 005D | |
| 005E | |
| 005F | |

App. 6.15.3 Servo parameter change number

When parameter settings within the servo amplifier are changed using the auto tuning function or parameter changes using MR Configurator2 (set up software), the bit corresponding to the servo parameter number that was changed is turned on to notify concerning which parameter number was changed (in units of 16). To identify the changed parameter, check the servo parameter change number (monitor No.0580 to 058F) corresponding to the bit which is turned on. To identify the changed parameter, check the servo parameter change number (monitor No.0590 to 05B7) corresponding to the bit which is turned on. Refer to Section 7.2 for more information.

(1) Servo parameter change number (SSCNETⅢ)

| Address | Content |
|---|---|
| 3800 | Servo parameter |
| 3801 | change number 01□□ Axis 1 |
| 3802 | Servo parameter |
| 3803 | change number 01□□ Axis 2 |
| 3804 | Servo parameter |
| 3805 | change number 01□□ Axis 3 |
| 3806 | Servo parameter |
| 3807 | change number 01□□ Axis 4 |
| 3808 | Servo parameter |
| 3809 | change number 01□□ Axis 5 |
| 380A | Servo parameter |
| 380B | change number 01□□ Axis 6 |
| 380C | Servo parameter |
| 380D | change number 01□□ Axis 7 |
| 380E | Servo parameter |
| 380F | change number 01□□ Axis 8 |
| 3810 | Servo parameter |
| 3811 | change number 01□□ Axis 9 |
| 3812 | Servo parameter |
| 3813 | change number 01□□ Axis 10 |
| 3814 | Servo parameter |
| 3815 | change number 01□□ Axis 11 |
| 3816 | Servo parameter |
| 3817 | change number 01□□ Axis 12 |

| Address | Content |
|---|---|
| 3818 | Servo parameter |
| 3919 | change number 01□□ Axis 13 |
| 381A | Servo parameter |
| 381B | change number 01□□ Axis 14 |
| : | : |
| 383E | Servo parameter |
| 383F | change number 01□□ Axis 32 |
| 3840 | Reserved |
| 3841 | |
| : | |
| 385E | |
| 385F | |

(2) Details on servo amplifier change number on axis n (SSCNETⅢ)

| Address | Name | Abbreviation | Remarks |
|---|---|---|---|
| 3800 | Servo parameter change number 01□□ | PSN01 | bit0: Parameter No.0100 to 010F<br>to<br>bit15: Parameter No.01F0 to 01FF |
| 3801 | | | |

Note. The address in the table is the address for the axis 1. For the axis 2 and above, increase in units of 2h for each axis.

## App. 6.16 Parameters

Concerning the parameters for which the parameter name shows that it is set by manufacturer, do not use other than the default values. If erroneous values are set, unexpected movement can occur.
The parameters are classified as is shown below.
When using the servo amplifier MR-J3(W)-□B, use parameter Nos. 0100 to 01FF as servo parameters.
For control parameters, refer to the parameter list of when the servo amplifier MR-J4(W□)-□B is used.

| Classification | Parameter No. (Note) | Remarks |
|---|---|---|
| System parameters | No. 0001 to 007F | |
| Servo parameters | No. 0100 to 01FF | Each axis |
| Control parameters | No. 0200 to 02FF | Each axis |

Note. Parameter numbers are given in hexadecimal.

### App. 6.16.1 System parameters

For system parameters, only the additions and changes are listed.

POINT

- The settings for the parameters with a * mark at the front of the abbreviation are validated when the system is restarted.

| Parameter No. | Symbol | Name | Initial Value | Units | Setting range | Function |
|---|---|---|---|---|---|---|
| 0001 | *SYSOP1 | System option 1 | 0000h | | 0000h to 0102h | 0 \| \| 0 \| \|<br>Control cycle setting<br>Set the control cycle<br>[When SSCNET communication method is 1: SSCNETⅢ]<br>0: 0.88ms<br>1: 0.44ms<br>SSCNET communication method<br>Set the SSCNET communication method.<br>0: SSCNETⅢ/H (Not use)<br>1: SSCNETⅢ<br>Make sure to set "1: SSCNETⅢ".<br>(Note) SSCNET communication method is shared in lines 1 and 2. |

App. 6.16.2 Servo parameters

The parameters described in this section are for using the servo amplifier MR-J3-□B. For details, refer to the Servo Amplifier Instruction Manual on your servo amplifier.

POINT

・The parameters with a * mark in front of the parameter abbreviation become valid according to the following conditions.

*: The setting value for the system startup or the SSCNET reconnection is valid. The parameter change after the system startup is invalid.

**: The setting value for the system startup or the SSCNET reconnection is valid. However, after the system startup, turn off the power supply of the servo amplifier once, and it is necessary to turn on it again. The parameter change after the system startup is invalid.

(1) Menu A) Basic settings

| Parameter No. | MR-J3-B Parameter No. | Symbol | Name | Initial Value | Units |
|---|---|---|---|---|---|
| 0100 | PA01 | **STY | Control mode | 0000h | |
| 0101 | PA02 | **REG | Regenerative option | 0000h | |
| 0102 | PA03 | *ABS | Absolute position detection system | 0000h | |
| 0103 | PA04 | *AOP1 | Function selection A-1 | 0000h | |
| 0104 | PA05 | | For manufacturer setting | 0 | |
| 0105 | PA06 | | | 1 | |
| 0106 | PA07 | | | 1 | |
| 0107 | PA08 | ATU | Auto tuning | 0001h | |
| 0108 | PA09 | RSP | Auto tuning response | 12 | |
| 0109 | PA10 | INP | In-position range | 100 | pulse |
| 010A | PA11 | | For manufacturer setting | 10000 | |
| 010B | PA12 | | | 10000 | |
| 010C | PA13 | | | 0 | |
| 010D | PA14 | *POL | Rotation direction selection | 0 | |
| 010E | PA15 | *ENR | Encoder output pulses | 4000 | pulse/rev |
| 010F | PA16 | | For manufacturer setting | 0 | |
| 0110 | PA17 | | | 0000h | |
| 0111 | PA18 | | | 0000h | |
| 0112 | PA19 | *BLK | Parameter write inhibit | 000Bh | |
| 0113 | PA20 | | For manufacturer setting | 0 | |
| 0114 | PA21 | | | 0 | |
| 0115 | PA22 | | | 0 | |
| 0116 | PA23 | | | 0 | |
| 0117 | PA24 | | | 0 | |
| 0118 | PA25 | | | 0 | |
| 0119 | PA26 | | | 0 | |
| 011A | PA27 | | | 0 | |
| 011B | PA28 | | | 0 | |
| 011C | PA29 | | | 0 | |
| 011D | PA30 | | | 0 | |
| 011E | PA31 | | | 0 | |
| 011F | PA32 | | | 0 | |

(2) Menu B) Gain filter

| Parameter No. | MR-J3-B Parameter No. | Symbol | Name | Initial Value | Units |
|---|---|---|---|---|---|
| 0120 | PB01 | FILT | Adaptive tuning mode | 0000h | |
| 0121 | PB02 | VRFT | Vibration suppression control filter turning mode | 0000h | |
| 0122 | PB03 | | For manufacturer setting | 0 | |
| 0123 | PB04 | FFC | Feed forward gain | 0 | % |
| 0124 | PB05 | | For manufacturer setting | 500 | |
| 0125 | PB06 | GD2 | Ratio of load inertia moment to servo motor inertia moment | 70 | 0.1 times |
| 0126 | PB07 | PG1 | Model loop gain | 24 | rad/s |
| 0127 | PB08 | PG2 | Position loop gain | 37 | rad/s |
| 0128 | PB09 | VG2 | Speed loop gain | 823 | rad/s |
| 0129 | PB10 | VIC | Speed integral compensation | 337 | 0.1ms |
| 012A | PB11 | VDC | Speed differential compensation | 980 | |
| 012B | PB12 | OVA | Overshoot amount compensation | 0 | % |
| 012C | PB13 | NH1 | Machine resonance suppression filter 1 | 4500 | Hz |
| 012D | PB14 | NHQ1 | Notch form selection 1 | 000h | |
| 012E | PB15 | NH2 | Machine resonance suppression filter 2 | 4500 | Hz |
| 012F | PB16 | NHQ2 | Notch form selection 2 | 0000h | |
| 0130 | PB17 | | Automatic setting parameter | 0000h | |
| 0131 | PB18 | LPF | Low-pass filter | 3141 | rad/s |
| 0132 | PB19 | VRF1 | Vibration suppression control vibration frequency setting | 1000 | 0.1Hz |
| 0133 | PB20 | VRF2 | Vibration suppression control resonance frequency setting | 1000 | 0.1Hz |
| 0134 | PB21 | | For manufacturer setting | 0 | |
| 0135 | PB22 | | | 0 | |
| 0136 | PB23 | VFBF | Low-pass filter selection | 0000h | |
| 0137 | PB24 | *MVS | Slight vibration suppression control selection | 0000h | |
| 0138 | PB25 | | For manufacturer setting | 0000h | |
| 0139 | PB26 | *CDP | Gain switching selection | 0000h | |
| 013A | PB27 | CDL | Gain switching condition | 10 | |
| 013B | PB28 | CDT | Gain switching time constant | 1 | ms |
| 013C | PB29 | GD2B | Gain switching ratio of load inertia moment to servo motor inertia moment | 70 | 0.1 times |
| 013D | PB30 | PG2B | Gain switching position control gain | 37 | rad/s |
| 013E | PB31 | VG2B | Gain switching speed control gain | 823 | rad/s |
| 013F | PB32 | VICB | Gain switching speed integral compensation | 337 | 0.1ms |
| 0140 | PB33 | VRF1B | Gain switching vibration suppression control vibration frequency setting | 1000 | 0.1Hz |
| 0141 | PB34 | VRF2B | Gain switching vibration suppression control resonance frequency setting | 1000 | 0.1Hz |
| 0142 | PB35 | | For manufacturer setting | 0 | |
| 0143 | PB36 | | | 0 | |
| 0144 | PB37 | | | 100 | |
| 0145 | PB38 | | | 0 | |
| 0146 | PB39 | | | 0 | |
| 0147 | PB40 | | | 0 | |
| 0148 | PB41 | | | 1125 | |
| 0149 | PB42 | | | 1125 | |
| 014A | PB43 | | | 0004h | |
| 014B | PB44 | | | 0 | |
| 014C | PB45 | CNHF | Vibration suppression control filter 2 | 0000h | |
| 014D | PB46 | | For manufacturer setting | 0000h | |
| 014E | PB47 | | | 0000h | |
| 014F | PB48 | | | 0000h | |

(3) Menu C) Expansion settings

| Parameter No. | MR-J3-B Parameter No. | Symbol | Name | Initial Value | Units |
|---|---|---|---|---|---|
| 0150 | PC01 | ERZ | Error excessive alarm level | 3 | rev |
| 0151 | PC02 | MBR | Electromagnetic brake sequence output | 0 | ms |
| 0152 | PC03 | *ENRS | Encoder output pulses selection | 0000h | |
| 0153 | PC04 | **COP1 | Function selection C-1 | 0000h | |
| 0154 | PC05 | **COP2 | Function selection C-2 | 0000h | |
| 0155 | PC06 | *COP3 | Function selection C-3 | 0000h | |
| 0156 | PC07 | ZSP | Zero speed | 50 | r/min |
| 0157 | PC08 | | For manufacturer setting | 0 | |
| 0158 | PC09 | MOD1 | Analog monitor output 1 | 0000h | |
| 0159 | PC10 | MOD2 | Analog monitor output 2 | 0001h | |
| 015A | PC11 | MO1 | Analog monitor 1 offset | 0 | mV |
| 015B | PC12 | MO2 | Analog monitor 2 offset | 0 | mV |
| 015C | PC13 | MOSDL | Analog monitor feedback position output standard data (lower) | 0 | pulse |
| 015D | PC14 | MOSDH | Analog monitor feedback position output standard data (upper) | 0 | 10000 pulse |
| 015E | PC15 | | For manufacturer setting | 0 | |
| 015F | PC16 | | | 0000h | |
| 0160 | PC17 | **COP4 | Function selection C-4 | 0000h | |
| 0161 | PC18 | | For manufacturer setting | 1000h | |
| 0162 | PC19 | | | 0000h | |
| 0163 | PC20 | *COP7 | Function selection C-7 | 0000h | |
| 0164 | PC21 | *BPS | Alarm history clear | 0000h | |
| 0165 | PC22 | | For manufacturer setting | 0000h | |
| 0166 | PC23 | | | 0000h | |
| 0167 | PC24 | | | 0000h | |
| 0168 | PC25 | | | 0000h | |
| 0169 | PC26 | | | 0000h | |
| 016A | PC27 | | | 0000h | |
| 016B | PC28 | | | 0000h | |
| 016C | PC29 | | | 0000h | |
| 016D | PC30 | | | 0000h | |
| 016E | PC31 | | | 0000h | |
| 016F | PC32 | | | 0000h | |

(4) Menu D) I/O settings

| Parameter No. | MR-J3-B Parameter No. | Symbol | Name | Initial Value | Units |
|---|---|---|---|---|---|
| 0170 | PD01 | | For manufacturer setting | 0000h | |
| 0171 | PD02 | | | 0000h | |
| 0172 | PD03 | | | 0000h | |
| 0173 | PD04 | | | 0000h | |
| 0174 | PD05 | | | 0000h | |
| 0175 | PD06 | | | 0000h | |
| 0176 | PD07 | *DO1 | Output signal device selection 1 (CN3-13) | 0005h | |
| 0177 | PD08 | *DO2 | Output signal device selection 2 (CN3-9) | 0004h | |
| 0178 | PD09 | *DO3 | Output signal device selection 3 (CN3-15) | 0003h | |
| 0179 | PD10 | | For manufacturer setting | 0000h | |
| 017A | PD11 | | | 0004h | |
| 017B | PD12 | | | 0000h | |
| 017C | PD13 | | | 0000h | |
| 017D | PD14 | *DOP3 | Function selection D-3 | 0000h | |
| 017E | PD15 | *IDCS | Driver communication setting | 0000h | |
| 017F | PD16 | *MD1 | Driver communication setting Master transmit data selection 1 | 0000h | |
| 0180 | PD17 | *MD2 | Driver communication setting Master transmit data selection 2 | 0000h | |
| 0181 | PD18 | | For manufacturer setting | 0000h | |
| 0182 | PD19 | | | 0000h | |
| 0183 | PD20 | | | 0000h | |
| 0184 | PD21 | | | 0000h | |
| 0185 | PD22 | | | 0000h | |
| 0186 | PD23 | | | 0000h | |
| 0187 | PD24 | | | 0000h | |
| 0188 | PD25 | | | 0000h | |
| 0189 | PD26 | | | 0000h | |
| 018A | PD27 | | | 0000h | |
| 018B | PD28 | | | 0000h | |
| 018C | PD29 | | | 0000h | |
| 018D | PD30 | TLC | Master/slave operation torque command factor on the slave | 0000h | % |
| 018E | PD31 | VLC | Master/slave operation speed limit factor on the slave | 0000h | % |
| 018F | PD32 | VLL | Master/slave operation speed limit factor adjustment value on the slave | 0000h | r/min |

(5) Menu E) Expansion control

| Parameter No. | MR-J3-B Parameter No. | Symbol | Name | Initial Value | Units |
|---|---|---|---|---|---|
| 0190 | PE01 | | For manufacturer setting | 0000h | |
| 0191 | PE02 | | | 0102h | |
| 0192 | PE03 | | | 0002h | |
| 0193 | PE04 | | | 1 | |
| 0194 | PE05 | | | 1 | |
| 0195 | PE06 | | | 400 | |
| 0196 | PE07 | | | 100 | |
| 0197 | PE08 | | | 10 | |
| 0198 | PE09 | | | 0000h | |
| 0199 | PE10 | | | 0000h | |
| 019A | PE11 | | | 0 | |
| 019B | PE12 | | | 40 | |
| 019C | PE13 | | | FFFEh | |
| 019D | PE14 | | | 0111h | |
| 019E | PE15 | | | 20 | |
| 019F | PE16 | | | 0000h | |
| 01A0 | PE17 | | | 0000h | |
| 01A1 | PE18 | IIRC11 | Filter factor 1-1 | 0000h | |
| 01A2 | PE19 | IIRC12 | Filter factor 1-2 | 0000h | |
| 01A3 | PE20 | IIRC13 | Filter factor 1-3 | 0000h | |
| 01A4 | PE21 | IIRC14 | Filter factor 1-4 | 0000h | |
| 01A5 | PE22 | IIRC15 | Filter factor 1-5 | 0000h | |
| 01A6 | PE23 | IIRC16 | Filter factor 1-6 | 0000h | |
| 01A7 | PE24 | IIRC17 | Filter factor 1-7 | 0000h | |
| 01A8 | PE25 | IIRC18 | Filter factor 1-8 | 0000h | |
| 01A9 | PE26 | IIRC21 | Filter factor 2-1 | 0000h | |
| 01AA | PE27 | IIRC22 | Filter factor 2-2 | 0000h | |
| 01AB | PE28 | IIRC23 | Filter factor 2-3 | 0000h | |
| 01AC | PE29 | IIRC24 | Filter factor 2-4 | 0000h | |
| 01AD | PE30 | IIRC25 | Filter factor 2-5 | 0000h | |
| 01AE | PE31 | IIRC26 | Filter factor 2-6 | 0000h | |
| 01AF | PE32 | IIRC27 | Filter factor 2-7 | 0000h | |
| 01B0 | PE33 | IIRC28 | Filter factor 2-8 | 0000h | |
| 01B1 | PE34 | | For manufacturer setting | 0000h | |
| 01B2 | PE35 | | | 0000h | |
| 01B3 | PE36 | | | 0000h | |
| 01B4 | PE37 | | | 0000h | |
| 01B5 | PE38 | | | 0000h | |
| 01B6 | PE39 | | | 0000h | |
| 01B7 | PE40 | | | 0000h | |
| 01B8 | PE41 | | | 0000h | |
| 01B9 | PE42 | | | 0000h | |
| 01BA | PE43 | | | 0000h | |
| 01BB | PE44 | | | 0000h | |
| 01BC | PE45 | | | 0000h | |
| 01BD | PE46 | | | 0000h | |
| 01BE | PE47 | | | 0000h | |
| 01BF | PE48 | | | 0000h | |

(6) Menu S) Special settings

| Parameter No. | MR-J3-B Parameter No. | Symbol | Name | Initial Value | Units |
|---|---|---|---|---|---|
| 01C0 | PS01 | | For manufacturer setting | 0000h | |
| 01C1 | PS02 | | | 0000h | |
| 01C2 | PS03 | | | 0000h | |
| 01C3 | PS04 | | | 0000h | |
| 01C4 | PS05 | | | 0000h | |
| 01C5 | PS06 | | | 0000h | |
| 01C6 | PS07 | | | 0000h | |
| 01C7 | PS08 | | | 0000h | |
| 01C8 | PS09 | | | 0000h | |
| 01C9 | PS10 | | | 0000h | |
| 01CA | PS11 | | | 0000h | |
| 01CB | PS12 | | | 0000h | |
| 01CC | PS13 | | | 0000h | |
| 01CD | PS14 | | | 0000h | |
| 01CE | PS15 | | | 0000h | |
| 01CF | PS16 | | | 0000h | |
| 01D0 | PS17 | | | 0000h | |
| 01D1 | PS18 | | | 0000h | |
| 01D2 | PS19 | | | 0000h | |
| 01D3 | PS20 | | | 0000h | |
| 01D4 | PS21 | | | 0000h | |
| 01D5 | PS22 | | | 0000h | |
| 01D6 | PS23 | | | 0000h | |
| 01D7 | PS24 | | | 0000h | |
| 01D8 | PS25 | | | 0000h | |
| 01D9 | PS26 | | | 0000h | |
| 01DA | PS27 | | | 0000h | |
| 01DB | PS28 | | | 0000h | |
| 01DC | PS29 | | | 0000h | |
| 01DD | PS30 | | | 0000h | |
| 01DE | PS31 | | | 0000h | |
| 01DF | PS32 | | | 0000h | |

(7) Menu F) Other functions

| Parameter No. | MR-J3-B Parameter No. | Symbol | Name | Initial Value | Units |
|---|---|---|---|---|---|
| 01E0 | PF01 | | For manufacturer setting | 0000h | |
| 01E1 | PF02 | | | 0000h | |
| 01E2 | PF03 | | | 0000h | |
| 01E3 | PF04 | | | 0 | |
| 01E4 | PF05 | | | 0000h | |
| 01E5 | PF06 | | | 0000h | |
| 01E6 | PF07 | | | 0000h | |
| 01E7 | PF08 | | | 0000h | |
| 01E8 | PF09 | | | 10000 | |
| 01E9 | PF10 | | | 100 | |
| 01EA | PF11 | | | 100 | |
| 01EB | PF12 | | | 100 | |
| 01EC | PF13 | | | 0000h | |
| 01ED | PF14 | | | 10 | |
| 01EE | PF15 | | | 0000h | |
| 01EF | PF16 | | | 0000h | |

(8) Menu O) Option setting

| Parameter No. | MR-J3-B Parameter No. | Symbol | Name | Initial Value | Units |
|---|---|---|---|---|---|
| 01F0 | Po01 | | For manufacturer setting | 0000h | |
| 01F1 | Po02 | | | 0000h | |
| 01F2 | Po03 | | | 0000h | |
| 01F3 | Po04 | | | 0000h | |
| 01F4 | Po05 | | | 0000h | |
| 01F5 | Po06 | | | 0000h | |
| 01F6 | Po07 | | | 0000h | |
| 01F7 | Po08 | | | 0000h | |
| 01F8 | Po09 | | | 0000h | |
| 01F9 | Po10 | | | 0000h | |
| 01FA | Po11 | | | 0000h | |
| 01FB | Po12 | | | 0000h | |
| 01FC | Po13 | | | 0000h | |
| 01FD | Po14 | | | 0000h | |
| 01FE | Po15 | | | 0000h | |
| 01FF | Po16 | | | 0000h | |

App. 6.16.3 Control parameters

For control parameters, only the additions and changes are listed.

| Parameter No. | Symbol | Name | Initial value | Unit | Setting range | Function | When tandem drive is being used |
|---|---|---|---|---|---|---|---|
| 021E | *CODE | Type code | 1000h | | 0000h to FFFFh | Set the type code.<br>[When SSCNET communication method is SSCNETⅢ/H]<br>1000: MR-J4(W□)-□B<br>[When SSCNET communication method is SSCNETⅢ]<br>0100: MR-J3-B, MR-J3W-B (for rotary servo motor)<br>0101: MR-J3-BS, MR-J3-B-RJ006<br>0107: MR-J3-B-RJ080W<br>0102: MR-J3-B-RJ004,<br>MR-J3W-B (for linear servo motor)<br>0180: MR-J3W-0303BN6 | Same value |

App. 6.17 Monitor

For the monitor, only the additions and changes are listed. For the monitoring of operation information and system information, refer to the monitor list of when MR-J4(W□)-□B is used.

App. 6.17.1 Servo information (1)

| Monitor No. | Content | Units | Remarks |
|---|---|---|---|
| 0100 | Unit type name | | Hexadecimal ASCII character string<br>(2 Characters per monitor number.) |
| 0101 | | | |
| 0102 | | | |
| 0103 | | | |
| 0104 | | | |
| 0105 | | | |
| 0106 | | | |
| 0107 | | | |
| 0108 | Software number | | Hexadecimal ASCII character string<br>(2 Characters per monitor number.) |
| 0109 | | | |
| 010A | | | |
| 010B | | | |
| 010C | | | |
| 010D | | | |
| 010E | | | |
| 010F | | | |
| 0110 | Type code | | 0100: MR-J3-B, MR-J3W-B (for rotary servo motor)<br>0101: MR-J3-BS, MR-J3-B-RJ006<br>0102: MR-J3-B-RJ004, MR-J3W-B (for linear servo motor)<br>0107: MR-J3-B-RJ080W<br>0180: MR-J3W-0303BN6 |
| 0111 | | | |
| 0112 | Motor rated revolution speed | r/min | |
| 0113 | Motor rated current | 0.1% | |
| 0114 | Motor maximum revolution speed | r/min | |
| 0115 | Motor maximum torque | 0.1% | |
| 0116 | Number of encoder pulses per revolution (lower) | pulse | |
| 0117 | Number of encoder pulses per revolution (upper) | | |
| 0118 | Reserved | | |
| 0119 | Initial within 1 revolution position (lower) | pulse | |
| 011A | Initial within 1 revolution position (upper) | | |
| 011B | Initial multiple revolution data | rev | |
| 011C | Reserved | | |
| 011D | | | |
| 011E | | | |
| 011F | | | |
| 0120 | Motor permissible pulse rate (lower) | kpps | Pulse rate of operation at the motor maximum revolution speed. |
| 0121 | Motor permissible pulse rate (upper) | | |
| 0122 | Maximum output pulse rate (lower) | kpps | Maximum pulse rate that can be output by the position board |
| 0123 | Maximum output pulse rate (upper) | | |

| Monitor No. | Content | Units | Remarks |
|---|---|---|---|
| 0124 | Reserved | | |
| 0125 | | | |
| 0126 | | | |
| 0127 | Station No. in order of connection | | Station No. in order of connection on line<br>Indicates the place where the station is connected from the position board.<br>Axes and stations are both included in the connection order.<br>Line No.<br>0: Line 1<br>1: Line 2<br>Example. Monitor value for the axis connected fifth on line 2: 1005h |
| 0128 | Reserved | | |
| 0129 | | | |
| 012A | | | |
| 012B | | | |
| 012C | | | |
| 012D | | | |
| 012E | | | |
| 012F | | | |

App. 6.17.2 Servo information (2)

| Monitor No. | Content | Units | Remarks |
|---|---|---|---|
| 0200 | Position feedback (lower) | pulse | |
| 0201 | Position feedback (upper) | | |
| 0202 | Reserved | | |
| 0203 | | | |
| 0204 | Position droop (lower) | pulse | |
| 0205 | Position droop (upper) | | |
| 0206 | Reserved | | |
| 0207 | | | |
| 0208 | Speed feedback (lower) | 0.01r/min | |
| 0209 | Speed feedback (upper) | | |
| 020A | Current command | 0.1% | |
| 020B | Electrical current feedback | 0.1% | |
| 020C | Reserved | | |
| 020D | | | |
| 020E | Detector within 1 revolution position (lower) | pulse | |
| 020F | Detector within 1 revolution position (upper) | | |
| 0210 | Home position within 1 revolution position (lower) | pulse | |
| 0211 | Home position within 1 revolution position (upper) | | |
| 0212 | ZCT (lower) | pulse | |
| 0213 | ZCT (upper) | | |
| 0214 | Multiple revolution counter | rev | |
| 0215 | Home position multiple revolution data | rev | |
| 0216 | Speed command (lower) | 0.01r/min | 0.01mm/s for linear servo motor |
| 0217 | Speed command (upper) | | |
| 0218 | Reserved | | |
| 0219 | | | |
| 021A | | | |
| 021B | | | |
| 021C | | | |
| 021D | | | |
| 021E | | | |
| 021F | | | |

| Monitor No. | Content | Units | Remarks |
|---|---|---|---|
| 0220 | Reserved | | |
| 0221 | | | |
| 0222 | | | |
| 0223 | | | |
| 0224 | | | |
| 0225 | | | |
| 0226 | | | |
| 0227 | | | |
| 0228 | | | |
| 0229 | | | |
| 022A | | | |
| 022B | | | |
| 022C | | | |
| 022D | | | |
| 022E | | | |
| 022F | | | |
| 0230 | | | |
| 0231 | | | |
| 0232 | | | |
| 0233 | | | |
| 0234 | | | |
| 0235 | | | |
| 0236 | | | |
| 0237 | | | |
| 0238 | | | |
| 0239 | | | |
| 023A | | | |
| 023B | | | |
| 023C | | | |
| 023D | | | |
| 023E | | | |
| 023F | | | |

| Monitor No. | Content | Units | Remarks |
|---|---|---|---|
| 0240 | Selected droop pulse (lower) | pulse | Select in the parameter when using the fully closed loop control (motor side/load side/motor side - load side) |
| 0241 | Selected droop pulse (upper) | | |
| 0242 | Reserved | | |
| 0243 | | | |
| 0244 | Selected cumulative feed pulses (lower) | pulse | Select in the parameter when using the fully closed loop control (motor side/load side) |
| 0245 | Selected cumulative feed pulses (upper) | | |
| 0246 | Load side encoder information data 1 (lower) | pulse | When using the linear servo/fully closed loop control |
| 0247 | Load side encoder information data 1 (upper) | | |
| 0248 | Load side encoder information data 2 (lower) | pulse | When using the linear servo/fully closed loop control |
| 0249 | Load side encoder information data 2 (upper) | | |
| 024A | Speed feedback (lower) | 0.01mm/s | When using a linear servo |
| 024B | Speed feedback (upper) | | |
| 024C | Voltage of generating line | V | |
| 024D | Regenerative load factor | % | |
| 024E | Effective load factor | % | |
| 024F | Peak load factor | % | |
| 0250 | Estimated load inertial ratio | 0.1 times | |
| 0251 | Position gain (model position gain) | rad/s | |
| 0252 | Motor thermistor temperature | ℃ | When using a motor with thermistor attached. |
| 0253 | Reserved | | |
| 0254 | | | |
| 0255 | | | |
| 0256 | | | |
| 0257 | | | |
| 0258 | | | |
| 0259 | | | |
| 025A | | | |
| 025B | | | |
| 025C | | | |
| 025D | | | |
| 025E | | | |
| 025F | | | |
| 0260 | | | |
| 0261 | Alarm/warning number | | |
| 0262 | Alarm detailed bits | | |
| 0263 | Reserved | | |
| 0264 | Alarm status AL-1 ☐ | | ☐ is 0 (bit 0) to F (bit 15)<br>Bit corresponding to alarm number is turned on.<br>Review the alarms when multiple alarms occurs simultaneously etc. |
| 0265 | Alarm status AL-2 ☐ | | |
| 0266 | Alarm status AL-3 ☐ | | |
| 0267 | Alarm status AL-4 ☐ | | |
| 0268 | Alarm status AL-5 ☐ | | |
| 0269 | Alarm status AL-6 ☐ | | |
| 026A | Alarm status AL-7 ☐ | | |
| 026B | Alarm status AL-8 ☐ | | |
| 026C | Alarm status AL-9 ☐ | | |
| 026D | Alarm status AL-E ☐ | | |
| 026E | Reserved | | |
| 026F | | | |

| Monitor No. | Content | Units | Remarks |
|---|---|---|---|
| 0270 | Reserved | | |
| 0271 | | | |
| 0272 | | | |
| 0273 | | | |
| 0274 | | | |
| 0275 | | | |
| 0276 | | | |
| 0277 | | | |
| 0278 | | | |
| 0279 | | | |
| 027A | | | |
| 027B | | | |
| 027C | | | |
| 027D | | | |
| 027E | | | |
| 027F | | | |
| 0280 | | | |
| 0281 | | | |
| 0282 | | | |
| 0283 | | | |
| 0284 | | | |
| 0285 | | | |
| 0286 | | | |
| 0287 | | | |
| 0288 | | | |
| 0289 | | | |
| 028A | | | |
| 028B | | | |
| 028C | | | |
| 028D | | | |
| 028E | | | |
| 028F | | | |
| 0290 | | | |
| 0291 | | | |
| 0292 | | | |
| 0293 | | | |
| 0294 | | | |
| 0295 | | | |
| 0296 | | | |
| 0297 | | | |
| 0298 | | | |
| 0299 | | | |
| 029A | | | |
| 029B | | | |
| 029C | | | |
| 029D | | | |
| 029E | | | |
| 029F | | | |

| Monitor No. | Content | Units | Remarks |
|---|---|---|---|
| 02A0 | Reserved | | |
| 02A1 | | | |
| 02A2 | | | |
| 02A3 | | | |
| 02A4 | | | |
| 02A5 | | | |
| 02A6 | | | |
| 02A7 | | | |
| 02A8 | | | |
| 02A9 | | | |
| 02AA | | | |
| 02AB | | | |
| 02AC | | | |
| 02AD | | | |
| 02AE | | | |
| 02AF | | | |
| 02B0 | | | |
| 02B1 | | | |
| 02B2 | | | |
| 02B3 | | | |
| 02B4 | | | |
| 02B5 | | | |
| 02B6 | | | |
| 02B7 | | | |
| 02B8 | | | |
| 02B9 | | | |
| 02BA | | | |
| 02BB | | | |
| 02BC | | | |
| 02BD | | | |
| 02BE | | | |
| 02BF | | | |
| 02C0 | | | |
| 02C1 | | | |
| 02C2 | | | |
| 02C3 | | | |
| 02C4 | | | |
| 02C5 | | | |
| 02C6 | | | |
| 02C7 | | | |
| 02C8 | | | |
| 02C9 | | | |
| 02CA | | | |
| 02CB | | | |
| 02CC | | | |
| 02CD | | | |
| 02CE | | | |
| 02CF | | | |

App. 6.17.3 Servo parameter information

| Monitor No. | Content | Units | Remarks |
|---|---|---|---|
| 0500 | Servo parameter error number (Note)<br>No. 0100 to 010F | | Bit corresponding to parameter number is turned on.<br>bit is No. 0100 (bit 0) to 010F (bit 15). |
| 0501 | Servo parameter error number (Note)<br>No. 0110 to 011F | | Bit corresponding to parameter number is turned on.<br>bit is No. 0110 (bit 0) to 011F (bit 15). |
| 0502 | Servo parameter error number (Note)<br>No. 0120 to 012F | | Bit corresponding to parameter number is turned on.<br>bit is No. 0120 (bit 0) to 012F (bit 15). |
| 0503 | Servo parameter error number (Note)<br>No. 0130 to 013F | | Bit corresponding to parameter number is turned on.<br>bit is No. 0130 (bit 0) to 013F (bit 15). |
| 0504 | Servo parameter error number (Note)<br>No. 0140 to 014F | | Bit corresponding to parameter number is turned on.<br>bit is No. 0140 (bit 0) to 014F (bit 15). |
| 0505 | Servo parameter error number (Note)<br>No. 0150 to 015F | | Bit corresponding to parameter number is turned on.<br>bit is No. 0150 (bit 0) to 015F (bit 15). |
| 0506 | Servo parameter error number (Note)<br>No. 0160 to 016F | | Bit corresponding to parameter number is turned on.<br>bit is No. 0160 (bit 0) to 016F (bit 15). |
| 0507 | Servo parameter error number (Note)<br>No. 0170 to 017F | | Bit corresponding to parameter number is turned on.<br>bit is No. 0170 (bit 0) to 017F (bit 15). |
| 0508 | Servo parameter error number (Note)<br>No. 0180 to 018F | | Bit corresponding to parameter number is turned on.<br>bit is No. 0180 (bit 0) to 018F (bit 15). |
| 0509 | Servo parameter error number (Note)<br>No. 0190 to 019F | | Bit corresponding to parameter number is turned on.<br>bit is No. 0190 (bit 0) to 019F (bit 15). |
| 050A | Servo parameter error number (Note)<br>No. 01A0 to 01AF | | Bit corresponding to parameter number is turned on.<br>bit is No. 01A0 (bit 0) to 01AF (bit 15). |
| 050B | Servo parameter error number (Note)<br>No. 01B0 to 01BF | | Bit corresponding to parameter number is turned on.<br>bit is No. 01B0 (bit 0) to 01BF (bit 15). |
| 050C | Servo parameter error number (Note)<br>No. 01C0 to 01CF | | Bit corresponding to parameter number is turned on.<br>bit is No. 01C0 (bit 0) to 01CF (bit 15). |
| 050D | Servo parameter error number (Note)<br>No. 01D0 to 01DF | | Bit corresponding to parameter number is turned on.<br>bit is No. 01D0 (bit 0) to 01DF (bit 15). |
| 050E | Servo parameter error number (Note)<br>No. 01E0 to 01EF | | Bit corresponding to parameter number is turned on.<br>bit is No. 01E0 (bit 0) to 01EF (bit 15). |
| 050F | Servo parameter error number (Note)<br>No. 01F0 to 01FF | | Bit corresponding to parameter number is turned on.<br>bit is No. 01F0 (bit 0) to 01FF (bit 15). |

Note. Information concerning parameter error (servo alarm 37) that has occurred at system startup can be monitored. If a parameter warning (servo alarm E4) occurs while system is running, it is not reflected in this information.

| Monitor No. | Content | Units | Remarks |
|---|---|---|---|
| 0580 | Servo parameter change number<br>No. 0100 to 010F | | Bit corresponding to parameter number is turned on.<br>bit is No. 0100 (bit 0) to 010F (bit 15). |
| 0581 | Servo parameter change number<br>No. 0110 to 011F | | Bit corresponding to parameter number is turned on.<br>bit is No. 0110 (bit 0) to 011F (bit 15). |
| 0582 | Servo parameter change number<br>No. 0120 to 012F | | Bit corresponding to parameter number is turned on.<br>bit is No. 0120 (bit 0) to 012F (bit 15). |
| 0583 | Servo parameter change number<br>No. 0130 to 013F | | Bit corresponding to parameter number is turned on.<br>bit is No. 0130 (bit 0) to 013F (bit 15). |
| 0584 | Servo parameter change number<br>No. 0140 to 014F | | Bit corresponding to parameter number is turned on.<br>bit is No. 0140 (bit 0) to 014F (bit 15). |
| 0585 | Servo parameter change number<br>No. 0150 to 015F | | Bit corresponding to parameter number is turned on.<br>bit is No. 0150 (bit 0) to 015F (bit 15). |
| 0586 | Servo parameter change number<br>No. 0160 to 016F | | Bit corresponding to parameter number is turned on.<br>bit is No. 0160 (bit 0) to 016F (bit 15). |
| 0587 | Servo parameter change number<br>No. 0170 to 017F | | Bit corresponding to parameter number is turned on.<br>bit is No. 0170 (bit 0) to 017F (bit 15). |
| 0588 | Servo parameter change number<br>No. 0180 to 018F | | Bit corresponding to parameter number is turned on.<br>bit is No. 0180 (bit 0) to 018F (bit 15). |
| 0589 | Servo parameter change number<br>No. 0190 to 019F | | Bit corresponding to parameter number is turned on.<br>bit is No. 0190 (bit 0) to 019F (bit 15). |
| 058A | Servo parameter change number<br>No. 01A0 to 01AF | | Bit corresponding to parameter number is turned on.<br>bit is No. 01A0 (bit 0) to 01AF (bit 15). |
| 058B | Servo parameter change number<br>No. 01B0 to 01BF | | Bit corresponding to parameter number is turned on.<br>bit is No. 01B0 (bit 0) to 01BF (bit 15). |
| 058C | Servo parameter change number<br>No. 01C0 to 01CF | | Bit corresponding to parameter number is turned on.<br>bit is No. 01C0 (bit 0) to 01CF (bit 15). |
| 058D | Servo parameter change number<br>No. 01D0 to 01DF | | Bit corresponding to parameter number is turned on.<br>bit is No. 01D0 (bit 0) to 01DF (bit 15). |
| 058E | Servo parameter change number<br>No. 01E0 to 01EF | | Bit corresponding to parameter number is turned on.<br>bit is No. 01E0 (bit 0) to 01EF (bit 15). |
| 058F | Servo parameter change number<br>No. 01F0 to 01FF | | Bit corresponding to parameter number is turned on.<br>bit is No. 01F0 (bit 0) to 01FF (bit 15). |

App. 6.18 System alarm

For the alarm No, only the additions and changes are listed.

App. 6.18.1 Servo alarm

The servo alarms of MR-J3(W)-□B are shown in the following table. For details, refer to the Servo Amplifier Instruction Manual for MR-J3(W)-□B.

Alarm

| Alarm No. | Name |
|---|---|
| 10 | Undervoltage |
| 12 | Memory error 1 (RAM) |
| 13 | Clock error |
| 15 | Memory error 2 (EEP-ROM) |
| 16 | Encoder error 1 (At power on) |
| 17 | Board error |
| 19 | Memory error 3 (Flash-ROM) |
| 1A | Motor combination error |
| 20 | Encoder error 2 |
| 24 | Main circuit error |
| 25 | Absolute position disappearance |
| 30 | Regenerative error |
| 31 | Overspeed |
| 32 | Overcurrent |
| 33 | Overvoltage |
| 34 | Receive error 1 |
| 35 | Command frequency alarm |
| 36 | Receive error 2 |
| 37 | Parameter error |
| 45 | Main circuit device overheat |
| 46 | Servo motor overheat |
| 47 | Cooling fan alarm |
| 50 | Overload 1 |
| 51 | Overload 2 |
| 52 | Error excessive |
| 8A | USB communication timeout |
| 8E | USB communication error |
| 888 | Watchdog |

Warning

| Alarm No. | Name |
|---|---|
| 92 | Open battery cable warning |
| 96 | Home position setting error |
| 9F | Battery warning |
| E0 | Excessive regeneration warning |
| E1 | Overload warning 1 |
| E3 | Absolute position counter warning |
| E4 | Parameter warning |
| E6 | Servo forced stop warning |
| E7 | Controller forced stop warning |
| E8 | Cooling fan speed reduction warning |
| E9 | Main circuit off warning |
| EC | Overload warning 2 |
| ED | Output watt excess warning |

## App. 7 Cables

In this cable connection diagram, makers of connectors are omitted.
Refer to "App. 8.3 Connector" for makers of connectors.

### App. 7.1 SSCNETⅢ cables

Generally use the SSCNETⅢ cables available as our products.
Refer to App. 7.3 for long distance cable up to 100(328.08)[m(ft.)] and ultra-long bending life cable.

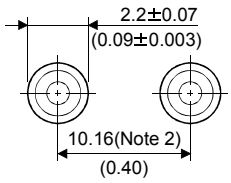
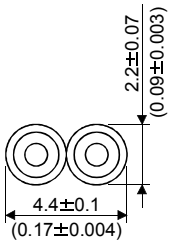
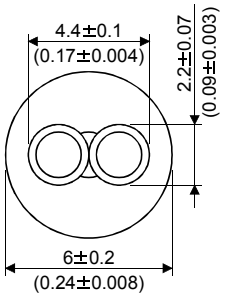
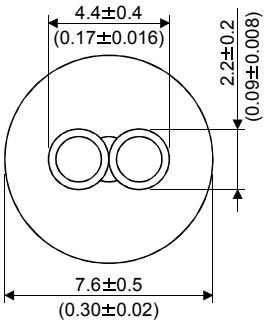
(1) Model explanation

Numeral in the column of cable length on the table is a symbol put in the "□" part of cable model. Cables of which symbol exists are available.

| Cable model | Cable length [m(ft.)] | | | | | | | | | | | Flex life | Application/ remark |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.15 (0.49) | 0.3 (0.98) | 0.5 (1.64) | 1 (3.28) | 3 (9.84) | 5 (16.40) | 10 (32.81) | 20 (65.62) | 30 (98.43) | 40 (131.23) | 50 (164.04) | | |
| MR-J3BUS□M | 015 | 03 | 05 | 1 | 3 | | | | | | | Standard | Standard cord for inside panel |
| MR-J3BUS□M-A | | | | | | 5 | 10 | 20 | | | | Standard | Standard cable for outside panel |
| MR-J3BUS□M-B (Note 1) | | | | | | | | | 30 | 40 | 50 | Long flex | Long distance cable |

Note 1. For the cable of less than 30[m](98.43[ft.]), contact your nearest Mitsubishi sales representative.

(2) Specifications

| | | Description | | | |
|---|---|---|---|---|---|
| SSCNETⅢ cable model | | MR-J3BUS□M | | MR-J3BUS□M-A | MR-J3BUS□M-B |
| SSCNETⅢ cable length [m(ft.)] | | 0.15 (0.49) | 0.3 to 3 (0.98 to 9.84) | 5 to 20 (16.40 to 65.62) | 30 to 50 (98.43 to 164.04) |
| Optical cable (Cord) | Minimum bend radius [mm(inch)] | 25(0.98) | | Enforced covering cord: 50 (1.97)<br>Cord: 25 (0.98) | Enforced covering cord: 50 (1.97)<br>Cord: 30(1.18) |
| | Tension strength [N] | 70 | 140 | 420 (Enforced covering cord) | 980 (Enforced covering cord) |
| | Temperature range for use [°C(°F)] (Note 1) | -40 to 80<br>(-40 to 176) | | | -20 to 70<br>(-4 to 158) |
| | Ambient | Indoors (no direct sunlight), No solvent or oil | | | |
| | External appearance [mm(inch)] |  |  |  |  |

Note 1. This temperature range for use is the value for optical cable (cord) only.
Note 2. Dimension of connector fiber insert location. The distance of two cords is changed by how to bend it.

POINT

- If the end face of cord tip for the SSCNETⅢ cable is dirty, optical transmission is interrupted and it may cause malfunctions. If it becomes dirty, wipe with a bonded textile, etc. Do not use solvent such as alcohol.
- Do not add impossible power to the connector of the SSCNETⅢ cable.
- When incinerating the SSCNETⅢ cable (optical fiber), hydrogen fluoride gas or hydrogen chloride gas which is corrosive and harmful may be generated. For disposal of the SSCNETⅢ cable (optical fiber), request for specialized industrial waste disposal services who has incineration facility for disposing hydrogen fluoride gas or hydrogen chloride gas.

(a) MR-J3BUS□M

1) Model explanation

Type: MR-J3BUS□M-∗

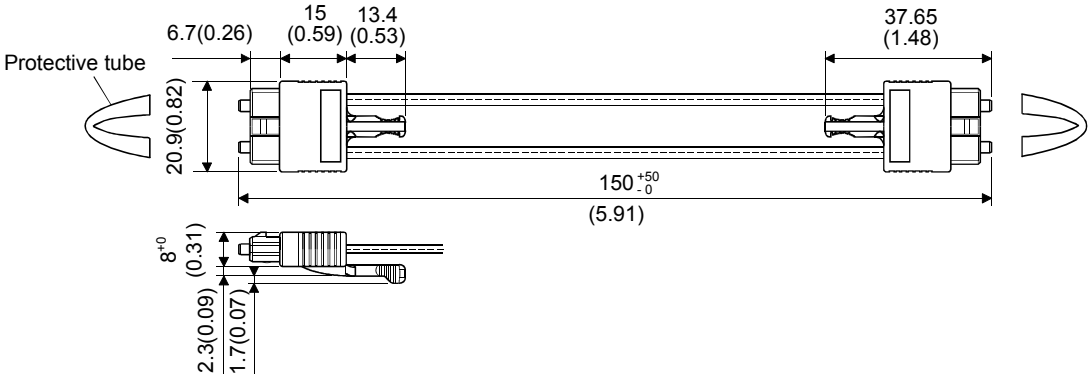
| Symbol | Cable type |
|---|---|
| None | Standard cord for inside panel |
| A | Standard cable for outside panel |
| B | Long distance cable |

| Symbol | Cable length [m(ft.)] |
|---|---|
| 015 | 0.15(0.49) |
| 03 | 0.3(0.98) |
| 05 | 0.5(1.64) |
| 1 | 1(3.28) |
| 3 | 3(9.84) |
| 5 | 5(16.40) |
| 10 | 10(32.81) |
| 20 | 20(65.62) |
| 30 | 30(98.43) |
| 40 | 40(131.23) |
| 50 | 50(164.04) |

2) Exterior dimensions

• MR-J3BUS015M

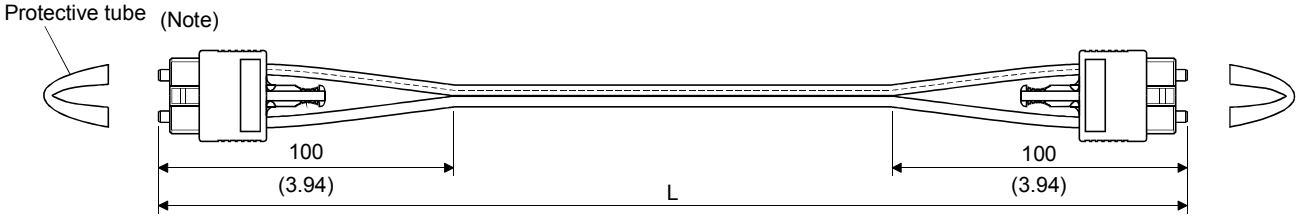
[Unit: mm(inch)]




• MR-J3BUS03M to MR-J3BUS3M

Refer to the table of this section (1) for cable length (L).

[Unit: mm(inch)]



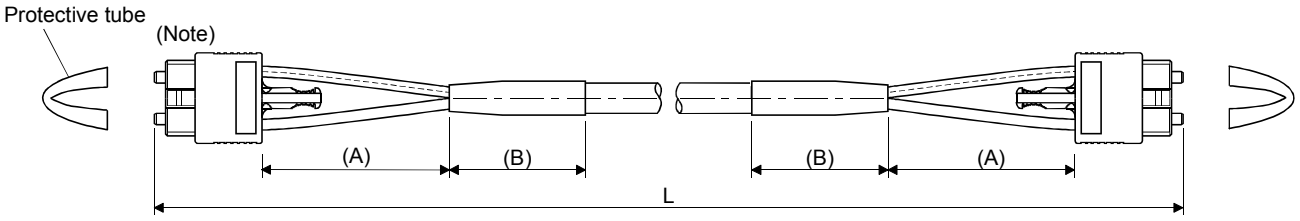

Note. Dimension of connector part is the same as that of MR-J3BUS015M.

• MR-J3BUS5M-A to MR-J3BUS20M-A, MR-J3BUS30M-B to MR-J3BUS50M-B

Refer to the table of this section (1) for cable length (L).

| SSCNETⅢ cable | Variation [mm(inch)] | |
|---|---|---|
| | A | B |
| MR-J3BUS5M-A to MR-J3BUS20M-A | 100(3.94) | 30(1.18) |
| MR-J3BUS30M-B to MR-J3BUS50M-B | 150(5.91) | 50(1.97) |

[Unit: mm(inch)]




Note. Dimension of connector part is the same as that of MR-J3BUS015M.

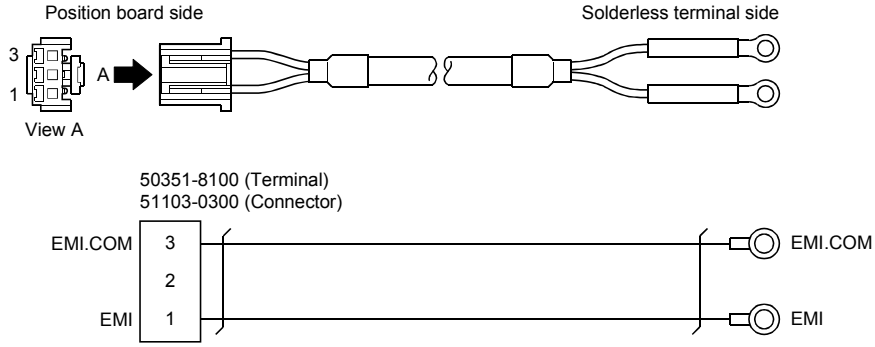
POINT

・Keep the cap and the tube for protecting light cord end of SSCNETⅢ cable in a plastic bag with a zipper of SSCNETⅢ cable to prevent them from becoming dirty.

App. 7.2 Forced stop input cable

Fabricate the forced stop input cable on the customer side.
Make the forced stop input cable within 30m(98.43ft.).

(1) Connection diagram




∫ : Twisted pair cable

Note 1. Use a cable of wire size AWG22 to AWG28.
2. Use solderless terminals that suit the size of the wire and terminals being used.

App. 7.3 SSCNETⅢ cables (SC-J3BUS□M-C) manufactured by Mitsubishi Electric System & Service

POINT

- For the details of the SSCNETⅢ cables, contact your local sales office.
- Do not look directly at the light generated from CN1A/CN1B connector of servo amplifier or the end of SSCNETⅢ cable. The light can be a discomfort when it enters the eye.

The cable is available per 1[m] up to 100[m]. The number of the length (1 to 100) will be in the □ part in the cable model.

| Cable model | Cable length [m(ft.)] | Bending life | Application/remark |
|---|---|---|---|
| | 1 to 100 (3.28 to 328.08) | | |
| SC-J3BUS□M-C | 1 to 100 | Ultra-long bending life | Long distance cable |

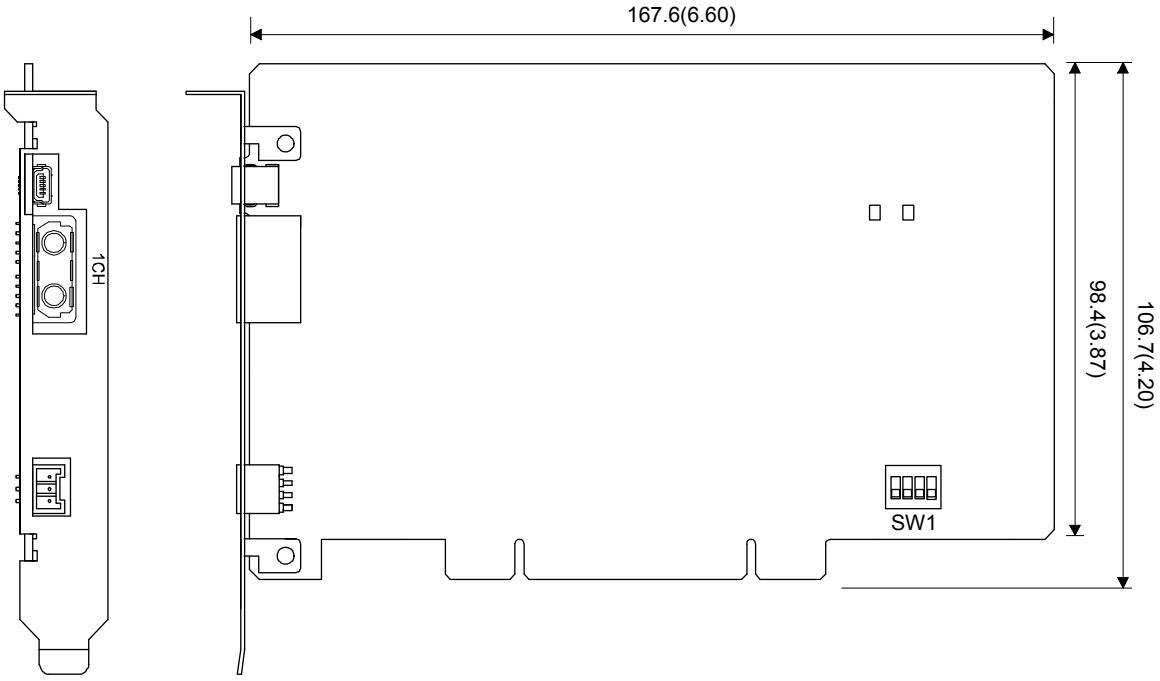
App. 8 Exterior dimensions

App. 8.1 PCI bus compatible position board

(1) MR-MC210

The MR-MC210 is a PCI short card size.

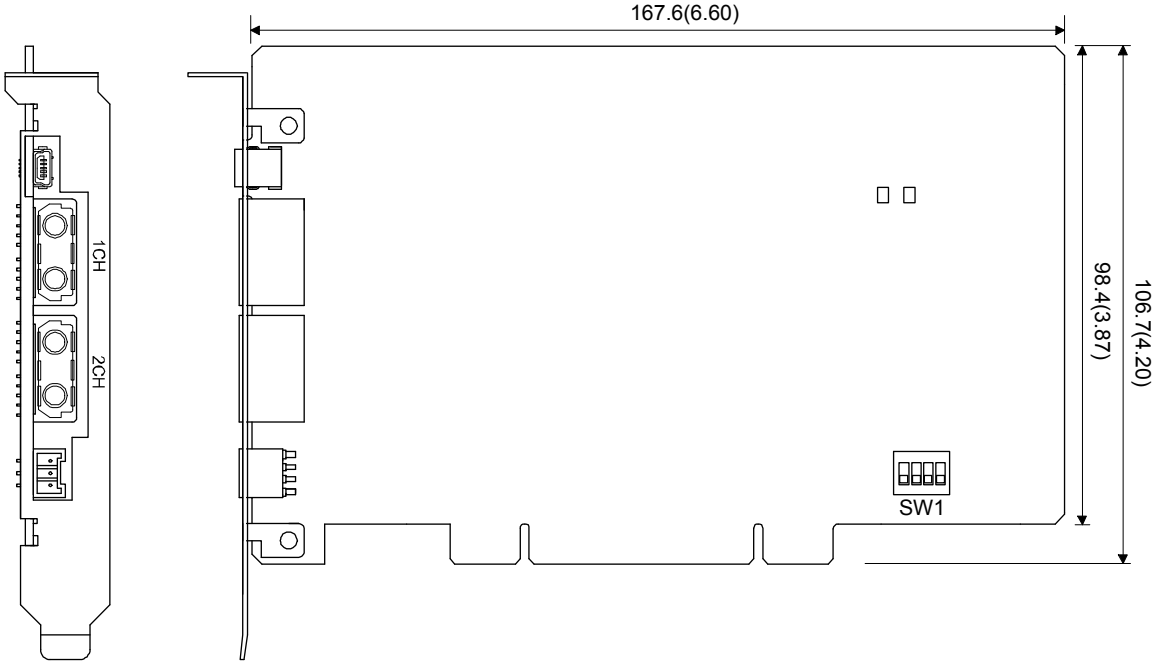
[Unit mm(inch)]




(2) MR-MC211

The MR-MC211 is a PCI short card size.

[Unit mm(inch)]

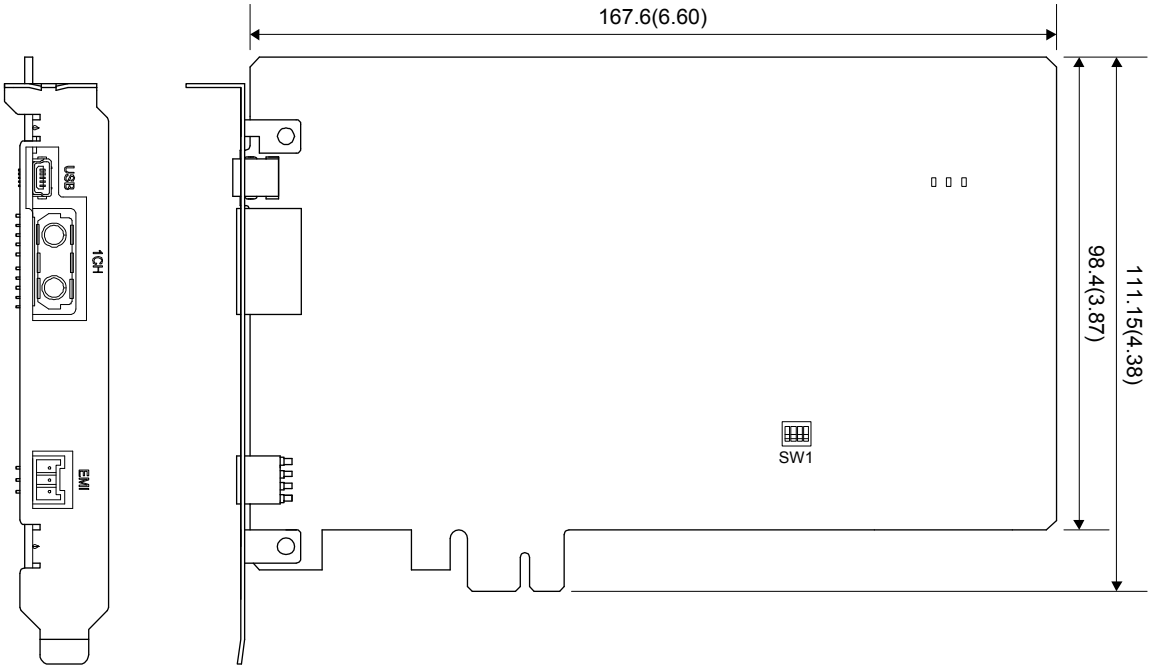


App. 8.2 PCI Express® bus compatible position board

(1) MR-MC240

The MR-MC240 is a PCI Express® short card size.

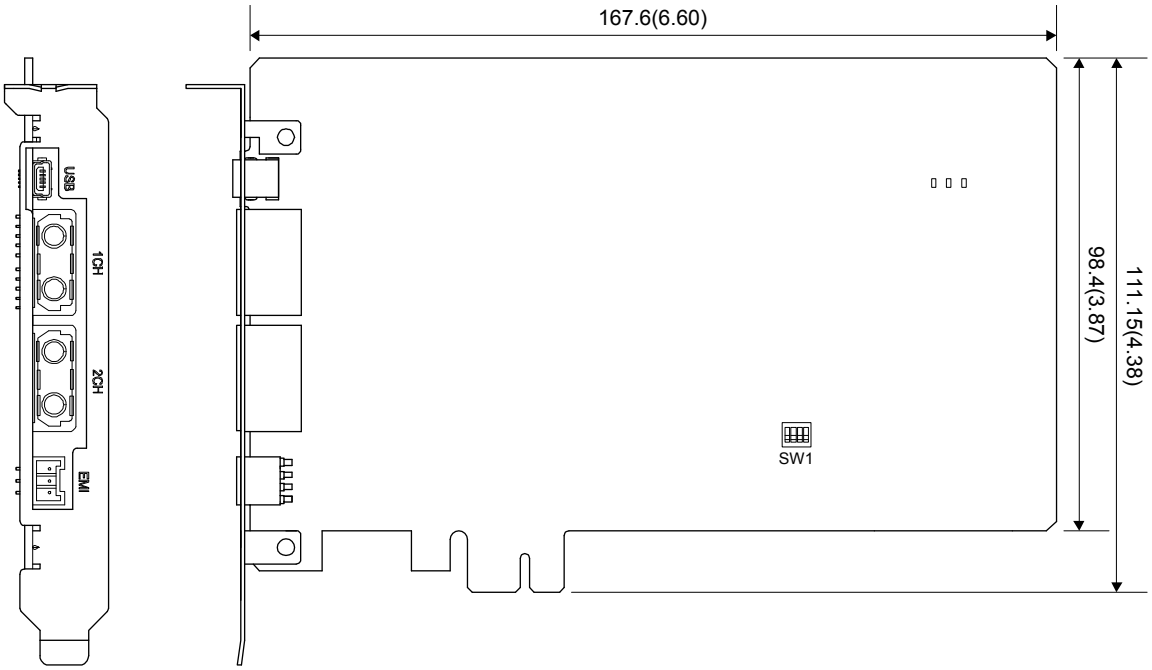
[Unit mm(inch)]




(2) MR-MC241

The MR-MC241 is a PCI Express® short card size.

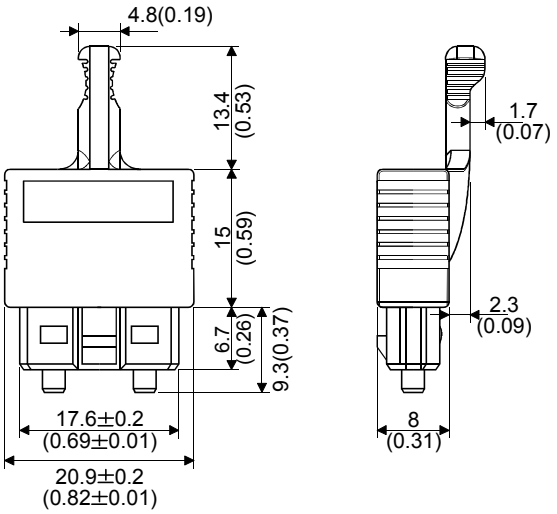
[Unit mm(inch)]



App. 8.3 Connectors

(1) SSCNETⅢ cable connector

[Unit: mm(inch)]

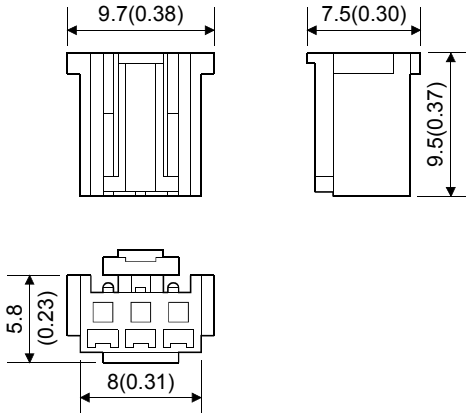



(2) Forced stop connector (Molex Incorporated make)

Type Connector: 51103-0300

Terminal: 50351-8100

[Unit: mm(inch)]



# WARRANTY

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

1. Gratis Warranty Term and Gratis Warranty Range

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 are repaired or replaced.

[Gratis Warranty Term]

The term of warranty for Product is thirty six (36) months after your purchase or delivery of the Product to a place designated by you or forty two (42) months from the date of manufacture whichever comes first "Warranty Period". Warranty period for repaired Product cannot exceed beyond the original warranty period before any repair work.

[Gratis Warranty Range]

(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, relay, fuse, 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. Onerous Repair Term after Discontinuation 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

Whether under or after the term of warranty, we assume no responsibility for any damages arisen from causes for which we are not responsible, any losses of opportunity and/or profit incurred by you due to a failure of the Product, any damages, secondary damages or compensation for accidents arisen under a specific circumstance that are foreseen or unforeseen by our company, any damages to products other than the Product, and also compensation for any replacement work, readjustment, start-up test run of local machines and the Product and any other operations conducted by you.

5. Change of Product specifications

Specifications listed in our catalogs, manuals or technical documents may be changed without notice.

6. Precautions for Choosing the Products

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

(2) Our Position 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.

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PCI Express is a registered trademark of PCI-SIG.
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# POSITION BOARD User's Manual (Details)

# (MR-MC210/MR-MC211/MR-MC240/MR-MC241)

| | |
|---|---|
| MODEL | MRMC2-U-S-E |
| MODEL CODE | 1XB968 |
| IB(NA)-0300223-C(1508)MEE | |

**MITSUBISHI ELECTRIC CORPORATION**

HEAD OFFICE : TOKYO BUILDING, 2-7-3 MARUNOUCHI, CHIYODA-KU, TOKYO 100-8310, JAPAN
NAGOYA WORKS : 1-14 , YADA-MINAMI 5-CHOME , HIGASHI-KU, NAGOYA , JAPAN

When exported from Japan, this manual does not require application to the Ministry of Economy, Trade and Industry for service transaction permission.

Specifications subject to change without notice.